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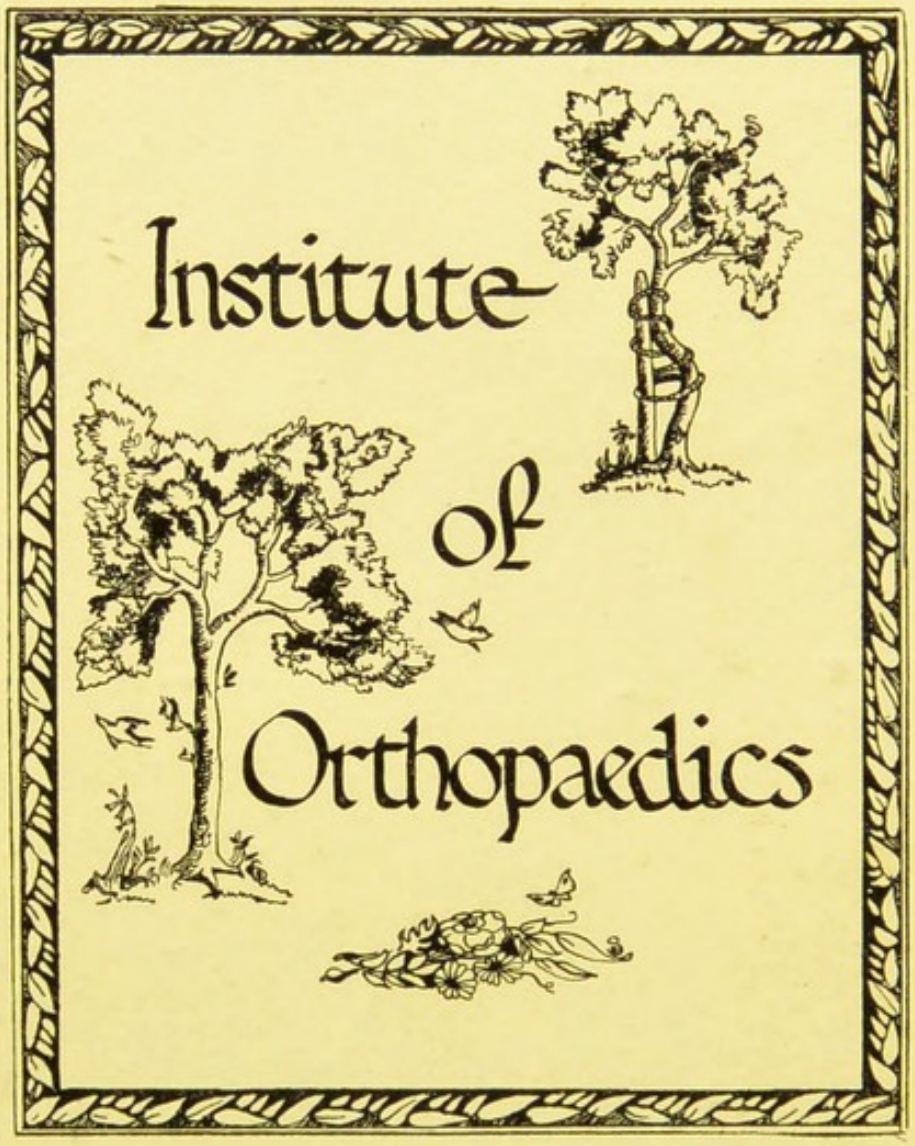

With The Authors
Respectful Comp.ts

DISEASES OF THE BONES.

A TREATISE ON THE

DISEASES OF THE BONES.

BY BENJAMIN BELL,

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TO

THE RIGHT HON. WILLIAM ADAM

OF BLAIR-ADAM,

LORD CHIEF-COMMISSIONER OF THE JURY-COURT

IN SCOTLAND;

IN TESTIMONY OF ESTEEM FOR HIS PUBLIC CHARACTER, OF RESPECT FOR HIS PRIVATE VIRTUES, AND OF GRATITUDE FOR THE MANY BENEFITS CONFERRED BY HIM, UPON THE FAMILY OF WHICH THE AUTHOR IS A MEMBER,

THE FOLLOWING TREATISE

IS AFFECTIONATELY DEDICATED, BY

BENJAMIN BELL.

PREFACE.

For several years past, I have felt much interest in that department of pathology which embraces the diseases of the osseous tissue. While I perused with pleasure and advantage many able works on the subject, I found it to be an arduous task to reconcile the conflicting opinions which different Authors entertained of the same disease, and to carry in my memory the lengthened details of systematic writers.

To satisfy myself respecting the nature of the various Diseases of the Bones, I embraced every opportunity of investigating them by the inspection of the human body, by experiments on the lower animals, and by the careful examination of morbid specimens, which are found in public and private collections. Thus prepared, I recorded, for my own satisfaction, some observations on the pathology of bone; when it ocurred to me, that, by publishing them in a condensed and systematic form, I might obviate some of the difficulties which occur to Students, in the investigation of this part of Morbid Anatomy. In doing this, it was not my intention to dwell upon the surgical treatment of the diseases which I notice: the brief remarks which I occasionally offer

on the subject, may be considered as hints, to be followed out by the perusal of the works of respectable practical Authors.

With a few exceptions I have described only those morbid conditions of the osseous tissue, which have come under my own observation. I have not, therefore, referred so frequently to the works of former writers, as might have been expected. Besides, some of the information detailed in the following pages, was obtained in conversation with professional friends, and with this acknowledgment, I beg to offer them my sincere thanks; in particular, to Sir ASTLEY COOPER, to Professors MONRO, BALLINGALL and TURNER, to Drs JOHN THOMSON and KNOX, to Messrs STANLEY, HOWSHIP, and A. SHAW, of London, and to Mr TURNER of Manchester.

I beg also to mention with gratitude, the liberality of the FELLOWS OF THE ROYAL COLLEGE OF SURGEONS OF EDINBURGH, in permitting me to subjoin to this Treatise, a Catalogue of the Preparations which illustrate the Diseases of the Bone and of the Joints, and which are contained in their excellent Museum. The value of this Catalogue will be enhanced to the pathologist, when he is informed that a great portion of it was drawn up by my friend Mr CHARLES BELL, Professor of Physiology in the London University.

26. ST ANDREWS SQUARE, EDINBURGH,
1st October 1828.

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DIVISION I.

DIVISION II.

DISEASES

OF THE

BONES.

INTRODUCTION.

In describing the diseases of bone, I shall follow that method of classification which appears to me to be the most simple, and shall take care to avoid the too frequent employment of newly invented technical terms derived from the dead or foreign languages, which, when resorted to, tend to obscure the subjects treated of.

Without farther preface, then, I proceed to lay before my readers the arrangement which it is my intention to adopt.

The Diseases of Bone may, I think, be classed under Six General Heads, each of which includes a number of subdivisions.

I. The First Head includes the various kinds of Inflammation to which Bone and its Membranes are subject, viz.

1. Inflammation of the Periosteum.
2. Inflammation of the Surfaces of Bone.
3. Inflammation of the Internal Structure, or Interstitial Inflammation of Bone.
4. Suppurative Inflammation of Bone.
5. Scrofulous Inflammation of Bone.
6. Adhesive Inflammation of Bone.

II. Under the Second Head are included the consequences of Inflammation, viz.

1. Abscess in Bone.
2. Ulceration of Bone.
3. Mortification of Bone.

III. The Third Head includes those affections of bone which apparently depend upon a morbid condition of its assimilating vessels, viz.

1. Softening of Bone.
2. Brittleness of Bone.

3. Interstitial Absorption of Bone.
4. Interstitial Deposition and Enlargement of Bone.
5. Atrophy or Wasting of Bone.

IV. The Fourth Head includes those preternatural growths from bone, which have not been proved to be the result of Inflammation, and which are not of a malignant nature.

V. The Fifth Head embraces those incurable diseases which depend upon degeneration of the osseous tissue, viz.

1. Spina Ventosa.
2. Osteo-Sarcoma, or Fungus Hæmatodes of Bone.

VI. A Sixth Head may with propriety include those anomalous affections of bone, concerning the nature of which little as yet is known.

1. Bloody Tumour, or Aneurism of Bone.
2. Tumours dependent upon the existence of Hydatids in the substance of the osseous tissue.

CHAPTER I.

INFLAMMATORY AFFECTIONS OF BONE AND ITS MEMBRANES.

CONTENTS.—1. Inflammation, and other Diseases of the Periosteum *.—2. Superficial Inflammation of Bone.—3. Interstitial Inflammation of Bone.—4. Suppurative Inflammation of Bone.—5. Scrofulous Inflammation of Bone.—6. Adhesive Inflammation of Bone.

SECTION I.

DISEASES OF THE PERIOSTEUM.

THE Bones, as my readers are aware, are covered by a dense fibrous membrane, denominated Periosteum. This membrane, which in structure closely resembles the fascia of the muscles, sends off an infinite number of minute processes, which penetrate into the substance of the bones, and serve as sheaths to the nutrient arteries, and perhaps the

* In order to avoid unnecessary repetition, I have thought it advisable to describe in this chapter, not merely simple inflammation of the periosteum, but also the other morbid affections to which it is subject.

other vessels which circulate through bone. Internally, the cellular tissue and medullary cavity of bone is lined by a delicate membrane, improperly termed by some anatomists *Internal Periosteum.* This membrane is highly vascular, and is connected with the periosteum by the interstitial filaments or processes described above.

On considering the close connection which exists between the surfaces and intimate structure of bone through the medium of the periosteum, it will be understood how diseases of this membrane may often be confounded with those of the osseous tissue itself.

Although this close connection does exist, and although disease frequently extends from the periosteum to the proper tissue of bone, we are not warranted, in the present state of our knowledge, to assert, that it is through the medium of the periosteum, that all or even the greater number of the morbid conditions of bone originate. We meet with cases in practice, where the periosteum is affected with disease, even of a malignant character, in which the bone itself remains healthy.

Having offered these few general remarks, I shall now proceed to describe those morbid affec-

tions to which the periosteum is subject. They may be ranged under three heads, viz. 1. Simple Inflammation; 2. Morbid Degeneration; 3. Transformation of this Tissue into a substance resembling bone.

1. *Inflammation of the Periosteum*, or *Periostitis*, as it is generally termed, is sometimes the result of external injury; sometimes it occurs as an idiopathic affection. From whatever cause it proceeds, inflammation of the periosteum is recognised by pain referred to the surface of the bone. When the bone which it covers is near the surface of the body, a distinct swelling, which is more or less circumscribed, may be felt. If we cut down upon and through this tumour, we find in some cases, that the periosteum is merely thickened, indurated, and separated from the bone, by the interposition of a gelatinous or sero-purulent matter. This may be called the acute variety of the disease. When it occurs in a chronic or indolent form, there is merely thickening, with increased density of the membrane, and little local uneasiness.

Chronic periostitis, which is termed Periostosis

by the French pathologists, has often been confounded with a disease of the bones called Exostosis; and I am persuaded that many of those reputed cures of exostosis, made by empirics, by means of friction, &c. were nothing more than indolent inflammatory swellings of the periosteum.

Both the acute and chronic varieties of this affection occur as the results of rheumatism, and as a secondary symptom of syphilis *.

2. The *morbid degenerations* to which the periosteum is liable, closely resemble those which occur in common cellular tissue. They are sometimes primary and sometimes consecutive; but both the primary and consecutive degenerations of the periosteum present similar pathological characters; and it is a matter of little consequence to the student or practitioner, whether the degeneration has originated in the periosteum itself, or has extended to it from the bone or neighbouring soft parts.

We sometimes find that the periosteum has lost its proper dense fibrous appearance, and is converted into a soft pulpy matter. Occasionally it

* Delpech. *Chirurgie Clinique* de Montpellier, 1823, vol. i. p. 374.

presents the peculiar characters of true cancer; and it frequently assumes that form of degeneration which has been variously termed Medullary Sarcoma, and Fungus Hæmatodes. Before any of these morbid conditions, however, are so fully developed as to be traced with accuracy, it commonly happens that the parts in the vicinity have put on the same action, and have become more or less connected or massed with the diseased periosteum.

It is proper, however, in a treatise of this kind, to state, that the periosteum is not exempted from those morbid changes which affect other tissues.

3. The periosteum, after having undergone those alterations in structure which are the result of chronic inflammation, sometimes remains permanently thickened, and acquires a cartilaginous hardness. When this is the case, the vessels of its tissue put on a new action, and the earthy matter of bone is deposited. This deposite, from its close approximation to the bone, in process of time becomes united with it, and gives rise to an affection resembling, in some of its external characters, true Exostosis. Ossified periosteum, however, is commonly of a denser texture than exostosis; and

on sawing through a bone to which it adheres, I have occasionally found that a distinct line of demarcation is visible between the bone and the affected periosteum.

Periosteum, which has become ossified, does not seem to enjoy so high a degree of vitality as exostosis, and upon this circumstance the surgeon founds his plan of treating it; hence we now and then hear of cure by means of the cautery, rubefacients, &c. of what some practitioners have termed Periosteal Exostosis.

SECTION II.

SUPERFICIAL INFLAMMATION OF BONE.

It is a difficult matter to give a description of the pathological characters of simple inflammation of the surfaces of bone, as it seldom exists uncombined with periostitis, or it spreads, before we have an opportunity of examining its specific characters, to the internal structure of the bone. But, nevertheless, appearances occasionally present themselves, which are sufficiently well marked to war-

rant the pathologist in distinguishing simple superficial from simple deep-seated inflammation of bones.

Simple inflammation of the superficies of bone is recognized on dissection by thickening of its enveloping periosteum. The vessels, too, of this membrane, are gorged with blood; and they can, on raising it gently, be traced penetrating into the substance of the bone. This appearance is more especially observable in those bones which are throughout of a spongy or cellular texture, and in the extremities of the long bones.

In some cases I have observed minute bloody points on raising the periosteum, and this appearance is most evident in those parts of a bone which are in the immediate vicinity of joints, or which are covered by the synovial membrane. Indeed we rarely meet with acute idiopathic inflammation in the surface of bones which are dense in their structure, or which are covered by a large mass of muscles. It is in the chronic idiopathic inflammation of bone, that the peculiar gorged state of the vessels is most apparent, and this engorgement is occasionally so palpable, as to justify one in supposing that it depends in some mea-

sure upon a varicose state of the veins of the bone.

It is seldom that we can observe these appearances in what may be termed *traumatic* inflammation of bone; they can only be traced with certainty in the idiopathic varieties of the complaint, and are most apparent in those individuals who have been martyrs to rheumatism, or some other constitutional disorder. That kind of inflammation which follows wounds or injuries of bone, whether it is produced by cutting instruments, or is the result of fractures or bruises, assumes in general either the *adhesive* or *phlegmonous* character. It may be remarked that superficial inflammation of bone seldom exists, uncombined with disease of the soft parts covering it. These are always more or less swelled, inflamed, and rigid; and I am persuaded that primary inflammation of the periosteum and surfaces of bones, are frequently confounded with inflammatory affections of the superjacent muscles, tendons, or ligaments.

The morbid appearances which have been described above, as being characteristic of superficial inflammation of bone, are chiefly referable to the

chronic variety of the disease. The simple acute variety, as I have remarked, can seldom be traced on dissection, at least I have never had the good fortune to see it in an uncombined form. It is in truth one of those affections which is more easily recognised during life than after death. When it exists, the patient complains of severe pain, which is referred to the bone, and the pain is increased on the application of forcible and continued pressure. Should the inflammatory action have commenced in the soft parts covering the bone, there is generally considerable tumefaction of the affected organ. This swelling is usually of a simple inflammatory character, sometimes of an œdemato-erysipelatous appearance, and pits on pressure; it differs, however, from common œdema, in being insufferably painful on pressure, and in being attended with very considerable constitutional irritation. We meet occasionally with good illustrations of this disease, in cases of incipient paronychia, and in the joints of rheumatic subjects.

SECTION III.

INTERSTITIAL INFLAMMATION OF BONE.

This variety in general constitutes merely an extension of the simple superficial inflammation. It occurs occasionally as the result of gunshot or lacerated wounds, or of severe simple or compound fractures, happening in unhealthy or irritable subjects. Like simple superficial inflammation, however, it is sometimes met with as an idiopathic affection, both in the acute and chronic form. When it occurs in an acute form, it is exceedingly apt to run into the suppurative inflammation. We nevertheless occasionally meet with cases of acute interstitial inflammation, in which the distinctive phenomena are sufficiently obvious.

In addition to the appearances already described as presenting themselves in superficial inflammation of bone, there is perceptible, on sawing through the bone, an undue degree of vascularity in the membrane which lines the cellular structure of the cancelli. This membrane, which, in a state

of health, is so delicate as to be scarcely visible, becomes, when inflamed, thickened, and occasionally covered with a gelatino-fibrous matter. The coherency, too, of the parietes of the cells is diminished, and, on forcing the finger into the divided cylinder of a long bone that is inflamed, the gelatino-fibrous matter mixed with blood is squeezed out.

These morbid appearances may often be observed in the extremity of an unhealthy stump, and I have now and then seen them in the bones of the skull. I possess the metacarpal bone of a thumb, in which they were very evident, immediately after amputation. It was removed from a gentleman who had the phalanges fractured by the bursting of a tin cannister that contained gunpowder.

Interstitial inflammation is in some cases so severe, that the minute foramina, through which the nutrient vessels of the bone, covered by their cellular sheath, pass, become much enlarged, and considerable cavities are formed in consequence of the absorption of the bone. These cavities are sometimes filled with the gelatinous matter mentioned in a former paragraph.

It is of importance to distinguish this state of the bones from caries and simple interstitial absorption, with both of which it may and has been confounded. Like caries, it is sometimes attended with extensive disease of the soft parts, and the formation of troublesome sinuses. When occurring in a chronic form, in unhealthy subjects, it may be also mistaken for fragilitas ossium, to which it bears a striking resemblance in some of its pathological characters.

It occasionally happens that interstitial inflammation, instead of giving rise to absorption of the osseous tissue, is attended, as I have stated above, with a deposition of gelatinous matter in the cells of the bone. This gelatinous matter sometimes, in process of time, becomes ossified, and thus renders the affected part more dense and compact in its structure than healthy bone. It is this state of the bone, which corresponds in the phenomena which it presents with those appearances that are met with in thickening and consolidation of the other tissues; and here I may remark, that the consolidation of bone, which is frequently the product of interstitial inflammation, has often been confounded with incipient necrosis of the

bone,—the bone being sometimes enlarged in its dimensions, and having exostotic productions on its surface, while its medullary cavity is filled with a spongy deposition of osseous matter.

SECTION IV.

SUPPURATIVE INFLAMMATION OF BONE.

Suppurative inflammation affects both the surface and internal structure of bone. When it occurs superficially, the periosteum is separated or raised from the bone, a thin, ichoro-purulent discharge, or thick unhealthy looking pus, covers its surface; and the external lamella is either of an ivory-white, or of a dirty grey hue: sometimes, too, small bloody points are seen on the surface of the bone. The purulent matter, or serous secretion, is not confined within any distinct sac or cyst, but is diffused between the periosteum and bone, over a considerable extent of surface. In pure superficial suppurative inflammation, in general, no tendency to adhesive inflammation exists, but after

it has affected the external lamina, it extends to the internal and cellular structure of bone.

It is difficult, however, to determine in every case, whether the disease has commenced in the substance, or on the surface of the tissue. After the disease has existed for some time, the periosteum in general becomes inflamed and thickened, and sometimes ulcerated. When this takes place, the soft parts inflame, and collections of matter form in the cellular tissue between the muscles. These burst, and sinuses are the result. On introducing the probe into these sinuses, the bone can in general be found bare at the bottom of them; but this is not always the case, for occasionally the opening in the periosteum is not opposite to that on the surface, or is so small as not to admit the point of the instrument.

Suppurative inflammation very frequently affects both the surfaces and medullary cavities of ill-conditioned stumps. It seems in truth to be more nearly allied to the erysipelatous than the phlegmonous inflammation. We frequently meet with it in the bones of stumps which have been attacked by hospital gangrene, and then the icho-

ro-purulent matter may be seen oozing out in large quantity from between the bone and periosteum, and in some cases from the cavity and cut surface of the bone itself.

In severe cases of suppurative inflammation, it sometimes happens that the texture of the bone suffers to such a degree that exfoliation or necrosis ensues. This, however, does not invariably happen, for I have seen instances in which the disease terminated without either of these events taking place.

It is of importance to remark, that in this disease the formation of matter does not seem to be a *consequence* of inflammatory action, but is in fact a primary symptom, and constitutes one of its earliest phenomena. It differs in this respect from that affection which I have arranged among the *consequences* of inflammation, under the title of *abscess in bone*.

SECTION V.

SCROFULOUS INFLAMMATION OF BONE.

It has been remarked, when describing suppurative inflammation of bone, that it is an intractable disease, and sometimes apt to terminate in death of the bone, nevertheless it is less formidable than the one at present under consideration.

When scrofulous inflammation affects a bone, it does not confine itself to any particular portion of the tissue, but pervades its entire structure, and in general occasions such a degree of disorganization, that it is a difficult matter for the pathologist to determine under what denomination of morbid conditions to arrange it. Indeed I felt doubtful whether to class it under the head of inflammation, or under that of degeneration of bone.

Scrofulous inflammation of bone affords a good illustration of a disease, whose nature, progress, and consequences, are materially influenced by peculiarity of constitution, and do not appear

to be dependent upon those causes which regulate the other varieties of inflammation.

There are three modifications of scrofulous inflammation, the Acute, the Sub-acute, and the Chronic.

Acute scrofulous inflammation is extremely rapid in its progress, running through the several stages of increased vascular action, suppuration, and disorganization. It generally occurs in those individuals who are of a sanguineo-strumous habit of body, and in those who are subject to acute glandular enlargements. It commences either in the bone itself, or extends to it from the periosteum, or other soft parts in the vicinity.

Unlike simple suppurative inflammation, which chiefly affects the shafts of bones, it in general confines its attacks to the epiphyses of the long bones, and to those bones which are of a comparatively soft or spongy texture. It is therefore most frequently met with in the bones of the wrist, elbow, ancle, knee, and hip-joints, and in the vertebræ and bones of the sternum.

On examining a bone affected with this disease in its early stage, it will in general be found to be denuded to a greater or less extent of its perios-

teum, or this membrane is raised from its attachments to the bone, and is in a thickened and pulpy state. Between it and the bone also there is effused an unhealthy purulent or curdy matter, occasionally tinged with blood. It rarely happens, however, that we are afforded an opportunity of examining by dissection the disease in its early stage, nor until the periosteum is entirely destroyed. The bone is then found to be bare, and as is the case in severe examples of simple interstitial inflammation, there is much thickening and, massing of the surrounding soft parts, with irritable sinuses, that communicate with the surface of the body. These sinuses are extremely apt to bleed on the introduction of a probe, and the skin surrounding them is of a livid or sublivid hue. Some time after the bone has become bare, portions of its external laminæ, of greater or less size, according to the violence of the disease, separate from it, and are discharged through the vents nature has made for them, or are removed by art. Frequently in the flat and spongy bones, considerable portions of the entire substance of the tissue come away. The separation of portions of bone may frequently be esteemed as a sanative

process, seeing that it depends upon an effort of nature to relieve itself of diseased parts (*Vide Chap. II. Sect. 2–3.*) After the dead laminæ have been cast off, granulations shoot up from the surface of the bone, and secrete an organisable fluid, which gradually acquires a cartilaginous consistency, and at length is converted into bone. (*Vide Sect. 2. Adhesive Inflammation.*)

I have described the more favourable termination of scrofulous inflammation, by exfoliation and the adhesive inflammation, but this happy termination of the disease is comparatively rare. The disease has in general such a disorganizing tendency, that a great portion of the fibro-cartilaginous matrix of the tissue of the bone is absorbed, thus giving to the bone, when macerated, as Mr Syme has remarked, the appearance of semi-dissolved sugar. The earthy portion of the bone that is left, seems mixed as it were with a gelatino-purulent matter. This peculiar description of organic alteration that takes place in bones affected by scrofulous inflammation, should be distinguished from that which occurs in true caries, or ulceration of bone, (*Vide Chap. II. Sect. 2.*

The scrofulous inflammation seems, for the most part, if not entirely, to implicate the fibro-cartilage of the bony tissue; while in caries the ulcerative process affects equally the whole substance of the tissue, both animal and earthy.

It is a singular fact, that, while the vessels of the part affected with this disease are busily occupied in removing the animal matter of the bone, they are occasionally employed in depositing new bone in the immediate vicinity of the disease. It is from this circumstance that the surgeon is now and then led to expect, and even to prognosticate, the termination of scrofulous inflammation in anchylosis, or the union of two separate bones by the adhesive inflammation. From a rational dependence on this operation, also, limbs have been saved by the removal of the articular extremities of bones *.

What has been stated relative to the characters of acute scrofulous inflammation, will apply to a

* Cases of the Excision of Carious Joints, by H. Park, & P. F. Moreau; with Observations, by J. Jeffray, M. D. Glasgow, 1806.—Cases of the Excision of Carious Joints, by P. Crompton, in the Dublin Hospital Reports, &c. in Med. and Surgery. 1827. Page 185.

certain extent also, to the subacute and chronic varieties of the disease. It may be remarked, however, that the acute scrofulous inflammation is attended with more violent constitutional irritation, and is more rapid in its progress, than either of the other varieties.

There are other symptoms, however, which attend the chronic scrofulous inflammation of bone that are worthy of notice, as they serve to distinguish it from several other affections of the osseous tissue, to which it bears some resemblance. It is, for the most part, as has been already remarked, when treating of acute scrofulous inflammation, confined to the spongy bones, and to the highly cellular tissue of the cylindrical bones. From the insidious manner of its approach, the whole tissue of the bone is occasionally disorganized, and the disease has extended to the periosteum, and synovial membrane and ligaments, before the surgeon has been able to form an accurate notion of its extent.

If the proper curative means have been employed, and the natural actions of the parts are favourable, the inflammation of the soft parts gradually disappears,—the disorganized portion of

the bone is absorbed,—granulations are thrown out,—and the extremities of the bones, should the disease be seated in a joint *, become united by the adhesive inflammation. But in those cases of chronic scrofulous inflammation, in which acute symptoms occasionally supervene, it frequently happens that, in addition to the disorganizing process already mentioned, large collections of purulent or curdy matter are deposited in the substance of the bone, but are not included within membranous cysts. When these collections form, they sometimes work their way to the surface of the bone, or find vent in the cavity of a joint. It is during the period of these depositions that the patient suffers most severely, both from local uneasiness and constitutional irritation.

When the matter of scrofulous inflammation has found its way to the surface of the body, the work of disorganization goes on with increased rapidity, and the system, in most cases, seems to experience serious effects, partly from the drain which has been thus established, and partly from the absorption of the matter; the body becomes

* Catalogue, II. M. 18. 26. 28. 29. 39. 51. 52. 53. 59.

emaciated—the countenance assumes a hippocratic character—there is a defined blush on each cheek —the skin is either dry and harsh, or moist and clammy—the tongue is red and parched—and colliquative diarrhœa occasionally supervenes. I have been thus particular in describing both the local phenomena and constitutional symptoms attending scrofulous inflammation of the more spongy bones, as it is a disease very different from that description of abscess which sometimes occurs as a consequence of simple interstitial inflammation of bone.

Having described the pathological characters of scrofulous inflammation in bones of a loose or cellular structure, I think it necessary to say a few words on the subject of this disease, as it occurs in the flat and hard bones.

When scrofulous inflammation attacks the bones of the cranium, it is in general preceded by inflammation of the cellular tissue, and periosteum covering them. A defined swelling, unattended by pain on pressure, is first felt; it is soft and elastic; and, in the course of a few weeks, if it is left to itself, an opening takes place, through which is discharged a sero-purulent matter, which

has sometimes, though not always, a fetid smell. On introducing a probe into the opening, the bone is found to be bare, and sometimes rough on its surface. After some time, minute scales of the external lamina of the bone occasionally separate, and are discharged. If the disease stop here, granulations arise from the diploë, and an osseous cicatrix is gradually formed. But in individuals of a highly scrofulous diathesis, the disease penetrates completely through the bone. Even after this untoward event has taken place, and when the general health has been improved by the exhibition of appropriate remedies, a cure is, as I have sometimes seen, effected by means of the adhesive inflammation, and the solution of continuity is closed up by a deposition of a fibro-cartilaginous matter. That the destruction of the bone is not occasioned by the pressure of matter, but by what VAN HELMONT has termed *Corruptor*, and JOHN HUNTER *Morbid Action*, in the vessels of the bone itself, is proved by the fact, that a similar result ensues, when an early opening has been made, and the matter allowed to escape.

SECTION VI.

ADHESIVE INFLAMMATION OF BONE.

ADHESIVE INFLAMMATION may with propriety be termed a Sanative process, seeing that it is the result of those efforts which Nature makes to repair the loss of parts. It is upon the processes of adhesive inflammation that the surgeon founds his hope of cure in fractures of bones, and in the less severe cases of scrofulous inflammation.

The phenomena attending adhesive inflammation of bone, are particularly interesting to the physiologist, as they afford a beautiful illustration of the powers which a tissue possesses in reproducing those portions of its substance which have perished, or have been removed.

When a bone has been fractured, whether by external violence, or by the irregular contraction of muscles, the soft parts covering it become swelled. The swelling is occasioned by the rupture and preternatural distention of innumerable small vessels, and a quantity of serous fluid min-

gled with blood, is poured out by them into the cellular tissue of the parts surrounding the bone. In a short time after this effusion has taken place, a kind of gelatinous matter is secreted from the fractured extremities of the bone, which assumes, after a longer or shorter period, a dense cartilaginous character, and in it is deposited the earthy materials of bone. This constitutes the mode of union in simple fractures, where the parts have not suffered the irritation which is occasioned by motion, or ill regulated pressure. But if the fracture is complicated with laceration, and bruising of the neighbouring soft parts, and with extensive injury of the periosteum above and below the seat of the fracture, large portions of bone sometimes perish by necrosis, and are removed by the surgeon. After the separation of the dead portions of bone, the union between the fractured extremities takes place by a compound process. The surfaces, from which the dead portions of bone have separated, become covered with minute florid granulations. These granulations secrete a tough fluid, which in process of time assumes the appearance of fibro-cartilage, and is at length converted into bone. While the adhesive process is

going on between the broken extremities of a bone, whether through the medium of the simple inosculation of the vessels that shoot into the gelatinous matter, or by granulations, the periosteum is also at work, in forming an investing membrane for the callus or new bone. This newly-generated periosteum is always thicker than that which covers uninjured bone, and remains so until the callus has acquired a sufficient degree of consistency to perform all the functions which are peculiar to the parent bone. It is to this thickening of the periosteum that Pott attributes the fulness that is generally felt over newly-united fractures. To a certain extent this opinion is just; but I think that a good deal of the fulness, in many cases, depends upon inflammation and thickening of the superincumbent soft parts, and occasionally also upon interstitial enlargement of the bone itself. This enlargement of the bone is most apt to occur in severe comminuted fracture, or in fracture attended with bruising of the periosteum and soft parts.

It is in consequence of the tendency which bones have to mortify, when exposed to the action of atmospheric air, or when they have suffered

from bruising, that surgeons have been induced to remove those portions of them that project, in cases of compound fracture, and to approximate, as nearly as possible, their fractured extremities, with the view of promoting union by the adhesive inflammation*. It is surprising to observe the power and success of nature, in reproducing bone in those cases where very large portions of the tissue have been carried away by external violence, and there are many specimens to be found in pathological collections that illustrate this fact.

A great deal depends upon the situation and structure of particular bones, as to the facility with which they will unite, by means of osseous matter, after fracture; for, although in healthy subjects the adhesive inflammation takes place in most situations, to a greater or less extent, still

* Some interesting information on this subject may be gleaned from an inaugural dissertation by JOHN ULRIC BILGUER, surgeon-general to the King of Prussia, on the 'Inutility of the Amputation of Limbs,' published in 1761, and translated into English in 1764. In one case of gunshot wound of the arm, this surgeon sawed off four inches of the ulna, and made a perfect cure. In another case he sawed off five inches of the tibia, and a portion of the fibula, and the patient got well, with a trifling shortening of the limb.

in many instances there is merely a fibro-cartilaginous deposite on the fractured surfaces, and the two extremities of the bone thus coated with cartilaginous matter, play freely on each other, and form what has been termed a *false joint.* Some bones will unite, although the fractured surfaces are not in juxtaposition, while others will not unite, unless they are retained in close apposition. Nay, very strong arguments have been brought forward to prove that fractures do occasionally take place in some situations which are seldom or never followed by ossific union; I allude more especially to fracture of the neck of the thigh-bone occurring within the reflected synovial membrane of the hip-joint. Some practitioners assert that a bony union has never taken place between the fractured extremities in that situation, while others as confidently state that it has. This question has given rise to a controversy which has agitated the schools for many years past, and appears to be still as far from being set at rest, as when the controversy commenced. But as this question may form a subject of little interest to the younger student, I shall throw the few re-

marks which I have to make upon it, into the form of an Appendix.

When, from causes with which we are not acquainted, the fractured extremities of bone do not put on a sufficient degree of inflammatory action, they either become coated with a fibro-cartilaginous matter, or remain for a long time in the state they were in after the receipt of the injury. It is the object of the surgeon, in cases of this description, to excite a sufficient degree of inflammation in the seat of the fracture, in order to promote the formation of callus; and this has been attempted with success by many surgeons, and by different means. The most common methods which have been employed are pressure, passing a seton between the fractured ends of the bone, or by removing a portion of the bone above and below the fracture: to accomplish this latter object, Mr WHITE of Manchester used the cutting pliers; others have preferred the saw.

CHAPTER II.

CONSEQUENCES OF INFLAMMATION OF BONE.

1. Abscess in Bone.—2. Ulceration of Bone.—3. Mortification, or Death of Bone.

HAVING described the different varieties of Inflammation that affect the Bones, and having shewn that they are as distinctly marked in them as in the other tissues of the human body, I shall now proceed to describe what may be considered as the consequences of inflammation.

Inflammation of bone may terminate in one of three ways,—in the formation of an abscess, in ulceration, or in death of the bone.

SECTION I.

ABSCESS IN BONE,

(Osteo-apostema of Dr W. CUMIN *).

ABSCESS in bone is in general the result of acute interstitial inflammation, and may occur in any of the bones of the body; it is more frequently met with, however, in the shafts and epiphyses of the cylindrical bones, than in the flat and broad bones. It is not confined to the parietes of a bone †, but occurs also in the medullary cavity ‡.

In the fresh bone we find the abscess, which generally contains a sero-purulent fluid, to be coated by a membrane, resembling in appearance that which lines the parietes of abscesses in the other textures of the body. The osseous tissue in the immediate vicinity of the sac has its cellular structure filled with a gelatinous substance, resembling recently deposited coagulable lymph.

* Edinburgh Medical and Surgical Journal for January 1825, p. 1.

† Plate I. fig. 1. ‡ Plate II.

There is also in some cases an enlargement of that part of the bone surrounding the abscess, but hardly to such an extent as would lead one to confound the disease with another affection of a malignant nature, termed *Spina Ventosa.* (*Vide Chap. V. Sect. 2.*

On macerating in water a bone which has been the subject of abscess, we find some of those pathological characters that are present in simple interstitial inflammation. The bone external to the abscess is perforated by an infinity of small foramina, and these foramina are also observable in the bony walls of the abscess itself.

It is of importance to remark, that, in the simple abscess of bone, we do not find those appearances of disorganization which are so obvious in scrofulous inflammation. There is no breaking down of the structure of the bone, and no alteration in the organic or fibro-cartilaginous portion of the tissue in the vicinity of the disease. Common abscess of bone differs also from another disease with which it has been frequently confounded, namely, spina ventosa, seeing that, in the former, there is little swelling out or expansion of the bone. The vessels, too, in those parts of the bone

which surround the abscess, frequently pour out osseous matter, and give rise to numerous splints of a stalactitic or lamellar form, which is never the case in true spina ventosa.

Like abscesses in the other tissues of the body, those in bone have a decided tendency to expand, and, by their expansion, to occasion the absorption of the parts surrounding them. They also obey the general law, of expanding to the greatest extent in the direction of the surface; and hence when they have arrived at maturity, they frequently burst either at one side of a bone, or into the cavity of a joint *.

The pain attending the formation of abscesses in bone is in some cases very violent, and the constitutional symptoms severe; in other cases their existence cannot be traced until after the amputation of the limb in which they occur.

I have seen cases of diseased bone, and more especially in the lower extremity of the femur, in which I am persuaded that abscess existed in the cavity or substance of the bone; both from the irritative fever which existed, and from the violent

* Plate II.

burning pain which was referred to the interior of the bone. These cases got well, although they did not burst externally. However, it may be assumed as a general rule, that the matter of abscesses, in the greatest proportion of cases, if they are left to themselves, works its way to the surface of the body.

SECTION II.

ULCERATION OF BONE.

This disease has been termed by the generality of modern writers *Caries*, and by the ancient pathologists was confounded with necrosis and spina ventosa. It is, strictly speaking, ulcerative inflammation affecting the osseous tissue, and may be induced by any of the causes which give rise to the same action in the other textures of the body.

It is sometimes met with as an idiopathic affection, and sometimes as the result of injury done to a bone by pressure, or external violence. But whether it be the result of constitutional or of external agency, the phenomena it presents are the

same. It is from its commencement attended by a greater degree of local uneasiness, than is the case in scrofulous degeneration *. It may be either slow or rapid in its progress; when slow, it is analogous to the simple ulcer of other tissues; when rapid, it resembles the destructive ulcer, ulcus exedens, or phagedenic ulcer of the soft parts.

