pair, as in the case of fracture. But its intervention is no more a benefit than is an erysipelas or a phlegmon in the cicatrization of a wound. I consider this augmentation of volume a superfluity, a complication, and I consider it even as being one of the causes of necrosis in long bones.

My third remark relates to the anterior condition of the constitution of those who have, with or without suppuration, hyperostoses consecutive to osteitis. In most of them the health was originally good. You will often hear it said that suppuration of the bones is due to scrofula; that is true of the suppurating osteites of the cancellous tissue of the short bones, or of the extremity of the long bones, and I will show you, at the proper time and place, that this suppurating osteitis of scrofulous persons is at the same time rarefying, and that if it becomes condensing, it is so only in places, and not over a great extent, as is the case in condensing osteitis of the compact tissue. We might give as an axiom this proposition, that condensation and hypertrophy, during and after osteitis, indicate a good constitution, or at least the absence of the scrofulous diathesis. I do not mean by this that patients do not die of an acute suppurating osteitis, for, on the contrary, I have shown you that this affection sometimes causes death by traumatic fever or by purulent infection; I mean only to say that they do not die of exhaustion and of phthisis, as is so often the case with patients affected with caries, that is, with rarefying suppurating osteitis of the cancellous tissue. Should we go so far as to say that patients affected with necrosis of the compact tissue never become tuberculous or phthisical? Of course not; I admit that they may become so; but it is occasionally, after the deterioration of their health by an abundant and prolonged suppuration, much more than by an original disposition. In a word, if necrosis can give rise to the lesions of the scrofulous diathesis, it is not, generally at least, the scrofulous diathesis which gives rise to necrosis.

The object of these general considerations, gentlemen, was to prepare you to grasp the details concerning a patient affected with necrosis of the humerus, in whom the suppurating osteitis, terminating in mortification, is not of traumatic origin like that of which you have seen so many examples after gunshot wounds. It is of spontaneous origin, and although it began at the age of eighteen years, and although in this respect we have in it another of the so frequent examples of spontaneous suppurating osteitis of adolescence, yet the disease has differed from what it ordinarily is, under these circumstances, by a much less acute, slower, and milder course.

The patient, who is now 32 years old, says his disease began at the age of 18. At that time, however, as I just told you, he did not have the acute or hyperacute form which we see so often in adolescents, and which we see more frequently upon the bones of the lower limb than upon those of the upper one. He knows of no particular cause to which this origin can be referred. He only knows that an abscess formed slowly on the outer side of the right arm, and that this abscess, after having opened spontaneously, remained fistulous. He came to me in 1859, three years after it began, when he was twenty-one years

old, and I treated him at the Hôpital Cochin, where I had charge of the surgical service. I felt with a probe a denuded and movable portion of bone at the bottom of the fistulous tract; I made an incision, withdrew the sequestrum, which was superficial and not invaginated, and, with the hope of modifying the vitality of the bone, I cauterized it with the hot iron. Notwithstanding that, the patient left the hospital with the fistulous openings, which he has retained for ten years, and you see them to-day (22 Feb. 1870), five in number, upon the superior external portion of the right arm, for the bony lesion occupies the upper fourth of the shaft of the humerus, without at the same time interesting the head of the bone.

Notwithstanding these fistulæ through which the pus continually flows, the patient is hearty and muscular, and for the last ten years has done, almost without interruption, the heavy work of a mason. But, annoyed by this continued suppuration, he has again come to ask my care.

A probe passed into these fistulæ finds a portion of bone denuded over a certain extent, and giving on percussion the dry sound and the sensation of hardness which necrosis presents. The sensations perceived are very distinct; it is a necrosis, there is no doubt remaining upon that point; but I should like to be enlightened upon two others: If the necrosed portion is movable, and if it is or is not invaginated. You understand the important bearing of these questions upon the method of operation. For, if the sequestrum is invaginated, it will be necessary, in order to remove it, to open all that portion of the still living bone which surrounds it. I made in your presence the examination needed to clear up this point. You saw that it gave me certain results only at the end. I felt at the beginning indistinct mobility of the denuded and sonorous portion, but I did not know if I ought to regard that mobility as real, or attribute the sensation to the bending of the probe. To remove this chance of error I abandoned the probes, and made use of grooved directors. I introduced two of them by different orifices, and leaving one of them loose in the fistula, I tried with the other, which I held in my right hand, to move the bone in which I suspected mobility. I at once saw the loose director move freely, and these movements could have been given to it only by the portion of bone upon which the other director was pressed, and proved clearly that this portion was movable.

