INDIRECT BULLET-FRACTURES.

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Communicated by the Director-General of the Medical Department of the Navy.

In the *BRITISH MEDICAL JOURNAL* of January 23rd, there is an interesting paper on The Surgery of the Suakim Expedition, which was read by Mr. Tobin, before the Surgical Section of the Academy of Medicine in Ireland. In this paper, Mr. Tobin describes a case of unusual bone-injury by a bullet; namely, complete transverse fracture of the femur, two inches below the point struck by the bullet; and, since, he has also mentioned that similar bone-injuries are described in the medical and surgical history of the war of the Rebellion, and that, in the museum of Haslar hospital, there is a specimen of a like nature.

I have thought a complete account of this specimen worthy of publication; for, if I interpret its characters aright, it is most instructive as to the way in which these injuries are produced; and, while Mr. Tobin's and the American specimens represent conoidal bullet-injuries, this one descends from the round-bullet age. The following is the history of the specimen.

"J. B., aged 46, gunner's mate, was received on board the temporary hospital ship in Rangoon River, on March 12th, 1825, from Doahne, at the storming of which he was wounded, on March 7th, by receiving a musket-bullet on the outer part of the left thigh, about half way down. The ball entered in an oblique direction, downwards and inwards, and lodged. Some tension and pain of the thigh followed, with slight symptomatic fever, but no fracture could be discovered. He was treated on general principles; the limb was kept in the semibent position, and hot cataplasms were applied to the wound. Towards the end of the month, the discharge became sanious, and fetid and (pieces) of duck trousers, and small spiculae of bamboo were observed to come away with the dressings. On April 8th, the internal wound was enlarged upwards and downwards, to give free exit to a very copious discharge of fetid and ill-conditioned matter, and the probe readily came into contact with bone, which appeared to be denuded of its periosteum. About the middle of April, the discharge still increased, and seemed to be confined in sinuses near or around the os femoris, and between the sheaths of the muscles. The general health became considerably impaired, and continued to decline from this period. Hectic fever supervened, and he died in the first week of May. The femur was then removed, and examined, when a fissure was discovered extending from the inner condyle upwards, to within three inches of the trochanter minor. Accompanying the bone is the musket ball, which was cleft in two, and found lodged in sacs close to the bone."

The specimen is a left femur, exactly in the outer border of which, almost midway between the extremities, there is a small oval area of white smooth bone, surrounded by a groove of a worm-eaten appearance. This piece of necrosed and partially separated bone, which of course marks the spot where the bullet struck, measures three-fourths of an inch from above downwards, and three-eighths from before backwards.

About the middle of the outer surface, one inch above the place of impact, a fissure starts, which runs upwards, curving gently forwards for two inches, passes through the outer border, and across the anterior surface, until it touches the inner border. It then turns downwards, almost at a right angle, inclines backwards through the inner border, and then runs down close behind it, until it reaches the part where the bone begins to expand into its lower extremity. There the fissure turns backwards, and ends in the inner condylar division of the linea aspera, about five inches below the place of impact.

These are the more evident characters of the specimen, but, on closer examination, other interesting ones are seen. Thus part of the fissure has been closed in with new osseous matter, and part of it remains open; and these conditions are observed, respectively, when the fissure runs in the long and in the short axis of the bone. Again, from the upper end of the area of impact, a very minute fissure, which can scarcely be seen without a magnifying glass, runs upwards and inwards, in a somewhat zigzag manner, towards the large fissure, where that crosses the front of the bone. The minute fissure is most distinct where it crosses the bony texture, but is in places, when running parallel with it, invisible. The presence of this fissure I only discovered a few days ago. It is not described in the original history of the specimen, and, perhaps, only became apparent after long drying

of the bone. It is, however, as I shall afterwards point out, a most instructive characteristic.