When a bone is affected with caries, it almost always happens that there is a good deal of swelling, inflammation, and thickening of the tissues in its vicinity. During life, or after death, before the soft parts have been removed by the knife, or by maceration in water, the bone feels rough, when examined by a probe; it is denuded of its periosteum, and occasionally loose portions of the surface of the bone may be felt. It often happens, however, that no loose portions of bone, *exfoliations*, or *osseous sloughs*, as they have been variously termed, can be perceived, but the bone feels soft where it is ulcerated, and bleeds on being roughly touched. If we have an opportunity of examining the

* Some writers have, I think on no just grounds, confined the term *Caries* to signify scrofulous degeneration.

bone during the early stage of caries, it will be found bare, the periosteum having disappeared in consequence of ulcerative absorption; in a few days the bone loses its proper yellowish hue and moist appearance; its surface becomes dry, and of a dingy grey tint. In a longer or shorter period after this, small thin scales of the external lamina separate, and the bone from which they have been thrown off, is found to be covered with minute florid granulations, similar to those which occur in simple ulcers of the skin. These granulations secrete a fluid, which becomes organized and amalgamated with a similar production from the edges of the periosteum and neighbouring soft parts. It often happens, however, that no scales are thrown off from the bone; and the external lamellæ seem to be gradually absorbed and replaced by granulations, which put on ossific action, and secrete the gelatinous matrix so profusely, that, when it has become consolidated, the part presents the appearance of an exostosis, or bony excrescence. This may be considered the most favourable termination of ulceration of bone, as it shews that the powers of life are sufficiently active and healthy to repair the loss of parts. It

is the result which the practitioner aims at in his attempts, by means of the judicious exhibition of mercury, to convert the spreading caries of syphilis into the simple adhesive inflammation *.

There is another variety of caries, which resembles in its phenomena and progress the phagedenic ulcer of the soft parts. This variety is extremely destructive in its effects, and is occasionally attended with much local uneasiness. In this variety of the disease, the absorbents seem to be excited to a degree of violent action; there are no sloughs thrown off from the surface of the bone, —no granulations are formed,—but the sore in-

* *Vide* a preparation of carious femur in my collection. This preparation I took from the body of a young gentleman, who died last year, in consequence of an injury of the head. Some years before he had suffered from lues. This complaint was neglected, secondary symptoms supervened, the outer tables of the left femur ulcerated, and many minute scales of bone were discharged through various fistulous openings. His health was much impaired; he took mercury in various forms; recovered slowly, and regained the use of his limbs. The surface that had been carious was covered by a production of bone, considerably elevated above the level of the adjacent sound portions of the femur.

creases rapidly in breadth and depth, occasionally penetrating through the walls of the bone, and producing an appearance not unlike the wound of a musket ball.

The phagedenic caries occurs most frequently in persons of an unhealthy habit of body, and in those who have a venereal taint. In syphilitic subjects the caries generally extends with great rapidity, both in a lateral and perpendicular direction; and in addition to its phagedenic characters, extensive sloughs or exfoliations are formed: there are no granulations, however, formed under the sloughs, but the diseased surfaces are highly vascular, and bleed when examined by the probe. When this disease attacks the flat bones, it very generally penetrates completely through their substance; but when it occurs in the long bones, it frequently confines its ravages to the external lamellæ. Good examples of this affection occurring as a purely idiopathic disease are to be met with in cases of that loathsome and intractable complaint of the nose and face, termed by most nosologists *Noli me tangere.*

If, by means of proper treatment, the progress of the complaint be arrested, and the constitu-

tional irritation which attends it subdued, nature, in many cases, makes powerful and successful efforts to repair the injury which the bones have sustained. Should the disease have confined its attacks to the external laminæ of the shafts of the cylindrical bones, healthy granulations are formed, the gelatinous matrix of bone is secreted, and osseous matter formed. There is one curious circumstance attending the new formation, which is worth remarking. Instead of presenting an uniformly dense texture throughout, there is interposed between the remaining lamellæ of the wall of the bone, and the external dense parietes of the new deposition, a kind of diploë, which, though more dense, resembles somewhat in structure the cancellar tissue of the bodies of the vertebræ. But if the caries has penetrated completely through the wall of the bone, and partially affected the meditullium, a dense osseous cellular deposite is formed, which fills up a portion of the entire cavity of the bone. The new osseous deposite is much more vascular than the original bone, and is hence liable to be easily excited, and to throw out exostotic excrescences.

When destructive caries affects a flat and broad

bone, it in general makes its way completely through the substance of the bone. I have repeatedly seen the os frontis, with the exception of its orbitar processes, entirely destroyed; and one case of caries of the ilium came under my care, in which a fourth of the bone perished, partly by exfoliation, and partly by ulcerative absorption. In these cases, a cartilaginous matter supplied the place of the bone which had been destroyed; but as I have not had the good fortune to be enabled to examine this substance after death, I can give no accurate account of its structure.

Various modes of treating the different kinds of caries have been suggested; and in Mr Samuel Cooper's excellent Dictionary of Surgery, they are accurately and concisely described. In this treatise I can only allude generally to the treatment of the disease, and shall merely offer a few practical hints, which may perhaps prove useful to the young student. The student, in his application of them, should attend to the following circumstances, viz. 1. To the functions, structure, and situation of the bone affected; 2. To the habit of body, constitution, age and sex of the pa-

tient; 3. To the state of the soft parts in the vicinity of the diseased bone; and, 4. To the peculiar character of the ulceration.

When *caries, of an eating or sloughy character*, affects a cellular or highly vascular bone, as, for example, one of those which compose the *carpus*, or *tarsus*, it will in general be necessary for the surgeon to remove the entire bone. When the short cylindrical bones of the *metacarpus*, or *metatarsus*, are the seat of the disease, they sometimes require to be removed entire; although in a variety of cases which I have witnessed, portions of them only were removed, and with success. In caries of the long and flat bones, if there exist a tendency to exfoliation, combined with inflammatory swelling, thickening, and suppuration of the soft parts, and considerable constitutional irritation, incisions should be made down to the bone, and the loose exfoliations, which act as foreign bodies, in inducing and keeping up irritation, removed. Should sinuses have formed in the soft parts covering the bone, before the surgeon is called to see the case, they should be dilated by the knife, or sponge-tent, and the exfoliations, if there are any, extracted by means of the forceps.

Simple granulating caries, the result of external injury, as, for example, of lacerated wounds of the scalp and pericranium, should be treated by mild dressings, and attention to the state of the bowels and regimen. The less that we interfere with the operations of nature the better.

Destructive caries, which in many respects resembles the phagedenic ulcer, or *Ulcus corrosivum*, of other tissues, requires what is termed energetic treatment. In this form of the disease, the practitioner should, in the first instance, attend to the patient's general health, and endeavour to ascertain whether either a venereal or mercurial taint exists. Having combated the constitutional disorder, the diseased portion of bone may be removed, by means of various instruments, such as gouges, scoops, &c. described in every system of surgery. When as much of the morbid structure is cut out as can be conveniently accomplished, an attempt should be made to promote the separation of such portions of the diseased bone as may remain, and at the same time to change the action of the vessels of the part. These objects may frequently be accomplished by the repeated application of the more powerful escha-

rotics, such as the *butter of antimony*, *concentrated solutions of the caustic potass*, and *nitrate of silver*, and even of the *actual cautery*. The last, though very terrible in appearance, is upon the whole the most easily regulated and least painful remedy, and is much employed by many of the best informed surgeons on the continent.

SECTION III.

MORTIFICATION OF BONE, OR NECROSIS.

From what has been said of caries, or ulceration of bone, the reader will be enabled to comprehend more easily the processes which take place in necrosis, mortification, or death of bone.

Necrosis, which was termed by some of the old writers *Spina venenosa*, to distinguish it from another complaint called *Spina ventosa*, may either affect the superficial laminæ, or entire tissue of part of a bone,—the internal structure of the whole of a flat bone,—or the internal laminæ and

spongy texture of the cylindrical portion of a long bone*.

When necrosis affects the surface of a bone, the dead portions are thrown off, in the manner described in my remarks on caries, and are termed Exfoliations. These exfoliations are replaced by minute granulations, which shoot up from the sound bone beneath, and secrete a gelatinous fluid that soon acquires the consistency of cartilage, and in this cartilaginous deposite ossific matter is generated. In consequence of the extremely compact texture of the walls of the apophysis of bones, and of the comparatively low degree of vitality which

* In stating that the whole of a flat bone, or the entire substance of the shaft of a cylindrical bone, may become necrosed, I do not wish it to be understood that I subscribe to the opinion that they are ever completely regenerated. None of those cases upon record, which have been brought forward in support of this opinion, seem to me to be conclusive.

J. L. Petit mentions, that in the Hospital of Bouvigny he examined the bodies of many persons who had died of scurvy. In those that he opened, the periosteum was loosened from the bone, and in many instances from all the bones of the body. In some instances he drew out the bones entire, excepting their epiphyses. He does not mention, however, that nature had in any instance attempted to form a substitute bone.

they enjoy, they are more easily acted upon by external injuries, than the vascular cancellous texture of the epiphysis, and are hence especially apt to mortify. A very slight injury will frequently occasion most extensive exfoliation from the surfaces of the cylinder of a long bone; while, on the other hand, a musket-ball may in many cases traverse the cellular structure of an epiphysis, or lodge in its substance, without giving rise to such a degree of mischief as a person might have been led to expect*. Indeed the cellular texture of the epiphysis, when irritated by the presence of a foreign body, is more apt to put on the suppurative inflammation, than to perish by necrosis. This latter circumstance I have often seen fully illustrated, in cases in the human subject, and in the inferior animals, when they have been subjected to experiment. Some authors have asserted, that when the external layers of the apophysis of

* Mr Charles Bell, in his Surgical Observations, p. 321, when contrasting compound fractures with gunshot fractures, remarks, that "*the extremities of bone are not subject to necrosis.*" To this excellent work, and to Mr Bell's *Observations on Injuries of the Spine and of the Thigh-bone*, I beg to refer the reader for much valuable information.

a bone perish, the inflammation extends through the subjacent laminæ, and new osseous matter is deposited in the hollow of the bone, so as to strengthen that portion of it which has been weakened by exfoliation. This statement does not apply to every case, but only to those instances where the mortification has extended to some depth, or has completely penetrated the wall of the bone.

Superficial Necrosis, termed by TRIOEN *Spina mitior*, may be the result either of inordinate action of the muscles in unhealthy subjects, of external injury, or of disease dependent upon constitutional causes; from whatever cause it proceeds, it is characterized by similar phenomena. It may be remarked, however, that, in idiopathic necrosis, and in that dependent on the action of the muscles, the exfoliations in general extend over a larger surface, and affect the bone more deeply, than the traumatic does,—comprehending frequently the whole thickness of the wall or shell of the bone. The idiopathic necrosis, also, is more frequently met with in the flat, than in the cylindrical bones; in this respect differing from constitutional caries, which most commonly attacks the cellular bones, and the extremities of the long bones.

When superficial necrosis is the result of external injury, it generally happens that there exists a considerable solution of continuity in the superincumbent soft parts, so that the dead portions of bone, when loose, are easily removed by the forceps, before they have had time to give rise to serious local irritation. On the other hand, when the disease is the product of a constitutional cause, or of an injury unattended by laceration of the soft parts, the loose exfoliations act as foreign bodies, and occasion considerable irritation, which is attended with the secretion of purulent matter between the bones and the teguments, and inflammation more or less extensive of the periosteum covering the bone in the vicinity of the necrosed portion. This inflammation of the periosteum, or Periostitis as it is termed, frequently runs so high, that it degenerates into ulceration; and the ulcerative action extending to the subjacent bone, produces a kind of caries, that is afterwards very intractable.

Many practical men have imagined that superficial necrosis is, in the generality of cases, the result of inflammation of the periosteum. Doubtless, instances may occur in which this is the case;

but I think it is as reasonable to suppose, that external injury, or constitutional predisposition, may be sufficiently powerful to destroy at once the vitality of bone, without the intervention of periosteal inflammation;—and every surgeon is aware that the periosteum may suffer to a very considerable extent from idiopathic inflammation, and may even be removed, by means of external agencies, without the bone which it covers suffering in the slightest degree.

I have seen cases, and specimens are to be found in pathological collections, illustrative of superficial necrosis occurring as the result of inflammation extending from the adjacent soft parts and periosteum to the bone. Caries, however, is the most common sequela; and very large portions of the osseous tissue are frequently removed by ulcerative absorption, in consequence of the pressure of tumours, aneurismal enlargements, &c.

Internal Necrosis.—If we perforate a cylindrical bone, in one of the lower animals, by means of a sharp-pointed instrument, and introduce any foreign body, such as a piece of lint or tow, into its cavity, we sometimes induce such a degree of inflammation in the medullary tissue, and in the

internal layers of the interior parietes of the cylinder of the bone covering it, that death of the part takes place *. The dead portion of bone, in the course of time, begins to act upon the more external layers of the bony parietes to which it adheres, —a high degree of inflammation takes place,— suppuration ensues,—and the necrosed portion is partially absorbed, and becomes enveloped in the matter which is poured into the medullary cavity of the bone. In process of time the inflammatory action extends from the cavity to the substance of the parietes of the bone; the bone gradually be-

* Bromfield mentions a case, in which almost a similar experiment was made upon the human subject. "I saw a very remarkable case that ended happily, where the upper part of the tibia had a caries extremely deep, from the mismanagement of an issue, as well as from its being improperly made. The account I had was, that the pea used to slip out frequently, and had not obtained a good bed; therefore, a compress, with a shilling in it, was bound very tight on the pea, which happened to be seated on the bone; and by its pressure soon destroyed the periosteum, and, not long after, made its way through the surface of the bone into its spongy parts."—"A large piece of spongy substance (of the bone) came away, and the sore healed." — Chirurg. Observ. by W. Bromfield, vol. ii. p. 9. Lond. 1773.

comes interstitially enlarged throughout its whole circumference, and its highly stimulated vessels pour out new osseous matter on its outer surface and into the expanded cellular texture of the bone; while the absorbents, in the interior of the bone, being also excited, take up a considerable quantity of the decayed portion or sequestrum, which is shut up within. Many of the older surgeons imagined, and some surgeons of the present day are of opinion, that the reproduction of bone, after the separation of the sequestrum, in cases of internal necrosis, is dependent upon the periosteum.

I coincide in opinion with those authors who do not assert that the periosteum, condensed cellular membrane, or fascia, which covers the bone, is endowed with such complicated functions as to be able, not only to repair its own lesions, but at the same time to secrete osseous matter *. Many able works, however, have appeared in support of the opinion, that bone is regenerated through the medium of the periosteum; but one might as well assert that the skin secretes the cellular tissue,

* I admit that the periosteum may be transformed into a substance resembling bone. *Vide* Chap. i. sect. 1.

which is often destroyed by sloughing, without the teguments suffering much, and which, we know, is reproduced after the dead portions have been cast off, through incisions made in the skin. One argument, which has been brought forward in favour of the opinion that the new bone is secreted from the periosteum, arises from the fact, that the new formation is covered externally, and lined internally, by a membrane resembling in structure the periosteum. On minute examination, however, it will be found that the internal membrane lining the cavity of the bone, is of a less dense and fibrous character than the periosteum; it, in truth, more nearly resembles the membrane which lines the interior of abscesses (*vide* p. 35), and seems to be a provision of nature, a new formation of condensed cellular tissue, intended for the defence of the new bone and sound portion of the old bone,—and for the purpose of secreting pus, or that matter which always surrounds the loose sequestrum in the hollow of bones that have suffered from necrosis. The matter contained in the cavity of the bone seems to have a natural tendency to approach the surface; and hence, in the advanced stages of necrosis, we al-

ways find the bone to be perforated by foramina of different dimensions, which communicate with sinuses that extend to the surface of the body. On introducing a probe into one of these foramina in the bone, we sometimes find the sequestrum within moveable; when this is the case, it is the duty of the surgeon to attempt its removal. This object may be accomplished by means of a variety of operations,—for a detailed account of which, I would refer the reader to Mr Benjamin Bell's System of Surgery, vol. vii. p. 223; to Mr Russel's work on Necrosis; and to the references contained in Mr Cooper's Surgical Dictionary.

Having described briefly the morbid phenomena which characterize simple external and internal necrosis, I shall now proceed to give a short account of the pathology of that variety of the disease in which a portion of the entire cylinder of the bone is implicated.

This kind of necrosis is comparatively rare, though preparations illustrative of its peculiarities are to be found in pathological collections. It is sometimes the result of severe gunshot wounds, of compound fractures, and of amputation in unhealthy subjects.

The phenomena of the disease are best illustrated in those cases in which, after amputation, the stump has put on an unhealthy action. When, after the removal of a limb, the soft parts of the stump do not unite by the first intention, nor heal by the more tedious process of granulation, but assume rapidly a gangrenous character, the extremity of the bone is exposed to the action of the air, and in a short time loses its vitality; the external lamina of the bone, for some distance above the point where it projects from the soft parts, also perishes, leaving some of the internal laminæ and medullary tissue uninjured, so that the vascular conical portion thus formed throws out granulations *. Granulations also are generated from the fleshy portion of the stump, after the mortified parts have separated from it, and, amalgamating with those from the bone, form a continuous cicatrized surface. This is the most fortunate termination of necrosed stump, but it

* A most interesting and valuable case of this variety of necrosis affecting the femur, occurred in the practice of my excellent and intelligent friend, Mr A. Copland Hutchison. He has related it at length in his work, entitled, *Some Practical Observations in Surgery*, London, 1816, p. 130.

sometimes happens that the disease extends higher up, even as far as the epiphysis. A large internal sequestrum forms, and the external laminæ becoming affected with interstitial inflammation, deposition, and enlargement, the bone presents most of those morbid appearances which have been described under the head of Internal Necrosis. I have seen cases in which, after the stump had healed kindly by the first intention, internal necrosis supervened upon the remaining portion of the bone, and gave rise to much distress.

Necrosis, the result of Progressive Inflammation.—There is still another variety of necrosis, which is more insidious in its progress, and more destructive in its effects, than any of the kinds already described. It may with propriety be termed *Progressive Necrosis*, as the disease does not in the first instance appear to implicate the whole, or part of the entire cylinder, of a bone at one time, but beginning at a point, gradually extends throughout the whole of the bone (with the exception of the epiphyses), in which it has originated.

This is a most complicated form of the disease, and may, I think, be esteemed as a constitutional

or idiopathic affection, called into action occasionally by an external cause.

When, in consequence of a blow, or some other external injury, a portion of a bone—of a femur, for instance—is deprived of its vitality, a sequestrum forms, the outer tables of the bone become thickened, and exostotic productions form on the surface. The mischief does not terminate here, for while nature is endeavouring to repair the injury sustained in one part, another portion of the bone, in the vicinity of the original seat of the disease, becomes in its turn necrosed; and in this way I have seen the disease proceed progressively, until it has consumed nearly the whole of the original bone *.

Progressive necrosis, then, differs in one essential point from every other form of the disease, in that the two distinct processes of reparation and destruction are going on at one time in different parts of the same bone. It may with truth be said to resemble some of those compound sores of the skin, where we meet with phagedæna, suppuration, and granulation, in combination.

* There is a most beautiful specimen of this form of the disease occurring in the femur, in my collection.

I have thus endeavoured to explain, in as few words as were consistent with the nature of the subject, my own views relative to the pathology of necrosis: they are founded entirely on observations made on the human subjects, and of a series of experiments performed at different periods on the lower animals. It will be observed by such of my readers as have studied the subject of necrosis with attention, that I coincide with those authors who are of opinion that bone is regenerated by means of the vessels of its proper tissue, and that the periosteum performs nearly the same offices to it which fascia does to muscle, and neurilema to nerve. But I do not mean to deny that periosteum may become ossified on its texture, at least impregnated with earthy matter; but this impregnation, I think, should rather be classed with those depositions which occur in many other tissues of the human body.

To the experimental treatise of MICHAELE TROJA, *De Novorum Ossium Regeneratione Experimenta*, Paris, 1775; to the admirable and most useful work of L. P. WEIDMAN, *De Necrosi Ossium*, Francfort, 1793; to the valuable *Practical Essay* of Professor RUSSELL, Edinburgh,

1794; and to the papers in the *Edinburgh Medical and Surgical Journal*, 1822, of my friend Dr KNOX, I would refer the student for further information on this most interesting disease. There are many other treatises on the subject, which the advanced pupil may study with advantage; but as brevity is my object upon this occasion, I do not think it necessary to occupy more space in enumerating the titles of works, which are to be found in every medical library.

CHAPTER III.

AFFECTIONS OF BONE, APPARENTLY DEPENDING UPON A MORBID CONDITION OF ITS ASSIMILATING VESSELS.

1. Softening of Bone.—2. Brittleness of Bone.—3. Interstitial Absorption of Bone.—4. Interstitial Deposition and Enlargement of Bone.—5. Atrophy, or Wasting of Bone.

Having considered, as briefly as was consistent with the nature of the subjects, the different varieties and consequences of inflammation, I shall proceed to describe those peculiar morbid changes which occur in bone, which seem to depend upon a morbid condition of the assimilating vessels. The diseases of this class may be arranged, as has been remarked in the first chapter, under five heads, viz. 1. Softening of Bone; 2. Brittleness of Bone; 3. Interstitial Absorption; 4. Interstitial Enlargement; and, 5. Wasting of Bone.

Although several of these affections run sometimes more or less into each other, they frequently occur in an uncombined state. It is in their sim-

ple or uncombined form that they are now to be considered, in order that their several peculiarities may be the more easily pointed out.

It is pretty generally allowed that the osseous tissue, although endowed with what has been termed a lower degree of vitality than the other textures of the body, is nevertheless supplied both with secerning and absorbing vessels. It has not been proved, however, that there are two distinct varieties of secreting vessels, the one intended for the purpose of depositing the animal, the other for depositing the earthy, matter of bone. With this question we have fortunately little to do at present, as the phenomena which characterize the diseases which form the subject of this chapter, may be explained, either by supposing that there are two distinct classes of vessels, or that, when disease exists, the arteries of the bone, or the nutrient fluid which circulates through them, are morbidly affected, either separately or conjunctly.

From my own observations of the diseases of bone, I am inclined to believe that softening and brittleness of bone depend in a great measure upon a morbid state of the fluid by which it is supplied with its different constituent parts, seeing

that persons of a cachectic habit of body, marasmatic patients, and those who are subject to scorbutic complaints, most frequently suffer from them, and they yield only to remedies whose influence is exerted, not upon the local disorder alone, but also upon the constitution at large. On the other hand, I imagine that the source of interstitial absorption, enlargement, and atrophy, exists in the vessels of bone, as they seem, in almost every instance, to occur as purely local affections, and are only relieved by remedies directed specifically to the part in which they are situate.

SECTION I.

SOFTENING OF THE BONES, OSTEO-MALACIA, MOLLITIES OSSIUM, OR RACHITIS.

Softening of the bones is an affection which, although it is not peculiar to infancy and early youth, is seldom met with in aged subjects. It may exist as an hereditary complaint, or may be the result of defective assimilation, occasioned by

subacute inflammation of the small intestines, or chronic enlargement and induration of the glands of the mesentery.

That it is an hereditary complaint, no one, I think, who has had an opportunity of studying the disease, will deny; and that it is often a sequel of mesenteric marasmus, I am perfectly convinced, from the *post-mortem* examination of children who have died when labouring under it *.

Softening of the bones has been termed by some writers Mollities Ossium, and by others Rickets; while not a few have drawn a line of distinction

* Several very interesting cases of this distressing ailment occurring in children have been under my charge. In two instances, the spine and lower extremities only were affected;—in both, the children, although three years of age, were unable to stand or walk without support. These cases got well under a persevering use of *laxative* medicines, and stimulating embrocations applied to the spine. I treated them as cases of marasmus upon Dr HAMILTON *senior's* plan; because the belly was tumid and hard,—the bowels irregular in their functions,—the alvine excretions of a lax and bilious appearance,—the countenance and limbs shrunk, and dry on their surfaces. It is rather a singular fact, that, in both of these cases, the spinal curvature evidently diminished, although neither bandages nor screws were employed.

between these two terms, and have employed them to designate what they considered to be different affections. I confess that it has never been in my power to trace the distinction.

In this disease, the bones are found, on examination after death, to be elastic, soft, and frequently pliant; their fibro-cellular structure can be more distinctly traced than in healthy bones, and, on being dried, and imbued with penetrating turpentine varnish, sections of them appear translucent. Occasionally the bones are so soft, that they may be easily cut with a knife, or fractured on the application of the slightest force.* Indeed, the action of the muscles themselves is sometimes sufficient to break the bone, as I once saw well illustrated in the femur of a child; and Bonn gives an excellent delineation of a similar instance†. Although in the generality of cases of mollities, the bones are extremely soft, they are not in every instance easily fractured; but may be suddenly

* See case in Edinburgh Journal of Medical Science, vol. i. p. 337.

† Bonn, Descriptio Thesauri Ossium Morbosorum Hoviani, tab. xii. fig. 1, 2. Amstel. 1783.

and forcibly bent, without any solution of continuity taking place *.

The soft and pliant state of the bones in mollities ossium, seems to depend upon a defective deposition of the earthy salts which enter into the composition of healthy osseous tissue †. When this merely is the case, and the fibro-cartilaginous matrix remains healthy, it is singular to remark with what facility fractures of softened bones unite. But when the softening of a bone is not attended with pliancy, and it snaps on the application of a slight degree of force, the fibro-cartilage seems to be in a diseased state, and the broken extremities are more apt to assume the ulcerative than the adhesive inflammation.

When, from proper treatment, or in consequence of a natural improvement in the constitu-

* We must not confound the pliant state of the bones, which always exists to a greater or less extent in childhood, with rickets.

† Antonio Scarpa, in his work *De Anatome et Pathologia Ossium*, p. 122, 1827, quotes a case related by Cheston, in the Philosophical Transactions, vol. lxx., in which the thoracic duct was distended with phosphate of lime. He also describes a similar instance which came under his own observation.

tion of the individual affected with mollities ossium, the earthy salts are deposited in due proportion in the substance of the previously morbid osseous tissue, it may frequently be remarked, that the bones acquire a degree of density superior to that which is observed in the bones of those who have not suffered from the disease. And here it may be proper to allude to the beautiful provision of Nature in its mode of regulating the formation of the cellular laminæ of the cylindrical bones, when curvature of them has taken place from softening.—As my friend Mr STANLEY, assistant-surgeon of St Bartholomew's Hospital, was the first who gave a distinct account of the phenomena, although they were previously delineated by SCARPA, I may be excused from borrowing a passage from his interesting memoir on the subject*. "In the curved bone, the part where there is the greatest need of strength, to prevent its further yielding, is in the middle of its concavity, or, in other words, in the line of its interior curve."—"It will also be noticed, that the bony fibres are arranged obliquely across the axis of the bone, in

* Med. Chirurg. Trans. vol. vii. p. 407. Lond. 1816.

a direction evidently calculated to augment its strength and power of resistance."

Mollities is one of those diseases which does not confine its attacks to any particular class of bones, —it occurs in the cylindrical, the flat, and the spongy bones. The deformity which it occasions is in many instances frightful. We meet with individuals who labour under it with their spines curved backwards, forwards, and laterally,—sometimes twisted like the letter S, and sometimes inclined forward, so as to form at the loins almost a right angle with the pelvis. The ribs, too, are occasionally bent at their angles in such a manner as almost to squeeze the contents of the thorax to the spine; sometimes they lose their natural curvature, and project in almost a straight line to the sternum. There are many valuable specimens of the disease in the Museum of the College of Surgeons* of Edinburgh; and in the Museum at the Garden of Plants, in Paris, I saw the skeleton of a female, in which the femora are twisted in such a manner, that the outer ankles are almost in contact with the ears.

* *Vide* Catalogue 1. 3. M. 8. 17. 19. 20. 21. 22. 24. 25, &c.

It is of much consequence, in practice, to distinguish curvatures of the spine which depend upon mollities ossium, from those which are the result of scrofulous inflammation of bone, or of interstitial absorption. *Vide Chap.* iii. *Sect.* 3. In the lateral and almost spiral curvatures, which depend upon softening of the bones, much may be done by an intelligent bandage-maker in arresting the progress of deformity by the judicious application of artificial supports; but in the curvature occasioned by interstitial absorption, a very different line of practice must be pursued *.

Before concluding these remarks, I may state, that, after the tendency to mollities has been overcome, and when the bones have acquired a proper degree of solidity, exostotic productions or splints are sometimes thrown out from the bones of the vertebræ, and are occasionally so luxuriant as to form what may be termed a kind of false anchylosis†.

* From Mr Fortune, a skilful bandage maker of this place, who has enjoyed a regular surgical education, much useful information concerning the mode of applying mechanical contrivances for the relief of this disease, may be obtained.

† *Vide* Preparations numbered in Catalogue, I. 3. M. 6-7.

SECTION II.

BRITTLENESS OF BONE.

Fragility of the Bones, or *Fragilitas ossium* as it is generally termed, is an extremely common affection, but it is one which does not admit of being very easily or clearly described. Its peculiarities may be more readily pointed out, if I give an example illustrative of the manner in which its existence is first recognized, than if I attempted to give a general detail of its symptoms.—A child falls upon the floor, and fractures a limb. The fracture unites, and is consolidated perhaps in less than the usual period. Some time afterwards, on lifting a moderate weight, or on giving the limb a slight twist, it is again broken, and again unites. This accident I saw occur three times in different parts of the right humerus of a child five years of age, within the short period of eighteen months. Several similar cases have been under my care; in all of them the patients seemed to enjoy robust health, were apparently untainted by scrofula,

and their fragile bones united in a shorter space of time than I have generally observed to be the case in individuals whose bones were tougher. I have more than once seen bodies brought into the anatomical theatre for dissection, whose bones were fractured by a slight blow or fall, and yet, on examining their intimate structure, no appearance of disease could be detected.

In only two cases of fragility have I been able to observe any palpable alteration from the healthy state, in the structure of the bone affected with it. The subject of one case was a gentleman at the middle period of life, who fractured his humerus in unscrewing a music stool. The fracture was comminuted, and did not unite. Several months afterwards the arm was amputated, by my father Mr George Bell, at the shoulder-joint. On examining the limb, the muscles surrounding the fractured bone were found to be in a pulpy state. A quantity of partly fluid, and partly coagulated, blood enveloped the bone, which was fractured near its centre. Several fragments of bone, varying from one to three inches in length, lay imbedded in the blood. No attempt at the adhesive or reparative inflammation seemed to have been made.

The bone was almost friable, and its entire surface, from the neck of the humerus to the condyles, was perforated by innumerable small irregular shaped holes, giving to the bone, when macerated, a true reticular appearance; and this peculiar reticulated appearance was also observable in the osseous plates of the cancelli.

In this case, which nearly resembles one described by FREDERIC MUZELL*, I conjecture that the fragility depended upon defective action of the secerning vessels of the bone, combined with an unhealthy condition of the fluids circulating through them; as, from a minute inspection of the

* In the case mentioned by MUZELL, the complaint commenced with uneasiness of the arm, an inch below the deltoid muscle, resembling rheumatism. The patient described the pain as being seated in the centre of the bone. The arm was fractured at the situation of the pain, in consequence of suddenly twisting it. By adhering to the antiphlogistic regimen, &c. the fracture was cured, but not until the fingers had become enlarged and painful.—Med. and Surg. Observations, by F. MUZELL, p. 93. Lond. 1755.—*Vide* also TULPIUS, lib. iv. c. 12. The disease in this case seems to have degenerated into Osteo-sarcoma.—BONETUS, Sepulchret. Anat. lib. iv. sect. v. Genev. 1700. The case quoted by BONETUS resembles in many respects that given in the text.

bone, it was quite evident that the earthy matter, even although it existed in too small quantity, was more abundant in proportion than the animal constituent.

When fragility occurs in combination with softening of the bones, it seems to depend, as has been already remarked (*Sect.* 1.), upon a morbid state of the fibro-cartilaginous tissue of bone.

Fragility of the bones, then, is an affection which may occur at different periods of life, but is most common in childhood, and in persons of an advanced age. The fragile condition of the bones in some children need not, I think, be regarded as a dangerous occurrence, as the tendency appears to diminish as the system is developed, and as the powers of life increase. But in advanced life, this affection should be considered with anxiety, as it often indicates a morbid state of constitution, over which medicine and surgery appear to possess a very limited controul.

SECTION III.

INTERSTITIAL ABSORPTION OF BONE.

In the latter part of the year 1824, I published a memoir on an affection incidental to the neck of the thigh-bone,—this I termed Interstitial Absorption. The term has been adopted by many of the profession, and since the period alluded to, interesting examples have been made public, and many valuable cases have been communicated to me, by intelligent pathologists in different parts of the kingdom.

Although interstitial absorption of the bones, as affecting the adult and aged, is met with more frequently in the neck of the thigh-bone, than in most of the other bones, still it is not peculiar to the femur. I have seen it in many of the other bones, very frequently in those of the spine; and there is a specimen shewing its existence in the neck and head of the humerus, preserved in the Museum of our College of Surgeons.

It is an affection which is not common to any

period of life: in the young, it in general confines itself to the vertebral column; in the middle-aged and elderly, its usual seat is in the neck of the thigh-bone.

Before describing the local peculiarities of this affection, it may be as well, in the first instance, to allude to its general characteristics. When a bone is undergoing those changes which take place in interstitial absorption, the pathologist will observe a series of very interesting phenomena. These phenomena may be arranged under two heads; the former head comprehending the appearances observed in the periosteum, the latter those which are peculiar to the bone itself.

I. The appearances observed in the investing membrane in some respects resemble those which are met with in simple superficial inflammation of bone, and in some varieties of exostosis. The periosteum is thickened, but there is no serous, purulent, or gelatinous deposit, interposed between it and the bone. It is vascular, but the vascularity does not resemble the uniform rosy blush of inflammation, and is more like congestion; the periosteo-osseous vessels are larger than they are

found to be when the bones are in a perfectly healthy condition, and, on raising the periosteum, they may be distinctly observed to proceed from that membrane into the substance of the bone, penetrating, as it were, the external table, by an infinity of minute foramina.

II. The bone, after maceration in water, seems to be, as it were, riddled by drills of different magnitudes. Its general texture, however, is not altered, the external laminæ and internal cellular substance retaining their proper degree of density.

The foregoing appearances characterize the early stages of the affection, but when it has existed for some time, an evident loss of substance takes place in the bone, its opposite extremities approach nearer to each other; or when the absorption has taken place to a greater extent, upon one side or table of a bone, than upon another, the bone seems as if it were bent, and assumes a preternaturally concave appearance on one side, while the other side either retains its proper form, or presents a greater or less degree of convexity.

1. *Interstitial Absorption of the Bones of the*

Spine proceeds with much greater rapidity in the young than it does either in the adult or aged subject. It is also more frequently met with in female than in male children, and more especially in those who are in the middle and higher ranks of society.

In former times when the young of the female sex were not shackled by tight stays and bands, which grasp the lower portions of the chest; or tortured by back-boards, stocks, and other detestable inventions of the mantua-maker and dancing-master, interstitial absorption of the spine was a comparatively rare affection; but in the present day there are few families in which it is not to be met with. To many mothers, and even to many medical men, its silent progress proves a source of much and painful anxiety. In itself the affection is not attended with danger, and may be remedied if attended to in time; but when it is allowed to proceed, without any effort being made to counteract it, it is apt to prove detrimental, in a secondary way, by interfering with the important functions of respiration, circulation, and digestion.

Interstitial absorption of the bodies of the ver-

tebræ in its advanced stage has been, I have no doubt, in many cases confounded with rickets, and the peace of mind of families ruined, from the supposition that one or more of their number were tainted with that scourge of civilized society, scrofula. When a lateral curvature, however slight, is observed to take place in the spine of a young female, her friends immediately imagine that she is rickety, and proceed to inflict upon her all those descriptions of torture, which have been cunningly invented by ignorant or interested empirics, for the relief of that terrible disease. When too late, they find that their attempts have proved fruitless, and the young, and perhaps beautiful female, who, with heroic fortitude, has surrendered her person to the infliction of the screw, or the torture of the steel-corset and braces, is doomed to spend the remainder of her life a martyr to indigestion, and the diseases dependent upon it. I am convinced that examples of simple interstitial absorption of the vertebræ have been converted into incurable cases of rickets, by the improper application of bandages, braces, back-straps, steel-stays, and corsets. These engines have in general a decided effect in counteracting the proper move-

ments of the limbs,—in depriving the muscles of their energy,—in contracting the chest,—and in impairing, from the pressure they exert, the functions of the midriff and stomach. Many of those cases of spinal deformity, which are met with in the young of the higher ranks, may without doubt be attributed to the agency of the dancing-master and mantua-maker, and to confinement in the school-room, occasioned by the over-anxiety of parents to cultivate the mind at the expence of the body.

The deleterious effect of pressure upon the digestive organs and the muscles of the back, I have frequently observed in the adults of the male sex, who, with a view to improve their shapes, have resorted to the use of hunting belts and corsets.

Interstitial absorption of the spine, in its early stages, is neither a dangerous nor incurable affection. In early life the bones are pliant, and it is the duty of the surgeon to take advantage of this circumstance, and so regulate his plan of treatment, as to counteract the tendency to bending and absorption of the bones of the spine, which, in the generality of cases, arises from inattention to

position, and the improper shape of clothing. At an early period of life, or even in adult age, when, from habit, the body has been suffered to incline to one side *, beyond the proper centre of gravity, the unequal pressure of one vertebra upon another, on the side to which the tendency to inclination has occurred, occasions, in the first instance, a partial absorption of the intervertebral cartilages, and subsequently of the vertebræ themselves.

As soon as an inclination, however trifling, of the spine has taken place, the process of interstitial absorption proceeds with great rapidity; and

* It has been observed by most surgeons and bandage-makers, that the inclination is in general to the right side. This may be explained, as my friend, Dr Knox, lecturer on anatomy, judiciously remarks, by the fact, that, in most employments, and in most practical studies, such as music, writing, arithmetic, &c. the right arm is chiefly employed, and the upper part of the body generally inclined to the right side. Parents, and those who are entrusted with the education of young persons, should therefore pay particular attention to the position of those under their charge when at study, and encourage them, when out of school, to indulge in those amusements, which have a tendency to give the muscles of the back and loins full play.

if proper means be not employed to restrain its progress, the affection terminates in what is termed curvature of the spine.

That curvature of the spine, in persons who are not of a rickety habit, is the result of inattention to position, there can be little doubt, and that its progress is materially influenced by a change in the equilibrium of the body*, and consequently altered sphere of action of the muscles of the back and loins, few I think will deny.

