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PART I.

ORIGINAL COMMUNICATIONS.

ART. XI.—*Fractures of the Ribs: an Examination of the Theory of Petit.*^a By EDWARD H. BENNETT, M.D., Univ. Dubl., F.R.C.S.I.; Surgeon to Sir P. Dun's Hospital; Professor of Surgery, Trinity College, Dublin.

THE subject of fracture of the ribs appears at first sight trite, and hardly likely to afford sufficient interest, or any novelty, to repay its study; but to this fact, I believe, are due the errors current in surgical writings with regard to it.

In spite of Malgaigne's criticism, the theory of Petit still remains accepted absolutely, and forms the basis of the descriptions in our text-books, in Erichsen, Gross, Poland, and a host of others. None seem to doubt its truth, or to remember that when Petit wrote his "*Maladies des Os*," in which the theory first saw light, his experience was not so great as to command an unhesitating belief in his views. Two things seem to have mainly rendered his theory so enduring—the simplicity of his classification (1. *Fracture en dedans*; 2. *Fracture en dehors*), and the plausible demonstration of its application on the isolated bone. Not only do the ideas of Petit rule the opinions on the pathology of these injuries, but from him is derived a faulty prognosis also. I shall return to this matter presently. His views are, I think, pretty clearly set forth in the following passages, which may be taken as representative of the

^a Read before the Dublin Biological Club, Tuesday, October 8, 1878.

teaching of our modern text-books. Professor Gross^a writes as follows:—"The ribs being firmly connected to the costal cartilages in front, and to the vertebræ behind, it is impossible for them to undergo any shortening when they are fractured, or for the ends of the fragments to overlap each other, as in fracture of the long bones. Derangement, however, may take place in almost any other direction, although the angular is by far the most common, and this may be either outwards or inwards, according to the manner in which the injury was inflicted, the latter being usually produced by direct violence, the former by indirect. It is seldom, however, that more than one end of the bone is displaced in this direction at the same time." It is hard to follow the author when he describes in the last passage the formation of angular displacement by a single fragment—the forming, in fact, of an angle by one line, right or curved.

Mr. Poland, in Holmes' "System of Surgery,"^b says:—"Here (in fractures occurring at a distance from the seat of injury, hence called indirect fractures) the ribs generally give way about their middle or most convex part, at a point intermediate between the two opposing forces, as, for instance, in those cases where the chest is squeezed against a wall or a post, or where the wheel of a cart or vehicle passes over the chest; in such fractures three or more ribs are involved, and the fractured ends are often driven outwards."

Both these descriptions are almost paraphrases of Petit's,^c so that to quote his at length would be simply tedious. I shall endeavour to prove that the views they contain as to fractures from indirect violence are far from being correct. With the opinion that a direct blow may break a rib or ribs where it strikes, and that such force tends, if continued, to drive the fragments inwards, no one can hesitate to agree. I maintain that the pretty illustration of a rib breaking as an over-bent bow, when we grasp its ends and press them together, conveys a false idea of the mode of occurrence of indirect fractures in the great majority of injuries of the living thorax.

Many fractures of the ribs are observed in practice from indirect forces such as are described in the passages I have quoted, but it is familiar to every practical surgeon, I believe, that nothing is more difficult than to localise the seat of fracture exactly by any visible

^a System of Surgery. Vol. II., p. 163.

^b Vol. II., p. 555.

^c *Maladies des Os.* T. II., p. 75.

or palpable deformity of the kind that must exist if angular deformity, salient outwards, is the normal character of these injuries. Again, in extreme injuries of this class we should expect, in some rare instance at least, to find a fragment pierce the skin covering the chest, but no record of this complication exists. Compound fractures of the rib, compound by skin wound, are stated to be observed only as the result of gunshot or similar wounds. In extreme injuries, on the contrary, laceration of the lung is frequently seen, laceration by the broken fragments of rib, in spite of the theory, passing into the chest.

Petit indeed holds, in discussing the question of prognosis, which forces itself on me here, that the fracture from direct violence is the more dangerous of the two forms. "*Celle qui se fait en-dedans, est plus fâcheuse que celle qui se fait en-dehors.*" He says "that those which give great pain with difficulty of breathing, those which prick the intercostal nerves, or wound their accompanying vessels, are the most dangerous." But I believe that this most fatal group includes most of the accidents resulting from crushing of the chest wall—buffer injuries and the like, where fracture from indirect violence takes place.

