Transactions of the Medical Society of King's College, London.

TRANSACTIONS

OF THE

MEDICAL SOCIETY

OF

KING'S COLLEGE, LONDON.

VOL. I.—WINTER SESSION, 1856-7.

EDITED BY

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MDCCCLVII.

King's College Hospital,

August 1857.

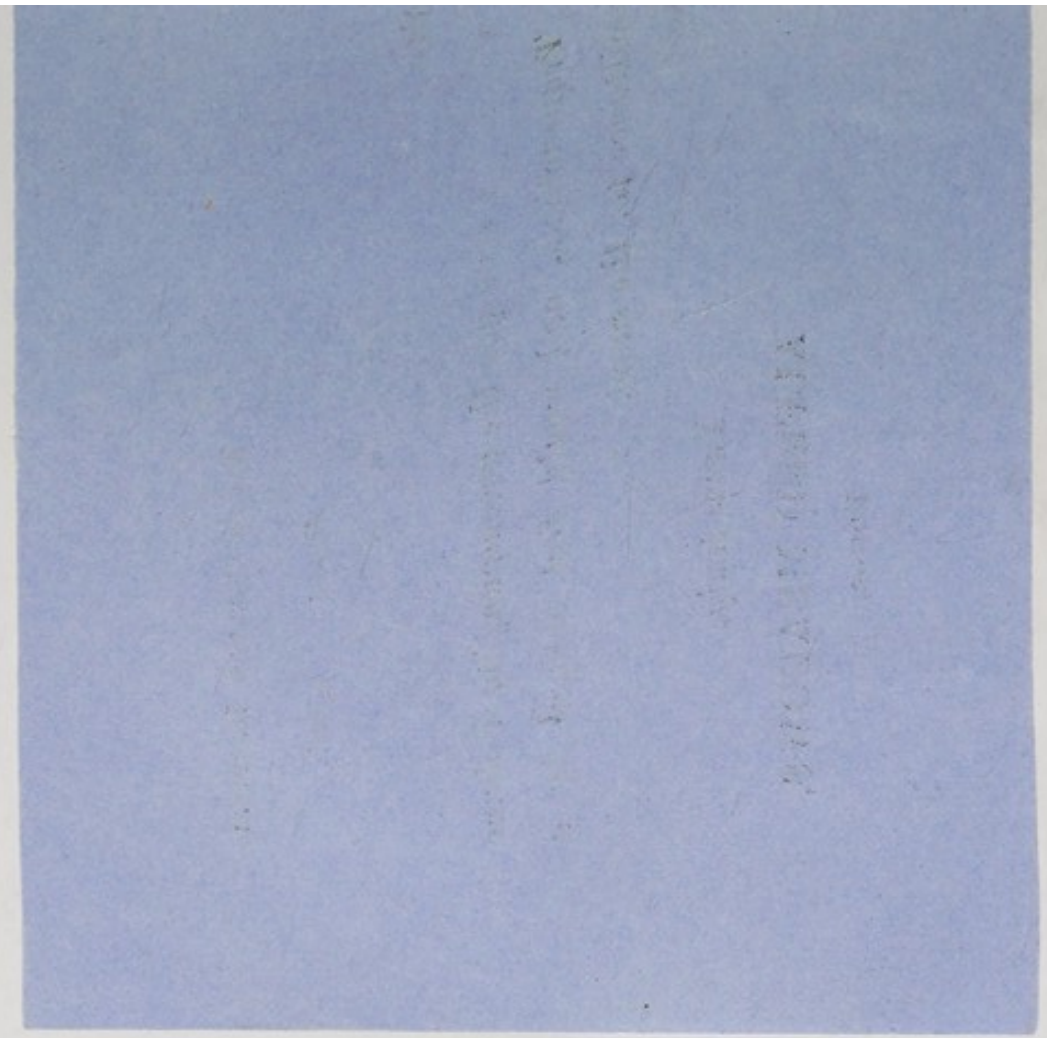
Sir,

I send you the accompanying Volume of Transactions, and would feel obliged by a Remittance for the same.

Yours truly,

ALFRED MEADOWS,

Editor.



To

GEORGE JOHNSON, M.D.,

PROFESSOR OF MATERIA MEDICA IN KING'S COLLEGE; PHYSICIAN TO KING'S COLLEGE HOSPITAL,

THIS VOLUME IS RESPECTFULLY DEDICATED AT THE UNANIMOUS WISH OF

The Members

OF THE

KING'S COLLEGE MEDICAL SOCIETY;

AS A TESTIMONY OF RESPECT AND ESTEEM,
AND IN GRATEFUL ACKNOWLEDGEMENT OF THE KIND MANNER IN WHICH HE PRESIDED OVER THEIR MEETINGS DURING THE WINTER SESSION, 1856-7.

PREFACE.

SINCE the foundation of this Society in 1833, many very instructive papers have been read, and numerous interesting cases and descriptions of pathological specimens communicated, by different corresponding members in various parts of the kingdom; unfortunately, however, no record has ever been made of these transactions, and thus much valuable information has been lost, together with many suggestions, originating in minds not perhaps qualified by the experience of age, yet possessed of great ingenuity and showing much thought.

Conscious of this, the members of this Society determined on publishing their transactions, in doing which, however, it is not presumed by the authors that their papers are to take their stand, or to bear a comparison with medical or surgical literature in general; they all feel that there may be in them numerous errors, which more extended observation would serve to correct, and they only wish that in judging of their value, the reader will be disposed to consider the circumstances under which they are written.

It is also hoped that this, the first volume of these transactions, though at present a small thing, may be the nucleus

of a work which some day may rival any similar publication. It is much to be regretted that the staff of the Hospital connected with King's College, as well as that of other Hospitals, does not annually publish some account of its own experiences. I am sure that such a step would confer incalculable benefit to the several schools connected with these institutions, while at the same time it would be giving to the profession at large the results of those opportunities for investigation which no one unconnected with such an establishment is permitted to enjoy.

In sending out this publication to the world there are thus several reasons which have actuated the members of this Society in the course they have adopted, and however feeble their efforts may seem, or fruitless their results, they have this great cause for satisfaction—that the spirit which prompts them is that which is the moving spring of their Society—the cultivation of medicine and the auxiliary sciences by the propagation of a spirit of original observation and research, and of a feeling of friendship and co-operation among those engaged in the pursuit of these sciences.

EDITOR.

KING'S COLLEGE, LONDON,
August, 1857.

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INTRODUCTORY ADDRESS

DELIVERED BY

HYDE SALTER, M.D., F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, LECTURER ON PHYSIOLOGY AND PATHOLOGY AT THE CHARING-CROSS HOSPITAL MEDICAL COLLEGE, AND ASSISTANT PHYSICIAN TO THE HOSPITAL.

GENTLEMEN,

It is a very bad omen of the quality of an address when the orator begins by talking of himself. But the circumstances under which I appear before you to-night are so exceptional that I must beg you to pardon my leading off with a little egotism; for without speaking of myself I cannot explain to you those circumstances, and they alone can give you the reason of, and plead the excuse for, the paucity and poverty of what I have to offer you to-night. If you please, I will relate those circumstances in a narrative form—it may move you the more.

Late one dismal, dark, and rainy autumn evening, worn out with his day's work, very tired and very wet, wet without and wet within (for the rain had acted as a cold shower-bath, and his exercise had acted as a sudorific), a humble and unfortunate member of our noble profession was seeking the haven of his own home. As his door yielded to his latch-key the bright light of his hall-lamp was very pleasant to his eyes. His thoughts were of tea. But the proverbial slip between the cup and the lip was soon administered to him by

his servant, who waylaid him with the message, that a neighbouring physician had "called for him twice, and wished particularly to see him."

Now, that greeting, gentlemen, which sends you out from whence you came the moment you had fancied yourself snugly home, and indefinitely postpones your comfortable and almost realized visions of a fire, a lamp, and a book, gives rise to very mixed sensations—to very *dulcamarous*, very bitter-sweet feelings. On the one hand, all is cheerful and comfortable within, all is dark and dismal without, and you are tired, and, it may be, wet; on the other hand, the hardship of facing any weather and any fatigue, at any hour of the twenty-four, is greatly counterbalanced by very weighty reasons—reasons of very considerable specific gravity.

"Called twice!" thus soliloquized this worthy man; "case of a guinea, depend upon it;—let me see though; a consultation; that's *two* guineas. Called twice! the patient must be very ill—two or three visits a day, I dare say. Perhaps it's out of town—long journey—who knows? I'll be off at once." For this good man was somewhat affected with the spirit of John Gilpin,—

> . . . . . and loss of tea,
> Although it grieved him sore,
> Yet loss of guineas well he knew
> Would trouble him much more.

So off he started: and being, as I said before, rather in a sudorific condition, and being disposed to prefer prophylactics to therapeutics when he himself was his own patient, he set off in a run to prevent getting chilled. He became immediately conscious that two suspicious-looking individuals whom he met, stopped, turned, and followed him; he quickened his pace, they quickened theirs, they gained on him,

they overtook him, they stopped him. And on turning to confront them he recognized—whom do you think? None other than two distinguished students of King's College, and two prominent members of this Society! And what do you think they said to him? "Oh, Dr. ——! we are in a fix—a most dreadful fix—we want you to deliver the introductory address at the opening of the Medical Society of King's College, the day after to-morrow." His fears were at once turned into compassion. "Poor fellows!" he thought, "they can't be quite right up here—they must be very far gone." However, he did not *say* so; what he did say was—"Deliver the introductory address the day after to-morrow? Impossible! I thought S—— was going to give it. I saw it positively advertised on your cards, this very day." "Oh, S——," they said, "is gone to Jersey, and says he can't give it." "Well," said the little doctor, "it's utterly impossible. But I'm in a perspiration; I mustn't stand here; just walk a little way with me, I am only going to Dr. ——'s, close by." "Oh!" they said, "we have just come from there; that's what he wants to talk to you about." "That's what he wants to talk to me about, is it!!" Down went the visions of the guineas—down went the consultations, and the daily visits, and the journeys into the country—down went the *spes lucri* altogether. Surely this was slip number two between the cup and the lip.

Well,—to make a long story short—the unsuspecting and unoffending doctor that was thus waylaid was the victimized individual who stands before you; the bandits who beset him were Messrs. Anstie and Siccama; and the doctor to whose house they adjourned was your respected President.*

* Dr. George Johnson.

To their united solicitations I opposed the reply, that "that which was impossible seldom happened, and very rarely came to pass." But this impossibility was immediately met by another, a counter impossibility—the impossibility, namely, of refusing the collective request of the King's College Medical Society, comprising, as it does, the best of the students of King's College. And this impossibility was backed by another impossibility—that, namely, of refusing what was begged as a personal favour by one, my deep and warm regard for whom is shared by you all, and to whom I have especial reason for feeling under obligation, for within the past fortnight he has been the kind and solicitous attendant at my sick bed.

I found, therefore, that impossibilities were ranged rather on the side of my giving the address than against it; so I surrendered at discretion; and the result is that you see me before you to-night, full of good intentions and wishes, but, I fear, with rather an empty head, and but a small amount of paper indifferently spoiled.

Such, gentlemen, with a little oratorical license, is a true and particular account of the way in which an unsuspecting man was trepanned the evening before last;—the *dramatis personæ*, such as I have mentioned to you; the hour, half-past eight in the evening; the scene, the western side of Russell Square.

Now, with only one clear day to collect my ideas, and engagements numerous and various enough to prevent any collecting of ideas at all—hospital practice, physiological lectures, private engagements, &c.,—I am sure I shall not plead in vain for your indulgence.

But while I ask you for your indulgence I do *not* ask you for your sympathy. The pleasure I have at feeling I have stood by the Medical Society of King's College at a pinch,

and stopped a gap for them, and especially the pleasure I feel at finding myself once more surrounded by the persons and associations, many relations with whom constituted the happiness of five of the pleasantest years of my life, will not let me have the face to ask you for your sympathy. When I see myself surrounded by those who were my superiors and teachers once, and always my friends,—your excellent Principal who has never, for twelve years past, to my knowledge, failed to give his presence and countenance to the inaugural meetings of this society, who has so long been the "*dulce decus*," as well as the "*presidium*" of this college, whose name will always be associated with its prosperity, and who so well knows how to combine those two characters so difficult of combination, but so essential to his onerous and responsible position—the authoritive head of this great institution, and the considerate friend of every student. When I see around me those who were my first teachers in medical knowledge, and from whose experience and wisdom I received lessons of which I shall never cease to feel the value—when I see around me those who were my fellow-students, and who are now, like myself, teachers of the sciences we once learnt side by side—when I see around me those who sit where I once sat, and who now are what I once was—what I once was to my great and lasting advantage—medical students of King's College—how can I be otherwise than moved by feelings the most pleasurable?

I remember once, on an occasion identical with the present—the inaugural meeting, namely, of this Society—that the president of the year, one of the most distinguished and witty of your staff of teachers,* taunted another,† who had

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* Professor Partridge. † Mr. Simon.

recently seceded from the college, with inconstancy, because, having (as he expressed it in Jacobite phrase) gone "over the water," he still came back to frequent his old haunts, and could not keep himself from the meetings of your society; and he reminded him that

> "It's good to be off with the old love
> Before you are on with the new."

Now, this sentiment, or rather its application to such a case, I utterly repudiate. You might as well forbid a man to love his mother because he loves his wife, as tell him to forget his alma mater because he has become attached to another school: they are kinds of affection that are diverse and perfectly compatible. Of course I give my chief energies and all my efforts to my own school; I am bound to, by every motive; but I do not feel that that tends in any way to shake my old attachments, or to weaken the feelings with which I must ever regard this place.

But, gentlemen, you will tell me that my lecture is all exordium—that having very little fruit I am giving you very thick pie-crust—that I am padding my figure to hide its thinness. Let me then cut my pie, and see what there is in it—let me hasten to the more serious part of these few fragmentary observations.

And I think I shall say best what I want to say to you, by dividing you into two classes. There are many ways in which I might divide you. I am afraid I might divide you (if students are not very much changed since I was a student—no very long time ago) into working men and indolent men, (though I hope the last are in an increasingly small minority.) I might divide you, I am afraid, too, into college men and hospital men—a division that ought never to exist—you ought all to be both. Or, I might divide you, by a

division often adopted, but altogether a mistake, into the reading men and the practical men—for no man who does not read can have the basis of rational practice. And if I possessed the acumen of the Rt. Hon. Member for the University of Oxford, I have no doubt I could suggest many more methods of dividing you. But I shall adopt none of these divisions; I shall simply divide you into those who do not, and those who do, belong to the Medical Society of King's College; a very simple and inevitable division, and one that must include you all.

To those who are *not* members of the Medical Society, I have one piece of advice to give, and several reasons to offer there for.

My single piece of advice is—*Join the Medical Society of King's College, and join it at once.*

And now for my reasons.—

But before I give you my *special* reasons let me make one or two general observations.

Nothing is good, or great, or lasting that is not based on some principle or requirement of man's nature. Man is a *social* animal, he is by nature gregarious—he herds. Gregarious habits are given to birds and beasts for beneficent purposes—their comfort, their convenience, their safety. But to man for the achievement of great deeds, for doing that for which his divided energies would be perfectly inadequate, for the perfection of his civilization, for strengthening his grasp on inanimate nature, for confirming his domination over the earth and its inhabitants.

Man also differs from the beasts in being an *accumulative* animal. He is acquisitive, retentive, and communicative, and therefore, accumulative; and not only accumulative by transmission and inheritance, but by concentration. And how?

By banding with his fellows for a definite object, by concerting means for compassing a pre-determined end, by concentrating an immense number of individual energies on one point, by the accumulation of resources, by the division of labour.

And this view seems to me to vindicate from the charge of unnaturalness, that advanced, and elaborate, and refined state of civilisation in which we find ourselves. For surely that to which man himself has brought himself, that which springs spontaneously from the exigencies of his nature, must be natural. Given, (in mathematical phrase) the formula that would represent the various factors or forces of man's nature and circumstances, and civilisation would be their inevitable resultant. It is as much man's nature to be progressive as it is that of the beasts to stagnate in their primæval helplessness.

And how does man thus band together, and concert, and concentrate, and accumulate? By forming societies, and associations, and companies. Yes, and we may even include under the same category those wider systems, those great political and social combinations, which have parcelled out the world into republics, and principalities, and kingdoms, and empires.

And surely there never was a time in the history of the world so teeming with societies and combinations of men as the present day. Just look around you and think of the immense number of societies there are in London alone. There is hardly a thing that can be named or thought of that is not represented by a society; there is not an object that man pursues, not a science that he studies, not an enterprise that he undertakes, that is not represented by a society. For *religious* objects how many there are!—The Bible Society,

the Pastoral Aid Society, the Church Missionary Society, the Chinese Evangelization Society, the Book Society for Promoting Religious Knowledge, the Christian Instruction Society, the Christian Mutual Provident Society, the Church of England Educational Society, the Church of England Liturgical Revision Society, the Church of England Young Men's Society, the Baptist Missionary Society, the Baptist Home Mission Society, the Congregational School Society, the Church Protestant Defence Society, the Church Building Society, the Colonial Church and School Society, the Colonial Missionary Society, the Eclectic Society of London, the Religious Tract Society, the Monthly Tract Society, the Weekly Tract Society, the Evangelical Continental Society, the Foreign Aid Society, the London Diocesan Church Building Society, the Hibernian Society, the London Missionary Society, the Society for Promoting Christianity among the Jews, the Society for the Propagation of the Gospel among the Jews, (as if the two were not the same thing) the Lord's Day Observance Society, the Prayer Book and Homily Society, the Society for Promoting Christian Knowledge, the Society for the Propagation of the Gospel in Foreign Parts, &c., &c. For *Social* and *Moral* purposes societies are innumerable; we have the Humane Society, the Temperance Society, the Society for the Protection of Life from Fire, the Model Lodging House Society, the Mendicity Society, the Society for the Protection of Young Females, the Provident Society, the Shipwrecked Mariners' Society, the Indigent Blind Visiting Society, the Home and Colonial School Society, the Society for Promoting District Visiting, the Friendly Society for Visiting and Relieving the Sick, the Aged Pilgrims' Friend Society, the Strangers' Friend Society, the Alleged Lunatics' Friend Society, the Anti-Slavery

Society, the Apprenticeship Society, the Mutual Improvement Society, (a most excellent one) the Benevolent Society of Blues, the British and Foreign School Society, the British and Foreign Female Emigration Society, the Society for Aged and Infirm Deaf and Dumb, the London General Pension Society, the Clergy Orphan Society, the Family Colonization Society, the Deaf and Dumb Society, the Female Aid Society, the Female Servants' Home Society, the Society for the Prevention of Cruelty to Animals, and a great number more of similar Societies. Then again in *Scientific* Societies, we have the Botanical Society, the British Natural History Society, the Chemical Society, the Horticultural Society, the Linnæan Society, the Microscopical Society, the Numismatic Society, the Antiquarian Society, the Asiatic Society, the Astronomical Society, the Royal Society, the Statistical Society, the Paleontographical Society, the Paleontological Society, the Archœological Society, the Entomological Society, the Ethnological Society, the Geological Society, the Genealogical Society, the Meteorological Society, the Ornithological Society, the Phytological Society, the Philological Society, the Zoological Society, the Epidemiological Society, and a host of similar societies. As purely medical societies, there are the Medico-Chirurgical Society, the Medical Society of London, the Pathological Society, the Pharmaceutical Society, the Hunterian Society, the Harveian Society, innumerable local medical Societies, and numbers of these for charitable and benevolent purposes confined to the profession, among which the Medical Benevolent College would occupy a first place. Among the other professions Societies are equally numerous; the same in the different trades, some of which rejoice in very circumscribed objects and very long names,—as for instance,

the London District Letter-Carriers' Assistant Pension and Widows' and Orphans' Annuity Society, and the Society for Providing Asylum and Relief for Aged and Infirm Fishmongers and Poulterers. For the mere purpose of *publishing books* on special subjects I know at least six—the Architectural Publishing Society, the Camden Society, the Cavendish Society, the Parker Society, the Ray Society, and the Sydenham Society. And besides those to which the particular name of "society" is given, there are innumerable others that are just as much societies, under the names of Homes, Committees, Institutes, Unions, Institutions, Associations, Colleges, Leagues, Guilds, Missions, Funds, Reformatories, Clubs, Academies, Charities, Hospitals, Infirmaries, Asylums, and Companies—for Reforming, Reviving, Protecting, Nursing, Relieving, Curing, Educating, Rescuing, Defending, Preventing, Promoting; and for all sorts and conditions of men—Christians and heathen, compatriots and foreigners, the poor, aged, friendless, deaf, dumb, blind, halt, diseased, injured, convalescent—in short, for doing everything to every body.

Now, all this great system, this complex machinery, is the offspring of man's exigencies, the spontaneous fruit of his requirements, and springs immediately from his gregarious, restless, determined, progressive nature. Of this great system your society forms an integral, though humble part, it springs from the same causes, and answers the same ends, and of the common advantage of all societies—the unity of design, intensity and concentration of energy, division of responsibility, division of labour, accumulation of resources, and mutual support—it has its share.

But leaving these general advantages which it shares in common with all other Societies, let me just glance at a few

of those special advantages which your Society holds out to its members, and which are therefore motives for joining it.

1. In the first place it offers an additional way of gaining knowledge, a method of medical study very different from any that the theatre, or the hospital-ward, or any other of the means of professional culture with which you are so abundantly supplied, can offer you. This multiplication of the methods of study is of great value, and is attended by advantages of which the earnest student will not be slow to avail himself. These advantages are twofold. One is, that every additional method of acquiring knowledge gives you an additional kind of information; you cannot get exactly the same kind of knowledge in two different ways;—you look at the same object, but it is at another side of it; you view the same phenomena, but it is through a different medium; thus each method of study is complemental to the rest, and possesses some advantage which all the others put together could not supply. The other advantage arises from the mere variety itself; it makes the acquisition of knowledge more vivacious, more interesting and impressive, and relieves the mind at once from the stress of monotonous effort; for the same work pursued in two different ways is no longer the same work, and the passage from one form of study to another gives the mind all the refreshment of absolute relaxation; nay, more, it combines at once the advantages of rest and exercise, and by banishing fatigue from uninterrupted work increases almost indefinitely our powers of acquisition.

2. The suggestiveness of dialogue, the vivacity of immediate rejoinder, are advantages attaching to oral discussion, that give it a most important superiority over the passive reception

of information from books or from lectures. As we follow the speaker thought after thought starts up, to which in our turn, while the impression is fresh upon us, we give utterance. Objections are raised, questions are put, misconceptions are removed; the fleeting idea is seized as it passes through the mind, and the thought just trembling into life is confirmed by utterance, which otherwise might have slipped back into darkness, never after to be called forth. Our observations become in turn a fresh centre for thought to start from, and for criticism to be directed upon. And so we go on, wandering away into all the ramifications of the subject under discussion, till we have thoroughly probed and sifted it in every part. Each man acts as a foil to his neighbour, and serves to "bring him out;" and I assure you I have often gone away from one of this Society's debates surprised at the knowledge of the subject I had evinced, and equally surprised, I may say, at the amount I had learned.

3. We are all apt individually to get into a rut, to work upon a tram-road from which we cannot wander, and to think in a certain formulated way. In the debates of societies the discussions are influenced by other minds than our own, and thoughts are suggested to us which would never have occurred to us spontaneously, and thus the field of our speculations is widened, and we get more enterprize and variety of thought, our knowledge is less fragmentary and partial, and our thoughts and attention less confined to our own particular hobbies. There is many a department of medical knowledge that if left to ourselves we should never work. We are all disposed, more or less, to become specialists, to become *eccentric*, to wander away from the *juste milieu*. Our intellectual nature is subject to the same laws as our moral, and intellectual

isolation is fraught with the same evils as social isolation; the man who never exchanges ideas becomes intellectually what the man who never exchanges the charities of life is morally, the book-worm is the counter part of the recluse—one-sided, partial, prejudiced, preoccupied, crotchetty, and generally, egotistical and obstinate. His intellect may be in size a giant, but in shape it is a dwarf, misshapen and outgrown. Now, for the correction of this eccentric tendency, this disposition to deepen and strengthen the lines of our peculiarities (which, indeed, in itself is a wholesome force, and without which we should never maintain our individuality), I know of no remedy but its normal corrective, attrition, namely, with other minds; and nothing in my opinion better supplies this than the debates of such societies as yours, for nothing can furnish more active and intimate mental friction.

4. Perhaps the greatest good to be derived from attending, and taking an active part in, the debates of such a society as this, results from the familiarity you will thereby acquire with the sound of your own voice. How strange it is, that that which is a part of ourselves, our constant companion as it were, can be converted into a source of such terror to us; and yet I know some men who would rather hear a lion roar, than hear the sound of their own voices; who would rather engage the garrison of Pandemonium in single fight than speak in public. A man's own voice is a sound before which the stoutest heart will quail, and the clearest intellect collapse; it is a terror that haunts many men all their lives, damps their energy, cripples their usefulness, keeps able men in the back ground, and deters them from doing good to others or justice to themselves; they will not attend this meeting or that public dinner, for fear they shall have to

speak; and if circumstances force them on their legs their terror and mental syncope is so complete that it is positively painful to witness. Such men are perpetual ἑαυτὸν τιμωρούμενοι, and as good specimens of that miserable class as the hero of Terence's immortal play. One might apply to them with perfect aptitude those lines of Horace—

> "Vix credere possis
> Quam sibi non sit amicus; ita ut pater ille, Terenti
> Fabula quem miserum nato vixisse fugato
> Inducit, non se pejus crucia verit, atque hic." *

How often have I contrasted the private conversation and public speaking of able, but sensitive men; the one so pleasant, lucid, and fluent; the other so halting, fragmentary, and confused. And I know no class of men who suffer more from this form of self-torture than medical men, and none who, as a body, are worse speakers. They say medical men write badly; I am sure they speak worse. I have often contrasted, at the public dinner or on the platform, the way in which the clergyman and the doctor acquit themselves, and the contrast is always to the disadvantage of the doctor. The clergyman gets up so self-possessed, so much at home, all that he says so neat, so natural, and his own comfort and unrestraint so conspicuous, that you cannot but feel the same from very sympathy in listening to him. Then up gets the poor doctor, ready to sink into the earth; he boggles, stammers, and flounders on, now at a loss for a word, and now for an idea, telling you as plainly as he can, although he may not say it, that he is indeed "unaccustomed to public speaking," and filling you with sympathetic feelings that are anything but comfortable. But what is the reason of this

* Sat. I. ii. 20.

contrast? Simply this, that the clergyman's avocations make public speaking a weekly, almost a daily occupation; while the doctor never speaks, and perhaps never *has* spoken in public in his life. There is no profession so badly off as the medical for the acquisition of this habit; and it is for this reason that I would have you now, early in life, avail yourselves of the opportunities offered you, and which, amidst the pre-occupations and distractions of active professional life, may never again occur, of acquiring the invaluable art of easy and fluent speech, and of expressing your ideas in public. For it is an art that I am sure is in a great degree to be acquired; it is very much a matter of habit, and, like other things, the earlier the practice is adopted the better.

5. By entering into the proceedings of this society, and taking an active part in its meetings, you will invest matters of professional debate with a personal interest. You will feel that you have a stake in all that goes on. Here you are not mere passive recipients, as in the lecture room; all are teachers, all are equal. In a very interesting lecture on "Memory" that Cardinal Wiseman recently delivered, he said it had been very well remarked, by some one (I forget who), that people could remember any thing that it was their interest to remember. Now there is nothing that makes a thing more interesting to us than investing it with a personal relation to ourselves. Depend upon it, a man will never forget that about which he can say *quorum magna pars fui.* Again, one man thinks he writes a good paper, another that he speaks well, and that induces him to work different subjects up in order to display his powers; and we may be very sure that the subject-matter of a paper or discussion in which a man has shone will not be readily forgotten by him. And thus self-love, that omnipotent motive, that upon which all other strong feelings of

our nature—self-preservation, gratitude, revenge—are based, may be made auxiliary to your professional progress.

6. You will learn by practice to debate with temperance, to *differ* without *disagreeing;* in fact, you will learn to *agree to differ*. You will learn to distinguish between entertaining difference of opinion and personal acrimony; you will learn that facts in science and opinions on intellectual subjects are matters for thought and not for feeling; and you will learn in your gladiatorial exercises here to make the edge of your weapons not only sharp but smooth; and, while you strike home, to rob your blows of all vulgar weight and violence. Your combats here are not *à l'outrance,* but gentle tournays just for the love of your ladye fair; that ladye fair is Truth, and her knight-errants are ever courteous. It is the unopposed will, the unquestioned opinion, that is intolerant; it is the unseasoned horse that is easily galled. See two little urchins sparring together, how soon they lose their temper; the practised athlete never loses his temper.

7. The differences of opinion that debate will call forth, and the conviction, which those debates will often force upon you, that there is good ground for the opinions of those who differ from you, will teach you to hold your opinions lightly and with liberality to others, and to think that others may be right as well as yourselves. You will come sometimes to this Society's meetings with your minds fully made up, thinking that you *can't* be wrong; as the debate proceeds you will think that you *may* be wrong; and you will leave with the conviction that you *must* be wrong; and this, without interfering with the sincerity of your convictions, will tend more than anything else to give you a wide charity on subjects intellectual, and to break down that impenetrable wall of self-satisfied complacency, with which those who

never expose themselves to mental attrition with others are so apt to surround themselves. It will give you an openness to conviction; it will render your minds *tabulæ rasæ*, sensitive recipients of the impress of every fresh fact; it will prevent that confirmed preoccupation which is so obstructive to all progress, and which so effectually bars the avenues of access to the mind.

8. In the very constitution of your society, composed as it is of members who are young in age and students in position, you will possess a great advantage. There is about the debates and speculations of the young an untrammelled enterprize that has often excited my admiration, and (I suppose I am old enough to say) almost my envy. We teachers who go on year after year grinding eternally round and round like mill-horses in the same unvarying circle, uttering in the same stereotyped and formulated way the same facts (and, I am sorry to say, the same jokes) lose the lithe and supple play of thought which the young possess. We get wedded to our notions, they become a part of ourselves, we get an affection for them, we make it a point of honour to maintain them, we regard with pious horror the bare thought of questioning them.—"What! no truth in what I have been teaching for thirty years? the moon not made of cream cheese after all? *Procul este profani!*" The young are troubled with no such qualms. They possess that glorious self-reliance which springs from the conscious possession of newly found and daily increasing powers. They are told of so much that they are *not* to believe, the wrecks of so many exploded theories are exposed to them, that they do not think it altogether an unpardonable sin to regard even what is recommended them as orthodox as possibly questionable. Their march has been so rapid that they do not fear to throw

out skirmishers far beyond the lines from which the veterans in science would hesitate to advance. We teachers, too, like all who are in possession, or who are placed in situations of authority and responsibility, become from our very position conservatives;—we sit on the ministerial side of the house, we are inside the city walls, we therefore observe a defensive position. The young are a sort of Chartists in science, and exercise a kind of free thinking as appropriate in matters of speculation as it is inappropriate in matters of faith. Doubtless this enterprise of thought has its disadvantages, and the freight may sometimes be placed in danger from want of ballast, but on the whole it is a good fault. The young have another great advantage. First impressions are generally correct impressions, and most impressions on the minds of the young *are* first impressions. Truth falls on their young thought in its naked simplicity. To the minds of the old every fresh fact comes wrapt up in some theory or explanation which may altogether conceal it, and it is stowed away, not in some nitch made for it, but in one whose shape is regulated by the previous occupants of the mind, and to fit which it must be twisted quite out of shape. We are all familiar with the almost instinctive acuteness of children, and a power of observation that often looks like intuition. Now I do not think that this depends on their exercising faculties that older people do not possess, but simply on their seeing things just as they are. The same thing is repeated in the infancy of scientific life. As the visible things of the natural world fall on the eye of the infant, so on the mind's eye of the young student fall the facts of science. He sees them at once in their simplicity and entirety; he takes them for just what they are worth; and as far as mere appearances will warrant conclusions he arrives at those conclusions infallibly

and at once. And there is yet a third advantage, conducing to truthfulness of impression, which the young possess, depending on their tenacity of memory. Things new and old make an equal impression on them, nothing is forgotten, and their opinions are formed on a fair average of their whole experience, of recent as well as of long past events. But as we get older our memory of recent things becomes from our diminished impressibility more and more feeble; recent impressions exercise less and less permanently their proper corrective influence over old ones,—we are converted to-day, but to-morrow we fall back into the old belief. The character of the papers and debates in this society have often suggested to my mind such thoughts as these; and, acting on a conviction of their truth, I have often consulted the impressions of the young when I have mistrusted my own, and generally with advantage.

9. Another, and no mean good, resulting from your joining this society, will be that your intercourse here, your meetings for a common object, your cultivation of a common pursuit, your discussion together of subjects of a common interest, will be a bond to bind you to one another, and a most worthy and reliable foundation of permanent and life-long friendships. Depend upon it there is nothing like community of tastes and pursuits to cement friendships; and the stronger the love for the object pursued, and the more intimate and personal the relations that its common pursuit gives rise to, the stronger and faster will be the friendship that will be built upon it. Bulwer says that the love that binds man to woman is not stronger than that wherewith the student is enamoured of his studies. No wonder then that such is the case. No wonder that such genuine worshippers at the same shrine should find, in their common devotion to such dearly-

loved objects, the bond of an indissoluble brotherhood. Look at the friendships of Ray and Willoughby, of Gilbert White and Pennant, of Rudolphi and Bremser, of Reaumer and Bonnet, of Kirby and Spence, of Owen and Bell. The finest and fairest friendships that the social history of mankind furnishes us with have been friendships of this kind; and some of the most precious knowledge that we have inherited has been bequeathed to us in the familiar letters of these fast friends. It is, I believe, from this circumstance, from the fact that they start from the common possession of the same deep, strong passion—the love of knowledge, that college friendships are the pleasantest and the most permanent that are ever formed. There is something so pure and elevating, so unpersonal and unselfish, in the love and pursuit of knowledge, that it cannot but have an ennobling effect on a man's character, and adapt him for a higher kind of social intercourse and a purer friendship. But you *must* have the social intercourse, as well as the love of science. The most exact correspondence of tastes may exist, but unless the possessors of it are brought into personal contact it remains unknown, it becomes a dead letter, and can never rise to sympathy, still less to friendship. But personal contact vivifies it, and adds to the intellectual those two still more essential elements of friendship—the personal and the moral. Now this personal contact is just what your society supplies. It is, therefore, of all your means of intellectual culture, that which will afford you the most intimate bond of union, and will add to the *advantages* the *sweets* of science. If any one questions the effect of these *reunions*, let him recognise his answer in the character of the men who the most frequent them; let him attend the scientific societies of this city, and judge for himself. I promise him he will see what

he will see nowhere else. What the effect of such intercourse is—that indescribable amenity, that dignified and simple brotherhood—I will not attempt to pourtray; but certainly it is one of the pleasantest sights that human nature affords, and one of the most delightful aspects in which to contemplate it. I believe that from the scientific and literary societies of the different European capitals might be selected the finest specimens of friendships and of men that are to be found in the world.

Such, gentlemen, are some of the advantages you will derive by joining this society and becoming its active members. It seems to me that they are neither few nor small. And, let me tell you, you will be joining a society in a state of great prosperity. At no time since its existence has it been in so flourishing a condition. It is out of debt, with some balance in hand. Its numbers are higher than ever, its meetings are well attended, its most active members are the picked men of your school.

And now let me give a few words of advice to those who *are* members of this Society.

1. Make your meetings as *practical* as possible. In your papers and discussions, I should advise you to emerge from those theoretical subjects which constitute the mere rudiments of the science of medicine, which you hear enough of in the theatre, and read enough of in your own studies, to their practical application—to therapeutics and surgery and pathology: these are subjects on which each of you may say something new, and on which each may learn something from the experience of the others that he would not get elsewhere. To this end, I should advise you to make the relations of this society with the hospital as intimate as possible; keep *pari passu* with the most interesting part of its resources; discuss

here all that goes on of importance in the wards. Such a plan would tend very powerfully to excite an interest in the clinic of your surgeons and physicians, and greatly increase the profitableness of your hospital practice. It is to the hospital that such a society as this is chiefly auxiliary; it cannot be subservient to or much connected with the dogmatical lessons of the theatre. With this view, I am glad to find so great a number of meetings allocated to exclusively clinical subjects.

2. *Bring microscopes and specimens.* There is no reason why you should not have here all the advantages of a pathological society. Such a practice would give you the advantage of *seeing*, instead of merely hearing a description; and on that advantage of seeing how many other advantages hang; what definite ideas are gained by sight, how well remembered the knowledge so gained, how essentially positive and demonstrative it is, and on how many subjects is it the only possible method of acquiring really valuable information. Morbid anatomy for instance can never form a useful or interesting part of this society's discussions unless you have specimens to show. By procuring and showing here post-mortem specimens you will be able to demonstrate the very end of your cases, and to give an additional interest to the dead-house and the ward.

3. Acquaint yourselves beforehand with the subject matter of the paper under discussion; read it up during the day or two previous; the advantage of this will be that you will understand what otherwise you might not, and will see the bearing and full meaning of what is brought before you. You will be able to institute a comparison between what you have read and the facts stated in the paper, and thus to acquire that comparative and relative knowledge which is so much more

valuable, so much more interesting, and so much better remembered, than absolute and isolated facts. You will be able to recognise what is new and what is old, what is regular and what is exceptional, and to convict the speaker when he trips; you will be able also to communicate something yourselves, to give as well as to take.

Lastly, gentlemen, let me assure you, you who are members, and especially you who are office-bearers of this society, that King's College is under great obligations to you. To your fellow-students you are unpretending but genuine benefactors, and to your teachers you are most efficient aids, for you powerfully contribute to that which they have most at heart,—the practical training of those placed under their care. For the prosperity of your society, its continued and still increasing prosperity, I most earnestly wish, and of that prosperity the list of names on this card which I hold in my hand—names of those who are pledged to take an active part in your proceedings during the ensuing session—is the best and surest omen.

ON THE VARIOUS INFLAMMATORY AFFECTIONS OF THE ENCEPHALON.

By M. J. Sturges, M.D.

In the following observations I shall attempt a brief review of the inflammatory disorders of the brain and its coverings; and in doing this I do not aim at advancing anything novel, but simply at a new arrangement of the subject.

Many things contribute to make all diseases of the brain and nervous system specially attractive. The manifold difficulties in their diagnosis,—for there is probably no class of diseases of which it is so hard accurately to interpret the meanings of their symptomatology. The mysterious connexion between the brain and mind of man, impaired by causes apparently the most trivial, and entirely dissolved with almost as much facility, perhaps for the very reason that the union is so intimate. The well-known fact that brain and nervous affections increase in frequency every year, from causes beyond the scope of our immediate observation. These, and other reasons, will induce you to concur with me in considering that we cannot too often, or too closely, direct our attention to the diseases of the brain, as it can only be by the patient investigation of many observers that we shall at length arrive at a tolerably complete knowledge of the relations which their symptoms bear to morbid actions, and of the treatment proper to the varying phases of each disease.

Inflammation, as it occurs within the cranium, may be confined to the dura mater, may affect the arachnoid possibly

alone, may reside in the adjacent surfaces of the pia mater and brain, or in the substance of the hemispheres. In addition to these seats, already sufficiently diverse, we may have the cerebellum or its meninges implicated; and finally there is the peculiar inflammation of children, acute hydrocephalus.

The pathological changes thus variously induced, are to a great extent of the same character with those occasioned by inflammation elsewhere. There are, however, some peculiarities, in consequence of the peculiar structure of the nervous substance. Most of the post-mortem changes that have been observed will be found included in the following summary.

Inflammation of the dura mater may be idiopathic; or arise from external injuries, from the extension of disease from the subjacent membranes, or be a consequence of inflammation in the internal auditory passages and mastoid cells. It has also been found associated with caries of the ethmoid bone. Idiopathic inflammation is excessively rare: one case is recorded by Abercrombie, but in *this* the arachnoid and other parts were more or less involved; as, however, there are few such cases, perhaps the annexed abstract of the autopsy will be of interest.

"A quantity of pus escaped on removing the calvarium, which was contained in a space the size of a crown piece, on the anterior part of the right hemisphere, and defined by an elevated margin of adventitious membrane by which the dura mater had adhered to the bone. The included dura mater was depressed, and its surface in some places ulcerated, in others black, but the membrane was entire, and the bone sound. Held up to the light, this part of the membrane appeared thickened in some places, and thinner in others. The superior surface of the right hemisphere of the brain was

covered with a thin layer of thick pus, and an extensive stratum of adventitious membrane was found under the arachnoid. The pia mater between the convolutions was highly vascular, and the cerebral matter of the right hemisphere was, to a slight depth, of a dark livid colour. There was no ventricular effusion, and the brain in other respects was healthy."

When the inflammation has been connected with otitis, effusion of lymph or pus is found under the dura mater; over the carious bone especially the membrane is black and sloughy, and the brain is more or less involved; but the cerebellum more frequently, according to the observations of Mr. Toynbee. It is not uncommon to find an abscess in the cerebellum, and the tentorium along which the inflammation may have reached it, covered with coagulable lymph. When purulent otorrhœa has been of long standing, the dura mater sinuses sometimes become inflamed. This form of phlebitis is most common in early life; after death the dura mater is found adherent along the line of the affected sinuses, which are blocked up by fibrinous coagula. Generally more or less adhesion exists between the dura mater, and the visceral layer of the arachnoid, when the former has been inflamed.

To the uninitiated, the term arachnitis would imply simply an inflammation of the arachnoid, but such a disease is not recognisable during life. The word is used to indicate inflammation of the two inner meninges, and although admitted to be bad, is as good as meningitis, since the dura mater is certainly as much a membrane of the brain as the others, while for obvious reasons inflammation of it must be considered separately. Using then the words arachnitis and meningitis as synonymes, and taking inflammation of the two inner meninges together, let us glance at the pathological results.