If the account which I have given of the causes of interstitial absorption of the bones of the spine be correct, the student will at once understand the impropriety of employing, in its early stages, the different kinds of mechanical support for its relief. These agents always tend in one way or another to impair the general health, and to enervate both body and mind.

* Mayo attributed lateral curvature to an excess of tonicity in the muscles of one side; Petit and Vacher to the same cause, combined with the alteration of gravity produced by the head and shoulders being inclined to one side or the other. Glisson thought that it was the result of an irregular distribution of the nutrient matter of bone, the deposition of osseous particles being more on one side of the vertebræ than upon the other.

Although it is not my purpose in this work to enter into any detailed account of the mode of treating the different diseases of bone, of the pathological characters of which I only profess to give a brief outline, I cannot refrain from offering a few hints upon the treatment of this most interesting affection.

If the surgeon should be called to examine a case of interstitial absorption of the bones of the spine, in its first stage, when the curvature is so slight as to be scarcely perceptible, and when the patient has her clothes on, the treatment is very simple,—a pair of scissors is the only instrument he requires; with this instrument he should freely divide, in the first instance, the tightly drawn belt, which in general encircles the waist of young females, and then the cord which binds the stay or corset to the body. This being done, regular exercise on foot, in the open air, should be inculcated. The propriety of exercise on horseback, for delicate females, is questionable, as, from the awkward position in which they are obliged to sit on the saddle, the tendency to curvature is apt to be increased. Indeed I have observed that some

of the most confirmed cases of curvature have been in young females, who were fond of, and indulged much in, riding on horseback. How few post-boys even have straight spines!

In the second or more advanced stage of this ailment, when, in consequence of a slight inclination of the spine to one side, the ribs and shoulder-blade of the opposite side appear somewhat prominent, in addition to the treatment already recommended, passive exercise of the dorsal and lumbar muscles should be inculcated. By *passive* exercise, I mean that regular but slight contraction and expansion of the muscles produced, independent of the will, by the proper application of friction. It is surprising to observe the effects of well applied friction, in increasing the bulk and strength of the muscles, and of this fact bone-setters and empirics in general are well aware. In the east, where the system is rendered lax by the intense heat to which the body is constantly exposed, there are individuals, whose sole occupation consists in rubbing and champooing the bodies and limbs of their masters. Even in this country there are, in great towns, professed female rubbers, and of the good effects of their ex-

ertions, in cases of lateral curvature of the spine, from *interstitial absorption*, I have frequently been a witness.

In the application of friction in this affection, care should be taken that the muscles of the back and loins be placed neither completely on the stretch, nor yet relaxed. The patient should be desired to stand or kneel by the side of a bed or sofa, with her arms placed close to her sides; she may then lean forward on the couch, and the rubber standing at one side of her, carefully rubs and kneads the muscles on each side of the spinous processes, from the inferior cervical to the inferior lumbar vertebra.

In addition to the treatment recommended above, the patient may indulge in sea-bathing; but if the state of her health, in other respects, should prevent her from doing so, sponging with sea-water, or diluted vinegar, may be employed. It is needless to add, that minute attention should be paid to the state of the bowels and catamenia.

When, in consequence of neglect, or *obstinacy* on the part of the patient, the spinal curvature has increased to such an extent, as to approach deformity, I do not think that, in the

generality of cases, the affection can be alleviated, far less cured. The spine can be supported certainly by steel stays, which only do what nature would have accomplished in an earlier stage of the ailment; under this disadvantage, however, that, in more advanced life, when personal appearance is of little importance, the sufferer, who has submitted in her youth to the torture which steel-stays occasion, lays them aside, and prefers to spend most of her time extended on a couch, a prey to melancholy and indigestion.

If the fair sex were fully aware of the bad effects which result from tight lacing, I feel assured that they would not practise it. In addition to the diseases which it occasions; the deformity it produces, *independent of that arising from the spinal curvature*, is very great. In this age, when the march of intellect has made such rapid strides, that not only the sciences but the arts are taught in every school, and no child is ignorant of the elegant proportions of the Venus of Medicis, and the manly beauty of the Antinous, is it not surprising that the most accomplished, the best informed, and most beautiful of the sex, should strive to imitate the barbarous customs of the Chi-

nese, who, to do them justice, however, confine their efforts in distorting nature to the foot alone!

The student will perhaps pardon me for having entered more fully into the consideration of this affection of the bones, than I have done in my description of the other diseases of the osseous tissue, when I inform him that it is an ailment which will occur very frequently in the course of his practice, and will give him more trouble and anxiety than diseases of a much more serious description.

2. *Interstitial Absorption of the Neck of the Thigh-Bone**.—As this is a disease of frequent occurrence, but has nevertheless been almost overlooked by systematic writers, or confounded by them with fracture, dislocation, mollities ossium, and scrofulous affections of the hip-joint, I shall perhaps be excused for entering rather minutely into a consideration of it.

History and Symptoms.—In persons at an advanced period of life, we frequently observe an evident inclination of the body forwards. This

* Catalogue, I. I. M. 33. h.—I. I. M. 22.

inclination, or bending of the body forward, depends in a great measure upon the failure of muscular power, the weight of the head and superior portion of the trunk becoming too great in old age, for the enfeebled dorsal and lumbar muscles to sustain.

We do not find, however, that the stoop forms a regular curve; for, on examination, it will be perceived that the curvature is more or less acute at the joint of the hip, and slight, comparatively speaking, in the back and loins. In fact, there is superadded to the bending forward of the vertebral column, a permanent semiflexion of the pelvis upon the femur. In some individuals the stoop has a lateral inclination, and in these cases the limb on the more depending side is always shorter than the limb of the opposite side *. Individuals thus affected cannot perform the motions of abduction beyond a very limited range. A dull pain and sense of weariness are felt in the re-

* In this respect interstitial absorption of the neck of the thigh-bone differs from inflammatory and scrofulous affections occurring in the hip-joint. In such cases the inclination takes place on the side of the sound limb.

gion of the hip-joint, and these are much increased on the slightest exertion.

The patient cannot stand erect, and bear his weight on the affected limb, without experiencing considerable uneasiness in the joint. Pains resembling those of rheumatism dart down the thigh, and spread across the loins; the muscles of the lower extremities become wasted, and the general health is in some instances impaired.

I have stated that, in general, the symptoms described above do not present themselves, until an advanced period of life; but I have met with cases, since the publication of my memoir on this disease*, in which interstitial absorption had affected the neck of the thigh-bone of one side, in persons of thirteen, thirty, and forty years of age †.

* Remarks on Interstitial Absorption of the Neck of the Thigh-Bone. Edinb. 1824. *Maclachlan & Stewart, publishers.*

† My friend Dr KNOX has related a most interesting and curious example of this affection occurring in the neck of the thigh-bone of a child three years of age.—*Edin. Med. and Surg. Trans.* vol. iii. p. 1. Edin. 1828. This case is particularly valuable, as, with the exception of one mentioned by SANDIFORT, and delineated in the lxxvii. tab. fig. 1, 2. of his *Museum Anatomicum*, Lugduni Batav. 1793, it is the only one I have found on record. As the case mentioned by

In the cases which occur in middle age, it does not in general appear to be an idiopathic affection,

Dr KNOX may be met with by turning to his paper, I shall not allude to it more particularly at present; but as the work of SANDIFORT is rare, and only to be found in the library of an university, I may be excused for inserting an abstract of the case to which I have alluded. It occurred to PALLETTA, who presented the preparation of the affected bone to SANDIFORT. The patient, a young man, twenty years of age, who had been lame from his birth, died in the year 1783, in consequence of a wound of the head. "Capsa deinde articularis incisa profluxit parum synoviæ mucilaginosæ, non vitiatæ. Acetabulum sanum erat profundum, cartilagine sua abductum, figura duntaxat mutatum. Caput femoris in vertice valde depressum, atque inferius productum velut in obtusum rostrum desinebat. Tota ejus superficies cartilagine, colore, et crassitie naturali, tegebatur, excepto exiguo tractu circa ligamenti teretis foveam, ubi sic attenuata cernebatur, ut diaphana redderetur. Ligamentum teres infra capitis centrum trochanteri minori proprius inserebatur. Robustum tamen illud erat, crassum, et lata triangulari basi ex acetabuli sulco prodibat. Femoris collum erat perbreve, si eo nomine distinguenda est ossea portio a capitis rostro in transversum ducta, et in trochanteris basim inserta. Hæc porro una cum capite compressa a lateribus, et circum eminentiis parvis obsita erat, circulari articuli ligamento inclusis." It must be remarked, that these congenital cases of shortening of the neck of the thigh-bone

but is the direct result of cold, or of a fall, blow upon, or other injury of, the trochanter major. The patient, immediately on the receipt of the injury, complains of pain in the hip-joint, which, in the course of a few days, subsides into a sense of dull uneasiness, resembling chronic rheumatism. But even in this state, an increase of pain is felt on moving the joint, or on bearing the weight of the body upon the injured limb. When this disease is the result of cold, I have known it to be attended with much local uneasiness: but in one case, which came lately under my observation, although shortening of the limb to the extent of an inch had taken place, the individual, a gentleman about sixty years of age, had never experienced much inconvenience beyond what proceeded from stiffness of the joint.

Appearances presented on dissection.—On reflecting the orbicular ligament, which invests and

should be considered in a very different light from those which occur in old age, or in consequence of the operation of external causes. In the former, the shortening may be esteemed as original malformations, in the latter as the result of morbid action.

incloses the joint of the hip, we find the synovial membrane thickened, and in a highly vascular, though not inflamed, state. The thickening of this membrane is most apparent at that part where it begins to be reflected over the head of the thigh-bone at the edge of the cartilage. Occasionally the thickening exists in distinct portions of a round or nodulated form; but in the generality of examples it is diffused, and affects equally every part of the membrane. Occasionally, also, the capsular ligament is of an unusually dense texture.

In addition to the thickening of the synovial membrane, those of its vessels which, in the healthy state, are colourless, appear very turgid, and of a bright red tint, anastomozing with each other, and giving rise to a beautiful reticulated appearance.

In a more advanced stage of interstitial absorption, the periosteum, covering the distal portion of the neck of the femur, becomes thickened also, and injected with red blood. When this membrane is raised, the subjacent bone is found to be drilled, as it were, by an infinite number of minute holes, of calibres varying from the fifth of a line to a line in diameter. These holes, on minute

examination, do not appear to penetrate deeper than the shell or external table of the bone, and are filled by the processes of periosteum which envelope the vessels of the osseous tissue. The foregoing phenomena characterize early stages of interstitial absorption, and are chiefly confined to the membranous parts. In the more advanced stages, we find, that, in addition to the thickening of the synovial membrane and periosteum, the bone is more thickly studded with the small foramina already alluded to, and these commonly exist in greatest number at the lower or concave surface of the cervix femoris. Something resembling a yielding or bending of the neck of the bone may now be perceived, for the inferior edge of the corona of the bone has approached to the lesser trochanter *. This effect does not proceed from any softening or alteration in the intimate texture of the bone, but arises in consequence of the absorption and disappearance of a portion of its entire substance. On a cursory examination, it looks as if the head of the bone were forced downwards by

* Morgagni describes two cases of lameness, in which, on dissection, there appeared an evident shortening of the cervix femoris.—Epist. lvi. lib. iv.

the action of some great pressure; and I have seen cases in which the interstitial absorption had proceeded so far, that the head of the thigh-bone rested upon the upper part of the trochanter minor; and, in a specimen which is in my collection, that tuberosity is actually hollowed out, so as to afford a cavity for the head of the femur.

It does not always happen, however, that the shortening proceeds to the greatest extent at the lower surface of the cervix, the upper surface being in some cases most materially affected; and there are specimens in pathological collections which prove that it may take place in every part of the circumference of the neck of the thigh-bone. In some rare cases * I have observed, that, combined with the shortening of the cervix femoris, there is also a flattening of the head of the bone,† and the formation of a deep groove around the lower edge of the corona. The absorption some-

* *Vide* a delineation in the plates, from a preparation in my possession.

† Morgagni observed this in the left thigh-bone of an old woman, after luxation.—Epist. lvi. lib. iv. This is a common occurrence, and specimens illustrative of it are to be met with in every extensive pathological collection.

times occupies even a wider range than has been mentioned above, more than two-thirds of the neck of the bone occasionally disappearing; so that the head of the bone is as if it were forced in the direction of its axis towards the base of the trochanter major.

Superadded to the simple absorption of the neck of the thigh-bone, we frequently observe extensive osseous depositions on the surface of the bone; the lower part of the neck of the bone seeming as if it were incased in a sheath of osseous matter, which is sometimes of a spongy texture, and sometimes of a dense structure, and presenting an irregular stalactitic surface. In the Medico-Chirurgical Observations of Cornelius Trioen, two excellent delineations are given, which illustrate this form of the affection *. It is those cases of interstitial absorption which are combined with exostotic deposition, that are apt to be confounded with fracture of the neck of the thigh-bone †.

* Lic. citat. p. 143. tab. xi. & xii.

† In confirmation of my views relative to the nature of interstitial absorption, I have received communications from numerous correspondents in different parts of the island.

In the treatment of interstitial absorption of the neck of the thigh-bone, the object to be held in view is, to promote a determination of the vascular action which is going on in the bone to the surface of the body.

In the early stage of the affection, perfect rest in the horizontal position should be inculcated, and along with this may be conjoined the use of tepid water poured from the spout of a tea-kettle, or from a garden forcing syringe, on the joint, together with emollient cataplasms and evaporating lotions. If these means fail, local irritants may be employed. The applications of this class are very numerous; and it may be proper, therefore, to specify those which are most worthy of consideration. Blisters, the tartar emetic ointment, ointment of corrosive sublimate, issues, seatons, moxa, and the actual cautery, are those which may be resorted to, as being at once the most easy of ap-

To Mr Howship of London, Mr Turner of Manchester, Professor Ballingall, and Dr Knox, I feel especially obliged for the kindness and promptness with which they have on this and various other occasions given me their valuable advice and assistance, in prosecuting my pathological investigations.

plication, and the most efficacious in their operation.

In employing blisters, care should be taken to keep up a continued irritation on that part of the skin immediately over the joint, and a little in front of the great trochanter. This object can only be accomplished by a frequent succession of them. The tartar emetic ointment is a remedy nearly similar in its operation to a blister, and is, on the whole, more manageable. It must be employed, however, with great caution, as the particles of the antimonial salt are very slowly absorbed. Care should therefore be taken, after having, by friction with a piece of flannel, promoted the action of this application, to wipe away the remainder of the ointment which adheres to the surface,—as, on drying, the antimonial powder is apt, on the slightest motion of the bed-clothes, to be brought into contact with other parts of the body, and I have seen the most disagreeable consequences result from inattention to this circumstance. The moxa is liable to fewer objections than either of the preceding applications; its operation may be regulated with greater certainty, and it has no tendency to affect the stomach or

bladder. Indeed the moxa may be employed either as a simple vesicatory, or as a substitute for the actual cautery.

SECTION IV.

INTERSTITIAL DEPOSITION AND ENLARGEMENT OF BONE.

This affection occurs more frequently than is generally imagined *,—and although it is not always met with, uncombined with inflammation and other diseases of the bone, still it deserves a place in pathological arrangements. Like interstitial absorption, it sometimes can scarcely be

* Catalogue, I. 5. M. 52. 1. 1. M. 54. Internal enlargement and deposition of femur from venereal inflammation. Also No. 1000. has conjoined with the deposition and enlargement, many exostotic productions of a stalactitic form on the surface of the femur.——1. 5. M. 79. exhibits a section of the tibia, in which there exists enlargement and expansion of the tissue, without interstitial deposition.

1. 5. M. 74. 1. 5. M. 7.

termed a disease, since, in many instances, it is unattended with any constitutional disturbance, is productive of no local uneasiness, and does not interfere with the functions of the part in which it is seated.

We sometimes find that there is an enlargement of bone without interstitial deposition, and in this case there is little alteration in the intimate texture of the bone. It seldom affects the whole of a bone; but occurring in a cylindrical one, is generally confined either to the epiphysis, or to the shaft of the bone. When it occurs in the articular extremities, it is frequently the result of a sprain, blow, or other injury; but when it affects the cylinder of a bone, it seems, in most instances, to be an idiopathic affection.

The enlargement of bone* is generally combined with interstitial deposition. In this case,

* In the *Museum Anatomicum* of SANDIFORT, tab. lxxxix. there is a beautiful engraving which illustrates this affection. "Femur dextrum, cujus pars inferior in tumorem expansa, crassa, indurata, laminas osseas, fibras, spinas, tubera magna parva, aspera sistit." From the appearance of the bone in this delineation, I suspect that the enlargement depended in some measure upon interstitial inflammation.

the bones occasionally acquire a degree of density and hardness approaching to that of ivory. This peculiar alteration I have often observed in thickened crania, and in the shafts of thigh-bones that have suffered from interstitial absorption of their necks.*

It would be an interesting point to determine whether interstitial enlargement and deposition in the bones of the head are in most instances conjoined with organic or functional disease of the brain. I have in my possession a highly interesting specimen of this affection, which occurred in the cranium of an individual who had suffered long from chronic mania. With a view to determine this question, I consulted my friends Professor MONRO, Mr HOWSHIP, and several other able pathologists, but they had not met with a sufficient number of cases of the affection to enable them to form a satisfactory conclusion †. I may be excused for inserting in this place a short extract from an interesting communication I re-

* Catalogue. This ivory appearance of the bone illustrated in the humerus, 1. 5. M. 90.

† SANDIFORT, lib. citat. tab. xiii. has given five delineations of thickened crania; some of them were unusually

ceived from Mr Howship, in answer to a letter I wrote him on this subject. "I have seen but little of thickening from interstitial deposition, or from exostosis, of the bones of the cranium. The best marked specimen of increased density is the one from which I have had a specimen engraved, and some particulars mentioned in the Medico-Chirurgical Transactions, in my paper on Inflamed Bone. There was in this case no connection with any mental affection, nor disease of the brain; nor have I ever seen such a case; although I believe you allude to the specimen from a maniacal person in Mr Heaviside's Museum."

"In my own collection I have a specimen of increased density and thickening, with obliteration of the diploë, from a child of seven or eight years old. Scrofulous disease having led to abscess beneath the pericranium, at different parts, followed by chronic inflammation in several parts of the skull, and productive of necrosis in the right parietal bone."—"In this case, the symptoms of

dense, others preternaturally spongy in their texture. But he is silent as to whether mental alienation accompanied this peculiar condition of the bones. *Vide* Catalogue, I. 3. M. 38. 39. 40. 41. 48.

mental affection were only those of water in the brain, which was found after death between the membranes."

Some of my readers may perhaps question the propriety of arranging interstitial enlargement and deposition of bone under a separate head from that of inflammation; but from the description I have given of the affection, they will understand my reasons for having done so. It is true, that enlargement is often the result of interstitial inflammation of bone, as I have stated at page 16; but it is also true, that it occurs independent of inflammatory action, and its existence often, when it occurs in some of the bones, cannot be traced until the body is examined after death.

SECTION V.

WASTING OF BONE, OR ATROPHIA OSSIUM.

ATROPHY is another affection of the bones dependent upon defective assimilation, but originating from other sources besides those which give rise

to Fragilitas Ossium and Interstitial Absorption. It seems to depend essentially upon a diminution of nervous energy, and to occur, for the most part, in those cases when the bones which it affects are not called upon to perform their usual functions. We accordingly find that it is most common in the bones of the extremities, and more especially in those of the lower limbs, when there has existed disease in the hip or knee-joints * so severe as to incapacitate the patient from employing the limbs in locomotion. This affection differs from interstitial absorption in the following particulars. The general form of the bone in which it exists is not altered: it is attenuated, however; and most of the cellular or cancellous tissue disappears: the greater part both of the internal and external surfaces of the parietes of the bone is absorbed, and the remaining thin shell of bone is in general preternaturally brittle. It is a singular fact, that atrophy of the original

* My friend Mr Howship, who, as a pathological observer, ranks very high, mentions in a letter to me, dated 21st June 1828, "I have never seen a decided instance of atrophy of the bones, unless connected with disease, I believe of a scrofulous nature, in the joints."

bone may exist in combination with exostosis; which proves, that, although the arteries of the bone have ceased to have the power of secerning osseous matter in the substance of the bone itself, they still convey earthy matter, and possess the power of depositing it on the surface of the bone.

I have in my possession the lower part of a femur which has suffered from atrophy; the parietes of the bone are a mere shell; but on the posterior surface of it there are numerous exostotic productions. On the articular extremities may also be observed that peculiar appearance which has been termed, improperly, the Porcellanous alteration of bone.

There is in the collection of my friend Dr KNOX the most valuable, and perhaps the most illustrative, specimen of this affection that is to be met with in Britain; at least, I have never been fortunate enough to examine any preparation which more fully exemplifies all the peculiarities of atrophy of bone *.

* CHESELDEN, in his great work entitled "Osteographia, or the Anatomy of the Bones," London 1733, has delineated, tab. 1. fig. 1., a thigh-bone resembling those femora which are in Dr KNOX's collection. In his description of the plate,

The subject from which this preparation was taken, had suffered from caries in both hip-joints; the heads of both femora were destroyed; no anchylosis had taken place, and consequently the patient was incapable of using the lower extremities. The cylinders of both thigh-bones are scarcely more than half the diameter of those of healthy subjects of the same age; the shell of the bone is very much attenuated, and the spongy portion of it is in a great measure obliterated. The right thigh-bone, it may be remarked, in addition to the diminution of its bulk, is shortened to the extent of several inches *.

The same phenomena, according to BECLARD,

he observes, that it is "the thigh-bone of a soldier who was shot in the right groin at Gibraltar; who being brought home the next winter, died soon after of a dropsy;—the right thigh-bone was wasted so much as appears in the draught, and being weighed, was found to be less than half the weight of the other." I may remark, also, that it evidently appears from the engraving, that the head and neck of the bone had perished from caries.

* For an accurate account of the condition of the hip-joint in this preparation, I beg to refer to my friend Dr BALLINGAL'S excellent Clinical Lecture, published in July last.

are sometimes the result of pulmonary consumption; but I confess that I have not paid minute attention to the appearance of the bones in phthisical patients. Atrophy of the bones is a much more common affection than practitioners are generally aware of, and seems to occur very frequently in the long bones of aged subjects, and in those of persons suffering from chronic diseases of the joints. My late friend Mr Shaw, in his excellent work on the treatment of the Distortions of the Spine, attributes this affection entirely to the effect produced upon the osseous system by want of exercise *. He, also, in some of his remarks on this interesting affection, seems to have confounded it with the interstitial absorption which occurs in the head and neck of the thigh-bone after dislocation.

The opinion entertained by Mr Shaw, that atrophy depends upon the bone in which it occurs not being called into exercise, derives support from the fact of its being an extremely common affection in old age; and I have no doubt but that a great variety of the fractures which occur

* Catalogue, I. 3. M. 42. 43. 44. II. M. 50.

to the aged, are mainly attributable to the attenuated condition of their bones.

In aged and bedridden subjects, the bones, and more especially the cylindrical and flat ones, become wasted and preternaturally brittle; their cancellous structure and diploë are almost entirely absorbed; and hence, in the crania of old persons, we frequently find no cellular matter interposed between the external and internal tables of the ossa frontis.

Little can be said on the treatment of atrophy of bone, and what I shall advance on the subject must be considered rather in the light of prophylactic than curative suggestions. If atrophy of the osseous tissue be the result of inaction, it is obvious that the only way to preserve the bones in a healthy and sound state, is to inculcate the necessity of exercising the limbs; although in many chronic affections to which the human body is subject, this cannot be done in an active, yet there are few cases in which it cannot be accomplished in a passive manner. If, in consequence of disease of any of the viscera, of the psoæ and iliac muscles, or of the muscles of the spine or abdomen, the patient is necessarily con-

fined to the horizontal posture; that usual remedy of bone-setters, namely friction, may be employed with much hope of a beneficial result. It has the effect, if properly applied, of promoting the capillary circulation, and of exciting a moderate degree of contraction in each individual fibre of the muscles which lie under its traject. However slight the movement may be of the muscles covering the bones liable to atrophy, it has the direct effect of stimulating the vessels of the bone, and perhaps of exciting them to deposite earthy as well as fibro-cartilaginous matter. I have frequently seen patients attenuated by disease, in whom the bones seemed to have suffered nearly as much as the flesh itself, and to have been reduced to a bulk much inferior to that which they probably enjoyed previous to the accession of disease.

The wasting of bone, in consequence of want of use, should have some influence in regulating the treatment of chronic affections of the joints, whether they proceed from constitutional disease, or are occasioned by accident. It should also prevent parents from permitting delicate children to indulge too freely in violent exercise, or to

throw themselves suddenly into the awkward and unnatural postures recommended by some teachers of gymnastics. In weak children it is fair to suppose that the bones suffer with the other parts of the body, and indeed, when examined, during the life of the individual, by the hand, they often appear preternaturally attenuated, and must therefore be especially apt to suffer, when suddenly or forcibly acted upon by external agents. At all events, I think that it is improper to permit a child, who devotes nine hours out of the four and twenty, to the sedentary occupations of reading, writing, and arithmetic, to rush from the school-room into all the tumult and exertion of the gymnasium.

CHAPTER IV.

PRETERNATURAL GROWTHS FROM BONE.

Preternatural Growths from Bone, which have not as yet been proved to be the result of Inflammation, and which do not appear to be of a Malignant Nature.

The diseases alluded to in the title of this chapter, have, by most writers on pathology, been termed Exostoses, and by the vulgar Splints. They may occur in any of the bones of the body, and they very frequently attain a considerable magnitude.

Mr Philip Crampton, in his admirable memoir in the Dublin Hospital Reports, on osteo-sarcomatous tumours, considers only those tumours of bone as malignant, which have a tendency to mass with and implicate the neighbouring soft parts. With all deference to his valuable opinion, I am inclined to go a step farther, and esteem as malignant those morbid *degenerations* which, originating in one part of a bone, extend to other parts of its tissue, and which, if they are not

removed by the surgeon, at last implicate the whole of the bone in which they are situate.

The tumours of bone, however, which are to be described in this chapter, are purely osseous, that is to say, they do not differ in their intimate structure from that of healthy bone, or at least in so slight a degree as that the difference is not appreciable.

Exostoses constitute a class of affections* which may be said strictly to depend upon excited action of the vessels of the osseous tissue. They may occur spontaneously, or may follow a blow or other injury done to a bone. Some authors have described what they considered to be different kinds of exostoses, and have classed them according to the degree of density which their in-

* RICHERAND compares exostoses to phlegmons of the cellular tissue: their nature, he observes, is the same; "all these tumours depend upon an '*exaltation*' of sensibility and contractility, upon which an increased flow of the humours is a necessary consequence. In both the one and the other, the swelling may terminate by resolution, suppuration, induration, or gangrene."—*Nosographie Chirurgicale*, tome iii. Paris, 1808, p. 116. I confess that I cannot comprehend M. RICHERAND'S reasoning on this point; his opinions have been borrowed, I imagine, from J. L. PETIT.

ternal structure presents, and the peculiar forms which they assume. I confess that this refinement of classification does not appear to me to be of much utility, either in a practical or pathological point of view. The degree of density of their texture seems in a great measure to depend upon their situation, and upon the rapidity of their progress. In bones which are vascular, but neither very loose nor very dense in their texture, exostoses are harder, and of a more compact structure than the osseous tumours which form on bones, enjoying either a comparatively low, or a very high degree of vitality. Hence exostoses of the lower jaw-bone, of the shaft of the femur, and of the skull, are generally of a more compact texture, than those which are found in the ossa ilii and the epiphyses of the long bones.

Peculiarity of constitution seems to exert considerable influence on the structure of exostoses: in some individuals they are spongy and cancellar, and shoot out into botryoidal and stalactitic forms, in others they are of a semi-spherical or conical form, and of a density intermediate between that of ivory and bone*.

* When this is the case, the walls of the bones themselves

The spongy variety seems in general to be more rapid in its progress, and to acquire a greater magnitude, than the hard kind of exostosis; and, as it frequently shoots up by the sides of the attachments of the muscles, it has been imagined by some pathologists, that it may derive its origin in part, from the irritation occasioned by inordinate action of these organs.

The different kinds of exostoses may, for practical purposes, be arranged under three heads. 1. Exostoses which are purely idiopathic, and which seem to derive their origin from constitutional causes; 2. Exostoses which are apparently the result of injury; 3. Exostoses which form the sequelæ of ulcerations of bone.

1. The *Idiopathic Exostosis* in some measure partakes of that affection which is termed interstitial enlargement and deposition of bone. The texture of the bone in which it is seated, is in general not altered, and the tumour itself resembles in structure healthy bone; it is sometimes smooth

are in general observed to be unusually compact in their structure.

on its surface, and sometimes covered with small processes, which project from it. On examining its internal structure, it in some cases is found to shoot directly from the external lamella of the bone, and to consist of cellular texture, closely resembling the diploë of the cranium, covered externally by a dense or osseous shell. In other cases, both the external and internal surface of the bone, together with the cancellar substance, are implicated, leaving the wall of the bone itself unaffected; and in some examples it seems to be so completely identified with the substance of the parietes of the bone, that it can only be considered as a local expansion of its texture. I have got specimens in my collection, which illustrate all these three varieties of appearance in *exostosed* bones; two of them were taken from venereal patients. If a bone affected with exostosis be immersed in diluted muriatic acid, so as to remove the earthy salts which enter into its composition, it will be found to retain its form, and to present the same kind of fibro-cartilaginous matrix which exists in healthy bone.

That exostoses are not a product of the periosteum, is proved by the fact, that they are fre-

quently found to exist on the internal table of the bones of the cranium, which we know is not supplied with that membrane.

On attaining a certain size, this kind of exostosis often remains stationary, and if it is not situate on the inner surface of the bones of one of the four great cavities, and is away from a joint, it is productive of no other disagreeable consequences than that which its bulk occasions. It is a most troublesome affection, when it occurs on the posterior surface of the pubis, or anterior surface of the sacrum. In the latter case, I have known it push the rectum so far forward, that it almost prevented the introduction of a small bougie into that gut.

This disease, when it occurs on the tibia, may be frequently mistaken for chronic thickening of the periosteum. It will not yield, however, like that ailment, to any plan of treatment that I am acquainted with; but I have little doubt that it may sometimes be converted into troublesome caries, by the injudicious application of hot irons, and caustics, and the ill-regulated exhibition of mercury.

It may be remarked, that, when exostoses form in the neighbourhood of a joint, as they frequently

do in the spines and hips of rickety and scrofulous subjects, and when they have acquired a considerable bulk, they are apt to occasion much local irritation, in consequence of their coming frequently in contact with the adjacent bone. It is in cases of this kind that the ignorant empiric may do much mischief, by violently stretching and kneading the limb.

2. The second variety of exostosis, or that which is the result of injury done to a bone, in consequence of a blow, fall, or sprain, resembles in its pathological characters the former variety. Its formation, however, is very frequently attended with pain, and swelling of the adjacent soft parts; but whether or not the pain and swelling, in the first stage of the affection, are to be attributed entirely to the state of the soft parts and periosteum, I am unable to determine. It is certain, however, that when the inflammation of the soft parts is subdued, and the swelling which affects them disappears, pain ceases to be felt, and a protuberance gradually arises from the bone, and, after acquiring a certain size, it remains stationary during the rest of the patient's life. From this it appears, that, even although we allow it to have

originated from inflammation, its subsequent increase is independent of this cause.

My old preceptor and most kind friend, Mr ABERNETHY, used to mention in his lectures the case of an individual, who, whenever he received a blow on any part of the body, the subjacent bone became in a short time affected with exostosis.

This variety includes all those exostotic formations which follow fractures of the bones, and which the ancients termed Redundant Callus. It not only occurs after fracture of the bones, properly so called, but also in the patella, that body which constitutes an intermediate link between the osseous and ligamentous tissues. When bony union takes place between the portions of a fractured patella, the exostosis which sometimes forms on the line of fracture, is always, as my friend Mr CHARLES BELL has remarked in his lectures, on the outer surface of that body.

3. Exostosis is sometimes a sequela of caries, and as such it may be said to resemble those ulcers of the soft parts, which have healed with an elevated cicatrix; it is in reality a luxuriant se-

cretion of osseous matter from the surface of a bone, that is recovering from the effects of ulcerative absorption.

It is this variety which very frequently follows syphilitic and mercurial caries, in some cases of these diseases. After the ulceration has penetrated through the walls of a bone, as deep as the medullary cavity, and has ceased to extend its ravages, a new deposition of osseous matter takes place, which fills up not only the vacancy occasioned by ulceration on the walls of the bone, but also the canal of the bone opposite to that vacancy; it likewise rises above the external table, and forms a tumour.

In those cases where the caries has been superficial, the exostosis which is formed, after the ulcerative action has ceased, and the adhesive inflammation is established, is of a peculiar structure. The inner tables or laminæ of the bone remain entire, and an osseous deposition of a cellular character is formed on their outer surface, and is covered externally by a layer of dense bone, which is in continuity with the outer lamella of the original bone.

This variety of exostosis never acquires the

same great bulk which some of the osseous tumours, described under the two former heads, attain. Its surface is always regular, and it may rather be termed the result of a reparative effort of nature than a disease. I have never seen in practice, or observed in pathological collections, a specimen of exostosis, supervening upon caries, which has acquired any great bulk; but I know that it has frequently been esteemed as the secondary effects of the syphilitic virus, and has been improperly treated with mercury as such. No course of mercury will cure, or, in other words, remove an osseous tumour. No remedy except the saw, is likely to be of any use, and this should only be employed when the disease is evidently of a local nature, and unconnected with constitutional disease.

In removing exostoses by operation, the surgeon will frequently find that they are not of an uniformly dense texture throughout their surfaces, being occasionally coated with a substance, resembling cartilage in some of its characters. When this appearance is observed, it may in some cases with propriety be believed that the osseous tumour is upon the increase; but in other cases,

where the muscles play freely over the exostoses, the cartilaginous matter may be esteemed as a provision of nature, intended to counteract, in some measure, the effects of friction.

True exostosis differs, then, from other bony tumours, in the appearance of its intimate structure. In malignant swellings of bone, there is an alteration to a greater or less extent in the structure of the original osseous tissue, and in the arrangement of its materials. In exostosis, the new formation does not visibly differ in texture from that of the original bone.

In the treatment of exostosis, the surgeon must be guided very much by the site of the disease, the inconvenience it gives rise to, and the deformity it occasions. When an exostosis is situate on the parietal bones, on the lower jaw, or on one of the long bones, and is evidently on the increase, it should be removed; for, if allowed to remain, the irritation occasioned on the skin from the pressure of a hat, or other articles of dress, is apt to prove exceedingly troublesome. But when the exostosis is not increasing in size, and is situate upon a bone which is well covered by flesh, the practitioner should hesitate, and avoid recom-

mending an operation for its removal, in which his own eclat, and not the true interest of the patient, is concerned.

It sometimes happens that exostoses mortify, and are thrown off like exfoliations. Among the medical and chirurgical cases of HALLER, there is an account given by Dr SPORING of Abo, of an osseous excrescence, which grew from the bone in the immediate vicinity of the internal canthus of the eye. The patient was a young man, thirty-five years of age, who lived in Ahala. The exostosis grew to the size of a very large walnut, and from its magnitude nearly pushed the eye out of its socket, and impaired the vision;—a camp-surgeon tried to remove it, by promoting exfoliation; but the wound bled so freely, that he was happy to close it up again.—In December 1736, however, a peasant, named OLOF-IKAIN, offered to try his skill,—beginning with an incision round the bone, which caused a great effusion of blood, and afterwards applying to it some secret remedy, which gave intolerable pain. The pain, attended with faintings, continued for twelve days. Several months afterwards, however, he had the courage to undergo the operation again. In the following

spring the *entire* exostosis dropt out,—the eye returned to its proper situation in the socket, and vision was restored.

Although cures have been accomplished in the manner related in the foregoing case, the practice there pursued does not appear to be a good one. The process of exfoliation is always tedious, and frequently painful; and where the saw or the chisel can be employed for the removal of exostosis, escharotics and the cautery should not be trusted to. Of the impropriety of tampering with exostosis, that most admirable surgeon, and excellent man, J. L. Petit, has given a splendid illustration; and, although the case is a long one, I feel convinced that I shall be doing the student a service in presenting it to him. Besides containing an accurate description of the disease, the case abounds with hints, which will prove useful guides to the young practitioner, and lead him to despise those mean arts which are often pursued by desperate and unprincipled men.

"I cannot pass over (Petit remarks) in silence, an observation I made upon a disease, almost like the tumour just mentioned, of the soldier's of the Royal Roussillon. T. was a young man, who

had had it seven years, from the time it first appeared to that wherein he resolved to undergo the operation. This tumour was upon the upper and middle part of the parietalia, being above four inches high, and of a conical figure,—four inches in circumference in its *basis*, three in its middle, and two towards the top, the end of which was slightly putrified. This patient was recommended to me by one of my friends, in whose presence I examined him, and promised to perform his operation; for which reason I prepared him by bleeding, purging, and dieting. His Eminence the Cardinal de Rohan recommended him to me, and ordered him all the assistance whereof he might stand in need. This uncommon disease made some persons *curious* to see it, and *enviously* desirous of performing the operation, since they got my patient away from me by *secret* and *underhand* practices, such as I have never made use of, apprehended or avoided. The patient, who reposed some confidence in me, obtained as a favour of these usurpers that I might be present at the operation; they proposed it to me—I refused it, and did them a pleasure, without design. They made an incision, uncovered the swelling, and looked

upon it as a *hernia* of the brain, whereof the bag was made by the lengthening of the brain. They trepanned the tumour at the place where the caries was, with a great deal of difficulty, on account of its hardness; and they introduced the trephine till the top of the swelling touched the bottom of the corona, and being fatigued with an operation as laborious as unprofitable, they dressed the patient, and put off the rest till the next day. They had not the same trouble, the fever that seized upon the patient prevented their continuing it; their *rash* and *plentiful* bleeding did not at all diminish the accidents, and a delirium that followed carried off the patient.