The two pieces of the bullet, which accompanied the specimen, are of unequal sizes, one weighing 167, and the other 59, grains. They are both circular in outline, but, while the smaller is flat on both sides, the larger is flat on one side, and convex on the other. The bullet was, therefore, doubtless a small round one. It was divided on striking the outer border of the bone, and was probably fired at short range.

That the main fissure in this specimen is connected with the bullet-injury, and is not an example of that extremely rare fracture—simple fissure of a long bone from ordinary violence, is proved by the following considerations.

In the first place, there is no mention in the history of the patient of his having received any accident besides the bullet-wound; and the specimen has, from the first, been described in the catalogue of the museum as a "Fractured and Fissured Femur from Gunshot."

In the next place, the presence of the minute fissure, running from the place of impact of the bullet towards the large fissure, all but demonstrates the connection of the latter with the direct injury.

Now, the specimens to which I have referred, and that which I have just described, show that in the bones of the thigh and leg, when struck by bullets, there sometimes occur fractures, between which, and the injury produced by the direct impact of the missile, there is no visible connection, or only one or two fissures of little seeming importance; while, in the histories of the cases from which the specimens came, there is no record of accident besides the bullet-wound.

Of the existence then of these fractures, which, from their nature, are appropriately termed indirect bullet-fractures, there is no doubt; and, therefore, the manner of their production becomes an interesting and not unimportant question.

In the *Medical and Surgical History of the War of the Rebellion* (Surgical Vol., part third, p. 722), it is stated that "fractures of this nature are principally found in the long bones of the lower extremities, and are, probably, the result of the direct impact of a missile, at a high velocity, upon the bones, somewhat firmly fixed by the weight of the body." As far as is known, this is a correct statement of the conditions under which all these fractures have occurred, for it applies to Mr. Tobin's specimen, and, apparently, to the Haslar specimen also.

At any rate, under such conditions, it is evident how this bone-injury could arise. Thus, there being a strain on the bone at the time it suffers disruption of its integrity, by the violent stroke of the bullet, it yields at the place where the strain is sufficient to widen and extend some breach of structure which has been produced.

In most of the specimens of indirect bullet-fracture, fissures are seen to connect the direct with the indirect injury, but in some, this connection is not evident. I am fully persuaded, however, that visible or invisible, connecting fissures always exist; and the Haslar specimen is most valuable, as it exhibits an intermediate and very suggestive condition. I think it is also likely that, if the specimens in which the connecting fissures have not been observed were carefully examined, after having dried thoroughly, such fissures would be discovered. Yet, on the other hand, it is possible that bone, like iron, may, by violent vibration, have its power of resisting strains reduced, without at the same time exhibiting visible fracture.

I wish to add, further, in connection with the specimen in this museum which I have described, that it seems to show that fissures in long bones, which run in the long axis, have a greater tendency to heal than those which run in the short axis.

The knowledge of this difference in the proneness to heal between these two varieties of fissures, if it exists generally—and, for evident reasons, that is probable,—is important, in connection with the nature of rifle bullet-fractures, and, in the practice of military surgery, should strengthen endeavours to treat these injuries conservatively.

THE LATE DR. DIO LEWIS.—Telegrams from New York announce the death of Dr. Dio Lewis, a well known physician. Deceased was born at Auburn in 1823, was educated at Harvard Medical School, and began practice at Buffalo. He deprecated the use of drugs, and advocated the introduction of physical exercise as a part of public education. In 1863, Dr. Lewis settled in Boston, where he founded an institution for training teachers in his new system of physical education. He likewise established in Lexington a school for young women, in which all rules of government were abandoned. The buildings were, however, destroyed by fire in 1868, and, a year later, the whole project was abandoned. Dr. Lewis afterwards devoted himself to the advocacy of hygienic questions and temperance reform. He was the author, among other works, of *New Gymnastics*, 1862; *Weak Lungs, and how to make them Strong*, 1868; *Our Girls*, 1871; and *Chats with Young Women*, 1874.