A Lecture

ON THE

ACUTE NECROSIS OF GROWING BONES.

DELIVERED AT THE HOSPITAL FOR SICK CHILDREN.

BY

THOMAS SMITH, F.R.C.S.,

ASSISTANT-SURGEON TO THE HOSPITAL.

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THE *local symptom* of most note, and usually first in the general order of things in this disease, is enlargement of the limb, caused by subperiosteal effusion. This appears externally as a painful swelling of a firmly œdematous character, diffused in its outline, pallid in colour, or only faintly mottled over with red, and generally shining on its surface. The local symptoms will now perhaps begin to concentrate themselves around the articular end of the bone and neighbouring joints, which will be attacked by acute suppurative inflammation, as in the following cases; for one of which I am indebted to Mr. Marsh of the Children's Hospital, and for the other to Mr. Paget.

CASE XVIII. A boy, aged 2½ years, of weakly constitution, three weeks before admission complained that "his foot was bad," and became feverish and restless at night. The leg and lower part of the ankle became swollen and very painful. After a few days, matter was let out at the lower part of the leg.

When he was admitted, under Mr. Holmes, into the Children's Hospital, the leg, especially at the lower part, was swollen, œdematous, and red in patches. A probe could be passed through the opening that had been made down to bare bone. Next day, a collection of matter was let out higher up the leg, from over the tibia. The limb was intensely painful; there was no affection of the knee-joint. The following day, another collection was opened on the front of the leg. The bone was found bare; the periosteum thick, and raised from its connections by pus, which was thin and sanious in character. The child's health suffered much. The ankle-joint became the seat of abscess; and six weeks after his first attack, the limb was removed at the knee-joint.

The tibia from this patient, which I now show you, presents the following appearance. The lower epiphysis is dead, and lying loosely separated from its shaft, which latter seems to be necrosed in its whole extent; the upper epiphysis being unaffected. The periosteum is completely separated from the bone for about half its extent; elsewhere there intervene between it and the bone deposits of semi-ossified lymph. This patient eventually died, soon after the stump was healed, from an attack of acute pneumonia.

In this case, the lower epiphysial end of the tibia seems to have been first affected; since it was about this part of the bone that the swelling first showed itself; and after death, the softened, separated, and rotten condition of this part, seems to indicate that it has been longer dead than the shaft of the bone.

In the next case, taken from the *Guy's Hospital Reports*, the upper epiphysis of the tibia seems to have been first attacked.

CASE XIX. George E., aged 15, five weeks before admission, felt pain in his knee, which he thought resulted from a blow. Inflammation and suppuration followed at

the end of three weeks. The knee-joint became involved; and he died with symptoms of pyæmia.

The *post mortem* examination showed the tibia to be necrosed; the knee-joint disorganised; and evidences of pyæmia in the lungs, spleen, and kidneys. The iliac and femoral veins contained a softening clot.

CASE XX. The patient, a boy, aged 14, of strumous diathesis, on December 4th, 1853, a week before his death, jerked up a school-slate by the sudden action of the extensor muscle of his thigh, and suffered immediately afterwards from a little pain and stiffness in the knee-joint. He was ordered a blister; and, three days afterwards, as there was no improvement, leeches. The boy was no better for these; but, on the contrary, became delirious; the whole thigh swelled. On December 11th, more leeches were applied. The thigh at that time was much swollen, without redness. There was tenderness on pressure from the hip to the knee. The knee-joint was slightly distended, and the upper part of the leg a little swollen. The boy was feeble and sinking; and, in spite of ammonia and stimulants, he died.

Post Mortem Examination. The tissues of the thigh were loaded with serous effusion. The substance of the crureus muscle was studded with small purulent deposits of the size of pins' heads. The knee-joint contained about three ounces of bloody pus; and its synovial membrane was ulcerated in two places. The periosteum of the femur was highly vascular; it was easily separable from the bone along the inner side of the shaft; and at one point, near the inner condyle, its surface was highly granular for about the size of a shilling, and the corresponding part of the bone was roughened, as if from acute ulceration. The bone itself was redder and bluer than usual, especially in its lower half. The lungs were congested; and there were pins'-head spots of puriform deposits in the left upper lobe. The infundibula of the kidneys yielded a little pus-like urine on pressure; and some of a similar kind was found in the pelves of these organs.

