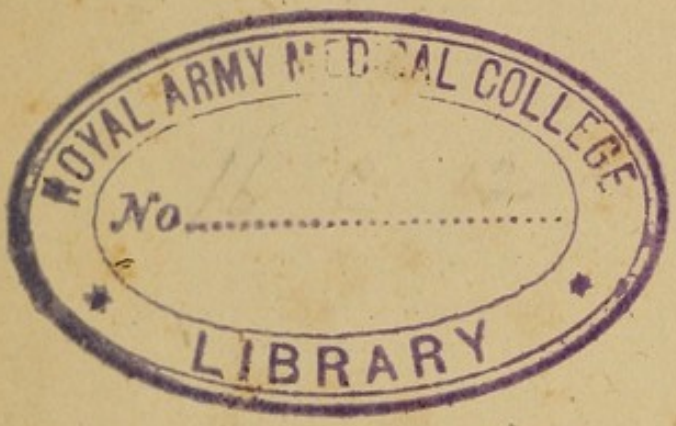
**On the treatment of wounds : clinical lectures / by Sampson Gamgee.**




# CLINICAL LECTURES

ON THE

# TREATMENT OF WOUNDS

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ON

# THE TREATMENT OF WOUNDS:

## CLINICAL LECTURES



BY

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WITH ENGRAVINGS ON WOOD.

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1878.

*"Travaillons Toujours."*

Velpeau's dying words addressed to Barth and Nélaton.

"Toujours aus Travail"
Voltaire

TO MY

OLD FELLOW STUDENTS

AT THE

UNIVERSITY COLLEGE AND HOSPITAL, LONDON,

AND TO MY

PAST AND PRESENT PUPILS

AT THE

QUEEN'S HOSPITAL, BIRMINGHAM.

# PREFACE.

I have re-arranged and condensed in this small volume, "On the Treatment of Wounds," the materials of many of my clinical discourses to Students, and addresses to Medical Societies, delivered during the last ten years.

Only a small part of the materials at my disposal has been utilized. My chief object, and sincere endeavour, has been, to illustrate fundamental principles by typical cases, so concisely as not to make too great a call on the time of busy practitioners, and yet so clearly as to be intelligible to junior students.

Observation from various stand-points is essential to the clear understanding of complex truths; and I have therefore deemed it useful to compare, with my own results, those of some distinguished surgeons practising at other times, and under different circumstances.

Scientifically and practically, "The Treatment of Wounds" is a subject of intense interest, deserving, nay urgently calling for, comprehensive study. The great want is a clear understanding, and an exact application, of principles long since demonstrated, but not yet generally or justly appreciated. Another want is a close examination of new methods of treatment, without theoretical bias or hasty generalization,—for or against.

I hope the facts herein recorded, and the suggestions offered, may, in some measure, help to reconcile differences, to establish simple and safe methods of treatment, and to stimulate investigation in the right direction.

Broad Street, Birmingham,

January, 1878.

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# LECTURES.

# LECTURE I.

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## CONTENTS.



Gentlemen,—

On the Treatment of Wounds, no clinical teacher can be indifferent to the conflicting state of surgical opinion. Progress in this department

of Surgery has, in late years, been characterized by divergence from, rather than by approach to, unanimity. Lecturing here in 1867 (1) I told you that I looked upon water dressing, as not much better than a poultice, as favouring suppuration and opposed to healing. Experience has only added confirmation to this opinion; and it is now many years since I applied water dressing, or a poultice to a wound which I wished to heal. Yet, in the last edition of his work, Mr. Erichsen seems scarcely less fond of water dressing than (following immediately in Robert Liston's steps) he was, when Joseph Lister and myself acted as his earliest dressers, now seven and twenty years ago. (2)

Once parts have been brought together after

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1 The *British Medical Journal*, Vol. II., 1867, p. 355.

2 Under the head of Dressing of Wounds after Operations, sutures having been introduced, Mr. Erichsen advises "that a narrow strip of water dressing should then be applied along the edge of the incision. . . . . If union do not take place by adhesion, inflammation and suppuration having commenced, with much tension and heat about the part, the substitution of a poultice for the water dressing will be advantageous. When suppuration has fairly set in, the applications should be changed at least twice or thrice in the twenty-four hours, and the wound may with advantage be washed out twice a day with injections of carbolized water." — Erichsen: Science and Art of Surgery, 7th Edition, 1877, p. 32.

division, they cannot be too studiously kept at rest, to which infrequent dressing is eminently conducive; yet you will see surgeons, in this and other schools, who dress an amputation daily from the first, and sometimes twice and even three times in the twenty-four hours. Pressure, gentle, uniform, sustained, I have taught you to look upon as an auxiliary of the very first importance in promoting healing action. Whether it be in the deep-seated lacerations of a violently sprained ankle, or in a compound fracture attended with extravasation, swelling, and blebs; in a clean first incision for ovariotomy; in a subcutaneous division of a tendon; or in an axe wound severing the insertion of the quadriceps into the patella, and largely laying open the knee-joint,—in one and all such lesions is pressure a therapeutic agent of the most beneficent potency. But very many excellent surgeons would only partially assent to this proposition, many would wholly dissent from it.

The exclusion of air from a wound has been dwelt upon as eminently conducive to its rapid cicatrization; others teach that air may beneficially flood a wound, so long as it is deprived of those noxious germs which are believed

universally to pervade it. Air, say the disciples of this school, is only injurious because swarming with countless fertile germs; destroy them, and the air loses its maleficence.

If the germ theory, and the practice based upon it, be correct, the sooner it is accepted the better. But if its foundation be in great part illusory,—if it be unequal to explaining, and be actually inconsistent with, many of the results of practice,—if it be unnecessarily complicated, and if it tend to exclude, or to supersede, without good reason, principles and methods which are demonstrably simple, safe, and sound,—it will be impossible to accord to it the assent which has been claimed for it. Experience must decide the issue.

To illustrate how simply and successfully an important wound may be treated, let me direct your attention to the case of John Pardo, aged 21, on whom I operated for strangulated inguinal hernia, the 6th September ult. I found it necessary to open the sac, which contained some omentum and a knuckle of intestine, deeply congested but otherwise in fair condition. Bleeding from two vessels was arrested by torsion. The wound was closed by three points of silver suture, and a pad

of dry lint was applied over it, with a gently-compressing spica bandage. One grain of opium to be given every four hours. Milk diet.

The temperature, which on the day of operation was 101.2° with a pulse of 104, fell in forty-eight hours to 99.5° with a pulse of 76, and respirations 20. The opium was now discontinued, as the patient continued free from pain, and the thermometric chart denoted gradual return to the normal standard of health; the bandage was not interfered with until the seventh day after the operation. The pulse was then 62, respiration 20, temperature 98.2°. I found the pad of lint quite dry; no tenderness or redness around the linear cicatrix, which was solid throughout. The sutures were now removed, another pad of lint applied, and a gruel enema ordered, the bowels not having yet acted.

The note on September 13th is:—The bowels acted 15 minutes after the enema; pulse 62, respiration 16, temperature 98.3°. The patient says he feels quite well; is allowed meat diet. He was discharged with a truss the eleventh day after the operation.

In a case of strangulated femoral hernia, in

which I operated the 15th May ult., in consultation with Dr. Sawyer and Mr. Cresswell, the wound healed perfectly in four days, under a pad of cotton wool and a lightly compressing bandage. The symptons had existed some days before the operation, and on opening the sac a knuckle of deeply-congested intestine was found within it. The recently pared edges of a hare lip could not have healed more directly and soundly, than the wound in the inguinal region had done.

Before commenting on these cases, it will be convenient to recall the main facts of two other operations performed in this theatre. In a patient from whose neck I removed a good-sized lipoma, I may remind you, that the tumour extended from the cervical spine and occiput forwards and downwards on the carotid sheath; the incision through the integuments was five inches in extent. I put three silver stitches in the upper half of the wound, three silken ones in the lower half, subsequently exercising pressure by pads of dry lint and bandage. The wound, when inspected at the end of a week, was found to have healed directly and firmly, without a drop of discharge of any kind.

Another wound treated on the same principles, and with equally successful result, was presented by Mary Ann Sweet, aged 20, who was sent into the hospital under my care by my friend Dr. Suffield, for the performance of ovariotomy. The tumour, being in great part solid, required a free incision (nearly eight inches) for its removal; the pedicle was secured in a carpenter's callipers, and the wound accurately closed with points of silver suture a third of an inch distant from each other; a superjacent compress of dry lint and bandage completed the dressing. Cicatrization was perfect at the end of a week, when the sutures were removed, transverse strips of adhesive plaster applied, circular bandage and dry pad renewed. The patient made an uninterrupted recovery.

The wounds in these four cases, though differing in situation, had several features in common. They were all clean cuts of several inches in extent, with sufficient surrounding skin to admit of easy approximation of the edges without tension. They were in parts of the body—two in the abdomen, one in the groin, and one in the neck—which only required the patient to be in the recumbent position to admit of perfect rest; no vessels required ligature;

in neither case was the dry dressing touched for several days; and in each was union perfect without a drop of discharge. I attach much importance to the dry dressing. The sponges used at the time of operation were very well squeezed out of clean water; not a drop was afterwards allowed to touch the wound. Drenching wounds with water during an operation, and washing them with it afterwards, are mistakes. (1) Water favours decomposition, which is the enemy of healing action. In the case of an incised wound, which has only partially healed, let anyone try the experiment of covering one part of the recent cicatrix with dry lint, and the other with water dressing. As a rule, liable to very rare exceptions, consolidation will be found to take place under the dry, and suppuration under the wet part,.

The sutures used in three of the cases were metallic, in the other case one half of the stitches were of silver, the other half of silk. The fact

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[1] For most instructive observations on this point, and generally on the subject of wounds, the reader is referred to the article "On the Science and Art of Healing Wounds," by Benjamin W. Richardson, M.D., F.R.S., in the Transactions of the St. Andrews Medical Graduates' Association, edited by Leonard W. Sedgwick, M.D.—London: Churchill, 1872, p. 37—52.

that healing occurred at each point and suppuration at none, proves that union may be secured, with proper precautions, irrespective of the material of which sutures are composed. None the less, it must be admitted, that in the general practice of surgery metallic sutures deserve the preference, for one reason above all others,—that they can be left a much longer time with practically no risk of exciting suppuration.

Reserving to the next lecture more extended observations on the safest means for arresting hæmorrhage from large vessels, I shall here simply observe, that the two vessels which were stopped spouting by torsion, in the case of inguinal hernia, illustrated the rule that, in all such arteries as are met with near the surface of the body, torsion is a successful and perfectly safe means for checking bleeding.

The fact that in three of the cases under notice the first dressing was left untouched for a week, and in the other case for four days, is of capital importance. Once a recent wound has been nicely adjusted, the less it is interfered with the greater the chances of healing. Under such circumstances, to meddle without good reason is

to muddle. In carrying out the practice of infrequent dressing, the thermometer is of the greatest use. To revert for a moment to the inguinal hernia case. With a pulse at 70, respiration 20, and in the absence of pain, it was perfectly justifiable to leave the dressing untouched; when the thermometer fell in forty-eight hours from 101.2° to 99.5°, the evidence in favour of leaving well alone was of the strongest. A glance at the thermometric chart at the head of the bed, is frequently sufficient to assure the surgeon of the progress of a case, without his addressing a single question to nurse or patient.

Nothing more need be said of the four cases, than that their progress was as absolutely free from pain, as the treatment was simple and successful.

It is not only recent incised wounds that admit of being so treated. As a striking example I may quote the case of Maria Mason, aged 18, from whom I removed a solid, movable ovarian tumour some years ago. The clamp separated on the fifth day, and everything was proceeding most favourably, when the patient, in the absence of the nurse, left

her bed and walked about the ward. She was quite unconcerned, when another patient called attention to something hanging below the front of the nightdress. My colleague, Mr. Wilders, who was then our house surgeon, was summoned, and found that several feet of small intestine had protruded through the lower part of the abdominal wound, which had gaped just above the stump of the pedicle. The sutures had not been disturbed since the operation, and it became necessary to remove them, to open up the wound to admit of the bowel being replaced. The edges of the wound were now brought together again with metallic sutures and strapping, covered with a pad of dry lint and circular bandages. Not a single unfavourable symptom ensued, the dressing was not disturbed for a week, cicatrization was then complete; the sutures were finally removed, and the patient was ready to leave the hospital, a fortnight from the day of operation.

Here is an equally successful case of a different kind, yet confirming substantially the same general principles which should guide you in the treatment of wounds. This youth is the son of one of our principal ivory and bone turners,

who, while practising the other day with a fine circular saw, nearly cut off the soft pad at the end of his right thumb. He did not consult me until the third day, when the little flap was swollen, the wound dirty, the whole thumb throbbing and very painful. On compressing the radial artery just above the wrist, the throbbing and pain ceased, and I taught my patient how to obtain the relief, by effecting the compression himself with the left thumb. I then brought the edges of the wound together with narrow strips of emplastrum elemi, leaving slight intervals for the escape of matter; covered the end of the thumb with a little fine picked oakum, bandaged it so as to effect gentle uniform compression, and supported the hand at an acute angle with the arm. The sling used for the purpose enclosed the elbow, as every arm-sling should do to be efficient. (1)

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1 "To make such a sling for the right arm of an adult, take a piece of black alpaca or other suitable material 29½ inches wide, and 35 inches long; fold it cornerwise with the smallest triangle inwards; the outer one will thus have about five inches projecting beyond the half square; the hand rests in the basis of the triangle, the opposite angle is at the elbow, which is efficiently supported by the projecting portion of the outer layer being carried round the lower end of the humerus, and pinned or stitched to the inner part of the sling; its two other extremities are carried upwards, on the dorsal and palmar aspect of the forearm respectively, and secured

Relief was immediate; the dressing was not touched for four days, and only twice afterwards, at intervals of three days. You see the thumb very nearly a match for its fellow, and a linear cicatrix is all that is left of a very ugly wound.

This case illustrates, like the previous ones, the advantages of compression, with dry and rare dressings, in the treatment of wounds, whether contused or incised; and it further exemplifies the benefits to be derived from digital compression in the treatment of inflammation of the limbs. ([1])

Under water dressing or a poultice, the chances are that this young man's thumb would have suppurated, and we should probably have had to deal with burrowing matter, sloughing tendons, and subsequent loss of power, which so frequently follow contused wounds of the hand and fingers. In averting those results, in the case under notice, no influence was more powerful than the uniformly compressing bandage.

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by a strap of the same material at the back of the neck."—*On the Treatment of Fractures of the Limbs, by Sampson Gamgee. London, Churchill, 1871, p. 255.*

[1] Observations on the Treatment of Inflammation by Digital Compression, by Dr. Tito Vanzetti, translated in Treatment of Fractures of the Limbs, by the Author, p. 168 *et seq.*

Of all surgical agencies none so beneficent as compression, none requiring more delicate manipulation, none so inadequately appreciated. Under a smooth and uniformly, while lightly, compressing bandage, applied to the head, the trunk, or the limbs, extravasations of blood are absorbed, the healing action is promoted, and a soothing influence is exercised. There must be no constriction—only equable adaptation of surface to surface, with the light pressure which always comforts. There must be no squeezing like that of an old college friend's hand, when seen after a long absence; such pressure as that, on tender parts, is intolerable constriction. The soothing surgical pressure is like that which you interchange with the hand of a lady, when the pleasure of meeting her is tempered by a respectful regard. Your hand adapts itself to hers, and gently presses it wherever it can touch it, but nowhere squeezes it for fear of offending. Such pressure, when employed by the surgeon in the treatment of injuries, always soothes and heals.

To apply a nicely compressing bandage well, you must practise hundreds and hundreds of times. Bear in mind that in surgical, as in all art,

the greatest results are almost always obtainable from the simplest means, provided they be employed with the accomplished skill which can only result from the most zealous and patient assiduity.

# LECTURE II.

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Gentlemen,—

It was incidentally remarked in the preceding Lecture, that compression is one of the most beneficent of surgical agencies, but inadequately appreciated in principle and practice. A clear idea

of its advantages is of vital importance to a correct understanding of the treatment of wounds and their complications.

When the edges of a cleanly cut wound through the skin are brought together, it is generally agreed that the contact necessary for healing may be easily maintained by strips of adhesive plaster, a bandage, or a handkerchief to bind the parts together; but it is a greater and a more methodical application of pressure which is required to prevent subcutaneous effusions, and, when they do occur, to promote their absorption. This is forcibly exemplified in such a case of deep-seated injury as a sprain, without laceration of the skin. If the joint be immobilized at once, and uniform compression nicely applied, the subsequent swelling will be very limited indeed. If delay occur, either in the absence of surgical aid, or while fomentations and lotions are being prepared, swelling takes place so rapidly, that, in less than twenty-four hours, an ankle may attain a circumference two inches greater than its fellow. Under methodical compression, not only is the further increase of the swelling checked at once, but it very rapidly subsides; and, at the end of two or

three days, faint bluish-green discoloration may be seen to have extended from the toes nearly to the knee along the shrivelling limb. This diffusion of the extravasated blood, under the influence of pressure, is the first step to its removal by a widely increased extent of absorbing surface.

Compression acts with equal advantage, when the products of extravasation have undergone change through inflammatory action. Here are the notes of a case in point, in which I was consulted by my colleague Mr. John Clay. His patient, an elderly gentleman, had recently sprained his right ankle in going over a ploughed field. As he had a policy in one of the Accidental Insurance companies, its medical officer saw the case. He advised an incision, for the purpose of giving vent to matter which he thought had formed in the centre of the swelling. In this advice he was sustained by a hospital surgeon of great experience, who was additionally called in on behalf of the company. Mr. Clay, dissenting, invited my attendance. I found the right ankle hot, and exquisitely painful. It was so much swollen, that its circumference over the heel exceeded that of the corresponding sound joint, by nearly an inch and

a half. The skin on the outer side of the ankle was especially hot, red, tense, and shining; palpation in this situation communicated a feeling of elasticity closely simulating, but not amounting to, fluctuation. With Mr. Clay's concurrence and assistance, I enveloped the limb from the toes to the knee in fine cotton-wool, applied well-moulded pasteboard splints on each side, and bandaged with methodically uniform compression. A second consultation was held in the course of three days. when I found the patient very much easier. He had had good nights' rest, had been able to turn over in bed, and could bear the limb lifted and put down again without pain. On opening the apparatus in front, I found the swelling had considerably decreased; the previously red skin was yellowish and shrivelled, like the skin of a late russet apple; not looking, as at my first visit, like the red shining skin of a prime Blenheim. That shrivelled look is always a good sign. I readjusted the apparatus with firmer pressure.