" They opened the cranium, and were undeceived as to the idea they had of its being a hernia;—a notion I myself had of the soldier's swelling, *but not of this*, because the other had informed me better. The tumour which they took off being sawed, they found it full, hard, and as white as ivory."

CHAPTER V.

DISEASES WHICH DEPEND UPON DEGENERATION OF THE OSSEOUS TISSUE.

1. Spina Ventosa.——2. Osteo-Sarcoma.

SECTION I.

SPINA VENTOSA.

In the last chapter I have briefly described those tumours of bone, or rather osseous excrescences, which are not of a malignant character, and the intimate structure of which does not materially differ from that of healthy bone. The present chapter shall be devoted to the consideration of those malignant swellings in which the texture of the bone is broken up, and in which it ceases to present any of the characters of healthy osseous tissue.

Spina ventosa is a disease of bone which was known to many of the earlier pathologists, and

was esteemed by them as a dangerous and incurable affection. However, several of the ancient surgeons confounded it with other morbid alterations of structure, and classed it with caries, necrosis, abscess of bone, and osteo-sarcoma.

This disease may attack any of the bones of the body, but its general seat is in the shafts of the long, and in the bodies of the short cylindrical bones. It is an affection which is not peculiar to any period of life, but occurs in the infant, the adult, and the aged person.

In consequence of the severity and peculiar nature of the pain which frequently attends its origin and progress, this disease received the singular name which it bears. When a bone is affected with spina ventosa, its parietes seem, as it were, to swell out or expand; and hence, in its first stage, when no pain is felt by the individual in whom it occurs, as is frequently the case when it is seated in the metacarpal bones, it may be confounded with simple interstitial enlargement. As the disease advances, the expansion of the bone appears (if I may be allowed the expression) to be circumscribed, and to be confined either to the middle of the shaft, or to one of the extremities of

the bone. The skin covering the diseased bone remains perfectly sound, and does not become ulcerated, nor discoloured, until a very advanced period of the ailment. The superficial veins, however, appear gorged, and form a kind of blue network on the surface of the swelling.

As the tumour increases in bulk, the peculiar darting and burning pain, which attends its formation, becomes more and more severe, and if the limb in which it is situate be not amputated, acute irritative fever almost always supervenes.

When the patient will not suffer an operation for his relief, the expansion of the bone proceeds to a prodigious extent, and by the distention of the soft parts which it occasions, at last produces ulceration of the attenuated muscular tissue and skin. From the ulcerated spots an unhealthy-looking ichorous pus is poured out, and the ulcerations degenerate into irritable sinuses, that closely resemble in appearance those which exist in the advanced stage of white swelling, or scrofulous inflammation of bone.

On introducing a probe into one of the sinuses, it will be found that it communicates with an opening in the wall of the bone, and that the

instrument may be pushed forwards, so as to traverse the diameter of the swelling.

If the bone which has suffered from spina ventosa be examined after amputation, the expanded portion, which is generally either of an oval or globular form, will be found covered by its periosteum in a thickened state, except at those points where the openings already alluded to exist.

On cutting into the swelled bone, the shell of the tumour appears remarkably attenuated, and is in some places no thicker than common writing-paper, and part of the osseous parietes, indeed, is often absorbed. From the internal surface, which is lined by a delicate membrane, small spiculæ and plates of bone sometimes project. The contents of the tumour consist of a sero-purulent matter, combined with a substance not unlike gelatine in appearance*.

* It will be seen, from what I have stated on the subject of spina ventosa, that I differ from RICHERAND, and some other French pathologists. RICHERAND classes spina ventosa under the head of osteo-sarcoma, and describes the disease in the following terms:—"Le *spina ventosa* ne diffère de l'exostose suppurée, ou de la carie, qu'à raison de l'excessive tuméfaction de la substance osseuse, de l'énorme volume qu'ont

Spina ventosa differs from simple abscess of bone in the following respects:—1. Spina ventosa in general affects the apophyses, and seldom the epiphyses, of a bone; 2. Simple abscess, when it does occur in the shaft of a bone, is in general confined to one side of the wall of the bone, and while the pus contained in it is working its way to the surface of the body, organizable lymph, which at last becomes ossified, is poured into the medullary cavity and cancellar tissue, in the vicinity of the apostema. On the other hand, in the spina ventosa, the entire circumference and substance of a portion of the cylinder of the bone is

acquis les extrémités articulaires des os; car c'est dans ces parties spongieuses que l'ostéo-sarcôme, de meme que l'exostose et la carie, a presque constamment son siége. Les chairs entrent en grande proportion dans la tumeur, des lames osseuses très-minces renferment ces fonguosités. Lorsqu'on soumet à l'ébullition, ou à la macération un os ainsi altéré, elles s'en détachent, il ne reste qu'un moule celluleux, tres-fragile, formé par l'os dilaté. L'exostose laminée ou lamelleuse des certains auteurs doit être rapportée à cette variété de l'osteo-sarcome. Il en est de mème du gonflement scrofuleux décrit sous le nom de *Pædarthrocace*, par Marc. Aurèle Sévérin."—*Nosographie Chirurgicale*, tome iii. p. 131. Paris, 1808.

affected, and no appearance of reparative or adhesive inflammation can be traced in the neighbouring cancelli or medullary canal.

3. The comparatively trifling degree of swelling which attends common abscess, depends upon *interstitial enlargement and deposition* in the bone surrounding it, whereas the enormous tumefaction, which constitutes the peculiar characteristic of spina ventosa, is the result of *interstitial degeneration*, and the *actual expansion* of the attenuated walls of the bone, *at the seat*, and not in the vicinity, of the disease.

4. Abscess of bone has been cured by means of the combined efforts of nature and art, without having recourse to amputation. Spina ventosa, so far as I know, has never been relieved, except by the removal of the *entire* bone in which it was seated *.

* The ancients, as has been remarked in the text, confounded this disease with caries and necrosis; and TRIOEN appears to have been the first pathologist who attempted to distinguish it from these affections. In the seventh plate of his Medico-Chirurgical Observations, there is an excellent delineation of the disease, etched by SPYK, from a drawing by the illustrious MIERIS.

The treatment of spina ventosa is very simple, as the surgeon, when he is assured of its existence, must at once have recourse to the amputating knife. If the disease is seated in the bones of the metacarpus or metatarsus, as is generally the case in childhood, they should be removed at their articulations. If it has attacked the tibia and fibula, or radius and ulna, the amputation may be performed either at the knee or elbow, or a short way above these joints. The general rule to be observed is, that the entire bone, in which the disease has its seat, should be removed.*

SECTION II.

OSTEO-SARCOMA.

UNDER the general head of Osteo-Sarcoma, I mean to describe those morbid affections of the osseous tissue, which are of a malignant nature. There can

* For an excellent description of this disease, *vide* Mr HOWSHIP'S Memoir in the Med.-Chir. Trans. of Lond. vol. x. p. 176.

be no doubt of the incorrectness of the term Osteo-Sarcoma; but, as I am unwilling to coin new names for diseases, and as its import is understood by the generality of practitioners, it will answer my purpose as a generic title.

The diseases of the genus osteo-sarcoma are perhaps the most untractable of all the idiopathic affections to which the bones are subject;—their existence, in a variety of cases, cannot be recognized until a late period of their progress,—the skin covering the diseased bone is not always discoloured, and many of their symptoms resemble those which are met with in other morbid conditions of the osseous tissue, which are not of a malignant character.

The malignant diseases of bone may be arranged under two heads; under the former may be classed those degenerations which are confined entirely to the osseous tissue itself, and never throw out fungous growths, nor ulcerate on their surfaces, until a very late stage of their progress; under the latter are included the diseases which implicate not only the bone itself, but also the periosteum and neighbouring soft parts, and have, when the skin is broken, a tendency to fungate.

I. The former class embraces those tumours which have been termed, 1. Cartilaginous degeneration; 2. Fleshy degeneration of bone; 3. Cystic sarcoma of bone; 4. Osteo-steatoma; 5. Encysted medullary sarcoma of bone.

1. Cartilaginous degeneration, which most frequently attacks the flat bones, has been admirably described by my excellent friend and preceptor, Sir Astley Cooper, in his Surgical Essays, under the name of Cartilaginous Exostosis. Sir Astley is of opinion, "that it originates in the inflammation of the periosteum, and of the corresponding part of the bone; and that a deposition of cartilage, of very firm texture, and similar to that which forms the nidus of bone in the young subject, adheres to both these surfaces. The periosteum adheres to the external surface of the swelling, and the swelling itself is attached still more strongly to the surface of the bone. Within this cartilage a bony matter is deposited, which is first thrown out from the original bone; it continues afterwards to be secreted, as the cartilage increases in bulk; for it appears that between the periosteum and bony mass, cartilage is constantly

secreted, which constitutes the exterior surface of this tumour. Thus, on dissection, we discover, 1*st*, The periosteum thicker than natural; 2*d*, The cartilage immediately below the periosteum; and, 3*d*, Ossific matter deposited within the cartilage, extending from the shell of the bone, nearly to the internal surface of the periosteum, still leaving on the surface of the swelling a thin portion of cartilage unossified *." I have given *verbatim* Sir ASTLEY COOPER'S description of the pathological characters of what may be termed cartilaginous osteo-sarcoma; it corresponds, to a certain extent, with what I have frequently witnessed in the course of my investigations. In its formation, however, the disease differs from that which we observe to occur in healthy ossification, in the following respects. The cartilaginous matter which is deposited between the periosteum and bone, and which is in fact amalgamated with the bone, possesses none of those centres of ossification which are observed to exist in the gelatino-cartilaginous matrix of the bones of the fœtus, and in the callus of fractures; but the earthy

* *Surgical Essays* by ASTLEY COOPER and BENJAMIN TRAVERS, London, 1818, p. 186.

matter shoots from the disorganized shell of the bone, into the substance of the cartilage, and between each osseous stem there is interposed a layer of cartilage. In truth, the disease may with propriety be called the cartilaginous degeneration of bone, seeing that cartilaginous matter, or a substance closely resembling cartilage, forms the greater proportion of the tumour, and, to use a painter's phrase, is as it were shaded off into the structure of the original bone, and very often implicates also the medullary tissue. This kind of cartilaginous degeneration is frequently met with in the flat bones. It is sometimes exceedingly deceptive in its symptoms, and I have known awkward mistakes made in its treatment; in one case especially, where the disease had affected the os ilium, two able surgeons were so deceived by the feeling of the tumour, that they imagined that it depended upon a collection of matter beneath the gluteal portion of the broad fascia, and actually plunged a trocar into the heart of the swelling. This operation of exploration luckily did no harm, but it was a good practical lesson, and served to shew how cautious surgeons should be in their diagnosis of bone cases.

I know of no cure for this variety of disease except amputation, and this operation can only be performed when it occurs in isolated bones, such as those of the lower jaw, or extremities; for, when it affects the bones of the trunk, it is incurable, and any attempt at extirpation will only hasten the fatal result.

2. *Fleshy Exostosis*, *Fleshy Degeneration of Bone*, or *Pure Osteo-sarcoma*, is a disease which was observed and alluded to by PETIT: it occurs alone; in combination with the previous variety; and in conjunction with medullary sarcoma. Unlike cartilaginous degeneration, it seems often to occur simultaneously in the bones, and in the soft parts covering them, although a line of demarcation is in general drawn between the diseased structure by the periosteum, which is often merely thickened. It presents various modifications; sometimes the whole, or greater part of a bone, loses all traces of its original structure, and assumes a vascular fibrous character, closely resembling flesh that has been partly deprived of its blood, and has undergone the hardening preparation of salting.

The fleshy degeneration of bone forms a large portion of the structure of those compound tumours, termed Fungus Hæmatodes, and it may happen, that, in some cases, fungus hæmatodes of the bone is only a secondary affection, and in truth a disease supervening upon the fleshy alteration that has taken place in the osseous tissue.

Like the cartilaginous degeneration of bone, pure osteo-sarcoma seems to have no tendency, until a late stage of its progress, to occasion ulcerative absorption of the soft parts, nor to throw out fungous growths. It may be remarked, however, that even from its origin the patient experiences considerable uneasiness in the affected parts. The uneasiness complained of somewhat resembles the pain produced by rheumatism, and, like it, is intermittent. Frictions, stimulating applications, and the cautery, have a decided effect in rendering more severe the symptoms of this disease. While local bleeding, fomentations, and emollient cataplasms, do no good; narcotic remedies, exhibited internally, and poultices of cicuta, hyoscyamus, or poppy heads, applied externally, alleviate in some measure the local uneasiness.

There is a variety of structure that may be ob-

served in some examples of osteo-sarcoma, which is intermediate between cartilaginous and fleshy degeneration. The disease is confined entirely to the bone; the osseous tissue seems to lose all its natural characters, and is converted into a tough, elastic, and slightly vascular substance, which, in point of density, is intermediate between *simple* cartilage, and *interarticular* cartilage. It is of a homogeneous structure, and is so soft as to admit of being cut with a knife. The periosteum, which covers the affected bone, is merely thickened, and does not appear to be implicated in the disease. Cases of this disease are very rare, and I have seen very few specimens which illustrate the peculiarities of its structure.

3. *Cystic Sarcoma* of bone is an affection which presents appearances very different from those which have been described as presenting themselves in the two former varieties of malignant disease of bone. In cystic sarcoma, the vessels which secrete the earthy materials of bone, do not seem to lose entirely the power of performing their functions. This form of disease is most especially apt to attack the very vascular bones of

the carpus and lower jaw. When it does occur, the bone, covered by its periosteum, is found to be expanded in a manner somewhat similar to what is observed in spina ventosa, but it differs from that disease in its intimate structure.

Besides the expansion or swelling out of the bone, processes of osseous matter will be observed, which shoot from the inner surfaces of the parietes of the bone, and, intertwining with each other, form cells of various magnitude, which are lined by a vascular membrane, and filled with a glairy fluid, or a sero-sanguineous matter.

This disease, although it has been frequently met with in a simple form in the vascular bones of the extremities, is in general combined, when it affects the lower jaw-bone, with the cartilaginous and fleshy degenerations, and the medullary sarcoma.

When it occurs in the bones of the extremities, it is not expedient for the surgeon to amputate the limb in the bone which is affected. His operation should be performed in the adjacent sound bone, which is no ways implicated in the disease, and which is nearer the trunk of the body than the bone in which the malady is situate. Thus,

for instance, if the disease be situate in the bones of the metacarpus, it will be necessary to amputate above the wrist.

From numerous practical proofs it appears, that in those cases in which the lower jaw-bone only is the seat of the disease, there is every chance of eradicating it by means of a surgical operation. We accordingly find that M. DUPUYTREN, Messrs CRAMPTON and CUSACK of Dublin, and Mr J. SYME of this place, and others, have removed nearly the whole of this bone with perfect success. The operation, which was performed by the last named individual, has not as yet found its way into the public prints; but I understand, from gentlemen who witnessed it, that nearly two-thirds of the lower jaw-bone were removed; and the patient, a young man, was thus relieved of a tumour which weighed upwards of four pounds.

4. *Osteo-steatoma*, while it occurs in an uncombined form, may be considered as a variety of the fleshy degeneration of bone, and differing from it only in the density and colour of its structure. It is sometimes found contained in the bony cells of cystic sarcoma, and in the heterogeneous structure

of fungus hæmatodes. I should not have placed this affection under a distinct title, had I not been aware that many of the French pathologists consider it as a disease which differs in some of its characters from all the other malignant degenerations of bone. There is no external diagnostic mark by which the surgeon may distinguish it from common osteo-sarcoma, and its peculiarities can only be traced on dissection. With regard to its treatment; in its early stages, the application of anodynes externally, and cautious exhibition of them internally, as recommended under the head of Fleshy Degeneration, seem to be indicated. In its more advanced stages, the removal of the affected bone is the only chance which is afforded the patient of recovery.

5. *Encysted medullary*, or *cerebriform sarcoma* of the bones never occurs, so far as I am aware, in a simple or uncombined form, but is always complicated with one or other of the varieties of degeneration previously described. It is most frequently found in conjunction with the cystic sarcoma, and forms the contents of some of the cells in that modification of disease. As its name

indicates, the structure of medullary sarcoma closely resembles, in its external characters, brain that has partially undergone the process of decomposition, and is mixed with broken clots of dark blood.

When the medullary matter is found to constitute a portion of an osseous tumour, it generally happens that there exists a disposition in the affected bone to throw out fungous growths, which are extremely vascular, and apt to bleed either spontaneously or on being handled.

It is this variety of degeneration which most frequently extends from the bones affected with it to the soft parts which cover them. In no bone does it occur so frequently as in that of the lower jaw; and it is not peculiar to the human race, for I have met with it in the ox *,—and my friend and preceptor Professor MONRO, informs me that he has seen it in the dog.

* I have in my possession a most beautiful specimen of the disease occurring in the lower maxillary bone of a young ox, which was in every other respect healthy. It may be remarked, that, in this preparation, the permanent teeth are imbedded in the diseased mass, and are quite sound; but the fangs of the temporary teeth seem to have assumed the diseased action.

In treating this disease, it is of importance to attend to the state of the soft parts. If it be seated in one of the bones of the extremities, or in the lower jaw, and the soft parts covering it are quite healthy, there is some chance of curing it by amputation; but if fungus has arisen from the surface of the tumour, and if the periosteum and neighbouring soft parts are implicated, the surgeon should be exceedingly cautious in his prognosis. When fungus arises from any tissue, it is impossible for any practitioner to determine where the disease will terminate,—the absorbents seem to put on a peculiar action, and to convey to other parts of the body the malady which is preying upon the texture originally affected.

It is my duty to solicit the indulgence of my readers for the concise manner in which I have described the local malignant degenerations of the osseous tissue, as I have been obliged, in the classification which I have adopted, to trust almost entirely to my own observation of disease. There are perhaps errors in what I have stated, for it is a most difficult task to describe the minute shades of difference which prevail in morbid structure. And as my object has been, in this treatise, to en-

deavour to enable the student to take advantage of the riches contained in the pathological collections of Britain, I may be excused for being a little more minute in distinguishing alterations of structure than is absolutely necessary in the actual practice of the profession.

Before concluding this branch of the subject, it may be proper to state, that all the five varieties of osseous degeneration which have been described in the previous part of this section, demand a similar plan of treatment. When, as has been already remarked, the affected bone can be removed without risking the life of the patient, it should be done;—but if the disease affects a bone which is so situate that the patient would be *exposed* to the *risk* of immediate death on its removal, the surgeon should hesitate before proceeding to an operation, and state candidly to the patient and his friends all the chances and dangers attending it.

II. Having briefly described those varieties of disorganization which originate in the osseous tissue, I shall now proceed to consider *those diseases which do not originate in the bone itself, but com-*

mence in the periosteum and neighbouring soft parts.

The diseases alluded to in the previous sentence are not very numerous, and may be arranged as follows:

1. Cancer of the Bones.
2. Fungus hæmatodes.
3. Cartilaginous Degeneration.

1. *Cancer of the Bones* is not a common affection. There is no doubt, however, of its existence; and in the Pathological Museum of the Royal College of Surgeons of Edinburgh, there are deposited preparations in which its peculiar characters are well marked. This disease of the bones, in general, depends upon extension of cancerous action from the neighbouring soft parts, and seems more especially to be confined to the periosteum and its interstitial processes. In inveterate cases of cancer of the breast, that peculiar thickening and consolidation of the cellular tissue, which produces what is termed cartilaginous bands, is very apparent. These bands proceed from the periosteum, which is thickened, and intersect the softened and disorganized bone. Between the cartilaginous intersec-

tions the osseous tissue will be found converted into a soft matter, containing minute spiculæ, and granules of bone, and cartilage.

Cancer seldom occurs in bone as a primary affection, but is almost in every case the result of the extension of that kind of degeneration from the neighbouring soft parts.

From the specimens which I have seen of cancer of bone, I am inclined to think that the cancerous action propagates its morbid influence through the medium of the cellular tissue which lines the longitudinal canals and cells of the bone. There are two splendid preparations in the Museum of the Royal College of Surgeons, which illustrate the existence of this disease in the bones of the sternum.

When the disease has existed for some time, the surface of the affected portion of bone frequently ulcerates, and the ulcerative action proceeds with a frightful degree of rapidity. The pure cancerous ulcer of bone shews no tendency to throw out fungous growths from its surface, but it is covered by unhealthy angry-looking granulations, which secrete a stinking ill-conditioned matter. I have seen melancholy instances of the

rapid and destructive progress of this terrible disease in the upper jaw.

I know of no plan of treatment which is calculated either to cure or relieve this inveterate affection; the knife, gouge, and cautery, possess no power in arresting its progress; it extends its ravages from bone to cartilage and synovial membrane, and from them to bone again. The whole system appears to be contaminated; the stomach is irritable, and rejects its contents; the features are sunk, sallow, and listless; the eye anxious and dull; the skin harsh and dry; and the pulse rapid, thrilling, and feeble. All that the surgeon can do is, to attempt, by every means in his power, to allay the constitutional and local irritability, by the internal administration of hyoscyamus, opium deprived of its narcotin, cicuta, digitalis, camphor, citrate of ammonia; and by the external application of the solution of chloride of soda *, cicuta, and powder of the leaves of hyoscia-

* I have used with success the solutions of the chloride of soda and lime in a very great number of cases of ill-conditioned sores of a syphilitic, herpetic, phagedenic, and sloughing character. And I think that the British surgeons, and the *British public*, should feel deeply indebted to Mr

mus made into a paste with axunge, and applied to the diseased surface, beneath any common emollient cataplasm.

2. *Fungus Hæmatodes of Bone*, is that peculiar disorganization which takes place in the osseous tissue, in consequence of an extension of the malignant disease of the same name, from the adjacent soft parts. It seems to be produced in bone, in consequence partly of the pressure, and partly of the altered condition of its nutrient vessels, which are involved in the diseased soft parts. I have never seen or read of a well authenticated example of fungus hæmatodes originating in the tissue of bone; but I have seen cases, in which

Thomas Alcock of London, for the introduction of these powerful medical agents into this country. The work of Mr Alcock is probably by this time in the hands of every practitioner who studies with attention his profession; but for the benefit of students, I shall give its title in this place. "*An Essay on the Use of the Chlorurets of Oxide of Sodium and of Lime, as powerful disinfecting Agents, and of the Chloruret of Oxide of Sodium; more especially as a Remedy of considerable Efficacy in the Treatment of Hospital Gangrene, Phagedenic, Syphilitic, and ill-conditioned Ulcers, Mortification, and various other Diseases.* By Thomas Alcock. London, 1827."

the morbid action had extended from the soft parts to the bone, and destroyed completely its healthy structure.

It may be remarked, that when this disease attacks the soft parts surrounding a cylindrical bone, or those covering a flat bone, of the cranium, for example, the bone is only destroyed where it is in contact with the diseased parts. In this way a great portion of the cylinder of the femur has been destroyed, and I have seen fungous tumours, which had originated in the tissues covering the skull, occasion perforations through the bones of that receptacle, without extending their disorganizing influence to the bone surrounding the perforations.

It appears to me that the disease which has been described by authors as constituting fungus hæmatodes, was in all probability medullary sarcoma of bone.

There is this distinction to be observed in the treatment of *medullary sarcoma* of the *bone itself*, and the *fungating tumours* which extend by *progressive* morbid action to its tissue, that the former may in some cases be *cured*, by removing the affected bone by a surgical operation; whereas the

latter, in almost every case, depends upon, or is connected with, constitutional causes, and is *irremediable.*

3. The *Cartilaginous Degeneration of Bone, which does not originate in the tissue of the Bone,* but is formed first in the soft parts, and extends from them to the osseous tissue, is a most formidable affection, and in few instances admits of relief, either from internal remedies, external applications, or surgical operations.

It is this variety of disease which so frequently affects the bones of the face, and is the result of the extension of that inveterate affection, termed *Epulis**, by many surgeons. I have never met with this disease in any other situation than in the bones of the face and cranium. When it exists in the face, its usual site is in the cavity of the antrum, and in the alveolar processes of the upper jaw-bone.

The first symptom of the disease frequently consists in the formation of a small and irregu-

* Derived from the two Greek words επι, upon, and ουλου, the gum.

larly shaped indurated swelling of the gum. If this be not removed by the knife, the periosteum covering the alveolar margin of the superior maxillary bone becomes thickened, and of a dense structure; the bone beneath is at length affected, and is converted into a cartilaginous substance.

It is frequently the case, however, that the disease arises, in the first instance, in the lining membrane of the maxillary antrum, and extends from it to the bony parietes. When this is the case, the earthy matter of the bone is absorbed, and the cartilaginous degeneration increases in bulk, and, if left to itself, gradually acquires a prodigious magnitude. It is surprising to remark the very great size that these malignant cartilaginous tumours attain, without causing any ulceration of the enormously distended integuments.

Their formation and progress are sometimes unattended with pain, but in other cases they are productive of much local uneasiness and constitutional irritation.

Cases have been met with, in which this disease has extended, previous to the occurrence of a fatal result, from the bones of the face to those

of the cranium. It usually happens, however, that the bones below the orbit only are implicated.

In many instances, these cartilaginous growths have been removed by the surgeon, but seldom with permanent benefit. Indeed some able practitioners are of opinion, that an operation, performed with the view of eradicating this disease of the antrum, rather tends to hasten its progress, and render it more speedily fatal. It may be remarked, that, at the present time, when the rage for surgical operations has attained such a pitch of intensity, that men pride themselves upon the desperate nature of the operations which they undertake, and measure the talents of their contemporaries by the extent of the wounds they inflict, many opportunities will be afforded the student, should he have the patience to trace the progress of cases to their final results, of witnessing the inutility of operating in cases of this disease, when it is in an advanced stage.

CHAPTER VI.

ANOMALOUS AFFECTIONS OF BONE.

1. Bloody Tumour, or Aneurism of Bone.—2. Tumours dependent upon the existence of Hydatids in the Substance of the Osseous Tissue.

SECTION I.

BLOODY TUMOUR OF BONE.

M. BRESCHET* of Paris, and M. LALLEMAND† of Montpellier, have published two most interesting memoirs on a disease of the bones, which, in many of its phenomena, closely resembles aneurism from anastomoses of the soft parts. This disease has been noticed by other authors, and I have good reason to believe that it has been seen by se-

* Observations et Réflexions sur des Tumeurs Sanguines d'un Caractère Equivoque, qui paraissent étre des Anévrismes des Artères des Os.—*Répertoire Général d'Anatomie et de Physiologie Pathologigue et de Clinique Chirurgicale*, &c. tome, ii. p. 142. Paris, 1826.

† Observations sur une tumeur anéurismale accompagnée de circonstance insolites. *Idem*, p. 139.

veral practitioners who have not published their observations, or were not perhaps aware of the precise nature of the malady.

To M. Breschet we are indebted for the most accurate and lucid account of this very singular affection; and as some of my readers may not have had an opportunity of studying his valuable memoir, I shall give an analysis of that portion of it, in which the results of his observations are summed up. The disease, he remarks, has generally its seat in the vicinity of the knee-joint, implicating the upper portions of the tibia and fibula, separately or conjunctly. According to M. Breschet, it has been observed only in young and adult subjects; the cause of its origin has not as yet been precisely ascertained, although Scarpa has observed it to occur in a longer or shorter period after a blow, fall, or other injury. In some cases it has apparently been the sequela of rheumatic or gouty swellings of the knee-joint.

The affected part is swelled and painful, the cutaneous veins are distended, tense, and varicose, the entire limb is of a reddish-violet colour, and

exquisitely painful on pressure. In a short time a deep-seated pulsation, isochronous with that of the arteries, may be felt in the tumour.

In a more advanced state of the disease, the pulsation is attended by a general "*mouvement d'expansion.*" The pulsations cease when the *main* artery of the limb is compressed between the tumour and the heart.

The leg is sometimes œdematous, sometimes emaciated, and the motions of the whole limb, or only of the knee-joint, are painful, constrained, and difficult. Pressure with the finger on some parts of the tumour communicates a feeling similar to the crackling of parchment, or the forcible bruising of an egg-shell. On other parts the finger does not encounter any resistance.

Structure of the Tumour.—The cellular tissue of the bone is either in a great part, or entirely, destroyed. Its cavity is enlarged and filled with coagulated blood, disposed in concentric layers, as in the sac of an old aneurism, and these clots communicate with one or many arterial branches.

The external or compact tissue of the bone is very thin, in many points destroyed, and in some

points flexible and elastic, like a thin lamina of cartilage, or brittle like the shell of an egg. The periosteum and external aponeurosis are in general thickened, and of a denser structure than when they are in a healthy state, and they not unfrequently assume a fibro-cartilaginous character.

The joint which is in the vicinity of the disease, has always been found in a healthy state, although only separated from it by a layer of cartilage.

When the limb in which the disease was situated has been injected, all the vessels have appeared healthy, except those which were proper to the bone; these in general have seemed to be more voluminous and dilated, than when in a state of health, and open by many mouths into the sac situate in the centre of the bone.

I trust that I shall be excused for the heavy contribution I have levied from the celebrated French pathologist; but I felt that it was my duty to borrow from him, as he is undoubtedly the only author who has given an intelligible account of this disease.

It has been my lot to meet with but few examples of the bloody tumour of bone. There are two specimens of the disease in the Museum of St

Bartholomew's Hospital *, one in that of the Royal College of Surgeons of Edinburgh, and one in my own collection. Both of those which are in the Bartholomew collection illustrate the disease as occurring in the humerus. In that which is in the Museum of the College of Surgeons, the disease affects the metacarpal bones of the hand of a young man, which was amputated by Mr Joseph Bell; and the preparation which is in my possession is the humerus of a lady, whose arm was removed at the shoulder-joint, by my father, Mr George Bell, in the year 1823. As this disease is comparatively rare, I may be excused for quoting at length the last mentioned case, as I had an opportunity of watching it from its commencement to its termination, and of examining minutely the morbid appearances by dissection.

The patient was a lady about sixty years of age, who for several years had suffered from what

* My friend Mr Stanley, assistant-surgeon in St Bartholomew's Hospital, informed me, that, during the lifetime of one of the patients, pulsation was very evident in the tumour, but she died of pleurisy, before any operation could be performed for her relief.

she imagined to be rheumatism of the upper arm of the right side. The arm was painful on being handled, and a feeling of aching was referred to the bone. In the course of several months after the first symptoms of the bone being affected had appeared, the upper arm began to swell, and the enlargement went on progressively increasing, until the middle portion of the diseased humerus measured more than double the circumference of the sound one. She suffered considerable uneasiness in the part, and the pain extended downwards to the points of the fingers. The surface of the tumour was not discoloured, but several large and swollen veins coursed over it. Before applying to my father she had consulted a bone-setter, who, according to the principles of his craft, recommended frictions and champooing. This practice, the patient affirmed, had the effect of exasperating the disease, and of inducing intolerable pain.

Although the real nature of the complaint was not suspected, still as it was on the increase, and presented some of those characters which are met with in osteo-sarcoma in its middle stages, and in spina ventosa in its more advanced, it was deem-

ed proper, by the several surgeons assembled in consultation, among whom were Professor Russell, Dr Abercrombie, and Mr Craig of Ratho, to amputate the limb. My father accordingly removed the arm from the socket of the shoulder-joint; there was little bleeding at the time, although the arteries which supplied the upper part of the limb with blood, were unusually dilated. About six hours after the operation, however, secondary hæmorrhage occurred, and it was found necessary to secure three large vessels, which had not thrown out blood during the operation. This patient recovered in a short time from the operation, and *suffered no return of the complaint*, but died two years afterwards, from a sudden attack of pleuritis.

In order to ascertain whether any connection existed between the great vessels of the limb and the tumour of the bone, I injected the arteries of the arm from the humeral artery, with a preparation of glue and vermilion. The injection ran kindly, and flowed through the minutest of the distal arterial ramifications.

On removing the muscles, the tumour was found to be confined entirely to the bone. It was,

when divested of the soft parts, nine inches in circumference, and six in length. The periosteum was entire, and somewhat thickened. On cutting into the tumour, the scalpel grated upon what seemed to be osseous depositions, which pervaded its tissue; but its general texture was of a fibrous character. A thin, though imperfect, shell of bone, which was internal to, but in immediate contact with, the periosteum, nearly coated the tumour. There was a large cavity in the centre of the tumour, lined by an organized membrane, into the vessels of which the size injection had flowed; and the cavity itself was filled, partly with fluid blood of a dark colour, partly with concentric coagulæ, and partly with hardened injection.

From the pathological appearances presented in this preparation, I have no hesitation in esteeming it as a specimen of what M. Breschet has termed Aneurism of Bone; and several able anatomists to whom I have shewn it coincide in opinion with me.

The preparation of aneurism, occurring in the metacarpal bones, contained in the Museum of our College of Surgeons, differs in some respects from that mentioned above. The blood, in this

case, was contained in numerous distinct bony cysts, each of which was lined by a highly vascular membrane. The blood also was fluid, and had not concreted in the manner described by M. BRESCHET and myself. There was no pulsation in the tumour previous to the amputation of the hand, and, on being punctured, it discharged dark-coloured blood *.

* A case resembling that mentioned in the text, although the disease occupied a different situation, occurred in the course of my father's practice several years ago. Mr S——, æt. 22, took a good deal of exercise on horseback. The buckle of the stirrup-leather on the right side of the saddle was so placed, that it exerted considerable pressure on the middle of the inside of the thigh. A good deal of local uneasiness, with swelling, was the result. The surgeon in the country judiciously prescribed leeches, and various kinds of embrocations. These proved of no avail, for the swelling in the course of three months attained a great size. He came to town, and was seen in consultation by various practitioners; during a fortnight the swelling obviously increased. As the tumour occupied the whole of the thigh, and exhibited no signs of diminution, it was proposed to amputate the limb at the hip-joint. To this the patient gave a willing assent, but died suddenly three days after the operation was proposed to him, and on the very day it was to have taken place.

On examining the thigh, it measured thirty-nine inches

On considering attentively the phenomena presented in the cases described above, I am inclined to consider the bloody tumour of bone to be an affection similar in many respects to anastomatic aneurism of the other tissues;—like aneurism from anastomosis, it is sometimes, though not always, found to pulsate. It undoubtedly derives its origin from a morbidly increased development of the capillary vessels of the bone, conjoined most probably with increased vascular action of the second and third classes of arteries. It differs, however, from aneurism from anastomosis in other textures, —in this respect, that the structure of the bone, in some cases, undergoes alteration, and assumes a fibrous character; and in so doing, perhaps ex-

in circumference. The tumour was hard in some places, and in other places communicated that peculiar crackling feeling so well described by BRESCHET. It could not be divided by a knife, and much difficulty was experienced from its hardness in making a section of it by means of a saw. The parietes of the femur, covered by the periosteum, were expanded; and the internal structure of the tumour consisted of an immense number of cells, which were lined by a membrane, and were filled with florid arterial blood; one cell contained upwards of a pint of blood. The preparation is preserved in the Museum of the Royal College of Surgeons.

hibits the power which nature possesses in accommodating parts to the changes which morbid action occasions. For, if the fibrous change of structure did not occur, a complete solution of continuity would be apt to take place, either from the tension occasioned by the flow of blood into the cavity of the bone, or from the mere contractions of the muscles of the limb.

In those specimens of the disease which have come within the sphere of my observation, the parietes of the tumour have differed in appearance from those described by the French pathologists. In the cases mentioned by M. Breschet, the parietes were thin, and in some parts of a cartilaginous character; in the four preparations alluded to by myself, they consisted, partly of a thick and dense fibrous matter, and partly of bone.

SECTION II.

TUMOURS OF BONE CONTAINING HYDATIDS IN THEIR SUBSTANCE.

Tumours of this description are extremely rare, and few examples of them have been placed upon record. Ruysch, indeed, has mentioned, and even delineated, bones which contained animals in their cavities*; but I suspect that the drawings must have been taken from specimens found in the dissecting-room, as no other author whose works I have consulted makes any allusion to the existence of insects in the substance of bone. In the delineations of Ruysch, also, it may be remarked, that the bones in which the insects are represented as existing, do not seem to have undergone any alteration of structure, and are of a healthy appearance.

* Sections of the femur and humerus containing *chrysalides* and *scarabæi*. Fred. Ruyschii, *Adversar. Anat. Med. Chirurg.* Decas tertia, p. 36, tab. i. ii. Amstelodami, 1733.

That hydatids may be generated in the substance of bone, there is no doubt; these animals have been found in many of the other tissues of the body, and therefore there is no reason for supposing that the osseous texture should be exempted from their presence.

It has never been my good fortune to meet with a specimen of this very singular affection, and there are only three cases of it which I have found described in the course of my reading. M. CRUVEILHIER, in the first volume of his *Anatomie Pathologique*, page 236, mentions, that M. CULLERIER received into the wards of his hospital a man who had, on the anterior part of the surface of the tibia, an indolent tumour of a steatomatous appearance, with an unequal osseous border, which indicated that the tumour was implanted in a cavity. M. CULLERIER applied the caustic potass to the surface of the swelling. On the separation of the eschar, a thick inodorous fluid, resembling the dregs of wine, flowed out. An examination of the base of the cavity indicated a development of the tibia; he then applied the actual cautery to the part. The cauterized portion of bone covered a cavity, from which a number of globular bodies,

varying from three to four lines in diameter each, escaped. One of these bodies was more than an inch in diameter, and contained within it many smaller ones. On examination, these productions were found to be hydatids, of that species which M. Laennec has termed *Acephalocystes*.

Sir Astley Cooper, in his Surgical Observations, has alluded to a case which occurred in the practice of Mr Forster; the hydatids in this instance were also found in the upper part of the tibia *.

* "A man was admitted into Guy's Hospital, under the care of Mr Forster, with a large tumour seated upon the upper part of the tibia, which felt soft, and yielded to the finger, so as to give the impression of its being a fungous disease. Mr Forster directed adhesive plasters to be applied, by the pressure of which the size of the swelling was so much reduced, that the patient quitted the Hospital, satisfied that a continuance of the means which he had applied would suffice to accomplish a cure. In a few weeks he returned with the swelling greatly increased, when he was admitted under the cure of Mr Lucas, who made an incision into the swelling, and discharged several *hydatids*, which were of the common globular kind. However, constitutional irritation, with sloughing of the integuments which covered the swelling, induced the necessity of amputation. An inci-

To the excellent paper of Mr KEATE, contained in the tenth volume of the Medico-Chirurgical Transactions of London, I would refer the reader for the most valuable practical information concerning this curious disease. In the case described by Mr KEATE, the patient was a young woman, and the hydatidical tumour was situated in the frontal bone; it resembled externally an exostosis, and, on being cut into, the hydatids were found to be surrounded by a serous fluid. It was a most difficult matter, in this instance, to destroy the hydatids; for, although both the actual and potential cautery were frequently and freely employed, they were again and again regenerated.