I will not stop to enquire whether, according to the old-fashioned doctrine, the arachnoid is to be viewed as a serous membrane of the same kind as the pleura or pericardium, or whether, as Henle and Kölliker believe, its external lamina is nothing more than an epithelial lining to the dura mater; but merely remind you of its entire dependance on the pia mater for vascular supply. As we should imagine, therefore, inflammation of the one can scarcely exist without that of the other; while the post-mortem appearances are derived, in my opinion, almost entirely from the vessels of the pia mater; the subarachnoidean effusion being due to their congestion, and the transudation of serum. Without any history of inflammation, opacity and thickening of the arachnoid are often to be observed, especially in those who have been habitual drunkards, or have died of delirium tremens, and this opacity is frequently accompanied with some serous effusion. In simple acute meningitis, we observe great vascularity of the membranes, a false membrane between the arachnoid and pia mater, and effusion of serum and pus in the same situation:—we may meet with one, or other, or all, according to the progress of the disease. If effusion of lymph has occurred, adventitious membrane will be found here and there between the meninges; or the whole surface of the brain may be found covered with a stratum deposited between the arachnoid and pia mater. There is often some serous effusion about the optic chiasma, and sometimes a small quantity of serum in the ventricles, but never so much as in acute hydrocephalus. Pus is seldom a product of arachnitis, but now and then such cases occur, as that mentioned by Dr. Sieveking, where two patches of pus were discovered under the meninges on each parietal surface of the brain. A microscopical examination of the inflamed vessels of the pia mater, shows them to be

studded with minute oily-looking vesicles. Inflammation corpuscles will also be observed, which consist apparently of an aggregation of the exudation matter. They may or may not have an envelope, and are of a brownish hue. For a knowledge of their existence in meningitis, we are indebted to Professor Bennett of Edinburgh.

Encephalitis, or cerebritis, *idiopathic* and acute, is not very common, since the membranes are usually involved. The post-mortem results vary with the stage at which the disease has proved fatal. Thus, there is first the transition state of congestion, which occurs in many different circumstances. Not only may it be the precursor of inflammation, but it is to be found when death has taken place from opium or alcoholic poisoning, from an apoplectic or epileptic fit, continued fever, bronchitis, pertussis, hypertrophy of the heart, and Bright's disease. Congestion of the membranes is common in lunatics, although by no means the rule; indeed, according to my own observation, the reverse is the more usual appearance. Pinel considered congestion of the grey matter to be the pathological feature of mania. The more characteristic results of inflammation are softening, purulent infiltration, encysted abscess, and induration.

Softening, as every one now knows, is of two kinds, white and red, I think better named by Dr. Todd, atrophic and inflammatory. Atrophic softening is occasioned by causes the very opposite of those in inflammation. It is important, therefore, to be able, on seeing a portion of softened brain, to say definitely, *this* is the result of inflammation, or this depends on faulty nutrition; and this is not always easy, because colour is not an absolutely certain test. Inflammatory softening may be either simple, from the effect of the exudation matter, or it may be accompanied by suppuration.

In the *first* we shall observe a reddish hue, and the microscope will probably reveal disintegrated nerve matter, and the exudation corpuscles of Bennett; in the *second*, pus, or pyoid cells. Softening varies in degree; the cerebral matter may be little altered in consistence, or it may be perfectly diffluent. The colour varies also from straw to red, as suppuration, is or is not, conjoined. Red softening is asserted to occur most frequently in the grey matter of the brain, by the majority of writers, Dr. Watson among them, but Bennett considers that the white matter is chiefly thus affected. It certainly seems most reasonable to suppose that that portion of the brain most liberally supplied with blood should be the most liable to softening; if so, we must coincide with the former opinion. A brief review of the points of diagnosis between these two forms of softening, founded on their pathological appearances, will not be out of place.

They differ, in the first place, in their causes; in white softening the arteries leading to the part are diseased, and the consequence is, defective nutrition; in the red, inflammation has existed, exudation is the result, perhaps suppuration, and the nerve fibres subjected to this pressure may undergo a solution of their continuity. But the microscope affords the best means of diagnosis. Dr. Todd says, speaking of the eighteenth case in his Clinical Lectures, "The creamy matter contained in the cavity was found, on microscopical examination, to contain great numbers of large cells, containing oily matter in large globules, and also in a state of extremely minute subdivision. These curious organic globules might suggest the idea that some active process had been going on during life; what their precise signification is I do not pretend to determine, but I think I may affirm that they are characteristic of a state of white softening, as I have

found them in other cases in which no doubt could exist of the atrophic nature of the lesion."

On the other hand, inflammatory softening is distinguished by the presence of a large number of exudation corpuscles; or the vessels are covered with or contain in them molecules of exudation matter, this being a prior condition, in all probability. If suppuration has existed, then there will be pus or pyoid cells; and if cerebral hemorrhage has taken place, blood corpuscles, in a more or less altered state, will be observed.

Suppuration occurs concurrently with ramollissement, or may occupy the convolutions in the form of a ragged ulcer, varying in size from a fourpenny piece to half-a-crown; this is rare: or it may be infiltrated through a large extent of cerebral tissue. Thus, in one of Dr. Abercrombie's cases, for example, the whole of the posterior part of the left hemisphere of the brain was one mass of undefined suppuration, and in another the right was in a similar state. Or the pus may be collected in a cavity lined by a pyogenic membrane, as in a case in the hospital about eighteen months since, under the care of Dr. Todd, in which the abscess was seated in the cerebellum.

The last result of encephalitis I have to mention, is *induration*. It is an occasional sequence of inflammation, especially when it has been of a partial or chronic nature. Limited portions of the brain, whether superficial or deeper seated, exhibit no marked change except an increased density. Dr. Watson said they look as if they had been immersed for a short time in nitric acid. A somewhat similar condition is found in chronic and acute lead poisoning, but is then of a more general nature. Dr. Budd thinks this induration results from the condensation of the coagulable lymph, which has been slowly effused in chronic inflammation.

I have now to desire your attention to the peculiarities in the morbid anatomy of that modified inflammation which is so common among children that more than 92 per cent. of all cases of fatal inflammation of the brain occur before the age of fifteen. Modern investigation has clearly shown that this is a disease closely connected with the tubercular diathesis, and that its essence consists in the presence of tubercles in the membranes; and this is now so well established that the old name of acute hydrocephalus seems in a fair way to be replaced by that of tubercular meningitis. So late a writer as Abercrombie was not aware of the entirely tubercular character of this disease. He considered acute hydrocephalus to consist essentially in an inflammation of the central parts of the brain, and believed there were two forms of the malady; the one in which inflammation was seated in the membranes lining the ventricles; the other where it was confined to the fornix, septum lucidum, and corpus callosum. He supports his opinions by the records of two cases he had witnessed, in which the only post-mortem appearances were softening of the fornix, septum lucidum, and corpus callosum, while the symptoms during life had been those of acute hydrocephalus. No doubt such cases do happen, but they are very rare; for Dr. West states, that in thirty-eight out of forty cases he examined, an appreciable quantity of fluid was found in the ventricles—this being the leading feature; and Louis says that in seventy-five out of his one hundred and one tubercular cases, each ventricle contained a quantity of fluid varying from half an ounce to two or three ounces; how many with less he does not state, while in six only were the central parts at all softened. In all tubercular deposit was found, and this must be held to be the efficient cause of the disease. I will not detain you by recounting what is common in the pathological anatomy of this

and simple inflammation, but pass on to its distinctive features. In the greater number of hydrocephalic cases the secretion that moistens the sac of the arachnoid, instead of being increased is suppressed, and the membrane looks dull, and has a sticky feel. Probably this is due to the mechanical pressure of the intra-ventricular fluid displacing the sub-arachnoid and preventing the secretion. The membranes at the base of the brain are much more frequently affected than those on the convexity, and M. Rilliet has considered this to be pathognomonic of acute hydrocephalus. Dr. West found that the membranes at the base were diseased in thirty-four out of thirty-nine examples, and always more than at the vertex. These changes are a milky condition of the pia mater chiefly, and effusion of yellow lymph beneath the arachnoid, about the olfactory bulbs, across the longitudinal fissure, or in the fissure of Sylvius. But the pons and optic nerves are subject to the most remarkable alterations: to use the words of Dr. West: "The opacity of the arachnoid is here particularly evident, while the subjacent pia mater is opaque and thickened, and often infiltrated with a peculiar semi-transparent gelatinous matter, sometimes of a dirty yellowish-green colour. This matter is occasionally so abundant as perfectly to conceal the third and fourth nerves, and at the same time to invest the optic nerves with a coating of two or three lines in thickness; though on being dissected off, the substance of the nerves beneath appears quite healthy. When this morbid condition exists in any considerable degree, it extends beyond the pons, and involves the membranes covering the medulla oblongata, especially at its anterior surface."

The real nature of the malady, however, is attested by the existence of very small spheroidal bodies in various parts of

the membranes, about the size of a pin's head. These are either yellowish in colour and somewhat friable, or appear as grey granulations. They are sometimes seen of a dead white colour, and are considered to be then in an earlier stage. The site of the yellow is the convexity of the brain occupying usually the sulci between the convolutions. The grey occur about the pons, or in the pia mater, about the optic nerves; often also in the arachnoid lining the occipital bone, and collected round the foramen magnum. The white are mostly observed in the arachnoid covering the cerebellum. Both yellow and grey are sometimes found in the velum interpositum and choroid plexus. When these granulations are examined with the microscope, the corpuscular bodies peculiar to tubercle are detected, possessing a faint outline with granular contents. Occasionally, on separating the folds of the arachnoid, they are found glued together by an effusion of matter which looks like yellow lymph; but which in reality consists of granular bodies connected together by the lymph or pus in which they are embedded, the result of the inflammation they had excited.

The other pathological condition which is very characteristic of tubercular meningitis is serous effusion into the ventricles. This fluid is usually a transparent serum, but is sometimes turbid from the presence of surrounding brain substance in a softened state. It is generally some ounces in quantity, but never so much as in chronic hydrocephalus. The softening varies in degree, from a slight deviation from the ordinary consistence to a creamy thickness, and affects chiefly the fornix, septum lucidum, corpus callosum, and the posterior horn of the lateral ventricles, less frequently the optic thalami and corpora striata. The anterior lobes are not often affected. These parts are quite bloodless in appear-

ance. Two reasons have been assigned for this softening in acute hydrocephalus, one that it is the physical and necessary result of soaking in a watery fluid; the other that it is simply an event of inflammation. In my own opinion a fatal objection to the former theory, so plausible at first sight, is that several cases are on record of softening without *any* effusion, so that clearly effusion could not have been the cause; and an equally fatal objection is the converse one, that there have been very many cases of most extensive effusion unaccompanied by ramollissement. And Rokitansky has found that no change is occasioned in the consistence of cerebral matter by soaking it for hours in serum. Moreover, I do not understand why tubercular inflammation should not lead to softening as well as the ordinary variety. This softening is attended by alterations in the lining membrane of the ventricles in many instances; it becomes opaque, the vessels are turgid, and now and then there is a slightly granular appearance. So that I do not see how there can be any doubt of the cause of the softening, since every fact points to the pre-existence of inflammation. I may here mention that yellow tubercle may be deposited in the brain; and the fewer the tubercles the larger they are, the average size being that of a chestnut; they usually occur in childhood on the meninges of the brain. All these tubercular bodies are very generally associated with tubercle elsewhere, since they are only another symptom of that diathesis. I will not detain you by pointing out the analogies between tubercle in the brain and in the lungs, as they are sufficiently obvious; but I cannot refrain from suggesting that tubercular inflammation, met with in a debilitated because highly scrofulous constitution, should not be treated in the same severely antiphlogistic manner as would be justifiable in simple inflammation.

Having thus briefly reviewed the more prominent lesions inflicted by these inflammatory diseases, I propose now to direct your attention to two or three of the more prominent indications of inflammation of the brain. The most important of these, I think you will conclude, are, convulsions, delirium, paralysis and coma. Not that these are at all pathognomonic, for they may each and all be traced to other causes. Nevertheless, they are the most marked and startling symptoms, and, associated with others, serve to mark the nature of the affection.

Convulsion is to voluntary motion what delirium is to the intellectual processes, and in my apprehension, bears a relation to paralysis very analogous to that of delirium to coma. Convulsion and delirium belong to the stage of excitement, coma and paralysis to subsequent and resulting states. In convulsion there is a perverted and excited condition of muscular action; in delirium there is the same perverted and excited state of the intellect. The one frequently inaugurates the loss of muscular power, paralysis; the other as frequently of the powers of sensation and perception, coma. But since the motor power is resident in the entire tract of the cerebro-spinal axis, the pathological causes of convulsion are spread over a much wider extent than of delirium. But in so far as we have to do with convulsion depending on an inflammatory state of the encephalon, it seems to me that the analogy is tolerably complete.

Convulsions are of frequent occurrence in inflammation of the brain and its membranes, and may happen when the dura mater only is involved. They are very usually held to be pathognomonic of inflammation of the pia mater and arachnoid, but although they do often indicate such meningeal mischief, still they occur when the brain substance is jointly or even

solely affected, frequently preceding the paralysis, which is a consequence of red softening, and being then confined to one side of the body. By themselves, therefore, they are not indicative of meningitis. A sudden attack of convulsions is one of the modes in which acute hydrocephalus begins. Inflammatory softening is often accompanied by more or less contraction of the flexor muscles of one or more of the limbs, and this may be viewed as a species of tonic spasm or convulsion. It is to the centres of motion we must look for an explanation of these phenomena. They may be directly and immediately affected, or their motor function must be impaired by the propagation of irritation to the corpora striata downwards; such being the case, I presume, when convulsions result from inflammation of the membranes and brain surface.

As convulsions have been designated delirium of the muscles, delirium may be conversely termed a convulsion of the mind. Delirium is induced by very many apparently opposite conditions, but the delirium of encephalitis can have but one origin. As the intellectual powers are manifested through the cerebral convolutions, a priori, it is to be expected that these, or other parts intimately associated, would be implicated when the phenomena of delirium are exhibited, and experience confirms theory.

Andral observes, that the delirium of meningitis may be explained by the propagation of inflammation from the membranes to the brain; but the fact is, the pia mater can scarcely be inflamed without a similar affection of the adjacent brain surface.

Delirium is an early, and coma is a late symptom of inflammation, and the intimate connection subsisting between the two is explicable, as Dr. Todd says in his Lumleian Lectures, by the fact that the same parts are affected in each. In order

that coma may be produced, it is necessary for the perceptive faculties residing in the convoluted surface, or for the centres of sensation to be subjected to certain abnormal influences. This may ensue from the presence of a peculiar poison in the blood, as in renal or toxic delirium, or coma, or from inflammation and its physical results.

Paralysis, either hemiplegic or more partial, is another result of encephalitis, when it has ended in softening or suppuration. As a rule it is a late symptom, and is very often preceded by convulsion of the palsied parts. Sometimes, however, it takes place suddenly, with little or no warning, as in the form of acute hydrocephalus, denominated the water stroke. The diagnosis between this form of paralysis and that dependent on atrophic softening, or cerebral hemorrhage, mainly depends on the prior existence of symptoms of inflammation. Andral says, inflammatory paralysis may be known by its increasing very rapidly from the moment of its first production. We shall also observe early muscular contraction. The paralysis of inflammation then, results from the impairment of the integrity of the nervous matter, by the continuous and increasing pressure of the inflammatory products.

Coma is "a complete suspension of that influence of the mind, and of the organ of consciousness, on which, speaking physically and physiologically, our consciousness depends."* The coma of inflammation is due generally to the effects of pressure by the inflammatory products, and may happen in the case of either meningitis or encephalitis.

But little time remains for the discussion of the symptoms of these diseases; a brief outline must suffice, although I run the risk of being charged with obscurity.

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* Dr. Todd.

Dura matral inflammation, when idiopathic, is, perhaps, usually attended with these symptoms. There is pain in the head, commonly severe, which may intermit and leave only a feeling of confusion. There is some fever at first, but the pulse is not very high, and the tongue is white and moist. Then, it may be in the second week, the patient has distinct shiverings, followed by heat and perspiration. The intermissions may be so regular as to deceive the practitioner into thinking he has a case of ague to deal with. There may be some convulsion or delirium towards the termination, but the patient usually retains his intelligence until the last. When this inflammation follows on otitis, we suspect it has occurred if severe headache come on in the course of the malady, the pain in the ear becoming at the same time more violent. Then the patient is oppressed and drowsy, slightly delirious, and dies comatose; or there may have been no discharge of matter, but deep-seated pain in the ear, succeeded by restlessness, and then fatal coma sets in; or there has been a discharge from the ear of some standing, it ceases, there is pain in the ear, the patient gradually grows drowsy and comatose. The pulse varies much in different cases, and may be slower, or more frequent than is natural. I suspect the explanation of the differing number of the pulse is, that meningeal mischief is attended by a rapid pulse, while if we have a slow, we may in this connection expect to find an abscess in the cerebellum, or more rarely in the cerebrum.

Uncomplicated meningitis is not always uniform in its symptoms. Sometimes it comes on with headache, vomiting and intolerance of light. More commonly, however, but by no means invariably, there occurs a sudden paroxysm of general epileptiform convulsions. Or there is headache first of all, but so violent that the patient screams loudly. The

convulsions may either be immediately followed by coma, or the patient appears to recover, seems doing well, but the appearance is most fallacious, for he soon relapses into fatal coma. But the best way of describing the disease is to place a simple example before you.

"A boy aged 11 had had frequent vomiting for a fortnight, and was listless and inactive, and his bowels costive, but he complained of no pain. He was suddenly seized one evening with violent convulsions, which recurred several times. In the intervals he vomited and then complained of headache. P. 60. The convulsions recurred frequently during the night, but ceased towards morning, and left him comatose. The coma continued till mid-day, when, after free purging, it abated, and he was sensible in the evening, but still complained of headache. P. 120. For four days he continued pretty well, with no headache or vomiting, and the pulse varying from 108 to 120. But on the fifth his pulse fell to 70; he had an attack of vomiting, and complained of his head. Afterwards he fell into a state of stupor, but was sensible when roused, and still complained of his head. The vomiting continued, and next day the coma was perfect, with frequent convulsions, and a pulse varying from 120 to 160. The succeeding day the coma became more profound, and death occurred in the night."

The post-mortem appearances were those of simple meningitis. The long interval in which the patient was free from coma was noticeable in this, as it is in many cases. The cause of this common phenomenon is I believe yet to be explained. In simple meningitis, delirium now and then occurs; probably the inflammation has then involved the convoluted surface of the brain. The symptoms of encephalitis proper, cerebritis, are also variable. It is probable this is in

part owing to the stage and rate of progress of the malady; whether simple inflammation, or softening, or suppuration and so on, and partly to the exact locality of the affected portion. Symptoms elsewhere bear a more or less obvious relation to normal function, and doubtless it is so in inflammation of the brain. But two reasons concur to prevent our making a very exact diagnosis. The one, that our means of doing so are much more limited than in other organs, and the second, that we do not yet possess an accurate knowledge of the functions of the different parts of the encephalon.

Sometimes, and then the membranes and the brain are alike affected, there is acute pain in the head, intolerance of light, and unusual susceptibility to external impressions. The eyes are suffused, the face flushed, there is general fever of an inflammatory type. Delirium is early and violent. Convulsions perhaps occur, and there is great constipation. This period of excitement lasts from twelve hours to three or four days, and is succeeded by a rapid prostration of the vital powers. A low muttering delirium follows the maniacal excitement, and the patient passes into a state of stupor. Then in rapid succession follow strabismus, double vision, subsultus tendinum, relaxation of the sphincters, and finally death in a state of coma. The disease is quickly fatal, and frequently the appearances on dissection do not appear to be at all sufficient to account for the symptoms. I believe the coma which is here induced without any mechanical cause, may be explained in a parallel way to toxic or renal coma for example. The centres of sensation or perception are supplied with an abnormal quantity or quality of blood; there is a consequent alteration in the nutrition of these organs, and impairment of function results. Another way in which encephalitis comes on is by a sudden onset of delirium and fever, or else there is nausea

and vomiting, combined with headache. Or perhaps the malady takes this form:—there is violent headache, but no fever; the pulse is only 60; the face may be flushed or pale, and the eye natural, or intolerant of light. The pain is acute and deeply seated. Delirium appears early, and in five or six days passes into fatal coma—the pulse not having been more than 70 or 80 throughout. Often the pulse falls regularly, and there are appearances of amendment, which last some days, but nevertheless end in fatal coma. Sometimes the pulse sinks suddenly below the natural standard, and this is almost invariably a sign of impending coma. The cases which terminate in ramollissement are usually characterized by paroxysms of general convulsions, followed by paralysis and coma; or there may be a sudden attack of hemiplegic palsy, very much resembling hemiplegia from cerebral hemorrhage. Sometimes, the power of speech is lost. When inflammation terminates in encysted abscess, convulsion frequently occurs, followed by paralysis; but the symptoms vary a good deal. In the case of a man mentioned by Broussais, an extensive abscess was found in each hemisphere, while during life there had been no other symptom than a peculiar dulness of manner, which ended in coma, after lasting thirty-seven days. In most of these cases of inflammation of the substance of the brain, the pulse is either below the natural standard, or is not remarkably increased. When induration exists, it is in a very chronic case, in which convulsive paroxysms have been the most general symptom. But occasionally the symptoms do not by any means indicate the extensive mischief going on within the cranium. In one remarkable case of Abercrombie's, there were during life some degree of amaurosis, occasional giddiness, and insensibility now and then occurring and

lasting for a short time, but nothing more of any moment. The patient, a lady, was so well, in fact, that she got married, and remained about as usual for two months. At the end of that time, and the evening before her death, she was so well as to be at a party at a friend's house; but in the morning she suddenly expired. A post-mortem examination showed the left hemisphere entirely softened and converted into one great cyst, full of soft pultaceous matter, enclosed in a covering, not a quarter of an inch thick, of healthy cerebral tissue. Such a case as this seems to favour Dr. Wigan's notion of the duality of the brain. It is certainly very extraordinary for a person to be able to discharge most of the duties of life with one-half of her brain in a state of utter disorganisation.

From the foregoing brief account of the varying pathology and symptomatology of these diseases, it will at once be perceived how imperfect is our knowledge of them, while this very knowledge of our ignorance should be a stimulus to increased investigation.

ON SYPHILITIC PARALYSIS.

By F. E. Anstie.

Of all the long list of diseases which we are called upon to investigate and to treat, there is perhaps none more varied in its forms, or more fruitful in the origination of secondary evils, than syphilis. Many of these sequelæ are perfectly well known to every student and practitioner of medicine, and are recognised and treated with more or less success, in ordinary every day practice. I have to direct your attention to certain forms of secondary syphilitic disease of which little comparatively is known, and which there is reason to believe, frequently pass unrecognised. I refer to paralysis, occurring either in the form of hemiplegia, or paraplegia, or to a more limited extent, as in the case of palsy of some one or two muscles only, and arising from a syphilitic taint of the system.

Doubtless, there has for a long time been a vague sort of belief in the minds of the profession, that palsy, somehow or other, did occasionally result from syphilis. But the first person who clearly showed *how* this might happen, and published cases, and the results of post-mortem examinations, was Dr. Todd. Almost immediately after the publication of his clinical lectures, Dr. Goolden, of St. Thomas' Hospital, communicated some more cases to the *Lancet*. Besides these, I know of no other *published* investigations on this subject, although the existence of this form of palsy is taught at many medical schools, especially on the Continent.

That syphilitic paralysis is not a very rare occurrence, one may gather from the fact, that during the three or four years that I have been a student here, at least 8 or 10 pretty well marked cases have occurred in the practice of the hospital, and have been recognised as such. Some of these I shall quote hereafter; and in two or three cases I shall be able to give you the result of post-mortem examinations, confirming in a remarkable manner the diagnosis made during life.

There is perhaps, on a primâ facie view of the matter, little apparent connection between syphilis as a *cause*, and palsy as a *result*. I shall, therefore, in the first place, endeavour to shew the rationale of this sequence of disorders, by giving you as much information as I can as to the pathology and morbid anatomy of syphilitic paralysis.

I shall first describe the changes which are induced in the membranes of the brain and spinal cord, and next those which take place in the nervous substance itself, in consequence of the action of the syphilitic poison.

First then, as to the meningeal affection. In most cases, probably, this begins in the dura mater; and it is easy to understand how this membrane would be obnoxious to syphilitic disease. Affections of the external periosteum of bones are among the most common results of constitutional syphilis, and the dura mater closely resembles in its structure the periosteum, and indeed in the skull it takes its place, there being no independent lining membrane. In the skull then, inflammation of the dura mater is nothing more than an internal periostitis, a thing quite as likely to happen as an inflammation of the pericranium, where the whole system is tainted, as it is in the advanced stages of constitutional syphilis. The syphilitic poison seems to have a liking for

fibrous membranes, and even when it does not affect the external periosteum it will indemnify itself, sometimes, by attacking the dura mater. This becomes congested, its vessels become filled with blood, and serum and plastic lymph are exuded. Where, as within the cranium, the dura mater lies close on the bone, it is probable that in addition there is in most cases a deposit of earthy matter, from secondary inflammation of the bone. Thus, there is formed a *node*, which, projecting inwards, pushes before it the membranes, and, resting on the brain surface, causes pressure there. Pressure cannot be long continued without exciting symptoms of irritation; to irritation, in time, follows superficial inflammation, and this may proceed to red softening of a portion of the cortical substance. All this may happen when the dura mater *within the skull* is attacked by the poison. It is more difficult to trace the changes which are produced in syphilitic inflammation of the *spinal* dura mater, because we possess no evidence from post-mortem examinations. But it seems likely that inflammation of the dura mater *merely* would be of less consequence here than in the skull. For here it is not closely applied to the osseous walls, but there is an independent periosteum, and between this and the true theca of the cord there is much loose cellular tissue. And consequently there is less risk of pressure on the nervous matter.

To the dura matral inflammation is frequently added inflammation of the arachnoid, or pia mater, either as the result of pressure, or by direct extension from the fibrous membrane. The result of this may be effusion of serum or pus in the arachnoid or subarachnoid cavities, or effusion of lymph in the meshes of the pia mater. Either of these will of course cause increased pressure on the nervous matter; in the skull

this pressure will operate at the point where effusion has occurred; in the spinal canal it will take place either at the point of effusion or lower down, according to the density or tenuity of the effused matters.

Let me illustrate the effect of syphilitic dura matral inflammation complicated with arachnitis, by a case which I quote from Dr. Todd's clinical lectures, which, however, I must necessarily abridge a good deal.

The patient was a woman æt. 31, who gave a history of chancre some four or five years before, followed by sore throat, papular eruptions, and nodes on the tibiæ. For a long time past she had suffered from pain in the head, fixed in the right parietal region. Two months previous to her coming to the hospital, she had an epileptic fit, followed by increase of the pain in the head. From that time the fits recurred frequently, and were preceded by a painful numbness of the *left hand and foot.* The right pupil was occasionally more dilated than the left, and the right eyelid hung lower than the left. When admitted to the hospital she was treated actively by bleeding, mercury, and blisters to the scalp, but she sank into a state of coma, and shortly had a fit, from which she never rallied. On examination the dura mater was found firmly adherent to a considerable portion of the right parietal bone, and also to the arachnoid beneath. Near this point there were two large masses of concrete pus between the layers of the arachnoid, and opposite each of these was a corresponding depression on the surface of the hemisphere, which was soft and red at these points. Here then, as Dr. Todd remarks, were first, inflammation of the dura mater with effusion of lymph, inflammation of the arachnoid, with effusion of pus, and consequent compression of the brain surface. In consequence of this, symptoms of irritation of

the brain arose, followed in time by inflammation and red softening of the cortical substance, causing partial palsy and at last death.

To this case let me add another, taken from my own note book. It is that of the man Harrison, who was lately in No. 5 ward, under Dr. Budd. He was 25 years of age, unmarried; had never had any serious illness. Six years ago he had chancres, which were followed by secondary and tertiary symptoms; and he was treated by the free administration of mercury. Since that, he had never been quite free from nocturnal pains in the bones. Six months ago he was attacked with severe pains in the head, much aggravated at night, and he discovered a gradually increasing numbness of the right arm and leg. He was also much troubled with startings of the affected limbs, and his mouth was sometimes drawn towards the *left* side. On this account he applied to St. Bartholomew's Hospital, and after remaining there for some time, during which he had considerably improved, he one day became suddenly unconscious, and remained so for an hour or two. On awaking from his stupor, he found that his right side was completely paralysed, his mouth and tongue being also affected. What treatment was adopted is not known, but he went out of the hospital four months afterwards, apparently cured. However, he only remained well for about six weeks, and then the old head ache attacked him again most severely, and he now began to experience weakness of the *left* arm and leg, accompanied by spasmodic contractions of the affected limbs, and occasionally of the *right* leg which had been paralysed before. When admitted to this hospital, his left leg had nearly recovered its power, but the left arm remained very weak, and was permanently *contracted* at the elbow. It firmly resisted all efforts at exten-

sion, and these gave him great pain. Sensation was but little affected; there was highly exalted reflex action in the *right* leg, which enjoyed, however, its full power. He complained of dreadful pain in the head, much worse at night, and there was great tenderness of the scalp. Under the use of iodide of potassium, he was completely cured in a fortnight, and when he left the hospital he had the free use of all his limbs, the left arm could be readily extended to the full, and the pains in the head and tenderness of the scalp had vanished. In this patient I believe that the affection was inflammation of the cranial dura mater, on both occasions, and that in the course of the first attack, he got a sudden increase of the meningeal inflammation, perhaps some arachnitis, causing effusion, and consequent pressure on the brain, resulting in temporary stupor and paralysis, which vanished with the absorption of the effused matters.

When the pia mater is seriously involved, plastic lymph is exuded from its vessels, and forms an additional source of pressure and irritation. This is supposed by Dr. Todd to be the cause of certain remarkable clonic spasms of the affected limbs which occur in some cases.

As a companion to the above cases of palsy from disease of the meninges of the brain, allow me to read you an abstract of a case of paraplegia, dependant, probably, on syphilitic disease of the membranes of the spinal cord, for the notes of which I am indebted to Mr. Heath.

The patient was a woman named Ann Scott, who was under the care of Dr. Budd, in Augusta Ward, early in the winter of 1853. She was then affected with paraplegia for the second time. It appeared that she had enjoyed pretty good health until her marriage, 15 years previously. Soon

after this she had syphilis, and suffered from secondary and tertiary symptoms. About 3 years before her admission to King's College Hospital she had an attack of incomplete paraplegia, with partial paralysis of the bladder and rectum, and convulsive startings of the lower limbs. There was tenderness of the lower part of the spine. She was treated in the Middlesex Hospital with *iodide of potassium*, and was soon completely cured. Lately, however, the paraplegia had returned, with complete paralysis of the sphincters, numbness of the legs, and a sense of constriction in the abdomen. She now applied to King's College Hospital; and after two or three months' treatment was again completely cured by iodide of potassium, mercury having failed to benefit her. In this case Dr. Budd clearly recognised the syphilitic origin of the palsy; and it would appear from some remarks he made in a clinical lecture at the time, that he considered that the first step in the train of disorder was syphilitic periostitis of one or two vertebræ.

I must now proceed to describe the changes which occur in the nervous substance itself. I have already stated that pressure on the surface of the brain gives rise, in some cases, to superficial inflammation of the brain substance, at that point; and, if it proceed far enough, to red softening. Another result of pressure on the brain surface, and which probably is the more usual one in chronic cases, is induration of the cortical substance at the point of pressure. A patch of the nervous substance corresponding to the local inflammation of the membranes is found harder than usual, and either of a dark grey colour and more vascular than usual, or of a pearly whiteness, and less vascular than usual. Various explanations have been offered to account for this change, the most probable being perhaps that of Dr. Budd, who suggests that it may

be owing to the contraction of plastic lymph thrown out during the inflammatory process.

I will here introduce a case taken from Dr. Todd's lectures, which illustrates more forcibly than any yet quoted, the amount of irritation that may be caused by effused matters causing pressure on the brain surface. The syphilitic origin of the affection was very clear.

The patient's name was Beglin, he was 34 years of age, and a compositor by trade; 14 or 15 years before Dr. Todd first saw him, he contracted sores, which were followed by bubo. Of his own accord he took mercury to an enormous extent and was much salivated. The sore and bubo healed, but he got a papular eruption all over his body, which was cured by antimony and nitric acid. After this he got an attack of iritis, which was cured, but by what means we do not know. He remained quite well after this for some years, when he was attacked with numbness of the right forearm and hand, and rigid contraction of the muscles of the forearm. He applied for relief to a hospital, where the nature of the case was altogether mistaken, and various local remedies having been tried in vain, it was proposed to divide the tendons. Fortunately this was not done, and he went out of the hospital no better than when he entered it. The same thing happened at other hospitals to which he applied. He then quite accidentally met with a friend, who told him that *he* had been similarly affected, and had been cured by iodide of potassium. Following the advice of his friend, Beglin thereupon took the medicine, and to his astonishment and delight completely recovered in three weeks. From that time he remained well for three years, but he then got out of work, and lived miserably for some time, till he became so reduced in strength as to be in a fit state for the develop-

ment of any disease that might be lurking in his system. He now had a fit, accompanied and preceded by severe headache. He applied to the out patient department of King's College Hospital, where Mr. Bowman at once recognised the syphilitic nature of the affection. He got another fit before he had been more than two days under treatment, and was then admitted into the hospital. At this time he had complete rigidity of the muscles of the right forearm, and the fingers were permanently bent into the palm. There was also numbness of the forearm, and great weakness of the limb. At the same time there was fixed and severe pain over the *left* parietal bone, and a node over the head of the fibula. The pain in the head was much aggravated at night; there was no external tenderness. He was very much reduced, pale, feeble, without appetite, and unable to sleep. Now the date of his admission was May 5th, 1849; he was put at once on three grains of iodide of potassium three times a day, and on May 19th, just one fortnight, he was discharged from the hospital, perfectly well. It seems that he did not live temperately or carefully, nevertheless, he continued well up to the 9th of June, 1851, when he was attacked with violent convulsions of the limbs of the *right* side, and was brought to the hospital, at that time being unconscious and speechless. He recovered his consciousness after the fit, but not his speech, and made signs that he suffered pain, as before, on the *left* side of his head. On the following day he had another fit, and, on the day after, a most violent one, attended with violent clonic spasms of the right side, total unconsciousness, and biting of the tongue. In the evening the fit had subsided, and he partly regained his speech. He was then blistered on the scalp, and put on a salivating course of mercury. After five days, during which time he had

frequent fits, ptyalism commenced, and, after recurring once or twice, varied with a period of noisy delirium, the fits ceased altogether. He complained for some time of pain in the head, on the left side, and of numbness and weakness of the right arm and leg. Under iodide of potassium and counter irritation these vanished, and by the 18th of July he was discharged well, six weeks from his admission.

From that time, up to the date of his last fatal attack, he continued to live intemperately, and frequently had recurrence of the pains in the head, and also in the bones of the formerly paralysed limbs. On the 7th of December, 1852, the pain in the head greatly increased, and convulsive fits came on in quick succession. He had no treatment, and in ten days he died; the fits, to the last, affected almost solely the right side.

Post mortem examination showed the following appearances.—In the left parietal region (the seat of pain), the dura mater was firmly adherent to the bone, and to the other membranes over a considerable space; and *the pia mater closely adhered to the brain*, so that the cortical substance tore away with it. Here the cortical substance was *hardened*, and darker than usual. Other adhesions existed, though none so remarkable as this. The brain had a generally shrunk appearance, and one or two convolutions had quite wasted away.

In describing the foregoing changes, induced by syphilitic inflammation of the membranes and of the nervous matter, I have represented *pressure* as being the chief cause of the *latter*, even in these cases. It may be that the inflammation is sometimes communicated directly, before pressure has time to operate; but this does not seem to be the usual order of things.

Before leaving the subject of the *inflammatory* diseases of

the brain and spinal cord, induced by constitutional syphilis, I will quote one more case, of a very remarkable nature, which occurred lately in the practice of our hospital, and of which I took notes.

Joseph Taylor, aged 28. Admitted to No. 5 Ward, under Dr. Budd, June 1st, 1856. Has always lived in London, is a painter, but has taken much care to preserve himself from the effects of lead, and has never had any symptoms which could be referred to it. Has never had any illness sufficient to lay him up. Has had syphilis three times—the last attack, twelve months ago, was followed by a pustular eruption, for which he took mercury to moderate salivation, and got quite well. He continued well until two months ago; he then began to suffer pain and uneasiness between the shoulders and round the chest, and gradually these pains extended down the trunk into the lower limbs, which became weak. This weakness continued to increase up to the time of his admission. When he came into the hospital he was a healthy looking man, with firm, plump muscles; he did not complain at this time of *pain* in the legs, but they were so weak that he could not stand on them, though he could move them slightly in bed. There was slight resistance to flexion at the knee joints. Sensation was nearly perfect, and there was no exaltation of reflex action; the rectum and bladder were not under control. There was pain in the lower part of the spine, worst at night; and there was much tenderness over the lower part of the dorsal region.

This man was treated, first, with iodide of potassium; but this did not effect much, and he was then put on bichloride of mercury, taking one drachm of the solution three times a day, which dose was afterwards increased to a drachm and a half. Under this treatment he steadily improved; one by one, all

the bad symptoms vanished: first, the rectum; then the bladder regained power; and, finally, he completely recovered the use of his legs. The last symptom to vanish was the uneasiness and tightness round the chest and between the scapulæ. On the 28th of July, eight weeks from the time of his admission, he was discharged, cured—having taken the mercury for a month.

I think there is every probability that in this case there was inflammation of the membranes coming on in a very slow and insidious way, causing pressure on the cord in such a gradual manner as not to excite the more violent manifestations of irritation, but probably causing a slight amount of inflammation in the nervous matter. The case was from the first pronounced "syphilitic" by Dr. Budd.

Another change which is apt to occur, at least in the brain, in syphilitic cases, is softening of the central parts—softening of an atrophic, non-inflammatory nature. And this would seem to be not unfrequently the cause of the fatal termination. The patient may have, in succession, various attacks of meningeal inflammation; from which, and from the palsy, or contraction of the limbs consequent on them, he may recover; and then, at last, white softening of the central parts, as the corpus striatum or optic thalamus of one or both sides may set in with all its usual evil results. The patient becomes permanently paralysed, and at length dies. Whether this white softening is a direct effect of the syphilitic taint of the system, or merely an accidental complication, it is not possible to say with certainty, and I shall have more to say about this hereafter. Meantime let me introduce two illustrative cases. The first is from the case book of Mr. Goodall, then clinical clerk to Dr. Todd; and I regret extremely that I cannot quote it so fully as it deserves.

George Jarvis, aged 32. Was in the navy from the age of fourteen till three years ago. He denied ever having had syphilis, but confessed to "gonorrhea," when he was about seventeen years old. There is every probability from the history, that he had, in fact, chancre of the urethra. His first head symptoms were three years ago, when he began to experience failure of sight and nocturnal pain in the occiput, greatly aggravated by any jerk or sudden movement. He used to vomit occasionally, and had a frequent feeling of giddiness. For these symptoms he was under medical treatment for two years without experiencing much relief; he had setons put in his neck, and took various medicines. Twelve months ago, two nodes appeared over the left parietal bone, which, after a time, subsided spontaneously. Two months ago, a node again appeared in the same situation, and this remained at the time of his admission to King's College Hospital, Oct. 20, 1854. When admitted, the pain in the occiput was very severe, extending quite down the back and shoulders to the very finger-ends. The muscles, especially those of the upper extremities, were wasted and flabby. He was deaf in the *right* ear. He was at once put on iodide of potassium, and the node was painted with iodine; and, under this treatment, the node disappeared, and the pain very much decreased. However, it would seem that the mischief had gone too far. After two or three weeks' apparent improvement, he began to exhibit symptoms of brain disorder—confusion of ideas—drowsiness—increased deafness; and on Dec. 4th he had an attack of complete paralysis of the right side, with temporary loss of speech; which latter, however, he recovered. He remained drowsy afterwards, and the sphincters were completely relaxed. On the 14th, reflex action was found to be much exalted in the right leg; and

on the 18th, the hamstring muscles were rigidly contracted. Quinine and sulphuric acid were now prescribed. On the 21st, the biceps of the right arm began to be rigid; on Feb. 15th, the left pupil was noticed to be more dilated than the right; and on the 22nd, there was pain over the left eyebrow, and partial ptosis of the left eyelid. Vomiting now set in, and some difficulty of swallowing, which however soon disappeared. On March 1st, the iodide of potassium was resumed, and for some days he seemed to improve; so much so that he could walk across the ward with the help of a stick. Still the arm remained quite powerless. On the 10th of April he had a severe convulsive fit, after which he remained comatose for twelve hours; and on the 12th, the right forearm was found firmly contracted on the arm, to such an extent that the fingers rested on the coracoid process; his intellect now appeared much confused, and the sphincters were totally paralysed. On May 7th the leg became firmly contracted on the thigh, in a similar manner to the arm. On the 9th he got spasmodic retraction of the tongue, to such an extent as almost to choke him. The pain in the head now became very intense again, and intellect was nearly lost; in two or three days more the difficulty of swallowing returned, he became more and more feeble, and lingered on in a semi-comatose state till the 2nd of June, when he expired somewhat suddenly.

Post-mortem Examination.—The bones of the skull were enormously thickened, in some places measuring as much as an inch. Just below the tentorium cerebelli there was a patch of firm adhesion between the dura mater and the bone. At this point the dura mater was also very thick, and adhered firmly to the posterior surface of the right hemisphere of the cerebellum; a patch of which exhibited a dark color, and

was much indurated. The middle portion of the corpus striatum of the left side was in an advanced stage of white softening, as was also the head of the same ganglion. The corpus striatum of the right side was beginning to show signs of softening. All other parts of the brain were healthy.