Three days later more shrinking was met by fresh paring of the edges of the apparatus, and still firmer bandaging. At a consultation held a fortnight after the first, the patient

was perfectly easy. No one thought any more about puncturing in search of matter. The Insurance company compromised by paying down a substantial sum of money, and I substituted for the paste-board apparatus, strapping the joint with emplastrum elemi spread on leather; a Churton's bandage being applied over it with smooth firmness. When I last saw the patient with Mr. Clay, he was walking about his garden with a stick; the plaster had been very properly removed, and the swelling had subsided, the only difficulty to locomotion being stiffness of the joint. I cracked the adhesions by using the requisite amount of well-applied force, and we concurred in advising free use of the joint. In a note which I received from my colleague seven weeks after our first consultation, he wrote: "Our patient is progressing very satisfactorily; he comes to business every day, walks about a good deal, and does not require surgical supervision."

In considering the relative value of the therapeutic agencies in this case, full weight must be given to the perfect rest in which the joint was placed; but experience proves that rest, without methodical compression would have been only

imperfectly and slowly successful, in allaying the inflammatory action, and in removing its products. Besides acting as the most powerful promoter of absorption, smooth circular compression ensures repose, by preventing muscular spasm, which, once excited, is an active cause of constitutional disturbance, and often the first link in a series of local troubles — disturbed union, hæmorrhage, nervous irritation, suppuration and its sequels.

The treatment of wounds after amputation affords abundant evidence of the operation of the therapeutic principles, which I have just been endeavouring to impress upon you.

This youth's right fore-arm having been crushed in a cog-wheel to within two inches of the elbow, I amputated just below that joint, utilizing some of the least damaged skin to cover the stump, which showed bruising of the muscles and effusion of blood into their substance. Two arteries were tied with silk, and some smaller ones twisted. Where the skin was quite sound, the edges were brought together with two points of suture; elsewhere the parts were approximated with strips of lint soaked in styptic colloid, a drainage tube being left in the lower part of

the wound, and the ends of the ligature brought out at the angle with the tube. The stump was covered with a layer of cotton wool, and oakum over it. Rectangular pasteboard splints, extending from the end of the stump to the shoulder joint, were applied with gently compressing bandage, to ensure perfect immobility and prevent swelling.

When the apparatus was opened four days afterwards there was very slight sloughing of the margin of one flap; but the stump was of good colour and healthy temperature, without tension. I removed the drainage tube, brought the edges closely together by adhesive strapping, and re-applied cotton wool and oakum as dry dressing, with pressure. The lad was discharged on the 17th June, a month within a day from his admission, the stump, then quite healed, having been dressed altogether seven times after the amputation. The sutures had been removed at the dressing on the tenth day, when the arterial ligatures came away with the dressing.

A parallel case is that of James B., aged six, whom you saw in Ward 6. The soft parts of his left lower limb had been extensively crushed by a wagon, and an attempt had been made to save

the limb. Sloughing and profuse suppuration had been followed by such exhaustion, that the lad might fairly be said to be moribund, when I amputated the thigh in the upper third. The structures in the stump were a good deal swollen, from the interstitial effusion which the severe contiguous inflammation had induced. I dressed with cotton wool, oakum, and pasteboard splints, covering the hip joint and extending upwards to the crest of the ilium; nicely compressing bandages completing the apparatus. In the forty-seven days which elapsed from the operation to the boy leaving the hospital, in comparatively good health, the dressing was only renewed six times.

We may compare with these amputations of the thigh and forearm, two smaller, but not less instructive ones, performed on out-patients. In the first of these I amputated the middle finger of a mechanic's right hand, because it had become stiff, and an encumbrance, as the result of old injury. I removed it at the metacarpo-phalangeal articulation, being careful not to wound the palm, and saving enough skin to admit of easy closure of the wound without tension. One bleeding vessel was stopped by torsion. The edges were united by three points

of silver suture, a fine drainage tube was placed in the lower angle of the wound, which was covered with a pledget of picked oakum; a moist pasteboard splint was now bandaged to the palmar aspect of the limb, from the tips of the fingers to the elbow, and the forearm suspended in a sling at an acute angle with the arm. At the end of four days the limb was unbandaged, and the drainage tube gently drawn out. There being no sign of suppuration or heat, the splint was re-applied with smooth pressure. In four days more—eight from the operation—I exposed the part. The oakum was quite dry, and the cicatrix pale and sound; but on removing the sutures a drop of creamy pus exuded from the opening of the suture nearest the dorsum of the hand. I wiped the drop of pus off with a piece of dry lint, and, keeping the fingers in the extended position, re-bandaged the hand with an intervening compress of cotton wool. The part was not looked at for another week, when the scar was solid throughout, the surrounding skin shrivelled and of healthy colour.

From the right hand of the man now before you, I amputated the little finger ten days ago, treating the wound precisely as in the previous

case, except that no drainage tube was introduced. At the end of a week the sutures were removed, the dry pad and compressing bandage renewed. On this, the tenth day, you see the linear cicatrix dry and solid, in the midst of parts as healthy as you ever see in the most successful case of hare-lip operation. The after treatment of these cases could not have been attended with less pain to the patients, or with less trouble to the surgeon; neither could the process of healing have well been more rapid and solid. Some of the chief amongst the agencies which conduced to this result were, absence of moisture in the dressings, accurate coaptation of edges, immediate immobilization, undisturbed for many days, and steady uniform compression. These therapeutic principles and agents have already been commented upon.

I now beg the favour of your attention to the means taken for arresting hæmorrhage in the cases on which this lecture is based. Torsion has already been noticed as unquestionably safe, when applied to medium-sized vessels. In 1850, while on a visit to the Clinique of Pavia, I saw Professor Porta twist all the vessels in an amputation of the leg near the knee. Torsion had then for some years

been the method which Antonio Scarpa's worthy successor had constantly employed, in preference to the ligature, in all amputations. The monograph (1) in which Luigi Porta advocated the practice in 1845, will ever remain a monument of wide erudition, careful experiment, and sound clinical reasoning. But in this country torsion gained few desciples, until Mr. Syme adopted it in opposition to Sir James Simpson's acupressure. It has since steadily gained ground; and Mr. Bryant thus expresses himself in the second edition of his "Practice of Surgery" (2)—"The physiological arguments in favour of torsion are very great, and the practical advantages seem to be no less. After seven years' experience of the practice applied to vessels of all sizes, the femoral being the largest, I have had no mishap."

If increasing experience eventually establish that torsion, applied to large arteries as well as small, is as safe as the ligature, its adoption must

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[1] Delle Alterazioni Patologiche delle Arterie per la Legatura e la Torsione. Esperienze ed Osservazioni di Luigi Porta Prof. di Clinica Chirurgica Nell' 1. R. Università di Pavia. Con Tredici Tavole in Rame Milano, Tipografia di Giuseppe Bernardoni, di Gio 1845.

[2] 1876, Vol. I, p. 409.

proportionately become more general; but the first condition must be absolute safety against hæmorrhage. This is practically attained with the ligature. In twenty-four years' work as a Hospital Surgeon, I have never lost a patient from hæmorrhage in private practice, and only one amongst the thousands who have come under my care in hospital. That was a woman from whose right axilla I had dissected a deeply-seated tumour. The bleeding was checked at the time by ligature and pressure, but, in the course of a week, secondary hæmorrhage occurred in the middle of the night, and proved fatal, in spite of the best efforts of our then house surgeon. As an instance of how successfully large vessels may be tied, let me read you a note which I had the honour of receiving from the late Professor Syme.

"No. 1, Shandwick Place, Edinburgh,

"January 19th, 1867.

"My dear Sir,

"I lately tied the femoral artery of a gentleman, "for popliteal aneurism, with complete success, and this "was the thirty-fifth time I had performed the operation "without any unfavourable result; except in one case, "where there had been an unsuccessful attempt by "pressure.

"Yours very truly,

"JAMES SYME.

"Sampson Gamgee, Esq."

These records of experience, satisfactory so far as they go, leave open the general question of the relative merits of the ligature and torsion, and of vegetable, animal, and metallic substances for the purpose of securing bleeding vessels. (1) That is a wide field of enquiry, to which precise investigations on a uniform plan, and upon a large scale by a number of observers, may be most profitably directed. To be complete, these enquiries should embrace the value of acupressure, of which I have little personal experience. The evidence adduced in its support by Sir James Simpson, (2) and the recorded experience of some surgeons who have tried it (3) justify

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1 American surgeons, to whom Surgery is so greatly indebted in the matter of animal ligatures and metallic sutures, have also accumulated most interesting experience on the use of metallic ligatures for wounded arteries. *Vide* "A System of Surgery," by Samuel D. Gross. London and Philadelphia, 5th Ed., 1872, vol. 1., p. 670, *et seq.*

2 "Acupressure, a New Method of Arresting Hæmorrhage, and of Accelerating the Healing of Wounds," by James Y. Simpson. Edinburgh: A. and C. Black, 1864.

3 Whilst revising these proof sheets Professor Pirrie, of Aberdeen, has kindly presented me with a copy of the third edition of his "Principles and Practice of Surgery." In an accompanying note he informs me that his decided impressions in favour of acupressure remain unchanged after long experience. In all operations odmitting of the surfaces of the wound being brought together,

further investigation, as does also Monsieur Péan's system of forci-pressure. (1) Never has the saying, that necessity is the mother of invention, been more completely justified, than by the discovery of means for the arrest of hæmorrhage. The available information on the subject is more complete and more nearly perfect, than on any other of the great surgical problems. There is the strongest reason for believing, that well-directed and sufficiently extensive experiments, and clinical enquiries, would soon raise our knowledge of hæmostatics to the rank of accurate scientific generalizations.

In estimating the relative value of the means employed for closing a divided artery, it must be borne in mind, that their efficiency is greatly influenced by the general treatment of the wounded part. Any plan, which favours rapid healing of cut surfaces, lessens in direct proportion the chances of recurrent bleeding. It is in this respect that

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Professor Pirrie, since March, 1864, has invariably employed acupressure, and in no single instance has he failed in arresting hæmorrhage.

[1] De la Forcipressure, ou de l'Application des Pinces à l'Hémostasie Chirurgicale, par G. Deny et Exchaquet, d'après les Leçons Professées par M. le Docteur Péan. Paris ; Germer Baillière, 1875.

the results of perfect quiet and uniform compression are most conspicuous.

The most imposing case of secondary hæmorrhage with which I have ever had to deal, occurred in the man whose thigh I amputated at the hip-joint 11th September, 1862 (1). After removal of the limb (which measured 48 inches in maximum circumference, and weighed 99lbs), many vessels were tied, including the femoral vein. Everything proceeded favourably until the morning of the fourth day, when arterial blood gushed freely from the centre of the wound, which was nearly all healed. A nurse and dresser had been constantly at the patient's side, with instructions to apply the aortic tourniquet at once, if bleeding occurred; they obeyed, and I was summoned. On my arrival, in the course of a few minutes, the evidences, that the loss of blood had been considerable, were unmistakable. To open up the vast flaps in search of the bleeding point menaced death. The tourniquet was retained with slight pressure nearly two hours, and a large ox bladder containing three pounds of pounded

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[1] History of a Successful Case of Amputation at the Hip-joint (with Photographs). London: Churchill, 1865.

ice placed over the anterior flap, to be renewed as rapidly as the ice melted.

The bleeding did not recur; at the end of twenty-four hours the ice-bag was discontinued. Pressure was kept up by means of a thick piece of sheet lead, weighing nearly one pound, cut and moulded to the shape of the anterior flap, on which it was placed, a piece of dry lint intervening. In the course of a few days the pressure was increased, and the man made a complete recovery.

Due importance must be attached to the effect of cold in preventing a recurrence of the bleeding, but the perfect state of repose of the part under the pressure, first of the 3 lb. ice-bag, and then of the lead, was most beneficial.

It was noted in the early part of this Lecture, that styptic colloid was applied, to the fore-arm stump of the youth who was before you The operation, you will remember, was necessitated by a machinery crush; the muscular tissue in the stump being a good deal bruised, as was also the skin. The styptic colloid was an effectual means of approximating the edges without tension, of stopping oozing of blood, and, by its antiseptic

properties, of checking the decomposition which was sure to occur in some degree as the result of the very severe contusion. The effect of the styptic colloid application could not have been more satisfactory. That agent was invented in 1867, (1) by my friend Dr. B. W. Richardson, F.R.S. It is produced by saturating ether entirely with tannin and a colloidal substance, xyloidine or gun cotton, a little tincture of benzoin being finally admixed.

When it has been on for a few days, styptic colloid dressing often peels off easily as a dry shell, leaving the parts beneath perfectly healthy. If the dressing be adherent, care must be taken to remove it so as not to disturb the subjacent parts, and not to give pain. This may be done by dropping on the dry colloid dressing, for a few minutes, a mixture of alcohol and ether, or equal parts of absolute alcohol and distilled water, warmed to a little above the heat of the body.

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[1] *Vide* Dr. B. W. Richardson, in *Medical Times and Gazette*, 1867, Vol. I, p. 383 *et seq.* "On a New Styptic and Adhesive Fluid—Styptic Colloid, and on Healing by the First Intention." The styptic colloid is prepared, after Dr. Richardson's instructions, by Messrs. Robbins & Co., Pharmaceutical Chemists, Oxford Street, London.

The dressing becomes moist almost directly, and can be taken off lightly, without the patient feeling it. In the absence of alcohol and ether, brandy or whisky will serve to soften dry colloid dressing before removal.

In advocating the use of styptic colloid, as an excellent preparation for hæmostatic and retentive purposes, also valuable for its anti-putrescent properties, I do not attempt to define its merits as compared with other spirituous and resinous solutions—*e. g.*, collodion, tincture of benzoin, and the Friar's balsam or Balsamum Traumaticum of the old surgeons, which are one and all excellent preparations. Any of them (1) may be used with great

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1 The Friar's balsam and the Balsamum Traumaticum are practically identical in composition with the Tinctura Benzoini Composita of the British Pharmacopœia. The latter contains exactly the same quantity of Balsam of Tolu as the former, and rather more Benzoin, Storax, and Socotrine aloes. The compounds are excellent in surgical use. The appended formula is from the Pharmacopœia of the London College of Physicians for 1771 :—

BALSAMUM TRAUMATICUM.

℞ Benzoini P. uncias tres.
Styracis calamitæ colati P. uncias duas.
Balsami Tolutani P. unciam unam.
Aloës Socotrinæ P. unciam dimidiam.
Spiritûs vinosi rectificati M. libras duas.
DIGERE :—Ut gummi, quantum fieri poterit, solvantur, deinde cola.

advantage in promoting the healing of wounds, as adjuvants to the great principles of rest, position, and pressure.

Styptic colloid has the advantage of drying very quickly; strips or pledgets of lint soaked in it, soon become so dry and firm as to act like splints in preventing motion. I have often treated injuries of the hand and fingers, with successful reliance on lint soaked in styptic colloid to close wounds and immobilize the joints.

# LECTURE III.

## CONTENTS.

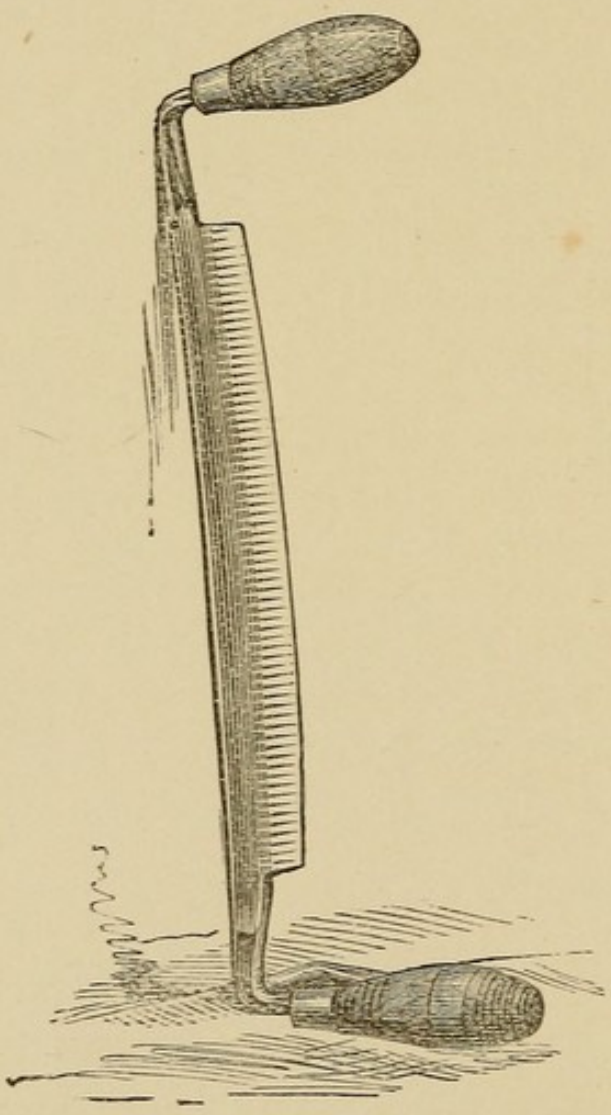


Gentlemen,—

Penetrating wounds of joints are, by common admission, some of the most serious injuries which surgeons are called upon to treat; and they afford a critical test of the value of therapeutic measures.

This patient, George Thomas, aged 48, was admitted into the Queen's Hospital, under my care, 20th of July, 1877, with an extensive wound penetrating the left kneejoint. It was self-inflicted, while the patient—a foreman in one of our large factories—was trying the temper of a double-handled drawing-knife on a piece of ash. (1)

FIG. I.



1 This and the succeeding woodcuts have been executed by Mr. R. Paterson, from photographs.

His knee was bent at the time, and the knife slipped into the limb, while being used with considerable force. On admission the patient was suffering from slight shock. The clean cut wound extended three inches across the thigh, just above the upper border of the left patella; the tendon of the quadriceps extensor cruris was completely divided; so that the finger could be passed underneath the upper border of the patella into the knee joint; the outline of the intercondyloid space could be made out; a thin currant-jelly-like clot was visible in the joint, and slight hæmorrhage was going on.