More frequently, the swelling will extend along the shaft of the bone, matter will form beneath the periosteum, the surface will show here and there a patchy redness; and, if the patient survive, the pus will make its way slowly and most painfully to the surface, disclosing at the bottom of the abscess a bare bone and extensive separation of the periosteum. The shaft and epiphysis are rarely attacked together; and the former is much more prone to necrosis than the latter.

It is to be borne in mind that the bone found denuded in this disease is not always dead, nor will it necessarily die. Much of it will doubtless die; but one often sees fresh adhesions form between the periosteum and bone; such points of separation and reunion being marked by fresh deposits of new bone adhering closely to both. Periosteum above and bone below. This may be seen in some of the bones before me; indeed, the fact is familiar to many of you.

The local symptoms of this disease are almost unimportant, compared with the *constitutional irritation* which accompanies them. This is, as one might imagine, extreme in degree, and of that type to which one usually applies the term typhoid. But there is added to all this a worse evil, a more imminent danger; I mean that of *pyæmia* or *blood-poisoning*; and it is on this that I would specially dwell.

So soon as the subperiosteal effusion has taken place, which, as I said, was the first local change, from that time the patient's life is in danger from the liability to general infection of the blood. In an article on the Causes of Pyæmia, in *Guy's Hos-*

pital Reports (1861), Dr. Wilks says: "A cellulitis of a limb surrounding a bone is eminently effective in the production of pyæmia; and thus it has been thought that the implication of some part of the osseous system is a favouring cause for the purulent infection. This is highly probable from the perusal of our cases," of which he brings forward about one hundred and fifty; in more than half of these, some bone was implicated. I believe we may seek for the cause of pyæmia in these cases in the peculiar local conditions of the subperiosteal effusion. We may fairly conclude from the *post mortem* appearances, that the pyæmia has been occasioned in these cases by the introduction of some morbid material into the blood, whether it be decomposing lymph or blood, or whether it be pus; and that this admixture has taken place at the part affected is rendered highly probable by the frequency with which the *deep veins* of the limb are found plugged with fibrine in these cases. Now beneath the periosteum of a growing bone, when raised by effusion from its connexions, we have conditions most favourable for the admixture of pus or other decomposing material with the blood. We have in this disease, as one of the earliest changes, a collection of lymph or bloody serum, strongly disposed to undergo a suppurative change, bound down by the periosteum and all the superjacent textures of the limb, and as it were forced into the open mouths of the veins of the bone, which have been but recently torn from their connexion with the periosteum, and which, from their remaining connexion with the bone, are disposed to remain patent. If then pyæmic poisoning of the blood takes place, as I believe it often does, from the introduction of pus or degenerating lymph into the blood through the mouths of open veins, we have in this disease local conditions peculiarly favourable to such an introduction.

The infrequency in adults of pyæmia connected with acute periostitis and large subperiosteal effusions may seem to contradict the explanation I have offered you; but I believe that the very diminished vascular connexion (to which I have before alluded) between the periosteum and the bone, as age advances, is quite sufficient to explain the decreasing tendency to general blood-poisoning in these. Of the twenty-three cases reports of which I have collected, there were but two that escaped pyæmia—both of these recovered. Of the other twenty-one, all of whom suffered with well marked symptoms of pyæmia, but two survive; one of these now lies, some months after his first attack, in a garret in Gray's Inn Lane, with the pus streaming from sinuses in his forearm and thigh which lead respectively to the necrosed shafts of the corresponding bones;* the other, after suffering from secondary pneumonia seven months after the first attack, is reported, "Wound still discharging".

This pyæmia shows itself during life by the ordinary symptoms of rigors, profuse sweats, and rapid sinking; and, at death, leaves most unequivocal traces of its nature and identity in the pericardium, pleuræ, parenchyma of the lungs, kidneys, or liver, or in the larger joints. In the pericardium and pleuræ, as has been shown by Dr. Kirkes and others, we may find marks of acute adhesive inflammation, with a strong tendency to suppuration. In

the solid organs, we find yellow fibrinous-looking deposits in various stages of disintegration, either as firm yellow lymph or completely formed abscesses. As I before mentioned, the patient is exposed to the dangers of purulent infection quite early in the disease—indeed, so soon as effusion beneath the periosteum has taken place, and before the effusion has degenerated into pus. Thus in the case (No. 1) of the little girl to whom this femur belongs, though the *post mortem* examination disclosed pyæmia, no pus had formed around the bone.

