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SOME EXPERIMENTS ON FRACTURE OF THE RADIUS:—A CASE OF RUPTURE OF THE QUADRICEPS EXTENSOR FEMORIS.

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BY breaking the radius of a dead subject just above the wrist (Colles's fracture) the forearm at once falls inward on the carpus, and the end and styloid process of the ulna are displaced to the ulnar side; thus demonstrating that this particular deformity, usually observed in Colles's fracture, is not the result of muscular action, but is merely owing to the giving way of the radius, the only connecting bond between the forearm and hand—since the ulna does not enter into the articulation of the wrist. The antero-posterior displacement, usually so marked, is undoubtedly due, however, to muscular action. Abducting the hand forcibly to the ulnar side does not reduce the lateral deformity; and we venture to think that better results will be got where the arm is treated in a straight position—midway, of course, between pronation and supination—and the fingers either left free, or, if confined at all, bent over a Bond's splint. Certainly the semi-prone position will counteract to some degree the influence of the *pronator quadratus*, which draws the upper fragment towards the ulna; and it must not be forgotten that the *supinator brevis*, the natural antagonist of the *pronator radii teres*, is untouched, and still acting normally on the upper fragment; and also that the *biceps*, from its insertion into the tubercle of the radius, assists very considerably in supination. The action of the *supinator longus*, from its insertion into the lower fragment at the styloid process of the radius, is more difficult to control; but extension and reduction of the parts by direct pressure, followed by moderate pressure with pad and bandage over the belly of this broad muscle on its anterior surface, will control it nearly as well as the position of the hand in the pistol-shaped splint; while in the latter position we stretch unnaturally, and often

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painfully, the ligaments of the wrist, and have sometimes the result of either stiffness, or considerable loss of power in the articulation. Pads or compresses of moderate size and hardness are of course proper to keep the fragments in place. But it must be remembered that next to the danger of deformity from non-reduction, or non-apposition of the fractured bone, is the equally serious danger of stiff and immovable fingers from inflammation of the tendons. As the risk of producing effusion and callus among the flexor tendons is much increased by strong pressure, better use may be obtained—

1st, by bandaging not too tightly, after restoring the fragments into place by pressure and extension.

2d, by leaving the fingers free, and by the early use of passive motion.

We have been struck, in dispensary practice, with the fact, that neglected fractures of the radius often get better use of the fingers, though at the expense of some deformity, than those which have been tightly imprisoned in a Goodwin's splint. The true aim seems to be to apply just enough restraint to keep the parts in position, without increasing or originating inflammatory effusion among the tendons of the flexor or extensor muscles—though trouble in the former is by far the most frequent. We are aware that much of this is in accordance with the treatment laid down by Hamilton. Certainly the tendency has been to regard *all* the deformity following this fracture as caused by muscular action, and to endeavor to control the *pronator quadratus* by firm pressure with hard pads, and even to attempt to pry apart the radius and ulna by a ridge on the palmar splint. As Hamilton well says, this is the expedient of a mechanic rather than a surgeon.

Similar experiments on the dead subject also proved, that in a very oblique fracture of the radius we may get rotation of the head of the bone under the outer condyle, even though the fracture be complete. This results, probably, from the lower fragment pressing against and turning the upper with itself; while, at the same time, much displacement is prevented by the lateral apposition of the fractured surfaces. Rotation of the head of the radius, at best an obscure sign, is not, therefore, always a diagnostic mark that the bone is unbroken. Partial fracture, the separation of the inner articular surface of the radio-carpal articulation, or a stellate fracture of the same, may also exist, and confuse the diagnosis, if we rely upon rotation. We have seen two instances of these obscure injuries during the past year—where there was no deformity, no displacement, and no crepitus, but where pressure over the expanded articular extremity of the radius produced severe and constant pain—where the arm and hand were helpless, and the recovery was measured by weeks. These cases followed falls, and there was no swelling of the wrist, as in a sprain. For obvious reasons, such cases can scarcely ever be verified by an autopsy.

Rupture of the Tendon of the Quadriceps Extensor Femoris.

Mr. —, 75 years of age, quite fleshy, fell upon some stone steps, and was unable to rise. When first seen, the left leg was flexed at the knee, and he could not extend it. The patella was in place and entire. A hollow was manifest just above the patella, about two inches in length, bounded by a firm muscular projection above. The fingers could plainly feel the articular surface of the condyles of the femur, when placed at the bottom of the depression. There was no pain, and the limb could be flexed or extended without any complaint. He was placed on his back, with the limb straight, and elevated about twenty-five degrees on a firm splint. The second day there was considerable serous effusion about the seat of injury, and a little tenderness. On the third day a blush of inflammation over the knee; no pain; tenderness the same. During a few days the effusion gradually shrunk and solidified. At the end of a week it was quite firm to the touch, and very little sensitive. There was some swelling. No pain during the whole treatment, except from irksomeness of position, or accidental pressure. The thigh was not compressed by a bandage, because it was thought that the retarding of the circulation in an old person might do more harm to the processes of repair than the partial pulling down of the retracted muscle could do good.

The process of union followed very exactly the course and results of Paget's experiments on the divided tendo achillis of rabbits. The health and constitution of the patient were excellent for his years.

At the end of a fortnight the limb was put in a starched bandage, with a ham splint, from the ankle to midway up the thigh, and laid down on the bed. At the end of three weeks he was allowed to sit up. In four weeks he used crutches freely. In six weeks he walked with a cane, and went down stairs. The bandage was gradually cut away, and entirely removed in seven weeks. In eight weeks he was in the street, and could walk without a cane, though cautioned not to do so. The swelling above the patella had settled down into a firm, insensible band, about two inches broad, and the leg could be firmly extended, and about one third flexed. The motion of the joint was free, and he was warned not to flex it suddenly.

The case is interesting on account of its comparative rarity, ruptures of other tendons and muscles being much more frequent, and also for the good result obtained by a patient so old and fleshy. There was only one bruise apparent after the injury. This was about two inches below the patella, on the fleshy mass of the anterior tibial muscle. It would seem probable that the patient fell with the leg flexed, and struck on this surface, and that the extensor muscles of the thigh, being affected with fatty degeneration, gave way at their junction with the tendon—where, Paget says, the rupture always occurs—and the patella was thus saved from fracture.