From the extreme rarity of this affection, I think that it is the duty of every practitioner who

sion being made into the tumour, after the removal of the limb, a large nest in the bone was found, containing numerous hydatids. Upon boiling the section opposite the bony nest, a fracture was found in the tibia, which had probably been produced by the disease, as the patient did not mention it. This fracture had united, but irregularly." — *Surgical Essays*, by ASTLEY COOPER and BENJAMIN TRAVERS, Part I. p. 163. London, 1818.

may meet with examples of it in the course of his practice, to put his observations on record, and to note accurately the precise variety of hydatid, as it would be an interesting point to determine whether the species which occurs in bone is always the same with that which is found in the liver, uterus and other organs.

Before concluding, I may observe, that, in the present state of our information, there are no marks by which we may distinguish tumours, dependent upon the formation of hydatids, from exostosis, and other affections of the bones.

In the treatment of hydatid tumours of bone, it is evidently the object of the surgeon to strike at once at the root of the disease; he should therefore endeavour to remove, in the first instance, as much of the membranous parietes of the cavity containing the hydatids, as he can accomplish with safety to the patient. Having done this, the sides of the cavity should be freely penciled with one of the more powerful escharotics, or seared with the actual cautery. The application of the caustics will in all likelihood require to be frequently repeated; for, so long as a single

hydatid cyst remains, however minute it may be, the disease will be apt to return, and even with renewed vigour, in consequence of the irritation occasioned by the operation.

REMARKS

ON

FRACTURE OF THE NECK OF THE THIGH-BONE OCCURRING WITHIN THE ORBICULAR LIGAMENT OF THE HIP-JOINT.

REMARKS, &c.

When considering the subject of Adhesive Inflammation of Bone (p. 33.), I stated it to be my intention to append to the foregoing Treatise a few remarks on fracture of the neck of the thigh-bone within the orbicular ligament, with a view to enable the student to understand the nature of the discussion which has been agitated for several years past, concerning the mode in which the fractured surfaces in that situation unite.

Many pathologists assert, that fracture of the neck of the thigh-bone, when it occurs within the capsular ligament of the joint, never unites by osseous matter; while others, and more especially

the French surgeons, entertain a contrary opinion *.

Sir ASTLEY COOPER, Mr CHARLES BELL, and Mr EARLE, are the authors who, in this country, have dwelt most largely in their writings upon this interesting subject; and in the course of their investigations they have thrown much light, not only upon the pathology of the hip-joint, but also upon the mode of treatment which should be pur-

* L'EVEILLE observes, "La consolidation se fait constantement contre l'idée d'un tres grand nombre de pathologistes, qui sont efforce, de prouves que le col de fémur était sans périoste. L'age n'est point un obstacle à la formation du cal, qui a en lieu chez un vieillard de 84 ans, selon l'observation de SESME, et d'apres la mienne, chez un femme de 84 ans immediatement confiée aux soins de mon confrère M. Arnaud Marchais, intérne de l'Hotel-Dieu de Paris, en 1793," *Nouvelle Doctrine Chirurgicale*, Paris, 1812, tom. ii. p. 292. In this passage the author neither mentions the *precise* situation of the fracture, nor alludes to the appearance presented on examining the body after death, so that his testimony cannot be considered of any importance in deciding the question. This remark will apply to other cases mentioned in some of the late French periodical publications.

sued in a variety of diseases and accidents to which it is exposed.

It would be a wearisome, thankless and useless task, to enumerate and quote from the treatises and memoirs of the many authors who have alluded to this accident, and for the following reasons. In the first place, with the exception of Mr LANGSTAFF *, my friend Dr BEGBIE †, Dr

* Mr LANGSTAFF, in an interesting memoir on fracture of the neck of the thigh-bone, mentions several cases in which union had taken place by cartilaginous matter. In one case the medium of union was partly osseous and partly cartilaginous. Mr LANGSTAFF makes the following useful remark relative to the treatment of fracture of neck of the thigh-bone:—"In fractures within this joint, which have proceeded to such an extent as to be nearly approximated by ligamentous deposit, or osseous union, the function of the joint is generally destroyed; while in those cases where the patient has been allowed, after several months' confinement, to move about with crutches, the nature of the union, and the support given to the joint by bone, between the trochanters, produces a more useful limb, and is preferable to those where the fracture is so closely united as to be nearly anchylosed." *Medico-Chirurgical Transactions of London*, vol. xiii. p. 487.

† The case related by Dr BEGBIE, in the first volume of the *Edinburgh Journal of Medical Science*, p. 74, deserves a most attentive perusal. The specimen is deposited in the

Colles* of Dublin, and the three gentlemen mentioned in the former paragraph, no one has given an accurate account of the precise situation of the fracture which they have described as taking place in the neck of the thigh-bone, and which has been followed by ossific union. And, in the second place, the greater number of specimens, which were supposed to illustrate bony union after fracture of the neck of the thigh-bone, were found in the dissecting room, and the previous history of the individuals from whom they were taken unknown.

It has been determined, on all hands, that fractures of the neck of the thigh-bone, which are not confined to that portion of it which is within the capsular ligament, but extend in the direction of the trochanter major and shaft of the femur, unite in general by osseous matter: but in those cases

Museum of the College of Surgeons. It is a difficult matter to form any decided conclusion concerning the precise nature of the change which has taken place in the neck of the bone, viewing it in connection with the previous history of the case. In my opinion it seems to afford an example of that variety of interstitial absorption of the neck of the thigh-bone, which I have seen to follow a fall upon the trochanter major.

* Dublin Hospital Reports, vol. ii. p. 334.

of the accident in which the fracture occurs within the capsular ligament, bony union very seldom, if ever, occurs.

When Sir ASTLEY COOPER first published his opinions relative to fracture of the neck of the thigh-bone within the orbicular ligament of the hip-joint, he stated, that, in the course of his long and extensive practice, he had never met with an instance of ossific union, but he did not assert that such an event was impossible; he merely hinted that it was not likely to occur *. The following

* "In all the examinations which I have made," Sir ASTLEY observes, "of transverse fractures of the cervix femoris entirely within the capsular ligament, I have never met with a bony union, or of any which did not admit of motion of one bone upon the other. *To deny its impossibility* would be presumptuous, under all the varieties of direction, extent of fracture, and degree of violence, by which it has been produced, for there is scarcely a general rule which does not admit of exceptions; but all I wish to be understood to say is, that if it ever does happen, it is an extremely rare occurrence, and that I have not yet met with a single example of it."—*Surgical Essays* by ASTLEY COOPER and BENJAMIN TRAVERS, Lond. 1819, Part ii. p. 29; also, *A Treatise on Dislocations and on Fractures of the Joints*, by Sir ASTLEY COOPER, Bart. Second Edit. London, 1823, p. 117.

reasons were adduced by Sir Astley Cooper in support of his opinion: 1. From the situation and structure of the hip-joint it is an extremely difficult matter to preserve the fractured extremities of the bones in steady juxtaposition; 2. From the impossibility of promoting a proper degree of pressure of the different fractured extremities upon each other; and, 3. From the absence of ossific action in the head of the thigh-bone, when separated from its cervix; its life being thus solely supported by the ligamentum teres, which has only a few minute vessels ramifying from it to the head of the bone *. With regard to the first objection, no argument can be offered which will invalidate it, and therefore it is unnecessary to dwell longer upon it at present. But in respect to the second and third, a diversity of opinion exists, and upon them the question at issue in a great measure depends. In those cases of fractures of the neck of the thigh-bone, in which the capsular ligament is not torn, Sir Astley Cooper remarks,

* A very beautiful delineation is given by Ruysch, representing the highly vascular state of the membrane lining the acetabulum and investing the ligamentum teres; Opera, vol. i. Adversar. Anat. Dec. Secund. Tab. iii. fig. 3.

that the synovial membrane of the joint is stimulated by the injury to secrete a superabundance of preternaturally serous synovia, which, distending the capsule, pushes the distal extremity of the fractured neck of the thigh-bone from the cavity of the acetabulum. In process of time the synovial fluid is absorbed, but not until the fractured extremities of the neck of the thigh-bone have become coated by a cartilaginous substance, and all inflammatory action has ceased.

Mr CHARLES BELL, who, in his most excellent observations on injuries of the spine and of the thigh-bone, has attacked Sir ASTLEY COOPER's publication with some acrimony*, attributes the difficulty of promoting ossific union in fractures of the neck of the thigh-bone to the absence of a due degree of inflammatory action in the parts surrounding the fracture.

"The real cause (Mr BELL observes) is one

* Observations on Injuries of the Spine and of the Thigh-Bone, in two lectures, delivered in the school of Great Windmill Street; the first *in Vindication of the Author's Opinions against the Remarks of* Sir ASTLEY COOPER, *Bart.* The second, *On the late* Mr JOHN BELL's *title to certain Doctrines now advanced by the same Gentleman*, by CHARLES BELL, Surgeon to the Middlesex Hospital, London, 1824, p. 53.

which you can best understand, who see the parts before you; if the bone be broken within this capsule, it is attended with an increase of colourless effusion into the joint, and the bones remain loose and subject to motion. But if the bone be broken external to the joint, the cellular connections are torn, and there is bloody effusions; there follows this—inflammation and consolidation of the surrounding parts; the bones are sustained by this mass of inflamed matter; and in due time bone is formed in it, and that bone constitutes the medium of reunion *." Mr EARLE, whose practical observations on fractures of the thigh deserve an attentive perusal, attributes non-union by bone in fracture of the neck of the thigh-bone, first, to the rough handling of the surgeon in his examination of the accident; and, secondly, to the subsequent improper treatment of the accident †.

I have stated very briefly the principal arguments which have been offered for and against the union of fracture of the neck of the thigh-bone within the orbicular ligament, and I shall now proceed to consider them in detail.

* Lib. Cit. p. 60.

† Practical Observations in Surgery, by HENRY EARLE, London, 1823.

That union by osseous matter of fracture in this situation, is a very rare event, few surgeons will deny; but it appears that as yet no satisfactory reason for this circumstance has been offered to the profession *.

I. That it is an extremely difficult matter to retain the portions of a thigh-bone fractured within the orbicular ligament in steady juxtaposition, is a fact which must be evident to every one who is acquainted with the peculiar structure of the hip-joint. But it cannot well be adduced in support of the doctrine of the non-union by bone of fractured cervix femoris. Every surgeon who has in the course of his education attended an hospital, must have seen cases of fracture of the bones

* Ruysch has given a delineation of a cervix femoris fractured within the capsular ligament. In this case union had taken place by means of a fibro-cartilaginous matter. This fibrous substance is arranged in the form of bands or columns, which proceed from the cancellous structure of the trochanter major, to that of the head of the bone. Between each of these bands there is a considerable vacancy; Ruyschi Opera, vol. ii.; Thesaur. Anatom. ix. Tabula i. Amstelodami, 1725.

of the extremities, in which, from the carelessness of nurses, and the restlessness of patients, the fractured surfaces moved and grated upon each other, but yet in due time union took place, and the fracture consolidated properly. No longer ago than last winter, I attended a boy who would not permit the proper application of splints to his broken fore-arm, and in his perversity was encouraged by a foolish mother; yet, although the fractured extremities of the bones played to a certain extent upon each other, union by bone took place. In truth, I should think that it would be a difficult matter to *prevent* ossific union in fracture occurring in almost any of the bones (when in a healthy state), except in the neck of the thigh-bone. Again, it is acknowledged, and numerous preparations prove the fact, that the fractured neck of the thigh-bone is frequently reunited by a fibro-cartilaginous material. This circumstance of itself shews that the head and neck of the bone are so situate with regard to each other, as to admit of the inosculation of vessels in the matter which is secreted from their cancellous structure. Mr Earle, also, has shewn, that it is possible to retain the fractured portions of bone

in contact, by the proper application of mechanical contrivances; and I have repeatedly seen in practice the fibro-cartilaginous union follow fractures of the neck of the thigh-bone, which have been treated with Boyer's splint *.

* The notions of AMBROSE PAREY, who published in the year 1579, do not differ materially from those stated in the text. "For there it is at the cervix femoris more dangerous than in the midst of the thigh, and consequently more difficult to dress and heal, for that the part *is bloodless*, and by reason of the multitude of nerves, and tendons and ligaments, which are obnoxious to many malign symptoms. But the surgeon must have diligent care in this kind of fracture, and must look often that the bone which is set do not fall forth again, which easily happens here by any slight stirring of the body, and the like occasion; for that the thigh hath one onely bone. Therefore, as oft as the bandage shall be loosed, and the fracture dressed, he shall attentively view the figure of the bone, and the magnitude of the affected part, comparing it with the sound, for the set and composed fragments of the broken bone can scarce fall asunder, but that the one must be on the other."

"But before it be knit, the part must be extended and restored to its state, that so the patient may not halt during the residue of his life; for I have read it written in AVICENNE, that *scarce any do well*, or recover a fractured thigh; therefore the patient must be careful that he move himself

II. It has been contended that it is impossible to promote a proper degree of pressure of one portion of the fractured cervix femoris on the other. It remains to be proved, I think, that pressure is necessary. Of what utility is pressure after cartilaginous union has taken place? Will it stimulate the vessels that circulate through the cartilage to secrete the earthy matter of bone? It is well known, that, in fractures of the long bones, which have not shewn a disposition to unite, that pressure has sometimes had a good effect; but then the fractured surfaces, although in close juxtaposition, were not, so far as could be ascertained, united by cartilage,—and the pressure was applied with the view of stimulating the vessels of the bone, which had previously exhibited no disposition either to deposite the cartilaginous or earthy material of bone. Did pressure ever cure a false joint, when the fractured surfaces were coated with cartilage? In those cases in which the head and neck of the bone, after fracture, are united by cartilaginous bands, it cannot be sup-

in his body as little as he can."—*The Works of* AMBROSE PAREY, *translated by* J. H. JOHNSTON, London, 1678, p. 340.

posed that they were not in contact. No one, I think, will assert that a cartilaginous band or process will of itself travel from the distal surface of the fracture, and incorporate with the cartilaginous matter formed on the cancellous surface of the head of the bone.

We have preparations which shew that the head and neck of the thigh-bone, after fracture, have been preserved in such close contact, that, although they have not been united, either by cartilage or bone, still the salient portion of the cervix has made a bed for itself in the head of the bone, and formed, in fact, with it a kind of false joint.

III. A third argument against the union by bone, of fractured cervix femoris, " is the absence of ossific action in the head of the thigh-bone, when separated from its cervix; its life being then solely supported by the ligamentum teres, which has only a few minute vessels ramifying from it to the bone."

I contend that this circumstance is not conclusive against the ossific union of fractured neck of the thigh-bone; the very circumstance of the head of the bone retaining its vital prin-

ciple *, will serve to controvert this opinion. If the vessels supplied by the ligamentum teres were not qualified to secrete osseous matter, how does it happen that the head of the bone is not always entirely absorbed after fracture?—and why is there found a cartilaginous deposite on the surface of its cancelli?

It is a well known physiological fact, that no part of the body which is disqualified by being placed beyond the range of the circulation for carrying on its proper functions, can exist in an unchanged state; it is either absorbed, or acts as a foreign body; and by the irritation it occasions, produces such a degree of derangement in the neighbourhood of its locality, that acute disease is the consequence. Now, after fracture of the cervix femoris, when fibro-cartilaginous union has not taken place, the head of the bone seems to possess an independent vitality; and if, in consequence of the pressure exerted upon it by the neck of the bone, a certain degree of absorption

* There is a case indeed mentioned by SALZMANN, in which the head of the thigh-bone was entirely absorbed after fracture of its neck.—MORGAGNI *De Sedibus et Causis Morborum*, Epist. 56. lib. iv.

has taken place, still the remaining portion, in general, retains all its proper osseous characteristics, and proves that its vascularity is not impaired, by throwing out a fibro-cartilaginous deposite on its cancellous surface.

IV. With regard to Mr CHARLES BELL's opinion, that the absence of ossific union depends upon the want of a due degree of inflammation in the textures surrounding the fracture, as exhibited by the secretion of a preternatural quantity of *colourless synovia* into the cavity of the joint, it appears that his argument is not founded upon just data. In the first place, there is always considerable pain and some tumefaction in the neighbourhood of the neck of a thigh-bone which has been fractured. In the second place, as Mr EARLE observes at p. 31 of his Observations, "On puncturing the capsule, about an ounce of *bloody synovia* escaped; and the introduction of the finger readily detected a fracture of the neck of the bone. A larger incision was now made; and on the limb being turned in different directions, the head of the bone was observed to move freely in the acetabulum. At first it was suggested that

the fracture was incomplete, but subsequent examination proved the contrary. The fractured surfaces accurately fitted to each other, and were retained in their proper relative situation, by a portion of the reflected layer of the fibrous and synovial membranes, of about an inch in extent, which had fortunately escaped being torn through, notwithstanding all the *examinations* which were instituted after the accident, and the total neglect of any apparatus to restrain the motions of the limb. On the broken surface of the superior portion or head of the bone, there were *considerable granulations.*"

That the effusion within the capsule is not colourless, another professional friend of mine, whose name has been mentioned in the body of my treatise, was satisfied by the examination of a recent case of fracture of the neck of the thigh-bone within the capsular ligament. Regarding the colour of the effusion I cannot speak from experience,—nor does Mr CHARLES BELL mention that he has examined the state of the joint a short time after the occurrence of the fracture.

We are bound, however, to believe Mr EARLE's assertion, which not only shews that the synovial

fluid of the joint is mixed with blood, after fracture of the thigh-bone, but what is a material point, the cancellous surface of the head of the bone is covered with *granulations*; a strong proof in opposition both to Sir Astley Cooper's and Mr Bell's opinion, that a proper degree of adhesive inflammation cannot arise in the fractured surfaces in this situation. I cannot understand the reasoning by which Mr Bell supports his opinion, that a higher degree of inflammatory action is necessary to promote union of fracture, by ossific than by cartilaginous matter. He is well aware that after fracture has taken place in any bone of the body, an organizable fluid, of a gelatinous appearance, is first thrown out from the fractured surfaces, which in process of time assumes a cartilaginous character, and in this cartilage, the earthy matter of bone is deposited. In the neck of the thigh-bone, however, and in the patella (which can hardly be called a bone), the cartilaginous matter which frequently forms the medium of union, after fracture, assumes, in process of time, rather a ligamentous than an osseous character. I do not think that much weight can be attached to the analogical proof brought for-

ward by Mr C. Bell, in the 58th page of his treatise. "In the common case of fracture of the patella, by the sudden action of the quadriceps extensor, the bone is broken, and the pieces drawn separate, without that degree of violence which is necessary to produce re-union by bone. But when the patella is broken, by a blow upon it, as by the kick of a horse, there is not only less retraction, but the injury, bloody effusion, tumefaction, and rigidity of the parts, resemble that which attends the fracture of any other bone, and the fragments unite by bone." The primary cause of union by osseous matter of fracture of the patella, occasioned by the irregular and violent contraction of the extensor muscles, may be partly attributed to the degree of pain which the patient experiences in consequence of the accident. When the pain is trifling, it is a difficult matter to prevent the patient from moving his knee; but when it is severe, as is always the case when the patella has been shattered by the kick of a horse, the blow of a bludgeon, or in consequence of a fall from a scaffold, no arguments are necessary to persuade him to keep his limb extended and at rest. From Mr Bell's statements on this point, one would

feel almost inclined to imagine that he had adopted the opinions of CRUVEILHIER, and some other French pathologists, who attribute the formation of callus to the action of the vessels which supply the soft parts covering the bones *.

V. Mr EARLE has attributed the non-union by bone, in cases of fracture of the neck of the thigh-bone, to the rude method pursued by the surgeon, in his mode of examining the accident, and to the subsequent treatment of it. So afraid does Mr EARLE appear to be of exciting inflammatory action in the fractured surfaces, when he suspects

* Sir WILLIAM BLIZARD, one of the fathers of surgery in this country, accounts for the union of fractured patella, by the following argument:—"But a fractured patella will become united by a firm bony production; under the laws of ossification, which direct the process of union of every other divided bone. In every case of fractured bone, union will necessarily have relation to the sphere of ossifying disposition of the preparative vessels, which in the patella appears to be very limited; to the proximity of the divided portions, and to various other relative circumstances; not to mention chirurgical treatment, as conformably, or not, to correct notions of muscular action."—*Hunterian Oration*, London, 1827, p. 17.

that the neck of the thigh-bone has been fractured, that he gives the following advice *:—" Where a person, previously in full possession of the locomotive powers of his limb, after the receipt of any injury, and particularly after a fall upon his trochanter, becomes suddenly deprived of that power; accompanied with a remarkable consciousness of incapacity in the injured member; and when, from the position and direction of the limb, it is obvious that there is no dislocation, a strong presumption must arise that a fracture has taken place. In such a case a surgeon is *fully warranted to act on such a suspicion*, and to treat the case as a fracture, without subjecting his patient to painful examinations, to gratify his own curiosity †." Here, then,

* Libro citato, p. 22.

† Sir ASTLEY COOPER, in the Appendix to the second edition of his work on Fractures, p. 11, makes the following remark upon the passage quoted in the text:—" Is this written by an English surgeon? in the land of JOHN HUNTER, the minute investigator of nature, whether in health or disease. This is indeed cutting the Gordian knot! What! shall not the surgeon satisfy himself there is a fracture, and its nature, before he exposes his patient to a confined position of great duration? for, if the surgeon is not suffered to exa-

we have Mr CHARLES BELL's opinions directly controverted, for Mr EARLE is so afraid of inducing inflammatory action in the fractured surfaces, that he does not even think it right for the surgeon to inform himself by examination of the precise nature of the injury. I do not know what may be the state during life of the synovial membrane, which Mr EARLE is so afraid of tearing, in the course of examining a fractured neck of the thigh-bone; but this I know, that, after death, when the capsular ligament is divided, the synovial membrane will admit of considerable stretching before it can be lacerated.

Mr EARLE has also stated, that the non-union by bone, in cases of fracture of the neck of the thigh-bone, depends in some measure upon the treatment of the case, so far as position is concerned; but he brings forward no conclusive il-

mine the limb, when is that confinement to terminate? are such doctrines to be taught, such advice to be given to young men just embarking in their profession, that they need learn nothing of these cases? *For if a man has a fall, and a consciousness of inability, his limb is declared to be fractured!* Certainly it will save a great deal of time in studying the profession, and a great deal of trouble in knowing the nature of the case the surgeon is called upon to treat."

lustration in support of his assertion. He mentions, to be sure, p. 95. of his work, the case of an old woman, in whom cartilaginous union had taken place, and which would, he thinks, have become osseous, had the patient *lived a little longer*. He also quotes a case from CHISTOPHER HENRY ENDLUS's Tour through England; but this man HEISTER has stated, in his Surgical Observations, to be a person unworthy of credit. And, lastly, he alludes to two thigh-bones, which I assisted in removing from a subject brought into the dissecting-room of St Bartholomew's Hospital, in the winter of 1822, and concerning whose previous history nothing was known. In this case something resembling an osseous line was observed to traverse diagonally the cervices of both femora, which were shortened apparently from interstitial absorption; and I think, from a subsequent examination of the preparations which I made in the month of May this year (1828), that there is little foundation for asserting positively that they illustrate the circumstance of bony union occurring after fracture of the neck of the thigh-bone *.

* These preparations are numbered 34–35. in the Catalogue of the Bartholomew Collection, and are thus described: "Sec-

If the foregoing remarks are well founded, it would appear that pathologists have not as yet ascertained the true reason of the non-union by osseous matter, of fracture of the neck of the thigh-bone occurring within the orbicular ligament. Much, therefore, remains to be done, both in the way of observation and of experiment. To Sir ASTLEY COOPER, Mr EARLE, and to Mr CHARLES BELL, the profession stands deeply indebted, for the careful and scientific manner in which they have investigated this most obscure though interesting subject, and I trust that they will still continue to direct their attention to it, and favour the public with the result of their farther observations.

tions of the Heads and Necks of the Thigh-Bones from the same individual. On the surface of each section a white line is visible, giving the appearance of a fracture which has united.—*From an aged female, whose history is unknown.*"

NOTE

TO

SECTION ON INTERSTITIAL ABSORPTION.

After the remarks which I have offered on *Interstitial Absorption of the Neck of the Thigh-Bone* had passed through the press, I was politely favoured with the following interesting notice from my friend Dr Fairbairn of this city. As the two cases which he describes accurately coincide with what I have witnessed in practice, it may not be improper to insert them here.

"D. H. a stout muscular man, aged sixty, whilst descending a dark stair, and in the act of leaning against the wall, was suddenly precipitated, and fell with the weight of the whole body upon the right hip, by which he received a severe injury. On examining the limb, and comparing it with the other, there was no apparent *shortening*;

the parts about the joint were swollen and painful, especially in the *front* of the thigh and *groin*, but there were no symptoms which indicated either *fracture* or *dislocation* of the femur. A respectable surgeon visited him a few days after the accident, and concurred with me in there being neither dislocation nor fracture of the bone.

" He was actively treated by the repeated application of leeches to the part, cold lotions, purgatives, and, in the course of the cure, various stimulating liniments and ointments were used with temporary relief. It is now better than a twelvemonth since the accident happened, and he is able to walk with the assistance of a stick, but there is an evident halt, and the affected limb is an inch shorter than the other.

" Mrs H. æt. 70, on venturing abroad one stormy day, was thrown down with violence upon the pavement, and received a severe injury of the left hip. On examining the parts they were found to be much swollen and painful, particularly on any attempt being made to rotate the thigh ; but there was no *shortening* of the limb, nor any other symptom which indicated either fracture or dislocation.

"The same treatment was pursued as in the former case, and the result, in regard to the permanent shortening of the limb, is precisely the same."

Dr FAIRBAIRN, in his remarks on these two cases, observes that they illustrate the affection described in my memoir on interstitial absorption, and "are interesting, in so far as they point out a process of nature gradually going on after a severe injury, by which the limb is actually shortened, and that, too, totally unconnected with either dislocation or fracture."

The latter case described by Dr FAIRBAIRN is valuable, as it proves that interstitial absorption may occur, in aged individuals, after an accident, which is apt to occasion fracture of the neck of the thigh-bone, in persons at an advanced period of life. The symptoms which he has so accurately described, closely resemble those which presented themselves in a lady, thirty-five years of age, whom I attended in the month of May 1825, but who could walk with assistance a few days after the accident. In this case the limb was shortened to the extent of an inch, in the course of ten months after the receipt of the injury.

It was at one time my intention to have communicated to the public, in this Appendix, the particulars of those cases of interstitial absorption of the neck of the thigh-bone which have come under my own observation, and under that of my correspondents; but it has since occurred to me, that, if they were inserted, they would swell this volume to too great a bulk, and defeat the main object I had in view in publishing it. I may merely assure my readers that this affection is not uncommon, and that it has frequently been confounded with other diseases to which the hip-joint is subject.

In several cases in which I have been consulted, this peculiar change in the neck of the femur had been mistaken for deformity of the pelvis, and also for that variety of subluxation of the hip which Palletta has so well described *.

In other instances, lateral curvature of the vertebral column has been confounded with interstitial absorption of the neck of the thigh-bone, in consequence of the peculiar gait and position of the patient's body, and the apparent shortening of

* *Animadversiones super Femoris Luxationes.* Exercitationes Pathologicæ. J. Baptist. Palletta. Mediolani, 1822.

the limb on the side to which the curvature had taken place.

The judicious surgeon, however, will easily detect fallacious symptoms, and, after repeated and careful examinations, determine the true nature of the disease. He will find that it rarely occurs in conjunction with rickets, or at that period of life when mollities ossium in general exists; that it is a purely local affection, and does not in general involve much constitutional irritation; and that its origin may be traced to some external exciting cause, such as cold produced by partial currents of air or damp, a blow, or a fall upon the greater trochanter.

CATALOGUE OF PREPARATIONS,

ILLUSTRATING THE

INJURIES AND DISEASES OF BONE,

CONTAINED IN THE MUSEUM OF THE

ROYAL COLLEGE OF SURGEONS OF EDINBURGH.

CATALOGUE OF PREPARATIONS,

&c.

NOTE. — The numbers at the end of the description of several preparations refer to the figures at present attached to them.

DIVISION I.

FRACTURES.

SECTION I.

FRACTURES OF THE BONES OF THE TRUNK.

I. I. M. 1. FRACTURE OF THE OS ILIUM. This exhibits a reunited fracture of the os ilium, occurring in an old man. Such fractures frequently terminate favourably, unless there has been much injury done to the viscera and external soft parts. In this case, the new bone is remarkably exuberant on both sides, and is the consequence apparently of inordinate action of the nutrient vessels of the bone, rather

than the necessary result of the accident; more especially as the spine of this subject was anchylosed at some parts, and had tubercles of bone connected with it.

I. I. M. 2. *Pieces of fractured ossa pubis.* A young man, by a tumbril falling upon him, received a violent blow on the pubes, which fractured them. The thigh-bone was also fractured; and the scrotum in a few hours swelled to a great size, and assumed a dark colour. Ecchymosis of the whole lower part of the body ensued; the stomach could retain nothing; no urine passed by the penis, and, when a catheter was introduced, no urine flowed through it; the lower part of the scrotum sloughed; the pulse became slow, and at length totally imperceptible. The patient died three days after the accident. On examining the body, the ossa pubis were found fractured, and the portions we have here were found detached from the rest of the bone. One of these portions, which includes their symphysis, is four inches wide; and another smaller one, an inch and a half in length. The bladder was collapsed, with an extensive laceration in it, so that the urine had escaped into the pelvis; there were a few spots of blood on the intestines, but no signs of inflammation; the sloughing of the scrotum was superficial, and the tumefaction was occasioned by venous blood extravasated into the cellular membrane.

I. I. M. 3. Three ribs which had been fractured, and united by bone.

I. I. M. 4. An oblique fracture of the clavicle, united.

I. I. M. 5. Fracture of ditto united.

I. I. M. 6. Fracture of the acromion portion of the clavicle.

I. I. M. 7. A fracture of the acromion scapulæ. This accident is very apt to happen when a man is pitched from his horse upon his shoulder. It has been mistaken for dislocation of the humerus. In treating this accident, it is required that the head of the humerus be pushed up, to prevent the broken piece from hanging down and uniting in that position.

I. I. M. 7. a. Fracture of the acromion scapulæ resembling the last.

I. I. M. 7. b. There has been a fracture of the acromion scapulæ; a false joint had probably been formed between the two portions, at the lower angle; a fracture, or perhaps a diductio, of the cartilage has taken place, which is now united.

SECTION II.

FRACTURES OF THE THIGH-BONE.

I. I. M. 8. *A case of diductio epiphysis* * of the lower head of the thigh-bone.——Case. A boy, æt. 13, fell from the joisting of a house on the floor below, and his right leg went through the flooring. When brought into the Middlesex Hospital, the house-surgeon reported the case to Mr J.

* Vide G. C. Reichel, Dissertatio de Epiphysium ab ossium diaphysi diductione. Sandifort, Thesaur.

as one of common fracture of the thigh-bone. The patient lay with the usual securities upon the limb, for about a fortnight, before Mr Charles Bell was called to consult upon it. The boy was hectic—much reduced—a dry tongue—pulse irritable; and upon the inside of the knee there were deep sloughy spots. Next day, in consequence of the restlessness of the boy during the night, Mr Bell found the bone sticking through the integuments, and saw, from the appearance of the bone, that the case had been mistaken; and that, instead of a fracture communicating with the joint, it was a separation of the epiphysis from the shaft of the femur. Even now he thought it not too late to amputate, with some chance of the boy surviving; but it was imagined he had somewhat rallied from the day preceding, and that he might be still better on the morrow. On the morrow he died. The dissection exhibited great suppuration within the knee-joint, and an immense abscess communicating with it, and extending up the thigh-bone nearly to the hip. The periosteum could be torn with the fingers from half the length of the bone. There are also evident traces of superficial inflammation having affected the bone for some way above the injury.

I. I. M. 9. Is a remarkable specimen of the separation of the epiphysis from the shaft of the thigh-bone, in a lad, who, in attempting to get upon the back of a gentleman's carriage, got his legs entangled between the spokes of the wheel. The lower extremity or epiphysis of the femur was broken off. Union took place after this accident, but the broken portions united irregularly, and a point projected. Several years after this accident had occurred, and when the

patient had grown to manhood, he suffered an accident of a still more serious nature. In carrying a burden upon his head, his foot slipped, and in the attempt to prevent himself from falling, the action of the muscles of the thigh perhaps pressed the popliteal artery against the projecting point of the bone, for the artery was ruptured, and an aneurism formed. It was finally found necessary to amputate the limb.

I. I. M. 10. *Fracture of the femur not united.* When the bone is fractured by a person dropping from a height, it is frequently fractured obliquely, as in the present instance; and the extremities of the bones are thrust past each other, both in consequence of the direction of the force, and from the points penetrating easily into the flesh.

I. I. M. 11. *Fracture of the thigh-bone.* The bone, in this case, was twice broken after the first accident. Matters seeming to go on prosperously, the patient had risen from his bed, and was walking on crutches, when his crutch slipt from under him, and he broke the bone a second time. It seemed now to be very ill set, for the preparation shows the bone riding; accordingly union by ossific matter did not take place; a joint formed instead—and in this condition he was brought into hospital. Various attempts were made, by exciting the extremities of the bone, to produce what has been termed Ossific Inflammation, but without success. At last, at the earnest request of the patient, the limb was amputated.

I. I. M. 12. *Fracture of the lower jaw-bone.* The bones remained loose after the fracture, and the preparation shows, from the smoothness of the fractured surfaces, that

a false joint may be formed, after fracture, in this situation.——NOTE. In the fracture of the lower jaw, produced by gunshot, the action of the pterygoid muscles tends to twist round the posterior portion, and force in the piece upon the tongue. The teeth, meeting with no resistance in mastication, become loose.

I. I. M. 13. Head of a femur, which was fractured six weeks before death.

I. I. M. 14. *Fracture of the thigh-bone at the neck.* The woman lived two months after the accident. No union of bone has taken place. In this preparation we see illustrated the rapidity with which the process of absorption proceeds in the head and neck of the thigh-bone, after fracture, within the orbicular ligament. From this circumstance, the leg becomes not only somewhat shorter, but the trochanters approach so close to the os ilium as to impede the motion of the limb.

I. I. M. 15. Fracture of the neck of the thigh-bone within the orbicular ligament. Union has taken place to a certain extent, through the medium of delicate fibro-cartilaginous bands.

I. I. M. 16. A thigh-bone fractured at the neck. When this accident occurred, the head of the bone was shattered, and inflammation had taken place, both in the head and in the extremity of the shaft of the bone. Notwithstanding this, no union had followed. This bone is articulated in a manner to show the space between the head and body of the bone, and the quantity of intervening osseous matter which has been absorbed.

I. I. M. 17. Pelvis and thigh-bones. The neck of the

femur, on one side, is fractured, and the extremity of the shaft of the bone is shattered. The fractured bones are articulated in the position in which they were found on dissection,—so that the cause and the degree of the shortening of the limb may be easily recognized.

I. I. M. 18. A thigh-bone, to which an accident of nearly a similar nature has occurred.

I. I. M. 19. The neck of the thigh-bone fractured, and afterwards united by ligament. Much of the neck of the bone is absorbed.

I. I. M. 20. Ununited comminuted fracture of the neck of the thigh-bone, and of the two trochanters.

I. I. M. 20. a. A section of the upper part of the thigh-bone, in which there has been fracture of the cervix exterior to the capsule of the joint, and the displacement of the lesser trochanter. The bones are united, with depression of the head of the bone, and shortening of the whole bone. The articulating surface of the head has suffered, probably in consequence of inflammation, and is somewhat irregularly moulded.

I. I. M. 20. b. A specimen of fracture of the neck of the thigh-bone, but not *entirely* within the orbicular ligament, united by bone. The cervix and trochanters were detached from each other, and broken off from their connection with the shaft of the femur. All the portions have united together irregularly, and with great shortening of the limb.

I. I. M. 20. c. The man from whom this thigh-bone was taken was a coachman, who fell from his box. He lived five weeks after the accident. The cervix, with a portion of the shaft of the femur, is obliquely fractured; the trochanters.

with a splinter, which extends almost half-way down the posterior ridge of the bone, are also detached. The greater trochanter itself has been partially fractured or split, and the cervices are filled up with newly formed bone. This preparation illustrates the projection of the upper fractured portion, and its tendency (in high fractures of the thigh) to be dragged outwards.

I. I. M. 21. and I. I. M. 22. In these specimens the affection termed *Interstitial Absorption* of the neck of the femur is well illustrated. Appearances are presented here which have been described by some as characteristic of reunited fracture within the capsular ligament.

I. I. M. 23. A thigh-bone fractured in two places, and reunited. This was the thigh-bone of a madman, who threw himself out of the window, and kicked and struggled so, that the limb could not be secured in a proper position. The bone in its natural state was eighteen inches in length. It is now only thirteen inches. It lost five inches in length, yet to that degree of shortening the muscles had adapted themselves.

I. I. M. 24. A thigh-bone carious. The man received a blow from a mallet on the thigh—a deep and large abscess formed—he died. On inspection, an abscess was found surrounding the thigh-bone; the bone broke in raising it; it is rough, and wasted on the outside; the cavity is filled up with bone, in consequence of interstitial inflammation.

I. I. M. 25. *Oblique fracture* of the thigh-bone reunited. The extremities of the bone have in this instance so overlapped, and stand so apart, that it must surprise us that any union has taken place at all. Sharp spiculæ of bone project, and the limb must have been very considerably shortened.