Another illustrative case is the following, taken from my own note-book. The patient was under the care of Dr. Johnson, in No. 4 Ward, during the summer of 1856 :—

Robt. Woolcott, aged 40. Has lived for the last 18 years in London, is married, has no family; has lived a very dissipated life, and drunk hard. Has had syphilis several times. Three months ago, a copper-coloured eruption appeared on his face, and he applied to the out-patient department of King's College Hospital for relief. For some time he refused to take mercury, but Mr. Bowman insisting, he was moderately salivated. The eruption got a good deal better; but he was attacked with iritis of the right eye. This was nearly cured, and he was altogether much improved, when, after neglecting his medicines and absenting himself from the hospital for nearly a fortnight, he was suddenly attacked with severe pain in the occiput. This went on increasing for several days, and he then became partially hemiplegic on the right side, without any loss of consciousness. In consequence of this he was admitted to King's College Hospital, under the care of Dr. Johnson, Feb. 4th, 1856. At this time he was a stout, healthy-looking man, with a few coppery spots on his face. He could only walk with the greatest difficulty, dragging the right leg after him; any attempt to rest on that limb made him quite faint. He could not grasp with the right hand, nor raise the right arm. Sensation was partially impaired in both leg and arm. Immediately after his admission, the iritis recurred with great severity, and it was neces-

sary to salivate him slightly again, and to apply leeches to the temple. Under this treatment the iritis disappeared, and the paralysis improved considerably. For some time he continued to complain of headache, but under the use of iodide of potassium this diminished, and finally left him. The paralysis continued to improve, till on Feb. 29th he was discharged, the only thing still amiss being a slight numbness of the tips of the fingers of the right hand. For the next three or four weeks he worked very hard, and was much exposed to cold winds, and on April 1st, the pain in the head returned with great violence; he began to pass his urine and stools involuntarily, and experienced great weakness of both legs and of the right arm. On the 6th he was re-admitted to the hospital, and his complaints were now of severe pain in the head, and pain and a sense of constriction in the abdomen; there was complete paralysis of both legs, and in the right one exalted reflex action. Both legs retained partial sensibility, but felt very cold. The palsy of the right arm was, as before, only partial. In both arm and legs the muscles were perfectly relaxed, and there was little or no resistance to flexion. The urine dribbled away, and stools were passed involuntarily at times. There was tenderness of the spine in the lumbar region. The treatment during this attack was as follows: first, calomel and opium, then iodide of potassium and bark, then mineral acids, and, finally, nux vomica. He slowly improved, suffering relapses from time to time, during which his mind sometimes seemed affected; and, at length, on the 11th of July, he was reported nearly well, though the limbs were still somewhat weak, and he left the hospital. However, in the course of a few days he became worse again; the right side became again paralysed, and he had severe pain in the affected limbs. Now, also, for the first time, there was spasmodic startings of

the affected leg. There was also severe pain in the head. He was readmitted to the hospital July 19th. At that time there was alternate constipation and relaxation of the bowels; what stools there were passed involuntarily, and the urine dribbled away. Protiodide of mercury was tried, but the improvement, if any, was but slight and transient; and, after a fortnight's stay in the hospital, he was evidently getting worse. His memory was now much impaired, his speech was thick and confused, and he had several convulsive fits, after each of which he seemed weaker. Next, the left pupil was found to be more dilated than the right, and insensible to light; then he began to be troubled with hiccough, then came still greater loss of the mental faculties, twitchings of the facial muscles of the affected side, and finally death on the 14th of September, seven weeks from the commencement of his last attack.

On post mortem examination, the only remarkable appearance connected with the membranes, was a slight thickness and opacity here and there. There was white softening of a considerable patch of the left optic thalamus, deep in its substance, evidently recent. There was also commencing white softening, slight in extent as yet, in the corresponding part of the right thalamus. Some of the arteries at the base of the brain, were thickened by atheromatous deposits.

What was the series of morbid changes which took place in this patient's case from first to last? I think, that without very much presumption one may state it as follows:— That the first attack of hemiplegic palsy, was owing to syphilitic inflammation of the *cranial* dura mater. The pain in the occiput, so constant and so much aggravated at night, taken in conjunction with the known history of the patient, point to this, as does also his rapid and complete recovery from

the palsy. In the second attack, in which *both* legs and the right arm were palsied, it is probable that there was again inflammation of the cranial dura mater, and that in addition there was inflammation of the *spinal* membranes; a consequence of periostitis of one or two lower dorsal vertebræ. The existence of this periostitis of the vertebræ was indicated by the local tenderness and nocturnal pain in the spine. From both these attacks of meningeal inflammation he seems to have recovered. But meantime, his whole system had become lowered, his cerebral arteries diseased, and probably circulating blood which was inadequate, from its quality, to the proper nutriment of the brain-substance, and white softening ensued. Any one who watched this patient as I did, from the time of his first becoming an out-patient till his death, will remember the remarkable change in his personal appearance. At the time of his first coming under treatment he was a fine, stout, healthy-looking man. Before his death he was quite emaciated, and for the last four or five weeks of his life his countenance wore a stupid, almost idiotic expression. It is, I think, improbable that white softening occurred to any considerable extent, till during his last illness; since he recovered completely from the palsy on the first and second occasions, and yet after death there was nothing discovered, which would indicate that any attempt at repair of the damaged nervous matter had been made. And it was not till during the last illness, that he was attacked by those general clonic spasms of the limbs, which so frequently follow on this change in the brain tissue.

I have now given you the history of two cases of syphilitic hemiplegia, in white softening occurred. That something similar occasionally takes place in the spinal marrow, is rendered likely by such cases as the following, which occurred

in the practice of our hospital, and for the notes of which I am indebted to Mr. Heath.

The patient was a man named Darreigh, 43 years old. He had led an intemperate life, and had suffered from syphilis 15 years before. Rather more than a year before admission to the hospital, he had first noticed weakness in his legs, which went on increasing, so that they sometimes gave way beneath him in walking. Two months after the first appearance of this symptom he fell down, one day, flat on his back, and suffered great pain in the loins for some time afterwards. The weakness of the limbs continued, and, if anything, increased somewhat up to the time of his admission; four months before coming to the hospital, he lost power over his bladder and rectum. On admission, there was no tenderness in the spine or projection of the vertebræ. There was at this time partial paralysis of the legs, with spasmodic movements of one of them, paralysis of the bladder, and *constipation* of the bowels. He remained in the hospital for a considerable time, and the only medicine which appeared to benefit him was the sulphate of zinc, under the use of which he ultimately got nearly well. In a clinical lecture, delivered at the time, Dr. Budd stated his belief that the paralysis depended on mal-nutrition of the spinal cord. That the affection did not in the first place originate from the accident which he met with, is apparent from the fact, that the paralytic symptoms had appeared some time before that occurred.

It is hardly necessary to say, that these cases of softening of the nervous centres dependent on *mal-nutrition,* are much more serious than the other affections which I have described. As I said before, we cannot as yet prove, that this softening in any case *directly* results from the effects of the syphilitic poison on the system; but there is certainly much probability

that this does sometimes occur, as in the case of Jarvis, for example, whose cerebral vessels were *not diseased.* I have thus narrated to you, so far as I know anything about them, the changes produced in the membranes and substance of the brain and spinal cord, by the syphilitic poison, and I have brought forward cases illustrative of the symptoms observed during life.

Briefly let us recapitulate these symptoms, and endeavour to see how far they aid us in diagnosis and prognosis. Let us take, first, the symptoms of affection of the *brain* and its membranes. All of them may be referred to the following heads:—I. Symptoms of inflammation of the membranes. II. Symptoms of pressure. III. Symptoms of irritation of the nervous matter. IV. Symptoms of inflammation of the same. V. Symptoms of atrophic softening.

I. Symptoms which indicate inflammation of the membranes. The dura mater being inflamed there will be pain, mostly *localised,* and greatly aggravated at night. If arachnitis be set up the febrile excitement will be more severe, and the pain in the head will become more general. If the pia mater be much involved, there will probably be symptoms of great irritation.

II. Symptoms of pressure. The most specific of these will be loss of consciousness, to a greater or less degree. If the pressure be so great as to cause *coma,* there will be palsy of the opposite side of the body to that on which the pressure is taking place. If the third pair of nerves be implicated there will be dilatation of the pupil and ptosis of the eyelid. Pressure in these cases is not likely to be sufficient to cause its extreme results, such as stertorous breathing, dysphagia, &c.

III. Symptoms of irritation, when they occur *early* in the

disease, will indicate that pressure on the surface of the brain is irritating the cortical substance. We can, I think, in no other way explain the early occurrence of rigid contraction of the limbs, in such cases as that of Beglin, where no general palsy of one side had yet occurred. When these rigid contractions do not take place till *late* in the disease, they result from irritation consequent on white softening of the central parts, either with or without the occurrence of hœmorrhage. Other symptoms of irritation are the epileptic fits, which occur in many cases. These may depend either on irritation with inflammation at the surface of the brain, or from irritation *without* inflammation, consequent on white softening of the central parts. When the fits are characterised by clonic spasms of the *palsied limbs only*, Dr. Todd thinks they depend on intense inflammation of the pia mater. Vomiting is another symptom of irritation of the brain, which probably occurs either in consequence of inflammatory softening, or of rapid white softening, in which a number of nerve fibres are being broken down; such was probably the case in the patient Woolcott.

IV. Symptoms of inflammation of the brain surface will be such as I have described under the head of irritation, with delirium; and, if the inflammation proceed to softening, palsy, loss of memory, and confusion of ideas. There will be, frequently, a quick succession of convulsive fits, followed, if the case is to terminate fatally, by coma and stertorous breathing.

V. The existence of white softening is indicated by the occurrence of spasmodic contractions of the limbs, alternating with palsy (which palsy is apt to become more complete after each fit), by the absence of any febrile excitement, and by its occurrence in an enfeebled system. The degree in which the

mind is affected may, perhaps, give us some clue to the locality of the softening, as to whether it is in the central ganglia or in the hemispheres; but this cannot be confidently relied on. In any case of white softening, *hæmorrhage* may occur in the substance of the brain. The early symptoms will be those of pressure, the later those of irritation.

These are the chief symptoms which you will observe in cases of syphilitic *brain* disease. With regard to the *spinal* cases, the first thing to be remarked is, that they are almost all chronic, from the first; and that they are very insidious in the manner of their onset. So entirely is evidence from post-mortem examinations in these cases wanting, that I can only speak in the most general terms of the import of symptoms.

It is possible that there are as many forms of syphilitic disease of the *spinal cord and its membranes*, each with its peculiar train of symptoms, as of the brain and its membranes. But we know much less about them, and for practical purposes it will suffice to particularize merely those symptoms which indicate affection of the membranes, and those which indicate disease of the nervous substance.

The symptoms dependent on disease of the membranes are—*pain* in the back, usually pretty general; and *tenderness* confined to some two or three vertebræ. These are of early occurrence. Soon, the bowels become constipated, or at least irregular; and after a time spasmodic jerks and contractions of the lower limbs are noticed, most frequently at night; and the patient complains of a sense of constriction in the abdomen. Sensation is affected in very various degrees; sometimes not at all. A sense of formication on the skin may be the only thing noticeable. Paralysis of motion is usually incomplete, sometimes it only affects the bladder and rectum;

but there is commonly exalted reflex action of the limbs; and there is almost always an irritable state of the bladder and rectum.

When the cord is itself involved beyond a mere state of irritation, in place of the spasmodic *twitchings* of the limbs, we may find more or less *rigidity* of the muscles, either occurring early, and while the muscles are still plump and firm, or late in the case, and accompanied by wasting. The palsy is more complete, and, in particular, the sphincters are more thoroughly paralysed. The rigidity of muscles which occurs late, is of bad augury.

In relation to the diagnosis of these cases of syphilitic palsy, it may be well to state that there are, at least, two other constitutional diseases, which are capable of producing dura matral inflammation and consequent palsy, viz., scrofula and rheumatism. It is therefore necessary to be very careful in making out the history, otherwise we might be tempted, from the success of treatment by iodide of potassium, which is the proper remedy in these other cases also, to assign a syphilitic origin wrongly; or, we might be led to administer mercury freely to a scrofulous patient.

Of the existence of the rheumatic form of palsy, I think I have myself recently had proof, in the person of a paraplegic patient under my own observation, in whom the rheumatic diathesis was very marked, and in whom a cure has followed the steady use of iodide of potassium and alkalies, and the application of a blister to the spine.

Lastly, we come to the subject of treatment. What I have to say on this score, will necessarily appear somewhat ludicrously dogmatic, from the small amount of experience which I can take my stand on. But, in fact, though I can only give you the records of a few cases, there are numbers

of cases unpublished, which would, I believe, support my assertions.

The two great remedies, no doubt, are iodide of potassium and mercury. One rule may certainly be laid down, that in no case, unless the symptoms are urgent, should mercury be given until the iodide has had a fair trial. In many cases the iodide will of itself suffice to accomplish a cure. Especially if the patient has already taken mercury largely, it is unadvisable to repeat it if it can be avoided. I believe that those cases in which the iodide will fail are, first those in which the arachnoid, or this and the pia mater are actively inflamed, and are rapidly throwing out morbid deposits; and secondly, in cases where mercury will fail too, namely, where atrophic softening of the nervous matter is taking place. The best dose of the iodide is perhaps three grains three times a day, increased if the patient bears it well. Where the stomach is irritable it ought to be combined with an alkali. According to Dr. Budd, it ought always to be taken on an empty stomach, or else it is decomposed by the gastric juice. With regard to the efficacy of this medicine, and its mode of operation, I would quote the words of Dr. Todd:—"The knowledge of these clinical facts," referring to the case of Beglin and others, "teaches us that we must not speedily abandon the use of the iodide of potassium, or of some preparation of iodine in cases of this description. In the present state of our knowledge, we can hardly determine whether the iodine acts by *eliminating* the syphilitic poison, or as an *antidote*. Possibly, it may act in both ways; it may at once promote the action of the emunctories, and so increase the amount of matters excreted from the blood, and unite with the syphilitic poison, forming an innocuous compound, of which, however, the iodine element disappears more quickly than the syphi-

litic, leaving the latter in undisputed sway in the system." The reference contained in this passage to the *temporary* nature of the protection afforded by the iodide is most important. It certainly is true, that after a time this protection ceases, and that imprudence on the part of the patient in diet or dissipation, or unavoidable exposure to fatigue and want, may reproduce all these alarming symptoms which we had hoped had vanished for ever.

Supposing the patient to become suddenly affected with symptoms such as I have described as indicating inflammation of the arachnoid and pia mater, it will be necessary to administer mercury; and, in order to induce its specific action quickly, calomel should be given in repeated doses, and mercurial inunction applied behind the ears. Moderate salivation should be obtained, and kept up for some days. In other cases too, where the iodide of potassium has failed, more especially if you learn that the primary attack of syphilis was not treated by mercury, you must administer the latter; but, in chronic cases, the bichloride will be the best form, as you must produce the specific action very gently, and maintain it for some time. Drachm doses of the liq. hyd. bichlorid., three times a day, are proper at first; to be afterwards increased if necessary. But in cases which have gone on a long while, and in which—from the persistence of the palsy, and the occurrence perhaps of frequent epileptic fits—there is reason to fear white softening, probably your best chance is the administration of tonics, especially sulphate of zinc, and steel. I said that iodide of potassium was unequal to the *cure* of these cases; but probably it would be most useful as an initial to the tonic treatment, while the ultimate advantages of the latter are seen in such a case as that of Darreigh, quoted above. Of course, fresh country air is a most useful

auxiliary; and it is necessary, in the most stringent way, to impress on the mind of a convalescent the dangers of intemperance in any form, or exposure to wet and cold; as also the necessity of placing himself immediately under treatment, on the first symptoms of a relapse.

In concluding this essay, I feel that some words of apology for its general style are necessary. The reader who may think that in some instances I have put forward hypotheses with but slight foundation, and with the impertinence of a mere student, is requested to remember that this address was originally intended for the ears of students only; and was rather designed to excite argument and inquiry, than as a positive announcement of settled facts. At the same time, it is but justice to myself to say that I have not, so far as I know, made any statement of opinion which was not grounded on facts which have fallen under my own observations, or which I have obtained from respectable authorities.

ON DIABETES MELLITUS.

By Morris Tonge.

To facilitate the consideration of this disease, I shall arrange it under the following heads:

1st. The characteristics and symptoms of diabetes.

2nd. The diagnosis of diabetes from other states of system which might be mistaken for it.

3rd. The varieties of the disease.

4th. The chief modes of death.

5th. The post mortem appearances.

6th. The pathology.

All consideration of the treatment of diabetes will be omitted, excepting only so much as will serve to elucidate its pathology.

1. The characteristic symptoms of diabetes are, as the name implies, increased secretion of urine, and the presence of sugar in it. The first of these is not diagnostic, as it may occur in other states of system where there is no sugar present in the urine. The second gives rise to several others, all highly characteristic of the disease. Not the least important of these is the increase in the specific gravity of the urine; as, where it is well marked, it at once points out the presence of sugar; and, unless sugar be found in the urine, the case cannot be considered one of true diabetes. One of the chief symptoms which engages the attention of the patient in the early stages of the disease, is, that he passes much more water than he does usually when he is in a state of health.

The amount of water passed by a healthy person varies from one to four pints per diem, according to the state of the weather and the season of the year, and several other disturbing causes. Every one passes much more in winter than in summer. In diabetes, however, the quantity passed varies from six to forty pints, according to the stage at which the disease has arrived. In some rare cases the quantity has been much less than six pints; it has also been known to exceed forty. On examination, the water is generally found to be pale and limpid, unless it contains a very large quantity of sugar. It does not, moreover, possess the usual smell of urine; its odor was considered by Dr. Prout to resemble that of hay. Dr. Watson likens it to the smell of apples. Of course it has a very sweet taste. Its sp. gr. varies between 1025 and 1060. The average sp. gr. of diabetic urine is about 1040. It rarely falls as low as 1025. In health, the sp. gr. is about 1015 to 1025. This is, therefore, one of the first tests to be applied when we are seeking for sugar in the urine, as it is the only substance which materially increases its specific gravity. The normal solid constituents of the urine undergo no material change, as far as regards the quantity of them that is secreted day by day. As much urea is formed as in a state of health, or even more, and it all passes out through the kidneys as usual; but, as it is diluted by an enormous quantity of water, it appears to be less than it really is. In some cases it has been found to be diminished in quantity. The saline constituents do not vary much. Uric acid, however, which is present in healthy urine, to the amount of about one part in 1000 parts, is partially replaced in diabetes by hippuric acid. The reaction of diabetic urine is acid.

It will not, perhaps, be out of place if I here mention a few of the most characteristic tests for sugar. We are led to

suspect its presence from the increased sp. gr. of the urine. Trommer's test may be applied by adding to a small portion of urine, in a test tube, a drop of a saturated solution of sulphate of copper, and then adding liquor potassæ till the blue precipitate at first formed is redissolved, forming a blue solution. Then, on boiling the liquid, if grape sugar be present, a yellowish red precipitate of suboxide of copper will be thrown down, the protoxide of copper having been reduced to the state of suboxide. This reaction is characteristic of the variety of sugar known as grape sugar. Cane and beet-root sugar do not produce it. If grape sugar is not present, the liquid either remains unchanged, or else a black precipitate of protoxide of copper is thrown down after some time. The tartrate of potash and copper test (Fehling's solution) may also be used. This consists of a mixture of tartrate of potash, sulphate of copper, solution of soda, and distilled water, in certain proportions. In testing with these solutions there should always be a considerable excess of alkali, in order to decompose any ammoniacal salts that may be present in the urine, as these interfere with the action of the above tests. Change of color alone, without the subsidence of any precipitate, should not be looked on as evidence of the presence of grape sugar. It cannot be positively said to be present, unless the yellow suboxide of copper is thrown down. Moreover, where great accuracy is required, the solution to be tested for sugar should first be treated with solution of acetate of lead till no further precipitate is produced. Then the excess of lead is to be removed by carbonate of soda, and the solution filtered. After filtration, the clear solution may be submitted to the action of Trommer's or Fehling's tests. Moore's test consists in adding liquor potassæ to the saccharine solution, and then heating it; an orange brown tint is

produced, its intensity depending on the quantity of sugar present. If a little diabetic urine be set aside for some time in a warm place, torulæ are developed. These are microscopic fungi, forming strings of oval vesicles. Diabetic urine, mixed with yeast, and kept at a temperature of about 70° Fah., soon ferments; carbonic acid is disengaged, varying in amount with the quantity of sugar present; and the liquid afterwards yields weak alcohol, on distillation. Lastly,—grape sugar may be discovered by the property that it possesses of rotating the plane of polarisation to the right, the extent of rotation depending on the quantity of sugar present. This then becomes a valuable mode of estimating very accurately the amount of sugar present in a given specimen of urine. Grape sugar may be obtained from the urine by crystallisation, but it is difficult to obtain well-formed crystals of this sugar.

Along with this saccharine condition of urine are certain other general symptoms. There is usually great emaciation, and this comes on very rapidly. In consequence of it, patients with diabetes generally have the peculiar expression of countenance known as the facies hippocratica. Intense thirst is another very distressing, but very characteristic, symptom; it is apt to occur especially at night. In Dr. Watson's Lectures on Physic, a story is related of a diabetic girl, in whom this intense thirst was present. Not being allowed to gratify it, she used to get up in the night, when she heard it raining, and catch the falling drops of water, in order to quench her thirst. Along with the thirst there is generally a voracious appetite, said to be especially for sugar, and bread and other articles of diet containing starch; notwithstanding this, the emaciation still continues. The voracious appetite is not quite so constant a symptom as the intense thirst. There are other minor symptoms which are generally present. There

is great weakness and indisposition to any exertion, either mental or bodily. There is generally more or less anxiety, and depression of spirits, and also great nervousness. The temper of the patient may be entirely changed, being the reverse of that which he possessed when first attacked by the disease. The extremities are generally cold, the skin is dry and harsh to the touch, and the patients hardly perspire at all. The tongue is morbidly red and clean, and sometimes very dry, and the bowels are generally confined. There are also symptoms of dyspepsia,—as pain in the stomach after meals, with frequent eructations, and other symptoms of deranged gastric function.

2. Diagnosis of diabetes from other states of system which might be mistaken for it.—There are a few conditions which are, at first sight, liable to be mistaken for diabetes; because of the increased secretion of urine that accompanies them—few of the other symptoms being present. More water is passed in cold weather than in warm; and more is passed by hysterical and nervous persons, than by those of an opposite temperament. The urine, in these cases, is of low sp. gr.; and the other symptoms, characteristic of diabetes, are absent. In persons with a wasted and contracted kidney, who pass much water, it is found to have a low specific gravity, and not to contain any sugar. The patient is generally rather dropsical, and the urine also contains albumen. It is not usual to find albumen in diabetic urine, except at the close of the disease, when it generally appears; dropsy is a rare occurrence in diabetic patients, except under the same circumstances. Lastly,—there is that rare disease, called diabetes insipidus. This is known not to be saccharine diabetes, by the low sp. gr. of the urine, and the absence of sugar. There is no albumen in it, and there is much less saline matter than usual.

3. The varieties of diabetes.— There are two principal forms—an acute form and a chronic form. The acute form is characterised by the rapid appearance and progress of the symptoms; and it generally runs its course in three or four months, at the end of which it proves fatal. It is, however, rare; and occurs more frequently in women than in men. The chronic form is more common than the preceding; it comes on more slowly, and lasts for several years. The length of time which may elapse before it proves fatal, depends more or less on the treatment pursued, and the habits of the patient. Besides these two varieties there is an intermittent variety, in which the secretion of sugar stops for a time and then recommences.

4. The chief modes of death.

a. Death may be from exhaustion of the powers of life.

b. In a state of coma.—This is caused by suppression of the urinary secretion, and the consequent accumulation of sugar and urea in the blood. It is especially liable to occur where, by any means, the secretion of urine is reduced considerably below the quantity habitually passed by the patient. This was the case with a patient named Catherine Jackson, who was in the hospital some time ago, under Dr. Todd, with diabetes. When the amount of urine passed daily fell very much, she became comatose. Morphia is said to reduce the secretion of urine.

c. From pulmonary disease.—This is generally considered to be phthisis. Dr. Todd, however, considers it to be a species of lobular pneumonia, caused by the deposition of portions of sugar in the lung. These set up chronic pneumonia, and cause grey hepatisation, leading to the formation of small cavities.

d. From inflammation of one of the serous membranes, as

peritonitis or pleurisy. This very soon causes death, from the great exhaustion of the patient.

5. The post mortem appearances.

The chief of these are—

a. Hypertrophy and congestion of the kidneys, and generally an increased quantity of oily matter in them.

b. Hypertrophy of the membranes of the stomach.

c. Atrophy of the pancreas was found in two cases by Bernard.

d. Diminution of the fatty matter of the liver.

e. Where death is from phthisis, there are the usual post mortem appearances of that disease.

6. The pathology of diabetes.

I shall now consider the principal theories that have been proposed to account for this disease. The characteristic symptom is, the presence of grape sugar in the urine. Two questions immediately suggest themselves.

Where is the sugar formed?

How is it formed?

I shall only discuss the first of these two questions.

a. Is it formed by the kidney? This does not appear to be the case. Sugar has been detected in diabetic blood by certain observers. Now very elaborate investigations have shown that the kidney is a purely separative, and not a formative, organ; so that it is highly improbable that it forms sugar, and then pours it into the blood, to be again separated by itself. For its main office is to separate from the blood certain materials which have been formed elsewhere, and which would be prejudicial if allowed to remain longer in the system. Urea is formed throughout the system by the destruction of nitrogenous matters; and if it be not immediately eliminated by the kidneys, it accumulates in the blood, causing coma and death. So that the kidney cannot

be considered to form the sugar, but only to separate it from the blood.

b. Is the sugar formed by the stomach?

To examine the truth of this view, let us first consider the precise function of the stomach. The mucous membrane of the stomach secretes the gastric juice; this fluid contains free lactic and hydrochloric acids and pepsine. It dissolves the nitrogenous part of the food, but does not act on the fatty matters at all, and but very slightly on starch.

It seems doubtful whether the stomach is at fault, as there is absence of any proof that the azotised matters are not properly digested by it in diabetes. Experiments have been performed on diabetic patients, with a view to ascertain the presence of sugar in food, containing none in the first instance, after partial digestion in the stomach. The experiments were performed by Mr. M'Gregor, of Glasgow, in 1837; and are related in Dr. Watson's Lectures on Physic. I give the passage in Dr. Watson's words. "He (Mr. M'Gregor) obtained, by means of an emetic, the digested food from the stomachs of two men who had dined two or three hours before. One man was in health, the other had diabetes. In each case the food had been of the ordinary kind. Applying after due preparation the test of yeast, he found that the vomited matters fermented strongly, especially those from the diabetic patient. Then he varied the experiment. Thinking that the sugar in these cases might have been introduced in the vegetable portion of the food, he adopted precautions to exclude that possible source of fallacy. He administered to a healthy man and to a diabetic man a vomit and a purge, to clear out the alimentary canal. Next he fed them upon roast beef and water and nothing else for three days. Then, three or four hours after a meal, the contents of their stomachs

were procured by the operation of the sulphate of zinc as an emetic, and treated as in the former case. What the healthy man vomited did not ferment at all, what came from the diabetic patient fermented pretty briskly." Now, although sugar was in one instance detected unequivocally in the matters from the stomach of a diabetic patient, I think it seems rather doubtful that the sugar was formed at the surface of the stomach. Sugar has been detected both in the saliva and gastric juice of diabetes. It has been detected in the saliva by Mr. M'Gregor, and in the gastric juice by Bernard and Valentin. The sugar that was found in the digested matters would probably be derived from both the above sources. It does not seem to be possible to make accurate experiments on the contents of the stomach of a diabetic man, at least with regard to sugar. The post mortem changes in the stomach do not throw any light on the matter. There is only thickening and hypertrophy of the mucous membrane. The secreting structure of the stomach would necessarily be hypertrophied, as, from the enormous appetite of diabetic patients, a much larger amount of food has to be digested than in health. It might have some relation to the state of the gastric juice. There is probably in diabetes some alteration in the chemical composition of that secretion, as far as regards the amount of lactic acid present in it. This acid would seem to be diminished in quantity, as, according to Dr. Headland, the administration of lactic acid in diabetes alleviates some of the most distressing symptoms. If this was the case, it would explain the dyspeptic symptoms in some measure.

c. Is the sugar formed by the liver?

The following facts seem to point out this gland as the source of sugar in diabetes:—

a. The liver is the only organ that forms sugar, in health, independently of any supply of starch or sugar. This has been shown by the experiments of Bernard; the following conclusions were drawn by him respecting the sugar-producing function of the liver.

"1. There is sugar in the liver of man and all animals in a state of health.

2. Sugar exists in the livers both of carnivorous and herbivorous animals, whether fasting or during digestion.

The presence of sugar in the liver is therefore independent of the nature of the food.

3. In a carnivorous animal there is no sugar in the portal blood, but there is a large quantity in the hepatic blood.

Sugar is therefore formed in the liver.

4. The sugar introduced into the blood is gradually destroyed the farther it gets from the liver, without ever appearing in the urine in healthy animals.

5. The blood which goes out of the liver contains no fibrine and much less albumen than the blood which enters it, while it contains much sugar.

The sugar is therefore produced at the expense of the albuminoid matters of the blood.

6. The glycogenic function undergoes changes.

It is most active during digestion.

It diminishes in the intervals.

It may disappear after a long fast.

7. External influences act on the secretion of sugar.

Cold causes it to disappear, completely or in part, according to its intensity.

Heat re-establishes it.

8. Changes in the nervous system influence this secretion to exaggerate it, diminish it, or pervert it.

9. The glycogenic function is in relation with the other functions of the economy, especially respiration.

10. In morbid states this function is exaggerated or annihilated.

Its exaggeration produces diabetes.

It is annihilated in all febrile conditions.

There is generally no sugar in the livers of those who have died from disease."

The liver also forms fatty matter, without any being supplied to it. After the death of a diabetic person, his liver is found to contain much less fatty matter than is usual in a state of health. Some experiments on this point were made by Dr. L. S. Beale (Medico-Chirurgical Review, No. XXIII., July, 1853). He examined two diabetic livers, and found in them only one-half the quantity of fatty matter usually present in the healthy liver. The kidneys of these persons were found to contain from three to five times as much fat as the healthy kidney. Is there any relation between the diminished formation of fat and the increased formation of sugar, by the liver, in diabetes? It is worthy of remark, that, in phthisis, there is generally fatty enlargement of the liver; whilst, in diabetes, it is an opposite condition. Where phthisis comes on slowly in a diabetic patient, the secretion of sugar ceases for some time before death; no sugar can be found in the urine, and, after death, none can be found in the liver. Does the liver, which, while the man was diabetic contained but little fat, gradually become fatty as the secretion of sugar ceases? In cases of acute phthisis, the sugar does not disappear from the urine, and it is found in the liver after death. Is there, in diabetic patients who die of acute phthisis, fatty enlargement of the liver?

b. Saccharine urine may be passed when no sugar or starch

is taken in the food. Administration of these substances only increases the amount of sugar in the blood; it does not affect the formation of sugar by the liver. By this I do not mean that administration of sugar, &c., does no harm in diabetes; for there is already in the system a continual formation of sugar in undue quantity, in an amount more than sufficient for the purposes to which it is applied in the organism in a state of health; and if we add more sugar from without, we of course aggravate the disease by increasing the quantity of material to be excreted. The emaciation in diabetes seems to be in a great measure due to deficiency of albuminoid substances, or rather to their perverted assimilation. The greater part of these matters, after digestion by the stomach, are absorbed by the veins and carried to the liver, without passing into the state of chyle. After the passage of the blood through the liver, it is found to contain no fibrine, and much less albumen than when it entered it. The fibrine and albumen that disappear in the liver are probably converted into bile, sugar, and fat; these are the three products formed by the liver. The bile is in part reabsorbed; some of its constituents are absolutely essential for the perfect digestion of the food (chiefly fat) in some way or other; others are deleterious, and, if allowed to remain in the system, would produce death. For, if the escape of bile from the ducts be prevented, or the secretion of bile be stopped, symptoms of poisoning by bile come on and are followed by death in a state of coma. If, on the other hand, it be allowed to escape from the system, without being poured into the intestines, there are no symptoms of poisoning; but the animal lives on for many months, and, becoming extremely emaciated, at last dies of inanition. This was found to be the case in some experiments performed on dogs by Professor Schwann, of Louvain (Todd

and Bowman's Physiology, pp. 257, 258). Now when, as probably occurs in diabetes, one of the secretions of the liver is enormously increased, we may reasonably suppose that some essential part of the other secretion must be absent, or at least present in very small quantity, as both these secretions (*i. e.*, bile and sugar) are formed from the same materials (*i. e.*, the albuminoid bodies). The bile of a diabetic person probably contains, at least in the early stages of the disease, all those principles which are excrementitious; for the excreting function of the liver does not seem to be much impaired. Those principles which are recrementitious and necessary for digestion, or other purposes, are probably formed in less amount than in health; and this would account for the emaciation in diabetes, according to the preceding experiments of Schwann on the uses of the bile.

Where diabetic patients have been kept for some time on a diet exclusively animal, though some of the symptoms have been amended, yet the sp. gr. of the urine has not been materially diminished, and there has still been much sugar formed.

c. Both phthisis and diabetes are benefited by the exhibition of fatty substances, as cod liver oil and cocoa nut oil. When fatty food alone is taken in diabetes, the production of sugar by the liver, and its quantity in the body, is diminished. It would seem to do good by excluding substances from which sugar can be formed. For the same reason, if fatty or starchy food be given in health, the secretion of bile is diminished; if albuminoid food be given, the secretion of bile is increased. It will here be proper to consider the nature of the food from which sugar is probably produced in diabetes. The digestion of the saccharine and amylaceous matters does not seem to be

at fault. They are always converted into sugar in a state of health, and cannot be absorbed unless this first takes place. In diabetes, the fault seems to lie in a considerable increase in the formation of sugar by the liver, out of albuminoid substances, which, in health, are chiefly converted into bile.

d. Another fact which points to the liver as the source of diabetic sugar is this: mercury, when given to a person in health, considerably increases the secretion of bile. It increases all the secretions, more or less; but it especially acts on the secretion of the liver. When given to a person with diabetes mellitus, it increases the quantity of sugar that is formed, and consequently more urine is secreted, both from the diuresis caused by the sugar and that caused by the mercury. That an increased amount of sugar is passed, is shown by the increase in the sp. gr. of the urine, notwithstanding its large quantity. Where, by any means, as by a reduction of liquid food or by the exhibition of opium, the quantity of urine passed has been diminished below a certain amount, so that the sugar is not excreted with sufficient rapidity, symptoms of coma come on. It has been already alluded to as one of the modes of death in diabetes, and would be caused by accumulation of sugar, excrementitious biliary matters, and perhaps urea, in the blood. This is especially liable to occur in the acute form of the disease.

e. The perverted action of the liver is caused by some irritation in the floor of the fourth ventricle of the brain. Bernard found that by a puncture in this part of the brain, an animal was rendered diabetic. The mode in which he produced this effect was as follows:—In his experiments on rabbits, he passed a needle—having a peculiarly shaped point—forwards and downwards through the integuments, the posterior part of the skull, and the middle lobe of the cerebellum.

The direction of the puncture was such, that the instrument cut at right angles the centre of an imaginary line drawn from one external auditory meatus to the other. At the centre of this line, the medulla oblongata is situated. The needle was steadily pushed on through the parts before referred to, till it was arrested in its course by the base of the skull; it was then immediately withdrawn. If the operation had been carefully performed, a diabetic state was produced without any paralysis. If, however, the needle had deviated from the median line in its course through the brain, more or less unsteadiness of gait and some paralysis were produced, as well as the diabetes. After a day or two, the animal recovered from the diabetes, as the irritation produced by the puncture in the medulla oblongata subsided. Bernard was led to this experiment by finding that, after section of the vagus in the neck, the healthy sugar-producing function of the liver was interrupted, and no sugar could be found in the liver after death. It was again restored by galvanising the cut end of the nerve next to the brain, but he could not produce an exaggeration of the healthy secretion by these means. He therefore tried the effect of irritating the point of origin of the eighth pair of nerves by means of a puncture, and found that it produced diabetes. He also showed that the exciting cause of the glycogenic function resides in the lungs, by the following experiments:—He took two dogs. In one of them he cut the pneumogastric nerves in the neck, in the other he cut the nerves between the lung and the liver. Both dogs were killed after a short interval, and their livers were immediately examined for sugar. (Unless this is sought for soon after death, it cannot be detected, as it rapidly becomes decomposed.) In the liver of the first dog, no sugar was found; section of the nerve between the lungs and brain had put a

stop to its secretion. In the liver of the second dog, sugar was found as usual. This showed that for the formation of sugar by the liver, in health, a communication between the brain and lungs is necessary; that some influence is transmitted from the lung, not directly downwards to the liver, but upwards through the vagus to the medulla oblongata, and thence downwards to the liver by some other nervous channel. He thinks that it is transmitted through the spinal cord, and that it reaches the liver through the filaments of the sympathetic connected with it. That the pneumogastrics do not transmit the nervous influence down from the brain to the liver, was shown by the following experiment. After section of the vagi in the neck, when the end nearest the brain was galvanised, the secretion of sugar, which was arrested by the division of the nerve, again went on. On galvanising the distal end, no effect was produced; the secretion of sugar could not be re-established. These experiments were made on healthy dogs. As in health, the formation of sugar by the liver depends on the integrity of its nervous connections with the brain and lungs; so also is the exaggerated secretion in diabetes controlled, to a certain extent, by changes going on in the lungs. By some experiments made by Bouchardat, on two patients who were slightly diabetic—it was shown that, when pure oxygen gas was inhaled, the urine was secreted free from sugar. This might possibly be owing to more complete combustion of the sugar at the surface of the lungs, in consequence of the increased supply of oxygen. Dr. Beale also detected sugar in the prune juice expectoration of a patient in the last stage of pneumonia, when there was very imperfect oxygenation of the blood, and imperfect combustion of the carbonaceous matters.

The conclusions that may be drawn concerning the pathology of Diabetes Mellitus are as follows:—

1. That there is a morbid increase in the secretion of sugar by the liver.

2. That this sugar is formed out of albuminoid substances.

3. That, consequently, the secretion of bile is diminished, so far as regards that part of it which is recrementitious—causing emaciation and at length death.

4. That the increased formation of sugar, by the liver, is caused by some irritation at the floor of the fourth ventricle of the brain; and that it is controlled, to a certain extent, by the condition of the lungs.

I have now completed all that I have to say regarding this disease. The account that I have given of it has been far too brief for its importance, and too much has been omitted for it to be considered a complete account of diabetes. In preparing this paper, I have made a free use of the labors of others. The chief sources of my information have been—Prout on Diabetes; Watson on the Principles and Practice of Physic; Copland's Dictionary of Practical Medicine; Simon's Animal Chemistry; Todd and Bowman's Physiology; and the published experiments of Bernard on this subject; as well as two papers by Dr. Beale, in some numbers of the Medico-Chirurgical Review of some years back, Nos. XXI. and XXIII.; and my own notes of a Clinical Lecture on Diabetes, which was given by Dr. Todd, last March.

ON THE MEDICINAL TREATMENT OF SURGICAL AFFECTIONS.

By Christopher Heath.

Some surprise has been expressed at my employing the term Medicinal, rather than Medical, in the title of this paper; but it appears to me, that, to use the latter word, would favor the erroneous idea that Medicine and Surgery are two separate and distinct things, instead of being merely artificial divisions of one great science: an idea which has done much harm, in a practical point of view, by leading men to confine their studies entirely to that particular branch of the profession which they intend to follow, to the neglect of every other; forgetting that he who would be a good surgeon, must be to a certain extent a good physician also.

I hope no one will misunderstand me, as wishing in any way to depreciate operative interference, or detract from the merits of a brilliant operator, when I say, that I think there is some danger of our regarding operations as the whole aim and duty of a surgeon; whereas there are many surgical affections which may be relieved by medicinal treatment alone: and again, the most brilliant operation is but of little avail, as regards the life of the patient, unless the treatment during convalescence be carefully and scientifically conducted. While on the one hand, however, constitutional treatment must be regarded as the helpmate of manual dexterity; on the other, nothing can be more erroneous than to trust to medicine alone, where an operation will give certain and im-

mediate relief; for thus, not only do the patient's sufferings continue unrelieved, but the proper period for an operation will pass away, never to return, and thus, through procrastination, a fatal result not improbably occur.

In the medicinal treatment of surgical affections, as in every other department of science, there may be faults, both of omission and commission, and I know not which are the most to be condemned; though perhaps, on the whole, the latter do most harm, by embarrassing those efforts of nature which would *certainly*, if properly assisted, and might very *probably*, though unassisted, lead to the mitigation of the patient's sufferings. Perhaps no better example of the truth of this proposition can be found, than in the case of a patient affected with inflammation of that delicate membrane, the conjunctiva of the eye. A patient presents himself with a blood-shot, watering eye, and other well-known symptoms of conjunctivitis, and the surgeon applies, and rightly so, some of those external applications usually resorted to, but on the nature of which I do not purpose to enter at the present time; some amelioration probably takes place, but still the affection is not entirely removed—the redness remains; other external remedies are tried, and with similar results, until at last the surgeon bethinks him of constitutional treatment—and what does he do? Why, having imbibed from works on materia medica, and other sources, the information that mercury is of wonderful efficacy in subduing inflammation of the eye, and not marking the distinction between the eye-ball, and its delicate covering, he, in too many instances, I am afraid, immediately administers mercury; thus replacing the sin of omission by that of actual commission, to the great detriment of his patient's eye, and the no small injury of his own reputation. For, after a patient's mouth becomes sore,

and salivation intolerable, the sufferer naturally expects that his eye will benefit from his great constitutional disturbance: how great then will be his disappointment, when he at length finds his eye rather more damaged than before, his health broken, and his attendant more perplexed at his symptoms than ever! Constitutional treatment was needed, but it was treatment suited to the cause of the disease; and that, the practitioner had not taken the trouble to investigate. Let us suppose the patient to be a child, with tumid abdomen, swollen lips, and all the other symptoms of struma, but too common among London patients; the eyelids being puffy and excoriated, and the intolerance of light so extreme that it is with difficulty any glimpse of the eye can be caught;—to put such a child under the influence of mercury, would be, probably, the most effectual means of hurrying it to its grave —whither it would go with its eyes not one whit improved. But if the surgeon, referring the state of the eyes to the strumous condition of the system, sets about rectifying the latter by alteratives, tonics, cod-liver oil, or syrup of the iodide of iron (a most effectual remedy), he will soon have the satisfaction of finding great improvement, and an ultimate cure of the local affection. To take another case in the same department of surgery—the patient with conjunctivitis is an adult, employed in some laborious occupation, by which his health becomes impaired and his strength lowered; his eyes become reddened, but without any very great intolerance of light. Now, in such a case, tonics (more especially the liq. cinchonæ, in combination with dilute acids) do wonders, and the eye soon recovers its wonted condition. But suppose it does not;—the surgeon, perhaps, makes further enquiry into the history of the case, and perchance extracts the confession of some quasi syphilitic affection, at some re-

mote period; here then, it may be said, is a clear indication for mercury. But if the enquiry were more carefully conducted, it might also be found that the patient's occupation was one which greatly tried his eyes, they being directed constantly upon minute objects, and by gas-light. The syphilitic hypothesis being therefore laid aside for a time, and the irritation of system being combated with opium, alone, or united with the tonics, in all probability the eye will recover, as it were by magic, to the no small comfort of the patient, and glorification of the medical attendant. In opium, the surgeon will, I believe, find a remedy of the greatest service, not only in the above disease, but in all those cases in which there is irritation of the system, in some the cause, in others only the evidence and accompaniment of local affection. To fly to the other extremity of the body, and take that very common affection—sore legs. Local treatment, alone, is in many cases effectual, no doubt; but we occasionally meet with a sore which tries our patience to the utmost, and exhausts all our remedies. Lotion after lotion, and salve after salve, are applied (though, by the way, I consider salve of any sort a very dirty and unsuitable remedy), and yet there remains a bright red sore, with no secretion of any moment, and apparently no intention whatever of skinning over. Purgatives, alteratives, and tonics may be given in vain; but if *opium* be administered, improvement will soon become manifest, and in a surprisingly short time the sore will heal over, under the simplest water-dressing. The same thing will be found in the treatment of sores in other parts of the body, even on the genital organs, in those cases in which there is nothing specific about the sore, and the system is much broken down, either by excess or previous courses of mercury.