In the following passage Mr. Erichsen^a goes further than Petit in stating his doctrine with regard to the second group:—"The fracture occurs from indirect violence, the fore part of the chest being forcibly compressed, so that the rib is bent outwards, and thus snaps. When the injury is the result of direct violence, and the broken fragments are forced in, the pleura, lung, liver, or diaphragm may be wounded, thus giving rise to the most serious fatal consequences, such as hæmorrhage, emphysema, and inflammation of the parts injured. When it is occasioned by indirect violence, as the fracture takes place in a direction outwards, the thoracic organs may be contused and thus injured, but they are not liable to be punctured by the fragments." Here we have the hobby ridden hard with a vengeance. Petit, while making the rib break in bending as a bow overstrung, still leaves himself a way of escape from the strict limit imposed by his theory in describing his unnumbered class "*les plus dangereuses.*" Mr. Erichsen has no such loophole in adopting the extreme view that indirect force can act in one direction only on the chest wall, and that the broken fragments cannot wound the lung.

By the examination of a large collection of fractures of the ribs

^a Science and Art of Surgery. Vol. I., p. 310.

we should be able to test these statements. If fractures from indirect violence are the least fatal group, specimens obtained without any thought of selection must be, many of them, of this class.

I have already stated my opinion that angular projection of a fractured rib is a rare clinical phenomenon—one that I have never seen. The collection of fractures of the rib in the Pathological Museum of Trinity College, formed without selection, obtained, many of them, by myself during *post mortem* examinations and in ordinary anatomical dissection, number, exclusive of cases of fragilitas ossium, seventy. Some are recent specimens, the result of fatal injuries; the great majority are united fractures. In this series not a single instance of angular deformity salient outwards is to be found.

There are in many specimens irregularities of the external surface of the rib, caused by overlapping, in some cases of the vertebral, in others of the sternal fragment; but no matter which overlaps, the result is the same. If the curve is altered, it is so changed that a slight bowing inward, or rather flattening of the normal curve is established, with perhaps a change in the even course of the spiral twist of the rib; or again, the fragments are united, so as to encroach on the upper or lower intercostal space. Fractures may be seen in the collection involving the head or neck of the rib, or any point from these to the anterior extremity. Do fractures of the head or neck of the rib occur from direct or indirect injury? Certainly from indirect. But to meet the theoretical views, indirect fractures must take place at the angle or centre of the rib.

Malgaigne^a makes no concealment of his opinion of Petit's theory of displacement. He says:—"Tout cela est de pure théorie, et ne saurait tenir devant l'examen des faits." Of the theory that fractures from indirect force must be seated near the centre or angle of the rib, he disposes by the observation that when the force is applied on the sternum in experiment on the dead body, the fractures take place always in front, closer to the sternum than to the centre of the rib; again, that in many such cases, notably in seven, observed in 1837, where the injuries were fatal, the seat of fracture was in front, from two to seven millimetres outside the cartilages; and again, he notices a recorded case in which the mode of application of the force was reversed, the accident happening by a horse and cart passing over the back of a man lying flat on his

^a Traité des Fractures. T. I., p. 432.

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face. Here the lower ribs broke close to, or at, the cartilages, the upper near the spine. I have already noticed that our collection contains illustrations of fracture, the result of indirect cause, of the various parts of the rib posterior to the angle, even back to the head itself. We have verification of the truth of the observation of Malgaigne in several recent fractures close to the cartilages, in injuries which have killed by pressure applied directly on the sternum. It now remains for me to notice a form of injury of which our collection contains sufficient examples, some of which I submit.

I direct attention to these specimens, as their characters, I think, afford unmistakable evidence of their being instances of fracture from indirect force—while, if this be admitted, they prove, contrary to the opinion of Petit, that displacement inwards may, and does, occur as the result of this mode of fracture. The two first specimens themselves, perhaps rare and special, enable us, I think, to interpret rightly a large group akin to them, being, like them, fractures from indirect injury, yet tending in displacement inwards. I have already stated that our collection does not contain a single specimen which agrees with the theory of Petit. In the first of these specimens (Figs. 1, 2) a fracture has occurred at a very common, perhaps the commonest, seat, just in front of the angle of the rib, and has been but recently and incompletely united; so recent and incomplete is the union that neither the callus nor the effects of absorption have masked the details of the recent injury, while it is by the very callus sealed, as it were, by nature as a *bonâ fide* specimen. The second (Fig. 3) is like it, but differs from it in being older, less easily interpreted, and in the fact that the splinter of bone which in No. 1, by its resistance, gave the fracture the features of an impacted fracture, in this has sprung from the inner surface of the rib, and projects inwards, with lines limiting its extent which are rudely parallel to those which define the end of the sternal fragment. In these two specimens we see a splinter of very definite form detached from the pleural face of the rib, limited by V-shaped margins, and beyond any doubt part of, and the direct result of, a fracture caused by a thrust in the axis of the anterior segment of the rib, suddenly interrupted by its curve at the angle—such a force as acted from before, backwards, and along the rib.