I visited the hospital, very shortly after I received notice of the patient's admission, and found that the assistants had prepared the spray and the requisite dressings, to treat the case on Mr. Lister's plan.

On hearing the account of the accident, satisfied that no foreign substance was in the joint, I took no heed of the blood clot, used neither sponge nor lint to the outside, but at once brought the lips of the wound very accurately together, and inserted three points of silver suture. Some strips of lint soaked in styptic colloid were placed lengthways, after the fashion of adhesive plasters,

over the wound; over them a thin layer of picked oakum, and another of cotton wool. The limb, being steadily held in the extended position, was immobilized by lateral and posterior pasteboard splints, which had been previously moistened; in bandaging them to the limb I used firm, smooth compression. To give unity to the apparatus, the outside was starched, and long heavy sand-bags placed on each side of the limb.

July 27th (seventh day after admission).—Has been quite free from pain; temperature normal; the limb has not been touched. The upper part of the bandages was this morning cut down, in front in the middle line. The skin of the thigh looked so natural, there was such an entire absence of swelling about the knee, and the materials covering it were so dry, that the investing case was not further disturbed, but at once reclosed with compressing circular bandage.

July 29th.—The case opened throughout in front; the adhesive strips, with the oakum and cotton wool, easily peeled off, leaving the skin pale and shrivelled; the outline of the knee perfect, and the patella movable; the wound quite closed, and absolutely dry. I left the sutures, covered the

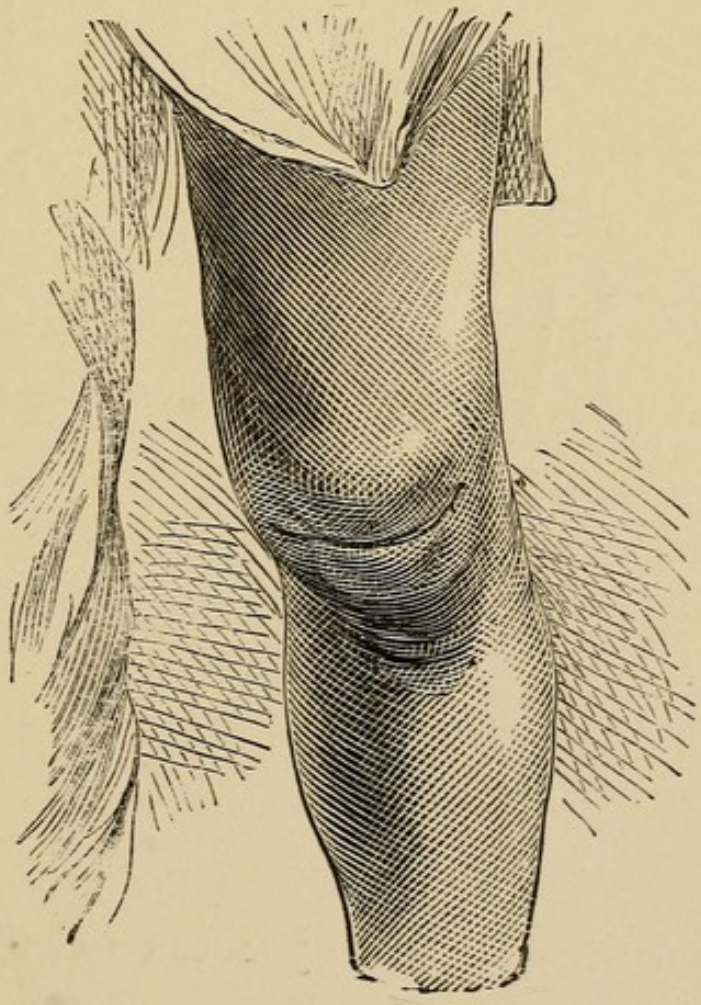
seat of injury with a pad of cotton wool, and immobilized the limb in the same apparatus.

August 1st.—On exposing the limb everything looked healthy—no pain, swelling, redness, or moisture; sutures removed; case reapplied.

August 6th.—The temperature and pulse have been normal throughout. Allowed to get up.

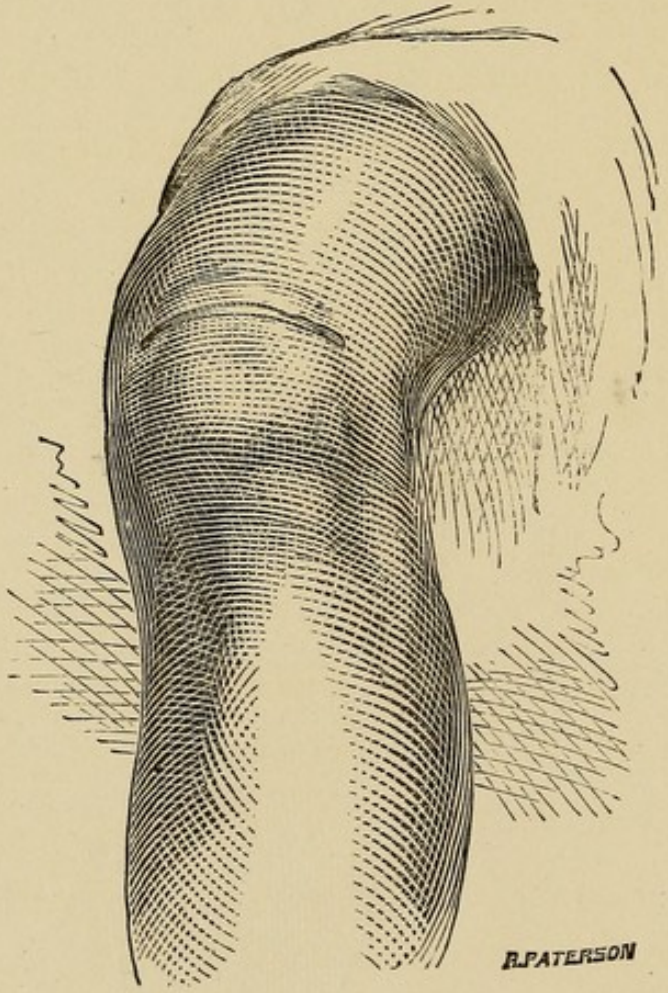
August 20th (thirtieth day).—Patient discharged, with a pale and dry linear cicatrix.

FIG. II.



I have seen this man from time to time since he left the hospital. The apparatus has been gradually reduced piece by piece. He has gone to business for the last six weeks; and now, barely three months and a half since the accident, he can walk with one stick; he can bend the knee nearly at right angles; when

FIG. III.




sitting, can lift the heel from the ground without help, and when doing so you can feel the restored

tendon, at its insertion in the knee-cap, of good average development and solidity.

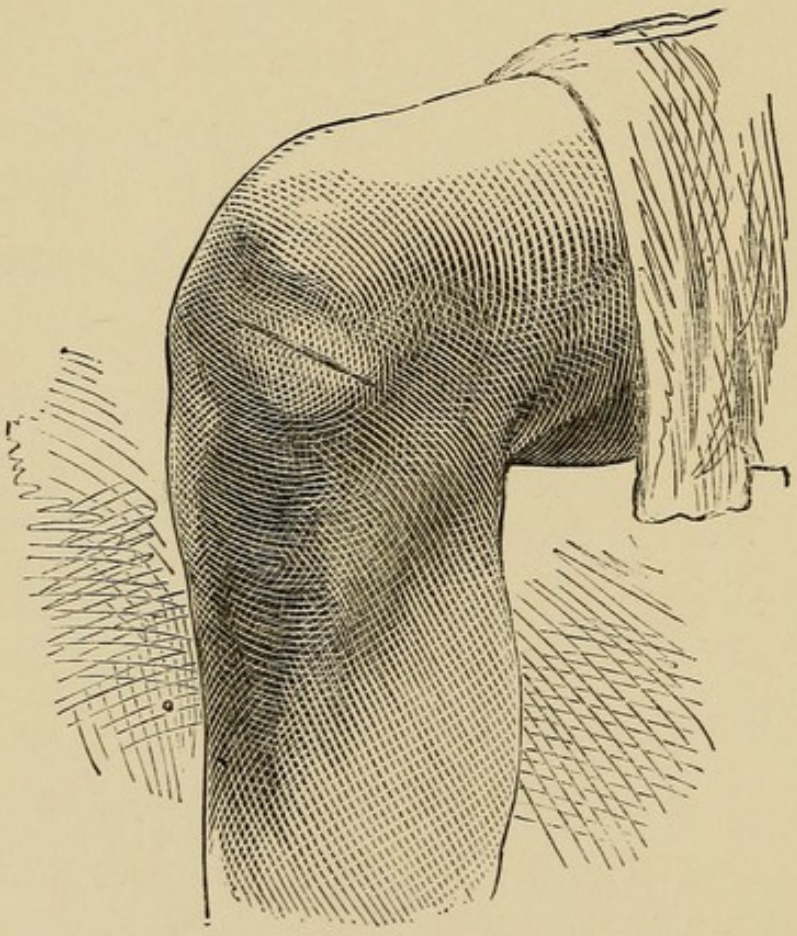
Here is another case of a similar kind, treated identically, and with equally good results:—William Bradley, aged 33, admitted under my care October 13th, 1877, with a clean cut wound, transversely over the centre of the right patella. The wound had been inflicted by a double-handled draw-knife, which slipped while the workman was shaping a spoke. The incision was two and a half inches in extent, and penetrated into the patella to the depth of one third of an inch. The joint capsule was intact, and hæmorrhage had been slight. Our house surgeon, Mr. Wilkins, very accurately adjusted the edges of the wound, and fixed them with two points of silver suture; a piece of lint soaked in styptic colloid was applied to the front of the knee, and over it some picked oakum. The limb was then immobilized with lateral and posterior pasteboard splints, previously moistened so as to admit of accurate moulding under a smoothly compressing circular bandage. Lateral sand-bags were added.

October 18th (fifth day).—The wound was looked at for the first time; it was perfectly healed, the

line of cicatrix scarcely visible, and quite dry, as was also the surrounding pale skin. The sutures were removed, and the limb put up as before.

October 26th.—There has been no rise of temperature or pulse throughout; the cicatrix, barely visible, is not adherent to the surrounding parts;

FIG. IV.



there is no swelling of the knee, which can be bent at right angles. The patient discharged (a

fortnight after admission), with a short back millboard splint and circular bandage.

As I am addressing you, just three weeks have elapsed since the accident; and the man, in ruddy health, can walk without a stick with barely perceptible limp.

You have here two very formidable injuries. In one the knee joint was extensively laid open, and the quadriceps tendon completely divided; in the other, a wound across the front of the knee penetrated some distance into the substance of the patella. The result in both cases has been complete union by the first intention, without the slightest symptom of local or constitutional disturbance. The two cases were identically treated. No water was applied to the wounds, which were at once and completely closed; very efficient means were taken for immobilizing the limbs; and, keeping a close eye on the thermometer chart, I waited, and did not interfere with the healing process. Nothing could have been more simple, nothing more free from pain, nothing more satisfactory in the issue.

My general experience warrants me in saying, that in equally severe injuries the same plan of

treatment, accurately carried out, will be attended with the same results, with exceedingly rare exceptions.

In confirmation of the soundness of the therapeutic principles in question, let me read you a clinical record from the work of one of the Masters of Surgery,—a record no less valuable because the case occurred upwards of ninety years ago. I read from Mr. William Hey's "Practical Observations in Surgery." (1)

"In 1784 a stout young man was brought into the Infirmary at Leeds, with a transverse wound penetrating the knee joint just above the patella. The patient had been working in the woods, and a woodman's bill had fallen from a bough above him, and striking the lowest part of the thigh, had made a transverse wound about two inches in length, dividing the tendon of the rectus femoris close to the patella. A wound was made through the capsular ligament, so large that I could easily introduce my finger into the joint.

"After examining the interior parts of the

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1 Second edition, London, 1810, page 359. The quotation is a transcript, with only the omission of immaterial details.

joint with my finger, that no extraneous body might be left there, I united the lips of the wound by three stitches of the interrupted suture, taking care to lay hold of nothing with the needle but the integuments. I could not remove all the blood from the inside of the joint, for that continued to flow as long as my finger remained in the wound. Neither could I favour the discharge of that blood which remained in the joint, by any method of placing the limb which would answer my principal intention. But I hoped that, if inflammation could be avoided, the extravasated blood would be absorbed without danger.

"That I might keep the knee quite steady, and the injured parts in a state of relaxation, I placed the man in a supine posture, with his leg upon a pillow in a heavy fracture-box, and covered the wound with ceratum saponis, spread upon a pledget of tow. This method kept the anterior parts of the knee, with the rectus femoris, in a state of the greatest relaxation, and the external air was excluded without making any pressure upon the injured parts. I gave directions that all possible care should be taken to prevent

the motion of the joint upon any occasion. The patient complained of smarting in the wound for about half an hour after the dressing, but had afterwards no return of pain. The same treatment was continued, and the ligatures cut out upon the tenth day after the accident. The patient recovered so well, that in the space of four weeks he became able to move about in the ward upon crutches. He regained the perfect use of his limb."

Be good enough to note that in this case, as in mine of George Thomas, the knee joint was extensively opened, and the great tendon completely divided close to the knee-cap. Mr. Hey, like myself, trusted to the extravasated blood being absorbed; in both cases the wounds were accurately closed and the air excluded, the sutures were not touched for many days, and recovery in both was rapid and complete. One material point of difference in the treatment calls for remark. Mr. Hey observes that he made no pressure upon the injured parts. I steadily and uniformly compressed the injured joint with a circular bandage, over an intervening pad of picked oakum and cotton wool, and applied smooth pressure from the toes to the groin.

Let me read you another case from Mr. Hey's work. I do so because the recovery, after a very severe injury, occurred though poultices were employed; the treatment differing in this particular from what you see in this Clinique; but fundamentally it was based on the same principles.

"October 4th, 1798.—Sarah Swordie, aged 18 years, was brought into the Infirmary on account of a wound in the elbow joint, which she had just received from the wadding of a pistol, fired very near her, during the rejoicing for Admiral Nelson's victory over the French fleet in the Bay of Aboukir. The wound was made near the olecranon, through the flat tendon of the extensor cubiti. The parts were contused and lacerated. The capsular ligament was divided so as to admit readily the introduction of a finger within the joint. A considerable number of grains of gunpowder were lodged in the integuments. I examined carefully the cavity of the joint, but could not find any extraneous substance lodged there. Though it is not probable, from the contused state of the parts, that an union by the adhesive process could be obtained, yet in order to diminish as much as possible the size of the

wound and exclude the external air, I drew the integuments into contact by some stitches of the interrupted suture. The young woman being put to bed, I placed the arm upon a pillow, in an extended position, that the wounded parts might be kept in a state of relaxation. The arm was covered with a poultice made of bread and water. An opiate was given immediately, and a gentle laxative the next morning. The young woman was not suffered to get out of bed on any occasion, nor was her arm removed from the pillow, except when gently raised for the purpose of applying the poultice.

"The symptoms of inflammation were trifling, and soon went off. The integuments had been so much contused that the ligatures did not retain the wounded parts in contact for a few days. The edges of the wound then sloughed off; but the size of the wound was diminished by the lips having been retained in contact for some days. The arm became quite easy in the course of a few days.

"On the 14th day I laid aside the poultices, and drew the lips of the wound towards each other with sticking-plaster. The patient regained

the perfect use of the elbow, and on December 5th was discharged cured." (1)

The successful result of this contused and lacerated wound into the elbow-joint, (duly allowing for the judicious opiate immediately after the accident, and the purgative next morning), was chiefly referable to two conditions—first, to the extended position of the limb, allowing of the nearest approximation of the edges of the wound; secondly, to rest.

Mr. Hey has recorded that "the arm was covered with a poultice made of bread and water," and that the only movement allowed was in quietly raising the limb to change the poultice, which evidently encircled the whole limb; it thus exercised a compressing and steadying influence favourable to rest. Several other brilliantly successful cases of extensive joint-wounds are related by Hey, who is clearly entitled to a larger measure of credit than is generally accorded to him, as one of the earliest surgeons who practised excisions of the elbow and ankle.

In the Surgical Clinique of the elder Larrey, are recorded great advances in many departments

[1] Hey Op. Cit., p. 361, 2.

of surgery, in none more so than in the treatment of wounds into the larger joints. (1) He clearly understood, and impressively taught, the value of gentle pressure, of absolute rest and of infrequent dressings. In keeping parts at rest he employed, besides adhesive plasters, a retentive apparatus composed of compresses and pledgets of tow soaked in a mixture of Goulard's extract, camphorated spirit, and white of egg: bandages externally. He specially counsels that, apart from accident such as hæmorrhage or unforeseen displacement, the apparatus is not to be removed before the twenty-first day. He adds, that it is even beneficial to leave it until the cure is completed.

Let me translate the main facts of one of Larrey's cases:—

"At the combat of Salahiez, in Egypt, one of our dragoons received, from one of Ibrahim Bey's Mamelukes, a sabre wound on the shoulder, extending obliquely from the acromion to the anterior border of the axilla. The inner part of the deltoid was divided in almost its whole

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[1] Clinique Chirurgicale exercée particulièrement dans les Camps et les Hôpitaux Militaires depuis, 1792, jusq' au 1829. Par le Baron D. J. Larrey. Paris, 1829. Tome Troisième, 371, *et seq.*

depth, the edge of the acromion was notched, the anterior and internal wall of the joint capsule was wounded to the extent of four or five lines, and the head of the humerus was slightly cut. I proceeded immediately after the combat to dress the patient. . . . We placed a pad surrounded with tow in the axilla, so as to press outwards against the posterior part of the joint. A circular bandage was then applied to the whole limb with light uniform compression. We united the edges of the wound by means of adhesive straps and an appropriate bandage; the fore-arm was placed in a sling, and the wounded man was sent to the hospital at Cairo, where we saw him some days afterwards. According to my instructions, the apparatus had not been touched. . . . I removed it myself for the first time on the ninth day. The wound was almost entirely healed without swelling or inflammation of the limb. After some weeks care and rest, the soldier went back to duty."

