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*BACKWARD*

# Dislocation of the Fingers upon The Metacarpus.

BY

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OF BOSTON.

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# BACKWARD DISLOCATION OF THE FINGERS UPON THE METACARPUS.[1]

BY E. O. OTIS, M.D., OF BOSTON.

Two cases of backward dislocation of the index finger upon the metacarpal bone give me the text of my subject. One refused to allow a proper attempt at reduction on account of the pain, was unwilling to take ether, and can be speedily dismissed.

The other, a student, was practising jumping for an athletic tournament, and fell upon his hand, with fingers extended. He and his companions noticed at once the deformity, and tried to pull the finger into place. Failing in this, he appeared with his friends at my office. I attempted, by the "Crosby Method" — to be described later, and which was first brought to my notice several years ago by Dr. William Ingalls — to reduce it. Not succeeding, I gave him ether and renewed my attempts, but unsuccessfully. I then rested a while, long enough to have made a Levis's apparatus, which, when applied, gives one an artificially lengthened finger by which greater force can be used in extension. Then, again administering ether, I made a careful and prolonged attempt to reduce the luxation. Several times I thought this was accomplished, but the joint, being left to itself, the dislocation always recurred. Finally, I desisted, and allowed the boy to come out of ether. I then told him that the only thing to be done was an operation; an incision of some ligament or ligaments, having a very vague idea myself of exactly what was to be done.

[1] Read at the meeting of the Boston Society for Medical Observation, May 3d, 1886.

His home being not far distant, I advised him to see his parents and family physician and explain to them what I desired to do, and obtain their consent. He went home, and I did not see him again for some weeks. His finger then did not seem to be in place, nor had it regained its original freedom of motion, although he told me his family physician had performed some sort of an operation. This is the last I saw of him, and the ultimate result I do not know. The case, however, left a very vivid impression upon my mind of the possible difficulties in the reduction of a dislocated finger, quite different from that one would obtain from Keetley's single sentence upon the subject: "Dislocation of fingers," he says, "are not common, and may be reduced by extension."

Since, as Billroth says in discussing dislocations, "Everything depends on correct anatomical knowledge," I shall first consider the *Anatomy of the Metacarpo phalangeal* joint, next the *pathology* of the injury, and finally, the *treatment*, based upon the previous considerations. I shall, moreover, refer often to dislocations of the thumb in considering those of the fingers, for the two injuries are anatomically and pathologically in many respects quite alike. I shall make frequent reference to Jalaguier's recent and admirable article on the subject in the *Archives Générales de Médecine* for February, 1886.

The metacarpo-phalangeal joint is an enarthrodial one (Tillaux), characterized by the reception of a head into a cavity, the cavity being much smaller than the head which it contains. The size of the cavity, however, is much increased by the anterior or glenoid (Cruveilhier) ligament. This ligament is thick, dense and fibro-cartilaginous in texture; placed on the palmar surface of the joint, inseparably connected with the phalanx where it is thick and strong, but only

loosely united to the neck of the metacarpal bone where it is thin and delicate (x Fig. I. Schüller.)

Fig. I.

The glenoid ligaments of the index and middle fingers sometimes contain a sesamoid bone. Constantly, in the index finger, according to M.M. Jalaguier and Polaillon, while two always exist in that of the thumb. There are two powerful lateral ligaments united one with another by the glenoid, and forming thus a continuous band from side to side. The glenoid ligaments are connected one with another by the transverse ligament of the metacarpal bone, which is a narrow fibrous band. The extensor tendon takes the place of a dorsal or posterior ligament according to Gray. Kelly,[2] however, says, with reference to the thumb, that the posterior ligament is a strong, independent structure, perfectly distinct from the dorsal tendons and their expansions, from which it is separated by a bursa.

The mechanism of flexion and extension is as follows, after Jalaguier: In flexion the phalanx glides over the head of the metacarpal bone through an arc of ninety degrees. The glenoid ligament is relaxed as well as the fibres of the lateral ligaments which are attached to its sides, while the phalangeal part of the latter ligaments, on the contrary, is put upon the stretch, and limits the movement of flexion.