But opium is of use not only in the comparatively slight affections; it is the drug on which the surgeon must frequently place his chief reliance in that most serious complication but too often attendant upon surgical operations, peritonitis. In cases of hernia, not merely after operative interference, but even after simple reduction by the taxis, inflammation of the peritoneum is but too frequently set up, and in most of the fatal instances, is the cause of death. In operations on the large vessels of the pelvis, in the formation of an artificial anus, or even the slighter operation of paracentesis abdominis, it is one of the chief sources of danger to the patient, and dread to the surgeon. It is in these cases, then, that we are able fully to appreciate the beneficial effects of the drug. Calomel and opium is constantly mentioned in medical works, as of great efficacy in this and kindred affections, but it may, I think, be fairly doubted by those who have witnessed the remarkable benefit resulting from the administration of opium alone, in cases of peritonitis in King's College Hospital, whether the *opium* ought not to have the greater share of the credit. It appears to do good by relieving the intense pain which is so prominent a symptom of the disease, and by that means also alleviating the great nervous depression which accompanies it, and which is one of the most serious obstacles to a favourable result. The patient is by its means placed in a condition the most favourable for recovery, and if proper measures are taken for the support of his strength, by the due administration of stimulants (a subject on which I will speak more fully presently), the healing powers of nature, thus assisted by art, will in all probability lead to a successful issue. But, in all cases, prevention is better than cure, and prophylactic treat-

ment, when possible, should never be neglected; with this object, therefore, it would be advisable, in all those cases in which the peritoneum is implicated, and inflammation may occur, to put the patient under the influence of opium, with the view of *preventing* the dreaded event. And this precaution should not be neglected, as a preparation for what some may consider a slight operation — viz., paracentesis abdominis, but which is, perhaps, more frequently followed by low peritonitis, than any other of the minor operations of surgery. Seeing, then, what great benefit results from the exhibition of opium in peritonitis (and we know the same result occurs in pericarditis), it is not unreasonable, I think, to expect that similar results may be looked for from its use in inflammation of somewhat similar membranes. I mean the synovial membranes of joints. In acute inflammation of a joint, we have the same intense pain, with nervous depression, and hence I think, the same indications of treatment, with every probability of the same favourable result. Of course local measures must not be omitted, any more than in peritonitis; rest, leeches, and counter-irritants must be employed; but proper constitutional treatment would greatly enhance the value of these remedies, and materially diminish, I believe, the number of joints lost from this disease. In chronic synovitis, depending upon a strumous or gouty condition of the system, opium will probably not be required; but we must direct our attention to the treatment of those constitutional conditions on which the disease depends, and without the rectification of which no cure can be expected. Iodide of potassium is said—and I believe with justice—to have considerable influence on chronic synovitis; but it must not be trusted to alone; iron

and cod-liver oil, separately or in combination, will be found of the greatest use, and in cases of gouty diathesis, colchicum must not be omitted.

I have already made mention of the beneficial effects of opium on non-specific sores on the genital organs, and I may now say a few words with regard to the specific affection of syphilis, than which, in no other disease probably, is there greater scope for medicinal treatment; the local affections, although of so numerous and varied a nature, depending solely on the systemic disease. I believe I may safely say, that mercury is still regarded by the most eminent men, as the only trustworthy combatant of the syphilitic poison. Efforts have been made at various times to damage its reputation, but up to the present time, and for several generations past, it has maintained its pre-eminence.

Briefly, the truth of the matter appears to me to be this, —a true chancre will undoubtedly produce secondary symptoms, unless the disease be combated by the administration of mercury, but, whether that drug be given at the time or no, must depend upon a variety of circumstances, of which the surgeon must take due cognizance. If the patient be in good health and the sore present the ordinary appearance of a chancre, I believe that the best course is, to administer mercury during the primary treatment, by which the latter will probably be considerably shortened, and the disease will in the end be fully eradicated; but if the sore be in a sloughy or phagedanic condition, or the patient's health much reduced, either by excesses, or previous courses of mercury, to administer the drug immediately, will lead to an aggravation of all the symptoms, and possibly to death itself. The surgeon must hold his hand, treat the local disease as he best may under the circumstances, and wait, until by tonics and opium,

he has brought the patient into a state capable of bearing the administration of mercury.

In hospitals, and more especially in the out-door department, I am afraid the mistake is too frequently committed, of giving mercury to the extent of affecting the mouth, perhaps to violent salivation, and then stopping it altogether; this is not only useless as regards the disease, but full of danger also to the patient. Mercury, to produce its full benefit, must be kept in the system for some time, and it must constantly be borne in mind that salivation is only a symptom of the presence of mercury, and its production not the object of our treatment. To stop the administration of mercury immediately its characteristic effects are produced on the mouth, is merely to do so much injury to the patient's constitution and comfort, without in the least combating the latent disease. Secondary syphilis, in all its varied local effects, is but another phase of the same disease, and although we may be able to gratify our patients by the relief afforded by the administration of iodide of potassium, sarsaparilla, &c., we must bear in mind that the disease remains as before, and that, although these may be very good temporary expedients, that nothing but mercury at some time or other, will really give the desired freedom from disease.

Some patients, it is true, are too much broken down to bear mercury, and then we can only temporise until they are in a fitter condition; but to others again, the administration of mercury restores almost immediately, that health, of which the syphilitic poison has too surely robbed them. The most striking example of this is, perhaps, in the case of children born with the syphilitic taint upon them; they being weak, sickly and pining, with probably, a coppery eruption on the skin, and aphthous mouth. To treat these affections locally

would be absurd; it is only by the administration of mercury that the child's life can be saved; but we may take advantage of the local eruption, to cloak the administration and for the remedy, and the sin of one at least of the parents. Sir Benjamin Brodie was the first, I believe, to propose the inunction of mercury in infantile syphilis, by smearing the unguentum hydrargyri on a flannel roller, and applying it to the thigh of the infant; when by the heat and friction produced, the drug becomes rapidly absorbed and taken into the system. In practice, however, it will be found more convenient to use the white precipitate ointment, simply for the reason that its mercurial character is not so commonly known, and the scandal caused by its administration thus less likely to be spread abroad.

A disease which has occupied the attention of the most eminent surgeons, in a greater degree perhaps than any other, is aneurism. This disease is more especially interesting to the surgeon, as having given rise to some of the most brilliant operations which he is ever called upon to perform; latterly, however, a new direction has been given to our ideas, by the revival of the cure by pressure, and it is in connection with the latter method that I would now speak of constitutional treatment; although, whether we treat the disease by pressure or delegation of the artery, the constitutional treatment equally demands our fullest attention. The object of pressure is to favour, I may say cause, a deposit of fibrine within the sac of the aneurism, every means therefore should be taken to facilitate this process as much as possible. Aneurism, however, may be found co-existent with two very opposite states of the system, hyperæmia and anæmia, and different courses of treatment must be adopted accordingly. If the patient is healthy and robust, with strong pulse, and no other

symptom of disease of the arteries, the indication clearly is, to moderate the heart's action, so as to favor the deposit of fibrine, care being taken however, not to impoverish the blood, so as to lessen the amount of its fibrine. These objects may be attained by the careful regulation of the patient's diet, depriving him of those substances which would excite the circulatory system, such as fermented liquors, and allowing him to eat in small quantity, those nitrogenous compounds only, which would favour the formation of fibrine, more especially bread. In addition, the administration of digitalis in small doses, carefully watched, will be found to be of service in moderating the heart's action, and with the same view small and repeated bleedings have been recommended. Purgatives have also been recommended to diminish the quantity of water in the blood, but they would, I imagine, interfere too much with the quiet so necessary for the due application of pressure, to be of material service.

But in the cases which we more frequently meet with of anæmic patients suffering from aneurism, the disease depending upon faulty nutrition of the arterial walls, depletion of any kind is clearly unnecessary and erroneous. The blood is too poor to be able to deposit its fibrine in the sac, and our object is, to increase its quantity by feeding the patient liberally with meat and bread, and by the administration of tonics, more especially those containing iron; by such means as these the blood will be restored to its normal condition, and will be in the fittest condition to perform its share in the obliteration of the sac, the object of the mechanical pressure.

In patients affected with calculus in the bladder, there is again scope for medicinal treatment, not indeed to relieve them of the stone, for of that, nothing but a surgical operation can ever rid them, but to prevent, if possible, its re-

formation in after years. A secondary formation of calculus is, it is true, not a common occurrence in the present day; but still such cases do occur, and it is not too much to say, I think, that by proper treatment this untoward event might be prevented. That calculi depend upon an unhealthy secretion of urine, and that varieties of calculi arise from a difference in the urine in the bladder, cannot I believe be doubted, but some doubts have lately been thrown upon the question, as to the nature of the urine when first secreted by the kidney, and the state of system producing it. According to the more commonly received notions, when highly acid urine is secreted, a lithic acid calculus is produced; and again, when the urine is alkaline, the calculus is composed of phosphates. This secretion of acid is found usually in healthy robust persons, addicted perhaps to the pleasures of the table, and the liberal use of vinous and spirituous liquors. If now we extract a lithic acid calculus from such a patient's bladder, but allow him to continue his previous mode of life unchanged, he will in all probability soon have to submit to another operation. What is required is not so much the administration of medicine, as the regulation of his diet and habits, and I think this cannot be expressed more forcibly than it is by Sir Benjamin Brodie, in his Essay on Sand in the Urine, thus—"Is the patient a great eater, pampering his appetite by a variety of dishes, and thus exciting himself to swallow more food than his stomach can readily digest? Let him make his dinner on a single dish, and eat of that in moderate quantity. Let him also incline to a diet of vegetable, rather than one of animal food; avoiding, however, undressed vegetables, and especially those which are acid, or acescent, as salad, oranges, or apples. Does he commit excesses in drinking? Let him leave off fermented liquors altogether, or take them only in

small quantity; and in particular let him avoid such fermented liquors, as, from the sugar which remains unfermented in them, are liable to become acid in the stomach, or which are acid already. The French white wines are injurious in these cases, especially champagne; so are all the varieties of malt liquor, from Burton ale down to home-brewed beer; but none of these liquors are worse than our old-fashioned English liquor, called punch." Such are the chief points of treatment; but we may with benefit administer small doses of alkalies, potash or magnesia, with occasional purgatives.

Alkaline urine, on the other hand, is said to be co-existent with impaired health, and more especially with depression of the nervous system, and here more can be done in the way of medicine, by the administration of acids, both vegetable and mineral, which not only have a direct acidifying effect upon the urine, but improve the system by their tonic qualities. Other tonics may also be administered, and every means taken to improve the general health, by healthy exercise and fresh air, and by these means the urine will soon be restored to its normal standard. This seems all straightforward enough; but Dr. Owen Rees, in the Croonian Lectures of last year, has promulgated the opinion, that urine is invariably secreted in an acid condition, and that the alkalinity and the deposit of phosphates, is the result of the peculiar state of the mucous membrane of the bladder. If this be so, it would seem to be rather irrational to acidify what is already acid; but this treatment, even if it should be proved to be empirical, is so satisfactory that we may safely adhere to it, at least for the present.

But the most important bearing of medicinal treatment, is in relation to surgical operations. It is, after all that operative skill can effect has been done, that we look to medicine to

aid in the convalescence and recovery of the patient. And here there is, I believe, a great field for inquiry and practice, hitherto but little entered upon. Surgeons are too apt to be content with their manual interference, and leave the rest to nature; if the patient recovers, the operator is pronounced successful, if the contrary, the unfortunate patient is said to have succumbed, and there is an end of it. This is more especially the case with the French surgeons; but some of the British are a good deal of the same way of thinking. What can be more terrible than to see a patient in sound health, or comparatively so, one day; the operation takes place, and within a week, or perhaps less, the unfortunate sufferer is in his grave, not from any fault in the performance of the operation, but from constitutional affection, it may be only from what is commonly called "shock." After a severe operation, particularly where there has been much loss of blood, the patient is often much depressed; the pulse may be quick and feeble, and he may appear to be rapidly becoming moribund. But do we not see precisely the same state of things, only from another cause, in patients suffering from typhoid fever; nothing can be more intense than the utter prostration seen in that disease, and how do we combat it? By large quantities of stimulants given in regular and repeated doses, and the effects are most remarkable; the pulse becomes fuller and less frequent as the brandy is poured in, the heat of the body returns, and the patient is saved. To those who have attended the Physicians' Wards in King's College Hospital, I am sure I need not dilate upon the beneficial effects of such treatment; but, I would say, that in these days of anæsthetics, prostration is rarely so great immediately after an operation, but the patient gradually becomes more and more depressed, until at last he dies; now,

by the liberal administration of stimulants, even within a few hours after the operation, if the symptoms, more especially the pulse, indicate them, the patient's strength will be kept up, and he will never pass into a worse state, from which it is very difficult, if not impossible, to raise him again. But perhaps, the patient gets over the first few days after the operation, without any untoward symptom, when one day he complains of pain in one of his joints, very likely the shoulder; this being a week perhaps after the operation (although I have known it come on on the day following); the surgeon, if inexperienced, might be inclined to set it down, as merely "a little rheumatism" and of no importance; but an experienced eye will detect a change in the patient, an anxious expression of countenance, perhaps an unhealthy appearance in the wound, and the pulse will be found to have quickened considerably; the pain is, in fact, but one of the first symptoms of purulent absorption, that affection which destroys by far the greater number of those who die after surgical operations. And now begins a struggle between medicine and disease, and the only chance for the patient lies in the free administration of that potent medicine, brandy, together with large quantities of easily absorbed nourishment, such as beef-tea. The issue may be said to depend almost entirely upon which gets the start during the first few hours, the disease or the doctor, for if vigorous measures are not taken at once, the disease will soon be beyond our control, and all our subsequent efforts will be set at nought. The same early treatment is of the greatest importance in another affection, which but too frequently complicates surgical operations, viz., erysipelas; the action of stimulants in this disease is really quite marvellous, and in a surprisingly short time the red blush

subsides from the skin, the constitutional disturbance disappears, and the patient is restored to his former health.

I have thus endeavoured to give a slight sketch of some of the principal surgical affections in which medicinal treatment is of essential service, being convinced of the necessity which exists, that any one who desires to practice surgery with success, should not omit those aids which medicine affords him.

THE VOICE.

By Edward Meeres.

Before we can at all satisfactorily proceed to an investigation of the laws which govern the production of the human voice, it is obvious that we must have a succinct and tolerably clear idea of the structure of the organ by which the voice is produced. I think it will be advisable, therefore, to give a brief sketch of the anatomy of the human larynx, noticing particularly those parts which are most essential to the formation of sound. In the next place, I shall endeavour to ascertain the principles on which the sounds of the human voice are formed, by comparing the vocal organs with the various classes of musical instruments whose mode of generating sound is understood. Lastly, I shall notice the phenomena which present themselves during vocalization, and the mode of formation of the falsetto voice.

Although many of the invertebrata, especially insects, have the power of generating sound, yet it is only in the higher vertebrate animals that a true vocal apparatus exists. The noises of insects are produced by the rapid vibration or attrition of their wings. The sound termed the "death-watch," which has warned so many old ladies of their approaching dissolution, is produced by a small beetle, the anobium, striking its mandibles against some hard substance. The crackling noise of the armies of locusts is occasioned by incalculable millions of powerful jaws in the act of mastication. Among vertebrata, the production of sound is limited chiefly to air-

breathing animals; no fishes having the power of producing any vocal sound. In reptiles, the vocal apparatus exists in a very rudimentary form; the sound is generated at the top of the trachea where it opens into the pharynx by a mere slit, bounded by two contractile lips. In birds the organ of voice is situate at the bifurcation of the trachea, while a second larynx, resembling that of reptiles, at the top of the trachea, regulates the ingress and egress of air. In mammalia there is but one larynx, which serves the double purpose of regulating respiration and generating sound; in most animals this organ bears a very close resemblance to the human larynx. The power of articulation, which is only found in man, does not depend so much on his physical as on his mental endowments, since many animals are capable of being taught to utter articulate sounds, though incapable of more than a very general apprehension of their import. Almost all animals of the mammalian class have the power of generating some vocal sounds; there are, however, one or two exceptions, as the giraffe, armadillo, &c.

It is scarcely necessary for me to prove that the larynx is the principal organ of voice in man; it is shown conclusively by the following facts: sounds resembling the human voice can be produced in a larynx removed from the body; when the larynx of a living animal is exposed, it is seen to be in action when a sound is produced; in a case which fell under the observation of Mr. Mayo, a man in an attempt to commit suicide, had cut off the upper part of the thyroid cartilage and exposed the vocal cords; the larynx was seen to be in action during vocalisation. When an opening is made in the trachea, so that no air passes through the larynx, no sound is generated; when the opening is closed, so that air again passes through the larynx, sound will be reproduced. The

vocal cords are shown to be the essential agents in the production of sound, by blowing through a larynx, when they will be thrown into strong vibrations; the same thing was observed in living animals by Majendie, and in man by Mr. Mayo.

The larynx is composed of certain cartilages, connected together by elastic ligaments, and moved upon one another by several muscles. In man, this organ is much larger than it is in woman; in children, it is nearly the same size in both sexes up to the age of puberty, when it undergoes great enlargement in the male, and a slight increase of size in the female. In eunuchs, it retains the small size of childhood, and the voice retains its original high pitch, though it alters somewhat in quality and increases in power.

The cricoid is the strongest cartilage of the larynx; its form is annular; its posterior surface is three or four times deeper than its anterior; its inner surface is smooth, and lined with mucous membrane; its outer surface is convex, and traversed in front and behind by a vertical ridge; on each lateral aspect there is an articular facet, which receives the inferior cornu of the thyroid cartilage. The lower border is smooth, and attached to the trachea; the upper border presents two undulating articular surfaces, which correspond with the bases of the arytænoid cartilages; it also gives attachment to the lateral crico-arytænoid muscle. This cartilage also gives attachment by its anterior surface to the crico-thyroid muscle, and by its posterior surface to the crico-arytænoideus posticus.

The thyroid cartilage consists of two flat pieces, united at an acute angle in front; this angle which is very prominent above, is called the pomum Adami; below, it almost disappears. The outer surface of each ala is marked by an oblique line

which runs downwards and forward, and gives attachment to the sterno-thyroid and thyro-hyoid muscles. The space behind it gives attachment to the inferior constrictor of the pharynx. The internal surface of each ala is smooth and slightly concave. The posterior borders are thick, and prolonged upwards and downwards into the superior and inferior cornu; the stylo-pharyngeus and palato-pharyngeus muscles are inserted into this border. The upper edge of the cartilage presents in the middle line a notch, and in front of each cornu another notch. The lower border of each ala presents, passing from before backwards, in the median line a tubercle, on each side of this a notch, next a tubercle, then another notch. The superior cornua are connected with the great horns of the hyoid bone by elastic tissue; the inferior cornua articulate with the cricoid cartilage.

The arytænoid cartilages are pyramidal, and about half an inch in height; each is articulated by its base with the cricoid cartilage, while its apex turns backwards, and renders the posterior surface deeply concave; the inner surface of each is flat, and the anterior surface convex; the base is triangular. They give attachment to several muscles; in the hollow posterior surface the arytænoideus is lodged. The anterior surface gives insertion to the thyro-arytænoideus; the external angle gives insertion to the crico-arytænoideus lateralis and crico-arytænoideus posticus. The true vocal cord is attached to the anterior angle.

The cornicula laryngis are small conical bodies, articulated with the summits of the arytænoid cartilages.

The cuneiform cartilages are little yellow bodies, inclosed in the fold of mucous membrane, which reaches from the arytænoid cartilage to the epiglottis.

The epiglottis is a lamella of cartilage, shaped like a cordate

leaf; inferiorly it is prolonged into a narrow fibrous band, which is attached to the retreating angle of the thyroid cartilage; its upper border is free; its lateral borders are partly free, the rest of their extent being connected with the arytænoid cartilages by a fold of mucous membrane. The laryngeal surface is free convex from above downwards, concave from side to side; the lingual surface is free above; below, the mucous membrane is reflected from it to the tongue, forming the glosso-epiglottidean ligaments; it is also connected to the hyoid bone by the hyo-epiglottidean ligament.

The thyroid cartilage is connected with the cricoid by the crico-thyroid membrane, which, by its elasticity keeps the cords in a considerable degree of tension; the joint formed by the inferior cornu of the thyroid with the cricoid is surrounded by a capsular ligament, and lined by a synovial membrane; the motion which it possesses is ginglymoid, so that the thyroid can move backwards and forwards on the cricoid, but no lateral movement is allowed. The arytænoid cartilage is fixed on the cricoid by a capsular ligament, reinforced by a strong posterior band; surrounding the cornicular is another capsular ligament. The thyro-arytænoid ligaments or vocal cords, reach from the angle of the thyroid to the arytænoid cartilage. The superior, thin and curved, are inserted into a little tubercle on the anterior surface of the arytænoid cartilage, while the inferior, straight and thick, are inserted into its anterior angle. Between the superior and inferior vocal cords is the ventricle, which communicates in front with a pouch of mucous membrane, called the sacculus. The use of the ventricle is, no doubt, as Sir C. Bell suggested, to allow the free vibration of the vocal cords.

The true vocal cords, which are essential to the production of sound, require rather a more careful notice; each cord is

composed of a band of yellow elastic tissue, covered with a very thin mucous membrane, which allows its colour to be seen through it; the length of the cords varies with age, sex, and degree of tension.

Male, . . .	relaxed 0·63	0·83 inch,	greatest tension 0·83	1·0	inch.
Female, . . .	ditto average 0·49 inch,		ditto	about 0·61	inch.

The two vocal cords when divested of mucous membrane, weigh, according to Bishop, about one grain. The vocal ligaments do not altogether project as free cords, but their upper edges only are free and sharp. The cords are capable of being stretched and relaxed, approximated and separated. They are stretched by the crico-thyroid muscles, which arise from the anterior and lateral surfaces of the cricoid cartilage, and are inserted into the lower border and inferior cornu of the thyroid. The action of these muscles is to draw the thyroid cartilage downwards and forwards upon the cricoid, and thus increase the distance between the thyroid and arytænoid cartilages, and stretch the vocal cords; the crico-thyroid chink at the same time closes, so that we can estimate, during life, the amount of tension which the cords suffer. The cords are relaxed by the thyro-arytænoid muscles, assisted by the lateral crico-arytænoid. The former arise from the retreating angle of the thyroid cartilage, and are inserted into the anterior surface of the arytænoid, some of the fibres appear to me to be inserted into the vocal cords, though this is denied by many anatomists. The crico-arytænoideus lateralis arises from the upper border of the cricoid cartilage, and is inserted into the external angle of the arytænoid; it is of an oblong form, and lies between the thyro-arytænoid muscle and the ala of the thyroid cartilage. The vocal cords are approximated by the arytænoideus and crico-arytænoideus

lateralis; the former muscle consists of two parts—a superficial, whose fibres cross one another like the letter X, arising from the apex of one cartilage, and inserted into the base of the other—and a deep part lodged in the concavity of the arytænoid cartilage, whose fibres pass horizontally from one cartilage to the other. The vocal cords are separated by the crico-arytænoideus posticus, which arises from the posterior surface of the cricoid cartilage, and is inserted into the external angle of the arytænoid cartilage. The mucous membrane of the larynx is of a pale pink colour, lined with ciliated columnar epithelium, and extremely sensitive. The larynx is supplied with blood by the superior and inferior thyroid arteries, and with nerves by the superior and inferior laryngeal nerves; the former divides into two branches—an external, which supplies the crico-thyroid muscle—and an internal, which perforates the thyro-hyoid membrane with the laryngeal branch of the thyroid artery and is distributed to the mucous membrane; it also gives off a branch to join the recurrent laryngeal nerve; the latter supplies all the muscles of the larynx except the crico-thyroid.

The rima glottidis during respiration is triangular with the apex forwards; it dilates at each inspiration, and again contracts during expiration. When dilated to the utmost the aperture is lozenge-shaped, with the posterior angle truncated. Before any sound can be produced, the vocal cords must be brought into a parallel position, and to within the distance of 1-10th or 1-12th of an inch. If, while the cords are in this position, air be forced through the chink, they will vibrate and produce a sound, no more tension being required for the middle notes of the voice than is ordinarily kept up by the elasticity of the crico-thyroid membrane. Having now completed this brief sketch of the anatomy of the larynx, we

have to inquire on what principle the sounds of the voice are produced.

The sensation of sound is produced by the communication of the vibrations of sonorous bodies to the auditory nerve; the nerve itself is not thrown into a state of vibration, but receives a succession of impulses. This is shown in the following manner;—when a piece of wood is held against a toothed wheel which is slowly revolving, at the stroke of each tooth against the wood, an impulse is conveyed to the ear, and the sensation of sound produced; if the wheel be revolved rapidly a continuous sound will be heard, which is caused by a succession of impulses following each other so rapidly, that they cannot be distinguished. The pitch of the sound will vary with the rapidity with which the impulses succeed one another; the slower the vibrations the deeper the note, and *vice versâ*, the deepest note that can be produced will have 32 vibrations in a second.

Sound is occasioned in three ways:—

1. By the vibration of solid bodies; metals, &c.

2. By the vibration of fluid bodies; (*a*) liquid, (*b*) gaseous.

3. By the simultaneous vibrations of both solids and fluids.

There are three principal classes of musical instruments, which are constructed on these principles:—

1. The class of stringed instruments, in which sound is produced by the vibration of elastic strings.

2. The class of pipe instruments, in which sound is produced by the vibrations of a column of air contained in a tube.

3. The class of reed instruments, in which a succession of impulses is communicated to the air by the oscillations of a reed; the sound being due to the vibrations of the air, and the vibrations of the substance of which the reed is composed.

1. The first class comprises all those instruments in which sound is produced by the vibration of a string, which may either be elastic by its property of cohesion, or rendered elastic by tension; it may be set in motion by striking it, as in the harp, piano, guitar; by friction, as in the violin, hurdy-gurdy, or by a current of air, as in the Æolian harp. Under all these circumstances, the strings obey the same laws, viz.:—

1. Cords of the same diameter and equally stretched, have the number of their vibrations in a given time, in the inverse ratio of their length.

2. Cords of the same length and degree of tension, have the number of vibrations in the inverse ratio of their diameter.

3. Cords of the same diameter and length, have the number of vibrations in direct ratio with the squares of the weights with which they are stretched.

The larynx may be looked upon as an instrument of this class, containing two elastic strings, which are set in motion by a current of air.—To this view of the larynx, three principal objections have been raised.

1. That the so called chordæ vocales have not the form of strings.—To this we answer, that it is not necessary that they should have the form of distinct strings;—by directing a current of air against the free edge of an elastic lamina, it will vibrate as a string, and produce sounds.

2. Liscovius urged that no string can receive sufficient impulse from a current of air to produce sounds of any intensity.—The experiments of Müller sufficiently disprove this assertion; he found that bands of moist animal elastic tissue, when a fine current of air was directed upon them, emitted very loud sounds.

3. M. Biot remarks, that it is impossible for the larynx to contain strings of sufficient length to yield the deep notes of the voice.—This objection can be easily controverted. A string, however much shortened, would still yield deep notes, if, at the proper degree of relaxation, it retained the necessary elasticity for vibration; small bands of caoutchouc, no longer than the vocal cords, under the influence of a current of air, give out clear sounds.

The proofs that the larynx is a stringed instrument, are—1. That the chordæ vocales vibrate like strings. 2. That they obey the laws of stretched strings. If we look upon the chordæ vocales as strings of invariable length and diameter, but capable of having their tension varied, the number of vibrations which they will perform in a given time ought to vary directly with the square of the force with which they are stretched; so that, supposing the cords stretched with a force of four to produce a certain note, when stretched with a force of sixteen they will produce a note an octave higher; and when stretched with a force of sixty-four, they will produce a note two octaves higher than the original note. Müller, in his experiments on the human larynx, found that the vocal cords, when stretched with the forces—four, sixteen, and sixty-four—did not produce perfect octaves, but generally a semitone or two less than the octave. This result ought to have been anticipated, but it does not seem to have occurred to Müller, that, while he was increasing the tension of the vocal cords, he was at the same time slightly increasing their length. Another particular, in which the vocal cords resemble stretched strings, is, that when divided ventrally they produce the octave of the fundamental note, just as tense strings when touched in the centre produce the harmonic octave of the open string. These facts sufficiently prove that sound is produced in the larynx, by the vibration of the vocal

cords as strings. During life, the pitch of the voice is not only varied by tension and relaxation of the vocal cords, but also by the increase and diminution of their length. I have already stated that, during ordinary respiration, the cords suffer a considerable degree of tension, which is sufficient for the production of the middle notes of the voice; as the voice becomes acute, the cords are stretched by the crico-thyroid muscles; the crico-thyroid chink at the same time closes; the cords also increase slightly in length. As the voice becomes grave, the cords are relaxed and shortened, and the crico-thyroid chink opens; the shortening of the cords is due to the thyro-arytænoid muscles. The cords, during vocalization, probably vary in length from 0·5 inch to 0·9 inch. The vocal cords alone do not vibrate to produce sound, but all the elastic tissues about the larynx vibrate synchronously with the cords and reinforce the sound; accordingly, in experiments on the dead larynx, when the thyroid cartilage above the vocal cords is removed, the sounds produced are much more feeble than in the entire larynx.

Since, then, the vocal cords vibrate like strings, and obey the same laws as stretched strings, and are adapted by their physical properties, as I have shown, to produce sound, I think we may assume that they do, in fact, like the strings of the Æolian harp, produce sound by their vibration.

2. The second great class of musical instruments to which we have to compare the vocal organs, comprises all those instruments in which sound is produced by a column of air contained within a tube being thrown into vibrations by blowing upon it at one point; such as the German flute, English flageolette, diapason pipes of an organ, &c. Since the sound is produced by the vibrations of the air only, the pitch of the note is not affected by the material of which the pipe is made,

but the quality of the note varies with the properties of the material. Pipes of the same length, whether they be of pasteboard, wood, or metal, yield notes of the same pitch, but of different tunbre. The number of vibrations in these tubes is inversely as their length; the pitch of the note is also varied; by altering the size of the embouchure—by varying the force of the blast—by substituting gases of different densities—the heavier the gas, the deeper the note. It has been considered by some, that the voice is due to vibration excited in the column of air in the trachea; and that these vibrations are excited by the compressed air rushing through the narrow chink of the glottis, just as in whistling, the compressed air in the mouth is thrown into vibration by its escape through a small aperture between the lips; and Dodart considered that the tension of the vocal cords was merely subservient to an alteration in the size of the aperture of the glottis, and that the difference of $\frac{1}{384}$ of a hair in the dimension of the aperture of the glottis was sufficient to alter the pitch of the voice;—this notion has been completely refuted by Müller, who found that, provided the tension of the cords remained the same, the pitch of the voice was not affected by altering the size of the glottis.

Although the sounds of the voice are not primarily caused by the vibration of the air in the trachea, yet it seems certain that the vibrations which occur at the glottis are communicated to the column of air in the trachea, and the sounds of the glottis in this way reinforced. The proofs that the trachea and its contained column of air participate in the production of sound, are—1. That the vocal tube is, according to M. Savart's experiments, physically capable of being thrown into vibration and strengthening the sound produced at the larynx.—2. The vocal tube can be observed to vibrate during

the production of sound; and where a stethoscope is placed over the trachea, the sounds of the voice are transmitted to the ear, as if the mouth of the speaker were applied to the ear.—3. As the pitch of the voice varies, the dimensions of the vocal tube also vary.—4. The pitch of the voice, like that of flute pipes, varies with the density of the gas which we respire; thus, a person who has inhaled some hydrogen speaks several tones higher than his natural voice. These facts, I think, amply show that the trachea and its contained column of air participate in the production of the voice. It ought to be observed, that, in tubes composed of flexible material, like the trachea, the parietes of the tube vibrate conjointly with the enclosed air, and give forth much graver sounds than rigid tubes of the same length in which the column of air alone vibrates. This explains how the short tracheal tube can yield the deep notes of the human voice. In many birds, the voice is entirely due to the vibrations of the column of air in the trachea, excited by friction against the lips of an opening.

M. Savart compared the human larynx to a bird-call, which is considered to belong to this class of instruments. It is formed of a very short cylinder of ivory or metal, covered at each end with a perforated plate: by blowing through one aperture, the wind contained in the cavity of the instrument is thrown into vibration, and sound produced. The larynx certainly bears a considerable resemblance to this instrument. The true and false vocal cords, with the chink between each of them, are analogous to the perforated plates; while the ventricles form the cavity of the instrument. M. Savart considered that the air rushing between the vocal cords set in motion the air in the ventricles, which produced the sounds of the voice. This theory is quite untenable; since, in many ruminantia which have remarkably sonorous voices, the upper

vocal cords are absent; and, in the human larynx, sounds may be produced when the false vocal cords have been removed, and the organ is no longer analogous to the bird-call.

3. The third class of instruments—that of the reed or tongued instruments—is considered by most physiologists to include the organ of voice. These instruments consist simply of a vibrating tongue, fixed in a frame, and capable of being set in motion by a current of compressed air. The tongue may be made of substances which are elastic by virtue of their property of cohesive attraction—as a lamina of metal; or of substances rendered elastic by tension. The sounds of the instruments are due to the vibration of the substance of the tongue, and the vibration of the air, which receives a rapid succession of impulses in passing between the tongue and the frame. The pitch of the note depends on the rapidity of the vibrations of the tongue, which obeys the same law which regulates the vibrations of a metallic rod; viz.—that, for tongues of the same material and thickness, their vibrations are in the inverse ratio of the squares of their length. When the tongue is metallic, the pitch of the note appears to be independant of the force of the blast, and of the chemical properties of the gas used to set the tongue in motion. It is not necessary that the tongue should accurately close the frame in which it is set; on the contrary—in the bassoon, clarionet, hautboy, &c., the aperture is not closed. Hence the objection which M. Savart urged, against the larynx being considered as a reed instrument, viz.—"that the essential principle of a reed consisted in the periodical opening and shutting of the orifice through which the air is passing; and in the larynx, this is not the case"—is untenable. I have before mentioned that the tongue of a reed may be formed of a

membrane rendered elastic by tension, and it may be arranged in several ways.

1. As a band between two firm plates, with a cleft for the passage of air on each side of the tongue.

2. The elastic membrane may be stretched over a portion of the end of a tube, the other portion being occupied by a solid plate, between which and the elastic membrane there is a chink for the passage of air.

3. Two elastic membranes may be stretched over the end of a tube, each covering a portion of the opening, and having a chink between them.

This last form of reed resembles the glottis. The pitch of these reeds with membranous tongues is varied by altering the length and tension of the tongue.

Compound instruments may be formed by combining a reed with a tube, when the column of air in the tube is thrown into vibration by the tongue of the reed. If the pitch of the pipe and reed when sounded separately be different, they will mutually accommodate each other when united. The pitch of a reed is always lowered by the addition of a pipe; and as the pipe is lengthened, the pitch is still further lowered. The note, however, does not become uniformly deeper, but gradually deepens till it approaches the fundamental note of the reed, when it suddenly rises to that note. Besides having a tube added to it, a reed may also have a tube prefixed to it, and this will have as powerful an effect on the pitch of the reed as the added tube. As the prefixed tube becomes lengthened, the note gradually deepens till the lengthening has reached a certain point, when the note suddenly rises to its original pitch, and is again deepened by a fresh lengthening of the tube. The pitch of the compound instrument formed by a reed between two pipes, may be

altered by diminishing the calibre of the prefixed tube, or of the added tube, unless the pitch of the reed is lowered by the length of the tube.

The vocal apparatus presents a very obvious analogy to the compound instrument I have just described. The larynx is a reed with two membranous tongues, which are capable of undergoing alterations in their length and degree of tension. The oral and nasal cavities form the tube added to the reed, and capable of undergoing alterations in its length and calibre. The trachea is the prefixed tube, which also suffers changes in its length and circumference.

I have now noticed the three great classes of musical instruments, and have mentioned that the larynx has been considered by different physiologists as belonging to each class. Thus, Ferreni maintained that the larynx was a stringed instrument; and, in accordance with this view, named the thyro-arytænoid ligaments the chordæ vocales. I have endeavored, in a preceding part of my paper, to show that this view is correct; since the vocal cords are capable, from their physical properties, of producing sound; they vibrate like strings, and obey the same laws as stretched strings. I conclude then that the sound of the voice is due, in part, to the vibration of the chordæ vocales. The next class of instruments which I considered, was the class of pipe or tube instruments; and I mentioned that it was the opinion of Dodart, that the vocal organs were analogous to an instrument of this class. This view, also, I believe to be in part correct; the sound produced at the larynx is reinforced by the vibrations of the trachea and its contained column of air. In some birds, the voice is entirely due to this cause. The third class of instruments which I have described is the class of reed instruments, in which, sound is produced by the vi-

bration of a tongue which communicates a rapid succession of impulses to the air. The larynx is considered by Müller to belong to this class of instruments; and there can be no doubt that the sound of the voice is principally due to the vibrations of the vocal cords, after the manner of the tongue of reed, forming a partial opening and closing of the glottis.

We must conclude then that the vocal organs partake of the characters of each of the three great classes of instruments, and the sources of the voice are due to three causes. 1. To the vibration of the vocal cords, after the manner of strings. 2. To the vibration of the trachea and its contained column of air. 3. To the oscillation of the vocal cords, after the manner of the tongues of reeds, communicating a rapid succession of impulses to the air passing through the runa glottidis.

Let us now examine the phenomena which present themselves during vocalization. The lungs, which serve the purpose of a wind-chest, are first filled with air; when the sound is to be produced, the air is again forced through the bronchi and trachea, and, as the sum of the areas of the two bronchi is greater than that of the trachea, the air becomes compressed in the trachea, the compressed air next rushes through the narrow chink of the glottis and causes the vocal cords to vibrate: lastly, the air escapes through the oral and nasal cavities, or, according to some, through the oral cavity only. For the production of the middle notes of the voice, the vocal cords are kept sufficiently tense by the elasticity of the crico-thyroid membranæ; but, as the voice becomes more acute, the cords are still further stretched by the crico-thyroid muscles. The amount of tension which the cords suffer can be estimated, during life, by placing the finger upon the crico-thyroid chink, which will readily be observed to diminish in

size as the voice ascends. But, since the voice is not only produced at the larynx, but reinforced by the vibrations of the trachea and its contained column of air, we should expect that this tube would undergo some alterations in its dimensions as the voice becomes acute; and such indeed is the case:—as the voice ascends, the larynx rises towards the base of the skull, and the trachea apparently becomes lengthened. This is evidently paradoxical, that the vocal tube should lengthen during the production of acute tones, and shorten when grave tones are produced: but the paradox is only apparent, and not real—for it was shown by Bishop, on the dead subject, and can be easily proved by any one, on his own person, that the trachea is not lengthened; for, as the larynx rises towards the skull, the trachea also rises to a corresponding degree out of the thorax; indeed it is probable that the trachea even shortens during the production of high notes; at the same time it can clearly be observed to diminish in diameter. Besides these changes in the trachea, the cavity above the larynx becomes shortened, and the palate, the uvula, and the velum contract. So that, for the production of acute tones, the chordæ vocales must be stretched, the tube of the trachea must be shortened and diminished in calibre, and the oral cavity shortened and diminished in diameter. These changes exactly correspond with the results which Müller obtained in his experiments on a compound instrument formed of a reed between two tubes. To raise the pitch of the instrument, he might increase the tension of the tongues, or shorten the tubes, or diminish their diameter. In raising the pitch of the voice, I have shown that all these changes concur. As the voice becomes grave, the reverse of these changes are observed; the vocal cords are relaxed; the oral cavity elongated and enlarged; the trachea lengthened and expanded.

It has been remarked by Weber and others that the tracheal tube is so short that it cannot affect the pitch of the note produced at the glottis. The experiments of M. Savart have shown that the flexibility of its parietes compensates for its want of length, and enables it to vibrate synchronously, and therefore to give forth sounds equally grave with those of the glottis; thereby *reinforcing* the sound which would indeed be produced by the glottis alone, though with much less intensity without this aid.

The falsetto voice has always been considered a most embarassing subject. Dodart and Bonnati supposed that it was produced in the cavity above the larynx. Weber suggested that the falsetto notes were produced by the development of nodal points in the vocal cords. These opinions, however, are mere conjectures, without any proof. It was observed by Bishop that, when the voice passed from the highest note of the chest voice to the first note of the falsetto register, the crico-thyroid chink suddenly opened, so that the cords were relaxed at the same time the larynx fell. As the voice became higher in the falsetto range the crico-thyroid chink again closed, and the cords stretched. It is supposed by Bishop, that in the production of the chest voice the cords vibrate in their whole length, but in the falsetto, the cords are placed in contact posteriorly, so that a portion only of the length can vibrate; as the falsetto notes become higher, the cords are tightened, but still kept in contact posteriorly. Müller considers that the falsetto notes are produced by the vibration of the inner edge only of the vocal cords; the thyro-arytænoid muscle acting as a damper, and preventing the outer portion of the cords from being thrown into vibration.