The mobility of the sequestrum being recognized, it remained, as I told you, to know whether it was invaginated or external; I inclined towards the latter opinion, but in view of the possible existence of invagination I prepared the instruments necessary to hollow out the bone.

The patient was anæsthetized with ether; I made an incision over the deltoid; uncovered the sequestrum, the mobility of which became still more evident when my finger touched it; then seizing it with strong forceps I drew it out. It was about an inch long, and three-quarters of an inch wide. Then introducing my finger into the wound to see if there were other sequestra, I felt none at first, and found only a large gutter in the humerus. It had been occupied by the

sequestrum I had just removed, and its very smooth walls were covered by a pyogenic membrane. But at the lower part I felt a movable piece of bone, which projected through an opening at the bottom of this gutter, and seemed to occupy the interior of the humerus. I seized it with a pair of dressing forceps, and drew out a sequestrum much longer and larger than the first. It was invaginated, and occupied in the thickness of the bone a canal which opened at the top into the gutter of which I have just spoken. The opening had been large enough to allow the fragment to pass. I again explored the different hollows of the wound, and withdrew two more splinters; I could feel no others, but, notwithstanding the care with which I sought for them, I cannot affirm that none remain.

Will this operation suffice to bring about a radical cure? I do not dare to hope so, for these affections are extremely long, and pass many times through the same phases before getting well. As I told you, there are splinters which may escape notice, and, on the other hand, new portions of bone may subsequently mortify and cause fresh inflammation. In children, these osteites with suppuration and necrosis disappear generally at the end of three or four years, leaving only the hyperostosis behind them. In adolescents, they last habitually until adult life, that is, until the age of twenty-five or twenty-six years. In this respect our patient is exceptional, for he has retained his bony suppuration and necrosis until he has reached the thirty-second year of his age; perhaps that is due to the fact that the disease was not very acute at the beginning.

Before going further, let me show you what there is peculiar and difficult in the etiology and pathogeny of this necrosis, and also in the anatomical form which it presents.

As to the etiology, I shall say nothing more about the absence of a known occasional cause. I tell you only that, although resembling traumatic necrosis, such as we see after gunshot wounds and compound fractures, it is spontaneous, and commenced at the period of adolescence, but without presenting the acute or hyper-acute form which we sometimes see at that period of life. I will remind you also that this patient has neither commemorative nor present signs of scrofula, that nothing in him indicates tuberculosis, and that if there has been intervention of an internal cause, as I am willing to admit, it remains unknown to us, and belongs to none of those which characterize the generally accepted diatheses.

As to the pathogeny, the mortification which occupies the compact tissue of the upper part of the shaft of the humerus coincides, as you may have discovered by comparing the size of the two arms, with a notable augmentation of the volume of the humerus, so that you have here another example of that triple lesson of which I spoke a moment ago: suppuration of the bone, its necrosis, and its hypertrophy.

As for the anatomical form we had, at first, an external sequestrum, the one which I first withdrew, then an invaginated sequestrum, the second one withdrawn. It happened that the opening in the living portion of the bone was large enough to allow me to reach and withdraw the invaginated piece through it.

Remember that it is not always thus, and that when the opening is too small, we are obliged to enlarge it with a gouge and mallet. I shall tell you in a moment that, so far as the consequences are concerned, it is better not to have thus attacked the surrounding bone. But is this surrounding bone of new formation, or is it formed of the original bone which has remained alive and has become hypertrophied in its superficial layers? Certainly, I cannot give you in this case a rigorous demonstration; but, if you remember the considerations which I presented at the beginning, you will admit hypertrophy of the original bone as at least possible and even probable, and you will not admit as proven (for nothing proves it) that it is a new bone formed by the periosteum. Finally, you will see in the bony hypertrophy a result of the suppurating osteitis and not a salutary effort, just as mortification at certain points of the same bone has been another result which is neither more nor less salutary than the former.

