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PART I.

ORIGINAL COMMUNICATIONS.

ART. VII.—*Case of Necrosis of Femur, with Remarks.* By W. COLLES, Surgeon to Steevens' Hospital, &c.

IT seems to me that there still exists considerable doubt in the minds of surgeons as to the action of the living on dead parts.

This is not readily observed in soft parts, where the action is rapid and the changes produced may be attributed to other causes, and cannot be accurately observed on account of the difficulty in contrasting the slough immediately at its death and at its final separation. We even find surgeons denying this action in bone, because they place a dead bone on healthy granulations, and find no alteration in the bone when examined after some time; but I think a surgeon who carefully examines the process as it occurs in many cases of necrosis must see that the action of living parts on dead bone is most energetic.

We will first consider the cases in which these changes can be most readily observed—that is, in a case of acute necrosis, occurring in a young subject, in the shaft of these bones in which we most frequently observe perfect regeneration of bone from the periosteum—the femur, tibia, and humerus; here, after exposure to wet and cold, the entire shaft of the bone suddenly dies, the epiphysary ends remain, preserving the joints and affording a base for the subsequent changes. The first effect of this death of bone is that it acts as a foreign body; the periosteum becomes detached;

pus is effused in great quantity; this gets out through openings which are termed cloacæ, and then the periosteum secretes material for the formation of new bone outside of the sequestrum, which new bone is lined by a soft, very vascular, velvety membrane secreting pus, and, therefore, we may term the elevations on it granulations. The periosteum still adheres to the epiphysary ends, which also form granulations for the purpose of separating the dead from the living bone.

Now, in these cases, we proceed to examine first the sequestrum, which we would expect to find, if not acted on—no matter how soon removed or how long it was allowed to remain—unaltered, presenting the same size, form, and density of this original shaft. But such is not the case, and the longer the sequestrum remains in the invaginating bone the more remarkable are the changes in it.

We will observe that though at first the medullary canal may be of normal size in the centre, yet at both ends the bone is excavated into a conical shape; at the edges of this cone the bone is thin and irregular, the interior presents a worm-eaten appearance, with regular indentations, the outer surface remaining smooth and unaltered. If we now examine the cavity, we find arising from both epiphysary ends a large, very vascular, conical mass of granulation, each separate lobe of which fits most exactly into each worm-eaten depression in the sequestrum, and the longer the bone remains in the cavity the greater the diminution of the substance in the original bone, so that we often find it divided into long splinters, and even, as in the case recorded, entirely absorbed.

At times we will observe cases in which the sequestrum is protruded two or three inches from the cavity; still here the cone of granulation retains its action and position, though bent so as to accommodate itself to the changes, but we will observe the inner portion of the bone entirely absorbed and grooved out to the level of this mass of granulations, and the outer surface, from which these granulations have been removed, undergoing no further absorption. In considering all these changes, I do not see how we can avoid coming to the conclusion that the dead bone has been acted on by the conical granulating mass eroding it from within, while those granulations from the lining membrane of the new bone produce no change, as we observe the outer surface of the bone still smooth and polished, although in such close apposition with the membrane for so long a period.

In the adult we seldom have so complete a death of the entire

shaft of a bone, and therefore cannot so readily measure the extent of the part acted on; and the deposition of new bone is uncertain and imperfect, still the absorbing granulations will spring from the living bone. We may remark the same kind of granulating mass filling up joints which have been extremely corroded by disease and in most carious bones. In necrosis of the bones of the skull we will also see evidence of absorption—first, the red line of demarcation gradually extends, granulations arise at the edges, and after a time we often observe a mass of granulation appear through the middle of the necrosed bone, which they must evidently have absorbed, so that at last only a ring of bone comes to be separated.

In compound comminuted fractures we at times find a dead portion of bone will gradually disappear without any evidence of its having escaped through the opening; hence we must conclude that it has disappeared by disintegration or absorption—that is, by having been acted on by the living parts.

As far as my observation goes the cases in which regeneration of bone from periosteum occurs in the human subject are very few; hence the anxiety of surgeons of the present day to scrape away and save periosteum are useless, if not injurious, for they interfere with the connexion of the periosteum and bone at the point of separation, and do not aid in the generation of new bone at the portion separated. I have often seen cases of necrosis of portions of the femur and tibia in adults, and no effusion of new bone to be observed.

In the bones of the fingers we have the same disease of acute necrosis as in acute paronychia, but it generally occurs in grown individuals; here the entire bone dies, the joints at both ends being destroyed. In these cases we never observe any new bone thrown out by the periosteum.

In necrosis of the bones of the forearm, after the removal of the sequestrum, we find that if new bone is found it generally grows from the epiphysary ends, not from periosteum, as a long conical projection, often not meeting in its centre, and after amputation and the operation of trepanning, new bone is thrown out, not by periosteum, but by the edge of the old bone. So that we find dead bone acted on and absorbed at times rapidly by granulations arising from a bony surface of epiphysis, but not by granulation of the lining membrane of new bone; and this activity of the ends so often converted from an absorbing action to the deposition of new bone.

When we find a mass of dead bone situated in either extremity of a long bone, as of tibia, we find the cavity lined by this velvety membrane, and here the bone may remain unaltered for years.

The most striking evidence of the absorption of dead bone is the following case, in which we find from the testimony of Dr. Deely, who attended the patient throughout, and the patient himself, that not even a splinter of bone was ever observed to pass through the opening; it was entirely either disintegrated or absorbed by these granulations. Thus the fact remains that the entire shaft of the femur disappeared without any external separation of bone, and that in this otherwise healthy boy a period of seven months sufficed for the completion of the process:—

T. L., aged sixteen, admitted into Steevens' Hospital, March 2, 1877, states that about eight months ago, while wading in a river after some fish, he was suddenly seized by severe pain in the left thigh, and had to be carried home. Limb greatly swollen and painful. After four days an opening was made which gave exit to a large quantity of dark pus; this discharge continued till about a month ago. There was no mark of any injury. On admission the left thigh was much enlarged through its entire extent, the enlargement evidently depending on the deposition of new bone, and the limb shorter than the right about $\frac{3}{4}$ inch. An opening is perceived about an inch or two above the joint, and is marked by a small cluster of granulations, with the skin around white and indented; through this a probe can be passed for 6 or 8 inches in an evidently bony canal, but no loose or dead bone can be felt. Thigh on right side measures $13\frac{1}{2}$ inches, on left $16\frac{1}{2}$. On standing the toes only reach the ground; in other respects is healthy. Ordered tonics and injections into the joint of dilute sulphuric acid; then a weak solution of salicylic acid, when the discharge gradually ceased and the opening closed. Never observed any pieces of bone to be discharged. After remaining closed for three or four weeks it again became inflamed when he left hospital.