These bones are broken but once on the external table, and the splinters of the inner table could have resulted from no other accident but that which broke the outer. The exceptional character

of these specimens is attested by the following passage which I may quote from Malgaigne:—"Je ne parle pas des fractures comminutives ou compliquées d'esquilles; il s'en rencontre fréquemment quand la côte est fracturée par un coup de feu, mais, à mon grand étonnement, je n'en ai pas trouvé un seul exemple dans les fractures produites par les causes ordinaires; et sur le cadavre je n'ai pas pu en produire."

In the specimens I submit the occurrence of splintering of the bone, and the cause of the splintering—a force acting after the occurrence of the first fracture and in the same direction as it—are incontestable. Anyone familiar with the comminuted and impacted fractures of the long bones will see in these comparatively trivial instances a repetition—rare perhaps, but not the least distinct—of the familiar phenomena—forms of fracture which such an inquirer would *à priori* expect to find. Can we, then, be surprised at the words of Malgaigne, "à mon grand étonnement," when he failed to find them?

I have stated above that our collection contains a group of specimens akin to those of which I have given the leading characters, but varying from them in being double or treble fractures of the body of the rib, and in the wide distances of the fractures, which involve great portions of the body in some instances; still a family likeness connects the series which justifies my placing them together as injuries resulting from the same cause. These specimens number five; adding the preceding two we get the proportion of injuries from indirect force acting in this particular mode, one in ten of the entire collection.

In each of these five specimens the fractures occur in front of the angle. Traces of impaction at one fracture at least can be seen in each. In 19, three complete fractures, each defined by **V**-shaped extremities projecting towards the pleural side of the bone, have occurred; two, an inch asunder, just in front of the angle; the third three inches nearer the sternum; the hindermost of these injuries shows marked traces of impaction of the vertebral into the sternal fragment. No. 32*a* has two fractures terminated by less regular lines, **V**-shaped, pointed to the spine and placed close to each other near the centre of the body of the rib. Here, again, in both fractures can be seen traces of impaction of the vertebral fragments. No. 32*b* presents three fractures near the sternal end of the bone, the shape of the posterior alone well defined, **V**-shaped,

projecting on the pleural surface, with a marked impaction similar to the preceding at the posterior fracture. 32b and 29 are double fractures; in each the injuries are close together within three inches of the sternal end; in these the signs of impaction are trivial, and the vertebral fragments are marked off more clearly than the sternal, but the general features are like the three preceding, clearly the result of pressure in the axis of the rib. I might perhaps add to this list from the series, but I take only such examples as leave no doubt on my own mind as having been clearly fractures from indirect injury attended with penetration of one or other fragment into the opposing one. I have casually referred to fractures of the neck and head of a rib of which we cannot doubt that the cause was indirect force, of which we possess several specimens, but I purposely avoid their details at present, as they do not in themselves afford evidence such as appears in the sections of the specimens of fracture in front of the angle I have examined. I may merely state that in every one of these specimens where any displacement occurs it encroaches on the chest cavity.

I believe, then, that I may indorse the statement of Malgaigne that Petit's theory will not stand when brought face to face with facts. I am fortunate in being able to supply the material for filling the gap in the range of ordinary fracture phenomena which Malgaigne has picked, by showing that impaction, with splintering as its result, may occur here as in fractures of other long bones.

ART. XII.—*Notes on Molluscum Sebaceum*. By WALTER G. SMITH, M.D., F.K.Q.C.P.I.; Assistant-Physician to the Adelaide Hospital.

IN the instructive Lectures on Clinical Surgery, Vol. I., Part I., recently published by Mr. Jonathan Hutchinson, the first lecture is devoted to the subject of *Molluscum Contagiosum* (*seu* *Sebaceum*). After noticing the curious fact that although the disease has been long and well known in England, yet it is only within the last few years that cases have been described either in France or Germany, where indeed they have been spoken of as interesting rarities, he remarks:—"It would not be without interest to collect further data as to the geographical distribution of contagious molluscum. It seems to be common in Scotland, if we may judge by the