Let me direct your attention especially to the fact that Baron Larrey himself, chief surgeon to Napoleon's army in Egypt, stooped down in the ambulance to dress the wounded dragoon,

and followed him to Cairo, to dress him again the ninth day after he received his sabre wound; —one of many lessons in which the great surgeon gave proof of his conviction, that surgical success is a question of gentleness and accuracy of surgical dressing, worthy exercise for a master of his art.

I must ask you to listen to another abstract from the Baron's clinique:—"The coachman of the Marchioness de Grouchy, falling from a height on to the edge of a footpath with his leg bent, had cut through the quadriceps tendon at its insertion into the patella, as well as the integuments covering it. We placed the extended limb in an immovable apparatus, and it remained in it for ninety days; during this time the dressing had only been renewed ten times. The man returned to his employment as a coachman. We have similarly treated with success, in several of our soldiers, wounds of the knee with transverse or oblique division of the patella. These patients having been dressed by us immediately after the accident, the bony fragments have been accurately consolidated, and the movements of the joint have been preserved."

To pass from old to modern times, from the

historic battle fields of Egypt, to the virgin forests of far West America, here is another case of most severe and extensive wound of the knee joint treated on what I have taught you to regard as principles of sound surgery:—

Dr. A. P. Knowlton, of Olmstead Falls, Ohio, records (1) that he was called, December 5, 1872, to see a lad, aged eleven years, who had received a severe wound of the knee. The boy was in the forest with his father, where the latter was chopping wood. The boy had climbed a sapling close by; the sapling bent over, and the boy slipped and fell, coming down in front of the father just as he was bringing down his axe. The axe struck the left knee of the boy, severing the patella, cutting down on the outside of the knee joint, penetrating the joint, with a cut through the synovial membrane about one inch long. After arresting the hæmorrhage and brushing over the cut surfaces with a solution of per-chloride of iron, they were carefully placed in apposition and secured with silver pin sutures. A figure-of-eight bandage was applied to hold the

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1 *American Journal of the Medical Sciences.* Philadelphia, 1876, Vol. I., p. 413.

fragments of the patella in apposition; a long splint was then applied from the axilla down to about six inches below the foot; an inside splint reaching from the lower part of the upper third of the thigh to six inches below the foot; cross-piece below the foot, another one just below the knee, and one just above; a rack was framed around the joint, leaving a chamber from integument to the inside of the rack about one inch in diameter, and this rack was covered with relays of ice-bags. The boy was ordered a one-grain opium pill every four hours; gentle extension and counter-extension was kept up. This treatment was continued for eight days, when the ice-bags were discontinued and the wound dressed with dilute alcohol and carbolic acid. Primary union had been obtained. At the end of three weeks the splint was removed each day and passive motion practised. The lad made a good recovery, and now has complete use of the leg with perfect motion of the knee joint."

The opium pill every four hours was a wise prescription; the sedative influence of the drug is of great service in keeping patients quiet, after severe injuries and operations. Discrimination

must of course be exercised, as to dose and repetition.

Nothing could have been more effective than Dr. Knowlton's appliances for securing the immobility of the limb. The long wooden cradle, with the bags of ice, precluded all possibility of motion.

I look upon the dilute alcohol and carbolic acid employed as surplusage, for it is expressly stated that the apparatus and ice-bags were continued for eight days, when primary union had been obtained. The perchloride of iron solution, which was brushed over the cut surfaces, acted in principle like the balsamum traumaticum the styptic colloid and the allied agents, to which we have already referred.

To sum up the lessons taught by the cases embodied in this lecture: Wounds into large joints, severing tendons and bony processes, repeatedly, and I believe as a general rule, do perfectly well, if (in the absence of foreign bodies within them or after their extraction) their edges be accurately approximated, air excluded, and the trunk and limbs kept as nearly as possible in a state of absolute quiet. Once these indications

are fulfilled, the surgeon cannot be too watchful, or too patient. The dressing of such cases is a work of the nicest surgical art, and a test of that patient confidence which only experience teaches. Act energetically and precisely, at the right time; watch unceasingly; and do not meddle without good and sufficient reason.

# LECTURE IV.

## CONTENTS.



Gentlemen,—

Wounds of the head are, for obvious reasons, of the first importance. They have engaged the special attention of leading surgeons in all times

and countries, and some points connected with their treatment are still matters of keen controversy.

Some wounds of the head—especially those directly, or in their remote issues, affecting the brain—differ materially from wounds in other parts of the body. In this course of lectures, I shall restrict myself to bringing before your notice a few typical cases of wounds of the scalp, and fractures of the vault of the cranium, unattended with symptoms of organic cerebral injury.

A simple wound of the head, though of considerable extent and in a critical position, was presented by the little old gentleman, who kindly attended in the theatre last term for your instruction. He consulted me about two months previously for a cystic tumour, about as large as a hen's egg, in the right temporal region. The covering skin was very red, tense, and painful. After removing the cyst with the knife, I dried the interior of the wound with a fine sponge which had been previously well squeezed. The edges were then very accurately approximated, and kept so with a few strips of lint soaked in styptic colloid. A few turns of bandage completed the dressing;

when I removed it, at the end of five days, there was not a drop of discharge; adhesion was perfect, and afforded a simple but complete illustration of the surgeon's first intention in treating wounds—to secure direct union. All that is visible of the cicatrix is a very fine pinkish line, extending upwards about two inches from, and just in front of, the right ear.

A more formidable lesion, treated on the same principles and with equally favourable result, was that of Ann Hand, now in Ward 5. She is 55, but looks much older. She had fallen down some steps, on to her head, into the cellar, when she was brought into the Hospital. Her scalp presented a wound 6½ inches in length, a little to the right of the middle line. The wound was gaping, and the bone was exposed in one small spot. There had been considerable hæmorrhage, and the patient was suffering from slight concussion. The edges of the wound were accurately brought together by Mr. Wilkins, and secured by five points of silver suture. A large pad of dry lint supported by carefully applied bandage, with considerable pressure, completed the dressing. The patient rallied in the course of a few hours, took milk and ice plentifully, and was quite

free from pain. The wound was not looked at until the completion of the seventh day. It was then perfectly healed throughout, the cicatrix appearing as a fine brownish line, movable on the subjacent parts as was also the healthy looking and feeling skin in the neighbourhood. Not the slightest irritation was visible at the points of suture, of which four were now removed ; the middle one being left as a precaution. The lint pad and bandage were re-applied. The eleventh day after admission the fifth suture was removed ; it had not produced any irritation. A bandage was lightly applied, and the patient (in perfect health) discharged.

Here are the notes of a much more serious case, which has been before you several times.

The man Thomas Moran, a bricklayer's labourer, aged 55, was admitted to Ward 3 on September 15th, 1875. While he was at work just previously, a brick fell from a considerable height upon his head, making a Y-shaped scalp-wound about two inches and a half in length, and situated rather above the middle of the left parietal bone. The flap of the wound being turned back, a Y-shaped fracture became visible, with its centre depressed to one-third of an inch ; the sides of the fracture

sloping evenly towards the central and most depressed point. The man seemed little affected by the accident, and had no idea of its serious nature. The edges of the wound, admitting of easy approximation, were brought together and dressed with dry lint; and for the first fortnight the patient was kept perfectly quiet in bed, on milk diet, with an ice-bag on his head. No signs of constitutional disturbance appeared, and the man was discharged at the end of seven weeks, to use his own words, "in as good health as ever he was in his life" The wound was then quite healed, and the area of the depressed bone measured one inch and a half longitudinally, and seven-eighths of an inch transversely; its depth was three-eighths of an inch in the centre. (1)

I took no notice of the fracture, but proceeded at once to close the wound, which was dressed with dry lint. Local and constitutional rest, milk diet, and an ice-bag on the head constituted the treatment, until the wound was firmly healed and the patient convalescent.

A more serious case was that of Henry Haddon,

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[1] I saw this patient some months after the accident, and he continued in perfect health.

a machinist, aged 25, who was admitted to Ward 1 at 11.20 p.m. on the 25th of September, 1875. A few minutes previously, in a street row, a brick had been thrown at his head, producing a wound an inch in length, over the left temporal ridge, in a line above and in front of the ear. The hæmorrhage was considerable. The probe passed into a very abruptly punctured fracture of the skull; the amount of depression being half an inch, and the edges of the bone, on one side at least, being quite perpendicular. Mr. C. R. Keetley, our house-surgeon at the time, to whom I am indebted for the notes of the case, made a memorandum on the spot to the effect that, in Haddon's fracture, a small piece of bone appeared to have been driven right in. The man was quite sensible, though faint from loss of blood. He was put to bed, with an ice-bag on his head. At 8.30 next morning, a little headache was complained of; the pupils were even; temperature 101°. A magistrate took the patient's depositions at his bed-side in the afternoon.

September 27th, morning. Pulse 80; temperature 98 deg. There was a thin drab fur on the dorsum of the tongue. The bowels were confined.

He had slept well; was very hungry. The wound was healthy. His eyes were slightly swollen.

The bowels acted the next day. The wound gradually healed, under dry lint dressing. On October 9th (a fortnight after admission) the ice-bag was left off, a flannel cap ordered to be worn, and the man allowed to get up. At the end of another fortnight the man was discharged in perfect health; the cicatrix was quite sound, and the depression at the seat of fracture admitted the end of the little finger, which did not seem to touch bone at the bottom. (1)

The third case of compound depressed fracture of the skull which I have to bring before you is that of T. Smith, a joiner's labourer, aged 25. He was stooping down at his work, when a brick fell on his head from a height of thirty feet. When admitted to Ward 1 (4.15 p.m., October 15th, 1875), half-an-hour after the accident, he was quite sensible. A wound on the left side of the head was bleeding freely; corresponding to it was a depressed fracture of the skull, the depressed piece of bone being horse-shoe shaped and situated near

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[1] I saw this man seven months after the accident, in perfect health.

the middle of the lambdoidal suture. The depressed surface was about one-eighth of an inch below the surrounding bony level. No head-symptoms. Pulse 80; temperature 99°; respirations 24. The edges of the wound were approximated and dressed with dry lint. An ice-bag was ordered to be kept on the head constantly.

October 16th. Temperature 99°; pulse 72; respirations 20. Patient perfectly sensible. He had taken plenty of milk. He was ordered to have an ounce of castor-oil.

October 17th. Has slept four or five hours in the night. The bowels have acted. Temperature 101·°; pulse 104; respirations 22.

October 18th. Temperature 101.6°; pulse 76; respirations 25.

November 19th, morning. Temperature 99.2°; pulse 84; respirations 22. There were still no symptoms of nervous lesion or constitutional disturbance. 7 p.m., temperature 104.4°; pulse 104; respirations 32. He had a rigor half-an-hour ago. The bowels not having acted for some days, a full dose of castor-oil was administered; the bowels were then freely relieved. The temperature rapidly

fell to the normal standard, and no other untoward symptom occurred.

December 8th. The patient had continued perfectly well, and for the last month had acted as assistant porter in the hospital. He was now discharged, and I made the following note :—" The length of the cicatrix is one inch and three-quarters. The depressed portion of bone measures one inch and one-eighth, by seven-eighths of an inch. The depression is deepest in the centre, where no bone can be felt. The man looks perfectly well, and says that he is so. (1)

These three cases have several characters in common. In each, the scalp was wounded and the skull broken; in each, the fractured bone was depressed. In all the cases, the offending cause was a powerful one, presumably sufficient to agent considerable intra cranial extravasation. Two of the men had each had a brick fall on his head from a considerable height; in the third a brick had been flung at the temporal region in a street row.

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[1] I saw this patient upwards of twelve months after the accident. He continued perfectly well, and had never missed a day's work. Three small pieces of bone had worked through the cicatrix, which was quite solid, pale, and painless over the depressed portion of the skull.

In neither of the cases were brain symptoms present. In treating them, I dismissed the fracture from consideration, closed and dry-dressed the wounds, kept the patients at perfect rest with large ice-bags on the head, fed them on iced milk, and watched the thermometer chart closely. Recovery was practically uninterrupted in each case, and was proved to have continued so, for many months after the patients were discharged from the Hospital.

As the special object of this series of lectures is to study the treatment of wounds, the histories of cases are condensed with special reference to that point. Many matters of collateral, yet very great, interest are unavoidably passed over; but I must notice, though briefly, the treatment of the fractures, which in point of fact were contused and lacerated wounds of bone. Many surgeons would have trephined in each case; the majority probably would have done so in Henry Haddon, in whom the brick had driven a small piece of bone right in.

The use of the trephine in fractures of the skull has been a fertile source of contention amongst the masters of surgery, especially since the

days of Pott and Desault, which are amongst the most glorious in the chronicles of surgical science and art. The Englishman was for boring, the Frenchman for watching. In the main, the schools of the two nations were long faithful to their respective traditions—the French one singularly so. But Englishmen, so early as Abernethy and Astley Cooper, hesitated to follow Pott's heroic counsels; and we have more and more assimilated our practice, in this important department of surgery, to the conservatism of our French colleagues.

Nearly everyone now admits that in a depressed fracture of the skull, without wound and without brain symptoms, the trephine should not be used. Why should the mere existence of a wound make all the difference when it admits of being healed simply and rapidly? After having seen much of the use of the trephine in my own practice and that of others, after wide reference to the authorities in civil and military practice, while feeling the necessity of precise and extensive statistical study of the question, I am clearly of opinion that in compound and depressed fractures of the skull, without brain symptoms, the trephine should not be used. Prolonged local

and constitutional rest is the most trustworthy principle of treatment.

In approximating the edges, in such wounds as those under consideration, I am careful not to close them completely; but to leave a dependent orifice so that any fluid may escape, and not be pent up with the risk of finding its way through the fissure into the cavity of the cranium.

As usual, I preferred dry dressings, carded oakum, dry lint, or cotton wool, as most favourable to healing. Thermometric observations are of the very first importance in pursuing the line of treatment which I have traced out to you. It is impossible to exaggerate, not easy to estimate fully, the clinical value of the thermometer to the student-surgeon. It was noted in one of the cases that the temperature suddenly rose from 99.2° in the morning to 104.4° in the evening; the patient at the same time had a rigor. The bowels were constipated; so soon as they had been relieved, by a full dose of castor-oil, the temperature fell and all progressed favourably.

The persistent ice-bag and iced milk diet were of the greatest service. Without going into the question of stimulants, which is just now

such a fertile—might we not say fashionable —matter of dispute and exaggeration, there can be no doubt that, after severe injuries to the skull, stimulants should be forbidden.

In further illustration of the therapeutic principles here enunciated, let me read you from my notebook the histories of two other compound and depressed fractures of the skull, the subjects of which have often been before you.

On the 22nd November 1875, Edward Armitt was admitted into the Queen's Hospital under my care. He had a transverse wound about an inch and a half in extent at the back of the head, a little to the left of the middle line, and just below the suture between the occipital and the left parietal bone. The wound, which had been inflicted with a cabman's metal badge, led directly down to the skull; this was fissured, and the edges of the bony cleft were distinctly felt to have been driven in. The man was perfectly sensible, but the right pupil was dilated, the corresponding eyelid drooped, and partial paralysis of motion in the right arm was well marked. The treatment prescribed was absolute rest in bed, low diet, close attention to the bowels,

dry dressing of the wound, and application of ice-bag to the head. At the end of nine days the wound had healed, and the symptoms of compression, after steady decrease, had completely disappeared. The patient was discharged on the 10th December, and resumed work six weeks after the accident. I saw him last week, in perfect health. The depression in the skull is still quite perceptible, but the man has not lost an hour's work, and has shown no symptoms traceable to the injury.

On May 11th, John Curtis, aged 46, was admitted under my care in our accident ward. He had been thrown out of a cart, in rapid motion, on to some stones. The greater part of the right half of the scalp was turned back, and much periosteum had been stripped from the frontal and left parietal bones, in each of which was a fracture with depression: one fracture, immediately above the parietal ridge, was characteristically punctured and depressed—a circular piece of bone, about the size of a split pea, having been firmly driven in to the depth of one-eighth of an inch. The man was barely conscious, and could only give a very imperfect account of the accident. When I saw him at 11.10 p.m., about two hours after admission, the pulse was 76;

respirations 22; temperature 99.8°. After carefully cleansing the wound, its edges were brought into contact, except at a small dependent point, with eight points of silver suture; an oakum dressing and gently compressing bandage were applied, and a large ice-bag all over.