The extremity of the upper portion of the bone, in this preparation, projects forwards, in a manner similar to that which is observed in the preceding specimen.

I. I. M. 26. *Fracture* at the *upper third* of the thigh-bone. The portions are here united by a redundant callus, and the upper broken extremity projects forwards.

I. I. M. 27. Reunited fracture of the thigh-bone. This is a specimen of better surgery, but still the upper portion projects forward to a certain degree.

I. I. M. 28. *Reunited fracture* of the upper third of the thigh-bone. Even here the upper portion projects forward. The person must have lived a long time after the accident, since the marks of the injury are almost obliterated from the bone.

I. I. M. 29. Thigh-bone fractured a short way above the knee-joint, the portions reunited. The upper portion projecting at its lower extremity.

I. I. M. 30. Reunited fracture of the thigh-bone. In this specimen the extremity of the lower fractured portion is anterior to the upper.

I. I. M. 31. *A portion of the femur;* a very uncommon and instructive specimen of fracture. The person lived some time after the accident, and at the time of his death was a patient in the Middlesex Hospital. The fracture seems to have proceeded nearly half through the bone from before, detaching but one large piece; posteriorly, several splinters have broken off, many of which have united to a different part of the bone, from which they were detached. One part, in particular, shews from the directions of the external fibres being very oblique in the splinter, but running directly from

above downwards, in the part of the bone from which it was broken off. A piece of bone, from three to four inches long on the back part of the femur, and reaching to the anterior part of it, has been broken off, and without much change of position has united to the bone above, and had begun to unite to the bone below. Splinters of bone are found adhering even to the detached portion. In some places there seems to be no attempt at union. This, with former specimens, demonstrates that splinters in fractures are sometimes broken off, and again adhere even to other surfaces than those from which they were separated, and that splinters do not necessarily loose their vitality. In the College of Surgeons of London there is a portion of the femur broken off, and, turned round, adheres with the concave part outwards.

I. I. M. 32. The cast of the thigh of a man who suffered fracture of the femur. This is the thigh belonging to No. I. I. M. 28. This cast is valuable, as shewing the degree of distortion of the thigh-bone, consequent upon the fractured bone being united irregularly.

I. I. M. 32. a. REMARK.—These specimens of fractured thigh-bones, with the exception of I. I. M. 28, are examples of that displacement of the extremity of the bones, the occasional consequence of laying the limb straight, with a long splint on the outside of the leg and thigh. We see by these specimens, what is confirmed by hospital practice, that there is a disposition in the muscles of the thigh, to draw the upper fractured portion upwards. This must principally be the operation of the psoas magnus and iliacus internus. It is to counteract this, that many surgeons place their patients with the knee bent, and the thigh upon the inclined plane; this some-

times prevents the rising of the thigh-bone from the relaxation of the psoas and iliacus.

I. I. M. 32. b. Fracture of the thigh-bone, in which the upper portion overlaps the inferior. There is apparently some attempt at ossific union.

I. I. M. 33. Anchylosis of the tibia and fibula at their upper extremities.

I. I. M. 33. a. Fracture two inches below the trochanter minor. This proves another circumstance we have daily experience of,—that, when the bone is fractured very high up, it is apt to be pulled outwards by the action of the glutei. It is not always easy to counteract this; it requires that the thigh-bone be not only elevated, but that a firm splinter be laid on the outside of the thigh, and even this will not in every instance fulfil the indication.

I. I. 33. b. *Dried* preparation of fracture in the femur, below the trochanter minor. The superior portion of bone is drawn upwards and outwards, causing great deformity.

I. I. M. 33. b. *Preparation in spirits.* Fracture of the lower head of the femur. The fracture has extended into the joint. This is a case which was attended with great inflammation and pain in the joint. In this preparation we have an instance of bone degenerating into fungus hæmatodes after fracture.

I. I. M. 33. c. Fracture of the femur, near its centre, united; the broken portions have been thrust past each other, and are united with a clumsy callus. The superior portion is drawn upwards and outwards.

I. I. M. 33. d. The same effect has been produced in this thigh-bone, as has been noticed in the preceding instances.

The upper fractured portion has been elevated as the patient lay in his bed, above the level of the lower portion, and shortening of the limb has taken place,

I. I. M. 33. e. Another specimen of displacement near the trochanter minor, after fracture. A section has been made, to shew the cancelli of the new bone. In this preparation the upper portion is displaced outwards, but is little elevated.

I. I. M. 33. f.
I. I. M. 33. g. } Are similar specimens.

I. I. M. 33. h. A preparation illustrating *interstitial absorption* of the neck of the thigh-bone in its advanced stage, combined with *interstitial enlargement* of the shaft of the bone.

I. I. M. 33. i. Fracture of the femur below the trochanter minor; the superior fractured portion projects, and has been drawn outwardly by the action of the muscles. A section has been made to show the internal structure.

I. I. M. 33. k. Thigh-bone fractured near its lower third. The superior portion overlaps the inferior, causing much deposition.

I. I. M. 33. k. Specimen of oblique fracture of the femur. The cure in this case was proceeding precisely after the manner of necrosis. 1159.

I. I. M. 33. l. Fracture of the neck of the femur. 174.

I. I. M. 33. m. Fracture of the femur through the trochanter. 174, a.——End of the femur of the right leg, from a woman of 70, whose knee was bruised by the wheel of a cart, and who died six weeks after the accident. There is a comminuted fracture of the condyle, with a little displacement of the fractured parts. 476.

I. I. M. 33. n. Specimen of fracture of the neck of the femur.——Case. John Fraser, ætat. 40, met with the accident which occasioned this fracture, by a fall on the causeway from the top of a loaded cart. Accompanied by Dr Abercromby, I saw him afterwards; and from the crepitus, shortening of the limb, and the toes being turned outwards, we had no doubt of what had happened, and accordingly sent him into the Hospital, where, if my memory fails me not, he was treated by Mr Newbigging, as a case of fracture of the neck of the femur, by the double-inclined plane. Five years after the accident the man died of an affection of the lungs, when an opportunity of examining the limb presented itself. Previous to separating the head of the femur from the body, the shortening of the limb and turning out of the toes were as apparent as ever; and the patient, ever since the accident, had been under the necessity of wearing a high-heeled shoe, and having recourse to a staff. 722. (Signed) D. Clark.

I. I. M. 33. o. Specimen of supposed fracture of the neck of the femur, within the capsular ligament, reunited. 746.—Dr Begbie's Case, Edin. Journ. Med. Science.

I. I. M. 33. p. Specimen of fracture of the femur. The great solidity and weight of the bone shew that it must at one time or other have laboured under disease, probably interstitial inflammation. 762.

I. I. M. 35. q. Fracture of the tibia.—J. S. aged 44, admitted into the Infirmary 18th January 1828, with fracture of tibia, and died on the 27th, rather suddenly. On examining the fractured bone, the restorative process had previously commenced. The fractured surfaces were highly

vascular, covered with soft downy granulations, and evidently in the progress towards reunion. 1098.

I. I. M. 33. r. Fracture of the neck of the femur. A great quantity of new bone formed. 998.

SECTION III.

FRACTURES OF THE TIBIA AND FIBULA.

I. I. M. 34. Fracture of the tibia and fibula. In this case the bones have been pretty accurately united; still there is a slight rising of the anterior spine, and consequently a slight arching of the bone. It is remarkable that the fibula is broken so much higher.

I. I. M. 35. A fracture of the tibia and fibula. In this case the limb has been laid upon the heel, and the surgeon, forgetting how far the heel is prominent, has permitted the leg to sink, and the bones have united in that position.

I. I. M. 36. A fracture of the tibia and fibula, resembling the last. The fibula has united to the tibia; the broken extremities of both bones have sunk down. This has been obviously the consequence of supporting the heel, and letting the leg fall.

I. I. M. 37. A fracture of the tibia and fibula, resembling I. I. M. 34. The broken extremity of the tibia projects remarkably in this case. This was not the fault of the surgeon, since there are marks here of this having been a compound

fracture, and we know that in such cases, it is not always possible to keep the fractured extremity of bones accurately adopted.

I. I. M. 38. Another specimen of fractured tibia and fibula. The upper fractured portion of the tibia is adhering to the lower fractured portion of the fibula, and the portions are altogether so irregularly attached, that, for the honour of surgery, we must suppose it to have been a bad compound fracture.

I. I. M. 39. A fracture of the tibia and fibula very irregularly united.

I. I. M. 40. Fracture of the tibia and fibula. These fractured portions have been immersed in the abscess of the compound fracture, and present many of the appearances of superficial and interstitial inflammation of bone.

I. I. M. 41. Fracture of the tibia and fibula near the ankle-joint united.

I. I. M. 42. In this case of fracture the bones are not firmly united. The young man was seized with an erysipelas, which carried him off. This affords us an opportunity of observing the progress of re-union. A tough substance intervenes between the fractured portions of bone, into which bone is not yet secreted.

I. I. M. 43. Tibia and fibula have been fractured and long re-united. The patient had returned from America, the limb was injected, the bone cleaned and put into weak acid, then dried, and put into turpentine. It shews the new bone to be more vascular than the old.

I. I. M. 44. Fracture. Time was not afforded for re-union by bone; it is dried and put into turpentine.

I. I. M. 45. Portion of tibia about two months after fracture. A space is seen where a portion of dead bone lay. The patient had erysipelas, and died of tetanus.

I. I. M. 46. a. A fracture of the fibula re-united. This is a trifling specimen, yet it reminds us of POTT's fracture, with dislocation; the most frequent accident in a London hospital.

I. I. M. 46. b. A specimen of very oblique fracture of the tibia and fibula, a little above the ankle, now united, without much irregularity of surface.

I. I. M. 46. c. A fracture of the tibia and fibula extending into the ankle-joint. The joint, upon dissection, exhibited marks of former injury and disease, being stiff, and the ligaments deprived of their natural structure. The muscles on the back part of the leg were reduced almost to common cellular texture.

I. I. M. 46. d. Fractured tibia. The anterior spine projects considerably, and the foot has been twisted outwardly.

I. I. M. 46. e. Fractured tibia united; the anterior spine is prominent here also. The toe has been allowed to fall to the outer side.

I. I. M. 46. f. A tibia which has been fractured near the ankle-joint. These are the appearances which bone that has been surrounded with suppuration presents.

I. I. M. 46. g. A fractured tibia. There is a curve formed at the place of union, as if by the heel being too much elevated by cushions.

I. I. M. 46. h. A tibia which has been fractured, and subsequently has united obliquely.

I. I. M. 46. i. Section of a fractured tibia.

I. I. M. 46. j. Seven fractured fibulæ re-united by bone.

I. I. M. 46. k. Fracture of the fibula which has not united; it has been surrounded by an abscess.

I. I. M. 46. l. Compound fracture of the leg.

I. I. M. 46. m. Fracture of the leg three weeks after the accident. 1146.

I. I. M. 46. n. Fracture of the tibia, with partial necrosis. The injury was received on the 1st of February, and the limb was removed 1st October 1805. 1178.

I. I. M. 46. o. Soft reunion, in the case of a fracture near the head of the tibia and fibula, at the sixth week. The patient died of erysipelas. 175.

I. I. M. 46. p. Specimen of comminuted fracture of the tibia, at first simple; but the leg became gangrenous, and was amputated. At the end of the third week no bony union, but the thickening of the periosteum, and exudation of lymph from canal of the bone, which is shewn to be highly vascular by injection. 312.

SECTION IV.

FRACTURES OF THE ARM AND FORE-ARM.

I. I. M. 47. Fracture of the lower extremity of the humerus. This is a very troublesome accident, since a stiff joint is generally the consequence, unless the case be managed with particular care. It happens most frequently by the person

falling forward on their hand, when the condyle is broken off. It requires that the patient's joints should be moved about the third week, to prevent anchylosis, since even it is better that the portions should remain loose, than that a stiff joint should take place.

I. I. M. 48. Fracture of the humerus united, near its upper third.

I. I. M. 49. Ditto, ditto.

I. I. M. 50. Ditto, ditto.

I. I. M. 51. A reunited fracture of the humerus. A section is made, which shews the state of the cancelli.

I. I. M. 51. a. A section of a humerus which has been fractured, and subsequently reunited.

I. I. M. 52. Fracture of the radius. Here the extremities of the fractured part have overlapped, and they have also been depressed towards the ulna, for there is a mark upon the bone where the ulna had been attached to it. This is a very common consequence of the mismanagement of a fractured fore-arm; the hand being raised, the lower fractured extremity of the radius is pushed up; the bones unite, as they have done here; the hand is in an oblique and awkward position, and the pronation and supination is impeded.

I. I. M. 53. A fracture of the radius near the wrist. This is a very frequent accident, and is apt to be mistaken for a dislocation or sprain.

I. I. M. 54. Fracture of the ulna.

I. I. M. 54. a. Fracture of humerus not united. 173.

I. I. M. 54. b. Fracture of the neck of the humerus. This preparation was taken from the arm of John Locke, ætat. 64, who, besides the fracture of the neck of the hume-

rus, as shewn in the preparation, had sustained a compound fracture of the elbow-joint, on the same side, in consequence of falling over a parapet at Stockbridge, one evening in the month of September 1824. The arm was amputated at the shoulder-joint, a few hours after the accident, and the patient recovered, without a single bad symptom. 774.

I. I. M. 54. c. Fracture through the anatomical neck of the humerus, passing also obliquely downwards into the shaft of the bone. Although the parts appeared to have been in very accurate apposition, and to have had a supply of nutriment for the investing membranes, sufficient to preserve their own vitality. No steps towards a re-union of the fracture seems to have taken place, though the patient survived the accident exactly thirty-one days.

SECTION V.

FRACTURES OF THE PATELLA.

I. I. M. 55. Fracture of the patella united by a long ligament, in the middle of which are some small portions of bone. The fractured portions are about five inches separate from each other.

I. I. M. 56. Fracture of the patella very much resembling the last; only in the last the fractured portions are not so far separated.

I. I. M. 57. Fracture of the patella united by ligament.

I. I. M. 58. Fracture of the patella united by a very short ligament.

I. I. M. 59. Fracture of the patella, with the portions very close together, but notwithstanding there is no long union.

I. I. M. 60. A patella with exostosis upon its outer surface.

I. I. M. 61. Curious cut in the lower surface of the patella. History not known.

I. I. M. 62. Patella fractured by a blow, and united by bone.

Remarks.—These preparations mark a distinction in the fractures of the patella. The bone may be broken by a blow, and then the portions remain nearly in contact, and reunite. But the most common case of fracture is, when the patient stumbles, and attempts to recover himself, and then the extensor muscles of the leg breaks the patella over the convexity of the end of the femur. In such cases one of the ends of the broken bone remains attached to the ligament of the patella, the other is drawn up by the tendon of the muscles, and the reunion is by the formation of new ligamentous matter, which extends between the broken portions of the patella. An opinion prevails, that it is better when the patella is united by a ligament than by bone; but Mr Charles Bell believes this to be an error; however, the experiment, we must confess, is very seldom made, since it is a rare thing to find the patella united by bone. Indeed, he is confident that he has sent out patients from the Middlesex Hospital, in whom the fracture was united by bone. He can imagine no inconvenience to arise from the bony union, unless there be some ir-

regularity in the position of the fragments, when they may grate in the motion of the joint.

I. I. M. 63. The knee-joint in spirits. The patella has been fractured, and ligamentous substance had formed between the fractured portions. The muscles have adopted themselves to the lengthened tendon. The man could walk, but walking under a heavy burden he fell, and his leg bent under him, so that the new ligament was torn up, and the integuments which had united with it, and by consolidating, had lost their elasticity, were torn also, so that, as is seen here, the interior of the joint was disclosed. The inflammation was not very acute.

SECTION VI.

FRACTURES OF THE SKULL.

1. 2. M. 1. A specimen of fractured cranium. This man fell from a great height, and was brought insensible to the surgeon. He had a large tumour over the right parietal bone, formed by an effusion of blood, indicating that the injury was there. An incision was made through the integuments down upon the bone, and a fine fissure was observed. Here the trephine was planted within an inch from the lambdoidal suture, the fissure was followed forward, and the trephine a second time planted. The object of these operations was the evacuation of the coagulum of blood from

betwixt the skull and dura mater. It succeeded, as usual, very imperfectly. The patient continued to snort in a state of total insensibility, and died.

Remark. It will be seen in this specimen, as it will generally be found, that the injury having been received on the top of the head, by the falling of a heavy body (or, which is the same thing, by the person falling and striking that part upon the ground), the fissure will run into the temple; and it will be found, as in the dissection of this case, that the coagulum lodges under the temporal and lower part of the parietal bone.—See Hospital Reports, p. 143.

1. 2. M. 2. This boy was brought into the Hospital in a state of death-like insensibility, and his head misshapen. An effusion on the temple tempted Mr C. Bell to make an incision through the scalp, and there he found the bone shattered: he applied a small trephine, and afterwards sawed the cranium, and took away the pieces of broken bone, and washed out the coagulum from under them; but there followed no amelioration of symptoms. The boy died: and now it is seen that a fracture extended round the forehead to the base of the skull, and that the injury was too great to allow of the expectation that the boy would live.

1. 2. M. 3. This is a case of counter fissure, the injury being inflicted on the upper part of the cranium, and the fissure having extended round the base in the situation of the coronal suture.

1. 2. M. 4. Specimen of fracture of the cranium. The injury had been inflicted on the temple. The trephine was applied, and portions of the bone taken away. The inequalities of this cranium are very remarkable; and it will be observed,

that the trephine was applied on a part very unequal, and great difficulty was experienced in cutting through the whole bone, without injuring the dura mater. Sharp pieces of bone had been left after this operation, which should be removed as soon as possible, or the dura mater, rising against them through the pulsation of the brain, may become ulcerated.

1. 2. M. 5. A fractured cranium, in which the trephine was applied. A large coagulum was found between the skull and dura mater; it was broken down by the end of a tea-spoon, and the greater part taken away; but the injury had been too great, and he died of concussion.

1. 2. M. 6. A vertical section of a skull, from the Middlesex Hospital, exhibiting the course of a fissure through the temple, and another extending into the orbit. The wound of the scalp was over the right temple. One of the fissures runs into the orbital plate of the frontal bone, and here it becomes a fracture; for the fissure diverges, and there is an insulated portion. The other, being traced backwards, goes down upon the temporal bone, and through the mastoid process, and terminates about an inch from the foramen magnum. Where the blow was received, the fissure is very narrow; but on tracing it towards the base of the skull, it is a gaping rent.

1. 2. M. 7. Fracture of the skull, where the trephine had been applied. Circumstances are unknown.

1. 2. M. 8. This is not a specimen of what had taken place in the living body; it is only a demonstration for lecture. The small end of a hammer was struck upon the head of the subject, and on the skull-cap being raised, these appearances were exhibited. An indented round hole, on the

anterior surface, without fracture; but opposite to it, in the tabula vitrea, there is a large square portion splintered off. This, then, is to explain the danger of contusion of the skull with such a point as the small end of a hammer, or the end of a poker, or the blunt point of a pike.

1. 2. M. 9. This skull-cap is remarkable for the irregularity in its thickness; a small exostosis may be remarked on the inside of the os frontis.

1. 2. M. 10. A portion of a skull fractured. The history is not known. This belonged to Mr Wilson's collection. The trephine has been applied, but they have not found it practicable to raise the depressed portion, because the diameter of the fractured part internally is greater than that of the external opening. The reason of this is, as illustrated by N. 1. 2. M. 8., the tabula interna is invariably fractured to a greater extent than the tabula externa. Indeed the splinter here, in actual practice, has a very accurate resemblance to the class illustration. The cranium-saw ought to have been applied, and the fractured portion cut across, and then the elevator, introduced at the trephine hole, would have raised the depressed portion with safety from the membrane.

1. 2. M. 11. Fractured portions of a skull, removed at St George's Hospital. The patient died.

1. 2. M. 12. Fragments of a skull shattered by a pistol-shot. Some remarkable circumstances attended this case. Mr C. Bell was called to a gentleman who had discharged a pistol at his temple. On the second day after this rash act, he found him sitting up in bed, bolt upright, without support, talking a great deal. Somebody remarked that he was even more

rational than he had been for some weeks. His face and head were enormously swollen, and the colon almost black; his eyes were closed by the swelling of the eyelids, and he presented altogether one of the most appalling objects Mr B. had ever witnessed. Mr B. imagined that the ball had passed the outside of the skull, but on putting his finger into the wound, he felt the edge of the fractured bone; and if there had been any doubt, a quantity of brain on the wound proved that the ball had penetrated. He concluded that the ball must have passed across the anterior part of the cerebrum, and that it lay under the bone on the opposite side. Feeling a puffiness there, he made an incision, raised the bone, and discovered the ball flattened, and extracted it. He lived four days after this operation.—On dissection, it was found that the skull was fractured to a much greater extent than could have been believed before death, as these portions prove.

1. 2. M. 13. Portions cut out by a trephine, by the late Mr Wilson, from a boy fourteen years of age. The following is Mr Wilson's account of the case. "He had been thrown from a horse about two hours before I saw him; he was taken home insensible, and remained so until the operation. Finding the bone fractured, I immediately applied the trephine; and having scooped out the coagulated blood, and found that the bleeding came from the principal artery of the dura mater, nearer the basis of the skull than could be got at, without destroying life, I was obliged to apply the crown of the trephine seven times before I could remove all that pressed upon the brain. An hour after the operation the boy recovered, without experiencing a single bad symptom in the

cure. The operation was performed in 1792. In 1807, I saw him quite well, but the whole of the bone had not regenerated."

1. 2. M. 14. Portion cut out by the trephine, shewing the necessity of inclining the instrument during the operation, on account of the irregularity of the lower surface of the bone.

1. 2. M. 14. a. The boy from whom this skull-cap was taken, received a kick from a horse. Four fissures radiated from the point where the sagittal suture joins the coronal, and there was slight depression in one part. For eight days he had no bad symptoms, and the wound was dressed with a dossil of oiled lint. After that time he began to have sickness and vomiting, and severe headache. In four days more his breathing was stertorous, the left side of his body was paralysed, and he had convulsive twitchings of the right side; pus oozed through the fissures of the skull; the operation of trepanning was performed; the external layer of bone separated before the internal layer was sawed through; a quantity of pus was washed away from the dura mater; the symptoms were not improved, and the boy died next day.

Dissection. There was extensive ulceration of the dura mater over the longitudinal sinus, and on each side of it. Around the ulcer there were blotches of red inflamed parts, the dura mater was greatly thickened, and the ulcer had a shreddy appearance, which was covered with pus of a bright yellow colour. The veins which entered into the sinus were filled with dark coagulated blood, which could not be drawn out from the vessels. Anterior to the ulcer, the longitudinal sinus was choked with a firm and light-coloured

coagulum; posteriorly, a quantity of pus was squeezed out from the sinus. Under the ulcer of the dura mater, there was ulceration of the surface of the brain, in both the hemispheres; the pia mater was tinged with blood. There was inflammation of the substance of the brain in the neighbourhood of the ulcer, but the rest of the brain appeared healthy. There was no fluid in the ventricles.

1. 2. M. 14. b. The skull-cap of a boy, who received a kick from a horse. The bones were found depressed into the very substance of the brain, and were so lodged as to afford no hole for the elevator; the trephine was therefore used. The dura mater was found cut by the intruded bones, and a considerable portion of the substance of the brain lost. He lay insensible, and had convulsions. A part of the brain protruded. He died five days after the accident. The torn dura mater is preserved, and marked 1. 2. M. 26.

1. 2. M. 14. c. 7. The skull-cap of a boy, who lived three months after having his skull fractured by the kick of a horse. These two portions of the bone were removed by the bone-nippers. In about a month the wound cicatrised, the boy was quite well, and he was discharged from the Hospital. Five weeks after his dismissal, he was twice seized with fits, and was readmitted into the Hospital. The wound was now tumid and painful,—a small speck of bone was removed from it;—he lay on his bed listless, and without complaining, until a few days before his death;—he became blind—he remained sensible, and could recognize his dresser's voice;—by his mother's account, his appetite was good. He died in strong convulsions.

Dissection. The scalp and dura mater adhered firmly

together at the place of the cicatrix; the edges of the bone and dura mater were separate; a very extensive abscess was found to occupy almost the whole of the right hemisphere of the brain. The thinnest parts of the walls of this abscess were opposite to the wound, and at the base of the brain near the optic nerves. It was calculated that about eight ounces of pus were evacuated from the abscess. There was no dead bone found on dissection.

1. 2. M. 14. c. Exfoliation of the skull-cap. A portion of the parietal bone is in the first stage of exfoliation; the roughness around is what is called simple ulceration; the bone has been absorbed under the granulations. This man had his scalp torn off his skull; it was replaced; suppuration under the scalp followed, and he died finally of suppuration of the membranes of the brain.

1. 2. M. 14. d. This man lay with the surface of the cranium exposed, and the process of exfoliation going on; he was attacked with symptoms which were attributed for a time to the formation of matter under the skull, but which might be more correctly attributed to typhus fever, since, after death, no signs of affection of the brain could be discovered.

1. 2. M. 14. e. Fracture of the cranium. 1053.

1. 2. M. 14. f. Portion of skull in a case of fracture. 1155.

1. 2. M. 14. g. Do. where the trephine was applied. 1156.

1. 2. M. 14. h. Portion of the skull in a case of fracture, where the trephine was applied. The patient died in about three weeks after the accident. The bone is getting polished, and is undergoing the same change seen in the following preparation. 1165.

1. 2. M. 14. i. Two portions of skull in a case of fracture; one portion came away immediately after the accident, the other a considerable time afterwards. 1166.

1. 2. M. 14. k. Fracture of the skull. The trephine has been applied at the anterior edge of the coronal suture, on the left side. This preparation very much resembles 1. 2. M. 3. Robert Wood, æt. 20, the patient from whom this skull-cap was taken, fell from a height of thirty feet on his head. On being brought into the Infirmary, there was observed an incised wound in the scalp, an inch in length, and about three inches above the left eyebrow, and at the summit of the temporal bone. The bone was denuded, and a fracture, in a line with the external wound, could be felt; but there was no depression; he was perfectly sensible, and had no other bad symptom, except a peculiar expression of anxiety. On the 12th day he became feverish, and complained of headache. On the 14th, some vomiting, with rigors. The surgeon then made a crucial incision over the seat of the fracture; and having dissected back the flaps, found the bone slightly depressed. In the evening, his pulse felt quick and hard; he was drowsy, and averse to answer questions. At 10 o'clock on the morning of the 15th, the trepan was applied; and before the section of the bone was half completed, a little purulent matter was discharged. A small portion of detached bone was removed along with that contained in the crown of the trephine; the surface of the dura mater was found coated with coagulable lymph. He died at 4 o'clock on the following morning. On dissection, the fracture, or rather fissure, was found to have extended downwards to the base of the skull. 1010.

SECTION VII.

FUNGUS CEREBRI.

1. 2. M. 15. Fungus cerebri. This boy was swinging on the gate of a sunk area; the gate gave way, he fell, and one of the pikes entered the skull and dura mater. He was trepanned.—See JOHN BELL's Principles of Surgery, Case of Billy Cameron, page 800.

1. 2. M. 16. Laceration of the dura mater from fracture of the skull. Fungus cerebri protruded here.

1. 2. M. 17. Hole in the dura mater through which the fungus cerebri in 1. 2. M. 21. protruded.

1. 2. M. 18. Portion of the dura mater of a person who was trepanned; the mark of the circle of the bone may be seen.

1. 2. M. 19. Tumour of the dura mater, which shot up four days after a patient was trepanned for fracture of the inner table. He lived for a short time after.

REMARK.—This is the true fungus of the dura mater, which authors have too much confounded with fungus cerebri.

1. 2. M. 20. A scirrhous tumour adhering to the inner surface of the dura mater, near the falciform process. It was embedded in the brain, and hollowed out the inside of the cranium, to correspond with its form. Much water was found between the pia mater and brain, and the ventricles were fuller than common. The patient was a young woman,

who was successively affected with symptoms of pressure and inflammation of the brain, mania, dilated pupils, insensibility to light, and at length something like paralysis.

1. 2. M. 21. Fungus cerebri. The brain was protruded eight days after the accident; lived three weeks.

Remarks.—This during life presented such an excrescence, as I have modelled in 1. 2. M. 15, and here in death it is almost wasted away.

1. 2. M. 22. Fungus cerebri forming in consequence of ulceration of the dura mater. In this instance the destruction of the surrounding substance of the brain is well exposed. There was exfoliation of the cranium from venereal disease.—See 1–7. M. 18.

1. 2. M. 23. A very fine specimen of fungus cerebri, where we have the bone, the ruptured dura mater, and protruding brain, after the operation of trepanning.

1. 2. M. 24. Preparation of the fungus cerebri, which is described by Mr C. Bell, in his Operative Surgery, vol. i. page 405.

1. 2. M. 25. Laceration of the dura mater of the skull; this preparation is spoiled.

1. 2. M. 86. Laceration of the dura mater from fracture of the skull. The skull-cap is preserved.

Dissection.—Pus extended under the scalp; there was an irregular protrusion of the substance of the brain through the torn dura mater. It was considerably elevated above the surface of the dura mater, though it had sunk a great deal when compared with its condition during the life of the boy; it was of a dark colour, as if sloughy and perfectly soft to the touch. A layer of coagulable lymph was deposited on the

surface of the dura mater around the fungus, and its extent corresponded with the fracture of the skull. There was a great quantity of pus under the dura mater, and a layer of coagulated blood adhered to its inner surface near the fracture. The brain was of a highly inflamed colour, and the small vessels of the pia mater were gorged with blood. This appearance, however, did not extend beyond the neighbourhood of the fungus; there was a deep hollow of the brain, where it had lost some of its substance, and its surface was of a dark-brown colour, perfectly soft; but on slicing down the brain there were numerous dark spots, of different sizes, near the fungus, and the minute vessels were observed to course in that direction. The rest of the brain had the appearance of being healthy.

1. 2. M. 27. Model of a brain, exhibiting coagulable lymph on the surface consequent on concussion.

1. 2. M. 28. A drawing of a case of fungus cerebri.

SECTION VIII.

DISTORTIONS OF THE SPINE.

1. 3. M. 1. A sacrum, with the last lumbar vertebra united to it by the process of anchylosis.

1. 3. M. 2. A sacrum, having the lowest lumbar vertebra united to it by the bone. The sacrum is slightly curved, and the right side is deeper than the left.

1. 3. M. 3. Sacrum and last lumbar vertebra united; the

slight curve which is visible, and the obliquity of the plane of the upper surface of this bone, may have been the cause of considerable distortion of the whole column.

1. 3. M. 4. Sacrum and last lumbar vertebra anchylosed. There is a slight curve, the right side being deeper than the left, and, of course, the base of the spine presents obliquely.

1. 3. M. 5. A good instance of distortion of the spine, from interstitial absorption, although, in the individual vertebræ, the change of their shape is so slight, as scarcely to be observable. Such a change in the form of the column produces very marked distortion, by its affecting the position of the ribs and scapulæ.

1. 3. M. 6. Preparation illustrating interstitial absorption of the vertebræ in its advanced stage. There are three curves in this spine; there is also a slight curve in the cervical vertebra, as it were, to bring the head perpendicular to the pelvis. The upper lumbar and lower dorsal vertebræ are altered in their form, and also are partially anchylosed; a considerable quantity of exostosis is thrown out on their sides. This preparation shews the danger of attempting to cure a distortion in this condition by violent means.

1. 3. M. 7. Pelvis and part of the spine. It shews the curve, beginning at the lower part, and continuing gradually upwards. A splint of solid bone has formed on the inner side of the curve: it resembles the anchylosis so frequently found in aged horses.

1. 3. M. 8. Spine and part of the ribs of a person affected with rickets. The last lumbar vertebræ project into the pelvis, so as to diminish the capacity; the bones of the pel-

vis are much distorted ; the distortion of the spine is chiefly at its lower part; the ribs are misshapen in an irregular manner. It is introduced at this part, to form a contrast with the other preparations.

1. 3. M. 9. Shows anchylosis of the spine in an old person ; the intervertebral substance is wasted, and the vertebræ are united together by ossific matter. This affords an example of the curve, which is very common in old people, in consequence of an habitual stoop, inducing interstitial absorption of the anterior portion of the vertebræ.

1. 3. M. 10. This example of caries of the bodies of the vertebræ is introduced here, to be contrasted with the other preparations, which shew distortions of very different characters. These last six preparations are engraved in Mr Shaw's work on Distortions, and they are there accurately described and commented upon.

1. 3. M. 11. Section of a spine, and pelvis of a female, in which the spine is greatly distorted ; the pelvis is natural.

1. 3. M. 12. Corresponding section of the preceding preparation. It shews the canal of the spinal marrow perfect, as when there is no distortion. The intervertebral substance and ligaments of this spine were found perfectly healthy, adapted to the altered form of the vertebræ ; the internal structure of the bodies of the vertebræ is not different from that of the vertebra in their natural state. Some of the transverse articulating processes are however anchylosed.

1. 3. M. 13. Are examples of the distortion of the feet in an infant, and they are placed here to form an analogy between the causes of distortion of the foot and the curvature of the spine. One leg is left undissected, to shew the exter-

nal appearance of the deformity ; in the other the bones and ligaments are shewn, to prove that this deformity may be removed by art.

1. 3. M. 14. This preparation explains why the right shoulder is sometimes prominent, while the left side of the neck and left breast, are fuller than on that side, on account of the changed position of the ribs. The right scapula is greatly removed from the spine, thus producing a prominence of the right shoulder, while the superior ribs of the left side, arising from the great convexity of the curve, are the cause of the fulness of the breast and neck of that side.

1. 3. M. 15. This preparation exhibits the same circumstances as the preceding one.

1. 3. M. 16. This preparation is an example of rather an unusual form of distortion ; the lumbar vertebræ are scarcely affected, the deformity having fallen on the dorsal vertebræ, and consequently very much also on the ribs ; the right side of the chest must have been at the first more capacious than the left ; but now it is evident that the area of the right side is much diminished. The bodies of the vertebræ are twisted round towards the right side, the ribs of that side are consequently folded round them, and the middle of each rib is brought nearer to the spine ; the angles of the ribs, in this way form together a ridge, such as in the living body has been mistaken for the spine itself.

1. 3. M. 17. The distortion of the spine and ribs in this preparation is very remarkable ; the bodies of the last dorsal vertebræ are twisted round, so as to face completely backwards ; the ribs of the left side are flat, and lap round the bodies of the vertebræ ; those on the right side are huddled

together, and greatly attenuated. It is further remarkable that there are no marks of disease in any of the other bones of this skeleton. The man from whom this preparation was taken lived nearly to the age of fifty, and died of apoplexy. There is a beautiful engraving of this specimen in Mr SHAW's work on Distortion.

1. 3. M. 18. Is a cast taken from a man fifty-three years of age, who was at the time in good health. The form of the distortion is very similar to that of the last preparation.

1. 3. M. 19. This preparation illustrates well the effects which distortion of the spine produces on the form of the ribs. At the upper part on the left side the ribs bulge out, while lower down in the back the contrary is the case. High on the back, on the right side, the ribs are contracted, and close a little lower down they become rounded and full.

1. 3. M. 20. This illustrates the same kind of deformity as the preceding. The patient from whom it was taken died of consumption.

1. 3. M. 21. Here one great curve occupies the dorsal part of the spine; the left side of the chest is larger than the right; the ribs on that side (as they arise from the convex side of the curve), being expanded, while those on the other side converge and are confined.

1. 3. M. 22. Complete skeleton of a female, in which the marks of rickets are discernible, especially in the legs. This specimen is valuable, as it shews that although the spinal column be scarcely affected, the pelvis is distorted.

1. 3. M. 23. The skeleton of Christie Moore. She died in child-bed. She was the little woman, with rather a good face, and a great deal of impudence, who generally stood at

the Infirmary-gate, to talk to the students. She went with great velocity on her crutches. She had no motion in her legs separately, they being curiously twisted; this made it the more extraordinary that she ever suffered as she did in childbed. She was pregnant twice, and the first child was brought away at the eighth month entire, but flattened. In her second labour Mr C. Bell saw her; she had gone the full time: when he examined the head of the child he found it perforated, and one of the parietal bones brought away; after this the other parietal bone was brought away by the use of the crotchet. The hook was then put into the foramen magnum, and the base of the skull brought down obliquely, but could not be brought down with the utmost force. This was on the second day of her delivery; she was much exhausted, her voice, however, was hale and strong, and she would talk in her usual style of impudence. She sunk rather rapidly, and died undelivered. A model represents the appearance which presented on dissection. This model is in Dr Macintosh's possession. The distortion in this case has fallen principally on the pelvis and legs. The pelvis is not like that in the next preparation of a triangular form, but is a specimen of the flat kind. It measures between the sacrum and tubes two fingers' breadth only, or an inch and a-half, the transverse diameter four and a-quarter inches. The linea-pectinea forms a very sharp line, as sharp as a paper folder; this was the cause of death, for, in attempting to bring the head through the pelvis, the womb was forced against the ridge, and being pressed continually, gave way, so that part of the child escaped through the rent in the womb. As, in the following specimen, the humerus is shaped

by the action of the deltoid muscle, the muscles of the shoulder were very powerful, and she took great pride in the rapidity of her progress.

1. 3. M. 24. A very remarkable case of distortion by rickets. This woman died in childbed. The skeleton measures from the top of the head to the heel 31½ inches. The heel touches the knee; the measurement from the os sacrum to the pubis is 2⅛ inches; from the prominence of the os coccygis to the pubis, 3 inches; from the brim of the one ilium to that of the other 4¾ inches. The spine is distorted in the form of an S; the ribs, on the left side especially, are flattened and compressed together; the cranium has a natural appearance, and the teeth are not at all affected. The arm-bones are only distorted by the action of the muscles,—but these muscles were those which carried the weight of the body.