The influence of the epiglottis on the voice has always been a disputed subject. Liscovius asserts that it has no in-

fluence on the voice, and may even be removed without affecting it. Haller deduces the same opinion from the fact that the organ is absent in birds. Müller thinks that in the production of the deep notes of the voice, the epiglottis renders the tone duller and graver. Bishop concurs with Müller in this opinion. The varieties of voice depend on the size of the larynx and length of the vocal cords. The difference of quality observable in the voice depends on the difference in form and nature of the resounding walls, which in the male are more extensive, and form a more acute angle in front than in the female larynx; in old people the organ becomes ossified, and the tones of the voice unsteady and restricted in extent; the vocal cords also undergo some change.

I have now completed the investigation of the production of voice, and I have endeavoured to prove that the vocal organs combine the properties of the various classes of instruments; the favourite hypothesis of some has been, that the larynx is a stringed instrument; while that of others is, that it is a pipe or a reed; experiments, however, are equally in favour of all. In conclusion I have to thank you for your patient attention in listening to my paper: I have endeavoured to render my account of the voice as complete as my limited time and other circumstances would admit of, and I hope that but few errors have escaped my notice. If any dissent from me, it ought to secure me from censure, inasmuch as I only pretend to propose to, and not to impose upon, their judgments:—

Si quid novisti rectius istis
Candidus imperti; si non his utere mecum.

ON URIC ACID AND URATE OF AMMONIA, AS OCCURRING IN THE URINE.

By Arthur Ernest Sansom.

In any process of the manufactures, there are two classes of things, the examination of which is, and is deemed, of especial importance—the matters produced and the matters cast off. If the bran be bad, the flour is bad also, and either the corn is impure or the mill out of order. So, in the consideration of that compendium of processes—processes whose cause and end are seen but darkly, in man—are these important also. To the latter class, we will confine ourselves; not entering on the subject in that spirit of exaggeration, which declares it the very foundation of true pathology; but with a hope that something may be elucidated, and therefore something gained.

The urine may indicate impairment of the functions of the body, first by containing morbid products bred in the organism, the very signs of disease; and, secondly, an excess or deficiency of its natural constituents. Care is necessary in their examination, and especially should we be careful to bear in mind, that adventitious or subsequent changes may be those on which their existence depends. So, substances, introduced through the negligence of the patient, may often cause the practitioner, if not false impressions, at least considerable trouble.

The substances, to the examination of which these few pages are devoted, belong to the second class.

Now, URIC ACID exists in the urine in varying amount. It is said, that about eight grains are excreted in the course of the day. Its average proportion has been given as one in 1000 parts of urine; but this is certainly too high. Dr. Miller says about three is the normal, healthy average. In an analysis of healthy urine made in the laboratory, I found a quarter of a grain of uric acid to 1000 grains of urine—there being 949 grains of water to 19·75 of urea. It is thrown down from its combinations by almost any other acid.

I.—THE MEANS TO BE ADOPTED FOR THE DETECTION OF THESE DEPOSITS.

First, to the naked eye, a deposit of uric acid appears as fine sand, occupying but small bulk, and sinking to the bottom of the vessel. The grains are sometimes yellowish, at others of a deep red color; often distinguished by the name of "cayenne pepper grains."

Urate of ammonia deposits occupy considerable bulk, and vary in colour from white to red; the urine-pigment is very prone to adhere to them. They constitute the lateritious and nut-brown sediment. The appearance of urate of ammonia in the urine is often greatly simulated, when pus or phosphates are contained as deposits therein. The diagnosis between pus, lithates, and phosphates, becomes then of great practical utility, and this may be easily accomplished. First, warm a little of the thick urine in a test tube; if it *dissolves* the deposit consists of *lithates*. Supposing it unaltered, add a few drops of liquor potassæ, which, in the case of pus, will produce a *glairy, honey-like appearance*, the solution stringy

when poured from one vessel to another. If these changes do not occur, the deposit probably consists of *phosphates*.

Deposits of uric acid and urate of ammonia occur very frequently (in fact, most frequently) together.

Secondly, chemical detection of uric acid. If to normal, healthy urine an acid (hydrochloric for example) be added, the uric acid is thrown down and appears as bright sparkling points in the liquid. These ultimately subside at the bottom, or adhere to the sides, of the containing vessel. The crystals are alway coloured by the urine-pigment. They are dissolved by liquor potassæ, and may be re-precipitated by acid. Uric acid is very sparingly soluble in water.

There is a very ready, accurate and characteristic test for this acid alone or in combination. Let a little of the substance containing the acid be placed in a watch-glass, and thereto added a few drops of nitric acid, the whole is to be evaporated, till it assumes a reddish colour; a drop of ammonia being now added, a beautiful crimson colour is produced. This colour is due to the formation of murexide. It will seem strange to say here, that the urate of ammonia which has been spoken of, that forms part of the title of this paper, is not urate of ammonia. But such, according to Lehmann, is the case. The deposit so universally considered urate of ammonia, is principally made up of urate of soda, the rest being made up of urates of ammonia, lime, magnesia, &c.

It would, however, create confusion to call this common deposit otherwise than urate of ammonia at present, since it has been for so long known by that name. Probably "amorphous urates" would be the better term.

This compound is distinguished by its solubility in hot water, being eight times as soluble in hot as in cold.

Thirdly, microscopic detection of these deposits of *lithic*,

or uric acid. The form of the crystals of uric acid varies considerably; they are all, however, modifications of the rhombic prism; and occur, either as individual separate crystals, or as aggregations of these.

(*a.*) The simplest form of uric acid crystal is the rhomboid. It occurs most perfectly in the pale sand of infants' urine. These are sometimes very thin; at others, large, thick, and extremely characteristic. Crystals are sometimes found square. I have often seen them in uric acid artificially prepared. They may even be sometimes cubical.

(*b.*) If we imagine the rhomboidal crystal, seized at each of any two of its opposite angles and drawn out, we have the acicular prisms. These are sometimes very small, and present a marked tendency to cohere. Rhomboidal prisms too frequently occur—they are merely lengthened rhomboids—*i.e.* two sides of such crystals approximating much more closely than the other two.

(*c.*) Another form which uric acid assumes is the lozenge. They are thick rhomboids with their edges rounded off. When they lie on their sides, they appear like cylinders; but the fallacy can be detected by making them roll over.

These are, I believe, all the *simplest* modifications of the crystal. The form of any of them may be altered by various circumstances, such as imperfect crystallisation, subsequent action of the menstruum, coalescence of crystals, &c. Nearly all, however, can be referred to the forms spoken of. But yet, so numerous are the apparent varieties presented, that it has been said, that whenever an urinary deposit has, when seen under the microscope, a remarkable shape and a yellow colour, it may be safely set down for uric acid.

If uric acid be artificially obtained by filtering a warm solution of urate of ammonia into dilute hydrochloric acid,

two forms are, for the most part, obtained; the first, rhomboids and squares; the second, these excavated at the sides and sometimes serrated, the last much more seldom than the first.

Crystals of uric acid are extremely prone to aggregate, and many of those forms apparently simple, are really produced by crystals overlying crystals.

When the urine is very acid, according to Golding Bird, the edges of the rhomboidal crystals are serrated, and the mass is traversed by many dark lines. This I believe to be due, first, to the particular outline of numbers of minute acicular crystals; and second, to the sinking in of the urine between them. Dr. Burton has considered their mode of formation to be thus:—two rhomboidal crystals approximate,

Fig. 1.

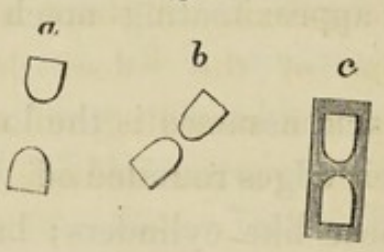
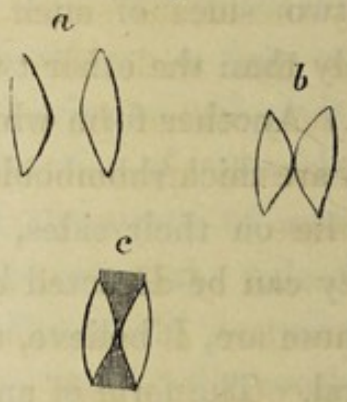


Fig. 2.



(Fig. 1, *a*), these unite (*b*) at their apices, and ultimately become covered by acicular crystals (*c*). I have several times observed these, both during their formation and while they were undergoing solution, and their appearance has rather been that shown in Fig. 2; the crystals, lengthened rhomboids or lozenges uniting by their obtuse, and not by their acute, angles, as in the diagram in Dr. Bird's work. Eventually, they are evidently covered with acicular crystals. This will be reconsidered, when we come to the action of liquor

potassæ on them. Very often, uric acid crystals occur in *masses* which form, in fact, minute calculi. One form consists of prisms cohering and forming rosettes, as it were. Others consist of aggregated lozenges. Pisiform concretions are sometimes met with; these are made up of minute rhombohedra, which converge to a common centre: other crystals of uric acid, and amorphous granules of urate of ammonia, filling up the interstices between them.

The composition of these crystals may often be well observed when a drop of liquor potassa is added, under the microscope, to water containing them. The crystals become paler, and many, before seeming simple, appear compound. The extremities of crystals often exhibit apices of others gradually dissolving; these probably produce the serrated appearance. The rhomboids often coalesce, and their figure is, by the means stated, often recognised. A shape is sometimes met with like the outline of the "fleur de lis;" this may either be produced by the rounding off of this coalescence of rhomboids, or by the partial solution of the lozenges.

Genesis of Uric Acid.—If a drop of acetic acid be added to another of solution of urate of ammonia, under the microscope, a number of minute granules or globules are first seen, which exhibit the molecular movement. These aggregate in lines, become oval, and then crystallize.

What is the cause of the variations in the form of uric acid crystals? These points have been made out:—

1. *Rapidity of Cooling, (Dr. Schmidt).*—When the solution was strongly heated, and acetic acid added, rectangular columns and tables were principally formed; sometimes also, aggregations of parallelopipeds. When less strongly heated, rhombic prisms. When suddenly cooled, prisms to a certain

point; then these became opaque, and split into parallelopipeds.

2. I have endeavoured to determine what the influence of greater or less acidity was on the formation of these crystals, and with the following results:—

Acid in small quantity.	Crystals regular; mostly tables and squares—lozenges.
Acid in large quantity. Solution of urate of ammonia strong	Large and long tables, with very elongated lozenges.
Acid strong—the amorphous mass itself used.	Most frequently acicular prisms.

The acicular prisms, I think, are mainly due to excess of urate.

Rapid crystallisation tends to cause aggregation.

Examined by polarized light, uric acid crystals have a beautiful appearance; seeming to be luminated, and exhibiting coloured bands.

Microscopic Appearance of Urate of Ammonia.—This common deposit appears as a collection of mere amorphous particles. Sometimes, they cohere, forming, at one time, curvilinear masses, at another, dark spherical bodies. In rare cases, to these sphericles, crystals of uric acid are found adhering.

II.—The Causes of these Deposits and Mode of their Formation.

Having considered the appearances manifested by uric acid and urate of ammonia (so called), we now come to the causes of their appearance in the urine and the mode of their formation in the organism. And here difficulties beset us. We have to deal with a word at which eyes look askance now-a-days—speculation. We have greatly to build upon hypotheses, and these offer but narrow ground. Part of this *questio vexata* has, however, been set at rest. We have

hitherto had a theory advanced by Liebig, and confutations of the same through the self-denial of Lehmann, who experimented on himself, and by Boussingault, who employed ducks for the purpose; then there was another theory advanced by Liebig, and a modification by Bird, and now Scherer advances one—undoubtedly the true one.

First, the physiological origin of these bodies. Observers have pointed to two sources—the elements of the tissues and the elements of the food. That they are produced by the metamorphosis of tissue is assumed, since Lehmann excreted uric acid in considerable quantity, when living on a diet nearly free from nitrogen. So also Boussingault found that when no food was administered, and when lumps of clay were given to ducks, still urate was excreted. It also seems to be a product of the metamorphosis of tissue in the pupa state of insects. The albuminous and gelatinous tissues are, no doubt, the sources. Birds of prey, subsisting wholly on animal food, excrete this substance in large quantity.

Is the quantity excreted modified by the kind of food? According to Lehmann's experience, the more highly nitrogenized the food, the greater the quantity of uric acid. But Dr. Bence Jones says, "The amount of uric acid is little influenced by the kind of food;" but he declares the *amount* to be *greater after food than before it*. More lately still, however, Heller states that protracted diet on wheaten bread causes uric acid wholly to disappear from the urine, and hippuric to usurp its place.

Concerning the true proximate origin of uric acid, there has been much doubt. The more recent observations tend to shew that uric acid is the substance, whence, at least in part, urea is derived; that it is a body of higher grade in the scale of metamorphosis of tissue. It would then appear

that when uric acid increased in quantity, urea would correspondingly decrease. Now, although to this, perfect proof cannot be given, yet the researches of Becquerel tend, at least, to shew that an approximate inverse ratio is observed between these two substances. Wöhler and Frerichs find that uric acid being introduced into the system, an augmentation in the amount of urea and oxalic acid takes place, such as may be artificially induced by peroxide of lead.

Uric acid then may be supposed to exist in a step between the tissues and some of their derivatives, on the one hand, and urea on the other. It is possible that it may be formed in this way:—

	C.	H.	N.	O.			C.	H.	N.	O.
1 atom of creatine	8	11	3	6	=	10 atoms of water	0	10	0	10
+ 2 atoms of carbonic acid	2	0	0	4						
+ 1 atom of ammonia	0	3	1	0		+ 1 atom of uric acid	10	4	4	6
+ 6 atoms of oxygen	0	0	0	6						
	10	14	4	16			10	14	4	16

LIEBIG.

It is useless to give more tables of the manner in which these changes may occur. We can hardly expect to know how the vital force changes food to tissue, tissue to excrement. A discovery lately made will, perhaps, throw more light on this part of chemistry and physiology; viz., the production of urea from albumen. This has been accomplished by a French observer, who employs permanganate of potash as the oxydizing agent.

To sum up then—a small part of the food we eat, of the substances, the casting off of which the wear and tear of our systems necessitate, by a peculiar process, passes through the changes of indefinite and definite chemical compounds. Thus, from tissue, creatine, &c. From this, by a continuation of the process, uric acid and other compounds, whence, urea, &c.

Let us consider now the condition of these substances in the urine, and the cause of their appearance therein. Since uric acid requires 10,000 parts of water for its solution, it is impossible that it should be contained in the urine free; urate of ammonia is nearly four times as soluble, and that solubility is increased, according to the researches of Dr. Bence Jones, by the presence of saline matter.

It is possible that uric acid may, when formed, be combined with its bases; it is found in the blood as urate of soda. But it is considered by many that the acid is generated primarily, and forms salts either when in the nascent state, or during its course through the kidneys. Urine depositing urate of ammonia generally appears:—(1.) As containing stringy masses, similating the appearance of purulent and phosphatic deposit; (2. Of a pale amber or fawn colour, sp. gr., usually about 1018; (3.) Highly coloured febrile urine, sp. gr. 1025 (circà); or, (4.) As having a purple deposit, when an obstruction occurs to the elimination of carbon.

It is by no means necessary that, if lithate exist in the urine, it should form a deposit. Again, when the urine is highly acid, a deposit may occur without these being in excess.

Urine depositing uric acid is generally of a rather deep amber colour, *always reddens litmus*, and its specific gravity is usually above 1020.

Concerning the determining cause of these deposits, there have been many theories. Liebig referred it to the action of tribasic phosphate of soda; if uric acid be added to this, it is dissolved, and the reaction is changed from alkaline to acid. On cooling, by the reaction of the acid on the urate of soda formed, uric acid, in an impure form is precipitated. Golding Bird modified this, and attributed both the natural acidity of

the urine, and the deposition of urates and uric acid, to the action of the latter on triple phosphate. I give his theory:—

Uric acid, at the moment of its separation comes in contact with phosphate, derived from the food, evolving phosphoric acid, which causes the acidity of the urine. If the bulk of the urine is to the urate of ammonia not less than 2701 to 1, an amorphous deposit occurs. But if an excess of uric acid be formed, it will act on the phosphate of soda, and be precipitated as acid sand, probably mixed with urate of ammonia.

The acid reaction, then, of the urine is due to the superphosphate of soda. If uric acid (an acid so extremely weak) is capable of converting ordinary phosphate of soda into an acid salt, surely other and stronger acids, liberated in the animal economy, are all to do the same. This accounts for the acidity of fresh urine; subsequently the developed lactic and acetic acids increase that acidity.

But this does not wholly explain the deposition of uric acid; for this never occurs in urine just passed (except, perhaps, in some cases of the "lithic diathesis"), scarcely ever in urine nearly cooled. *Acidity* is, no doubt, the disposing cause of these deposits; a slight excess precipitating urate of ammonia, while uric acid crystals afford a test of the over acid state of the urine (Bence Jones). An excess of these substances in the urine, acidity and low temperature, favour their precipitation.

How is this acidity produced? No doubt, according to the German theory, by the occurrence of *acid urinary fermentation*. Scherer names, as inducing this change, the urinary pigment and the bladder mucus. He considers the latter to be a body capable of inducing fermentation, and this to act on the pigment of the urine, instituting a process

whereby are formed lactic, and probably acetic, acids. If urine be filtered from its mucus, while quite fresh, the uric acid either does not separate at all, or that only after a very protracted period. Again, circumstances which have an influence in retarding fermentation, in general retard also this process; for instance, the addition of alcohol or boiling. All normal healthy urine undergoes this change sooner or later; the free acid in it being, undoubtedly, increased. The duration of the change is usually four to five days, but this may be prolonged for five, six, or even eight weeks.

III.—Uric Acid and Urate of Ammonia in the Urine of Disease.

We have seen the form and discussed some of the properties of uric acid, with the cause of its precipitation, and now we come to its pathological relations.

It is seldom that the occurrence of these deposits constitutes a disease "per se;" it is rather the symptom of another lurking in the system. But the deposit may, by its mechanical influence, so injure the parts with which it comes in contact, as to be a serious source of mischief. Under this head, a few words on gravel and calculi.

Lithic acid gravel is well known to consist of crystals or aggregations of crystals which, by mechanical irritation, produce pain and desire of frequent micturition.

Calculi, of which uric acid forms the whole or part, are of very frequent occurrence. Uric acid and urate of ammonia formed the nucleus of 72 per cent. of the calculi examined by Dr. Golding Bird. The *uric acid calculus* is the most common of all. Its colour varies from yellow to dark red brown. *Urate of ammonia*, owing to its solubility, seldom forms en-

tire calculi. Such are usually small, of pale slate colour, and slightly tuberculated.*

There has long been doubt as to the true cause of calculous concretion. This is now, however, to great extent, set at rest. To investigate it, let us put the following facts together:—

1. In the centre of nearly all calculi, is either a body foreign to the organism, a clot of blood, or a clot of mucus.

2. This is, in almost every case, surrounded by a layer of uric acid.

3. The rest of the formation consists of substances arranged in concentric layers—urate of ammonia, oxalate of lime, and so on, one or many.

Connect this with—

4. Scherer's theory concerning the production of acid urinary fermentation, and you have what that observer has given, as the disposing cause of calculi.

The fragment of mucus, &c., sets up the acid fermentation—as a consequence of this, uric acid is deposited immediately around it—a nidus is formed, whereon other deposits may aggregate. So calculi grow.

But, besides, these deposits are indications of certain changes occurring in the body.

A mere deposit of urate of ammonia may depend upon simple causes; an increase in quantity of the salt; a decrease in the quantity of water necessary to hold it in solution; a slight increase of the acidity of the urine—of these changes, any or all. Its occurrence may depend on the too free use of animal food; on a slight derangement of the general health, as a cold, and so on. Some persons are more liable to have this salt in their urine than others.

* For further remarks on calculi, see "Bowman's Medical Chemistry."

Appended is a table of the quantity of uric acid in the urine in different diseases, deduced from analyses which I have made in the laboratory. I have always endeavoured to experiment on morning urine, so as to obtain, as far as possible, an uniformity to start with.

Proportions of uric acid to 1000 grains of urine :—

	Grains.
Health	0·250
Acute gout*	0·830
Acute rheumatism	0·802
Heart disease	0·711
Erysipelas	0·679
Muco-phosphatic urine	0·140
Chronic gout	0·120
Excessive debility	0·078

The quantity of uric acid is increased absolutely, in the urine, in febrile disorders. Then the due relation between circulation and respiration is not kept up. In these cases there is very often a deposit in the urine. But it must be recollected that a *deposit* is not necessarily an indication of *excess*. It rather tells that the urine differs from that of health in containing more elements, whereby the acid urinary fermentation is promoted. In acutely inflammatory affections, as those of the liver, spleen, and heart, uric acid is increased in amount. In heart disease it is common to find, on one day, a deposit of urate of ammonia; on another, a stratum of uric acid, a stratum of urate, and so on. In erysipelas, the amount is considerably increased. In rheumatic affections, especially the acute articular, it is in great excess. It has been thought that the same was the case in gout. But it is now certain that (at least whenever this is accompanied by

* At a stage when there was extreme pain and swelling.

chalk stones) "a constant and well-marked diminution of uric acid, in the urine, occurs before the paroxysm in acute gout, and always in chronic gout." The acid then seems rather to prefer the joints as its resting-place. A great augmentation of the urea occurs in the urine, in this case; as if, as has been suggested, combustion of the uric acid occurred with the paroxysm, the product being urea. The amount is increased in phthisis.

In the case of kidney disease, the occurrence of a deposit of uric acid in the urine affords a valuable sign of convalescence. It shows that the vascular and secreting elements are reassuming their normal condition, and so cease to allow of the transudation of the albuminous constituents of the blood.

Another frequent cause of a precipitation of uric acid is an unusually large supply to the system of the nitrogenous elements of food. A cloud of urate of ammonia frequently appears in the urine after too great indulgence in animal food.

Indulgence in alcoholic stimulants, by some means or other, is undoubtedly a frequent cause of these deposits. The same thing will occur when the digestive organs cannot thoroughly perform their office. So, in dyspepsia and stomach affections, the amount is increased. Lehmann says, that, according to his experiments, whilst the proportion of this to the other constituents of the urine was, in health, one to sixty, after indigestion, its ratio was increased to about one in forty-one.

A great cause of the appearance of this acid is impairment of the functions of the skin. The skin, like the kidneys, is capable of casting off effete nitrogenous matter; indeed, activity of the former may compensate for inactivity of the lat-

ter. In tropical countries these deposits are unknown. So, in many skin diseases, the normal amount of uric acid is increased.

In some nervous diseases, such as chorea and sciatica, an increase also takes place. In the former there is great disintegration of muscular tissue, and the latter affection is very often associated with the lithic acid diathesis.

In chorea, where there is much waste of tissue, an increase also takes place.

In debility, chlorosis, anæmia, &c., a marked deficiency in the uric acid is observed.

IV. Plans of Treatment which cause the Disappearance of these Deposits from the Urine.

It now only remains for me to say a few words on the means for getting rid of these deposits. They should rather guide us to the state of disease of which they are the symptom, that we may prevent their occurrence by removing their cause. But it is often important that special means be taken for their removal.

Urate of ammonia is readily brought under medical control.

Something to add to the watery constituents of the urine, moderate diet, and moderate exercise, are generally all that are required to render the urine clear again.

The agents which have the effect of disposing of uric acid are as follow:—

First, promotion of the action of the skin. Deposits may frequently be removed by slight diaphoretics alone. The vapor-bath is spoken of as valuable in such cases.

Careful dietetic treatment should be enjoined. Food,

capable of being thoroughly digested by the patient, only should be given. Dr. Golding Bird has related a case in which uric acid deposits came on after exposure to cold, which was relieved by diaphoretics, and cured by excluding, in great part, nitrogenous food. Such cases are common. The use of tonics seems to serve a beneficial purpose in restraining deposits of this sort, when they are dependent on insufficient digestion of food, through an unhealthy state of the blood.

Lastly, we have to consider those remedies which act as solvents of uric acid. They are very numerous. The most important are alkalies and their salts. *Liquor Potassæ* ranks as, perhaps, the most effectual and ready solvent. To render the urine alkaline, it must be given in much larger doses than those usually prescribed—f℥j three times a day. *Bicarbonate of potash* is a prominent remedy. It is readily absorbed; renders the blood and urine strongly alkaline, and stimulates slightly the action of the kidneys. It readily dissipates a deposit of uric acid. The influence which it possesses on rheumatic fever is remarkable. There is a disease, one of whose characteristics is the production of an excess of urates;—alkalinize the blood, and soon the disease subsides. This is the plan of treatment with which Dr. Garrod's name is associated. Vichy water, which contains a good deal of alkaline carbonate, is in considerable use. Salts of the vegetable acids may next be mentioned. *Citrate and tartrate of potash*, and the combination of those acids with ammonia. The juice of a lemon, mixed, at the time, with carbonate of ammonia, forms a draught at once pleasant and effectual. *Borax* has been recommended, but is not now much employed. *Phosphate of soda*, in small doses, is diuretic, a solvent of uric acid, and frequently prescribed in

that diathesis. Phosphate of ammonia has also been used.

Benzoic acid has been recommended, but is now considered, I believe, *not* to diminish the quantity of uric acid. It is transformed into, and appears in the urine as, hippuric acid.

ON KIDNEY TUBE CASTS.

By JOHN WAY.

THE subject to which I have the honour of inviting your attention has been selected, partly because it happens to have much occupied my own during the last few months, but chiefly on the ground of its great intrinsic interest. Disease of the kidney has become a branch of pathology second to none in point of importance, and the examination of the renal tube casts has taken the foremost place among the means of diagnosis which are offered by renal diseases.

The theme I have chosen is comparatively a new one; it is a field won from the waste, within the compass of our own remembrance; won for us, not without long and patient toil. We shall neglect it not without loss, and desert of blame to ourselves. To justify the prominences which I have given to kidney disease in pathology, I may adduce the fact, that out of 54 medical cases yesterday morning under treatment in King's College Hospital, no less than 7, or 13 per cent. were cases of renal affection, either acute or chronic. I learn that in the out-patient department, the proportion is by no means less; yet, so small a place does the kidney, as an organ obnoxious to disease, occupy in the older literature of medicine, that we are driven to the inference, either that it has acquired an increase of proneness to disease, or that it has come to be recognised as the seat of mischief where it was formerly overlooked, in a large proportion of the dropsies, internal inflammations, and other vague maladies, of

which people died in the days of our forefathers. The latter is the view to which I am inclined, and the axiom that a correct diagnosis is the most important, because the first step towards cure, surely holds good in affections of the kidney, to at least as great an extent as in any other form of disease to which our frames are liable.

To the interest which attaches to the microscopic examination of urinary deposits I can earnestly testify, and predict with confidence, that the student who, with an average instrument, devotes a few minutes of each day for the space of even one session, to availing himself of the opportunities of collecting and observing specimens, offered him continually at the hospital, will find that he has furnished himself with agreeable relief to his severer studies, and that before many weeks have elapsed, he will have made sensible progress, as regards the power of recognising morbid conditions and interpreting their significance, and thus acquired a new protection against mistake and mystification for the time when he will have to diagnose disease for himself.

It is my purpose to preface the remarks which I shall have to offer on casts, with a word or two about the precautions and appliances to be made use of in their observation. The microscope should be capable of at least tolerable definition; this is indispensable, at least more so than the perfect achromatism offered by the expensive English glasses, and which may be dispensed with where, as in casts, *form* is the chief thing to be attended to; the power should be a quarter with a low eyepiece magnifying about 200 diameters. A moderator lamp for night work, raised to about the level of the microscope stage, completes this general part of the equipment. A conical glass, holding about four fluid ounces, a pipette, and half-a-dozen thin cells with circular covers being pro-

cured, one has but to proceed to work with his specimen, premising that it has stood three or four hours at least in the conical glass. Sufficient is then to be taken up with the pipette from the bottom of the specimen to fill the cell, and stand convex above it, then laying down the cover obliquely so that it may touch the fluid near the edge only at first, and then to subside gradually until flat, no air bubbles will be left in the field, and there is then nothing left to do but to observe and note. I have only to add before I leave this brief catalogue of hints that a sketch, however rough, made in circles of constant sizes—say that of a crown piece—of the one most characteristic field obtained in any specimen will be found a treasure, and one not painful on acquisition.

I proceed to speak of tube-casts, and what they signify. I at first thought a sketch of the general anatomy of the kidney would be advisable, but I found it incompatible with due limits to my paper, and must presume an acquaintance with the form, size, and relations of the organ and its vessels. Briefly I may remind you that, starting from its most essential element, the kidney includes—1. The *malpighian body*, a tuft of convoluted capillaries lying within a sac, formed by the dilated extremity of the uriniferous tube, and dotting the cortical or secreting portion of the section. 2. Of a pair of capillary vessels, one bringing blood to the malpighian body, the other efferent from it. 3. Of a plexiform arrangement of these efferent vessels, which spread themselves over the convoluted tubes, and ultimately unite to form the renal vein. This intimate relation of the capillaries to the renal tubes, is a cardinal point in their physiology. You will notice that we find in the kidney a circulation like the systemic in miniature, a main artery, a direct branch of the abdominal

aorta dividing and subdividing, ultimately forming capillaries, from which venules arise and converge in turn to the renal vein, forming to the systemic circulation a diverticulum, like that which a loop line forms to the main trunk of a railway.

Reverting to the malpighian tuft of capillaries we find that it is, as before said, enclosed in a dilated extremity of the uriniferous tube; it is about $\frac{1}{80}$th to $\frac{1}{144}$th of an inch in diameter, and just visible to the naked eye; it is uncovered by epithelium, and the walls of the capillaries are extremely thin and delicate; the capsule in which it lies is covered towards its constricted neck with a delicate squamous epithelium, and so is the first part of the tube leading from it; the rest of the convoluted tube is furnished with a glandular spheroidal epithelium, and is about $\frac{1}{480}$th of an inch in diameter; the epithelium, with which the inner surface of the tube is clothed, is of such a thickness as to reduce its real bore to about half this, or roughly to $\frac{1}{1000}$th of an inch. These dimensions you will please to keep in mind, as they bear direct relation to those of the casts to be hereafter spoken of. The tubes passing from the cortical or secreting portion of the kidney to the excreting portion (the straight tubes of the cones), become lined with a thin pavement epithelium, and open into the calyces, and thence into the infundibula of the kidney, and so converge to the ureters. Now, as to the functions of these portions of the organ, we learn from the researches of Mr. Bowman, to whom we owe most of the minute anatomy of the kidney, and all the significance of that anatomy, that the malpighian tuft of capillaries secretes from the blood the watery constituents of the urine, while the convoluted tubes, through the medium of their epithelial lining, withdraw the solids to be excreted; these solid constituents, bearing to the cells the relation of formative mate-

rial, are thrown upon the free surface of the tube, and so washed away by the current of fluid from the malpighian body, into the excretory portion of the kidney.

Into the chemistry of the urine it is not my purpose to enter further than to remind you that in health it contains besides water, urea, uric acid, salts in the shape of chlorides, phosphates, and sulphates of the alkalies and earths, with some lactic acid, colouring matter and extractive. Under the microscope the salts present themselves both in crystalline and amorphous conditions, and the organic matters in the shape of a scanty amount of epithelial cells. There is a complete absence of albumen and of tube casts.

We come now to the question what is a cast? In its most simple form, it is a solid cylindrical rod of fibrin, colorless and transparent, moulded in the uriniferous tube within the epithelial lining. Its formation is thus to be accounted for. The malpighian capillaries which in health permit the transudation only of the watery parts of the blood, become, under the stress of an exalted circulation as regards the blood generally, or what is the same in effect, of a retarded circulation in the kidney itself, apt to allow a portion of the denser constituents of the liquor sanguinis to transude; hence on applying tests we find albumen in the urine, and under the microscope, fibrine in the shape of the before mentioned moulds of the tubes. This is the condition essential to the formation of a cast; in most of the varieties of cast we have a large proportion of this plastic lymph, it is often masked, and to all appearance replaced by matters such as pus, epithelial, or blood cells; but I believe that there is in every case a matrix of this fibrinous material, however inconspicuous, which serves to bind the varying constituents of the cast together.

To proceed to the individual peculiarities of casts, I will describe:—

1. The "small waxy" or intracellular cast, (pl. 1, fig. 1,) formed of fibrin alone, its diameter usually about $\frac{1}{1000}$th of an inch, and its length very apt to vary, sometimes too great for the field of an ordinary $\frac{1}{4}$ inch glass, at others scarcely greater than its own diameter, often so diaphanous as to be with difficulty detected, and then only by its faint parallel bounding lines. The general approach of its diameter to a uniform standard, its homogeneous appearance, and freedom from branchings and longitudinal striæ, will prevent its being confounded with organic fibre of any kind. It is the most common form of kidney tube cast, and occurs in many states of disease unassociated with structural change in the kidney itself. In cases of continued fever, in cholera, bronchitis, in various heart diseases, in any malady in short which tends to produce congestion in the kidney, the pale waxy cast may be looked for with tolerable certainty. Not that it is prone to be wanting in kidney diseases proper; it accompanies most of the other forms of cast, and hence its presence is not alone to be relied on for diagnosis in any case. Between the pale intracellular cast and the other forms to be described, there are all shades of variety; the former may be dotted with fragments of broken down epithelium, or with blood discs, or entire epithelial cells, and between it and the cast made granular by comminution of the fibrinous material itself, the relationship is apt to be most near, and it is often a puzzling, but happily unimportant question, whether a cast is to go down in our notes as waxy or granular; I say unimportant, because, although the difference is wide between the significance of a purely fibrinous cast, and one of crumbled epithelium, it is in the preponderance of one over the other, not in

the doubt between an isolated example of either, that the grounds of diagnosis will lie.

2. The "large waxy" intramembranous cast. (pl. 1, fig. 2.) This is usually about 1-500th of an inch in diameter, and occurs for the most part in shorter fragments than the small waxy kind; it is often yellowish in colour, and its outline clearer and sharper even than the intracellular cast; its larger size will alone however suffice to prevent its being confounded with other varieties in most cases. It occurs at times, in cases of acute nephritis, but is more often found in the advanced stages of chronic disease, when there has been wasting of the kidney tissue from denuding of the tubes, the arteries thickened from the embarrassed circulation, and here and there, the denuded tubes expanded into cysts, from obstruction in front, while secretion of fluid goes on behind the seat of obstruction.

3. The *Granular Cast*, (pl. 1, fig. 4,) about which almost enough has been said incidentally in speaking of the pale waxy cast. Next perhaps to this kind it is the most frequent of occurrence; here the fibrinous material is dotted with minute fragments of crumbled epithelium, or of unorganised fibrin itself, which in its progress through the tubes becomes transformed, as it were, from the pale waxy into the granular variety. Now the difference between the purely fibrinous cast, and that formed from degraded epithelium, as regards import is momentous, and it may be asked how is the difference to be made out by the eye? Well, I am inclined to think that again the observation of the isolated cast would leave us in the dark or else mislead, but by seeking for what may be called collateral evidence, we may arrive at satisfactory conclusions, if the specimen, or, what is better, several specimens be carefully examined. If there be much scattered

epithelium, and if the casts (some or all of them) be dotted plentifully with epithelial cells, and their fragments, we may safely conclude that it is a case of desquamation of the epithelial lining of the tubes, and on the other hand, if there be a large admixture of the pale translucent casts, and little or no epithelium lie scattered about the fields, we may conclude as confidently, that desquamation forms no important feature in the case. Not unfrequently the granular cast presents a yellowish brown appearance due to its being composed wholly, or in part, of broken down blood discs, and the colour, in addition to the presence of free blood cells, furnishes a ready means of recognition. Often the granular cast presents an appearance of extreme blackness, as if it were composed of pigment granules, but I believe that this is rarely due to anything but the extreme degree of comminution to which the crumbled epithelial cells or the fibrinous debris before spoken of, has been subjected. Granular casts occurring as the main constituent of a copious sediment is in most cases an appearance of evil omen, as indicating a wasting of the lining of the kidney tubes, or in fact of the essential part of the secreting structure. They are in most cases the precursors of the large waxy intramembranous cast which I have mentioned as formed in tubes which have become denuded of their epithelial lining, and which offer to the plastic material a smooth mould about $\frac{1}{500}$th of an inch in diameter, instead of one of about half that calibre, and made irregular by the presence of epithelium on its walls.

4. *Epithelial Casts*, (pl. 1, fig 3). These are of course moulded in tubes not denuded, and are therefore of the smaller size; they occur in greatest frequency in cases of acute nephritis, and appear to be examples of a rapid desquamation, and a reproduction as rapid, of the secreting

cells. To this inference as to their mode of formation, we are led by the comparative infrequency of the large waxy cast as a sequel to this form of disease; this is strengthened by the perfect condition in which we find the cells making up this form of cast; in many cases the morbid condition appears to be simply a tendency on the part of the cells to detach themselves too speedily from the basement membrane. No doubt this is due to some abnormal material in the blood which the kidney cell takes upon itself the office of removing; in so doing it derives in a certain sense more than its natural amount of nutritive material; the cell grows, arrives at perfection, degenerates, and is shed within a period less than elapses under healthy conditions. The appearance of casts formed of entire epithelium in considerable number would give room for a more hopeful prognosis than where we find, in the abundance of granular casts, evidence of crumbling going on whilst the cell remains adherent to the wall of the tube. In the latter case, where the secreting surface must be largely occupied as it were by the ruins of the cells, there must be greater interference with the function of the organ than where the casts being detached in a state of integrity, there is room for the growth of new and perfect successors to those which have become detached and washed away as casts. In some cases the epithelial cells, though remaining entire, present a collapsed appearance, they are smaller, and present a corrugated outline, as if a step had been taken towards rupture, and comminution previous to detachment.

5. *Blood Casts.*— These are readily recognised by the biconcave discs which make up the cast, and are seen to have a yellowish tint, highly characteristic of blood under the microscope. As I have before noticed, this yellow or yellowish brown tinge is sometimes noticeable in the granular cast,

apparently from an admixture of the coloring matter of the blood with the proper debris of cells forming the cast. The formation of blood casts is necessarily associated with an albuminous condition of the urine. As regards their origin, the conditions which give rise to the pale waxy cast, will suffice, with a difference in degree as to one of them, to explain the production of both forms. Imagining the congestion, either active or passive, to attain a certain degree of intensity, we expect to find translucent waxy casts, with albumen in the urine. Supposing this degree overstepped, we should look for a transudation of the red particles of the blood, from the ruptured capillaries of the malpighian tuft; in other words, the dropsy becomes a hæmorrhage, and we get free blood cells, probably intermixed with casts, composed more or less of aggregated discs. From some cause, which I am unable to explain, the tendency to collect into rouleaux, noticeable in the blood given out in other hæmorrhages, appears to be wanting in this case; and a cast rarely, if ever, presents a series of discs adherent by their flat surfaces to each other, in the manner of blood drawn, for example, by venæsection. The presence of blood casts in the urine, other symptoms being concurrent, would be of favorable import in a case of kidney disease; at least it would imply that the attack is recent, and indeed it is a feature rarely wanting in acute nephritis. Dr. Johnson has shown that in chronic, and therefore less hopeful, cases, a process of thickening goes on in the malpighian capillaries, a provision which renders them no longer liable to transudation of the blood constituents. This process may even go to the extent of depriving the urine entirely of its albuminous admixture; and in the advanced stage of the desquamative disease, we may have no microscopic sign of the spoiling which the kidney has undergone, beyond an occasional cast of the large, waxy variety,

formed from material secreted by the denuded surface of the convoluted tubes, unassisted by the malpighian capillaries. The general characters of the urine will, however, come to our aid in the prognosis; it is apt in such cases to be very pale, of low specific gravity—1010 or 1011, and passed in unnaturally large quantity.

To revert again to casts, I have to mention—

6. The *Pus Cast* (pl. 1, fig. 6), formed of the easily recognised pus cell; easily recognised, that is to say, when in the shape of casts; for, when scattered, it is not difficult to confound it with the mucus corpuscle, but this latter never forms casts.

The pus cast is not infrequent of occurrence in the early stages of acute nephritis, and implies a suppuration on the surface of tubes taking the place of the normal epithelial cell formation; it rarely, if ever, leads on to the formation of ulcer, as we are apt to expect as a result of the suppurative process going on elsewhere, though diffuse abscess of the kidney is not an unknown form of disease, leading to complete breaking down and discharge of the whole secreting structure of the organ—a result scarcely to be looked for in the examples of pus cells and casts associated with the ordinary appearances observable in nephritis.

A word on *Oil Casts* (pl. 1, fig. 5), and I have done with the distinctive characters of the kidney tube casts. Oil sometimes forms apparently the bulk of the cast; but more usually the oily matter presents itself in the shape of globules, dotting the pale waxy, or granular casts. Oil casts themselves are recognisable by the clear, sharp, and perfectly circular outline of their constituent globules; these have usually a bright centre, owing to their high refractive power, but at times are too minute for separate distinction, and form a densely black mass, not unlike some examples of casts formed

1

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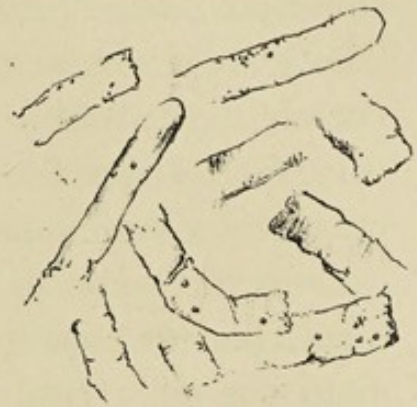

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1. Small waxy - (intracellular)
2. Large waxy - (intramembranous)
3. Epithelial
4. Granular. (intracellular)
5. Oily.
6. Pus - (intracellular)

Drawn from the Microscope by R. R. Siccama.

of epithelium, much comminuted; and where such is the case, we have to confirm or correct our impressions as to the nature of the appearances, by observing the scattered bodies in the field; if there be much free oil, or epithelial cells dotted with oil, the conclusion that the cast is oily will be unavoidable; of evil augury when the casts are very numerous, as indicating a fatty and irremediable degeneration of the kidney; their appearance, in limited number, is often only associated with a temporary secretion of oil by the cells, or, as it is more often termed, a deposit within them.

Permit me now to solicit your attention to the microscopic specimens under the instruments on the table, and to read to you my notes of some cases of renal disease now under treatment in the hospital (omitted here as being necessarily ephemeral in point of interest, and therefore unsuited to the pages of the Transactions).