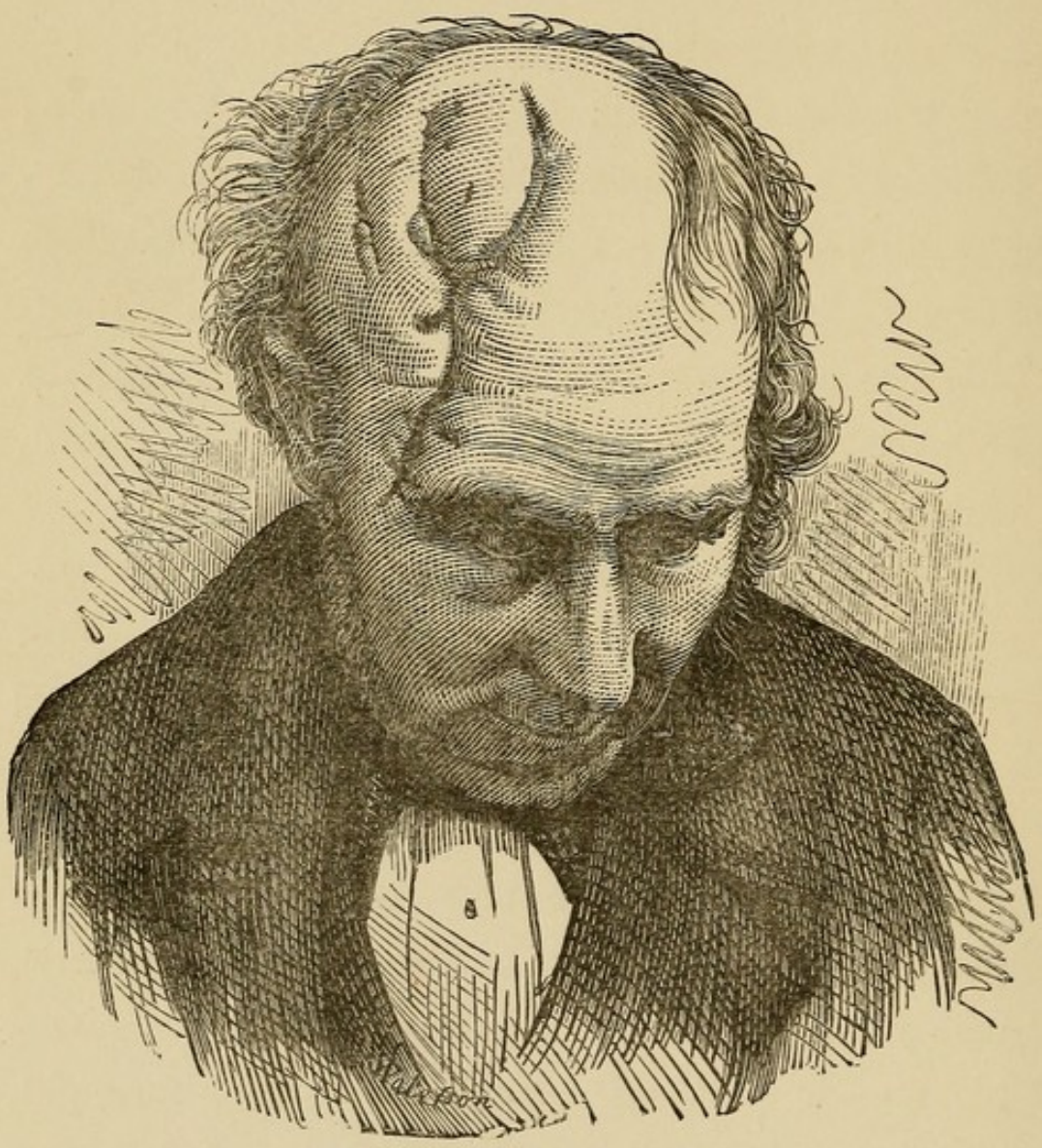
On the following day (May 12th), 9.30 a.m., pulse 84; respirations 22; temperature 101.2°. 9 p.m., pulse 108; respirations 28; temperature 103°. After this visit, I noted numbness and impaired motor power in the left hand, with complaint of headache. Ice-bag to be persistently continued, and an aperient draught prescribed.

May 14th. Dressing changed; discharge considerable, but wound looking very well; the lower half of it healing by the first intention. Pulse 80; respirations 20; temperature 101.2°. Pain in head and numbness in hand gradually decreasing.

From this date, the progress to recovery was uninterrupted. The man was discharged June 21st, barely six weeks after the accident. He resumed his regular work as a carter in another fortnight, and has ailed nothing since. When I last saw him (September 28th), he was in vigorous health. Two splinters of bone were extracted about two

months ago from the cicatrix, which throughout is pale and painless, the points where the sutures were inserted being scarcely perceptible. (See Fig. V.)

FIG. V.



That compound fractures should be reduced to the condition of simple ones by closing and

promoting the cicatrization of the wound, is even more generally true in the treatment of compound fractures of the limbs than of the skull.

A compound fracture of both bones of the leg from direct violence occurred in the man before you; and you perceive, from the V shaped cicatrix, what a large flap of skin was turned down in front of the solution of continuity of the tibia. I saw the patient within half an hour from the occurrence, reduced the fracture at once, and fitted the skin-flap into place, keeping it there by strips of dry lint, one of which was successively laid on the other as it became soaked with blood. Softened millboard splints, from the middle of the thigh down to embrace the foot, were the basis of the retentive apparatus; two similar splints being placed at the back, from the same point above, to within three inches of the heel-bone; a nicely-compressing circular bandage keeping the whole firmly together. I merely starched the bandage, while applying it in front, to keep the case together when it became necessary to cut it open.

The patient had not a single bad symptom; the apparatus was not touched for ten days, when the wound was wholly healed,

consolidation, of the then simple fracture, proceeding in the usual course. Here, repair of the wound in the soft parts and in the bone occurred by one and the same natural process, aided by the same means,—exact co-aptation of the divided surfaces, exclusion of air, and absolute immobilization persistently maintained. The strips of lint soaked in blood, laid across the wound, and allowed to dry over it, call for comment. The practice is an excellent one; its origin is often attributed to Sir Astley Cooper, but unjustly so. John Hunter, after calling attention to the healing of small wounds without any dressing, by blood coagulating and drying into a scab, observes:— "Even compound fractures with a small opening, if suffered to proceed in this manner, will often give but little trouble. (1)" But the merit of establishing the principle in question, as a canon of practice in the treatment of severe compound fractures, belongs to John Bell, "When after a more terrible accident, the limb being torn by machinery, or by carriages passing over it, the laceration is great . . . . . the sides of the wound are to be generally supported by laying

[1] John Hunter's Works, Palmer's Ed., p. 429.

small and thin pieces of lint on each side of the wound; these pledgets of lint are soon soaked with blood, which cakes and adheres to the open part of the wound. By making small rolls and compresses of linen and soft lint, which you lay upon the edges of the wound (at those particular points where you apprehend a gaping of the lips, or where you apprehend that suppuration and cavities will form), you keep the parts very close , . . . you give as much firmness as possible with the many tailed bandage. The steady firmness with which you support the parts helps the adhesion, prevents suppurations, and hinders an afflux of blood to the limb." (1)

As a very striking illustration of the practical soundness of those instructions, and generally of the therapeutic principles embodied in these lectures, let me briefly recapitulate the main facts in the history of the Midland Railway porter, John Smith, who came in from Selly Oak for your inspection a few days ago. He walked with a slight limp, it is true, but briskly and without a stick, and could bend the knee on the injured side nearly to a right angle.

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[1] The Principles of Surgery, Edinburgh, 1802, vol. I., pp. 653-4.

I happened to be in the hospital when this man was brought in; he looked death-like, was nearly pulseless, and the surface of the body everywhere felt chilly to the hand. (1) The man had been carried up on a stretcher from New Street Station, whither he had travelled, partly in a cart on the common road and partly in the guard's van on the line, a distance of some fifteen miles, since a laden coal-truck (weighing about eight tons) had knocked him down and passed over his left thigh, at the junction of its middle and lower thirds. His clothes were torn to rags and soaked in blood, at the seat of injury; they were carefully removed, while hot bottles, wrapped in flannel, were packed along the sound limb and the trunk, warm blankets to cover, and teapoonsfuls of warm tea given to the man, as his head was kept low on the mattress. I was told that the district surgeon of the Railway Company had sent the man in to undergo amputation of the thigh, and the attendants were preparing the instruments in the theatre, when I interposed. Nothing could look more

[1] Precise thermometric observation was not made at the moment of admission.

formidable than the injury—short of actual crush of the whole limb. It lay on the bed helplessly everted, the outer border of the foot flat on the mattress. About three inches above the knee, the thigh was distorted, the soft parts in front destroyed to an extent nearly as large as the palm of the hand; the bone was crushed into many pieces, which grated loosely on the least touch. The structures in the popliteal space and the knee-joint were sound; I could feel pulsation distinctly, though feebly, in the anterior and posterior tibial arteries, and I resolved upon an attempt to save the limb.

After gently straightening the limb (which was nearly three inches shorter than its fellow), I confided the foot to an assistant to make gentle extension, and applied myself to the seat of injury. Manipulating it, and the parts above and below, with both my hands spread out, so as to grasp smoothly and firmly, I moulded the parts into shape; no piece of bone was taken out; where the skin was least damaged and could be brought together, I secured the edges with points of silver suture, and strips of lint soaked in styptic colloid. Where the skin was much bruised I left it, and introduced a drainage

tube, as thick as a goose-quill, into the seat of fracture through the opening (as large as a half-a-crown), which was left in front, after the parts were approximated as much as possible without dragging upon them. I now packed the seat of injury with a layer of carded oakum carefully teazed out, over it cotton wool which enveloped the whole limb, and mill-board splints from the toes upwards, embracing the pelvis. In applying the outward compressing bandage, care was taken to allow the drainage tube to project outwards. Long heavy sand-bags were then applied on both sides of the limb, and a narrow one, weighing about 3lbs., was placed in front, from the groin to just above the seat of injury.

The man rallied satisfactorily, was kept gently under the influence of opium, and the apparatus not touched for ten days; after that every week. When it was changed, pledgets of lint or cotton wool were employed to remove any discharge from around the wound; but neither water nor lotion was ever allowed to approach it. Dry dressing was the same each time, carded oakum and cotton wool, nice adjustment of compresses and steady pressure. Progress was uninterrupted, and the man

could walk on crutches at the end of two months. There is barely an inch shortening, only one small bit of bone has worked through the cicatrix which is perfectly sound and painless. The man can bend his knee and walk long distances. Such a case needs little comment after the other cases which have occupied our attention this morning; it cannot fail to impress itself upon you, as a striking illustration of how satisfactorily surgery may be practised with simple methods and painstaking care. The first essentials for success are, a clear appreciation of proved scientific principles of treatment, accuracy, gentleness, and thoroughness in carrying them out.

# LECTURE V.

## CONTENTS.



Gentlemen,—

Before proceeding further with an examination of the principles which should guide you in the treatment of wounds, it will be convenient to say something about the materials and apparatus employed in the cases already brought before you.

Of the necessity of rest, as nearly absolute as possible, it is impossible to say too much. It is not enough, for a man with an open knee joint, to be put to bed with an ordinary splint

or two, such as a couple of lateral wooden, or leather, or gutta-percha splints extending from mid-thigh to the middle of the calf. If the splints do not fit perfectly, or if they be not strong enough, the least movement of the patient in coughing or using the bed-pan, even a trifling muscular twitch, is enough to produce discomfort; this causes the patient to move a little, and induces the surgeon to endeavour to make the apparatus more comfortable; hence more movement, pain, constitutional irritation, and the whole chapter of accidents. The first essential for rest is comfort, as nearly perfect as possible; to ensure this, in the assumed case of open knee, you must fix the entire limb from the toes to the crest of the ilium;—of open elbow, from the tips of the fingers to the root of the neck. You must fix every joint in the injured limb, especially the one above the seat of injury; you must neutralize every muscle by gentle controlling pressure. For this object you require (after having attended to the wound) to mould to the limb such a case as shall accurately take its shape, and become reliably solid without unduly pressing at any one point.

The limb having been enveloped in cotton wool, plaster of Paris splints and bandages may be applied outside it. A plaster of Paris case admits of being accurately fitted, and of being made strong enough. It is, however, more difficult to open, and does not admit of such easy refitting as the millboard apparatus.

All circumstances considered, I have found millboard the most handy material for immobilizing a limb. Take care that it is in the rough state, not rolled and glazed. Do not cut the splints, but bend and break the rough millboard in required lengths and widths over the edge of a table or bench; the ragged uneven edges facilitate the moistening of the material, and bevel off smoothly when moulded by the hand, as the bandage is being applied. The splints are greatly strengthened by putting two thicknesses of millboard together, with an intervening layer of bandage and starch. Starch may also be applied with advantage on the front and sides of the millboard apparatus, while it is being constructed. It gives unity to the case, particularly useful when it is cut up in the middle line in front; the edges admit of being pared and more cotton wool interposed to allow

for reduction in size, and to keep up even pressure. It is needless to starch the apparatus at the back; doing so is often a source of discomfort, causing adhesion to the bed-clothes. Starch thus employed is merely an additional means of consolidation; the great instruments in giving immobility are the millboard splints and intersecting layers of bandage spirally applied. I never use reverses, which, though pretty, are unstable, and do not so readily admit of even pressure as can be exercised, by applying a nice soft roller in figures of eight up and down the limb.

Let me repeat my warning against the deceptive uselessness of starched bandages as such. They are practically powerless in immobilizing a limb.

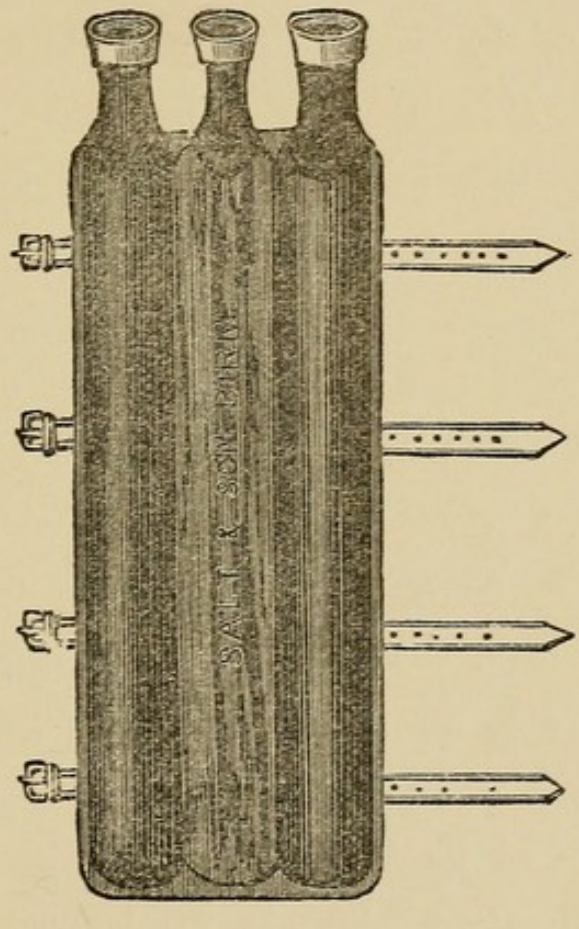
In the absence of millboard, ordinary bandages, and cotton wool, use tow for padding, paper for splints, and tear up an old sheet for bandages. Fold the paper of the required width and thickness, stick the layers together with paste made by boiling flour and water, and spread the same material between and over the bandages.

Sand or earth bags are of the greatest service in immobilizing a limb, by being packed closely on each side of it. Small bags may also be placed in front of the limb lengthways, or across; their even pressure is very comforting. and has a great effect in preventing and neutralizing muscular contraction. One great advantage of sand or earth bags is that the materials for making them may be obtained anywhere in town or country, and that they require no skill in preparation—very little in application.

On my suggestion, Messrs. Salt and Son (1) have manufactured an india-rubber pillow, which is of great service and comfort. The pillow is divided longitudinally into three compartments, of which the middle one is filled with water, and the two lateral ones with fine dried sand. A strip of thin board, with straps under the water compartment, admits of the lateral sand partitions being brought close round the limb, and the whole being suspended to an ordinary cradle or in a Salter's swing. By means of this pillow, a patient with a broken thigh or an open knee joint may lie on

[1] This firm is prepared to supply any of the materials recommended in these Lectures.

an ordinary feather bed, and have a very suitably firm and easy basis of support for the injured limb. The elasticity of the central water compartment is a source of great comfort, and the long lateral sand bags give very efficient support.




Oakum was used in our cases as a compress, according to the practice for which we are indebted to the surgeons of the American Civil War. Consisting as the material does of picked ship rope, its use is no innovation in

principle; for tow as padding or pledgets, and tar as a dressing, were popular in the treatment of wounds ages ago. Setting aside all questions of priority, there can be no doubt that picked oakum is a very good dressing; its anti-putrescent qualities make it specially valuable when wounds are discharging, and the carded oakum prepared by Messrs. Southall, and known as Tenax, has the advantage of being softer and more absorbent than the ordinary oakum of commerce.

To prevent the oakum adhering unpleasantly to a wound or cicatrix, this may first be covered with a layer of gauze or muslin. A good plan is to make muslin bags, which need be only lightly stitched, to hold the oakum; this must first be well teazed out, as it makes a softer and more absorbent pad when loose.

If a wound be discharging through a drainage tube, a convenient plan is to leave this rather long, so as to project between the layers of bandage, or through a hole made for it. An oakum pad outside the bandage, and against the end of the drainage tube, catches the discharge, and may be changed, as frequently as necessary,

to ensure the patient's cleanly comfort without the least disturbance. After removal of the breast, for instance, if union by the first intention be not complete, a muslin and oakum pad can be placed in the arm-pit, under the night-dress, and changed at any time without even the most trifling displacement. When ladies object to the smell of tar, the muslin bags may be filled with sawdust or tow scented according to taste.

These injunctions for gentle manipulation and for the patient's comfort may seem tedious, but they are of the very essence of success.

Cotton wool was employed in nearly all the cases mentioned in these lectures, and it is so very valuable an agent as to deserve special consideration. I have used it for many years, and grown more and more partial to it with increasing experience. M. Alphonse Guérin, by his communications to the French Academy of Sciences, and his hospital practice, has greatly contributed to generalize the use of cotton wool as a surgical dressing; but the claim made on his behalf by M. Raoul Hervey cannot be conceded,—that to Guêrin belongs the merit of discovering a new method for the treatment of wounds, in the

application of cotton wool. I am not about to engage in a question of priority for its mere historical interest. It is to an examination of accumulated clinical evidence, which has unfortunately been almost wholly overlooked, that I invite your attention for its practical surgical interest.

Seutin and Velpeau, who, Larrey alone excepted, have done more than any other surgeons to demonstrate the value of immovable apparatus, made use of cotton wool many years ago; but the earliest and best work in point, which has come under my notice, is that of Matthias Mayor. He was enthusiastic in praising the merits of cotton wool for surgical purposes, especially in the treatment of large numbers of wounded persons in great hospitals. He thoroughly understood and taught the "resolvent" and anti-phlogistic qualities of the agent, in the treatment of violent contusions and of erysipelas. He was fully alive, also, to the importance of the infrequent dressing of wounds, and to the superiority of cotton wool, in the class of cases above described, over cold lotions, fomentations, and poultices. But Mayor had one misfortune: he lived, worked, and taught

at Lausanne. Scarcely anybody seems to have thought it possible, that a great surgeon of truly original genius could grow up among the chestnut trees of a Swiss valley; and Mayor has been practically forgotten.

Nearer home, and in more recent times, Burggraeve, of Ghent, (1) became a firm believer in, and a forcible demonstrator of, the surgical advantages of cotton wool. "It moulds itself exactly," he said, "to the limb, and absolutely excludes the air" ("et entretient l'hermétisme le plus parfait"). "Cotton wool," he added, "admits of methodical compression being applied, and thereby prevents inflammation; moreover, it exercises a very marked sedative action." Burggraeve further taught the advantages of cotton wool applications after operations on the eye; and even in so severe a case as a gun-shot wound of the thigh, not requiring immediate amputation, he advised immobilizing the limb in a cotton wool and pasteboard apparatus, and disturbing it as little as possible.