1. 3. M. 25. A skeleton of great value. In procuring this skeleton the surgeon lost himself for two hours, and found himself at two in the morning in the court before P———k House. This skeleton differs from the others, being distorted by the disease called Mollities Ossium. In this woman the disease continued for many years. It was attended with incessant pain in the bones, and a deposition of the phosphate of lime from the urine. But what was most remarkable in the case, was the many children she had, with increasing difficulties in the labours, until at length the bones of the pelvis were so closed, that it was necessary to perform the Cæsarean section upon her. She had a cross-birth, the belly of the child protruding. She had a child, with a dangerous flooding. She had a child brought away by embryulcio, and the crotchets. The

disease proceeded, and the distortion of the pelvis increased. She became pregnant again, and it was necessary to bring the child away piecemeal. In this operation the surgeon seems to have conducted himself with great good sense, dexterity and perseverance; his strength was exhausted by the exertion, so that for two days after the operation his hands and arms were benumbed. She suffered also in this painful operation, and was left for dead, and was long insensible, so that they were about to prepare her dead-clothes. She recovered, and became a seventh time pregnant. The surgeon that previously attended her, refused to attempt the extraction of the child by the crotchet. The disease, in the mean time, had made progress, and the pelvis was much more distorted. When the surgeon examined her, on the approach of labour, the womb hung forward, so that the integuments of the belly made a tumour like a great scrotal hernia betwixt the thighs. On examination per vaginam, the promontory of the sacrum presented itself in the middle of the passage, and only one finger could be passed through the pelvis, with which nothing could be felt. As for the child, it lay in a manner out of the pelvis. For a full account of the case and operation, see the fourth volume of the Medico-Chirurgical Transactions. The mother died; but the child lived, being the only one out of the seven that was born alive.

Dissection.—Two large masses of coagula lay in the bag. The cavity of the womb was filled with blood; strings of coagula reached from the mouths of the sinuses of the womb to these coagula, as if the streaming blood had been arrested, and coagulated while flowing. The uterus was not contracted, and the edge of the incision into it was everted,

as if paralytic, with the mouths of vessels open upon it. She died of hemorrhagy.

Description of the Skeleton.—The bones were all soft, covered with their periosteum, which was not easily separated, and, in endeavouring to separate it, the knife went into the bone. She had been in bed for the last two or three years, and, therefore, the spine, the thorax, and the pelvis, are the parts most distorted: the arms and legs are as long as those of a tall woman. From the occiput to the ridge of the ilium, is less than ten inches. The femur measures sixteen inches, yet, on each side, it is a little shortened, by the neck being at right angles to the rest of the bone, so as to make the lesser trochanter almost touch the ilium. The lower vertebræ of the neck, and upper of the back, protrude backwards almost at right angles; and the lower vertebræ of the back and loins make a great protrusion forwards. There is a remarkable indentation in the middle of the ribs on the right side, and those on the other side are very much compressed and irregular. This was evidently caused by the muscles of respiration on the softened ribs.

Measurement of the Pelvis.—That which at first sight appears as the projection of the sacrum, is the bodies of the three lower vertebræ of the loins fallen forward, so as to occupy the cavity of the pelvis. The sacrum has receded. From the promontory of the sacrum to that part of the brim of the pelvis opposite to the left acetabulum, is somewhat less than a quarter of an inch; from the right side of the promontory of the sacrum to the linea innominata is half an inch. The forefinger here can with difficulty be introduced between the bones; from the sacrum to the symphysis of the os pubis is

two and a half inches. There is one part, and only one part, of the brim which admits a ball of an inch in diameter to rest in it. The ball will nowhere pass through where it lies; it rests against these points, the fourth vertebra of the loins, and the bodies of the two ossa pubis. The sacrum has suffered severely by her continually resting on it; it is so bent that the base and angle of the bone approach within half an inch of each other. The outlet of the pelvis would also be considered remarkably distorted, were not the attention fixed upon the unique distortion of the brim.

I. 3. M. 26. Pelvis of a rickety person. It is much distorted, and is particularly interesting as connected with the operations of midwifery. It is part of the preparation marked I. 3. M. 8.

I. 3. M. 27. The cast of a female pelvis distorted by rickets.

I. 3. M. 28. The entire skeleton of a female much distorted by rickets. It forms a good medium in regard to the degree of deformity between the skeleton marked I. 3. M. 22. and that marked I. 3. M. 24. The distortion of the pelvis makes it also interesting, when compared with the other specimens. The lower extremity of the left side is shortened; all its bones have been wasted, and diminished in their growth, compared with the other side. The right limb measures 26 inches, whereas the left leg is only 24 inches; the difference is perceptible in each of the bones of the limb, and even of the pelvis.

I. 3. M. 29. Is an extraordinary sternum, together with

its cartilages, taken from a person distorted by rickets, in breadth three inches.

1. 3. M. 30. Six bones distorted by rickets, all from the same skeleton; the fibulæ are curved in an extraordinary degree, so that they approach to the form of clasps.

1. 3. M. 31. The bones of the right upper distorted by rickets; the scapulæ are bent inwards, as if by the action of the muscles; the roughness for the insertion of the deltoid muscle is peculiarly prominent.

1. 3. M. 32. The corresponding bones of the last preparation similarly distorted.

1. 3. M. 33. The bones of the right lower extremity distorted by rickets; the thigh-bones and bones of the leg have the convexity of their curves projecting anteriorly.

1. 3. M. 34. The left lower extremity similarly distorted; the bones of the lower extremity have suffered more than those of the upper extremities, and thus accounted for, because they sustain the weight of the body, and are subject also to the action of the muscles.

1. 3. M. 35. A specimen of the thigh-bone bent by rickets.

1. 3. M. 36. The bones of the leg affected by rickets.

1. 3. M. 37. A specimen of the distortion produced by rickets.

I. 3. M. 38. A skull-cap remarkably thick in some parts, and irregular in the depth of its substance, owing to rickets. The outward superficies no longer corresponds with the inner surface, nor with the surface of the brain. Such irregularities are important to the surgeon, and teach him to use the trephine with unwearied caution.

1. 3. M. 39. A portion of the skull remarkably thickened, and likewise very thin in some places.

1. 3. M. 40. A portion of skull similar to last.

1. 3. M. 41. A portion of the os frontis of an extraordinary thickness.

1. 3. M. 42. The skull-cap of an old person; the whole of it is very thin, but there is a depression over the longitudinal sinus, which makes the bone at that part as thin as paper.

1. 3. M. 43. A specimen of a skull-cap, as remarkably thin as some of the others are thick.

1. 3. M. 44. A remarkably thin skull-cap.

1. 3. M. 45. A great enlargement of the sternum of a ricketty person; it measures in breadth three inches; while that of a very strong man, six feet two inches in height, measures one and a half inch.

1. 3. M. 46. The thigh-bones, bones of the leg, and feet, of a young dwarf affected with mollities ossium; they are very small, and were quite soft.

1. 3. M. 47. A portion of the femur of a patient who had mollities ossium, and whose case is described in a paper by Mr Thompson, in the fifth volume of the Medical Observations and Inquiries. Some other portions are preserved in the College of Surgeons in London.

1. 3. M. 48. Section of a frontal bone, which is greatly increased in its thickness, probably from venereal inflammation.

SECTION IX.

DISEASES OF THE VERTEBRÆ.

1. 3. M 49. This is a specimen of the diseased state of the vertebræ, which precedes the destruction of their bodies, and the consequent yielding to the superincumbent weight. There was, in this case, paralysis of the limbs, probably in consequence of inflammation of the bone attacking the spinal marrow. As there is here no compression of the spinal marrow, to account for the paralysis on mechanical principles, we must suppose it is the influence of the contiguous inflammation,—and not the curvature of the spine, and pressure of the spinal marrow, which produced paralysis.

1. 3. M. 50. This specimen exhibits a further stage of the disease of the bodies of the vertebræ than the preceding preparation. The woman from whom this was taken died from lumbar abscess. The intervertebral cartilages were softened, and the ligaments loose and spongy, as if macerated by the pus which was around the diseased part. The bodies of the vertebræ have partly been consumed, and one vertebra is seen to be sinking down, and, as it were, dovetailing itself into the one below. Some of the ribs of the left side were diseased in a similar way. Partial anchylosis has taken place.

1. 3. M. 51. A specimen of the vertebræ of the back carious. The scrofulous disease, which is apt to fall on these spongy bones of the spine, has here made great ravages.

Some of the vertebræ are united together by bone. A small part of the third vertebra remains;—the sixth and seventh are much destroyed; the ninth and tenth, also, and the heads of the ribs, have partaken of the disease, some of them being carious, others united together. A great abscess covered these bones, and the patient died of hectic, as it appeared.

1. 3. M. 52. The vertebræ spongy and carious, preserved in spirits. The cancelli of the bodies of the vertebræ are exposed, the bones being included in an abscess which formed lumbar abscess. The body of one vertebra, with the intervertebral substance on its upper and lower surfaces, have been absorbed. A part of the walls of the abscess which surrounded the bones has been preserved.

1. 3. M. 53. The last dorsal vertebra is entirely absorbed, and the eleventh of the back rested on the first of the loins; the destruction of the bodies of the vertebræ has been very extensive; they are partially anchylosed, and the articulating processes are united by bone, except between the eleventh dorsal and first lumbar. The effect of raising the spine too far, by JONES's instrument, or any other, will be understood,—a gap is left, which does not admit of union or consolidation. The consequence of letting the spine lose suddenly this support, and the fallling down of the superior vertebra, may be an irretrievable injury to the spinal marrow.

1. 3. M. 54. In this specimen, not only the body of the bone, but also the intervertebral substances, have suffered, so there is a deficiency of a considerable part of the spinal column. The spinal marrow even is exposed, and forms part

of the boundary of the abscess which surrounded this part of the spine. A curdy scrofulous kind of matter, contained in a thick cyst, occupied this part of the spine, where the bodies of the vertebræ are deficient.—For a similar case, in which instantaneous death occurred, *vide* the Surgical Observations.

1. 3. M. 55. Is a model of a carious spine, and of lumbar abscess, which is not an unusual attendant upon disease of the vertebræ.

1. 3. M. 56. The destruction of the bodies of the vertebræ has been so great, that it seems, now when anchylosis has taken place, that six vertebræ have been united to form one body of a vertebra.

1. 3. M. 57. A specimen which is used in illustration of the degrees of curvature produced by the destruction of the bodies of the vertebræ by caries.

1. 3. M. 58. A portion of the spine, in which there is caries of the bodies of the vertebræ, and anchylosis, especially between the spinous and transverse processes.

1. 3. M. 59. There has been a partial destruction of one of these vertebræ, and a mass of bony matter unites them together.

1. 3. M. 60. In this specimen, the ribs are preserved, to shew the change produced in their position by the destruction and anchylosis of the vertebræ.

1. 3. M. 61. The spinous process is separated from the transverse process, so as to divide the ring which forms the canal of the spine. The surfaces are rounded and smooth, shewing that they were united by ligament, and permitted a certain motion.

1. 3. M. 62. & I. 3. M. 63. Are sections shewing how perfectly the canal for the spinal marrow may retain its form, although the bodies of the vertebræ have been destroyed, and anchylosis has taken place.

1. 3. M. 64. & I. 3. M. 65. These are perpendicular sections of a spine, in which there has been caries of the lumbar vertebra. As the skeleton is entire, they form good examples of the peculiar curve produced, when the disease has attacked the lower part of the column.

1. 3. M. 66. & I. 3. M. 67. Are similar sections of a skeleton, in which the disease has been situate in the upper dorsal vertebræ. The curve forms a good contrast with the last.

1. 3. M. 68. A very fine example of the curve which is the consequence of caries, in the spine of a young person. The disease has been stopped, and a partial anchylosis has taken place. The aorta accommodated itself to the curve of the spine. The œsophagus reached directly from the neck to the diaphragm, so that it was not more than three inches in length; while the aorta measures between the same points nearly nine inches.

1. 3. M. 69. & 3. 3. M. 70. Are two casts taken from the body from which the above skeleton was taken.

1. 3. M. 71. Cast taken from a boy, eighteen years of age, who had anchylosis of the spine, after caries of the vertebræ. The pelvis and scapula are within an inch of each other.

1. 3. M. 72. Destruction of the bodies of several vertebræ, by the pressure of a large aneurism.

1. 3. M. 73. The sections of several vertebræ which are anchylosed. Anchylosis seems, to a certain degree, to be a

natural consequence of old age; but it is occasionally found in young persons, and is probably the sequel of a slight chronic inflammation of the spine.

1. 3. M. 74. Fine example of anchylosis in the spine of a horse.

1. 3. M. 75. The bones of the trunk of a lad who died consumptive. The spinous process of one of the dorsal vertebræ is twisted unnaturally to one side.

1. 3. M. 76. It is well known that the monkey tribe are liable to scrofula; but this is more remarkable, as exhibiting a scrofulous affection of the bones, rickets, and disease of the spine, in so powerful an animal as the lioness. It expresses in a very distinct manner the influence of confinement and unnatural food in the production of these diseases. This animal was procured from the Tower of London, where it was born and confined.

SECTION X.

FRACTURES AND INJURIES OF THE SPINE.

1. 4. M. 1. Fracture of the atlas and tooth-like process of the dentata. The arch of the atlas is partially fractured on each side, and a portion of its body, where the process of the dentata rolls upon it, is also fractured and detached. The odontoid process of the dentata is broken through, just at its base; it is separated completely, and was found embraced by

the transverse ligament, in its natural situation upon the atlas. The man from whom this was taken had fallen fifty feet, and came to the ground upon both his shoulders: by the accounts of the man who carried him to the Hospital, he appears to have been instantaneously killed. There was besides, extensive fracture and injury to the dorsal part of the spine, which is marked 1. 4. M. 15. See the Exposition of the Nervous System, by CHARLES BELL, page 233.

1. 4. M. 2. Luxation of the atlas. The odontoid process of the dentata has started from its place, in consequence of the diseased softening and rupture of the transverse ligament. It was taken from a patient in the Lock Hospital, who had venereal sore throat, and the ulceration extended to the spine. The atlas falling forwards, carried the spinal marrow against the tooth-like process, and crushed it; he died in an instant.—See the Hospital Reports, page 149–469; and the Exposition of the Nervous System, page 234.

1. 4. M. 3. The cervical vertebræ of James Saunders, whose case is given in the Exposition of the Nervous System, page 231. He fell and struck his neck against an iron railing; he lived half an hour after the accident; his breathing was attended with an effort to raise his shoulders, so that his head appeared to sink beneath them, and on contraction of the muscles of the throat, the motion of the viscera could be perceived. His voice was weak, and he spoke in a tremulous tone; his breathing was more like sighing than common respiration, and his face indicated great anxiety and alarm; he had no feeling, even in the upper part of the chest; he had a motion of his hands,—a sort of rolling motion, which may have proceeded from the shoulders. It is seen that the

transverse processes of the fifth and sixth cervical vertebræ are fractured, and there is diastasis of the articulations between the vertebræ; the body of the sixth vertebra is fractured; the spinous processes of the fourth and fifth vertebræ are fractured at the bases.

1. 4. M. 4. Part of the spine of Charles Osborne, whose case is given in the Exposition of the Nervous System, page 225. He was precipitated through a window into the area, a height of thirteen feet; his lower extremities were motionless and insensible; he could raise his shoulders, and rotate the humerus, and thus give a certain motion to the fore-arms, but over his hands he had no power. The skin of the arms was sensible to the point of a pin, the abdominal muscles were completely paralysed, and the integuments of the abdomen and chest, as far as the nipple, were insensible; his urine was drawn off by the catheter, his fæces passed involuntarily, and he had priapism. His breathing was frequent, and at each inspiration the chest was heaved with a quick and short movement; at each expiration the abdomen was protruded with a sudden shock and undulation. He can yawn naturally, but he coughs weakly, and with difficulty. In his attempt to cough he expands the chest, and then lets it fall, and it is only by the weight of the parts, together with the elasticity of the ribs, that he expels the breath. He cannot divide the expiration into two coughs, but each time that he coughs the elevating of his chest must precede it; neither could he blow his nose, and he was conscious of his wanting the power of expelling the air. During inspiration, as when he prepared to speak, the action of the serratus magnus muscle could be felt, and also the lower margin

of the trapezius. He died on the night of the seventh day from the accident. It may be seen from the preparation that the arches of the fifth and sixth cervical vertebræ are broken.

1. 4. M. 5. A sort of subluxation, but it is accompanied with fracture of one of the bodies of the cervical vertebræ.

1. 4. M. 6. Part of the spine of Marshall, whose case is given in the Surgical Observations and Reports, page 145. He was riding on the shaft of his cart, when, by a sudden jerk, he was thrown off, and pitched on the back of his neck and shoulders. There was a swelling and discoloration between his shoulders; although he could not stand, yet he could draw his legs after him, when he was supported to his bed. For nearly a week he lay complaining of nothing, and had no symptoms of paralysis. He could throw his legs and arms about, and retain his fæces and urine, and expel them naturally. On the eighth day he was suddenly seized with convulsions over the whole body; after having been bled, he remained sensible, although his jaw was locked; his convulsions returned, and he was relieved by bleeding. In a few hours his jaw began to move with great rapidity, and continued to move in an extraordinary manner, for nearly five minutes, when all at once he exclaimed he could speak. He was maniacal; he proved he was not at all paralytical, for it required two men to hold him, and he almost sprung out of bed, to be revenged of the nurse. He passed a great deal of fæces and flatus with singular force; in twelve hours he became again rational. On the third day after the attack of convulsions, he complained of difficulty of using his arm, and two days after he had total palsy of the lower extremities,

which was more remarkable, as at this time he regained the use of his arm. He lived for a week after this, but continued sinking, and still retained much of the character of typhus fever. The day before his death he was perfectly sensible, and had recovered sensation in his legs, for he could feel the rubbing of a finger upon them. At this time, although he appeared to pass the fæces involuntarily, still he passed them with great force, and he was able to reject an enema, which was given contrary to his desire.

Dissection.—The brain was examined carefully, and nothing was remarked, except a little effusion between the pia mater and tunica arachnoidea. On cutting the muscles by the side of the last cervical vertebra, a little pus oozed out; it was found to come from between the vertebra. On dissecting up the muscles, there was found to be an evident loosening of the last cervical from the first dorsal vertebræ. The intervertebral substance was completely destroyed, and an immense quantity of pus surrounded them. On the back part, the pus had extended under the scapula, and on the fore part was bounded by the œsophagus. On examining the spinal canal, the pus was found to have dropped down the whole length of the sheath to the cauda equina.

Remark.—Authors, considering the strength of the intervertebral substance, have said, that the dislocation of the bodies of the vertebræ from each other was impossible. It is true, that commonly the vertebra gives way before the ligaments yield; but here is an instance of diastasis, or subluxation of the bodies of two of the vertebræ. From Hippocrates, down to the multitude of French authors who have touched on this subject, dislocation has been considered in no

other light formidable, than as producing pressure on the spinal marrow; but this case serves well to shew that luxation will prove fatal, even although the spinal marrow be not bruised. It is the progress of inflammation to the spinal marrow, and not the pressure or extension of it, which makes those cases of subluxation and breach of continuity in the tube fatal.

1. 4. M. 7. The man from whom this was taken, came to his death by falling headlong from a barge lying a-ground in the Thames. His head stuck in the mud, so that the whole weight of the trunk and limbs was thrown on the neck, and an obliquity in the motion of the force probably twisted the vertebræ. A hiatus is seen between the first dorsal and last cervical vertebra. This man died instantly.

1. 4. M. 8. The man from whom this was taken fell from the second story of a neighbour's house; he was deprived of sensibility and motion in all the lower parts of the body, and the bladder and intestines were insensible to their natural stimuli. After six days his breathing became affected, and the pain and difficulty continued to increase. He died on the 12th day.

On *dissection*, much coagulable blood lay over the sixth and seventh dorsal vertebræ, and the spinous processes of these vertebræ were broken. The tube of the spine was forced in on the spinal marrow, and a sharp portion of bone belonging to the body of a vertebra had pierced, and lay pressing on the spinal marrow. A rib was fractured on the left side, the broken extremities of which pressed against the pleura. This side of the chest shewed marks of inflammation.

1. 4. M. 9. Part of the spine of a child, who had been

knocked down by a Hampstead stage-coach, about eleven months before its death. It is an unique specimen. A separation has taken place between the lowest dorsal and uppermost lumbar vertebra. The dislocation of the bones and processes is complete. It may be objected to this statement, that a portion of the lumbar vertebra has been broken off. A strong ligament now united the displaced bones in their new relation. The circumstance of the greatest interest is, that the spinal marrow has been torn asunder; it has been divided and separated. The child was paralytic in its lower extremities; the bladder had risen to the umbilicus, and the urine came away involuntarily. Eleven months after the accident he was seized with croup, and died very suddenly.—This case is referred to in page 75. of Mr Shaw's work on Distortions; and in Mr Bell's Lectures on Injuries of the Spine and Thigh-Bones.

1. 4. M. 10. Is a fracture of the spine. The broken portions are united by bone; the body of the first lumbar vertebra suffered, and a portion has been broken off, and driven in upon the tube, so as to crush the spinal marrow. The accident was occasioned by a bank of earth falling on the man's shoulders. Notwithstanding the compression of the spinal marrow, the patient survived the immediate injury.—See the Lectures on Injury of the Spine.

1. 4. M. 11. A section of the spine fractured, exhibiting the spinal marrow crushed by the splinters of bone. Here, as in all other preparations of fractured spine, the body of the vertebra is fractured; this is important in reference to the proposed operation of trephining the spine. The surgeon

would have found the spinal marrow betwixt him and the displaced bone, if he had operated in this case.

1. 4. M. 12. Part of the spine of Auton, whose case is mentioned in Mr C. Bell's Surgical Reports and Observations, page 138. He fell from a height of thirty feet, and his back struck against the corner of a stone stair. There was no defect of motion or feeling in his lower extremities, on his admission into the Hospital. On the third day he became delirious, yet without symptoms of paralysis. On the fourth day his pulse was 136; he was in a state of extraordinary excitement, and threw himself out of bed; he had priapism; it was necessary to tie him down in bed. The eleventh dorsal vertebra is fractured in its body, the spinous process is crushed; the articulating processes on the left side of the spine are crushed. On the opposite side, a portion of the cortex, or shell of the body of the last dorsal vertebra, has been torn, and adheres to the intervertebral substance; pus of a thick consistence, and of a greenish colour, lay betwixt the sheath and the spinal marrow. There was an effusion of serum between the membranes of the brain.

1. 4. M. 13. A pistol ball, received in a smuggling rencontre, has passed through the body of one of the dorsal vertebræ, and lies in the canal, pressing on the sheath of the spinal marrow. It is catalogued with the gunshot wounds.

1. 4. M. 14. Is a specimen of the formidable fracture of the vertebræ which takes place in old men. This happens in consequence of a preternatural splint of bone joining the vertebræ together, and destroying their elasticity, so that if a weight falls on the shoulders, the spine, instead of bending, breaks down like one of the long bones.

1. 4. M. 15. On dissecting the muscles and exposing the spine, the injury was found to be very extensive. The spinous processes of the seventh cervical, and also those of the first six dorsal vertebræ, were fractured, some of them being retained by their connection with the ligamentum nuchæ. At the fourth dorsal vertebra, the spine and its marrow was torn quite across. Near this part the articulating and transverse processes were broken into small pieces, their corresponding ribs were also fractured, where they articulate with the vertebræ. The ligamentum longum anticum was stript from the bodies of the fifth, sixth, and seventh dorsal vertebræ, and it was this ligament which connected the upper broken portion of the spine to the lower.

SECTION XI.

INFLAMMATION OF BONE.

1. 5. M. 1. Inflamed humerus, radius, and ulna, injected. The patient was supposed to have syphilis, though that was disputed.

1. 5. M. 2. Ulcer of the tibia injected. A small piece of dead bone may be seen, which is detached from the surrounding bone. The ulcer has a great resemblance to an ulcer of the soft parts.

1. 5. M. 3. Diseased tibia injected. The boundaries of a large abscess are seen.

1. 5. M. 4. Effects of inflammation in the tibia and fibula; they are anchylosed by new bone shooting irregularly between them. The tibia is ulcerated in one part; the appearance of the part above the ulcer is like that of a syphilitic node.

1. 5. M. 5. Section of the lower half of a femur, which has an exostosis surrounding it.

1. 5. M. 6. Disease of the tibia producing swelling of the bone, and ulceration on its surface.

1. 5. M. 7. Osseous granulations, arising from the surface of a diseased tibia.

1. 5. M. 8. Portions of the tibia, fibula, and ulna, diseased.

1. 5. M. 9. Inflammation producing caries of the fibula.

1. 5. M. 10. Scrofulous caries of the sternum of a Negro; the hole communicated with a vomica of the lungs.

1. 5. M. 11. A sternum, the texture of which is much destroyed by a scrofulous caries.

1. 5. M. 12. A sternum, which has been inflamed. The difference of weight in these two last specimens is remarkable; the former is light and spongy, the latter solid and heavy. Scrofulous degeneration of the sternum is not unfrequent: this is probably owing to its being a spongy bone, and in an exposed situation.

1. 5. M. 12. a. Destruction of great part of the temporal bone from suppuration in the mastoid cells. This is a disease which was formerly supposed to commence in the lateral sinuses, but which is by modern pathologists attributed to disease of the ear.

1. 5. M. 13. Diseased clavicle, an abscess formed in centre.

1. 5. M. 14. An abscess has occupied the lower end of the radius. Three foramina communicate from different sides of the bone. This specimen is very valuable, and should be carefully examined by the student of pathology.

1. 5. M. 15. Venereal node on the surface of the tibia: the bone is very heavy.

1. 5. M. 16. Specimens of inflammation of the phalanges of the fingers. One of these bones appears to have been fractured, and re-united. There is also a specimen of dislocation of the thumb, which has not been reduced. A false socket has formed at the dorsum of the metacarpal bone of the thumb.

1. 5. M. 17. A large and deep ulcer in the inner surface of the tibia. Granulations of new bone project from its edges.

1. 5. M. 18. In this there is still greater destruction of the tibia; from ulceration the bone is very nearly divided in two.

1. 5. M. 19. A specimen of caries affecting the head of the tibia.

1. 5. M. 19. a. Caries of the tibia, with exfoliation. 1052. Tibia carious.

1. 5. M. 19. b. Portion of tibia in an old carious ulcer. 1153.

1. 5. M. 19. c. Five portions of caries of the skull. 1169.

1. 5. M. 19. d. Six of the dorsal vertebræ of a youth, in three of which the bodies of the vertebræ are entirely destroyed by a scrofulous affection. 1180.

1. 5. M. 19. e. Six of the lumbar vertebræ in the adult, in the bodies of which a scrofulous affection seems to have made a considerable progress. 1181.

1. 5. M. 19. f. Five of the cervical vertebræ in the adult subject affected with caries. The atlas seems to have escaped the effects of the disease, but the dentata has suffered most severely. Nature would seem to have been very active, however, in her endeavours to save the life of the individual by strengthening the part. It will be observed, that the whole bodies are anchylosed. 1182.

1. 5. M. 19. g. Large irregular carious hole in cranium, from cancer in the dura mater. 323.

1. 5. M. 19. h. Caries of the palate bone and alveolar processes of the maxillary, in a young subject. 329.

1. 5. M. 19. i. & 1. 5. M. 19. k. Extensive caries of the femur, patella, and tibia, in a case of white swelling. 374.

1. 5. M. 19. l. Caries of left parietal bone, with great loss of substance. 368.

1. 5. M. 19. m. Caries of parietal bone through both tables, with great thickening of the surrounding bone. 369.

1. 5. M. 19. n. Caries of the lower extremity of the femur. 375.

1. 5. M. 19. o. Bones of the middle-finger carious. In this case the inflammation was very extensive, involving the whole hand. The cure was very perfect and beautiful, it requiring careful examination of the hand to discover that a finger had been lost. 862.

1. 5. M. 19. p. Caries of the metacarpal bones of the thumb, approaching in some of its characters to spina ventosa. 937.—Tarsal and metatarsal bones of the foot carious; the limb was amputated below the knee. 940.

1. 5. M. 19. q. *Carious tibia.*—Donald M——, æt. 36, a labourer. On the anterior part of the middle third of the

left leg, there is a very extensive ulcer, of the size of a hand's breadth, which has destroyed not only the integuments, but also a part of the tibia, which is exposed and rough, to the extent of an inch. The surface of the ulcer is very uneven. The granulations and discharges have a very unhealthy appearance; the secretion of pus is in large quantity. He complains of much pain, referable principally to the bone; surrounding inflammation considerable; general health very good. Reports that the disease commenced twenty years ago, after the receipt of a contusion; five years subsequently it healed, and remained so for ten years, when it again made its appearance. It has gradually increased since. Mr ALLAN scraped the surface of the bone, which he found to be very much diseased. The leg was amputated, and the patient recovered. 913.

1. 5. M. 19. r. Portion of a skull. The boy received a blow on the os frontis, which rendered it carious. The crown of a trephine was applied, to evacuate the matter. The boy was scrofulous.

SECTION XII.

NECROSIS.

1. 5. M. 20. A preparation exhibiting in the bone of a fowl the formation of necrosis. A bristle was introduced into the cavity of the bone; inflammation of the bone was the

consequence; the bone formed around it new bone; and, finally, itself died. A section has been made. The new case of bone is seen to be vascular; while the original bone is white and dead, and is becoming detached from the new bone around it.

1. 5. M. 21. A section shewing new bone forming in laminæ around the fibula.

1. 5. M. 22. A beautiful example of the process of exfoliation, or separation of the fibula from its lower head, which is dead.

1. 5. M. 23. Necrosis in the early stage, before the old bone is quite dead.

1. 5. M. 24. A fine example of the process of exfoliation in the tibia of a boy.

1. 5. M. 25. Inflammation of the fibula. An imperfect process of necrosis is seen commencing at the lower part.

1. 5. M. 26. A thigh-bone greatly enlarged in its bulk from the lower trochanter nearly as far as its lower head. This may be considered as an example of interstitial enlargement and deposition.

1. 5. M. 27. A beautiful example of necrosis in the tibia, injected. Bristles mark the boundaries of the remaining old bone; the newly formed bone is beautifully vascular. A hole is seen in the new case of bone, which is an opening characteristic of the disease for the escape of pus sometimes, and, finally, of the dead bone.

1. 5. M. 28. A section of necrosis in the tibia, in which there is also a large portion of its anterior part exfoliating. The disease was produced by the patient receiving a kick on the shins.

1. 5. M. 29. Bone of a stump, which is illustrative of inflammation extending upwards, after amputation. The bone is carious in one part; at another, the process of exfoliation is going on, and new bone has been thrown out on its surface.

1. 5. M. 30. Necrosis in the femur occurring after amputation.

1. 5. M. 31. Very beautiful example of necrosis in the femur, following amputation. The disease stops before it reaches the head of the bone.

1. 5. M. 32. Necrosis of the tibia, after amputation of the leg. It shews well the extent to which the death of the old bone extends.

1. 5. M. 33. Necrosis of the femur. A large portion of sequestrum still remains, which seems to have caused great irritation to the new bone, there being a deep cavity and large foramina opening on its sides. An attempt has been made, by touching the new bone with the actual cautery, to form an opening for the exit of the sequestrum; the portion of bone, however, which was touched, has not completely exfoliated.

1. 5. M. 34. There has been, in this instance, ulceration and disease of the bone; the whole thickness of the bone has not undergone the (operation) process of necrosis. An imperfect case of new bone encloses the sequestra, or portion of bone which was about to exfoliate.

1. 5. M. 35. Several examples of sequestra, which have been brought away from patients who had necrosis; they are rough and scabrous.

1. 5. M. 36. Two sequestra. Of the larger one, one part appears to have been separated by exfoliation, without new

bone forming over it; while over its other end, new bone seems to have grown. It resembles 1. 5. M. 42. The lesser piece of bone has simply exfoliated.

1. 5. M. 37. Fine specimen of necrosis. The new bone is seen, and the sequestrum within it is partially wasted.

1. 5. M. 38. Necrosis of the tibia, and a loose sequestrum.

1. 5. M. 39. Very fine example of necrosis. The new bone is more destroyed than it usually is; a portion of sequestrum projects through one of the foramina.

1. 5. M. 40. A section of necrosis of the femur, shewing the sequestrum which is reduced to a very small size.

1. 5. M. 41. A very fine specimen of necrosis in the thigh-bone. The peculiarity here is, that the disease began in the knee-joint, and was communicated to the thigh-bone.—See the Lectures on the Injuries of the Spine and Thigh-Bone, and a drawing of this specimen, by C. Bell.

1. 5. M. 42. A diseased tibia, presenting an imperfect specimen of necrosis.

1. 5. M. 42. a. Necrosis of the tibia, John Kerr. 1056.

1. 5. M. 23. b. Necrosis. Accident happened 18th April, amputated 12th May 1793. 1057.

1. 5. M. 23. c. Necrosed tibia,—Janet Macglashan. 1059. Necrosed tibia,—the sequestrum removed eighteen years previously. 1142. Necrosed tibia,—subject fourteen years of age; the sequestrum removed when the individual was eight years old.

1. 5. M. 23. d. A case of necrosis of the whole thickness of the bone, mistaken for an exfoliation of the external lamella; removed, and the case did well. 1162.

1. 5. M. 23. e. Necrosis of the tibia in an old man; the restoration imperfect. 1173.

1. 5. M. 23. f. Cast of a necrosed tibia in a progress of cure.

1. 5. M. 23. g. Do.—See Treatise on Necrosis, by JAMES RUSSELL, Esq. Plate V. Fig. 1. 1177.

1. 5. M. 23. h. Necrosis of the tibia, in which the cure has been completed, without the complete destruction of the original bone, which will be observed lying loose in the form of a sequestrum within the newly formed case.—See Professor RUSSELL's Treatise on Necrosis, Plate I. 1184.

1. 5. M. 33. i. Necrosis of the tibia. In this case the injury was a compound fracture.—See Professor RUSSELL's Treatise on Necrosis, Plate VI. 1184.

1. 5. M. 23. j. Exfoliated portion of bone, apparently from the extremity of the fibula. 202.

1. 5. M. 23. k. Necrosis of a portion of the upper extremity of tibia, in all probability preceded by ulceration. 376.

1. 5. M. 23. l. Necrosis of the lower jaw,—Andrew S. aged 62, a wright. The left cheek, especially of whole of the left side of lower jaw, presents a rounded equable swelling, which, on examination, consists of the swollen glands, and of the integuments, as well as of the body of the jaw, which is much enlarged. There is a considerable purulent fetid discharge, from an opening below the socket of first molar tooth, where the probe can be introduced for an inch among carious bone. All the molar teeth, and their alveoli, are carious, and there is an ulcerated state of the gums in general. The affection commenced eleven weeks back similarly to

toothache; became much swelled, burst, and discharged matter for three weeks into the mouth, as above described. Has occasionally very severe pains in the ——; his health has suffered much; bowels have been very loose; pulse rather quick; tongue foul; has poulticed the part frequently.

16.—Health much improved; teeth clean; bowels still rather loose; external tumour much less, but a large mass of the bone is moveable, along with the alveoli of all the molar teeth.

25.—A piece of the lower jaw, of 2 inches in length, and 1½ in breadth, including the canal for the artery and nerve, was extracted yesterday with great ease, and little pain. The cavity left was stuffed with dry lint; there is yet considerable swelling of the cheek; health pretty good.

27.—Another large plate of bone extracted yesterday; granulations look healthy; in other respects he is quite well.

991.

1. 5. M. 23. m. A necrosed femur and tibia; in the inside of the tibia there is seen the sequestrum.—20th November 1825. J. B. a labourer. Upon the anterior part of his left leg there are numerous small ulcerations, all of which lead down to the tibia, which can be felt to be in a state of caries. The limb, particularly at its lower part, is swollen, and altered in form; from the sinuses there is a great discharge of pus, of a very fetid odour. He experiences a constant dull pain; his general health is very much impaired, and his strength much reduced; pulse 100. Frequent shivering and flushing of the countenance; incessant thirst; bowels loose. Three years ago the disease commenced without any cause, and with a very severe pain; inflammation, swelling, and suppuration

ensued. A year after this a piece of bone was discharged; the sinuses have gradually increased in number, from which a great quantity of small bones have been discharged. His general health began to suffer about three months ago. The limb was amputated on the 27th. The patient died on the 11th December. 1000.

SECTION XIII.

DISEASED BONES.

1. 5. M. 43. The stump of a tibia and fibula after amputation.

1. 5. M. 44. Section of the stump after amputation of the thigh-bone, shewing the newly formed bone upon the end of it.

1. 5. M. 45. The stump of a radius long after amputation.

1. 5. M. 48. Section of the bone of the stump. A small portion of bone on its face is seen in the process of exfoliation.

1. 5. M. 47. Granulations of bone on the end of the femur, after amputation, or rather exostotic deposit.

1. 5. M. 48. The young man from whom this specimen was obtained, suffered a secondary amputation of the thigh for an irritable stump. The first amputation was performed when he was fourteen years of age. The contrast between the linea aspera, into which muscles that were in use were

inserted, and the smallness of the cylinder of the bone is remarkable.

1. 5. M. 49. Inflamed femur and tibia, probably from syphilis; they are very light: from church-yard.

1. 5. M. 50. A rickety femur, having exostosis on its posterior part.

1. 5. M. 51. A thigh-bone bent by rickets, and disfigured by venereal nodes.

1. 5. M. 52. & 1. 5. M. 53. Femur and tibia of the right side increased in their bulk and their weight, by venereal inflammation. A bone, after having been inflamed, will often acquire a great increase of weight from the deposition of phosphate of lime; but if the person have died during the inflammation of the bone, it is very light and spongy *.

1. 5. M. 54. & 1. 5. M. 55. Femur and tibia of the left side of the same body, from the dissecting room.

1. 5. M. 56. Femur having a venereal node extending downwards on its inner surface.

1. 5. M. 57. An inflamed femur, probably from venereal disease.

1. 5. M. 58. A section of a femur, exhibiting the nodes distinct from the old bone, from a venereal patient.

1. 5. M. 59. Section of a femur with a large node. The node has a cancellated structure within, and a firm cortex externally.

1. 5. M. 60. Another section shewing the internal structure of an inflamed femur.

1. 5. M. 61. A section of a femur, having an enlargement of its cylinder, probably produced by syphilis.

* A most just and valuable remark of Mr C. Bell's.

1. 5. M. 62. Section of a femur, with a large node on its surface.