I cannot conclude my paper without acknowledging once for all, that to the writings and oral teachings of Dr. George Johnson—sources that have been, and still are, open to all of you here present—I am indebted for such information as it has been in my power to lay before you this evening, on the subject I have had to descant upon. My vindication for assuming the position which I am now about to relinquish, is, that, during the two years which have elapsed since I first held a case book, as his clinical clerk, I have had—and may say, without presumption, availed myself of—daily opportunities of observing, in the wards of King's College Hospital, the correctness of his views, and their important bearing on the pathology and treatment of kidney diseases. I can only hope to *corroborate;* for a subject which he has exhausted I can scarcely hope to add to, or enrich by any results of original research.

action. In both these instances it is the fluids circulating in the body which determine the changes of action alluded to. There are other diseases almost without number which would, perhaps even more forcibly, illustrate the views I hold on this subject, especially the class of nervous diseases; but time will not allow me now to dwell on these. I have been induced to make these remarks in explanation of, as well as justification for, the use which I intend to make of the word "functional," and I shall hope to show in the following pages, that the function of menstruation, which is the exclusive office of the uterus to perform, is subject to very considerable derangement, and this without any change occurring in the structure of the uterus itself; at the same time many of these derangements are accompanied with great structural change, and it is very important that on these two points our mind should be perfectly clear, for without it, he who attempts to treat these diseases will continually find himself thwarted, to the great detriment of his patient, and the no small annoyance of himself. I would wish however to preface my observations by a few remarks on the minute anatomy of the uterus, and on the healthy function which it is intended to perform.

I suppose no one now will be prepared to deny the muscularity of the uterus. I have several preparations which show this to my mind most conclusively, and any one at all conversant with microscopical manipulations can readily satisfy himself on this point; one of the preparations I allude to, was taken from the uterus of a woman who died thirty-six hours after labour, in this the muscular fibres are well seen; they are of the involuntary or non-striated kind; are much larger and coarser than are seen in the unimpregnated state, the nuclei are also much more distinct; they do not on section

appear to be arranged in any very definite manner, and are here and there separated by small spaces representing the position of the capillaries. In the virgin uterus it is by no means so easy to distinguish these elements; still, with a little care, and perhaps more of chance, some of the fibres at the edge of the section will serve to satisfy your mind. The substance of the uterus is entirely composed of these fibres, interspersed with blood vessels, nervous elements (derived exclusively from the sympathetic), and some few lymphatics; its outer surface is covered nearly entirely by peritoneum, its inner by mucous membrane.

As regards the arrangement of the vessels, nothing very definite has been made out; they seem to take a meandering course in the muscular substance, and are most numerous immediately beneath the mucous membrane; on the whole, the vascularity of the uterus in the unimpregnated state is not at all high.

The interior of the uterus is lined with mucous membrane, which is continuous with that of the vagina, and extends from it along the fallopian tubes; it differs however in character in these several situations; that with which we are now more immediately concerned is described by M. Cruveilhier as having somewhat of a papillary nature, and is interspersed with follicles or crypts, from which mucus can be extruded, and which form when distended small vesicles.

M. Coste, who is also another labourer in this field, states that the thickness of this mucous membrane varies in different parts of the uterus; it is thickest about the body, and diminishes rather abruptly at its junction with the neck; it is also stated by this observer to be a very vascular tissue, and is closely adherent to the muscular tissue of the uterus, between it and which there is no sub-mucous tissue; situated in this

mucous tissue are the glands or follicles before alluded to; they are arranged vertically side by side, pretty much the same as the follicles of the stomach, their attached extremity forming a cul de sac, embedded slightly in the muscular tissue. In the interior of these so-called glands is a quantity of thick viscid liquid, which increases during menstruation, *and it seems probable that this fluid is in reality a true secretion, and constitutes the essential part of menstruation.*

On this question, however, much discrepancy of opinion exists; some considering it in the light of a secretion, others as a mere exhalation of blood. There can be no doubt that it is derived from the mucous lining of the uterus; though at one time it was believed to come from the walls of the vagina. Lately I have had an opportunity of witnessing this process, in a case of procidentia which came under my care in the hospital. The body of the uterus was completely protruded, the os being the most depending part; and from it, during the menstrual period, which lasted about three days, there was a constant discharge of a thin sero-sanguineous fluid, presenting all the ordinary characters of healthy menstruation.

The protruded viscus was tender, swollen, and hot, more so at this than at ordinary times; as far into its interior as I could see, its surface was of a dusky red hue, and this appearance extended all round the os. The covering which it had, and which was the inverted mucous membrane lining the vagina, was perfectly dry and shining, but had not been long enough exposed to become cuticular. I succeeded in procuring some of the menstrual fluid, by gently squeezing the organ. It was a thick, highly viscid, and tenacious fluid; semitransparent and amber-colored, when it could be seen pure; but was considerably interspersed with streaks of bright arterial blood. This blood I observed coming from

parts looking more congested than others; and I am of opinion, that, as the amount of color—in other words, the quantity of blood—is subject to much variation, it may be looked upon as a mere accidental circumstance, not at all essential to, though a most common attendant on, healthy menstruation. I also incline to the belief that the true secretion—for such, in my opinion, it is—consists of that amber-colored fluid to which I just now alluded. This I found exuding from all parts within my gaze, and it seemed to adhere very closely to the parts with which it was in contact. On examination, it did not appear to possess either acid or alkaline reaction; if any, rather the former than the latter; under the microscope it presented the following appearance:—There were a number of cells, of a more or less elongated character; some, three or four times the length of their breadth, their diameter being tolerably uniform for the whole length; these seemed to form by far the greater portion of the secretion; there were no nuclei that I could discover. Beside these were a quantity of cells, very like those described as exudation cells; and a large number of mucous globules and free blood discs, which presented nothing remarkable. I may mention that the glands about the cervix were rendered much more prominent and distinct, and seemed to be actively exercised.

Granting then that the fountain whence the menstrual discharge flows, is the mucous membrane lining the uterus, what is the determining cause of this function? Very curious notions have at different times been entertained regarding this. At one time it was believed that the moon excited some influence over the fluids of the body, and that menstruation was a sort of tidal flow. Drake believed that some fermentative process was continually going on in the body, which required a periodical elimination of its products: by others it has been

considered analogous to the period of heat in the lower animals; which, I believe, is always accompanied with a discharge of some kind from the generative organs of the female; others believe that menstruation depends on plethora of the uterus, without giving the reason for this condition. All these opinions, however, and there are very many others which I might adduce, are altogether erroneous; they are formed partly from a too superficial consideration of the facts then known, but chiefly from ignorance of those changes, which more recent investigation have proved to be continually going on in the ovaries. Here it is, I think, that we must seek for that we wish to discover. Of late years, considerable attention has been directed to this subject, from some observations made by M. Coste. I will not detain you with a description of the changes taking place in the ovaries, but confine my remarks to those of the uterus. He says, that during the evolution of an ovarian vesicle, the first change noticed is a sudden injection of the mucous membrane of the uterus, the vessels of which become very turgid, and the whole volume of the organ is increased. This last fact was also noticed by Dr. Blundell, in a case of procidentia; and in the case to which I have previously alluded, this point was very well shown. Very frequently this mucous membrane, from the distension of its glands (for you will remember I mentioned previously that these glands often become distended with the mucous which they have secreted during this period), becomes thick and corrugated; and, as I saw in the case above mentioned, minute hæmorrhages take place, either by a kind of exudation, or, more probably, from ruptured capillaries.

In cases where this hæmorrhage is more free, the entire secretion, at first of a pale rose colour, mixes with the mucus

from the vagina, and has its color considerably heightened, possibly from some chemical change. After two or three days, a clot is sometimes, though rarely, formed. M. Cazeux expresses himself very decisively as to the source of this hæmorrhage; for he has seen, in women dying during menstruation, blood transuding from small microscopic apertures. Whether this blood comes from arterial or venous capillaries, there is some difference of opinion; in my opinion it is undoubtedly arterial. Some indeed believe that, so soon as the arterial runs on to venous plethora, the menstrual secretion ceases.

Whatever other changes this secretion induces in the blood effused, these two are tolerably constant;—first, that it seldom, if ever, coagulates; and, secondly, it has the power of resisting putrefaction. Hence it is considered a rule, that, if the discharge be at all fœtid, or has any tendency to coagulate, the function is not healthily performed.

The quantity of fluid secreted at each period is subject to much variation in different persons; for, while in some the discharge is kept up for a week, or even more, in others it lasts but two or three days. Both of these may be quite normal, and depend on a peculiarity of the individual. The average amount is from three to four ounces; but, in this respect, climate seems to exert considerable influence, it being always much more profuse in hot than cold countries; that which would be termed menorrhagia in a cold climate, is quite healthy in the tropics. I am told, too, by some patients of whom I have enquired, that a similar variation exists in the same person at different seasons of the year.

Healthy menstruation occurs once in every twenty-eight days. The reason of this seems at present, however, a subject of much speculation. The idea most prevalent is, that at each

period the escape of an ovum from the ovary takes place: this circumstance facilitates impregnation, and is accompanied with a slight increase of the sexual feeling, and, as a consequence of the changes being wrought in the ovaries, the uterus takes on some sort of sympathetic action and menstruation is the result. As regards the increase of the sexual feeling, this I believe is more fanciful than true; it is intended as corroborative evidence of the analogy between this function and the heat of other animals. In these, however, such a provision is made, for obvious reasons; but, in man, endowed with high moral feelings, and blessed with a free will, such a provision is not necessary. The question of periodicity must still remain an open one; it is not a satisfactory way of leaving it, but it is no more than we are obliged to do in numerous other instances. We know no reason why certain flowers, such as the monthly rose, should bloom once a month, while others do so only once a year; or why some animals are in heat every month—others every six, nine, or twelve months.

Let me now briefly give you some of the reasons which have been adduced in support of the belief that every menstrual period is attended with the rupture of a graafian vesicle.

1. In those who have died during menstruation, certain changes have been found going on in the ovaries.

2. Where no ovaries exist, even though a uterus be present, there menstruation is never established.

3. In cases of disease, involving both ovaries, menstruation, though previously healthy, has ceased.

4. That impregnation is much more likely to occur within a few days after menstruation, than at any other time; and hence the rule to reckon the duration of pregnancy as nine

months and eight days from the last menstrual period.

And lastly, though this is a point not agreed upon, the supposed analogy between the function of menstruation and the period of heat in other animals—the latter being a time characterised in them by the escape of ova, and their consequent aptitude for conception. In this view Bischoff agrees, and he considers menstruation as little else than the crisis of that state of congestion which the increased sexual feeling occasions.

With such strong proof as this you would almost think doubt impossible, but it is very far otherwise, and it is so because further investigation has proved that the graafian vesicle may undergo all the changes of its evolution, and yet no menstruation accompany it; while conversely the menstrual function may be duly performed in every respect without any of the changes above alluded to occurring in the ovaries. Instances have occurred in which these follicles have been found ruptured long before menstruation had been established; and the same thing has been noticed after its cessation. These, however, are quite the exception to the rule, and are of very rare occurrence; Dr. Ritchie says also that there is this difference in them, that the openings in the peritoneum over ovarian follicles are in the unmenstruating female punctiform, while in the other they are uniformly linear, or crucial, and larger. From all that I have said then on the subject of healthy menstruation, I would deduce the following facts.—First, that the uterus is supplied with a mucous membrane differing from ordinary mucous membrane, both in its anatomy and physiology.—Secondly, that the function of menstruation is performed exclusively by this structure, which is for the purpose, compound —Thirdly, that the menstrual fluid bears the strongest analogy to a true

secretion, having characteristics peculiar to itself.—Fourthly, for the due performance of this function, the integrity of one ovary at least is essential.—And, lastly, that it is so, from its relation to changes produced there at the time of rupture of the graafian follicle, the two standing to each other, as cause and effect. *Why*, or *how*, it is, that these should bear such a relation, is very difficult to understand; this very interesting fact, as bearing upon the subject has been noticed, namely, that impregnation rarely if ever takes place where there is any lengthened absence of menstruation; the explanation of this may be one of two, either the absence of menstruation may indicate the absence of any ovarian change, such as the escape of an ovum would produce; or it may give rise to such constitutional defalcation that the faculty of impregnation shall be hindered, possibly by effecting a change, such as defective development, in the ovum itself. Whatever the explanation may be, there is I think no doubt, that menstruation is almost as essential to impregnation, as is the escape of the ovum itself from the ovary.

Again, as to *how* it is that these ovarian and uterine relations and sympathies are maintained, is another very difficult question to answer; you will find it merely stated in books that during the occurrence of certain changes in the ovaries, certain others are produced in the uterus; that is what I also have stated, but how is this? I would venture to suggest, that these secondary uterine changes are produced through the medium of the nervous system; you know that both the uterus and ovaries derive their nervous supply, each from the same source; the inferior hypogastric plexus of the sympathetic; neither of these viscera are commonly believed to be very highly supplied with nerves, unless indeed the observations of Dr. Robert Lee are correct; and

at present there seems much doubt about this; but still, be that supply great or small, of their connection there is no doubt, and we know well how apt organs are which are supplied by the sympathetic to take on sympathetic actions; this is particularly true when any organ is affected by pain. Now when the changes which I have before described are going on in the ovaries, there must be as an effect of these an exaltation of the nervous force in that particular part, and the uterus being in such intimate connection with it would naturally experience a similar result, the effect of which must be, a determination of blood to the organ, just as occurs when the nervous excitability is heightened from other causes, such as sexual desire, &c.; the consequence of all this is, that a kind of exudation, if you will it so, takes place, which is the essential part of menstruation; of course this determination of blood may go on to a morbid degree, and hæmorrhage of different degrees is the result; of this I shall speak further on.

The objections which have been raised against this ovarian view of menstruation generally, may however be thought to upset the opinion I have given; I shall endeavour to refute these as I speak of the several varieties of morbid menstruation, and this part of my subject I propose now to enter on. I confess I do not see the utility of making so many nice divisions, which writers on this subject seem so much to delight in; they are described often with such accuracy, and with such clear marks of distinction, that I fear practical observations will sometimes serve to discourage you, for you will frequently find yourself much puzzled in deciding what subdivision any given case ought to come under; such I assure you has often been my lot, and though I can but admit the possibility of such classification on accurate data,

yet, with all due deference I am inclined to think there is much in it that is fanciful.

The first form of disordered menstruation I shall describe is *amenorrhœa*. This term in itself simply implies absence of menstruation, but this absence of menstruation may depend on a variety of causes; many of these I shall merely mention. Usually this variety is divided into two subdivisions, the amenorrhœa of retention, and that of suppression; under the former head are arranged those cases depending on either partial or complete arrest in the development of those parts essential to the performance of this function; I need not tell you that such a condition as this is quite beyond our art to remedy; generally you will not I think experience much difficulty in deciding on such cases, for with this arrested development there are many other symptoms which cannot be mistaken, but which mark very clearly the nature of the case; puberty is never fairly established, childhood seems not to pass away, even though age may lead us to expect it, and bodily conformation is alike retarded in its development. Sometimes the amenorrhœa of retention is caused by an imperforate hymen; the treatment of such a case is obvious, small incisions should be made, and subsequent treatment according to the ordinary rules of surgery, guided by the peculiarities of the case.

It is, however, with the second form of amenorrhœa that I wish most to dwell. We will imagine that puberty has been fully established, menstruation duly performed for some time with all regularity, and at length ceased; for this a patient seeks your advice; it is clear, before attempting to treat such an one, you must make out, if possible, the *cause* of the mischief. What now may this be? You must first make out that the case is not one of those in which the function was *suddenly* suspended, at a time when it was being performed. You will

learn, perhaps, that the last time your patient menstruated, she noticed nothing in it remarkable, except that it was not quite so abundant; that the discharge was thinner, less coloured, and was of shorter duration than heretofore; she will also tell you that this condition had been gradually becoming manifest to her, until it finally ceased altogether; during all this time her health has suffered much, she has been low spirited and desponding, evincing a general apathy; her appetite has fallen off, she has become weaker, lost flesh and colour, has experienced pains in her head, is dyspeptic, and frequently vomits early in the morning; she has a weak and quick pulse, slight cough perhaps, tongue pale and flabby, bowels sluggish, and their secretions very light coloured; other symptoms may also manifest themselves, indicative of a general derangement. In such a case you would, and no doubt rightly, attribute all this disturbance to the absence of menstruation, and yet it is very remarkable, that there are certain conditions of female life in which, though this same cause may be in action, namely amenorrhœa, yet no such effects are produced; look, for instance, at the states of pregnancy and lactation; in the former, perhaps, this is not so striking, seeing that other and much more important changes are going on in the uterus, but in the latter this cannot be said; here the uterus is quiescent, and yet no menstruation occurs; it has been said, that this is owing to the sympathetic action between the breasts and the uterus being such, that both cannot be actively exercised at the same time; whatever the explanation may be, I have no doubt of the fact, though I confess, as the result of my enquiry, that I do not find amenorrhœa nearly so frequent in lactation among the out patients of the hospital, as I had been led to imagine. I have found that at least 35 per cent. menstruate

during suckling, and in those cases where this process is carried on for a lengthened time (as it often is among the poorer classes, under the impression that it checks impregnation), such as 18 months and two years for instance, there menstruation almost always returns for some few months ere lactation is given up. My friend, Mr. Hood, tells me that he has met with similar results.

Now, seeing that the simple absence of menstruation is not in itself, at all times, sufficient to produce such effects as are sometimes ascribed to it; seeing also, that in the form of amenorrhœa to which I have directed your attention, and which is by far the most common form; there are concomitant symptoms often of very severe character, I am led to believe, or at least to suspect, that after all, we must not look upon amenorrhœa as anything else than a symptom of some great constitutional defect, when occurring in persons such as I have described; it may be that this defect is one retarding the process of evolution in the graafian vesicle, and rendering this so sluggish that the secondary uterine excitation necessary for the performance of menstruation cannot be maintained; or it may be, though I think it less probable, that the required excitation is set up in the ovaries, but fails to be transmitted; or, lastly, the fault may rest with the uterus itself. There is no reason that I see, arguing from analogy, why the uterus in itself should not fail to perform its functions just as many other organs do, independently of the influence excited upon them by their "brothers in arms." All this, however, I am free to admit is matter of speculation. I throw it out to you as such; should there appear any reason in any part of it, I hope you will, some of you, deem it worth your while yet further to investigate it.

But what now is the best mode of treating such a condition

as this; to a great extent this must depend on the views entertained of its nature; of course, the first thing to do in this, as in all other diseases, is to attend to the digestive apparatus, put this in good working order. I usually commence with small doses of hyd. c. creta, about three grains, with the extract of lettuce every night, and the following draught in effervescence three times a day:—

℞. Soda, Bicarb. ℈j.
Tinct. Lupuli. ℥j.
Syr. Zingib. ℥ ss.
Aq. ad ℨj. M.

℞. Acid. Tart. gr. xv.
Aq. ℨj. M.

This forms a most agreeable medicine; the most fanciful young lady will not object to it, a point of no small importance to your success in private practice. After this has been persevered in for a week or two, you will generally have good cause for satisfaction. The patient feels stronger, is much more cheerful, her appetite is returning, and her whole nervous system is much more invigorated; you may now take your choice of some more powerful tonic, calumba, cascarilla, gentian or cinchona, or if she is anæmic, steel would doubtless be what you would select; but as they do not sometimes bear this very well at first, I usually order it in an effervescing draught, forming a kind of chalybeate champagne, mixing about five grains of the citrate or tartrate of iron, with citric or tartaric acid, as the case may be, and taking this in effervescence with potash; an occasional alterative must still be given, and a cold bath every morning will be found of great service; after a week or two, should the function not have

been restored, the following is a mixture I have found to answer better than any other:—

R. Ferri Sulphatis, gr. ij.
Acid. Sulph. Dil. m. x.
Infus. Quassiæ, ℥iss.
M. ft. Haust. Ter in die sumend.

If the bowels are sluggish, magnes. sulph. ʒj. may be added to each dose of the medicine.

This is generally the plan of treatment I am in the habit of following, and I do not think from all I have seen that better can be adopted. There is no doubt that tonics are the essential part of the treatment of these cases, particularly if, as I have stated my belief, that the great defect is one originating in whole or in part of the nervous system; for, as Dr. Billing observes, "Tonics are substances which neither immediately nor sensibly call forth actions like stimulants, nor depress them like sedatives; but give power to the nervous system to generate or secrete the nervous influence, by which the whole frame is strengthened."

But there is another form of amenorrhœa coming under this division of the subject, one not characterised by this depression of the vital powers, indeed there may not be to all appearances but very little constitutional disturbance. The patient, it may be, makes no special complaint to you, except that she is not "regular;" perhaps she has occasional headache and transient fits of giddiness; her skin is rather hot and dry, there is some slight thirst, and the symptoms generally are rather those of excitement than depression; such a case I should commence treating with a tolerably free purge, and if there are symptoms of plethora, leeches to the perinæum or sacrum will do much good. I remember one very

obstinate case of amenorrhœa, in which I had been trying a great many medicines, but all to no purpose; the patient was a woman of rather full habit, had a quick and hard pulse, and frequent headache, especially on stooping. I ordered her twelve leeches over the sacrum, and left off all medicines; in two days' time this patient menstruated quite healthily. I kept up from that time a steady alkaline plan of treatment, giving her nothing but scruple doses of bicarbonate of potash three times a day, with a gentle laxative every night. My object in this was to diminish the plasticity of the blood, and thus by impoverishing it to a certain extent, render its circulation more free; for it seemed to me that there was a great torpidity in the uterine circulation, and that this was to a great extent the cause of the amenorrhœa; however, whether this theory was the true one or not, I had the satisfaction of seeing my patient get quite well under the treatment pursued, and I should have no hesitation in trying it again, if such a case came before me.

Sometimes, however, abstraction of blood, even to a small extent, may not seem expedient; the patient may be of rather a delicate constitution, though not such as I described in the first variety of this disease; several cases of this kind have come to me, and I have found the application of a blister over the sacrum answer very well indeed; how it acts I cannot satisfactorily explain, any more than I can how dry cupping and other forms of counter irritation do, when applied over deep seated organs. Of course general treatment must be adopted; at the same time, a warm hip-bath night and morning is a very useful adjunct. The secretions and excretions should be carefully watched, and as the health of your patient improves, you will generally find that this function, in common with the others, will be duly performed.

The last form of amenorrhœa to which I shall allude, is that of acute suppression. As regards the diagnosis of these cases, you will not I think, using ordinary discretion, be liable to much mistake; the fact is simply this, that during the healthy performance of the menstrual function, it, from some cause, suddenly stopped; most commonly this is the result of cold; but there are certain mental conditions equally, if not even more, powerful, such as fright, anger, &c. The effect which such suppression occasions will vary, according to the constitution of the patient, and will require different plans of treatment; this is no more than you would expect. In a plethoric person very serious results may follow, unless indeed active treatment is pursued; thus Dr. Gooch mentions a very remarkable case of fatal suppression, in which the uterus was found in a state of gangrene after death. There can I think be no doubt, that the immediate effect which is produced is entirely localized in the uterus, though this may react on other organs. Generally, the patient will be seized with pain referred to the back, lower part of the body and thighs; there will be a sense of weight and throbbing deep in the pelvis, pain in the head, hot and dry skin, and other inflammatory symptoms; in one case, I remember there was some little œdema of the lower extremities; in short, the complications which may follow on this are very numerous; they are all dependant on the sudden cessation of a most important function, which cessation is in itself accompanied, and indeed caused, by inflammation, and that often of a very active character, in the very organ whose office it is to discharge that function; that it is an inflammatory disease post-mortem appearances have been quite sufficient to show, and were we destitute of this evidence, analogy would be quite sufficient to give us good ground for believing it; look, for instance, at the common occurrence of

acute nephritis from exposure to cold. Seeing then, that the symptoms, the diagnosis, and the pathology of this affection are so clear, there ought not to be much difficulty in selecting the proper remedies; these, of course, will be governed by the particular circumstances of each case, at least, as to their severity. If it be a mild case (and I may state that as the result of my experience those cases are as a rule mildest in which longer rather than shorter periods are occupied in the ordinary performance of the function), a warm hip-bath, friction, or some slight counter irritation over the sacrum, as a mustard poultice, and hot bottles to the feet, should be the means first pursued; the patient should be kept quiet in bed, and some saline aperient draught given; this should be followed up with a mixture intended to act on the skin and to quiet the circulation. The following I think a very useful formula:—

℞ Liq. Ammon. Acet. ℥ij.
Spts. Æth. Nit. ℥ss.
Tinct. Digitalis, m. v.
Tinct. Hyoscyam, m. xv.
Mist. Camph. ℥j.
M. Ft. haust. 4tis horis sumend.

You must not aim at restoring the menstrual function; at least, I have never seen this succeed. After a few days, the inflammatory action will have subsided and all will be well. You must then look forward to the next period, and caution your patient against exposing herself to similar dangers.

The above, however, is a very happy example; you must not always expect to be so successful; cases will occur, in which your treatment must be much more active. Leeches, locally to the perinæum, or cupping over the sacrum, or general blood-letting, or, in yet more severe cases, scarifying the os

uteri, or the application of leeches in this situation—either of these must be followed by warm fomentations, or the hip bath, and such general antiphlogistic treatment as the circumstances of the case may seem to demand.

So much then for the subject of amenorrhœa, or at least those forms of it which are the more common. That which in my opinion, in the treatment of this disorder requires most to be kept in mind, is the fact, that, though in itself it may be considered a disease, in the chronic form of suppression, it must be regarded only as a symptom of a deeper and more pervading dyscrasia. There are many diseases in which this, looking on it as a symptom, is very common; phthisis is proverbially so. Many believe, indeed, that amenorrhœa is a very common cause of phthisis. My own opinion leads me in just the opposite direction; regarding phthisis, as I believe we may safely, as a blood disease, and seeing how very defective, even in the earlier stages, are the processes of nutrition, I can readily believe that such a morbid deterioration of the blood will engender a want of power in the ovaries to perform those evolutions which I have shown to be essential to menstruation. Examples of the contrary may occur sometimes, but I am sure they form a small minority. Holding the views I do, therefore, you may imagine I have not much faith in the efficacy of the so-called emmenagogues, restricting this term to those drugs supposed to have a specific action on the uterus in the unimpregnated state—such as aloes, hellebore, savin, the ergot of rye, and some others; this action tending to induce the catamenial discharge. I believe that these medicines do exert some irritative influence on the uterus, but I much question if they can bring on a return of this secretion when once stopped, particularly if the changes before alluded to as occurring in the ovaries are essential to the performance

of this function. Some consider that iron possesses emmenagogue properties. This, I believe, is as great a mistake; and the proof to my mind that it is so, and that it only acts by supplying that which is deficient in the blood, and which in such cases is the cause of the disease, is the fact, that its good effects are only seen in cases of anæmia, where too its value is in direct proportion to the severity of the case.

I come now to speak of another form of morbid menstruation, the opposite of that we have just discussed; namely, *menorrhagia*. This term, considered in the abstract, must be viewed in a relative sense, and can only be estimated with a due consideration to the peculiarities of individuals, climate, and more especially as to its constitutional effects; for, implying a morbid condition, it can only be so when apart from that which may come under the term "average," it departs from that which is "peculiar." Thus, as I before stated, persons living in warm climates menstruate more profusely than those living in colder regions. So, also, some persons habitually secrete more (if it be a secretion, as I believe) than others. There is also another distinction which I think it right to make, though authorities on this point are not agreed, between menorrhagia and uterine hæmorrhage. My definition of the former would be this: "that it consists in an overabundant secretion of the menstrual fluid which may depart from that which is normal and peculiar to the individual, either as to frequency or to quantity, periodicity remaining correct; but that in all cases the fluid secreted shall still retain all the characters which I have before described as peculiar to this secretion;" while the latter, which may also present the same abnormalities as to frequency of recurrence and as to quantity, "has this additional peculiarity—that it comes away either in clots or possessing the power of

coagulation, and has other characteristics which more closely resemble an ordinary hæmorrhagic flow."

These distinctions, which I think are important, inasmuch as, to me, they present peculiarities requiring diverse treatment, are so obvious as regards their diagnosis, considering them as characterised by the above mentioned differences, that I do not deem it necessary to enter on the symptoms which each may present; they will be found fully described in any systematic work in this department of medicine. As, however, the treatment I should be inclined to follow is based on the views I entertain of the pathology of these two conditions, some explanation is necessary, in order to render more intelligible that which otherwise might seem empirical; it will also serve, if correct, to justify the division which has seemed to me necessary.

Supposing then that menorrhagia means literally an excessive secretion, on what may this depend? we must revert to the theory which has been given to healthy menstruation for a solution of this problem, and I think we shall best understand this by considering those circumstances which induce excessive secretion in other organs; it will be sufficient for my purpose, and clear I think to each of us, if I merely state, what none I am sure will deny, that generally this is dependant on some irritative influence; look for instance at the mucous membrane of the stomach under such circumstances, or that of the intestines, or even the secreting portion of the kidney or salivary glands; in all these cases we know that there are medicines whose action must be more or less irritative, and whose effects are such as I have alluded to; how else do purgatives or scammony act on the intestines, or diuretics, as juniper, nitric ether, &c. on the kidney? But what is still more to the point, see how these are influenced

by nervous excitation; every one knows how his kidneys are influenced under such conditions, and the popular notion that the sight of food makes the "mouth water," as it is called, finds its explanation in the same way. Now, if it be true, as I have suggested, that menstruation is the effect of a nervous influence excited on the mucous membrane of the uterus by changes occurring in the ovaries during the evolution of the graafian vesicle, it does not seem to me too much to imagine that this influence may be of different degrees of intensity, and hence, that the menstrual secretion shall bear some proportion to it. Such a thing I confess does not admit of ready demonstration; I offer it for your consideration—you must judge of it as you think best.

Now this morbid condition presents two varieties, one as to quantity, periodicity remaining correct; the other in which the latter and not the former is at fault, it being more frequent than is natural, it may even be almost constant, in which case both varieties are combined. I believe, as a rule, certainly so far as I have seen, these conditions occur most commonly in persons of a debilitated constitution; accordingly the plan of treatment to be pursued has been this:—rest in the recumbent posture, quietude, the exhibition of tonics and sedatives, and light but nourishing diet: such a mixture as this I have found of great service.

R. Acid. Nitric, Dil. m. xx.
Tinct. Hyoscyam. ℥ss.
„ Gent. Co. ℥j.
Aq. Menth. Pip. ℥j.
M. ft. Haust. Ter in die sumend.
And at bed-time a pill of 10 grains of the extract of lettuce.

Should not this succeed the tinct. ferri. mur., with tinct. hyoscyamus and infus., calumb. will often be found efficacious;

injections are not I think very desirable; they tend rather to increase the already existing excitability; some however have a high opinion of their value; perhaps the best that can be used is the decoction of poppy-heads with sulphate of zinc, about two grains to the ounce; it should be used two or three times a day. Should such a condition as this be accompanied with a plethoric constitution, small bleedings, local or general, will prove serviceable, together with tolerably free purging, taking care that those purgatives are avoided whose special action is on the lower bowel. On the whole then, menorrhagia is best treated, according to my belief—first, with sedatives, and these may be either applied locally or administered in the ordinary way;—and, secondly, with tonics, vegetable or mineral, according to the exigencies of the case; at the same time strict attention must be paid to the healthy performance of all the other organic functions, for these may, and no doubt do, indirectly, exert considerable influence on the function of menstruation.

Resembling in many respects, and by some considered identical with menorrhagia, is *uterine hæmorrhage*, occurring in the unimpregnated state. I take it, however, that there is a very essential difference; for this latter condition is I believe quite independent of any concomitant ovarian influence, and should be regarded in the same light as a hæmorrhage from any other source; essentially, no doubt, it consists in a lesion of the capillary vessels; it can be no simple exudation, it occurs most frequently in persons of a robust and plethoric constitution, and at about the middle period of life; it is very rare in unmarried persons; to a certain extent it is sufferable, nay even beneficial; but if unheeded may produce very direful effects, and engender such a condition as will be of very difficult cure. To distinguish this from true menor-

rhagia, I must refer you to the differences I before mentioned; and, having satisfied yourself on this point, it next becomes a question for you to decide on what this hæmorrhage can depend;—first, it may be simple uterine hæmorrhage without any organic lesion beyond that I before mentioned; this you would determine by the history and symptoms of the case, if it has come on suddenly and continued pretty constantly, the patient not experiencing any pain, and having hitherto been quite free from any uterine disorder, if she is unable to give you any reason for it, and does not direct your attention to any other symptom of disease in this locality, you may with all propriety refer it to this subdivision; but if she complains of sharp lancinating pains in and about the uterus, extending round the back, and down the thighs, if she has occasional nausea and vomiting, has been wasting some time, had more or less discharge previous to this attack, which was sometimes of a fœtid character, and menstruation has been irregularly performed for some time, if, besides this, there is some irritability of the bladder and rectum, your suspicions ought to be very strongly aroused to the probability of cancer of the uterus; in such a case of course a vaginal examination will be needed, and then doubt can no longer exist. Or, again, if the patient states that for some time she has been subject to considerable gushes of blood, with a constant mucous or muco-purulent discharge in the intervals, has had occasional pains of a dull, heavy character, and a sense of weight and dragging in the uterus, that her catamenia have been irregular as to periods and rather profuse in quantity, and this without any apparent cause, then the diagnosis must lean to the side of polypus uteri, and this also can only be confirmed by a vaginal examination. Of course all these varieties of uterine hæmorrhage will require very different

plans of treatment; but it is foreign to my present purpose to enter on this subject; I have mentioned them in order to show you, as clearly as possible, the essential differences between true menorrhagia and uterine hæmorrhage, both as to their causes, symptoms, and treatment.

The third form of disordered menstruation which I shall refer to is *dysmenorrhœa*. I shall not however dwell very long on this, because it is that form of which I have seen less than any other, and am therefore unqualified by experience either to accept or reject the opinions entertained by authorities. I can therefore only give you a short abstract of that I have been able to learn, with such opinions as my limited observation has suggested. You will find in the different treatises on this subject a great many subdivisions of this order; thus, there are the irritable, the plethoric, the congestive, the gouty and the hysterical forms; so also there is another depending on ovarian irritation, another connected with inflammatory action of the uterus, and another with derangement of the digestive organs, and all these comprise only that class which are included under the functional division; there are almost as many comprehended in the mechanical. I cannot help thinking, there is a little of fancy about all this. There is no doubt that dysmenorrhœa is often the result of mechanical obstruction; I am sure I have seen two cases of this kind; it has been held as a rule by some, that the diagnosis between this and the functional forms, rests on the fact that in the former, "pain always immediately precedes the discharge," and it does so because of this obstruction which is produced I believe, in the majority of cases, "by a contracted or closed state of the os uteri, or the canal of the cervix." Such a condition is made clear by the pain which the patient suffers for a variable period before the menstrual

flow occurs, and which is of a gradually increasing character, and the immediate relief which this flow occasions; the amount of pain will vary according to the amount of fluid secreted, and the consequent distension of the uterus; as a rule, there is absolutely less secretion than is normal or peculiar to the individual. The general symptoms resulting from this condition are briefly these—pain as before mentioned, extending also to the mammæ and across the loins; sometimes the uterus is so much distended that its fundus can be distinctly made out through the abdominal walls; there is great derangement of the chylopoietic functions, nausea and sickness; pulse is quickened, the skin is hot, and perspiring; the urine is more or less loaded with lithates, and the bowels act sluggishly; sometimes there is irritability of the bladder, which may even amount to strangury; if this state of things continue for any length of time, according to Dr. Rigby, there is great ovarian irritation, and as a consequence of this, no doubt explicable on the grounds I have before advanced, there is often profuse menorrhagia, which greatly aggravates the already existing derangement; finally, the health of the patient begins to suffer materially, and although very rarely fatal, the consequences may be very severe. The treatment of this disorder is just that which would suggest itself to almost every thinking mind, although the process by which this plan is pursued admits of some variety: the condition to be fulfilled is the removal of the obstruction; in other words, the dilatation of the strictured portion. This may be effected either by the use of sponge tent, which is perhaps the best, or by metallic bougies, or the uterine dilater, or the use of caustics, or the knife; time, however, will not allow me to dwell longer on this subject, and I would only add that measures must

be adopted, both medicinal, dietetic, and hygienic, for the conservation of the general health.

Of the functional forms of dysmenorrhœa, the irritable or neuralgic is by far the most common. I very much doubt if any derangement of the digestive organs is capable of producing this form of disease; the influence of the two upon each other is so remote that I can scarcely imagine the one giving rise to the other; still, however, it is believed to do so by some authorities, and, if true, the diagnosis and treatment must be so obvious, that I do not deem it necessary to say more upon it. If such a condition should exist in a confirmed gouty or rheumatic constitution, it seems not altogether unreasonable to ascribe such an affection to this peculiar diathesis, and the treatment would be pursued in strict accordance with such an opinion. In the idea that dysmenorrhœa is produced sometimes by congestion, either active or passive, of the uterine mucous membrane, I have no faith; I have before shown you the results which attend on such a condition, and the causes of it. By far the more common form of dysmenorrhœa is as I just now stated, the neuralgic; within the last few weeks I have seen two well marked cases of this kind, they occurred in the persons of two females, about twenty to thirty years of age, each unmarried, of delicate constitution, and in whom all the characters of the nervous temperament were well marked; one of them had suffered from this disease for many years; the other only for a few months, and the only cause I could assign for its commencement was a family quarrel; she stated, that soon after this she menstruated, and during the whole of the time suffered intense pain of the character I have before described, but rather more intense and lancinating; sometimes it seemed to come on with a sudden dart

from the pelvis, up along the spine, and to the breasts. I first in this case gave a smart purge, and followed it up with quinine and sulphate of iron; she was suffering acutely at the time I first saw her, but in the course of two or three days this greatly abated; I still continued my tonic plan of treatment, with an alterative of rhubarb and blue pill every night; in three weeks' time she menstruated again, and this time with very much less pain; still there was more than was usual, and the secretion itself was diminished in quantity. I have good reason to believe that in a short time this patient will be quite rid of this troublesome and painful malady. The other case I am happy to say is also improving, though much more slowly; this I anticipated, from the length of time she had suffered from it; the treatment I have pursued in this case is the following—an ounce and half draught of compound gentian mixture every morning as a mild aperient, at night time two pills, of equal parts of camphor and henbane, about three grains, and a mixture of quinine and steel during the day. I believe this treatment, steadily pursued for some time, will have the happiest results, and I cannot too strongly recommend it in similar cases; it must not however be pursued empirically; the particular exigencies of each case, and they will present almost endless variety, must receive their required attention; your patience will, I am sure, often be tried in these cases; but when your mind is once made up as to the nature of them, do not alter your treatment until you have given it a fair trial; remember that these are generally very chronic, and the operation of your remedies is slowly, though surely brought about. I may add that, during the paroxysms, anodynes of different kinds must be freely given; I believe opium is, of all drugs, the best, and I would give it both by the mouth and locally, either as enema or

injection, using the decoction of poppy heads or anything stronger, should the case seem to require it; a hot mustard bath is also of great service, and may be repeated once or twice a day.

I regret much that I cannot longer dwell on this subject, but already I know I have exceeded the limits awarded me, and I therefore hasten on to the consideration of the last form of morbid menstruation which I have to discuss, namely, *leucorrhœa*. Properly speaking, this cannot be regarded as a derangement of the menstrual function, seeing that menstruation may, and very often is, healthily performed, quite independent of the existence of this disease. It consists essentially of a discharge, from either the walls of the uterus or the vagina, varying in character from a thin transparent colorless fluid, to a thick opaque and greenish; it has its origin I believe exclusively in a morbid condition of the mucous membrane lining these parts; there may be discharges which closely resemble ordinary leucorrhœa, which however are connected with some more or less severe organic disease; thus, fibrous tumours of the uterus, and the different varieties of cancer, may all be productive of such a discharge; on these however, interesting as they are, I cannot longer dwell. The other forms of leucorrhœa which come under the term functional are two, the one in which the discharge is furnished from the uterus, the other from the vagina; these two present certain points of difference, both in their causes and treatment.

Vaginal leucorrhœa is, as a rule, I believe, more abundant than uterine; and the discharge is usually of a thinner consistence. It seems to me to present very much of a catarrhal character, and to resemble ordinary nasal catarrh. It is, no doubt, often associated with, and perhaps aggravated by, dis-

order of the digestive organs; and is unquestionably much influenced by any debilitated state of the constitution. It is a condition which may go on for a very considerable period, the character of the discharge altering somewhat by time, becoming thicker in the more protracted form. There is not usually any pain, or any other local symptom; it may come on without any apparent cause, or it may be the result of injury, such as a difficult labor would produce. Sometimes it has its origin in acute inflammation of the vagina, which is at first attended by a discharge, having much more of a purulent character; sometimes, too, and perhaps more frequently than from any other cause, it is the result of a greatly enfeebled constitution, engendering a laxity of all the tissues and of the vaginal mucous membrane in particular. In the more chronic cases this condition is, I believe, almost constantly present; being, in fact, due to that debility which the disease itself is capable of inducing. It is in this form of leucorrhœa (the vaginal) that I have so much faith in the efficacy of astringent injections; such an one as alum and sulphate of zinc, about two grains to the ounce of water, is that I am in the habit of ordering, or the ordinary lotio. plumbi of the pharmacopæia of the Hospital.

Useful, however, as I am convinced these are, I am sure their success is greatly strengthened by, if not altogether dependant upon, other constitutional treatment; they seem to form parts of a whole which is incomplete and very inefficient in the absence of the other: of course the general treatment would be such as is included under the term tonic, especially useful too are those tonics possessing some astringency. Of these, among the vegetable, are logwood, oak, and kino; among the mineral, the sulphates of iron, zinc, copper, or alumina; a cold hip bath, night and morning, is also of

great service. The plan of treatment just imperfectly sketched will not of course be suitable to any other than the more chronic forms. Should the case be one of acute vaginitis, a soothing and antiphlogistic plan of treatment must be pursued. Generally, an attack of this kind occurs in a person of plethoric constitution; is accompanied with some pain, has a sudden accession, and produces much more immediate constitutional disturbance. It may then be necessary to apply leeches either to the hypogastrium, groins, or perinœum; or, what is yet more efficacious, small scarifications may be made in the mucous membrane, warm hip baths, and warm emollient injections should be used; saline aperients and diaphoretics administered; and such sedatives as hop, henbane, or lettuce. Under this treatment the inflammatory action very soon succumbs, and the patient may completely recover; more frequently, however, it lapses into the chronic form of leucorrhœa, and would then require some such treatment as that before indicated.