In one very important particular Burggraeve's practice marks a great advance. A distinguished

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[1] Nouveau Systèmes de Pansements Inamovibles. Bruxelles, 1853, Génie de la Chirurgie. Gand, 1853.

pupil of, and firm believer in, Seutin, he put to the best uses the resolvent and antiphlogistic action of compression.

M. Guérin believes in all those virtues of cotton wool, and something more. He advocates its employment in the treatment of all wounds, whether due to surgical intervention, or occurring as complications of fractures, articular lesions, &c. The doctrine of the absorption of miasms by wounds, as a producing cause of purulent infection, is the busis of M. Guérin's method. Its therapeutic principle consists in the filtration of air by means of wadding. He attaches great importance to the infrequency of dressings and to the elastic compression of which the cotton wool treatment admits.

In further exposition of M. Guérin's treatment I shall translate to you the abstract of a communication which he made to the Academy of Sciences, May 18th, 1874:—"The cotton wool dressing *(pansement ouaté)* differs from exclusion of air *(occlusion)*. Cotton wool, while preventing putrid fermentation, does not offer any obstacle to the penetration of air. In effect, the pus of wounds dressed with cotton wool presents the same chemical and physiological transformations

as pus directly exposed to the air; cotton wool only bars the passage to the parasites and other germs of fermentation contained in atmospheric air. M. Guérin does not reject the explanation which M. Pasteur has given of this fact in saying that cotton wool prevents fermentation by absorbing the liquid parts of pus." (1)

M. Guérin lays it down as a rule that a wound once dressed with cotton wool is not to be dressed again until the twentieth or twenty-fifth day. He very much objects to such dressings being carried out in the wards, and urges that the operating theatre is the proper place for them. His house surgeon, Monsieur Raoul Hervey gives, amongst many other cases, one of gun-shot injury of the shoulder, necessitating amputation at the joint; the soft parts were so extensively destroyed that no cover could be obtained. Cotton wool dressing, applied with powerful compression, to the stump and the whole of the chest, was not changed until the twenty-first day after the operation; the second dressing, nineteen days later. The patient never felt the slightest symptoms of pain or uneasiness,

[1] Archives Générales de Médecine, Juillet, 1874, p. 117.

suppuration was scanty, and recovery perfectly satisfactory.

Here is another of M. Guérin's cases:—A young man, aged 18, was attacked by the Prussians, September 10th, 1871. He received two wounds, one on the head (parietal region), with depression of one edge of the bony fissure; the other wound being a clean cut through the olecranon,—the elbow joint was largely laid open and the articular surfaces visible. The patient was carried to the Hospital St. Louis, and M. Guérin attempted the preservation of the arm in a cotton wool apparatus. The hand, fore-arm, and arm were enveloped in numerous layers of cotton wool with methodical compression equally distributed over the limb; the fore-arm was semi-prone, the elbow flexed. No complication occurred in the wound of the head. The patient left his bed the twelfth day (September 22nd), and remained forty-two days in his apparatus without experiencing the least pain or inconvenience. The note on the 21st of October is—"Nearly cured." (1)

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1 For the details of Monsieur Guérin's practice, I am indebted to a series of articles on Pansements à l'ouate, by Raoul Hervey, in Archives Gènerales de Mèdecine, 1872, pp. 319, 417, 685, *et seq.*

M. Terrier states that the pus and serum, which are situated in the deep parts of the apparatus, undergo chemical, but not putrid, decomposition; they become oxydised, and do not ferment; they then give rise to odorous gases, which pass through the cotton wool.

Without entering upon a discussion of M. Guérin's theory, his employment of cotton wool, after the experience of Mayor, Burggraeve, and other eminent surgeons in Europe and America, furnishes additional reason for the more extended trial of cotton wool dressings. They have been employed for many years in this clinique with the greatest benefit; but I have been in the habit of adding millboard splints to ensure immobility; while advocating infrequent dressings, I have not pushed the practice so far, as not to look at a wound into a large joint for many weeks.

Two cases now in No. 10 Ward are fair examples of the benefits to be derived from cotton wool dressing within an immovable apparatus. Frank Downing, aged 47, attended as an out-patient the 24th ult. A fortnight previously he had severely bruised the end of his right middle finger under an iron weight. He went on with

his work for about ten days, when the finger became very painful. He still worked on, but the swelling and severe pain of the hand compelled him to stop and seek relief. I found the finger nearly twice its natural size, very tense, and fixed in a curved position, like a baked sausage. It was of a dusky red colour, which extended over the swollen back of the hand to just above the wrist; the radial and ulnar arteries were very tense, and the man could feel every throb in the end of his finger. He was easy, however, the moment the arteries were compressed. The man was put to bed, and, on my instructions, our house surgeon, Mr. R. B. Wilkins, covered the hand and fore-arm with cotton wool, bandaged each finger separately and the hand with steady uniform pressure; a pad having been placed over the radial and ulnar arteries at the wrist, the compressing bandage was then extended to the elbow. With the latter joint bent at an acute angle, the fore-arm semi-prone, and the fingers of the right hand touching the left shoulder, the limb was bandaged to the trunk. The temperature, which was 101.3° the evening of admission, fell in forty-eight hours one

degree; on the seventh day it was at the precise standard of health. Finding on the third day that the bandages were loose, through rapid subsidence of the swelling, I removed them. The fore-arm and hand were pale, shrivelled, and cool; the finger was little more than its natural size, and its joints could be flexed and extended; the pad at the end of the finger was dark grey over a small circumscribed patch. The limb was again rolled in cotton wool and immobilized in paste-board splints with compressing bandage. Only milk diet had been allowed hitherto; meat diet now ordered. The seventh day after admission you see the hand perfectly healthy, excepting a small slough in process of separation in the original seat of injury at the tip of the finger; cotton wool and pasteboard apparatus re-applied. According to very common practice, when I first saw this man an incision would have been made into the tense finger, and poultices applied. How often do the tendons of such fingers slough, the mischief extending to the hand and fore-arm, entailing matting of tendons and life-long disablement! We have relied, with the usual happy result, on rest, pressure, and physiological position

to control the circulation, and promote absorption of extravasated fluids.

Here is another case, in the same ward: John Reading, aged 26, was admitted with an oblique wound, of some days' standing, over the first joint of the left index finger. This was swollen, hot, and tense, and so was the hand; the temperature was 100.4° Under the same treatment as in the above case, confinement to bed, immobilization and compression under cotton wool, pasteboard and bandage, the temperature has fallen in two days to 99°, the swelling of the hand has disappeared, the finger is little more than its natural size, and can be flexed and extended. The same apparatus re-applied, and milk exchanged for meat diet. I shall not trouble you with much comment. If a junior amongst you be disposed to look upon those two cases as trivial, because only affecting fingers, anyone of his seniors in the class can tell him, that such cases often involve the most serious issues to limb and life. A finger is valuable to every man; injury to it condemns many a working man to the poorhouse, after long but ineffectual struggle with a matted, withered, and useless hand. Such cases afford the most abundant scope for

gentle, accurate, and successful dressing; they supply some of the most striking results of the happy application to every-day practice, of those principles of simple scientific surgery which I am endeavouring to impress upon you. (1)

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1 The authorities mentioned in this Lecture, and not already referred to in foot notes, are—

SEUTIN.

Méthode Amovo-Inamovible. 2nd Ed., Bruxelles, 1851.

VELPEAU.

Leçons oracles de Clinique Chirurgicale. Bruxelles, 1841, p. 627.

MATHIAS MAYOR.

La Chirurgie Simplifiée. Bruxelles, 1842, Article II., p. 98, "Du Coton." Article III., p. 104, "De la Mousseline et du Coton."

# LECTURE VI.

## CONTENTS.



Gentlemen,

Drainage has been employed in very many of the cases treated in our wards, and brought

before you, from time to time, in these clinical demonstrations. All surgeons are happily agreed, that drainage of wounds and abscesses is a most valuable therapeutic resource. It is curious that so simple and important a method should be of such modern origin, for it is barely three-and-twenty years since M. Chassaignac introduced it to the profession. True it is, that in very remote times surgeons have known the necessity of making openings for the evacuation of matter in dependent positions; to carry it off with greater facility they have employed setons, tents, and a variety of other appliances; but these differ widely in principle from, and in practice are far more harmful and less efficient than, M. Chassaignac's drainage tube, of which I hold a specimen in my hand. It is an india-rubber tube, made of different sizes, from that of a probe to the diameter of the little finger, with holes in its walls in different directions, at intervals of half an inch, more or less.

The essential fact in Chassaignac's system of drainage is, that india-rubber tubes may be made to traverse the muscular or bony structures

of the limbs, the large joints, or the great visceral cavities, without producing any irritation.

I was requested, some time since, to amputate the left leg of a youth, who had had the benefit of experienced professional advice. A number of openings led down to dead bone in all directions, and the patient was much exhausted by long-continued suppuration; but, as he was of healthy parentage, had sound lungs, and the knee and ankle were not yet involved, I could not conscientiously amputate; consultation resulted in making an incision along the front of the tibia, to within half an inch of the knee and ankle respectively. Uniting the cloacæ with a few strokes of the mallet and chisel, an ample channel was made for clearing out the large amount of imprisoned dead bone. A long drainage tube was placed along the bottom of the wound, with its ends depending. With dry and infrequent dressings, and suspension of the limb, convalescence was rapid, and recovery complete.

In another case Mr. —— called on me one evening to see his wife, who was to undergo amputation of the thigh the next day, by the urgent advice of the family attendant and of a hospital

surgeon. When I met those gentlemen in consultation, I found the right knee joint full of pus, in a delicate woman who had been ill some weeks. She had a clean tongue and cool skin, and was taking a fair amount of nourishment. The first consultant was for amputation at once. I counselled at least twenty-four hours' delay, to watch the effect of an attempt to save the limb. This advice having been accepted, I passed a drainage tube, the size of a goose quill, from side to side, through the knee joint, packed it with carded oakum, immobilized the limb with millboard splints and gently compressing bandage, and suspended it in a swing cradle. Improvement was immediate; there was no need for re-opening the question of amputation at the end of the first twenty-four hours; the joint gradually emptied itself of a large collection of pus, and the skin covering it changed, from a red and shining appearance to a pale and withered look. Pressure was gradually increased, the drainage tube was withdrawn at the end of three weeks, and not a single untoward symptom occurred. The patient can now walk,—with a limp it is true, but without the aid of a stick.

Of the advantages of drainage, in the treatment

of effusions into the pleural cavities, there is no lack of proof. The case to which I am about to refer is a striking instance in point. I was urgently summoned one morning to G. Madge, aged 25, recently admitted under my care to Ward 3. I found him propped up in bed, with sunken cheeks, open mouth, and widely staring eyes, a leaden hue, big drops of cold sweat on the forehead, breathing forty times in the minute, and with barely perceptible pulse. He had a history of phthisis of two years' standing. Some weeks previously he had been carried into the operating theatre of a hospital, with a view to tapping of the chest; but the operation was not performed, as I subsequently learned, on account of diffused pulsation over the left chest. I found this side much enlarged, the intercostal spaces bulging, percussion-dulness absolute. The heart's apex beat under the right nipple. Pulsation could be felt over a great part of the left chest wall; presuming that it was due to a recoil wave—seeing that the man was actually moribund—I passed a long silver probe, carrying at its end a medium-sized drainage tube, through the chest, from front to back, in the sixth intercostal space, and a little

outside the line of the left nipple. Creamy pus came out freely from both ends of the tube. The left chest was lightly packed with oakum, and a circular flannel bandage applied loosely. The pulse rallied, the face became animated, the man was able to lie on his back in a few hours, took food well, and lived 18 months—more than half the time with the tube in his chest.

Such cases as this, of abscess of the breast also illustrate, in a very marked manner, the advantages of Chassaignac's drainage tubes. When this woman was before you last week, her pale drawn face betokened suffering and exhaustion; the big, pendulous, and exquisitely tender left breast discharged matter through half a dozen openings, the result of *post partum* mammary abscesses and linseed poultices. I passed a long probe from the lower aperture on the outer side, under the mammary gland obliquely upwards and inwards, and out at the uppermost aperture near the sternum. A ligature, secured to the eye of the probe, enabled me to carry a good-sized drainage tube along its track, and I left it there, with both ends depending, covering the breast with a thick pad of carded oakum, and suspending it with a

smoothly-compressing bandage. The poor woman was easy at once, her appetite improved, and she slept well. When the dressing was removed after a lapse of four days, the breast was soft and much diminished in size, the openings other than those traversed by the drainage tube were healing rapidly, and the woman is now cheerful and in advanced convalescence. The drainage tube was a chief cause of the improvement in this case, draining the dependent and soddened breast, on much the same principle as a farmer drains a piece of boggy land with an earthenware pipe.

Mrs. T., aged 42, from Evesham, lately consulted me with a view to removal, from the right breast, of a tumour which was supposed to be scirrhous. From the history and physical signs I suspected deep-seated chronic abscess. An incision with a straight narrow bistoury revealed the presence of pus. I introduced a drainage tube the size of a crow quill into the aperture, and passed it along to the bottom, by a gentle spiral or cork-screw movement. A layer of gauze over the breast, a soft pad of carded oakum, and a bandage carefully applied, so as to compress the breast and suspend it, completed the dressing. The patient

returned into the country at once. When I saw her at the end of five days the discharge had permeated the bandages, but these and the oakum were quite dry. The tube was lying against the cicatrized opening, the breast having shrunk away from it. There was no pain and no discomfort, and I have since heard that the patient has perfectly recovered.

In these breast cases the india rubber tube was not the single beneficent agent; the raising and compressing of the breast were most powerful accessories. In the case of suppurating synovitis, immobilization, suspension, and compression had greatly contributed to the result in which the drainage tube was an important factor. The great value of surgical drainage is, that it admits of compression, rest, and infrequent dressing, carrying off matter as rapidly as it is formed, and thus preventing its decomposition and attendant irritation. The latter is especially the object which makes drainage of such exceptional value in the estimation of those who advocate antiseptic dressings.

It has been my object throughout these lectures, to demonstrate to you by typical cases the fundamental principles and simple methods, by which wounds may be successfully treated. Here and there, touching on some disputed point, reference to dissentient opinions has been inevitable, but controversial matters have, so far as practicable, been avoided. This is no longer possible in discussing the history and merits of the antiseptic treatment, which is advocated as an innovation on surgical practice based on special scientific grounds. The theory and the practice of the antiseptic system must be separately considered. The subject is so important, it has engaged the attention of so many able men here and abroad, and has been the theme of such keen controversy, that it is no use looking at it in a casual manner. It is a searching and comprehensive examination, that is demanded by the circumstances and merits of the case.

I must first trouble you with a few words of explanation, which I hope may reach a larger class of students than that I am immediately addressing. When visiting Paris in 1867, I found Professor Maisonneuve at the head of the clinical

wards in the old Hôtel Dieu. He was enthusiastic on the beneficial effects of what he called his anti-putrescent lotion, composed of one part of carbolic acid to one hundred of water. It was said to cleanse the wounds, promote healing, and prevent pyæmia. The matter was not treated as a novelty, but as the outcome of theoretical studies and practical investigations of six years' standing. It was in March of that year, that my friend Professor Lister published the first of his series of papers on a new method of treating compound fracture, abscess, &c., with observations on the condition of suppuration. (1) The treatment advocated was the free use of carbolic acid, and M. Pasteur's germ theory was put forward as the key to the explanation of the antiseptic effects. I visited Professor Lister's clinique in Glasgow in 1868, and on two subsequent occasions, in Glasgow and Edinburgh, enjoyed the fullest opportunity of examining his cases. I was uniformly struck with the admirable precision of the dressings, which were daily superintended, and in great part carried out by the Professor himself. Pure carbolic acid did

[1] *Lancet*, 1867, vol. I., p. 326, *et seq.*

not long hold its ground; it was diluted and variously prepared as putty, oil, and lotion; but Pasteur's germ theory has never varied, as the basis and explanation of Professor Lister's practice. In evidence of the importance which he still attaches to the maleficent potency of atmospheric dust, I shall read you an extract from the *British Medical Journal*, (1) in which an account is given of an operation for psoas abscess, at King's College Hospital. All the instruments to be used had been placed in carbolic acid lotion an hour before the time of operation; the dressing forceps had a little grease in the teeth, so that when drawn over a towel they soiled it; but, as they had been well soaked, Mr. Lister considered them perfectly antiseptic, and used them without fear. Clean and dry towels were placed around the patient, the pubes being carefully covered up, and the clothes drawn out of the way. A continuous cloud of carbolic spray was produced by a hand steam-spray producer, and directed over the seat of operation, carbolic lotion (1-20) was placed in the bottle of the apparatus, and by dilution with the steam this

[1] October 27, 1877, p. 572.

was reduced to about 1-30, before it fell upon the skin. The bistoury to be used had of course been soaked in carbolic lotion, but, when taken out, the water collected on its polished surface in dew-like drops, and, as the operator pointed out, "the blade was no longer antiseptic, as dust might fall upon it, together with septic particles; to keep it antiseptic, the knife must be freely exposed on both sides to the carbolic spray, and kept there till the conclusion of the operation."

From first to last, I freely confess that the germ theory, in its application to practical surgery, has not carried conviction to my mind. Anxious to solve it, I made a proposal in December, 1873, to Professor Lister, who accepted it, to visit his wards, and publish my observations for the benefit of the profession, with such remarks as I deemed just, and calculated to be interesting and instructive. Upon the facts, no question could arise; for I submitted the notes to my friend, and accepted the very slight alterations which he thought it necessary to make in them. I was not so fortunate with the commentary, for which I was solely responsible. In it occurs this passage: "Students of science know that a theory may be tem-

porarily useful in the pursuit of truth, though proved fallacious on the attainment of fuller knowledge; but, unless demonstrably true, a theory becomes embarrassing, to say the least, when, having once been adopted, it is made to fit all difficulties, and is itself maintained immutable in the presence of a succession of very varying facts. Pasteur's theory may be true or not, but since to my mind it only affords an incomplete explanation of the phenomena witnessed in the antiseptic treatment of wounds, I propose considering the facts themselves entirely apart from their theoretical explanation."