How early in the disease pyæmia sets in, may be seen by noting the date of death in the twenty fatal cases I have here before me: in nine of these, death took place before the twelfth day.

Of the ultimate termination of this malady I can only speak in general terms. I have here the list of twenty deaths and only three recoveries. This proportion represents too strongly the fatal tendency of the disease, as many of these cases are recorded on account of the severity of their symptoms or their fatal termination. I can only say that, when once the disease is fully developed, and the periosteum is separated to any considerable extent from the shaft of the bone, the patient, if a young person, is in danger; and, should symptoms of pyæmia show themselves, the danger is imminent, though recovery is more possible than in adults. To show the power of recovery from this disease possessed by young people, I will read you the case of a young lady, aged 12, seen by Mr. Paget, who kindly furnished me with the following account.

CASE XXI. A young lady, aged 12, two days after exposure to cold, complained of pain in her right knee. In a day or two she became feverish; and the pain increased, and was referred to the lower part of the corresponding thigh. Leeches were applied; restoratives enjoined; and she took salines. A week after her seizure, she was seen by Mr. Paget. She was suffering from severe constitutional disturbance, sleeplessness, and occasional delirium. The whole of the right thigh was enlarged; the skin of it was smooth, and rather paler than the opposite limb. Deep pressure over the bone gave pain. The knee-joint appeared quite unaffected. The limb could be jarred without pain; but the patient could neither move it, nor bear it to be moved. She was ordered support, wine and nourishing diet, and iodide of potassium. Three weeks from the first attack, she was again seen. In the interval she had had, and was still suffering from the effects of, double pneumonia and inflammation and swelling of both parotid glands; and she had a gum-boil at that time. She had swelling on the right ankle-joint, and pain in her shoulders. She suffered from profuse sweatings; her pulse was 120. In a day or two the right lower limb became generally oedematous and swollen; and there was tenderness over the femoral vein, just as in phlegmasia dolens. After this, the left hip and knee joints were attacked with pain and great tenderness on pressure; the least movement causing her great suffering. Six weeks after her first symptoms, fluctuation was detected over the right femur; and two or three ounces of pus were let out. Subsequently there was a free discharge of pus from this opening; and, a month later, another abscess was opened just above the patella, containing a pint of pus. The case went on well; the discharge lessening, and the parts getting sounder, until the following April, the seventh month of her illness; when the right thigh became suddenly bent just below its middle, evidently from fracture of the shaft of the femur, whatever new bone might be around it. Subsequently the bone reunited, and she regained her general health.

* He has since died of exhaustion.

The last account I have of this case reports a wound still discharging in the thigh. Here recovery took place after symptoms which, I think, we may fairly conclude indicated general pyæmia.

I would for a moment draw your attention to the spontaneous fracture of the thigh which occurred in this case, just to remind you that this accident is an occasional though not a frequent complication of necrosis attacking the shafts of long bones.

The most serious *local lesions* of this disease are, necrosis of the bone to a greater or less extent, and destruction of the neighbouring joint by suppurative inflammation.

In the *most favourable* cases, the subperiosteal effusion will clear up without proceeding to suppuration, and the patient will perfectly recover. Of such cases we have seen here, in the out-patient room, four or five during the last two years. If *suppuration* take place around the bone, the danger to life is greatly increased; and, in the most hopeful cases, the patient will not escape without necrosis of some portion of the subjacent bone; but, as I before said, and as is well known to many here, the necrosed portion of bone will often bear no relative size to the amount of bone previously denuded. In *less favourable* cases, the loss of bone is greater in extent, and the suppuration may extend to the neighbouring joint. In *any case* where the necrosed portion of bone is large, convalescence will be most tedious, as in young bones ossifying lymph is quickly and abundantly poured out from the under surface of the periosteum, and the dead part is pretty closely and thickly encased, often before its detachment from the living bone is complete.