The other form of leucorrhœa, namely—uterine, is generally much more intractable. It has been stated to be caused by two very opposite conditions, namely—plethora and anæmia. Some, however, believe that all uterine leucorrhœa is the result of anæmia. I am sure I have seen cases of this disorder in persons whose general appearance was very far removed from anæmia; and I see no reason why a plethoric condition should not induce a kind of irritation, a sort of sub-acute inflammatory action, ending in the formation of a leucorrhœal discharge. Such a state, however, may exist so long a time as shall ultimately give rise to the other form; but it must be very severe to produce this effect in a constitution acknowledged to be plethoric. I have examined several cases of leucorrhœa with the speculum, and certainly the conditions

noticeable are very different; in the one variety (the plethoric) —the cervix will be found somewhat swollen and tender, and its color either of a florid arterial hue, or more commonly having a dusky tint; from the os will be found continually oozing a thick muco-purulent yellowish discharge, of rather a tenacious character. While in the leucorrhœa of anæmia, the entire vagina and all the parts seen from it are pale and flabby; the cervix uteri seems rather shrunken than otherwise; and the discharge is usually thinner and less tenacious than in the plethoric form, while it is still thicker than the common discharge of vaginal leucorrhœa. These two conditions then being so very different, the treatment applicable to each must vary also; the course most frequently followed and recommended, is injections more or less astringent, and tonics, with steel, in case of the anæmic form; and, in the plethoric, saline aperients and a general course of alkalies, with certain of the milder vegetable tonics. These plans of treatment, however, have seemed to me far from satisfactory. I have seen cases under treatment, twelve, eighteen months, and even two years, and all this with but very little improvement. Injections of various substances have been steadily persevered in, but all to no purpose; and, in my opinion, they are more likely to prove injurious than otherwise, for this reason—in the most recent cases, the quieter the parts are kept the better; while, in the more chronic, the condition is so much dependant on a general derangement that local applications can be but of little service; and, furthermore, in neither case, in my opinion, does the injection ever reach the part to which it is intended to apply it. The orifice of the uterus is so small, and it is so constantly plugged with the thick soapy secretion, that no passage can be effected, unless the speculum is used, and the mouth of the syringe actually

inserted into that of the uterus. The inconvenience which such an operation would occasion—for it can only be done by a medical man, or some one well skilled in such a practice—together with the mischief which such constant use of the speculum is likely to produce, are objections which in my mind are insuperable. I have therefore of late strenuously avoided the use of injections in all cases where I have been positive the discharge came from the uterus and not the vagina. I have, however, felt equally the inefficiency of general treatment, without some local; and accordingly, in a very chronic case of this disorder which came under my notice about three months ago, and which had previously been under treatment of various kinds for eighteen months, I ordered a blister to be applied over the sacrum, and simple effervescing medicine, as there was then some little nausea and vomiting. The effect of this was, that the discharge greatly abated so long as the discharge from the blister remained; but this healing, the leucorrhœa again returned. I therefore ordered a second blister, and kept it open with savine ointment. This was continued for three or four weeks; and dilute nitric acid, 20 minims, twice a day given. By the end of the month, all discharge ceased; she subsequently menstruated quite healthily, and has not, so far as I know, had any return of the disease. Since that time I have had two other similar cases, and in both the same results ensued. I am now treating a case of chronic leucorrhœa, of four years' standing, complicated with slight ulceration of the cervix. This patient has had a blister on for about four or five days, and this morning she informed me that the discharge has been less since it was applied than had been before for years. I think, therefore, I can recommend this plan to you as one well worthy your consideration. In my mind it is decidedly preferable to the use of injections;

and I would always advise the use of astringent tonics and mild alteratives at the same time. Of the former, the mineral acids are those I prefer;—they give great tone to all the mucous and muscular structures, and are therefore specially applicable in this affection. When the case is attended with some little anæmia, steel must be administered; and of all the preparations, the sulphate, in conjunction with sulphuric acid, is, I think, the best.

ON SOME POINTS CONNECTED WITH THE MORBID ANATOMY OF THE HEART, ESPECIALLY THE FORMATION OF BELLOWS SOUNDS.

By Geo. W. Lawrence.

I have lately been very much struck by the fact, that amongst the number of patients admitted into the Hospital, there should be so many of them who, upon examination, present some morbid sound about the heart, or at least some sound alien to those which we usually hear in health, on listening with a stethoscope to the working of that organ. During the four months that I have been resident in the Hospital 170 patients have been admitted into the medical wards, and amongst these this phenomenon has been found present in no less than 32 cases; and in each in a well-marked degree, doubtful cases being omitted. Thus, supposing this to be a fair average, that of all the various diseased conditions, whatever their nature, which come especially under the care of a hospital physician, more than eighteen per cent. of such cases should present this condition as a point in their symptomatology, it will be evident how very important it must be; and furthermore, when we consider that this sign, in a great majority of cases, is indicative of an incurable structural change, which must sooner or later end in death, the evidence of its importance will become still further enhanced.

In support of the last statement I must mention that

amongst the cases of which I have spoken, seven have already died, and that of the remainder several are still under treatment, and that there is little hope of the ultimate recovery of a great proportion of these.

There are many diseases which are better studied by their symptoms and general clinical history than by their morbid anatomy, an observation which has been made by many authors; but I consider the reverse to obtain in the case of structual diseases of the heart; that is, that they are better studied by their morbid anatomy, and for the reason that the symptoms which they give rise to are not definite for any particular lesion, and further, that different injuries may give rise to exactly the same train of phenomena. It is for these reasons that I have chosen the morbid anatomy of the heart as the subject of my paper; and as it is too extensive to treat of fully, I shall almost entirely confine myself to an account of the causes which give rise to what are ordinarily named murmurs and bellows sounds, and to their modifications.

In the normal condition of the circulation, the passage of the blood through the heart is accompanied by no appreciable sound; the quantity of blood circulating being perfectly adapted to the capacity of the heart's chambers and orifices; but let this correlation be in any way altered, and a bellows sound is the result. The cause of bruits when they exist may reside in the blood, by alteration either of its quantity or quality, or in the heart itself; but, whichever it may be, the sound is caused by the circulating blood, and thus it will be seen, that all true bellows sounds are of endocardial formation.

I shall now proceed to notice more particularly the semeiography of these sounds, and for the sake of convenience shall divide the subject into six parts, and,—

I. *Of the causes which give rise to Bellows Sounds, and the manner in which they are formed.*

These sounds may originate from a great variety of causes. As I said before, any circumstance which alters the relation between the contained blood and the machine which moves it, may give rise to it. Thus there are bruits from spanæmia or poverty of blood. They may be caused by great losses of blood, diminishing its quantity; or from alteration in its quality, in the condition usually termed anæmia, and the same thing occurs in some blood diseases. These bruits may be termed evanescent, as the cause is generally remediable, and then they cease. But by far the most common cause of bellows sounds is some inflammatory affection of the endocardium, leading to roughening of the inner surface of the heart, or to thickening or insufficiency of its valves, and the valves are by far the most obnoxious to this change, so much so, that when we hear a bruit which depends upon this cause, we always assume that the valves are affected. This affection of the valves may give rise to bruits in two ways; it may consist of mere roughening of the valves, and then the sound is due to the friction of the blood against them; or it may be so severe as to render the valves imperfect, and then the sound is due to regurgitation through them. Certain valves are more subject to morbid changes than others, and these are the valves of the left side of the heart, at the mitral and aortic orifices. Why these valves should be more prone to become diseased than those on the opposite side, has never yet been satisfactorily explained. Some contend that it depends upon the structure of the left side of the heart being more fibrous; but this cannot be the true explanation, as there is in reality very little difference in the structure of the

valves of the two sides; or, at least a difference certainly insufficient to explain the great rarity of valvular disease on the right side, which indeed is so rare, that there is not one preparation in the Museum of the College of Surgeons shewing it. The true cause of this difference is, I believe, to be found in the oxygenised condition of the blood which circulates through the left side of the heart. We all know how frequently a surface inflammation may be cut short by defending it from the air; as by covering a part affected by erysipelas with collodion; thus shewing that oxygen plays an important part in the changes which inflammation induces. Dr. Johnson has told me of a very interesting circumstance connected with this, mentioned by Laennec, which is, that in certain cases of malformation in which the two sides of the heart communicate, the valves of the right side have been found as frequently diseased as those of the left. This is almost certain evidence that the cause resides in the condition of the blood itself. Another fact which goes to prove the same thing is mentioned by Dr. Watson, namely, how very seldom the veins are inflamed in comparison with the arteries.

However, the valves of the right side do undoubtedly become diseased at times, especially the tricuspid valve; and when this does occur, those of the left side are almost invariably found still more diseased. I have never but once seen the tricuspid valve alone diseased, and that occurred in a man who died in the hospital from chronic gout and renal disease, in whose heart one segment of the tricuspid valve was found much thickened and opaque. As I said before, the valves most frequently affected are the mitral and aortic; commonly, the mitral in young persons,* and the aortic in those of ad-

* There appear many exceptions to this statement, but it is generally true; inasmuch as acute rheumatism, the most common cause of mitral disease, usually first occurs during childhood or youth.

vanced age; and such change is found to be associated in a remarkable degree with three diseases, namely—rheumatic fever, scarlet fever, and chorea. Of twenty-six cases of valvular disease out of the thirty-two cases of bellows sounds already mentioned, fourteen have resulted from rheumatism, three from chorea, three from scarlet fever, two from injury consequent on exertion, and four have been of unknown origin; seven have involved the aortic valves, fifteen the mitral valves, and in the remaining four cases both these valves have been affected. The extent to which these valves may become diseased is very remarkable: they may become so altered by thickening, and by deposits or excrescences upon them—these involving not only the valves, but the lining membrane also of the heart, and especially the chordæ tendineæ—that the original conformation of the valves shall not be recognizable, and yet life shall be maintained. In the manner already mentioned the valves may be rendered imperfect by disease, but the same result may be brought about by injury. A man was under Dr. Budd's care, in No. 5 Ward, in January last, named Franklin, who had in this way suffered in all probability some injury to the aortic valves, allowing of a slight refluence of blood through them. His history was, that he had been engaged mowing; and that, after making some unusual exertion, he was suddenly taken ill; and that since that time he had suffered from painful palpitating action of the heart and general malaise. No bruit was audible, unless he became in any way excited; when there was a very distinct diastolic one, of a loud pitch, heard directly over the seat of the aortic valves, and slightly to the left of them. The lesion here must have been slight, as he suffered but little from it when he was kept quiet; but there are other cases on record of the same nature, in which an entire valve has been in this manner rendered useless.

I have lately been told of another case, in which a man was thrown from his horse, and fell on the shoulder: there was afterwards an intense bellows sound so loud that it could be heard at the distance of a foot from the chest; and it is remarkable that for a long time he suffered little inconvenience from it.

The remaining causes of bellows sounds are—

1. Enlargement of the ventricles from dilatation, leading either to imperfection of the valvular apparatus at their orifices, or to an analogous condition—

2. Constriction of the openings into or out of the ventricles.

3. The pressure of a tumour upon the heart, leading to a constriction of its orifices.

4. Aneurisms.

5. Congenital malformations.

Bruits are not I believe very frequently the result of dilated ventricles, or otherwise, as the right ventricle is especially liable to this change, we should expect to find imperfection of the pulmonary orifice; but this is a very rare condition, (and the reason is that the valves being attached to a fibrous ring, the muscular structure is very likely to yield under a pressure which the fibrous tissue would resist); however, it does occasionally give rise to imperfection of, and regurgitation through, the tricuspid valve. Those from constriction of the orifices are more common, as this may be caused by several circumstances, but the most common cause is contraction, in consequence of earthy deposit, leading to what is called ossification; aneurism of the arch of the aorta, immediately above the valves is not an infrequent cause of imperfection of them, thus causing a regurgitant bellows sound. The bruit which is generated

in the aneurism itself is an arterial sound, and therefore not included in the subject of this paper. Congenital malformations which give rise to the condition termed cyanosis, are not commonly attended by a bellows sound; but Dr. Walshe mentions one in which the sound was present, and so loud that it might be heard with the ear held at some distance from the chest. He likewise states that when such a sound is present it is caused by constriction of the left pulmonary orifice, and the bruit is a pulmonary systolic one.

Thus, from the foregoing remarks, it follows that bellows sounds may be caused by these conditions:—

1. By changes in the blood, quantitative or qualitative.
2. By roughening of any of the surfaces of the heart with which the blood comes into contact in its course.
3. By regurgitation through the valves.
4. By contraction of the orifices leading as it were to a ripple in the current.
5. By the vibrations of the valves, especially of a torn or injured one causing a vibratile bellows sound.
6. In consequence of aneurisms or other tumours.
7. By communication of the chambers of the heart.

II. *Of the Sounds themselves.*

The words "bellows sound" is simply a convenient term, and is perhaps more correct than any other, as nearly all those morbid sounds resemble more or less the blowing of a pair of bellows, yet they vary considerably in *pitch*, and a very good description of this variation has been given by Dr. Hope in these words:—

"The pitch of bellows sounds varies, the lowest being perhaps represented by the whispered word who, the highest by double S; intermediate notes may be represented by

whispering the word awe by inspiration, and the letter R with various degrees of closeness of the isthmus of the throat." Besides the pitch of the note the *quality of tone* is variable; it is usually more or less of a hissing sound, and this is especially the case with systolic sounds, and in this case also, the natural systolic sound is not replaced by the morbid one; they exist together. Sometimes the sound resembles that made by sawing or rasping wood, but this is not very common; the ordinary rubbing sound of pericarditis is much better represented by comparison with this sound.

The diastolic aortic bellows sound generally replaces the second sound of the heart; the click is not heard, but that of the pulmonary valve sometimes is, especially in cases where the mitral valve likewise permits of regurgitation. It may be simply a blowing sound like the systolic sound, or it may more or less approximate to a musical note, resembling the cooing of a pigeon, the whining of a dog, or pinching a violoncello string. Of course all musical notes are formed by the blood passing over valves which are more or less tense, and throwing them into regular rythmical vibrations. The aortic systolic sound may have somewhat this character when some point of the aortic valve is maintained tense during the systole. A very good example of a musical bellows sound existed in a man under Dr. Budd's care, Wilson who died with cardiac dropsy about a fortnight ago, and I understand that a very marked example of it occurred under Dr. Todd last summer. A musical diastolic sound heard at the apex of the heart is not common. A faint note of this character was produced in the case of a girl under Dr. Todd's care some time ago, where the mitral valves seemed thrown into vibration at the commencement of their opening. This case will be mentioned more particularly presently.

The third variation of these sounds is as regards their *intensity*. This depends much upon circumstances, just as the intensity of the natural note depends upon certain conditions. Thus the sounds are more intense in women and children than in men—in those who are thin than in those who are corpulent. Their intensity may be so elevated that they can be heard at a distance from the chest, or it may be so diminished as to be almost inaudible. The intensity is much increased by nervous excitement of all kinds, and thus it has frequently happened to me in examining a patient when he comes in, not to detect a bellows sound, yet at the time of the physician's visit one will be heard very distinctly. As a rule, clearness and elevation of pitch depend on the thinness of the walls of the heart, the ready elasticity of the valves, and on the mobility of the blood, a dull or subdued sound on the opposite conditions. Also the pitch of the note will become singing and echoing if it be listened to over a cavity filled with air in the neighbourhood of the heart, as over a distended stomach, or over cavity in the lungs, with a condensed wall.

III. *Of the Points at which the Sounds may be heard on Auscultation.*

The morbid sounds of the heart, like the healthy ones, are of course heard best in the region of the heart; the sounds formed at the mitral valve, nearest the apex, and those by the aortic valve over the base. But this is not always the case; for in some examples of mitral regurgitation the second sound is loudest at the apex, and the same thing sometimes occurs in health, and it was from this circumstance that Skoda erroneously argued that the second sound being weak at the base and loud and clear at the apex, whilst there was no

diastolic impulse against the wall of the chest, the second sound must originate in part in the ventricular region. But the true reason of this is, that whilst the heart is a good conductor of sound, the lung is a very bad one, and the heart may be covered everywhere by lung except at the apex, which may approach the chest wall even during the diastole, and thus lead to the second sound being heard best over the apex. The boy Hunt, who was under Dr. Johnson's care not long ago with chorea, had a very loud systolic bellows sound at the apex, heard in a space very little larger than a crown piece, and the explanation of this must have been that the heart was elsewhere covered by lung. The theory of conduction applies very much to the heart's sounds; thus, in some cases of consolidation of the apex of either lung, the heart sounds may be heard better under the clavicle than over the base of the heart. It should be remembered also, that the heart itself is liable to be moved, and of course the sounds follow it, but this does not apply more to diseased than to healthy sounds. Again, the sounds of the heart may be transmitted to a distance, and the sounds especially follow the direction of the current of blood; thus in many aortic bruits, whilst the sound is transmitted freely along the course of the arteries, it can scarcely be heard at all in the region of the heart's apex. Dr. Watson mentions a case of musical bellows sound, in which it could be distinctly heard when the stethoscope was applied over the radial artery. Nervous excitement, even more than disease, causes the heart sounds to be heard at a distance. There is a boy now in No. 4 Ward under Dr. Budd, in whom there is a loud systolic bruit, coupled with the other signs of mitral regurgitation; and this bruit may be heard all over his chest when he is at all excited. I can hear it whenever I put the stethos-

cope between the neck and the line of the diaphragm. But opposed to these cases where the sounds are heard so extensively, there are others in which they may be rendered inaudible. I will read a case of this kind which interested me very much.

M. J. Walter, admitted Feb. 4, into No. 7 ward, under Dr. Todd. Her history is, that she was just recovering from an attack of acute rheumatism, when she was seized with severe pain in the region of the heart, with very great general distress. On admission, the pain had ceased; but there was excessive orthopnœa, so that she could only remain in the upright position. There was some dropsy of the legs. A rapid and very compressible pulse. On examining the chest, there was found great dullness over the præcordial region, extending nearly to the clavicle on the left side, and there was considerable bulging of the chest. The dullness extended to the back. The heart sounds were almost inaudible, but no bellows sound could be detected, nor was there any rubbing sound. Conceiving it to be a case of effusion into the pericardium, I blistered her very freely, both on the front and back of the chest; and she was ordered calomel in one grain doses, with squill, and $\frac{1}{4}$ grain of opium every four hours. The fluid became rapidly absorbed, and as it did so, a systolic bellows sound became audible, first at the apex, thence extending over the heart generally. After a few days there was fresh fluid poured out, and the bellows sound again ceased; but the same treatment being pursued as before, the bellows sound returned as the fluid subsided; and as it did so the intensity of the sound bore a very near relation to the quantity of fluid. She has now recovered from all the distressing symptoms, but there is permanent regurgitant disease of the mitral valve. The only way I can explain this is, by

supposing that when the pericardium contained fluid, this was so highly compressed that vibrations could not take place in it freely. Again, the sound may sometimes be heard best centrally over the heart. There is a little girl, named Adams, now in No. 7 Ward, who has a double systolic bruit. One of these sounds is mitral, the other anæmic, and very much conveyed along the arteries. On listening to the heart both sounds are heard at the centre, very intense, yet as one sound, the intensity being derived from the union of the two sounds.

IV. *The Relation of these Sounds to the Heart's Rythm.*

A bellows sound may be originated at any period of the hearts' action. It may be systolic or diastolic, and in either case it may precede, accompany, or follow, or even replace the natural sound. The sound may occupy part or the whole of either the systole or diastole, and just as the normal first or second sound may be prolonged by circumstances, so may a systolic or diastolic bruit. Thus, a bruit attending the first sound may encroach upon, and even altogether mask, the second sound, and this occurs also in part with a diastolic sound, but more rarely. I was told yesterday by Mr. Buzzard, of a case which he is attending, in which there is but one sound attending the hearts' action; the whole period of the rythm being occupied by it. The case is probably one of aneurism of the neck of the aorta, in which there is great deficiency of the aortic valves, and perhaps great roughening of them also, so as to give rise to a continual bellows sound, which is therefore both systolic and diastolic, but heard as one of the thirty-two cases which I have mentioned as having occurred lately in the hospital; twenty-two have been systolic, five diastolic, one præ-diastolic, one post-systolic, and

three in which both the systolic and diastolic sounds were affected.

The præ-diastolic sound was very interesting; it occurred in a woman in Dr. Todd's Ward, suffering from acute renal dropsy. The sound was of somewhat a musical character, limited to a very small space just above, and to the left, of the heart's apex, following close upon the systole, as though caused by one segment of the mitral valve being thrown into vibration at the moment of opening; the sound ceasing before the ventricle became completely filled. The case of post-systolic sound occurred in a girl with rheumatic fever, under Dr. Johnson. In this case there was a bellows sound attending the end of the systole, and prolonged beyond it.

V. *The Diagnosis of the Different Forms of Valvular Disease.*

This is not in general difficult, as it is simply between aortic disease and mitral, and therefore the situation at which the sounds are heard is generally conclusive. The chief point of interest, is to determine whether there be permanent damage to the valves, or whether the sound be due to some ephemeral condition. Mitral regurgitation we can seldom fail to recognise. The rule has been laid down by Skoda, and accepted by Dr. Todd, thus:—If in a case we hear a systolic bellows sound over the apex of the heart, if this sound be heard well at the back of the chest, if the second sound be very distinct over the region of the pulmonary valves, and if added to this there be a pulse with a feeble hammering beat, such a case is one of mitral regurgitation. Several such cases have been in the house; there are three at the present time; one under Dr. Budd, in No. 6, one in No. 5, and one under Dr. Todd in No. 7. Their names are Quinn, Utley and

Adams. But a bellows sound may exist at the apex of the heart, which is not due to mitral regurgitation from roughening of the valve. Rogers, who is in No. 4 Ward, under Dr. Todd, is a good example of this condition. I will read you the account in the case-book of the sounds as described by Dr. Todd. "There is a systolic bellows sound not masking the first sound of the heart, heard most distinctly over the left edge of the sternum, on a level with the nipple. It is also heard at the back of the chest, at the lower angle of the left scapula. It is heard over the aorta at the upper part of the chest, and is propagated as far as the arteries at the root of the neck; in this situation there is a slight venous murmur, independently of the arterial bellows sound. By placing the fingers over the vessels at the right side of the root of the neck, a thrill is communicated to them. The pulse at the wrist is small, but fuller than would warrant the idea of mitral regurgitation; and the second sound of the heart is feeble." This case presents several interesting points in connection with what has been said already. Dr. Todd considers that in this case there is roughening of the inner segment of the mitral valve. If the sound be found over the base of the heart, a diastolic murmur will indicate a more serious condition than a systolic one, as that can scarcely exist except in consequence of regurgitation through the aortic valve. The character of the pulse will further aid the diagnosis. The chief diagnostic mark of insufficiency of the tricuspid valve, is a regurgitant venous pulse in the large vessels of the neck. If on pressing the veins there with the finger the vein does not completely empty itself below the point of pressure, and especially if movements of a rythmical character be observed in it, there is probably deficiency of the tricuspid valve. These cases are seldom known by the

character of the bellows sound heard, and existing alone they are very rare. Such a case was in the hospital during last summer. A distinct bellows sound was heard along the right edge of the sternum and at no other point. There was well-marked venous regurgitation. The subject of it may be still living. So, also disease of the pulmonary valves is rare. I have only heard of one case of deficiency of them, and that was narrated in the *Medical Gazette* some few weeks ago.

Another diagnostic mark of valvular disease, is a thrill communicated to the fingers when laid upon the chest. This occurs also in pericarditis; but it is more extended over the heart's region in that case. It is more often associated with mitral disease than with any other. In the case of the little boy, Nixon, who died recently, and whose heart is here, this thrill was very manifest, and attention was constantly directed to it by Dr. Budd. When present it always accompanies the systole, and is generally felt at the apex; this thrill may likewise, in some cases, occur without valvular disease owing to some change, either in the quality of the blood, or in the relations of the cavities to the discharging orifices causing a rippling current.

In the diagnosis of valvular disease, the position of the patient during the examination is always of importance; thus, a bellows sound may be heard in one position which is not in another. Dr. Elliotson gives these differences as the result of his experience.

1. Those sounds which are synchronous with the pulse, are heard much louder when the patient is in the recumbent posture.

2. Those which are auricular are, if anything, louder in the erect position.

3. Anæmic murmurs, as a rule, are only heard whilst the patient is upright.*

VI. *An Account of Cases in which Imitation Bellows Sounds exist, and others in which no Bellows Sound is heard, although their Morbid Anatomy would have led us to suppose that they would be.*

There are several conditions which give rise to sounds more or less resembling bellows sounds. Thus the first sound of the heart may be murmur-like from several causes. It may be so simply from weakness of the muscular structure, when, as it sometimes is, it is accompanied by a slow and as it were vermicular contraction. The contraction of the heart is usually quicker than that of other muscles, and this I believe is one reason of the greater sharpness of the first sound of the heart than of that which accompanies the contraction of other muscles; with them it is a mere sustained sound. Thus, on listening to the contraction of our masseter muscles, when the side of the face is pressed against some conducting surface, we shall notice that its sound is very similar to some bellows sounds. I once saw a case in which the patient had a very large and weak heart, which was beating only 40 times in the minute, in which the first sound very much resembled an ordinary murmur, and in which it was only after listening to the heart very attentively and when its beat became quicker, that it could be decided that there was not an actual bellows sound present. Again, the first sound may have this character when there is slight roughening of the pericardium, not sufficient to give rise to a to and fro sound, especially when it is upon or opposite to

* *Medical Gazette*, vol. xxxiii., p. 334.

the apex of the heart, so that a slight friction occurs at that point during the impulse. The next most likely part of the pericardium for this to occur is near the base of the heart. A short time since, a girl named Morrissey was admitted into the Hospital under Dr. Todd's care, with rheumatic fever, in whom there was a slight pericardial rubbing sound over the base of the heart, accompanying only the systole, which very much resembled a bellows sound. This case was further complicated by there being really a bellows sound in the same situation. Several leeches were applied; and on the next day the pericardial sound had disappeared, and with it a certain amount of pain and uneasiness which she had before felt in the part. A slight bellows sound still remained, which was probably anæmic, as it entirely disappeared as she recovered. Some time ago, I saw a girl suffering from pneumonia of the left lung, in whom there appeared to be a slight systolic murmur heard over a very limited spot to the left of the apex of the heart, and which was, I believe, caused by a slight roughening of the pleura at that part, so that the tilting forwards of the heart during the systole caused a slight sound to be heard, which was really a rubbing sound. It did not at all mask the heart's true sound, which was distinctly heard to the right of the heart's apex.

Amongst the other causes of an apparent bruit accompanying the first sound of the heart may be mentioned the coincidence of the respiratory sound with the heart's beat, and although this is by no means common, yet, when it does occur, the resemblance is very striking. Also, the heart's impulse sometimes causes movements of air in the adjoining lung, which may resemble in sound a morbid one in the heart itself. Again, a re-duplicate sound may give rise to an apparent bellows sound, either systolic or diastolic: but

the resemblance is seldom very difficult. It is most so at the apex, when it occurs with the systole. The re-duplication sound is said by many writers to be most common at the base of the heart; but I have never seen this condition. Of course all re-duplicate sounds depend upon a want of synchronism on the action of the two sides of the heart, and although I have frequently heard a re-duplicate sound accompanying the systole of the heart—and a very well marked example of it occurred in a patient of Dr. Johnson's, named Burns, about six weeks ago, yet I have never yet been able to hear the click of the pulmonary valves distinct from those of the aorta. Nevertheless such cases do without doubt occasionally occur, and should the interval between them be very short, so that the two sounds resembled rather one prolonged one, it might be mistaken for a sound caused by some imperfection of the aortic valves, and it would be one more example of a diastolic bellows sound heard at the base, denoting some other condition than aortic regurgitation. To recur to the subject of a re-duplicate sound heard during the systole at the apex of the heart, I may mention that in the cases I have seen where this phenomenon has been present, it has almost invariably been in connexion with rheumatic fever—a disease in which bellows sounds are so commonly met with that it is very likely to be mistaken for one. When I was Dr. Budd's clinical clerk I made a note in such a case of a bellows sound, but after he had examined it he explained to me what was the real nature of the sound, and I have since been able to detect the difference.

Passing to those cases in which, from a prima facie examination of their morbid anatomy, we should consider a bellows sound would be present, yet in which there has been none heard during life, we come to a subject which has been well

illustrated at the hospital during the last six months. Two very interesting cases of this kind, to which I need only allude, have already been read at one of our clinical meetings by Dr. Johnson. In both of these cases there was great thickening of the mitral valves, and contraction of the mitral orifice; and, in one of them, of the tricuspid valves also; yet in neither was any bruit detected during life. The first of these two cases I did not see, but I find this note in the history of it in the case book:—"The pitch of the two sounds of the heart is alike, and that which is best heard at the apex is double;" which is interesting in relation to some of the preceding remarks.

Some slight roughening of the valves, especially of the aortic valves, is not unfrequently met with, especially in aged persons in whom no bruit existed during life. A man named Beach lately died in the hospital with asthenic gout and renal disease, whose heart exhibited considerable thickening of, and deposit upon, one segment of the tricuspid valve, which had not been before suspected. All the other valves were healthy.

On examining the heart of a patient of Dr. Johnson's, named Noble, who died with chronic kidney disease about two months ago, we found two of the semilunar valves of the aorta united together at the part where they came into apposition, and at the point of junction a considerable deposit of earthy material.

The union in this case was most probably congenital; and such cases, I find, are not so very uncommon. There are a great many preparations in the Museum of the College of Surgeons, showing this condition of congenital union of the aortic valves. I have here very excellent delineations of three of these preparations, which I owe to Mr. Siccama's kindness. In the case of Noble, there was no bellows sound; although

there must evidently have been in some of the other cases. In connexion with this part of the subject, I will give you a brief detail of a case of unusual interest, which ended fatally not long ago.

Eliza Porter, aged thirteen, admitted into the hospital Jan. 12th, 1857, under the care of Dr. Todd, with great febrile excitement, constant noisy delirium, and sleeplessness. There was a diffused redness of the skin of the left thigh, great pain, and tenderness on pressure. She had never had any distinct attack of rheumatism. The only points of consequence elicited in the history are—that this attack came on after her being, on two consecutive days, thoroughly wetted through by being out in the rain. The disease, which began with the ordinary symptoms of febrile disturbance—marked rigors being one of them—ran a very rapid course; so that, although her illness did not commence until the Saturday, yet, by the time of her admission on the Monday, she had become constantly delirious. She lived until the following Monday, and with very little variation in the general symptoms, except in the frequency of the pulse, which, from being 140 in the minute at her admission, and subsequently as high as 160, fell, the day before her death, as low as 40; falling 10 beats in one hour. And this circumstance, combined with the fact of her being comatose for several hours before death, led me to suspect some arachnoid affection: such, however, the post-mortem examination showed not to have been the case. During life, no morbid sound whatever was heard in connexion with the heart's beats; its action was tumultuous, but its sounds clear—yet the pericardium was found to be everywhere adherent, and, although this was probably the immediate cause of her death, it gave rise to no sound during life by which it could be detected with the stethoscope. A col-

lection of matter was found deep seated among the muscles of the thigh.

Long as I have dwelt on this subject, I feel, however, that at best my story is still very imperfectly told. If I have told you nothing very new, I hope I have told you nothing very wrong. I have endeavoured as much as possible to make this paper clinical, as I consider one fact worth any number of theories. If I have not gone sufficiently into detail, this fault can be remedied by the discussion; and I shall now, therefore, with pleasure, take the position of a learner from you.

CLINICAL RECORDS.

I.

EXTENSIVE DISEASE OF THE MITRAL VALVE AND NARROWING OF THE ORIFICE, ASSOCIATED WITH REDUPLICATION OF THE FIRST SOUND, BUT WITHOUT A BELLOWS MURMUR —ALBUMINOUS URINE—GENERAL DROPSY —ENGORGEMENT OF THE LUNGS, AND EFFUSION INTO THE RIGHT PLEURA.

By George Johnson, M.D.

The following history of the case, taken by Mr. Price, is condensed from my case book:—

W. B., aged 34, was admitted into No. 4 Ward, October 22nd, 1856. He is a glove-cutter, a native of Somerset, but during the last four or five years has resided at Battersea. Habits, temperate; during the last three months he has lived badly, having had animal food only once a week. He states that he never had any serious illness until about six weeks ago, when he began to suffer from cough and shortness of breath; at the same time the feet and legs began to swell, and the urine was scanty and high-coloured. On admission he was very pale, with an anxious expression in his face; P. 96, feeble, R. 44, general dropsy to a considerable degree. Dullness on percussion over the lower half of the right side of the chest, diminished vocal vibration and absence of breath sounds over the same space. Large crepitation above on the right side, and over the lower part of the left lung.

The hearts' action regular, the impulse heaving, a distinct reduplication of the first sound at the apex; but no bellows sound is audible.

The liver extends some distance below the ribs. There is pain and tenderness in the umbilical region, and fluctuation is felt over the abdomen. The legs and thighs are very œdematous.

Urine high coloured, scanty, very albuminous, and contains small intra-cellular tube casts. He became rapidly worse; the dyspnæa increased, the pulse became so feeble that it could not be counted. On the 26th and 27th he expectorated a considerable quantity of florid blood. He died on the 28th.

Inspection 26 *hours after death. Recorded by Mr. Tonge.*

Thorax.—The right pleura contained a large quantity of clear serum. There were old adhesions on the left side.

The lungs were very œdematous, and in the lower lobe of the right there was a patch of pulmonary apoplexy.

The heart was enlarged and weighed 20½ oz. The mitral valve was much thickened, of a yellow colour, and partly ossified; its orifice was so much narrowed as to admit only the point of one finger. The left ventricle was small and filled with clots. The aortic valves were healthy. The right ventricle was dilated, and its walls so much hypertrophied as to equal in thickness those of the left. The tricuspid valve was slightly thickened and opaque. The pulmonary valves were healthy.

Abdomen.—A large quantity of serous liquid in the cavity of the peritoneum.

The liver, in a state of hepatic venous congestion, weighed 2 lbs. 15 oz.

Kidneys large, firm, congested; surface lobed; their combined weight 12 oz.

CASE II.—EXTENSIVE DISEASE OF THE MITRAL VALVE AND NARROWING OF THE ORIFICE; NO BELLOWS MURMUR OR OTHER ABNORMAL SOUND HAVING BEEN AUDIBLE WHILE THE PATIENT WAS UNDER OBSERVATION IN THE HOSPITAL.

The history of this case is condensed from Mr. Tonge's notes.

E. L., æt. 40, admitted into No. 7 Ward, under the care of Dr. Johnson, October 29th, 1856. She has been married nineteen years, has had ten living children, and several still-born. Has had two attacks of rheumatic fever—one before her marriage and one since. The present illness commenced six months ago, with swelling of the feet, which gradually increased and extended to the abdomen. She has had cough, with expectoration, and about a month since she spat blood.

On admission she was weak, anæmic, and emaciated. There was marked anasarca, and there were signs of liquid in the abdomen.

P. 100, very feeble—R. 40. She complained of palpitation. There was a doubtful pulsation in the veins of the neck, and she had a cough with expectoration, of a reddish, puriform mucus.

Physical Signs.—Dullness on percussion over the lower part of the right lung: elsewhere percussion, normal. A rather fine crepitation heard over the dull portion of the right lung, elsewhere on both sides, large crepitation and rhonchus.

The apex of the heart in the normal situation; impulse strong; sounds feeble; no bellows sound audible.

Urine scanty; turbid with lithates; not coagulable.

She died on the 2nd November.

Inspection, twenty-eight hours after death.

Thorax.—Some old adhesions of the left pleura. The lower lobe of the right lung was so much engorged as to sink in water.

Weight of the right lung, 1 lb. 8 oz.; of left, 1 lb. 1 oz. The heart was small, soft, and flabby; its weight being 9 oz. and 8 drachms. A white patch about an inch square on the anterior surface. The mitral valve was much thickened, yellow and opaque, its orifice being narrowed, so as to admit only the point of one finger. The cavities all contained clots, and in the left auricle there was a firm old coagulum, closely adherent to the surface of the auricle; this completely fitted the auricular appendix, and extended into the general cavity of the auricle.

Abdomen.—A large quantity of straw coloured liquid in the peritoneum.

The kidneys were small; the right weighed 4 oz., the left 4 oz. 2 dr. Part of the surface of each was irregularly atrophied and puckered; and there were a few small cysts in each.

On microscopical examination the kidneys presented the usual appearances observable in cases of chronic desquamative disease, and besides some tubes were filled with irregularly shaped highly refracting bodies, soluble without effervescence in dilute acids, probably some form of earthy matter.

Remarks.—The most remarkable and interesting feature in this and the previous case is the great degree of mitral disease, unaccompanied by an abnormal murmur; both cases having occurred in the hospital within a few days of each other. Dr. Stokes * has published two cases somewhat

* The Diseases of the Heart and Aorta, p. 141, *et seq.*

similar in this respect; and Mr. O'Ferrall* had previously published a series of cases illustrative of the disappearance of abnormal murmur during the progress of disease of the mitral valve.

It seems probable that in cases of mitral disease, several circumstances may contribute to lessen or cause the entire cessation of a bellows murmur. 1st. A very rapid and feeble action of the heart. 2nd. A smooth, rigid, and especially a bony condition of the orifice. And, 3rd. Extreme narrowing of the orifice. It is manifest that absence of an abnormal murmur at the apex of the heart does not invariably indicate soundness of the mitral valve.

II.

CASE OF INTUS-SUSCEPTION OF THE BOWELS.

By. F. E. Anstie.

The patient was a child aged 6½ months, who up to the time of this illness had been perfectly healthy. It was first seen on Dec. 13th; at that time it was suffering from frequent vomiting, which had commenced *two days before*, and had continued without intermission. The bowels had not been moved for three days, or one day longer than the vomiting had existed. The countenance was pale, the skin cool and moist, and there was no apparent thirst or fever. The abdomen was rather tympanitic, but not at all tender. Milk or any other food was rejected from the stomach as soon as it was swallowed. The treatment first adopted was that of

* Dublin Journal of Medical Science. Vol. xxiii., 1843.

successive small doses of calomel and sulphate of magnesia. But after these medicines had been administered for some hours, and had been found totally useless, they were abandoned; and the diagnosis of mechanical obstruction seemed almost certain. The countenance now (Dec. 14th) assumed a most anxious and haggard expression, the child cried almost incessantly, and the vomiting continued as before. An injection of warm water was cautiously thrown up into the rectum, but it had not the least effect, and quickly returned uncoloured by fæces. In consultation with Dr. G. Rees it was now resolved to employ opium, and the tincture was administered in doses of $\frac{1}{4}$ of a minim, allowed to fall on powdered sugar, and so evaporate. One such powder was given every two or three hours, according as the vomiting or pain seemed to require it. On the 17th, or three days from the commencement of the opium treatment, the pain and vomiting entirely ceased, the countenance became placid, and the child *passed two good healthy motions.*

All went well until the 25th, when there was a slight return of pain. The motions this day were scanty and watery, and in one of them there was, according to the servant's statement, a piece of membranous looking stuff, two or three inches long. Unfortunately I did not see this, as it was thrown away; but from the description, and from the examination of smaller fragments which subsequently came away, I thought that sloughing of the invaginated part of the bowel had taken place. After this time the motions were never satisfactory, being always more scanty than proper, and the child began to waste rapidly. On the 27th, therefore, cod liver oil was ordered, and this was continued for about a fortnight. No improvement, however, took place; and on January 15th, constipation again became complete,

and the vomiting returned with great severity. From first to last the vomit never contained stercoraceous matter, properly so called. The opium treatment was resumed, but with no other beneficial effect than that of partly quieting the pain, and on the 22nd of January, one week from the return of the vomiting, the child died.

Post-mortem examination 18 *hours after death.*—The body was greatly emaciated. Abdomen very much distended, and highly tympanitic; on opening it the general mass of the intestines were seen to be highly distended with gas, and to have assumed strange and unnatural positions. The rectum was perfectly empty, pale, and contracted to the size of a large goose quill. The *transverse colon* was completely invaginated in the *descending colon.* On slitting the latter the included portion of bowel was found to have been very tightly girded *above,* lower down it was distended, and highly inflamed; and the extreme end was the seat of a small slough, from which, no doubt, the pieces of membrane which I examined had come.

There are some remarkable features in this case. The first is the unusual site of the invagination; viz., altogether in the large intestine. Intus-susception in nine cases out of ten occurs either in the small intestine or at the iliocœcal valve. The second point is the temporary success of the opium. From the total cessation of all bad symptoms for so considerable a time, it is probable that the invagination was at one time partly if not wholly relieved. Perhaps if the opium had been continued even longer, there might have been no recurrence of the mischief. Another point of interest in this case is the total absence of bloody stools, which almost always occur at some time in the course of a case of intus-susception.

III.

CASE OF CONGENITAL MALFORMATION OF THE LARGE INTESTINES.

Reported by F. Porter Smith, M.B.

Sarah Ann Garratt, born at nine A.M. in the morning of April 22nd, 1856. Small and feeble—it appeared "all right" at the time. On making a visit next morning, I was informed that the infant had passed neither fæces nor urine. The genitals and anus seemed to be perfect. On repeating my visit in the evening, I found things in much the same state, except that the dose of castor oil, which had been directed to be administered, had been returned by vomiting, which had supervened.

24th. The symptoms becoming aggravated, and several doses of castor oil having been returned, as well as all food that had been given, it was determined to sound the rectum. It was found possible to pass a bougie to the extent of half an inch only, when resistance was felt. No feeling of fluctuation was perceptible.

25th. A little urine passed to-day for the first time. The abdomen is very full and tense—great pain and prostration.

26th (fourth day of infant's life). As matters were getting worse, it was determined to adopt some operative procedure, with the parent's consent now first obtained. Accordingly, an attempt was made to extend the canal in its wonted direction. A bistoury was cautiously passed, under cover of a bougie, and pushed carefully on in the direction of the curve of the sacrum. The bougie could now be passed to the extent of two inches, and its point seemed to press against a tense obscurely-fluctuating substance. The bistoury was

therefore re-introduced and pressed cautiously onward. No meconium, however, came away. It was deemed that to carry the knife further would be unadvisable and dangerous. Passed a few drops of water.