To my very great regret, Professor Lister regarded this passage as containing a grave charge against his professional character. Nothing was further from my intention. It has been my good fortune to be personally acquainted with a very considerable number of the distinguished surgeons of this generation, and I have never known one inspired by purer motives, or more devoted to his work, than Professor Lister.

But the progress of truth would be more rapid and less chequered, if self-sacrifice and lofty aims could dispense with logical accuracy and severity. History is full of examples of the judgment

of the most honourable and highly-endowed men being biased by preconceived notions. The vast superiority of the inductive over the old scholastic philosophy chiefly consists in this,—that in the former fact, and in the latter theory, is supreme. If an observer collects his facts, and reasons from them, step by step from particulars to generals, he has comparatively little difficulty in retaining the position of a dispassionate interpreter. But once he sets out upon an enquiry under the dominion or fascination of a governing hypothesis, it is very difficult for him to prevent himself seeing what he believes, rather than believing what he sees. It is not enough for the interests of truth, that what an observer sees should be *the truth;* it must be *the whole truth, and nothing but the truth.* Partial truths are often great errors; and whole truths, combined with error of fact or wrongly interpreted, are apt to be most deceptive when made the basis of generalization.

The whole of this question of the treatment of wounds antiseptically, has been seriously embarrassed by the pre-acceptance of Pasteur's germ theory; and I must adhere to the soundness of my suggestion, already quoted, to consider the facts

themselves, entirely apart from the theoretical explanation of the germicide action of the antiseptics.

It is the germ theory, and its practical application to surgery, which is the innovation and the professed basis of the new system, and which specially calls for examination. About the value of agents endowed with the power of preventing or checking decomposition, a large amount of evidence has accumulated for generations. Earth and tar, spirituous solutions of gums and barks, the terebinthinates, a great variety of acids and salts, medicated tow, oakum and cotton wool have been employed, under the various names of detersives, antiputrescents, disinfectants, and antiseptics. None of those agents, however, has acquired such wide repute as carbolic acid, which, without for a moment calling in question Professor Lister's belief in the novelty of his teaching, was first introduced to the profession as a parasiticide (phenic acid) by Lemaire and Déclat. A claim of priority has been contested between those two gentlemen, but, without engaging in it, I shall translate and condense from Déclat's work." (1)

[1] Nouvelles Applications de l' Acide Phénique en Médecine et en Chirurgie. Par le Docteur G. Déclat. Paris, Adrien Delahaye. Octobre, 1865. P. 21, *et seq.*

"On the 30th of November, 1861, M. Déclat was summoned by Count Paul Demidoff to a gentleman who was thrown from his horse against a tree while hunting. Paralysis ensued, and, in spite of the utmost care, the soft parts over a number of the bony eminences by-and-by became gangrenous. The smell was so offensive that the bedroom became uninhabitable, though spacious and well ventilated. In this state the gangrenous parts were *tanned*, by being brushed over with a solution of one part of carbolic acid to ten of common oil. The smell disappeared, the soft parts ceased to mortify, and the patient rapidly recovered; a carbolic lotion was injected into some purulent tracks along the muscular sheaths.

"From this date (1861), M. Maisonneuve having witnessed the surprising result in this patient, has not ceased to employ carbolic acid at the Hôtel Dieu as a common dressing. Accordingly his wards are made healthy, and the results are most satisfactory and remarkable. Alcohol and camphor, like carbolic acid, act as parasiticides, and in some way as poison antidotes. It is by an analogous action that they prevent purulent infection, hospital gangrene, &c.

"The fine researches of M. Pasteur clearly explain these unexpected phenomena. Everywhere where there is decomposition of an organic liquid or substance, such decomposition is caused by the physiological action of living beings, the germs of which pullulate in the air. Everywhere, where a wound is made, air penetrates, and with the air, germs, which have the power of developing themselves even in the interior of the blood-vessels where the circulation carries them. Hence result inflammations of the lymphatics and of the veins, erysipelas, gangrene, &c. The more cutting is the instrument with which the operations are performed, the more freely are the vessels divided, the better do the germs penetrate, the more easily do microphytes and microzoa cause complications, especially in loose and vascular tissues . . . . It is to-day well proven that carbolic acid and its compounds prevent the development of, and even partially destroy, the germs in the air. One can thus easily understand the favourable action of that acid in wounds of all kinds, in burns, and even in midwifery practice."

This public teaching of Déclat, in 1865, founded on experiments conducted in 1861, is unmis-

takably Pasteur's germ theory applied to surgical practice, with carbolic acid as the parasiticide. But, curiously enough, on Pasteur's own ground, and with his countrymen generally, the theory found very little favour. It probably would have been forgotten, but for its enthusiastic adoption and untiring advocacy by a distinguished British surgeon, and but for the admiring approval of Volkmann, von Nussbaum, König, and others of our German confrères. It is they who have added the term Listerism to surgical language. At present it is with Professor Lister's practice that the germ theory is identified, and it is his practice, based on that theory, that we have to consider.

I think I cannot give you a more faithful picture of what that practice is, than by reading you the bedside notes which I made in his wards, in the Royal Infirmary of Edinburgh, in December, 1873. Those notes embody the clinical appearances which came before me, and Mr. Lister's remarks in explanation of his method of practice. Since he was good enough to revise those notes, and I accepted at once the slight alterations which he made in them, their accuracy is beyond question.

Matthew R————, thirty-five years ago, received a gun-shot wound on the inner and back part of the right leg, at and just below the ankle. The result was a sore, which never healed. He was admitted on the 19th November last, with a very ill-conditioned ulcer. Though healing rapidly, it is still several inches in extent. On admission, the sore was sweetened with a chloride of zinc lotion (forty grains to the ounce). The epidermis around was cleansed with a carbolic acid lotion (one part to twenty of water). The latter lotion acts best on the epidermis, the former on the raw surface. The wound, once sweetened, was enveloped in antiseptic gauze, and next day dressed with boracic lint, which is prepared by dipping lint in a hot saturated solution of boracic acid, then taking it out and letting it dry. The lint is then loaded with crystals of the acid, and these crystals are unctuous, not harsh. If you applied the boracic lint next to the sore, you would stimulate it too much with the acid—you would have too much suppuration, too little cicatrization, and, on removing the dry lint, you would peel off the epidermis, and the discharge might irritate by tension by accumulating

under the lint; so we interpose between the lint and the sore a "protective," consisting of oil-silk varnished with copal varnish, and coated with dextrine to permit it to take a watery solution of the antiseptic. The object of the copal varnish is to prevent easy permeation by carbolic acid when that acid is employed. Carbolic acid is used in applying the dextrine, but it soon goes, and the protective is not antiseptic itself; its object is to keep out the antiseptic; but it must be put on in an aseptic state, and must, therefore, be dipped in antiseptic lotion before application. This lotion is a saturated solution of boracic acid, with the addition of a few drops of litmus to distinguish it from colourless carbolic lotion. The sore having been washed with the boric lotion lightly, the protective, dipped in lotion, is put on the sore and the tender epidermis around, with boracic lint outside. If we were to put it on dry, we should put on a septic lint, because boracic acid is not volatile, and septic particles—organisms, I may say—are not deprived of septic energy by it in the dry state; so we dip the boracic lint in boracic lotion, and then we are sure it is free from anything septic. Boracic acid is little soluble

in cold water, and at the temperature of the body the discharge may go through boracic lint without carrying off all the acid. Boracic lint consists of equal weights of lint and boracic acid, and under such lint there is no sore but would keep sweet twenty-four hours.

Matthew R——'s wound was at first dressed every day, then only once in two days, with two layers of the boracic lint, and a gauze bandage. Lister does not care much about pressure in such cases. The wound in this case and the surrounding parts, looked beautifully clean and rosy, were perfectly free from odour, and cicatrization was advancing rapidly. The wound, which on admission was intensely painful, had now become quite free from pain.

# LECTURE VII.

## CONTENTS.



Gentlemen,

I shall conclude the reading of my notes taken in Professor Lister's Clinique, before commenting on the practice.

Donald M'C——, eight months ago, while in an epileptic fit, fell on the fire, destroying a large part of the scalp on the right side, largely exposing and burning the bone, destroying the external ear and the zygoma and much skin on the back of the neck and shoulders. The wound

is dressed every other day in the same way as in the former case. The protective is applied on the granulating and cicatrizing parts, not on the bone, which is covered directly with the boracic lint. Though nearly the whole bony wall of the right side of the head is exposed, there is no putrefactive smell whatever. The wound is dressed as in the former case, with the exception that on the granulations adjacent to the bone is applied boracic ointment, consisting of one part of boracic acid to ten parts of axunge and one part of glycerine. At first we saw the entire zygoma sticking out as dead bone; we then saw granulations growing over the bone. The bone, just before being quite covered from each end, became pink, showing that the scale of dead bone had become thinned by absorption from within; and now it is all covered without exfoliation. With the dead bone, as with the catgut in the antiseptic ligature, the dead tissue is absorbed by the living tissue near it; for if the dead tissue do not become acrid by putrefaction, it is as good for living tissues to feed upon as clotted blood. I said, "What about the septic particles, as the vast wound is lying exposed

during this instructive discourse?" "Oh," replied the Professor, "they are lying in abundance upon it; we destroy them by washing with the boracic lotion." The vast wound was beautifully clean and quite odourless, and the granulations could be seen encroaching upon, and adhering to, the edges of the bone, and in several places as little rosy buds projecting above or shining through and just under the dry bony surface. The man was in excellent health, and quite free from pain.

In applying antiseptic gauze dressing, the deepest layer of gauze as well as the protective, must be dipped in carbolic lotion before applying it, because septic particles adhere to it, and carbolic acid is given off so slowly by the gauze at the ordinary temperature of the body as to kill the septic particles.

William H——. Three days ago the Professor removed a quantity of carious bone from the right foot. He removed the ends of three metatarsal bones and a good deal of the adjacent tarsus. After gouging, he applied the sulphuric acid (Pollock's) treatment. The large wound is clean, odourless, and without pus; and there is neither pain nor constitutional disturbance.

In fistula in ano, and in lithotomy and other wounds in the vicinity of the anus, as well as those communicating with the mouth, or a putrid sinus, Mr. Lister applies forty grains of chloride of zinc to the ounce of water, to *pickle* the wound, so to speak; the fact being that chloride of zinc has the remarkable peculiarity of rendering the cut surface incapable of putrefaction for two or three days, though in contact with septic material.

*Ward No. 5.*—William R——, aged forty-two. Temperature 98·2°; pulse 84. On Thursday last, for large popliteal aneurism, the femoral was tied just below the apex of Scarpa's triangle; the operation was performed antiseptically, and with the prepared catgut. Three carbolized silk sutures were put in. Metallic sutures are not used, because aseptic silk is softer and easier to manage, and antiseptically equally safe. The dressing consisted of—firstly, protective; secondly, a sponge squeezed out of carbolic acid lotion; and, thirdly, gauze dressing overlapping that. No drainage-tube was used. That was a mistake. The drainage-tube is more important with antiseptic treatment than without it, because the antiseptic treatment irri-

tates the cut surface, and in the first few hours there is more serous effusion than without it. With the three stitches and no drainage-tube inflammation occurred, and the man complained of pain on the second day, when we removed the dressing and found redness, tension, and already some pus. The lips of the wound having become adherent externally, the serous oozing from the parts could not find its way out; it irritated, not chemically but by its tension, affording an example of inflammatory or nervous suppuration, as distinguished, on the one hand, from antiseptic suppuration, due to the direct action of the antiseptic on the tissues as a chemical irritant; and, on the other hand, from septic suppuration, due to the acrid products of putrefaction, which resemble an antiseptic salt in acting on the tissues as chemical irritants, but differ in the all-important circumstance that they are perpetually multiplied by the septic fermentation which spreads wherever it meets with a favourable nidus. In this case it was purely inflammatory or nervous suppuration. When two stitches were removed the man was easy. (He is in no pain. I saw antiseptic dressing removed; no smell; a little pus on the surface, but none

came up on deep pressure). Professor Lister does not use carbolic oil, because dirty.

William T——, aged thirty-one, a farm-servant, and a powerful man, was admitted November, 19th, 1873. Two years and a half ago he began to suffer the inconvenient symptoms in the right elbow for which he now sought relief. Both flexion and extension were very imperfect. When the elbow was bent to about a right angle a sudden check was experienced, and when extension was attempted great pain was felt in the joint. So long as he kept his hand in his pocket he was perfectly easy; but when he let it hang by his side intolerable uneasiness ensued, so much so that he had been off work for twelve months, and had been subjected to various treatment without any arrest of the complaint.

On examination of the limb nothing was found wrong with the posterior aspect of the elbow, where the bony prominences had their natural appearance unaffected by any thickening of the soft parts. But anteriorly, on careful manipulation, there was felt a distinct abnormal projection from the humerus, on a level with the external condyle, and therefore in the region of

the joint. That the growth, of whatever nature, did extend into the articulation was further indicated by the great pain on extension, which could not be accounted for by mere stretching of fibres of the brachialis anticus, but was readily to be understood if the anterior ligament of the joint was put on the stretch over it.

Knowing that pedunculated exostoses occacasionally grow from the humerus in the immediate vicinity of the elbow, Mr. Lister was inclined to think that the present case was of that nature Two alternatives presented themselves in the way of operative procedure—viz., excision of the joint. and removal of the tumour alone. The latter necessarily involving opening the articulation, would have been, in Mr. Lister's opinion, altogether unjustifiable without reliable antiseptic measures; but with these it was believed to be perfectly safe, and likely to leave a stronger and more useful limb than excision.

Accordingly, on November 26th, the skin having been purified with 1 to 20 carbolic-acid solution, and a spray of 1 to 40 lotion playing over the part, an incision was made about five inches long over the outer condyle and supra-condyloid

ridge and the external aspect of the joint. The supinator longus and neighbouring extensors being then detached from the intermuscular septum and from the condyle, and the external lateral ligament exposed, the muscles were drawn aside with a spatula from the front of the joint, and on introduction of the finger into the wound the prominence before detected through the soft parts was distinctly felt. On the joint being opened, however, instead of an exostosis, a large number of loose cartilages were discovered, most of them, about 200 in number, being about an eighth of an inch in diameter or less, while six were larger, varying from one fourth of an inch to an inch and a half in greatest diameter. They were very irregular in form, the larger appearing at first sight like aggregations of the smaller ones, but in reality, as seen on section, consisting in the interior of true bone and medullary tissue, with a cartilaginous external layer and synovial investment, to which small cartilaginous bodies were attached by narrow peduncles. The larger of these bodies were most of them still connected by synovial bands to a prominent ridge of bone, across the front of the humerus; but the smaller ones were generally free

in the articulation. In order to extract the larger ones it was necessary to divide the anterior ligament with a probe-pointed knife to the extent of about an inch and a half, after which the ridge from which they sprang was removed with the gouge. The very numerous small ones were successively brought into view by free alternate flexion and extension of the joint; and as they continued to appear time after time when these movements were executed, and as it seemed right to endeavour to extract them all, the joint must have lain open exposed to the spray and sponging for full half an hour. The operation was performed in the bloodless manner, which has been practised by Mr. Lister for several years, by freely elevating the limb, and then screwing up the common tourniquet as rapidly as possible, so as entirely to arrest circulation. Some small arterial branches having been secured, two drainage-tubes, each about one fourth of an inch in diameter, were introduced fairly down to the open joint, their outer extremities being kept on a level with the cutaneous margins of the wound, which were elsewhere accurately stitched, after which the usual dressing of antiseptic gauze was applied, a

piece of protective being interposed between it and the wound.

The patient experienced no symptoms of irritation of the joint, nor any constitutional disturbance as the result of this procedure. For the first three days the dressing was changed daily, as the discharge of serum was still considerable; but after this, as the serous oozing diminished in amount, the intervals between the dressings were extended to three days, four days, five days, and six days respectively. Of the two drainage-tubes, one was removed the second day after the operation, and the other eight days later, when, the wound elsewhere being entirely healed, the stitches were extracted. On the 17th December, when I witnessed the dressing after an interval of six days, and just three weeks after the operation, the place where the two drainage-tubes had originally been was contracted to a very small size, and all that remained to heal was a grey patch, about one eighth of an inch in diameter, of the original blood-clot altered by organization; the neighbouring parts looked pale and healthy, having cicatrized, I was informed, not only without the appearance of a particle of pus, but without the occurrence of

granulation. Meanwhile the object of the operation had been so far attained that the elbow could be extended to almost the full degree without occasioning uneasiness. (1)

Collectively and separately considered, these results are admirable; others equally so have repeatedly been witnessed by visitors to Professor Lister's clinique, or by surgeons who have practised his method. In endeavouring to account for those results, care must be taken to distinguish between essentials and accessories in the chain of therapeutic causation. It would surely be a mistake to magnify the importance of the carbolic spray, to the exclusion of the influence of delicately painstaking and cleanly manipulation, with materials admirably suited for accurate dressing. I have seen a case, a type of a large class, in which a surgeon prided himself on the antiseptic treatment of an excision of the knee. The carbolic spray had certainly been used; but a good deal of constitutional disturbance, and not a little suppuration, had followed. When I saw the patient, matters were progressing

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[1] The above notes are a reprint from my papers on the Treat- of Wounds by the Antiseptic Method, published in the *Lancet*, 1874, Vol. I., pp. 9, 50 *et seq.*

favourably; but for some weeks the limb had been immobilized in plaster of Paris, and suspended in a Salter's swing; very considerable pressure being at the same time employed, with gauze bandages, in applying the dressings to the knee. A success under such circumstances is perfectly explicable in accordance with the proved principles of scientific surgery, without importing any hypothesis about germs.. But whatever be the explanation of the phenomena in successful cases under the carbolic spray, many surgeons, and even patients, might be utterly careless about. They might say, "We care nothing for the rationale; we are quite satisfied with the plan, if such are its results."

It is, however, a very important matter not to encumber surgery with an erroneous doctrine. No less important is it to discard all complications of operative procedure, unless absolutely essential to saving pain or life. Scientifically considered, the truth or error of the germ theory, in its surgical application, is a question of the greatest interest; practically, no less so. A surgeon exceptionally placed in public and private circumstances, with the resources of a great hospital at his command, and a class of

enthusiastic students to do his bidding, may be able to carry out with comparative ease a complicated course of treatment; but on the field of battle or at the mouth of a coal mine, in a parish infirmary or on a twenty-mile round in a country practice, hand and steam sprays, gauze and protectives, with the minute injunctions for their successful use on the antiseptic theory, become serious complications, if not absolute impossibilities,—hence the scientific and practical reasons for critically examining the matter.