1. 5. M. 63. A portion of a diseased femur, obtained from a church-yard.

1. 5. M. 64. Skeleton of a baboon. The specimen is curious, as exhibiting a scrofulous disease in this animal. They are very subject to scrofulous diseases of the glands.

1. 5. M. 65. Inflammation and ulceration of the tibia.

1. 5. M. 66. Caries of the surface of the tibia.

1. 5. M. 67. Diseased tibia and fibula.

1. 5. M. 68. A very common appearance of the tibia in syphilitic patients.

1. 5. M. 69. A large node on back of tibia, probably venereal.

1. 5. M. 70. Venereal inflammation producing node on tibia.

1. 5. M. 71. General thickening of tibia, from venereal flammation.

1. 5. M. 72. Node on tibia, from venereal inflammation.

1. 5. M. 73. Venereal inflammation of tibia and fibula.

1. 5. M. 74. Thickening of tibia from venereal inflammation.

1. 5. M. 75. Disease of tibia, probably venereal.

1. 5. M. 76. Part of tibia, with node from venereal inflammation.

1. 5. M. 77. Section of a diseased tibia.

1. 5. M. 78. & 1. 5. M. 79. Two sections of a tibia affected with venereal inflammation.

1. 5. M. 80. The lower part of a tibia; history not known.

1. 5. M. 81. Section of a diseased tibia.

1. 5. M. 82. Inflammation of the lower part of the fibula.

1. 5. M. 83. The lower part of the fibula carious from venereal inflammation.

1. 5. M. 84. Fibula carious at one part, probably from venereal disease.

1. 5. M. 85. Fibula affected probably with venereal inflammation.

1. 5. M. 86. Inflammation of the fibula.

1. 5. M. 87. Part of a fibula; history not known.

1. 5. M. 88. Caries of the surface of a humerus, probably venereal.

1. 5. M. 89. Diseased humerus,—probably venereal inflammation.

1. 5. M. 90. Humerus from the same body as the preceding preparation, of which a section has been made to shew the internal structure of the diseased part.

1. 5. M. 91. Inflamed humerus.

1. 5. M. 92. Diseased ulna, probably from venereal inflammation.

1. 5. M. 93. Diseased radius and ulna.

1. 5. M. 94. Diseased radius, probably venereal.

1. 5. M. 95. Ulna, diseased from venereal inflammation.

1. 5. M. 96. Portion of an ulna; its history unknown.

SECTION XIV.

TUMOURS OF BONES.

1. 6. M. 1. A specimen of osteo-sarcomatous tumours of the head of the tibia in a young person.

1. 6. M. 2. A model representing the above tumour in its fresh state. One side shows the appearance of the tumour, when the skin is dissected off; the other shews the appearance of the bone when newly macerated.

1. 6. M. 3. Cast of a disease of the humerus.

1. 6. M. 4. A specimen of the disease called Spina Ventosa. The greater part of the tibia is quite destroyed, and changed into a membranous bag. The fibula is curiously expanded, to form part of the boundary of this sac. The bones of the foot are remarkably soft and transparent, resembling the mollities ossium.

1. 6. M. 5. Another specimen of Spina Ventosa in the femur. The walls of this large cavity in the bone are formed of bony substance; two foramina communicated from behind.

1. 6. M. 6. The lower part of the tibia and fibula adhering together. A large abscess has formed in the substance of the tibia; the bone has enlarged nearly equally all around, and several holes are seen, which communicated with an abscess in the soft parts. The bone surrounding the cavity has become very thin.

1. 6. M. 7. A fine specimen of Spina Ventosa in the centre of the fibula. These tumours contain, during life, a sanious

ichorous fluid; the bone which surrounds them being the boundary of an ill-conditioned abscess.

1. 6. M. 8. The lower part of the tibia very much increased in bulk, from inflammation. A section has been made, which shews that the cortex of the bone has been expanded, and thin. A small cavity appears in the corresponding part of each section, which probably contained purulent matter.

1. 6. M. 9. Section of a tumour of bone surrounding the lower head of the femur, in a young person. The cancellated structure is in some places converted into solid bone.

1. 6. M. 10. A beautiful specimen of tumour of bone occupying the upper part of the fibula, in a young person. Its structure resembles very much that of the last specimen.

1. 6. M. 11. Bony tumour on a rib. It is difficult to ascertain whether it be scrofulous, or of the nature of soft cancer.

1. 6. M. 12. *Cancer of Bone.* Section of the sternum of a person whose breast had been extirpated. The body was brought into the dissecting room: it appeared, from the cicatrix on her breast not being healed, that the breast had been extirpated, but without success, as the disease had returned. The glands, both of the axilla and neck, were diseased. The sternum is much thickened in its substance, and was found softer than natural. A whitish substance, resembling cartilage, was found on both its sides, before and behind. This substance not only enters into, but, in some places, extends through the sternum. It formed processes which pushed outwards between the cartilages of the ribs, and were intercepted by membranous septa.

1. 6. M. 13. The larger section of the same sternum. A large portion of the tumour is seen extending behind the ensiform cartilage.

1. 6. M. 14. Section of a sternum and cancerous tumour. This was taken from a woman who died of cancer of the breast. The lungs were also affected.

1. 6. M. 15. A large and curious exostosis on the sixth rib.

1. 6. M. 16. Scapula and clavicle, with exostosis on them.

1. 6. M. 17. A humerus, with exostosis on its upper part,

1. 6. M. 18. A radius and ulna, from a Dutch dwarf. A large tumour, of which a section has been made, occupies the lower part of the ulna; the radius is united to the tumour, and is itself curiously twisted by rickets.

1. 6. M. 19. A humerus, with a large exostosis projecting backwards.

1. 6. M. 20. Several exostoses on different parts of the femur. The neck of the bone is strangely disfigured by disease.

1. 6. M. 21. Lower part of the femur, belonging to the same skeleton, with exostosis on it.

1. 6. M. 22. Tibia and fibula affected with exostosis; the fibula is united at both extremities to the tibia.

1. 6. M. 23. Tibia and fibula, taken from the same body as the three preceding specimens; they are distorted, besides being clumsily united together at their ends.

1. 6. M. 24. Disease of a tibia and fibula producing an irregular growth of bone from them. The tumour projecting from the anterior spine of the tibia *produce*, resembles a syphilitic node.

1. 6. M. 25. A section of the amputated limb of James Lewsly, whose case is given in the Surgical Reports and Observations, by CHARLES BELL, page 396. The tumour arises from the centre of the head of the tibia, and is seen to consist of a soft medullary substance. The limb was injected from the femoral artery; the coloured size burst out from the surface of the fungous tumour.

1. 6. M. 26. Dissection of the tumour of the leg described as acute fungus hæmatodes, or soft cancer. The case is detailed at page 394 of the Surgical Reports and Observations of C. BELL.

1. 6. M. 27. Cast of the leg from which the above preparation was taken.

1. 6. M. 28. Sections of the upper part of the femur, which was left after amputation of the thigh of Phineas, whose case is detailed in the Surgical Observations, p. 376. The peculiar matter, semitransparent and cartilaginous, is seen to reach to the head of the bone.

1. 6. M. 29. Shewing the same peculiar matter in the femur of Phineas, shooting downwards from the fracture to the lower head of the bone. See the preparation of the fractured part, marked 1. 1. M. 33.

1. 6. M. 30. Tumour projecting from the end of the bone after amputation of the thigh, in the case of Robert Lane, who died of soft cancer. See the case in the Surgical Reports and Observations.

1. 6. M. 31. Tumour of soft cancer from the wrist. The bone forms the base of the tumours.

1. 6. M. 32. Large cartilaginous tumours of the thumb

and fore finger. The patient, when a boy, had his hand crushed. The tumours rose gradually.

1. 6. M. 33. Cartilaginous degeneration of the bones of the thumb, taken off at St George's Hospital.

1. 6. M. 34. Section of a large fungous tumour, which was removed from under the jaw.

1. 6. M. 35. Section of a tumour of soft cancer from the thigh, an example of one of the conditions of the disease called Fungus Hæmatodes.

1. 6. M. 36. This preparation exhibits an example of the disease called Epulis, and shows the formidable extent to which it may grow. The disease in this woman commenced four years before her death, in a small tumour about the size of half a hazel-nut, over the first molar tooth of the upper jaw. See case of Susannah Tod, in the Surgical Hospital Reports, p. 422, and a drawing at the end.

1. 6. M. 37. The same disease is seen approaching on the bones of the cranium, and destroying them by its contact.

1. 6. M. 38. A section of the head of a patient who died in Middlesex Hospital. When he first presented himself, he had a large fungous tumour, which projected from the left side of his face, occupying the left side of his mouth, destroying the left side of his nose and his left eye. After some time, this tumour burst and ulcerated, and afterwards bled, exhibiting all the symptoms of Fungous Hæmatodes. The tumour is seen to extend backwards into the throat and posterior nostrils.

1. 6. M. 39. A cast exhibiting the effects of that disease called *Noli me tangeri*, or that kind of it which is called Lupus, in which the face is gnawed or eaten away. The man

from whom this was taken was long a patient in the Hospital; when he swallowed, the action of the muscles of the fauces could be observed.

1, 6. M. 40. This preparation shews the ethnoid, and part of the sphenoid, bone destroyed, in consequence of a tumour, of the nature of polypus, pressing up from the nose on the brain.

1. 6. M. 41. A tumour was found fixed upon this part of the cranium. The spiculæ of bone shoot inwards, as well as outwards: from the dissecting-room.

1. 6. M. 42. A cast of a chronic fungous tumour of the back.

1. 6. M. 43. Mr B., aged 57, healthy and active, formerly of habits unmarked by any peculiarity. About eight years since, travelling by night on the outside of a stage-coach, had his legs and feet extremely benumbed with cold. In a few days they were affected with severe pain; the left leg soon grew permanently better, the right leg never did; the pain was seated in the shin-bone, varying according to the season and state of the weather. About two years since, the anterior angle of the tibia was become serrated. In a few months afterwards a swelling of the periosteum appeared on the middle of the bone; this was reduced by a blister and issue. In February 1827, the lower two-thirds of the bone were become enlarged. Numerous processes from the anterior and posterior angles distended the neighbouring muscles; much thickening of the soft parts round the lower end of the bone, and œdema of the foot. At the end of three months, during which the treatment consisted of repeated applications of leeches and blisters, mercurial alteratives, sarsaparilla, and

regulated diet. There was a considerable diminution of the pain and of the swelling of the soft parts, but little or no reduction of the size of the bone. Amputation was now advised; but Mr B. was induced to place himself in the hands of a quack, who applied stimulating plasters to the leg, with a view, he said, of bringing on suppuration, and salivated Mr B. with mercury. At the end of three months this person was dismissed, and the former medical attendant again requested to see the patient. A great change had taken place,—emaciation, pale complexion, bad appetite, constipation of the bowels; a quick, weak, and irregular pulse; the leg greatly increased in bulk and deformity, hard all over, and exquisitely painful. Its surface irregular, in consequence of several large tubercles, round, firm, and elastic, somewhat yielding to pressure; the colour of the leg livid and dark purple; the tubercles of a dusky yellow, some of them superficially excoriated; the tibia, up to its tubercle, swelled; the knee and thigh apparently round, but the inguinal glands enlarged, indurated, though not painful. In a consultation with Professor Russell and Dr Thomson, amputation was again judged proper; this was performed above the knee on the 4th of September last, 1827. The leg was injected with minute size injection, and a vertical section made. The tibia, nearly in its whole length, appeared enlarged, and degenerated into a texture more like the carcinomatous than any other. The tibia, at its middle, seemed a little bent, as if it had yielded to the weight of the body; all the soft parts, with slight exceptions, had the same morbid appearance as the tibia.—(See Drawings, See also Cast 1036.) The stump healed in good time, the swelling of the inguinal glands en-

tirely subsided, and the patient, with occasional slight attacks of indisposition, recovered his former health and vigour. A slight irregularity of the pulse remains, which, previous to the removal of the limb, was conjectured to depend on a slackened state of the cardiac valves, and was considered no objection to the operation. 1035–1036.

SECTION XV.

VENEREAL SKULLS.

1. 7. M. 1. Venereal inflammation of the os frontis, injected.

1. 7. M. 2. Caries of the skull from venereal disease. The peculiar worm-eaten appearance is well seen. It is known why the trephine was applied.

1. 7. M. 3. Inflammation and caries of the cranium, probably from venereal disease.

1. 7. M. 4. Exfoliation had taken place. The roughness of the inside of the bone shews that the dura mater had also been affected.

1. 7. M. 5. Extensive exfoliation taking place, probably from venereal inflammation.

1. 7. M. 6. A skull-cap, the surface of which is rough from venereal inflammation, the disease must have terminated.

1. 7. M. 7. A skull-cap, having marks of being inflamed from the venereal disease.

1. 7. M. 8. A skull-cap bearing marks of being affected

with venereal inflammation on its external surface. The inner surface of this cranium exhibits the marks of high vascularity and disease of the dura mater.

1. 7. M. 9. Venereal caries in the skull-cap, chiefly in its back part, in the actual state of progress.

1. 7. M. 10. A skull-cap rough and worm-eaten on its external and internal surface, from venereal disease.

1. 7. M. 11. A skull-cap affected with venereal disease. There are three diseased parts, shewing different stages of the disease, and the largest forms a good specimen of the progress of exfoliation. The bone is particularly heavy.

1. 7. M. 12. A skull-cap carious from venereal disease. On the right side there is a deep excavation of the bone.

1. 7. M. 13. A skull-cap which has been at one time affected with the venereal disease. It exhibits the recovery of the bone after inflammation.

1. 7. M. 14. I can give no account of this skull-cap.

1. 7. M. 15. A skull cap from a syphilitic patient. The caries is very extensive, and a large portion of the whole thickness of the frontal bone is very nearly detached by the process of exfoliation.

1. 7. M. 16. A portion of skull, having a large ulcerated hole in it, about three inches in diameter, just over the right eye, through which the fungus cerebri projected.

1. 7. M. 17. Caries of the skull. About two years before I saw this man, he fell, and struck his head against a log of wood; some time after this he was grievously attacked with pains in his forehead, and about the shoulders and clavicles; corona veneris formed upon his forehead, and the integuments ulcerating disclosed a dead and black portion of the

bone. This portion, after some months, came away; the caries extended, and a second portion was in progress of being thrown off; the dura mater burst, and fungus cerebri forming, the man sunk into low delirium, with convulsions of the face, and expired. It is remarkable in this specimen, that the general surface of the bone is not marked by the inflammation, as in the following specimen, nor the bones of the nose spoiled. Much, therefore, is to be attributed to the blow. The dura mater, with the fungus cerebri protruding, are preserved, and marked among the specimens of fungus cerebri, 1. 2. M. 22.

1. 2. M. 18. A skull with venereal caries. A section has been made; the ethmoid spongy bones, and the nasal bones, the ossa lachrymalia, the vomer, the nasal plates of the superior maxillary bones, and the palatine bones, all but the cribriform plate of the ethmoid bone, were entirely destroyed. During life the patient exhibited a horrid spectacle. I could see into the throat, so as to observe the motion of the velum palati, whilst he was speaking. Some time after the disease was stopped in its progress, the cranium became affected; it did not strictly exfoliate, but the whole substance came away, the pulsation of the brain forcing the dura mater against the edge of the bone, it was destroyed by inflammation, and fungus cerebri followed, when the man died. The appearance of the cranial bone is worthy of observation; the vermicular-like line, and the spongy spots characteristic of venereal inflammation, are well marked.

1. 7. M. 19. Great destruction of the bones of the face from venereal disease. It is even more extensive than the last specimen; but here it appears that the disease has stop-

ped, and the patient has lived some time after the active state of the disease was stopped.

1. 7. M. 20. A skull with venereal caries. On the os frontis the disease has here also terminated.

1. 7. M. 21. A skull very generally marked with venereal caries.

1. 7. M. 23. A skull affected in many detached places with venereal caries; the disease in active progress.

1. 7. M. 24. A skull marked with venereal caries. Part of the bones of the nose have been destroyed; the palatine plate of the superior maxillary bone has also been partially destroyed.

1. 7. M. 25. Skull of a Negro, very generally affected with venereal caries. The peculiarities of the form of the Negro's skull are well marked.

1. 7. M. 26. Portions of the os frontis, with an indentation of its internal surface, and a small perforation over the situation of the longitudinal sinus, probably from the venereal disease.

1. 7. M. 27. A small portion of the cranium, with an irregularity of its inner surface. The history is not known.

DIVISION II.

DISEASES OF THE JOINTS.

II. M. 1. Bones of the pelvis diseased, an exostosis upon the os pubis. The posterior synchondroses have suffered much, the joint of the right side is destroyed, the bones are carious.

II. M. 2. A model intended to shew the obliquity of the pelvis, and consequent shortening of the limb from hip disease.

II. M. 3. Os innominatum and femur from the same patient as the above cast was taken, the edges of the acetabulum are wasted, and there is a hole in the acetabulum. Abscess must have formed within the pelvis in this case.

II. M. 4. Caries of the upper part of the femur, its head and trochanters are separated from the diaphris. The history not known.

II. M. 5. Os innominatum and thigh-bone diseased (the hip disease), scrofulous action attacking this joint; the head of the thigh-bone has been wasted away, and the acetabulum has at the same time been destroyed that the neck of the

thigh-bone was in the pelvis. The patient was exhausted by irritation and suppuration.

II. M. 6. A preparation very similar to the last; the disease has committed even greater ravages.

II. M. 7. Part of the os innominatum and femur carious, from a patient who died of the hip-disease, from Mr Brodie. The capsular ligament was much relaxed, and coagulable lymph was thrown out in the cellular membrane round it; the ligamentum teres was entirely destroyed; the cartilaginous surfaces of the bones were much eroded; the acetabulum was nearly filled up with coagulable lymph; the head of the thigh-bone was dislodged from this cavity, and situated on the upper and posterior part of it.

II. M. 8. Os innominatum and part of the femur, shewing the effects of the hip disease; the limb was fixed by an imperfect anchylosis, at an angle with the body; the inflamed bone having moulded itself in this position.

II. M. 9. Shews the effects of scrofulous disease of the hip-joint; it is remarkable for the polish which the head of the bone has taken, and for the depressed and shortened cervix of the thigh-bone.

II. M. 10. A hip-joint, which was affected with scrofulous disease, and has recovered; the acetabulum now locks in the head of the bone, and the body of the femur touching the ischium. A ligamentous union has taken place. The result in this case is very different from that in many of the other cases. In them the motion being permitted, the inflammation and distress continued until the patient died exhausted; but in this case the bones coming in contact, the motion was checked, and the attrition which keeps up the in-

flammation was prevented, and the patient recovered. He did not die under the influence of the disease.

II. M. 11. A section of an anchylosed hip-joint. The disease took place eight years before the patient's death. The anchylosis has taken place with the femur bent at right angles to the body, yet this man could walk, by twisting back his pelvis in a peculiar manner.

II. M. 12. The corresponding section of the above specimen in spirits. We may say that anchylosis has taken place, although there is still a cartilaginous crust between the bones; and the same remark is applicable here, as in the former case, with regard to the stoppage of the motion of the joint stopping the disease.

II. M. 13. A new joint formed at the hip. The body was brought into the dissecting-room; and as there was no appearance of disease of the hip-joint, this is probably the result of an unreduced dislocation of the thigh-bone. The head of the bone is wasted by its motion on the dorsum of the ilium.

II. M. 14. An inflamed knee-joint injected. The patient had many chalk stones in different parts of his body.

II. M. 15. Specimen of disease of synovial membrane, from a patient of Mr Brodie's. This is the state of the joint in which I pass the seton.

II. M. 16. Diseased knee-joint, injected. There is great destruction of the cartilages; the abscesses and sinuses, external to the joint, are seen to communicate with the cavity of the joint itself.

II. M. 17. The lower extremity of the femur, having the arteries filled with coarse injection. The person had suffer-

ed amputation of the leg some months before death; his knee was bent; the articular cartilages are crowded near the edges of each condyle.

II. M. 18. A diseased knee-joint, becoming anchylosed. The bones are very soft, and are much diseased. The bones are uniting in a bent state of the joint; the patella already adheres to the articulating surface of the external condyle of the femur. The interarticular cartilages are changed in structure, and form the adhesion between the femur and tibia. The fracture in the tibia was most probably made after death. The whole preparation shews how the bones waste when not put to use.

II. M. 19. A specimen of loose cartilage in the knee-joint. One of these bodies cartilaginous on the outside, but bony in the inside, is fastened before the anterior crucial ligament. Clusters of them are adhering around the patella. Around the articulating surface of the patella there is a ridge of projecting soft bony substance.

II. M. 20. The right patella, with the ligaments of the knee-joint, exhibiting an extraordinary change in the structure of the apparatus of the joint; both knee-joints were in the same condition. The body was brought into the dissecting-room, and the limbs were plump and muscular, as if the patient had not been lame. There was a little purulent matter in the joints. This is a disease not described, although it would correspond well with the term Fungus articuli.

II. M. 21. The left knee-joint, from the same body as the preceding preparation. A similar appearance of the ligamentous structure of the joint is seen.

II. M. 22. A part of the lower end of the femur; there was an abscess under the patella.

II. M. 23. A ganglion on the fore part of the knee-joint in process of cure.

II. M. 24. A patella, with projections like villi, or the pile of velvet, on its cartilaginous surface. It seems to illustrate the description which Dr HUNTER gave of the structure of articular cartilages, that the packets of fibres projected outwards from the bone, in the manner of the pile of velvet, and that this disposition bestowed elasticity, and prevented the bad effects of friction.

II. M. 25. A very common appearance found in the joints of old people.

II. M. 26. Anchylosis of the bones of the knee-joint after dislocation, from scrofulous affection of the joint. The patella is fixed to the lower part of the external condyle. The tibia has been dragged behind the condyles, so that the anterior part of its articular surface is adhering to the posterior part of the condyles of the femur, and the anterior spine of the tibia is twisted towards the outside. The leg, however, deformed as the knee is, is still nearly straight, and the foot has been turned out.

II. M. 27. Dislocation of the patella upon the side of the external condyle of the femur. The accident occurred many years before the patient's death.

II. M. 28. Anchylosis of the bones of the knee-joint consequent on disease. In this specimen the external condyle is united on its posterior part of the external articulating surface of the tibia. This kind of distortion is owing to the patient twisting his leg round the crutch.

II. M. 29. The femur anchylosed in a straight position to the tibia, after disease of the knee-joint.

II. M. 30. Disease of the upper head of the tibia. The bone is very light.

II. M. 31. Diseased end of the femur. The knee-joint was removed, on account of scrofulous disease of the joint. The external condyle is completely destroyed by the disease.

II. M. 32. Diseased bones of the knee-joint macerated, to shew the condition of the bones.

II. M. 33. & II. M. 44. Two specimens of anchylosis of the upper ends of the fibula to the tibia, from the same person.

II. M. 35. Injection of a diseased ankle-joint from a Negro boy.

II. M. 36. A number of cartilaginous substances found in a ganglion over the tendon of the extensor digitorum.

II. M. 37. Ulceration of the lower end of the tibia.

II. M. 38. The lower end of the tibia diseased. The patient fell from a great height, and lighted on the ground, so as to injure the ankle-joint. The leg was amputated some time after the accident, for what was supposed to be a scrofulous affection of the ankle-joint. The bone has the appearance of a fracture, that has communicated with the joint.

II. M. 39. Caries of the lower ends of the tibia and fibula. Scrofulous ankle-joint; the leg was amputated.

II. M. 40. Diseased ankle-joint. The bones, though anchylosed, are in a state of scrofulous degeneration.

II. M. 41. Lower ends of the tibia and fibula, from a patient who had a scrofulous affection of the ankle-joint.

II. M. 42. The lower end of the tibia diseased.

II. M. 43. Diseased os calcis. There is a growth of new bone, which marks the grooves for the tendons of the flexor longus digitorum pedis.

II. M. 44. Both arms of this man had been dislocated. On the left side, the scapula had also been fractured through its body; the posterior portion has been dragged forwards by the action of the serratus magnus muscle, and the two portions have united irregularly. The newly formed joint of the shoulder is exposed.

II. M. 45. The right scapula and humerus, from the same body as the preceding preparation, articulated as they were found in the body; there was dislocation inwards, with fracture of the inner edge of the glenoid cavity. Imperfect anchylosis had taken place between the posterior part of the body of the humerus and that portion of the glenoid cavity which was fractured, and was again united. The surfaces of the head of the humerus and of the glenoid cavity are both rough and unnatural, having, for a long period before the patient's death, been deprived of their office as a joint.

II. M. 44. The scapula, of which apparently a dislocation of the humerus had taken place; one half only of the glenoid cavity remains entire.

II. M. 47. Scapula and humerus. The shoulder-joint had suffered an injury: inflammation took place, and the inflamed bones have adapted themselves to each other by absorption, so that the flat surfaces of the bone are no longer capable of motion on each other. These present a fair parallel to the specimens of diseased hip-joint.

II. M. 48. Effects of the scrofulous inflammation in the bones of the shoulder-joint.

II. M. 49. Destruction of the articulating cartilages of the bones forming the elbow-joint, from scrofula. The bones are particularly soft and spongy. The arm was amputated, and the patient did well.

II. M. 50. Bones of a diseased elbow-joint amputated. You may see, in the portion of the necrosed apophysis, that which keeps up the irritation, to the destruction of the patient. The most remarkable thing is the wasting of the radius and ulna, obviously attributable to the inflammation having rendered the arm useless.

II. M. 50. Anchylosis of the elbow-joint; which, whilst it terminates the scrofulous disease of the joint, unfortunately as often precludes the person from reaching his mouth,—a thing to be attended to when anchylosis is expected.

II. M. 52. Anchylosis of the radius and ulna in a child; a very unusual circumstance.

II. M. 53. Complete anchylosis of the bones of the elbow-joint in a bent state.

II. M. 54. Diseased extremity of a humerus, shewing the condition of the bone in a case of diseased elbow-joint.

II. M. 55. Upper portion of the ulna carious, from a disease of the elbow-joint.

II. M. 56. A scrofulous hand injected. The bones of the wrist are here diseased, owing to a puncture of the wrist-joint. The scrofulous action was general in the whole hand, however especially produced.

II. M. 57. The bones of the wrist diseased, from a scrofulous affection of the joint in an elderly gentleman; he suffered amputation.

II. M. 58. Effects of the inflammation of the wrist and ankle-joints in the lower ends of a radius and tibia.

II. M. 59. Anchylosis of the radius. The bones of the carpus and metacarpus consequent on diseased wrist.

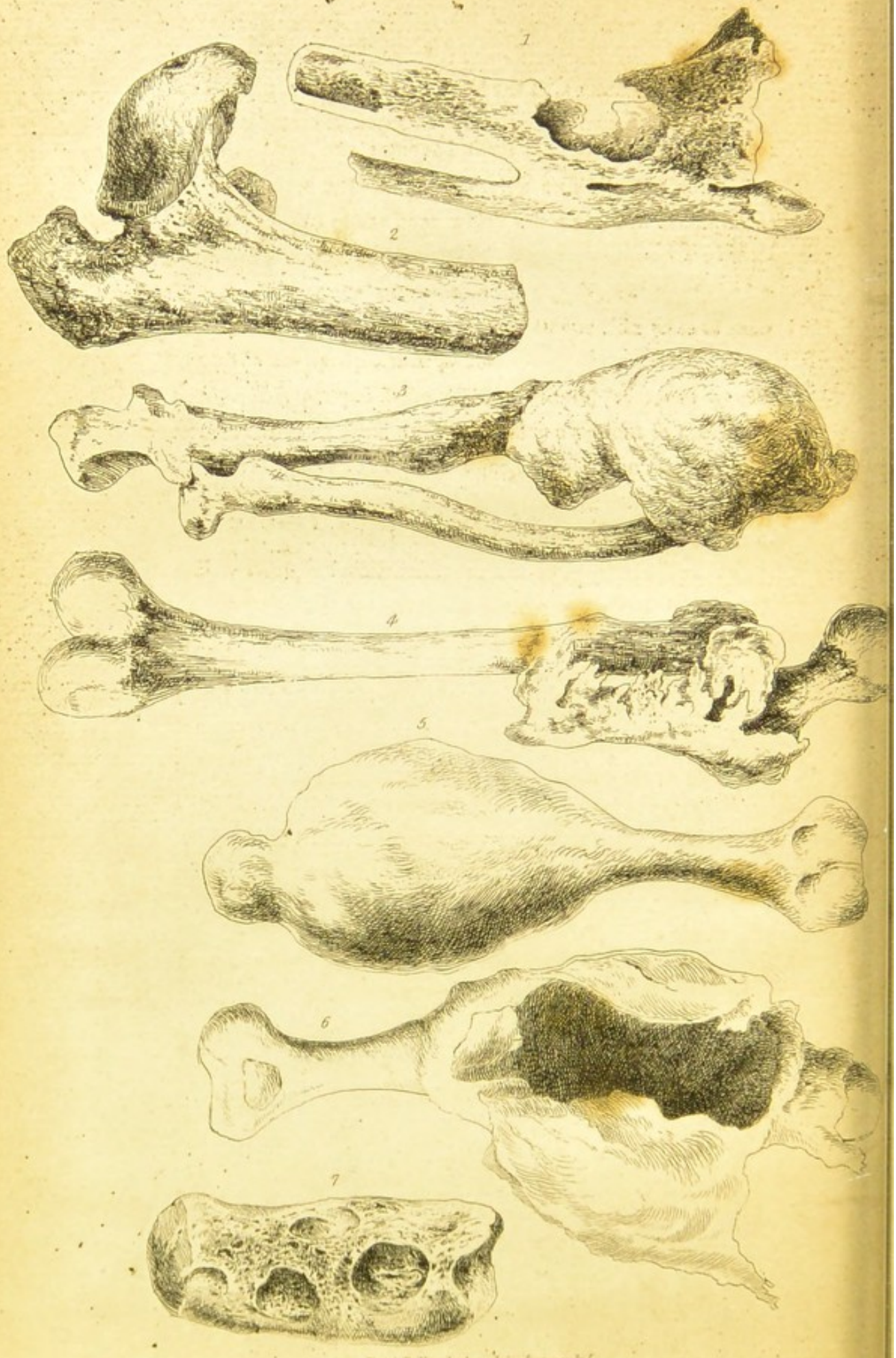
II. M. 60. The lower extremity of the radius diseased.

II. M. 61. A cast of the hand. Dislocation of the thumb of Wood the Pugilist.

II. M. 62. Anchylosis between two of the bones of a horse's leg. A cavity is seen where the cartilage was. The cartilage has been destroyed by maceration.

II. M. 63 to 68. Are very common examples of anchylosis and exostosis in the bones of the legs of horses.

PL. I.



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DESCRIPTION OF THE PLATES.

PLATE I.

Fig. 1. Shews *Abscess* occurring in the lower end of the shaft of the tibia, conjoined with anchyloses of the tibia and fibula. *Vide* p. 35.

Fig. 2. Illustrates *interstitial absorption* of the neck of the thigh-bone in its advanced stage. (*Vide* p. 93.) *From a preparation in my possession.*

Fig. 3. *Osteo-sarcomatous tumour* of the lower end of the ulna, occurring in a ricketty subject. *From a preparation* in the MUSEUM of the ROYAL COLLEGE OF SURGEONS.

Fig. 4. Comminuted fracture of the upper third of the thigh-bone, shewing the lateral overlapping of the fractured portion, with union, through the medium of numerous bony bridge-like processes. The head and neck of the bone are singularly altered in form, and exhibit the power which nature possesses in accommodating parts to the functions they have to perform in the animal economy. *Vide* Sect. vi. Chap. I. *From a preparation in my possession.*

Fig. 5. Humerus removed from the lady whose case is detailed at p. 157. This sketch exhibits the surprising expansion of the bone which takes place in consequence of aneurism of its vessels.

Fig. 6. The same preparation as Fig. V. cut open, and a portion of the parietes turned to one side, so as to shew the cavity described p. 160.

Fig. 7. Metacarpal bone of the thumb, removed by Dr HUNTER, from a man who was a patient in the Royal Infirmary. It affords a good illustration of severe *interstitial inflammation.* *Vide* p. 14. *From a preparation in the* MUSEUM of the ROYAL COLLEGE OF SURGEONS,

PLATE II.

Fig. 1. Exhibits the effects produced by scrofulous inflammation on the bones of the knee-joint. *From a preparation in my possession.*

Fig. 2. Abscess occurring in the epiphysis, at the lower end of the tibia.

PLATE III.

Fig. 1. Shews the enormous magnitude which an osteo-sarcomatous tumour occasionally attains before the skin gives way.

Fig. 2. Union by osseous processes of a fractured tibia.

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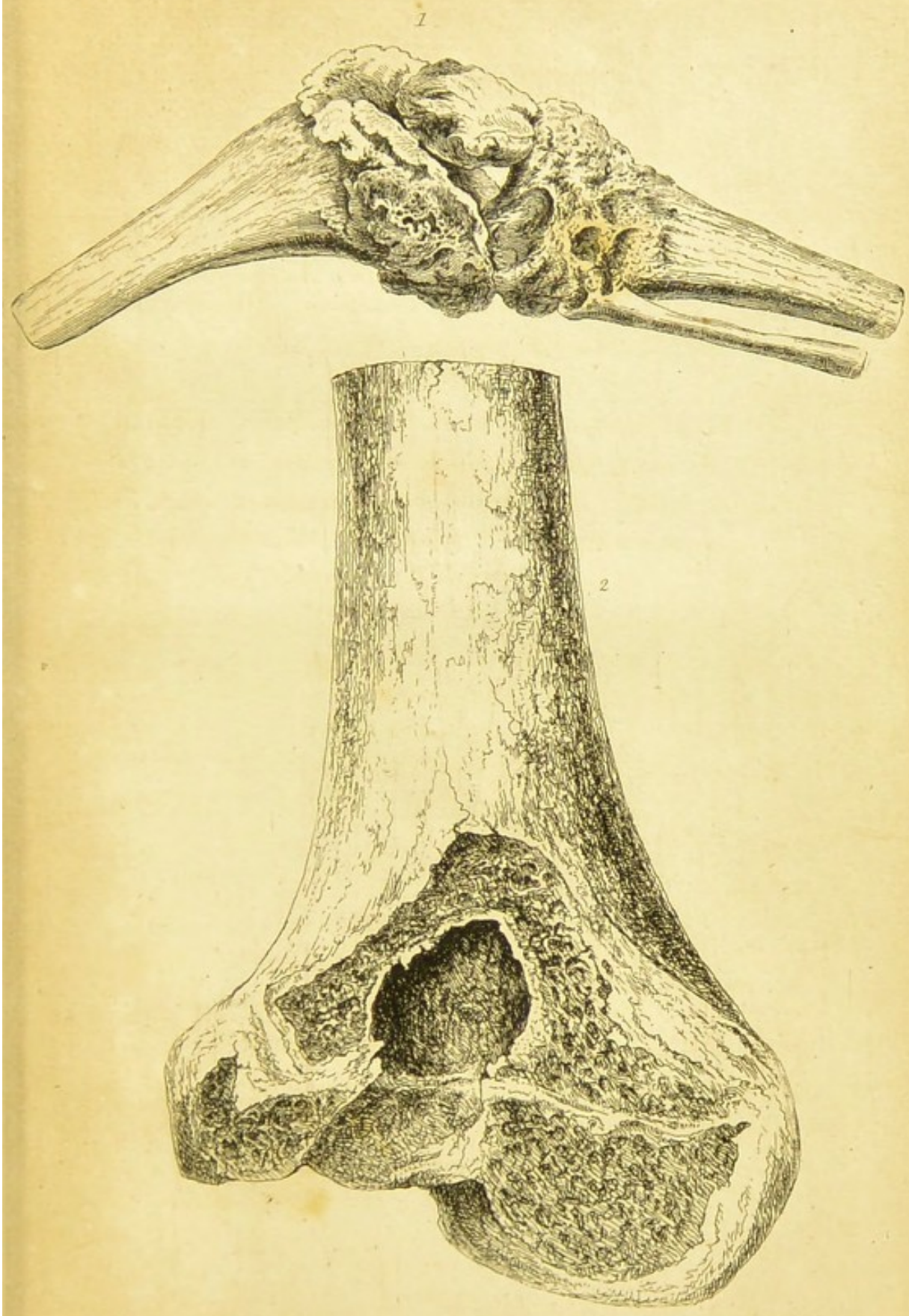
PL. II.



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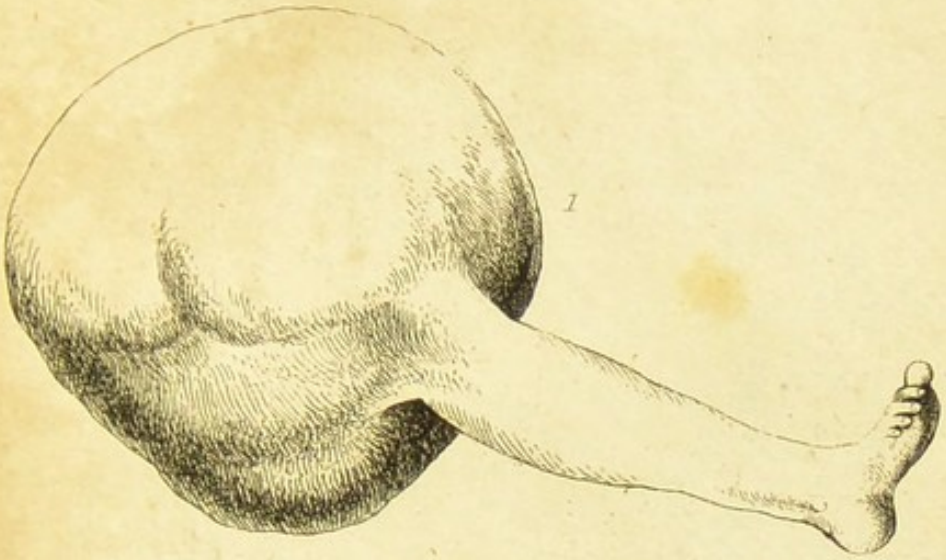
PL. III.



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