CASE XXII. A boy, aged 3½, was brought to me at the Children's Hospital, as his mother noticed that he was lame. There were pain and a firmly oedematous swelling over the lower part of the left thigh; there was great tenderness on pressure. He was admitted into the hospital, suffering from severe constitutional disturbance. A day or two after his admission, a swelling appeared on the left radius. On the fifteenth day of his illness, I made an incision in the deep parts of the thigh, and let out a quantity of pus from beneath the periosteum of the femur, which was found bare and rough. The swelling over the radius seemed to be subsiding; when his parents, thinking he was going to die, removed him from the hospital three weeks after he was first attacked. Six months afterwards, I saw him. Pus was streaming from three sinuses in the thigh, and from two over the left radius. The boy was emaciated and hectic. The parents not liking to part with him, and refusing to allow of any treatment, I saw no more of him, but heard of his death seven months after the commencement of his illness, from exhaustion—a termination which might, I believe, have been avoided, had the parents not refused to allow of any surgical interference.

I might well feel some diffidence in speaking to you of the *treatment* of this malady; but the less so, as I cannot but believe that the best general treatment for these cases is such as is suggested by the ordinary rules of practical surgery and the dictates of common sense. There are, however, one or two nice and more difficult points in particular instances, which are matters of opinion, and to which I shall direct your attention.

Following, then, the general principles of surgery, in the earliest stage we have periostitis with a subperiosteal effusion of lymph, liquor sanguinis, or

blood. Iodide of potassium internally, and leeches and fomentations externally, are the remedies which naturally suggest themselves; and such I have found to be the most efficacious. When suppuration occurs, or a suspicion of it arises, a small incision down to the bone may be made, to be subsequently enlarged, if matter be formed: to be closed at once, if no matter exist. *Very early* incision, unless suppuration has taken place, from my own experience I cannot recommend. As the admission of air to a collection of sanious lymph will often determine its suppuration, I would as well in these cases, where local suppuration were equivocal, be guided by the patient's general condition; and if rigors had occurred, and there was great constitutional irritation with great local tenderness, I would make an incision down to the bone.

Happily, the disease attacking either a shaft or epiphysis of a bone shows but little tendency to spread from one to the other; these parts, as I believe, having as it were separate centres of vitality, as well as of nutrition and growth. Still, occasionally it suggests itself, soon after the onset or during the progress of this disease, as it attacks the long bones of the lower limb, whether the patient's chance of recovery might not be increased by amputation; and on this point I would speak with some diffidence. So long as the disease is confined to the shaft of the bone, there can be no necessity for such treatment; but should the disease first attack the epiphysis, or should it subsequently invade that part of the bone, and should the joint (as is generally the case) be attacked by suppurative inflammation, two questions arise; first, and most immediate: How will the patient's strength bear up under this additional source of irritation? and, secondly: What chance of useful reproduction is there for a bone necrosed both in its shaft and epiphysis? The reply to the first of these considerations must be sought in the circumstances and condition of the patient in each individual case, and the question of amputation be thereupon decided. To the second I venture to answer myself, that if the shaft and one epiphysis be necrosed, there is but little hope of a useful reproduction of the bone; if the shaft and both epiphyses be affected, there is no hope of such restoration. Therefore, if the shaft of the tibia were affected with acute necrosis, and suppuration occurred in either the ankle or the knee joint, showing that the lower or upper epiphyses were also implicated, I should decide the question of amputation upon the constitutional condition of the patient. If, together with necrosis of the shaft of the tibia, suppurative inflammation attacked both knee and ankle-joints, I would amputate at once, provided the patient's constitutional condition allowed of it.

ALCOHOLIC DRINKS. In the year ending at Michaelmas last 94,908 persons—260 a day—were proceeded against before justices in England for drunkenness, or for being drunk and disorderly, and 63,255 of them were convicted. The great majority were only fined, but above 7,000 were committed to prison. The returns show a great increase over the previous year, for only 82,196 were then charged with drunkenness, and only 54,123 convicted. Of the persons thus charged in the last year 23,560 were females, and more than 10,000 women were convicted for being drunk. Coroner's inquests in the year 1862 found 211 verdicts of deaths from excessive drinking, 145 men and 66 women thus ended their days.