In discussing the comparative merits of different plans of treatment it must be remembered that man is so constituted, his organism so framed, his functions so co-ordinated, as to enable him to live in the arctic region and in the torrid zone. That fact is no proof that either extreme is best or safest for a mean duration of useful life. Wounds have healed times out of number under dirty poultices and clean dry earth, under bland glycerine and stimulating turpentine, under dry dressings and carbolic washes. These facts are no answer to the question, what is the easiest, the quickest, the least painful, and the safest treatment of wounds? The solution of the problem must be the outcome of

experience. It cannot be predicated on the basis of any hypothesis, however fascinating by its novelty and ingenious in its application. While conceding that I have witnessed admirable results under Professor Lister's treatment, I have never seen it secure such absolutely painless, rapid, and firm healing as can be obtained by dry and infrequent dressing, by absolute rest, easy position, and smooth pressure.

It has been urged that, for the perfect success of the antiseptic system, its conditions must be accurately fulfilled, and that it is owing to their violation that failure occurs. Professor Lister shows his class a number of long flasks, containing a variety of organic fluids, and having their mouths well plugged with cotton wool. The vessels have been filled with special precautions and exposed to great heat; their contents have remained clear for months. Admit air to one of these flasks, inoculate it with a ferment, and troubled action, turbidity, and stink soon follow. In the laboratories of scientific men these experiments have been the matter of much contention, not merely as to their theory, but as to the facts themselves. I am quite willing to admit the facts of the flasks and their

clear and turbid contents, just as they may be stated by the most ardent advocate of the germ theory. What do the facts amount to in their surgical application? Is not the whole history of physiology and surgery full of examples, to prove the fallacy of arguing from the demeanour of organic parts removed from the body, to what occurs in the living system?

Here are ten operations—1, hare-lip; 2, perineoraphy; 3, rhinoplasty; 4, ligature of femoral; 5, amputation of fore-arm; 6, Syme's amputation at the ankle; 7, excision of the elbow; 8, excision of the knee; 9, excision of the lower jaw; 10, removal of cystic tumours from the scalp. The selection is made as an average representation of so-called major surgery. Most of those operations I have performed many times, some only occasionally. I have never lost any one of the cases. Other surgeons can doubtless say the same. Where were the maleficent germs? Take the whole field of ophthalmic or orthopædic surgery practised so successfully by many surgeons. They all use clean knives, certainly; but I am not acquainted with any who take special precautions against atmospheric dust; yet how rare is suppuration

after iridectomy and cataract extraction? Whoever heard of it after division of the tendo Achillis? Where are the germs when the globe of the eye and the tendinous sheaths are opened? An answer is supplied by a passage in Dr. William Roberts's recent address on the Contagium Vivum. He warns us that—

"Before we can understand the pathology of septicæmia we must have clear ideas on the relation of septic bacteria to our bodies. We see in our laboratories that dead animal tissues, when exposed to ordinary air or ordinary water, invariably breed septic organisms; in other words, contact of the septic germs with the dead tissues never fails to produce successful septic inoculation. But it is quite otherwise with the same tissues when alive and forming part of our bodies. You cannot successfully inoculate the healthy tissues with septic bacteria. It has been proved over and over again that these organisms, when separated from the decomposing medium in which they grow, can be injected in quantity into the blood or tissues of a healthy animal, or applied to a sore on its skin, without producing the least effect. The healthy living tissues are an unsuit-

able soil for them; they cannot grow in it; or, to put it in another way, ordinary septic bacteria are not parasitic on the living tissues."

I submit, with much deference, that this passage, from one of the ablest advocates of the germ theory, concedes expressly and fully the basis of my contention against its surgical application,—throws upon its advocates the whole *onus probandi.* Take, amongst all the cases recorded in these lectures, that of George Thomas, whose knee joint was fully laid open. Air and germs had flooded it for an hour at least, and it contained a blood clot; but union by the first intention was prompt and lasting without one moment's constitutional irritation, the wound having been closed and the limb compressed and accurately immobilized. Dr. Roberts says it was because the healthy living tissues were not a suitable nidus for the germs, that they did not pullulate. It follows that practical surgeons need not trouble about germs, when they operate upon healthy living tissues, and have at command the simple means which are necessary to secure the conditions for physiological repair.

Admitting, as we have done, that organic

fluids in vessels closed with cotton wool may be sterilized by great heat, I am not aware of any facts being at hand to prove that air can be deprived of fertile germs by washing with boracic lotion, or by working a carbolic spray. A fine crack in a closed flask is said to be sufficient to fertilize its previously sterilized organic contents. If so, what are the probabilities that one or two spray producers can sterilize the air, while a thigh is being amputated and dressed? Professor Lister, and those who believe with him, may contend that the proof is supplied by their treatment of wounds. That is precisely the question at issue.

Against their explanation may be quoted this passage from Professor Dittel's "Experiences on the Management of Wounds after Lister." (1) "The theory of the antiseptic efficacy of the Lister bandage has been thoroughly upset in the clinique at Halle, which, according to Volkmann's publications, enjoyed the best results. Ranke proved by a hundred careful microscopic examinations that in the secre-

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[1] Erfahrungen über die Wundbehandlung nach Lister von. Prof. D. Dittel, 1877, p. 150. This Monograph is published as an appendix to the Aertzlicher Bericht des k. k. allgemeinen Krankenhauses zu Wien vom Jahre 1876, Wien, 1877.

tions beneath the Lister bandages, under the most favourable circumstances, all those forms of minutest organisms occur, which are said to be kept away, by the Lister materials (*Listerstoffe*) and their methodical employment.

"Birch-Hirschfeld's results concur in this opinion against the antiseptic theory, Ernst Fischer, in Strassburg, has proved by his investigations the existence of all forms of septic coccobacteria and of colonies of micrococci beneath all the layers of the Lister bandage. He concludes that the Lister bandage does not prevent the appearance of micrococci and bacteria."

With all respect for the distinguished histologists who have arrived at these significant results, I do not ask you to accept them as conclusive evidence against Professor Lister's theory. I am very well aware that as an authority on micrography he is deservedly held in high esteem, and it is only right to suspend judgment on the statements of his German critics, until he shall have had an opportunity of revising them. But taking into account the controversies on the germ theory between leading scientists, in this country and abroad, the German authorities, which I have just

quoted, furnish very strong reasons why that theory should not yet be accepted as the foundation of a new system of surgical practice.

# LECTURE VIII.

## CONTENTS.



Gentlemen,

Our discussion of the germ theory in the preceding Lecture, resulted, in substance, in this conclusion: that, in its applications to surgical practice, the theory is not proved. Setting aside the theory, let us ask ourselves whether it be not possible, that the doctrine may be wrong, and the practice founded upon it right? It is an admitted fact that William Harvey did not know the existence of the capillaries; and that he was wrong in his theory of the manner in which the

blood reached the veins from the arteries; but, that error notwithstanding, Harvey's exposition of the general circulation was right, and Malpighi's discovery of the capillaries only supplied the link in the chain, which never can be broken.

It is the antiseptic practice with which we have now to deal. I must recall to your recollection the remark made in a previous lecture, that for successive ages a long list of substances has been employed, with a view to prevent decomposition in wounds, to arrest it when it occurs, and to promote healing. It is also worthy of remark, that the carded oakum, the styptic colloid, the Friar's balsam (Tinct. Benz. Comp.), and the adhesive plaster (Emplastrum Elemi Southalls), which I employ, contain substances of undoubted antiputrescent potency; while Professor Guérin claims for cotton wool that its beneficen effect is due to its power of filtering the air of noxious particles.

In the present state of knowledge, particulars are wanting to enable us to generalize on the modus operandi of those and other agents employed in the treatment of wounds. What is needed is precise information, derived from observation, in a suffi-

ciently large number of cases under a variety of circumstances, to prove the relative value of so-called detersives, antiputrescents, or antiseptics, not as the foundation of a surgical system, but as useful accessories to surgical practice.

The merits of Professor Lister's particular system are a question apart. It is open to the objections of being expensive, and requiring more care than is practicable under ordinary circumstances; it necessitates frequent movement and is, in this respect, opposed to the great principle of rest; when long continued, the frequent ablutions and sprays with carbolic water tend to retard healing. Assuming these facts admitted, it is still competent for Professor Lister, and those who think with him, to say that the question of the superior merits of his practice remains open. If we concede their position, the *onus probandi* of their plan still rests with them as its advocates.

Some interesting evidence in point has just seen the light.

Dr. John Chiene, a distinguished member of the Edinburgh school, has lately published an article "on the antiseptic dressing of wounds," (1) in which

[1] *Edinburgh Medical Journal*, December, 1877, p. 509.

he puts this query—"Is there any way in which the surgeon may dress his wounds without the constant aid of the spray-producer? Can we in any way so alter the external conditions of our deep wounds that they will resemble a superficial wound?" I quote Dr. Chiene's reply.

"If this can be done, then the spray will not be required as long as these conditions are kept up. During the last two months I have attempted in several cases to comply with these conditions. My success has been such that I feel justified in stating the simple method adopted. The cases were a parotid tumour, an excision of an epitheliomatous tumour of the arm, an amputation of a great toe, and excision of the elbow-joint. In these cases a permanent deep dressing was applied on the day after the operation, and fixed in position either with a bandage or with some sticky material, such as Canada balsam, or solution of gutta-percha in chloroform. From the experience I have had in these cases, I am of opinion that if the dressing is so arranged as to be perfectly porous, and if an absorbable method of drainage is used, as catgut, it will not be necessary to remove the deep dressing until the

wound is superficial. As long as the deep dressing is in position, the spray will not be required. All that is necessary is to remove the outer dressing when the discharge reaches its edges; to damp with carbolic lotion and salicylic paste the deep dressing, and to apply anew an external dressing. It must be remembered that the deep dressing has lost its antiseptic qualities, while it remains, as it is covered by the outer dressing, perfectly aseptic. It must, therefore, be thoroughly damped with carbolic lotion whenever it is exposed to the atmosphere, in order to destroy any mischief that may have fallen upon it during the exposure, and in order to render it actively antiseptic, so that when the dry gauze dressing is applied over it no mischief may pass from it through the deep dressing into the wound. The spray is used at the operation and at the first dressing, and afterwards only when the deep dressing is removed. This method has another advantage: it approaches more nearly to the perfection of healing by 'scabbing,' and the wound is not irritated by the carbolic spray when exposed by the usual method."

Dr. Chiene's permanent deep dressing with

Canada balsam, or solution of gutta percha in chloroform, was substantially the same in character as the dressing with Balsamum Traumaticum or the Styptic Colloid; but why did he apply it the day after the operation, instead of the next minute? He remarks that the deep dressing has lost its antiseptic qualities, while it remains, as it is covered by the outer dressing, perfectly aseptic; and he advises damping the deep dressing with carbolic lotion, whenever it is exposed to the atmosphere, to destroy any mischief that may have fallen upon it during the exposure, and in order to render it actively antiseptic. I submit, with the most friendly feeling, that this is language which is not warranted by the facts, and which begs the whole question at issue. What *mischief can fall* on the deep dressing? If germs are referred to, who has ever proved, or seriously attempted to prove, that atmospheric dust can influcnce a wound through a well applied dressing of Canada balsam, or a solution of gutta-percha in chloroform? Why expose the deep dressing at all if the patients feelings, the pulse, and the thermometer point to "all right?"

Just glance at the case of Mrs. Bradshaw, in

Ward 5. Only a week ago I removed an enchondromatous tumour, the size of a pigeon's egg, from beneath the right zygomatic arch. The covering skin was loose, but the deep part required careful dissection, to separate the adhesions without injuring the contiguous nerve. After bringing the edges in close apposition, and securing them with three points of silver suture, our house surgeon, Mr. Wilkins, covered the part with a small pledget of lint, soaked in styptic colloid, dry oakum, and a compressing bandage. There has not been the slightest pain or constitutional irritation, the dressings have not been touched until this morning; they are quite dry. The surrounding skin is of natural colour, the sutures have been taken out, the linear cicatrix is firm, and the patient is discharged quite well. I say dismiss the germs and atmospheric dust, and experiment without theoretical pre-occupation. Those who are clean, light-handed, and painstaking dressers, and watchful clinical observers of the constitutional state, will have abundant opportunities for studying nutrition and repair, without troubling themselves about fermentation and putrefaction. They will find that

the great majority of wounds, when well treated, heal kindly and without complications. How could this be so if atmospheric dust were as powerful for evil as Professors Lister and Tyndall insist? The mere fact that we were at first told to rub pure carbolic acid into the innermost recesses of a compound fracture to destroy Pasteur's germs, and that now a solution of one part of Thymol in two thousand of water is said to be sufficient for the purpose, is surely pregnant with suggestiveness as to the fallacy of the new doctrine. But its leading advocates have never wavered; their faith in the germs has hitherto remained immovable. Are they right, or are the old principles of scientific surgery true?

The important issue is one which only rightly conducted experiment and rigid induction can decide. The necessary investigation involves no less a matter than a revision of surgical practice. It demands something more than delicate and patient manipulation, and cannot be conducted to a successful issue, without a wide and conscientious examination of the results obtained by other surgeons with other methods. Such

statistics as those of Spence (1) and Callender (2) and the critical teaching of Billroth (3) and Dittel (4) deserve the closest attention, and I confidently ask for most careful experiment with dry and infrequent dressing, with efficient means to secure absolute and easy rest, and to exert steady uniform compression. Oakum is unquestionably a cheap, handy, and very useful dressing for general purposes, while cotton wool possesses advantages which must win the favour of any surgeon who gives it impartial and extensive trial. Valuable

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[3] Statistical Report of Operations in the Royal Infirmary, Edinburgh, performed by Professor James Spence, from April 3rd, 1875, till Sept. 30, 1876, with remarks.—*Medical Times and Gazette, 1876*, vol. 2, p. 512, et seq.

[2] Note on the Death-rate after Amputations in Hospital Practice. by George W. Callender, F.R.S., giving a total of 25 consecutive Amputations, 21 of which were at the thigh or leg, without a death. St. Bartholomew's Hospital Reports, 1871, p. 179. In the succeeding volume of the same Reports, Mr. Callender's 30 amputations, "of which 13 of the thigh and 13 of the leg without a death." In vol. 10 of the same reports, Mr. Callender's "Surgical Notes on Wounds and Ulcers," comprise 43 Amputations, of which 19 of the thigh and 16 of the leg, with only one death.

[3] Lister 'sche Wundbehandlung, in Die Allgemeine Pathologie und Therapie von Dr. Theodor Billroth, achte vermehrte Auflage, Berlin, 1876, p. 108 et seq. Untersuchungen über die vegetationsformen von Coccobacteria Septica von Dr. Theodor Billroth, Berlin, 1874.

[4] Op. cit. ante.

as drainage is, a large number of wounds heal perfectly well without it, and it is important to determine by careful experience the rules for its employment. What agents should be used as detergents or antiseptics, and under what exceptional circumstances, must also be the outcome of careful investigation. Whatever be the particular results, whatever therapeutic generalizations may be arrived at, of this I am very confident, that there is vast scope for improvement in surgical dressings as generally applied, and that the mortality from surgical operations recorded in the text books is in very great measure avoidable.

To my old fellow students, and to my past and present pupils, to whom I dedicate these lectures, I would address a few supplementary remarks.

No one can be better aware than I am, of the imperfections of this small volume. It is not a treatise; but a collection of facts, thoughts, and suggestions, which I hope may prove a help in practise, and a theme for wider and deeper study.

If there be something almost discouraging in the very vastness of the enquiry projected, there is much that is comforting in a cursory retrospect. Only a hundred years ago primary union of wounds after amputation was scarcely dreamt of. The ligature for arresting hæmorrhage was only partially, and very imperfectly, employed; and dressers sat up all night to stem out-flowing life, by flouring the faces of stumps, in which skin, muscle, and bone had been amputated on one level.

Alanson, Mynors, Hey, White, and Park, were at that time, and shortly after, laying in our provincial Hospitals, the foundations of the great revival in British surgery which John Hunter promoted on independent grounds. The dawn and the first quarter of the century saw the surgeons in the van of medical progress. The Bells, Astley Cooper, Abernethy, Lawrence, and Brodie had few rivals. For the present generation of surgeons to prove themselves worthy of their great inheritance, they must advance in the intellectual race, by observing the conditions, cultivating the resources, and developing the powers, which enable distinguished men to go to the fore

in other walks of life. Surgery is as deeply interesting as it ever was; it offers a wider field than ever for investigation, and never made such great demands on the resources of those devoted to its study and practice.

A John Hunter to-day is an impossibility. The untrodden expanse before him was so wide, that the career of an original explorer could be persevered in with the disregard, almost amounting to contempt, which he cherished for the labours of others. But surgery has progressed since his day, nearly as much as in the whole time before him. If an enquirer in organic chemistry is not allowed to ignore the early labours of a Berzelius or a Gmelin, if a physiologist, aspiring to a first position, is assumed to know the works of Redi and Spallanzani, as well as those of Bernard and Ludwig, why should a surgeon ignore the works of those early masters who traced the lines, and laid the foundation, for surgical progress through all time? Equally important is it to keep abreast of contemporary progress, and never to tire in seeking the truth in facts, as superior to theories and systems; as on the one hand the surest anti-

dote to the paralyzing influence of prejudice, and, on the other hand, as the healthiest stimulus to appetite for more and purer knowledge.

The day is gone by, never to return, when a hospital surgeon could carve his way to eminence and fortune, could affect to despise erudition, and to be superior to the niceties of accurate clinical observation. He must now and hereafter consent to be a student of science, to read widely, to experiment accurately, and to reason closely. Surgeons will always have to use the knife; but in doing so they must never forget the great dictum of the old surgical academicians, "the operation is only one point in the practice of surgery." Given average manual dexterity, surgical success has come to be, in great measure, a question of accurate and painless, simple and watchful wound dressing.

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NOTE.—I have to thank my friend and pupil Mr. Edward Johnstone for valued help in the preparation of this Index.

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