27th (fifth day of life). The infant died at eight o'clock A.M., vomiting at last genuine meconium.

28th. *Autopsy.*—Child perfectly mature, but very much emaciated. On opening the distended abdomen, the first thing presenting itself was a large stomach-like looking body, occupying all the lower and front part of the cavity. On tracing it out, this was found to be the sigmoid flexure of the colon, which ended abruptly in a blind termination, just at the brim of the true pelvis, where the rectum should have commenced. On passing along the intestine, the whole of the colon and cœcum down to the ilio-colic valve was found greatly distended and congested. No products of inflammation had been poured out on the peritoneal surface, nor was there any fæcal extravasation. There was no fibrous cord detected, marking out the line of the absent rectum. There was no malformation of any other viscus of the body. The *bladder was intact* and *moderately distended* with urine.

Remarks.—I have been induced to record this case mainly from the rarity of the affection. Dr. Collins, of Dublin, met with it but once amongst 16,654 children. No remarks are necessary as regards the symptoms. It will be seen that any fears as regards the safety of the bladder, on these occasions, are unnecessary, as it is rarely injured in such operations as a careful operator would practise for the relief of such an affection. Neither does there seem to be any danger of serious hæmorrhage, which was almost entirely absent in this case. The use of the knife seems preferable to the trocar, which latter instrument would perhaps be suggested to the mind of

the operator. One point suggested itself in this case—namely, that if the intestine had been reached, its contents, spissated as they were from the absorption of the fluid portion, would hardly have come away, unless the opening were of very considerable size. It is the smallness of the aperture made by the trocar that constitutes the chief objection to its use on this occasion. Judging from what was seen in this case, it would seem desirable, under more favorable circumstances, that, after the opening has been effected, an enema should be administered, rendering the meconium more soluble, and thereby facilitating its escape. "Amussat's operation" upon the descending colon was of course suggested to one's mind; but the delay caused by the refusal of the parents, at first, to allow any operation, set this aside. Indeed it is a question in my own mind how far it is desirable to extend life to these infant sufferers, burdened with so horrible and disgusting a condition as that of an artificial anus in the loin. It is also to be borne in mind that, as was evident in this case, the descending colon does not lie in such desirable contact with the posterior wall of the belly as in the normal condition. Thus, the main advantage of "Amussat's operation," namely, the *extra*-peritoneal section of the bowel, does not obtain in this class of intestinal obstructions, from the distance to which the bowel is borne away from the abdominal walls by the abnormally foremost colon.

IV.

OCCLUSION OF THE VAGINA.

COMMUNICATED BY R. S. BRIGHT.

ELIZABETH BEST, æt. 32, applied at King's College Hospital last August, for attendance in her second confinement, which she expected about the end of October. Her first child was born six years ago, at full time; she was then attended at first by a midwife, who administered ergot, and at the end of two or three days a surgeon was called in, who ascertained that the head had been in the vagina twelve hours or more, and that the bladder was greatly distended; he passed a catheter and drew off a large quantity of urine; soon afterwards the child was born, no instruments were used to facilitate delivery.

It should be stated, that the surgeon found both the midwife and the nurse intoxicated.

In September, 1855, she had a miscarriage at the third month, accompanied with hæmorrhage. At the end of last August, being then "seven months gone," thinking labour was approaching she sent for me; and on examination I found the vagina completely occluded by a firm and tense membrane, about an inch from the vulvæ; the pains were only irregular and spurious. Mr. Traer, P.A.A. saw her with me, and sent for Dr. Farre, who being unable to come, asked Dr. Frere to attend for him. He made a careful examination, and found the vagina slightly contracted below the obstructing membrane; this was of unequal thickness, the posterior being much thinner than the anterior part; so that although the whole was continuous, the finger passing over it, seemed to distinguish the above differences by a well defined curved

line with the convexity forwards, the deeper part being about one-fourth from the posterior wall of the vagina. In this portion of the membrane was a small cul-de-sac, into which the finger could be passed to the depth of the nail. No orifice could be discovered, even of such a size as to admit a probe. On questioning the husband, as to his knowledge of this state of his wife, he declared that he had had *complete* connection with her six weeks before (the middle of July). All symptoms of labour passing off, and nothing further of note occurring until 6, a.m. November 13, when, without any previous pain, and whilst she was asleep, the membranes ruptured, and the liquor amnii escaped in large quantity. I was again sent for, and on examination could discover no change in the occluding membrane since I last saw her, two months before. She had now reached the full term of gestation. The pains were rather few and far between. Dr. Frere saw her about 3, p. m., and succeeded in passing a probe, but nothing larger through the membrane; by pushing the cul-de-sac before it, the finger could be passed up behind the pubes, and the head was thus detected; this was felt with more ease per rectum. The labour progressed, and the head having come down sufficiently low to distend the cul-de-sac, Dr. Farre about 8, p.m., divided the thick anterior portion of the membrane by a small incision, with a carefully guarded bistoury, directed towards the left acetabulum; by pressure, and by scraping the sides of the wound with the finger nail, he succeeded in enlarging the aperture, and in making it parallel with the os uteri, which was now felt, and dilated to about the size of half a crown. The membrane felt about one-eighth of an inch thick in the centre, by placing a finger behind and a thumb in front of it.

The head now came lower down, and pressing down the

cul-de-sac, converted the thick anterior portion into a firm unyielding band; this was slightly incised with the guarded bistoury, but not yielding much to the pressure of the head, Dr. Frere was again sent for; about 3, a.m., of the 4th, he found the head much lower than when he last saw her, and descending; chloroform was now given, and he divided the thicker part again, and then began to dilate the aperture with the hand arranged conically; dilatation was thus kept up for an hour, when the obstruction and the healthy tissues had so yielded that the entire hand could be readily passed up to the os uteri, which was now fully dilated; after three-quarters of an hour more the pains, now strong and frequent, had forced down the head sufficiently low to allow of the short forceps being applied, by means of which the child was born at 5, a.m. The perinæum was thick and rigid, having some cicatrices on its inner surface, but no laceration took place; the placenta was rather adherent, and was with some difficulty removed, about half an hour afterwards. The labour was thus completed within twenty-four hours. The child was a male, and alive. For the first three days after labour she went on pretty well; the pulse varying from 80 to 100; the lochia were natural. The day after labour she was ordered hydrarg. chlorid. gr. ij., pulv. opii gr. $\frac{1}{4}$ ter die, and a mixture containing carbonate of ammonia, tincture of henbane, and spirit nitric ether, with camphor mixture. On the third day the gums became affected, and she had a severe attack of diarrhœa, which was checked by a starch and opium enema, and the pills were left off.

From the fourth to the sixth days, she was more feverish, the pulse ranged between 108 and 120, the tongue was furred; she took ℥ss. ol. ricini, and continued the ammonia and henbane. On the seventh day, the discharge became very copious

and sanguineous for a time and then ceased; for this she was ordered a mixture of acid. sulph. dil. and tinct. camph. co. in mixt. camph. to take occasionally; and the following every four hours: sp. ammon. arom. ʒss., spt. ether, chlor. m.x., and tinct. hyoscyam. m.xx., mixt. camph. ad ℥iss.; the pulse was 120, tongue cleaner, and there was headache. During the night she became worse; the pulse rose to 160; she had rigors, the tongue became red and dry, and the skin hot, and thirst was great. Some clots of decomposing blood were found in the vagina, and the vulvæ were hot and tender; discharge was offensive; there was some uterine tenderness; the vagina ordered to be periodically syringed out with tepid water, and she was ordered brandy, ℥ss. every half hour; and a pill containing ½ gr. opium every two hours, and the ammonia and ether mixture to be continued every three hours.

From the seventh to the tenth days, she rather improved; the pulse ranging from 120 to 136; the syringing gave great relief. Ol. ricini, ʒij. continue the brandy ℥ss. every hour; the pill every four hours, and the ammonia and ether mixture every three hours.

Between the tenth and fourteenth days she became worse, and was at times delirious; she slept little or not at all; the lochia and milk gradually ceased; the pulse at times intermitting, varied between 108 and 132; skin was warm and moist. On the tenth day the opium pill was omitted, and the brandy only given every hour and a-half: on the twelfth, quinine in gr. j. doses was ordered, with each dose of the ammonia and ether mixture. On the 14th day, the brandy was again ordered every hour; the quinine pill, with opium, ½ gr. every three hours, and the ether mixture.

During the fifteenth and sixteenth days, seemed a little better; pulse, still however firm, 120 to 132; brandy seems

to cause sickness, it was therefore left off for about twelve hours.

On the seventeenth day she came into the hospital, after strenuously refusing to do so for several days. On admission seems very hectic, countenance extremely anxious, lips, teeth, and tongue covered with sordes; skin, hot and perspiring; some enlargement of abdomen; no uterine tenderness; pulse, 140; breathing, 32. Ordered brandy, ʒss. every half hour, with this mixture: sp. ether chlor. m. xv., ammonia sesquicarb. gr. v., mist. acaciæ, ʒiss.; 4tis horis sumend. with quinæ. sulph. gr. ij. in pil.

On the eighteenth and nineteenth days was frequently delirious, sometimes violent, at others quiet, and singing; pulse about 130; brandy given with difficulty, as she refuses to take it. The left leg now became œdematous; the thigh became red, and the saphenous vein felt hard and cordlike; pressure caused pitting; there was pain in the course of the vein. Is at times sick; urine is scanty and high-coloured. Tinct. opii. m. 40 was given her, and though it made her quiet she did not sleep long.

On the twentieth and twenty-second days, she slept very badly; being still occasionally delirious; she seems weaker; abdomen very tympanitic; the leg is less swollen and painful; pulse varies from 128 to 136; no morbid lung or heart sounds. Complains of much pain in right arm and shoulder-joint; ordered tinct. armoracia ʒi., acid. nitro. mur. dil. m. xv., quinæ disulph. gr. ij., aquæ. ʒiss. 3tiis horis sumend.

Between twenty-third and twenty-seventh days, prostration much increased, pulse very small and compressible, can scarcely be counted; both legs are now œdematous; the sphincters are relaxing, and she exercises no control over them; she has made several attempts to strangle herself.

Between the twenty-eighth and thirty-first days she became weaker and weaker; the pulse was scarcely perceptible, and she gradually sank and died on December 3, thirty-one days after labour. No post-mortem examination was allowed.

V.

CASE OF FATAL HÆMORRHAGE FROM THE DUCTUS VENOSUS OCCURRING IN A CHILD TWENTY HOURS AFTER BIRTH.

By Alfred Meadows.

E. M. æt. 36, was delivered on Jan. 12th of a full-grown, healthy, male child, the labour being in every respect natural, and no peculiarity observable in the child for first twenty hours. About this time, however, the child began to cry without any evident cause, and the mother accordingly gave it the breast. She noticed that it bit her somewhat sharply, and was continually scratching her neck, and giving other evidences of uneasiness; this at length became so apparent that she directed the attention of a neighbour to it, who at once undressed it, and discovered that its scrotum was much swollen and œdematous. As yet, however, there was no discoloration. Warm fomentations were immediately applied and persevered in for two hours; but the swelling continued to increase, and it began to assume a dark bluish appearance; in the course of an hour it was brought to King's College Hospital. The scrotum at that time was distended to the size of a small orange, and of a deep black hue. There was also some discoloration over the region of the

bladder, and especially along the course of the right spermatic cord. The child seemed so extremely exhausted and the nature of the malady so uncertain that it was deemed advisable not to interfere, and a fatal result was anticipated. This was verified in the course of three hours,—the child having lived only twenty-six hours.

On post-mortem examination the following appearances were observed; on removing the skin over the lower half of the abdomen, a considerable quantity of dark venous blood was found effused in the cellular tissue, upon and between the two oblique muscles; this effusion became less and less in proceeding upwards, and was not at all observable beyond the level of the umbilicus, or extended further laterally than on a line with the inferior spinous process of the ilium; below, it increased considerably, so as to fill up the distended cellular tissue of the scrotum and the cavity of the tunica vaginalis. There was no trace of it deeper than the internal oblique; the transversalis abdominis having quite a healthy appearance; on opening the peritoneal cavity a good deal of blood flowed out, and on pressing the scrotum blood regurgitated along the course of the spermatic cords into the cavity of the belly; the surfaces of the psoas and iliacus muscles external to the peritoneum were also covered with blood; this, becoming less and less distinct, was lost at about the third or fourth lumbar vertebra; none was found about the region of either kidney, the cellular tissue in these situations being perfectly normal. In seeking for the source of all this hæmorrhage none could be discovered in any of the pelvic viscera, all of which were quite healthy. The umbilical and hypogastric arteries were obliterated, and all about the cord normal; but on examining the liver an enormous clot was found lying on its upper surface, between it and the peritoneum which had

been stripped off by the effused blood; the same thing was also seen on the under surface of the right lobe; these two clots were much thicker behind than before, and seemed to have originated from the ductus venosus; but how the blood got into the cavity of the peritoneum could not be positively ascertained.

On most careful inquiry into the history of the case, no cause for the accident could be discovered. It was certain that the child received no injury either at the time of its birth or at any subsequent period, nor did any symptom of mischief manifest itself for the first twenty hours of its life; the labour was neither speedy nor protracted, and the only point giving any clue at all was that the mother, a fortnight prior to her confinement, sustained a rather severe fall, from which she felt very sore for a few days, but afterwards this all passed off.

VI.

CASE OF PARTIAL PARALYSIS CAUSED BY A TUMOUR IN THE CEREBELLUM.

By F. E. Anstie.

The patient, a man of about 48 years of age, was a chandler by trade, and about four or five years ago became much addicted to drinking, which caused two or three attacks of delirium tremens. After the last attack, which had ensued directly on a drinking-bout, he abstained from stimulants altogether, and his health improved for a time. At length, however, he began to complain of severe pain in the left temple, which subsequently extended to the left mastoid

process. At this time he came under the care of my friend Mr. C. J. Tomkins, who noticed a slight but decided deviation of the tongue towards the *right* side. After being under treatment for some time, during which the palsy of the tongue had quite disappeared, he left his medical attendant for some time, and attended at the London Hospital for two months. In October, 1855, he again came under my friend's treatment, and he then complained of pain in the same part of the head as before, namely, the left side; but the tongue was now curved towards the *left*, there was dysphagia to such an extent, that fluids taken into the mouth ran out of the nostrils; he was very much troubled with giddiness, and could not sleep at night in consequence of the pain. He had also pain down the left arm, but this was not constant, like the pain in the head. The tongue was covered with a thick yellowish coating, the bowels were confined. In addition to the difficulty of swallowing above mentioned, there was complete insensibility of the fauces to any external impression. There was also deafness in the *left* ear, and soon after his again coming under treatment, he suddenly became deaf in both ears, and remained so for a fortnight. However, the use of the right ear was gradually regained. After a time he noticed that he staggered in his gait, feeling not so much a *weakness* of the limbs as a want of power to control their movements. (Throughout the case there was no *palsy* of the legs). Subsequently he got paralysis of the orbicularis palpebrarum of the left eye in such a manner that he could not close the eye, which became very much inflamed. The pain in the head now became very intense, sleep was entirely prevented, except when he took strong opiates. He got first constipation of the bowels, and then at a later period, involuntary stools and retention of urine. In

this state he lingered on a long time; there was throughout the case no *palsy*, except that of the facial muscles. Nor was there any rigidity or contraction of the limbs. From time to time he suffered from great dysphagia, which after lasting a short time, went off again. For a long time before his death, he suffered constant and agonising pain in the head, which nothing but opium would relieve at all. The deafness also greatly increased, and the tongue was permanently drawn to the left side to such an extent, that it could not be protruded beyond the teeth. The cornea of the left eye, from constant exposure, was sloughing, and apparently just about to burst when he died. I saw him frequently during the last month or two of his life, and his chief distress at this time was from involuntary stools and retention of urine. His intellect never appeared deranged, except that he occasionally had short periods of delirium, which may, however, have been owing to the opium he took. He died on the 20th of September, 1856, between two and three years after the commencement of the pain in the head.

Post-mortem examination.—The membranes around the cerebellum were very adherent to the bone, and to the cerebellum itself, especially about the posterior surface of the petrous portion of the left temporal bone, where there was a mass of effused lymph between the membranes, and between the dura mater and the bone, involving and strongly compressing the fifth and seventh nerves. The whole periphery of the cerebellum, but especially on the left side, was very much softened, apparently in an inflammatory manner. In the centre of the organ there was developed a large tumour, which could be readily separated clean from the surrounding nervous matter. It was about the size of a large walnut, and very firm; and in section it displayed a fibrous structure.

It had no structural connection with the membranes, but was free, in the centre of the cerebellum. The rest of the brain appeared quite healthy.

VII.

CASE OF PNEUMOTHORAX, RESULTING FROM TUBERCULAR DISEASE OF THE LUNG, AND COMPLICATED WITH PERICARDITIS.

By Morris Tonge.

J. B., æt. 20 years, was admitted into King's College Hospital on Sept. 28th, 1856, under Dr. Johnson. His history was briefly this.—He is a native of Devon, but for the last four years has lived in London. Is a baker by occupation, and has generally enjoyed good health. Four months before admission, he got a bad cough and began to lose flesh. Two months after this, he brought up a small quantity of blood, after a violent fit of coughing. A week previous to admission, while engaged in his business, he felt a sudden pain in his left side, and was seized with dyspnœa: these have continued ever since. There is no family history of phthisis. Present condition — Sept. 28. P. 120. R. 36. He has pains in the left side of the chest, increased on coughing or a deep inspiration, and also by pressure. Not much cough, expectoration, or dyspnœa. There was a little diarrhœa before admission, but it has now ceased.

Physical signs.—The left half of the chest was found to measure sixteen inches, the right side measured sixteen inches and a half. Less motion on the left side of the chest than on the right. On percussion, beneath the clavicles and over the

supra-spinous fossæ on both sides, and below the mamma on the right side, the resonance is natural. The front of the chest below the mamma, on the left side, is dull; the axilla, from the fourth to the eighth rib, and the back, from the sixth to the ninth on the same side, is tympanitic on percussion. There is much less vocal vibration on the left side than on the right. The respiratory murmur on the right side is puerile. There is very feeble and distant respiratory murmur at the upper part of the left side; and over the tympanitic space on that side, amphoric blowing, both expiratory and inspiratory, metallic resonance of the voice and cough, and metallic tinkling are to be heard. When the ear is applied to the left side and the patient shaken, splashing is heard. The apex of the heart beats below the ensiform cartilage, and its sounds are heard to the right of the sternum.

Ordered sp. æth. chlor. m. xv.; mist. acaciæ, ʒiss.; ter die. sumend; pil. ipecac. c̄. scillæ, gr. x. o. n. This was afterwards changed for liq. morph. hydrochlor. m. xv. o. n.

Oct. 2. Amphoric resonance over left side is more extensive.

Oct. 14. Dulness on percussion, and tubular breathing at the apex of the left lung.

Oct. 30. Increased dullness on percussion over the left side, and but little tympanitic resonance in the axilla. There is scarcely any amphoric blowing to be heard over the same side. Large crepitation and rhonchus at the base of the right lung. Pointing of the fluid between the ninth and tenth ribs; and inflammatory redness of surrounding skin.

Nov. 1. P. 220, R. 40. Dulness on percussion over the whole of the left side. No amphoric blowing to be heard. A puncture was made between the ninth and tenth ribs, and ʒxlviii. of pus were drawn off. The pulse fell to 136, and he was much relieved by the operation.

Nov. 8. The fluid has again collected. The puncture was opened, and ʒxxx. of pus were evacuated.

Nov. 20. Operation was repeated in the same situation, and ʒxxivss. of pus were drawn off. After this and the two preceding operations, the erysipelatous redness of the skin about the left side was much diminished. There is some tenderness on pressure over the liver.

Nov. 28. Loud to and fro sound heard over the heart. The apex beats about one inch to the left of the right nipple, and rather below it. There is no preternatural dulness over the præcordial region, and no pain on pressure. Ordered—Emp. canth. supra cor.

Nov. 29. The rubbing sound is much louder and harsher. There is considerable œdema of the whole left half of the chest, with redness and tenderness on pressure over the four intercostal spaces above the punctured one. Dulness on percussion over all the left side, except just at the upper part. Splashing heard on succussion. No amphoric blowing has been heard since Oct. 30.

Dec. 2. Died.

Every now and then, during the progress of the case, apthous spots would appear on the tongue. These were benefited by sol. of chlorate of potass. (gr. xv. ad aquæ ʒj). The pulse varied from 108 to 220. At the close of the disease it fell to 92. The respiration varied from 24 to 52. There was no diarrhœa, and no very great dyspnœa, except on one occasion. The intellect remained clear, and the patient appeared to suffer but little.

Post-mortem examination, forty-eight hours and a half after death :—The diaphragm on the left side was convex downwards, and the left pleura contained more than a gallon of pus. The pleura was also much thickened. By blowing

into the trachea, an opening into the pleura was found at the apex of the lung. The upper lobe of the left lung was adherent to the ribs at the apex, and to the mediastinum laterally; and was, consequently, only partially collapsed. It contained crude tubercle and a small cavity at its apex. The lower lobe was quite collapsed. In the upper lobe of the right lung were a few crude tubercles and a small cavity. The heart was pushed over to the right side of the sternum. The pericardium contained about ʒij. of serous fluid, and it was very generally adherent to the surface of the heart by recent lymph. There were a few recent adhesions of the diaphragm to the liver on the left side.

Dr. Johnson considers that the probable explanation of the cessation of the amphoric blowing, during the latter period of the case, is to be found in the increasing accumulation of pus and the pressure on the lung. As a consequence of these conditions, the air-containing space in the pleura, and the inspiratory force and sound, were simultaneously lessened.

VIII.

CASE OF CIRRHOSIS OF THE LIVER,—GREAT HŒMATEMESIS,—DEATH.

By G. W. Lawrence.

William Cross, aged 22 years.—Admitted into King's College Hospital, Nov. 8th, 1856, with the following history. He is a native of Ireland; but has lived in a situation in London during the last 11 years, as a shopman in the Lowther Arcade; working many hours a day. His health

has been good with the exception of occasional colds, until about two years ago, when he got an attack of jaundice, for which he was admitted into St. George's Hospital, and remaining there three months, left it, still in a very weak condition. Since that period he has been gradually losing flesh, his appetite has been failing, and his strength has become much reduced. He continued thus till the 29th of October, when as he was walking in the street he was seized with a very severe pain just below the ribs on the right side, followed by general coldness and faintness, and a sense of sickness. He passed a restless night, and on the following morning vomited suddenly about two quarts of black coagulated blood, which was followed by fainting. The next morning he again vomited about a pint of blood. This was succeeded by the pitch-like stools, indicative of their containing blood. His habits he states to have been temperate, but that he has occasionally drank gin; never more than a quartern in a day, and often not any for days together.

When he came into the Hospital he had a sallow cachectic look, with no very evident jaundice. His conjunctivæ were yellowish; the pupils dilated; the skin hot and dry; the lips red, and much contrasting with the yellow appearance of the face. There was marked ascites, and the liver could be felt enlarged, with a well defined edge extending to about four inches below the margin of the ribs. The superficial veins of the belly were somewhat enlarged. Pressure over the right hypochondrium gave him considerable pain. Bowels rather relaxed; the motions containing no blood. Urine of a yellow colour, not very deep, albuminous, and containing a few granular casts, and some renal epithelium. The pulse 100; the respirations 20 in a minute. I ordered him:

A milk diet, and 4 oz. of wine daily.

Citrate of iron, and carbonate of ammonia, in a mixture three times a day; and on account of his not being able to sleep, 5 grains of compound soap-pill every night. This treatment was continued, with the exception that the ammonia was omitted from the mixture on account of the tendency to sickness which he exhibited.

He continued in the same state without change, except that he became much purged, for which he was ordered at several times logwood, opium, gallic acid, and starch and opium enemata, but without more than temporary benefit. He died on the 22nd of November, 14 days after his admission, having remained all that time in a state of great anæmia and exhaustion.

A post-mortem examination was made 45 hours after death.

Lungs and *heart* healthy.

Liver much enlarged, weighing 4 lbs. 10½ oz., very firm and condensed; of a pale yellowish colour; slightly nodulated on the surface; its appearance everywhere alike. Its capsule shewing no thickening or adhesions. The edge sharp and well defined. There was a considerable quantity of fluid in the belly.

The *spleen* was much enlarged, weighing 1 lb. 6 oz. without adhesions. The *kidneys* rather large, pale and flabby. The *intestines* healthy throughout, except in the lower part of the ileum, which exhibited slight marks of recent inflammation. There was no ulceration of Peyer's patches.

The microscopic examination of the liver shewed that the lobules were not much altered in structure; the ducts contained epithelium of the usual character; there was no fatty matter in the cells, nor were they of a yellow colour, or

containing yellow material. The lobules were separated by a transparent granular substance, probably effused lymph.

On attempting to inject the liver it was found that the fluid would not run well, and a perfect injection could not be made on account of the impediment which the condensed tissue of the liver offered to the passage of the liquid, but in those places where the injection had penetrated, the appearance of them under the microscope went to prove that there was no great change in the structure of the lobules, except that they appeared generally compressed.

The chief points of interest in this case are:—

1. As shewing that so small an amount of spirit drinking may, as the exciting cause, give rise to cirrhosis of the liver; at how early an age it may prove fatal.

2. The great amount of hœmatemesis; vomiting of blood in cirrhosis being said by Dr. Budd to be, when it occurs, frequent and in small quantity.

3. The appearance of the liver itself: it being an example of the early stage of cirrhosis, before contraction of the effused lymph, and consequent degeneration of the liver structure occurs; the liver instead of being small and contracted being very large.

4. As a good example of a case of cirrhosis in which the inflammation not having extended to the capsule of the liver, the patient suffers but little pain referrible to that organ.

IX.

CASE OF PLURAL BIRTH AND MONSTROSITY.

By Alfred Meadows.

M. S., a middle-aged woman, had had several children, all born at full time, and perfectly natural. Her present labour began in the usual way; she was attended by a mid-wife, who, detecting something abnormal, sent for a medical man, when it was discovered that two heads were projecting through the external parts; strong uterine action continuing for a few minutes, the entire bodies of two fœtuses were soon separated from the mother. The placenta followed in the course of half an hour; no hæmorrhage ensued, and the case ultimately did well.

On examining the fœtuses, which presented from the first no signs of life, they were found to be two nearly perfectly formed children; but joined together from about the middle of the sternum down to the pubes, the union extending laterally to nearly the entire breadth of the abdomen, and thence all their limbs were perfect, as were the whole of the upper part of the bodies; one head, however, presented a prominent caput succedanum, which the other was deficient in; it was concluded, therefore, that one only originally presented. On making an incision vertically between them, so as to separate the two bodies, there were found to be two perfectly formed hearts, both enclosed in one pericardium; the lungs all separate and distinct; the liver single, extending through from one body to the other, but grooved between the two, as if originally consisting of two; there were four kidneys, two stomachs, one mesentery, two sets of intestine, which united together at the cæcum, and proceeded onwards to terminate in a common anus; the ureters and bladders were distinct

and perfect, as were also the generative organs. The pelvic bones were all perfect, the pubes being firmly united together in front by thick cartilage. Before separating the two bodies the respective penes were situated one on either side in the groove between them; and underneath the broad band uniting the two bodies appeared the common anus. About the middle of the bodies, where would be the usual site of the umbilicus, one cord only existed—this serving one common purpose.

The mother could give no reason whatever for this singular condition; she had received no fright or injury during pregnancy, and had no idea that any abnormality existed.

X.

CASE OF INJURY TO THE HEAD, FOLLOWED BY TRAUMATIC TETANUS AND DEATH.

By Ebenezer Toller.

The patient, W. T., æt. 30, a waggoner, and a strong man, while in a state of semi-intoxication, on the night of June 28th, 1856, in a quarrel received a severe blow over his forehead. He was taken home, and a surgeon saw him three hours after the accident. He was sensible, and had vomited once or twice. On examination, a lacerated wound was discovered, about $1\frac{3}{8}$ in. in length, extending over the left frontalsinus. The edges were in tolerable apposition. Coagula and some dirt about the wound. The parts were sponged, and strips of plaster applied. He was seen on the following day, and again July 1st. At these two visits he complained much of his head, and kept in bed, taking only broth and tea. The

bowels were obstinately costive. The eyelids appeared paralysed. On July 2nd, being four days after the receipt of injury, tetanus came on; beginning, first, in the jaws, which were perfectly locked. The mouth was drawn on one side. There was twitching of the muscles of the face, commencing on the same side as that of the wound; great pain in the left side of the face, and in the epigastrium; extremities cold; skin moist. The wound had nearly healed by first intention. Twenty-four hours after the onset of attack, the jaws became somewhat apart, but the general symptoms of the malady were increasing. He would sit up in the bed, about every five or ten minutes, uttering shrieks. The muscles of the neck getting very rigid; the sterno mastoid feeling almost as hard as wood. Could with difficulty now swallow liquids. Kept his finger between the lips, to aid the voiding of saliva. The levator ani muscle was drawn up in such a manner that a large cup-like depression, that would admit an orange, was seen. His speech, the last few hours of his life, became affected, but he continued sensible all the time. He could pass his water. The bowels could not be made to act till just before his death, which took place July 4th, about sixty hours after the tetanus set in, and a week after the accident.

The treatment consisted in giving 50 minims of tinct. opii every three hours; and strong enemeta of turpentine and castor oil. He also took two or three doses of chloroform. A poultice applied to the wound.

A post-mortem examination made two days after death, showed the following appearances:

Muscles rigid—of a dark ecchymosed appearance about the ribs, back of arms, and throat. Fingers flexed; feet arched inwards. On cutting open the wound externally, the outer table of the left frontal sinus was found fractured; and

a piece of brick, the size of a small nut, completely embedded in the sinus. On removing the brain, blood was found effused over the inner surface of the orbital plate of the frontal bone (that portion corresponding to the inner table of the sinus), covering it about the size of a fourpenny piece; the inner table showed a little spicula of bone, but so slight was the projection that it could only just be felt when the end of the finger explored the surface. Membranes of the brain congested. Slight effusion in the ventricle, corresponding to the side on which the wound was situated. Heart empty and flaccid. Right lung filled with liquid blood. Liver pale. Kidneys congested. Stomach, intestines, and bladder empty.

Remarks.

In this case there was not that arching of the body that is commonly described as occurring in tetanus; nor was there any dread of light. With regard to the treatment of tetanus, I find that, in horses, in which the disease is not uncommon, it is generally treated by promoting suppuration of the wound, and that this plan is successful. A surgeon, the other day, was telling me he had treated a severe case of tetanus successfully by applying sulphate of copper to the wound, which was a large one, situated over the gluteal region.

XI.

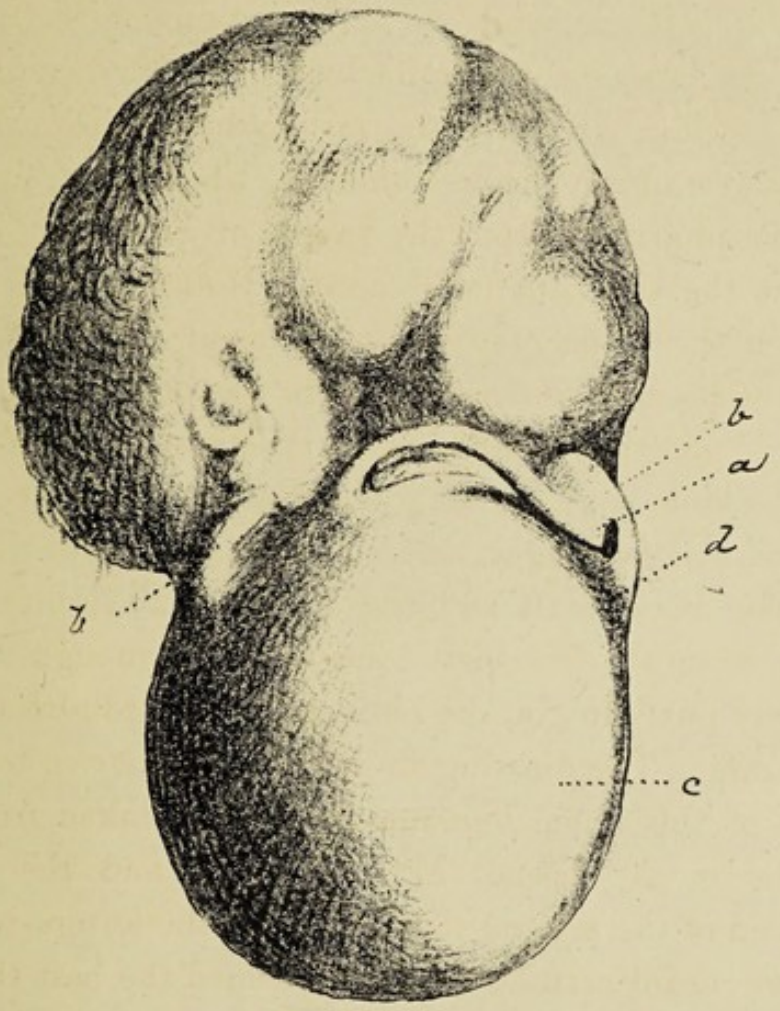
CASE OF SUPERFÆTATION.

By S. Griffiths, M.D.

E. M., a strong healthy woman, at 40, mother of a large family, all the previous births natural, and children well

formed. Her last pregnancy she passed through naturally, and was delivered at the full time by a midwife, of a fine healthy child, after a very easy labour. The placenta came away at the usual time; no hæmorrhage followed; nor was it remarked that the afterpains were unusually severe.

Five days subsequently, on beginning to exert herself, expulsive uterine pains came on, which were soon followed by the projection from the vagina of a curious looking mass about the size of a fœtal head. Nothing came away after this in the shape of placenta, so far at least as the observation of the midwife goes. There was no bleeding, but a discharge similar to that usual at this period after confinement. On looking at the mass, it was found to be a second fœtus of monstrous formation, and there was no doubt that the connection between it and the mother was broken off at the time when the first birth took place, as, though it was immediately put into gin, the cuticular layer had already begun to separate. The drawing in Plate 2 will serve to give some idea of this anomalous mass; this was taken from a sketch made by my friend, Mr. Siccama; and the explanation offered of the several facts to which the letters refer, though by no means certainly correct, seemed the best that could be derived from an inspection. I, subsequently to the sketch being taken, made a section of the lower portion, *c*; but nothing could be gained from it; it seemed a solid mass, without any separation or distinction of parts. The upper larger portion no doubt corresponded to the head, as it was even now covered with dark hair as of a fœtus at about the seventh month; on either side of it, just above the constricted part, was a small prominence, which seemed to be the rudimentary portion of the external ear; there was a small depression just in front of it—probably the external meatus;



a. Umbilical cord.
bb. Upper extremities.
c. Rudimentary trunk and lower extremities.
d. a deep groove formed by the cord.

Drawn from nature by R. R. Siccama.

there was also some indication of the visual organ, but only in one place; this was marked by a small aperture, bounded above and below by a small lip-like process, at the free edges of which were hairs; no mouth could be detected, nor with the exception of the small prominence shown in the drawing *b b*, was there any indication of either upper or lower extremities.

XII.

TUMOUR CONNECTED WITH THE HEAD OF THE TIBIA, AND IMPLICATING THE KNEE-JOINT, EXHIBITED BY MR. PARKINSON, Nov. 18TH, 1856.

THE specimen was removed from a married woman æt. 36, of a pale sallow complexion, but in good bodily condition.

About five months ago she first noticed a prominence of the inner tuberosity of the right tibia. She complained of a good deal of darting pain, especially at night, and having had primary syphilis some short time previously, was treated for syphilitic periostitis. The swelling becoming more prominent she was admitted into the Middlesex Hospital under the care of Mr. De Morgan; remained there six weeks, and was then discharged on refusing to consent to amputation. On her discharge about one month ago, there was a firm elastic swelling, somewhat lobulated, about the size of half an orange, just over the inner tuberosity of the right tibia. There was some fluid in the knee-joint, and the tumour seemed to be advancing upwards.

The disease being suspected to be malignant, amputation of the thigh was performed by Mr. Bradley, of Greenwich, under whose care she had been since her discharge from the Hospital. The tumour appeared to consist of two parts, the larger and softer portion was the size of a large egg, being situated under the popliteus muscle, and the smaller and harder portion over the inner tuberosity of the tibia.

XIII.

MICROSCOPIC EXAMINATION OF A TUMOUR CONNECTED WITH THE HEAD OF THE TIBIA, AND IMPLICATING THE KNEE-JOINT, EXHIBITED BY MR. PARKINSON.

Reported by Mr. Wood and Mr. Parkinson.

The tumour, which was about the size of an orange, had originated apparently in the periosteum under the popliteus muscle, and thence projected backwards into the propliteal space, and upwards and forwards into the knee-joint, involving the cartilage covering the internal tuberosity with a lesser projection forwards, and outwards between the tibia and fibula. The softest portion of the tumour was found in the site of the popliteus muscle, the outline of which was to be traced bound down by the popliteus fascia, though no muscular fibres were apparent under the microscope.

There were found large but various sized compound or mother cells, round and oval, containing 2, 3, or more, nucleated cells, with much granular matter.

Many of them were thickly studded with highly refracting globules of various sizes, and in some instances coalesced. These were apparently fatty matter. In the juice were multitudes of free granules and some fat globules. A few elongated fusiform compound cells were also found in this part of the growth.

In that part of the mass involving the interosseous and other ligaments, the cells were likewise compound and granular, but uniformly elongated and fusiform.

In the part involving the *cartilage* were many cells of the same character as those in the softer parts; but the majority were oval and some caudate. They had all an opalescent appearance similar to that of healthy cartilage cells, having a greater refracting power than the cells in the other parts of the tumour, but were still compound and granular, and varied much in size.

We think the microscopic appearances justify the inference that the growth is carcinomatous.

XIV.

CASES OF DISEASED JOINTS.

By P. C. Price.

The following cases and specimens will serve to illustrate some of the forms of joint affections, especially that termed scrofulous; which has its origin in the cancellated structure of the ends of bones entering into the formation of the articulation.

The first specimen showed the pathological condition of the first phalangeal articulation of the ring finger of the right hand, destroyed by strumous disease. It well illustrated what is known as "white swelling" of the knuckle. The cartilages were ulcerated; the synovial membrane destroyed; and the open structure of the ends of the bones carious to some extent. The patient from whom Mr. Price removed the finger, was a girl of decidedly strumous habit; when the source of irritation was taken away, the patient rapidly improved in health.

The next specimen, destruction of the right hip joint by scrofulous disease—known as morbus coxœ. The right half of the pelvis, and the upper portion of the shaft of the femur were exhibited. The little patient from whom the specimen was taken was under Mr. Price's care at Margate. She had been labouring for some years under the affection. A more extensive destruction of parts is seldom seen. The right wing of the pelvis was divided into three parts, by the extensive ulceration and necrosis that existed. The inner surface of the ilium was eaten away to a great extent, owing to an abscess which existed between the bone and its periosteal covering.

The entire cup of the acetabulum was gone; the margins were rough and necrosed.

The entire head of the femur had vanished, and the trochanters were so diminished by an extension of the ulcerative process, that their outline could but with difficulty be traced. The marasmus was extreme, and the muscular tissue appeared in many parts of the body to be almost destroyed. The absence of acute pain for many weeks prior to death had, in a manner, obscured the diagnosis of such extensive destruction.

The five specimens of disease of the knee joint, three of which had been removed by the operation of resection, and the remaining two by amputation, illustrated two classes of affections very common to this articulation. The various changes that take place in the meshes of the cancellated portions of the ends of the bones, upon the deposition of strumous material was well seen. In three of the specimens, one removed by resection, the other two by amputation, these morbid changes could be traced in different stages. In that which had been resected, the ends of the femur and tibia, were more or less carious, showing a very low type of vascularity, and little inclination to repair. In the other two specimens, the foreign material had been eliminated from the bones into the cavity of the joint, by destruction of the cartilaginous barrier between the two, and from the joint by means of various tortuous channels, which had been made by the formation and discharge of various abscesses. In one of these preparations, reparation of a busy character had taken place to a great extent. New bone of a solid compact structure had shot out, as it were, from both the tibia and femur, and had coalesced by means of a tough fibrous material, which allowed of a certain degree of motion between the two portions. The utter uselessness of the lower limb, the extensive degeneration of the bony and muscular tissues, and the general arrest of development, had the effect of precluding resection of the ends of the bones, so that amputation was the only resource left. All three patients made excellent recoveries.

The two other joints, which had been removed by Mr. Price, by the operation of resection—illustrates another form of disease—that in which the morbid change originates in the

synovial membrane, or the cartilages covering the ends of the bones. Both the cases from which the parts were removed, had come under notice at a late stage of the disease, so that it was almost impossible to say positively, in which structure the disease had first originated, as both were extremely diseased. In one specimen, not only had the synovial and cartilaginous structures suffered, but the bones had taken on a morbid action. Caries and necrosis had involved the osseous structures, which had materially increased the suffering of the patient; but not to such an extent as to preclude resection. In the other case, the cartilages were undergoing solution and rapid destruction by remaining in contact with a large abscess which filled the articulation. Both these cases made a good recovery from the immediate effects of the operation.

The remaining specimen was interesting, as it illustrated the effects of a piece of *conservative* surgery. It was a leg, removed by Mr. Price, by amputation in the middle of the calf. The patient, a strumous boy, had suffered from disease of the ankle joint for some months, the integrity of which was now destroyed. The cuboid bone, and the posterior portion of the two external metatarsal bones were also implicated by caries. The boy being most unwilling to lose his leg, the astragalus articular end of the tibia, and the posterior surface of the cuboid bone, with a portion of the external maleolus were removed. At the same time the cuboid and posterior surface of the two external metatarsal bones were taken away. Subsequently, however, the entire bones of the foot became more or less diseased, and an acute abscess having formed among the muscles of the leg, and implicating the surface of the fibula to some extent, amputation was im-

perative. The reparation that had taken place between the lower end of the tibia and the foot was so extensive, that, had not circumstances demanded the removal of the leg above the seat of the abscess, it would have been worthy of consideration whether a partial amputation of the foot would not have been possible and at the same time advisable.

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