Let us now examine the prognosis. Well, I admit that I do not fear the consequences of the operation. You will perhaps think that I am too bold in saying that, for this morning the suppuration was fetid, and you know that fetid suppuration of bone may lead to dangerous septicæmia. But what reassures me is, that I have made no fresh solution of continuity in the humerus with the gouge and mallet. Experience has taught me that dangerous traumatic fever and purulent infection are consecutive especially to osteo-myelitis caused by a recent solution of continuity, and the putrid form of osteo-myelitis does not occur when, as in the present case, the bone has been spared.

I do not, however, shut my eyes to the fact that this preservation of the integrity of the humerus has its disadvantage, the existence in the interior of the bone of a canal closed below and open at the top. It will be difficult to prevent the pus from collecting in this canal, and it may become necessary to make a counter-opening with a drill so as to prevent stagnation of the liquids, and thus cause that bleeding solution of continuity which predisposes to pyæmia.

But, on the other hand, it is possible that the bony canal may become filled by the continuation of the hypertrophic process, and that the formation of pus may cease without having caused any accidents. However that may be, there is, in the persistence of this canal, which is about an inch long, a disadvantageous condition which may keep up suppuration and hecticity, and prolong the affection. This condition does not exist when the sequestra have been superficial, and in this respect the prognosis has a greater gravity in this patient than if the necrosis had not been invaginated.

(The patient affected with necrosis of the humerus had no fever and presented no complication. The wound made by the operation suppurated, the bone itself continued to suppurate, the pus flowed with difficulty from the canal in which the sequestrum had been lodged. We made injections of a weak solution of carbolic acid every morning and evening, by passing a gum catheter attached to the canula of the syringe into the bony canal. The patient wished to return home, and we showed him how to make the injections.

I am still unwilling to propose a counter-opening, because this operation might have unfortunate results, and because I hope the canal will dry up or fill by the addition of new bony layers. If this does not take place, if the suppuration continues, if it becomes more fetid, if the patient is unable to work, he will return to us, and then, recognizing the inability of nature to complete the cure, I shall make a large opening at the bottom of the accidental canal so as to prevent the stagnation of the pus.)

PART IV.

TRAUMATIC FEVER, PYÆMIA, AND SEPTICÆMIA.

LECTURE XXIX.

TRAUMATIC FEVER.

Gunshot wound of the right elbow—Resection followed promptly by death from traumatic fever—Considerations upon grave traumatic fever following compound fractures.

GENTLEMEN: We lost yesterday a patient who was struck at the battle of Montretout by a ball which passed through his right elbow, causing a comminuted fracture of the three bones forming the articulation. He was brought to the hospital the next day, and on the following morning, thirty-six hours after the accident and while the fever of the first period was still moderate, I resected the elbow. You remember that the bones were so shattered that I found it very difficult to remove all the fragments, since most of them were still adherent and had to be separated one by one from the muscular and aponeurotic fibres. I made a T-shaped incision, the vertical portion of which was on the outer side of the arm and forearm, and the horizontal portion posterior, passing above the olecranon. This incision is similar to that adopted by Roux,[1] but differs from it in this: that in the latter the vertical incision is on the inner side, while in the one which I used and which belongs to M. Nélaton, it is on the outer side. This enables the operator to reach the radius immediately and resect it, and then, having thereby opened the articulation freely, to isolate and remove, while avoiding the ulnar nerve, first the upper extremity of the ulna and then the lower extremity of the humerus. In this case the operation was not as regular as it would be under many other circumstances, for after having made the external incisions, I came upon a mass of splinters which I removed without knowing to which bone each belonged, and then I sawed off the end of each bone so as to substitute a regular and uniform surface for the irregular and jagged one due to the injury. You remember that I then brought the edges of the solution of continuity together with four points of metallic suture, rather with the view of giving them a good position and immobilizing them than in the hope of obtaining immediate union. Indeed the latter is very difficult to obtain, and

[1] Thore, Résection du Coude, Inaugural Thesis, 1843.