In extension the phalanx glides from before backwards upon the head of the metacarpal bone, which, in extreme extension, almost entirely corresponds to the glenoid ligament, which becomes more and more stretched along with the glenoid fibres of the lateral

[2] Notes on Dislocations of the Thumb, reprinted from Dublin Journal of Medical Sciences, May, 1883.

ligaments. The tendon of the flexors and transverse ligament also contribute to limit extension.

If now extension is exaggerated violently, a rupture is produced at the weakest point, which is at the metacarpal attachment of the glenoid ligament (x Fig. I). In a hundred trials upon the corresponding joint in the thumb, M. Farabeuf found that the phalangeal insertion of this ligament was not once ruptured. Schüller[3] also says, in reference to the same joint, that the palmar capsule, as he calls this ligament, regularly ruptures at its metacarpal insertion in backward dislocations. In my limited experiments upon the cadaver (through the kindness of Professor Dwight and of Drs. Newell and Conant) the glenoid ligament was always ruptured at its metacarpal attachment in case of the fingers. With the thumb, however, the sesamoid bones seemed to make a difference, and in the few experiments tried, the ligament was ruptured nearer its centre, once directly through the sesamoid bones.

It is upon this pathological fact — the rupture of the glenoid ligament and its place of rupture — that all procedures for reduction must be based, and from ignorance of it that all the trouble from wrong procedures has arisen, just as in the case of the hip joint before Bigelow discovered the part played by the Y ligament. Indeed, there is quite a striking analogy in the case of the two joints in the matter of ignorance of the exact cause of the dislocation, and consequently of wrong procedures in the reduction. In attempts to reduce the hip by extension alone, the femur has been fractured, and irreparable injury done. In attempts to reduce the first phalanx by extension alone, it has been torn off, according to Hey.

The glenoid ligament, being ruptured then at the point named, the head of the metacarpal bone escapes

[3] Chirurgische Anatomie, part I, 1885.

through the rent, and the phalanx, with the torn ligament hanging to it, ascends the dorsum of the metacarpal bone. At the same time, also, the anterior fibres of the lateral ligament are torn, though Schüller says these are not necessarily ruptured. In my own experiments, it seemed necessary that these ligaments should be more or less ruptured in order that the head of the metacarpal bone should escape entirely through the rent

Having, then, a complete dislocation, the disposition of the parts is as follows for the index finger, according to Jalaguier. The phalanx rests by the anterior part of its articular face, upon the neck or dorsal surface of the metacarpal bone (Fig. II). It is held there by the flexor tendon deviated within, by the extensor tendon, which raises the skin, and by the remnants of the lateral ligaments. The glenoid ligament, which has followed the phalanx, is in contact with the head and dorsal surface of the metacarpal bone (Fig. II). Its palmar surface has become dorsal, and corresponds to the anterior face of the dislocated phalanx, with which it forms an angle with its apex above; open if one apply dorsal flexion, and closed by palmar flexion. Its articular face rests upon the neck, or even upon the dorsum of the metacarpal bone (Fig. II).

FIG. II.

Such being the disposition, the glenoid ligament must be brought into its place, and this can only be done by using the phalanx as a lever, and pushing before it the ligament which followed it in the act of dislocation.

The technique of the procedure is as follows: Carry back the phalanx in forced extension, keeping its base

closely applied to the dorsum of the metacarpal bone. Then slide its articular surface upon the dorsum of the firmly-fixed metacarpal bone until it reaches the head of the latter, and finally flex the phalanx, when reduction ensues. All attempts at extension in a straight or flexed position, although they may be followed with success, offer the risk of making the dislocation irreducible, and are based upon a wrong conception of the part played by the glenoid ligament.

This is called the Roser or dorsal-flexion method, and also in this country, the Crosby method. Dr. Cutter quotes Dr. Crosby as saying in his lectures — "that he had never failed in the few cases which had occurred in his practice, although, in several instances, all other methods usually adopted had been tried without effect." Dr. Cutter, in the *Boston Medical and Surgical Journal* for 1857, Vol. XVII, p. 172, gives so admirably his procedure with this method, in case of the thumb, that I will reproduce it here: — "I placed the patient," he says, "in a common chair, and took a seat in another at his side, both of us facing the same way. An assistant sat behind us to hold the patient's elbow fixed. I then took hold of the metacarpal bone with my right hand, my forefinger passing between his thumb and forefinger, and my thumb resting on the top of the metacarpal bone, with the end touching the dislocated end of the phalanx. With my left hand I tipped the phalanx back until it stood perpendicularly on the metacarpal bone; then pressing the phalanx forward by the end of my right thumb, it was readily carried by flexion into place, and the joint restored to its natural condition. The manipulation was performed in a twentieth part of the time taken to describe it."

If the method of dorsal flexion, when carefully and thoroughly applied, does not succeed, the indication is that the dislocation is a *complex* one, as Jalaguier terms

it. This condition is generally, if not always, induced by improper manipulation, namely, by first flexing the phalanx, and then making traction upon it.

This procedure has a tendency to raise the phalangeal border of the glenoid ligament, instead of pushing the whole ligament towards the extremity of the metacarpal bone. The ligament then becomes completely reversed, its palmar surface resting upon the metacarpal bone, and its articular surface looking upward and towards the phalanx. It is interposed between the articular surfaces, and is spread out over the dorsum of the metacarpal bone, extending about a centimeter backwards from its phalangeal attachment (Figs. III and IV), thus forming an insuperable obstacle to the reduction of the dislocation. Ranke,[4] quoted by Jalaguier, opened the joint on the palmar surface in an irreducible dislocation of the index finger, and also of the thumb, and in both cases, found the glenoid ligament interposed between the two articular surfaces. The two sesamoid bones in the glenoid ligament of the thumb, and the single one in that of the index finger, when it exists, offer an additional impediment to the reduction, says Tillaux, as one would suppose. Schüller, says, with reference to the thumb, that it has been made perfectly clear that the difficulty in re-position most frequently depends upon the interposition of the capsule, as he calls the glenoid ligament. Far more seldom, he continues, upon the interposition of the tendon of the long flexor, or upon the incarceration of the head of the metacarpal bone between the muscles inserted upon the phalanx

FIG. III.

[4] Berliner Klinische Wochenschrift, 1877.

(flexor brevis pollicis). Lawrie, quoted by Kelly, also says that the interposition between the bones of the passive anterior wall of the articular fossa (which is practically the glenoid ligament) is the cardinal difficulty in reduction.

Numerous are the anatomical reasons which have been given to explain this difficulty of reduction. In the "Encyclopædia of Surgery" (Vol. III, p. 679), it is ascribed to the imprisonment of the phalanx by the lateral ligaments. In Holmes's "System of Surgery," the author, upon the subject, states that the majority of writers have agreed that the flexor brevis pollicis is in

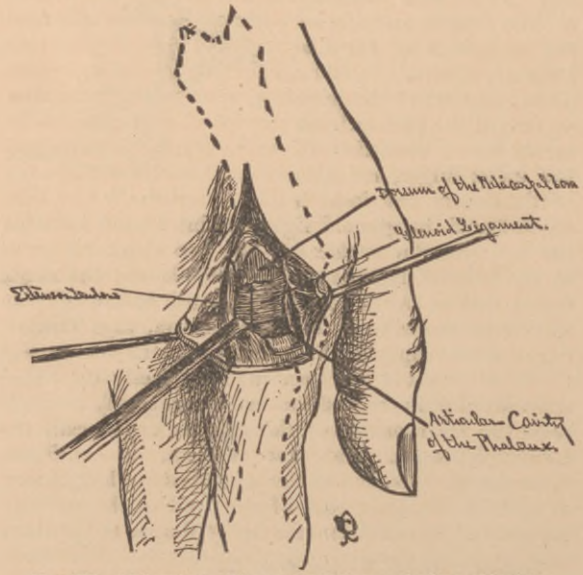


FIG. IV. (Jalaguier). The arrow indicates the line of incision.

some way the chief obstacle to reduction in case of the thumb. Hyrtl says that the head of the metacarpal bone is encircled by the two heads of the short flexors of the thumb as in a tightly-locked vise. Hamilton gives the reasons of many other authors.

In a complex dislocation, then, when the glenoid ligament is reversed and interposed between the two articular surfaces — a condition which is rarely primary, but due to traction made upon the flexed phalanx — what is to be done? The only chance of success, and that a small one, is an attempt to disengage the glenoid ligament, and change the dislocation from a complex to a simple one.

To accomplish this, the same method of dorsal flexion is to be used to an extreme degree. The phalanx must be carried, if possible, beyond and behind the torn metacarpal border of the glenoid ligament, and so establish the immediate contact between the articular surface of the phalanx and the dorsal face of the metacarpal bone; then the phalanx can be carried forward, pushing the ligament before it, and finally flexed.

If this does not succeed, then the patient must submit to the inconvenience of a dislocated joint all his life, or recourse must be had to surgical interference. To apply extreme extension by means of such arrangements as the Levis apparatus, Indian puzzle, or the clove-hitch seems to me to be hazardous and irrational. Surgical interference being determined upon — as it should always be when the luxation is irreducible — what should it be, and how executed?

Numerous operations have been devised and done. Resection; section of one or both of the heads of the flexor brevis muscle, in case of the thumb; or of one or both of the lateral ligaments; or section of both muscle and ligaments; and finally, by M.M. Farabeuf and Jalaguier, dorsal subcutaneous section of the gle-

noid ligament, a method which they declare is both simple and absolutely efficacious. This can be done either subcutaneously or by open wound; the former would naturally be chosen.

The only instrument required for this operation, M. Jalaguier says, is a strong tenotome, with a short blade and a rather blunt point. The landmarks for the index finger are the posterior border of the glenoid cavity of the phalanx, which can be easily felt on the dorsum of the hand, and the extensor tendon. One must also determine the exact situation of the dorsal face of the metacarpal bone in its relation to the phalanx, to see whether or no the two bones are in the same axis as they should be, in order that the middle of the glenoid ligament may lie upon the middle of the dorsal face of the metacarpal bone. In order to favor this, M. Jalaguier suggests that the phalanx be brought back upon the dorsal face of the metacarpal bone. In my experiments with the operation, I found that the exact position, antero-posteriorly, of the phalanx did not make so much difference, but the two bones must be in the same axis; perhaps the best position of the phalanx is that of an obtuse or nearly right angle with the metacarpal bone. An assistant should hold the finger firmly, and making traction upon it, M. Jalaguier says, which did not seem to me to be necessary. In the thumb, and when a sesamoid bone exists in the index finger, it must be avoided. The tenotome is to be entered about two centimeters behind the base of the phalanx, and immediately outside of the extensor tendon.

Being kept flat upon the dorsum of the hand, the knife is glided under the integument until the articular surface of the phalanx is reached. Then the handle of the knife is raised so as to lower the point, and bearing hard down upon the dorsum of the metacarpal

bone, the section of the glenoid ligament is made by withdrawing the knife about a centimeter (Fig. IV). In my trials, I did not always find it necessary to incise the whole extent of the ligament, but sometimes a small incision upon its torn edge seemed to be all sufficient to allow the head of the metacarpal bone to slip back into place. If the reduction does not immediately and easily follow, the knife can be entered again and the operation repeated, for perhaps some portion of the glenoid ligament escaped incision in the former attempt.

It is hardly necessary to say that antiseptic precautions should be used. The finger should be fixed in flexion upon a tampon or wad of some light material placed in the palm of the hand. This, then, is the simple and successful method of operation in irreducible dislocations of the fingers, as proposed and executed by M.M. Farabeuf and Jalaguier, the latter of whom says in recapitulation, that, given a *complex* backward metacarpo-phalangeal dislocation of the thumb, or any one of the four fingers, attempt at first to reduce it by dorsal flexion. In case of failure, do not hesitate to use the bistoury to divide the obstacle. It is irrational to attack the muscles and lateral ligaments whose preservation is precious. The incision of the glenoid ligament made on the palmar surface is difficult and dangerous. The simplest and surest method is to cut this fibrous band on the dorsal face, subcutaneously.

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