

OPEN REDUCTION AND OSTEOSYNTHESIS OF THE SO-CALLED BENNETT'S FRACTURE IN THE CARPO-METACARPAL JOINT OF THE THUMB

By

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Bennett's fracture is the type of fracture involving the basal intra-articular part of the first metacarpal bone, in which more or less of the volar joint surface is displaced. Usually there is a radio-dorsal subluxation of the joint, so that it is called "Bennett's fracture-dislocation". The name Bennett's-fracture should be reserved for that described by Bennett and not applied to other fractures of the metacarpal bone of the thumb.

It is worth pointing out that while fracture through the joint surface may be present without simultaneous subluxation the opposite extreme is also possible, so that a fracture with a tiny fragment may show marked subluxation or even total dislocation.

Bennett in one of his reports on this fracture (1886) described lines for treatment. He recommended manual reposition of the fracture, with application of a splint with an extension bandage for a sufficiently long time for union. With recent appreciation of the difficulties both in the reduction of this fracture and in the maintenance of the proper position, it is not surprising that the result of this treatment was not always favourable. Therefore, since anatomical restitution of the joint was so uncertain, surgeons advised short and if possible simple immobilization (Bardenheuer, Beatson, Grashey, Matti among others and most recently Blum 1941). Even if cases are found, which, after such treatment of the injury, regain good function, such a result is uncommon. This is shown by the great number of published operative methods which are directed at treatment of the post-traumatic disablement in the form of greatly decreased grasping power and pain. Considered practically, these conditions may in themselves lead to a disability which means a correspondingly total loss of the use of the

thumb (Spotoft). It may perhaps be compared with the high degree of disability involved with a fracture of the femur which has healed in a bad position. A series of methods for manual reposition with subsequent fixation of the fragments in abduction-extension position have been published. Even complicated bandages (Robinson) and special stretching apparatus have been constructed (Bonino, Goldberg).

Fairly generally used is the method of treatment which was published in 1929 by Ehalt from Böhler's clinic and which has become universally known under Böhler's name. This method is described in a number of fracture handbooks and consists of a reposition of the fragment through abduction, extension and ulnar pressure on the base of the metacarpal. Retention is maintained by traction on a wire through the terminal phalanx of the thumb. Even with this method it is evident that exact replacement is often very difficult. Reposition is impossible in certain cases, as some authors have stated (Bunnell among others). Extension, in such cases, is not entirely without the risks of necrosis and infection. This has led Böhler to condemn the use of wire traction in a new edition of his textbook.

In trying to obtain more physiological traction and free the outer part of the thumb, Felsenreich, Thomsen, Bunnell and Scheidt have modified Böhler's method by placing the attachment for extension more proximally in the form of a Kirschner wire through the thumb's basal phalanx or metacarpal.

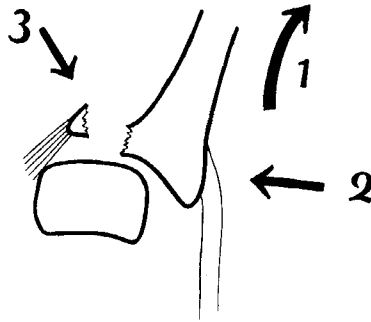
Operative reduction is also described. Already in 1913 Lambotte performed open reduction and fixed the small fragment with a pin. Ellis (1946) fixed the metacarpal to the greater multangular by inserting a screw in the latter bone and Johnsson (1944), after replacement, fixed the first metacarpal to the second with a Kirschner wire. Wagner presented (1950, 1951) a new method. After reposition, new subluxation of the metacarpal was prevented by boring a Kirschner wire through the base of the metacarpal and into the greater multangular. The wire was removed after union of the fracture. He produced thus a temporary arthrodesis apparently without harm to the future function of the joint. The method could, if necessary, be supplemented by open reduction with introduction of the pin under edirect vision. The treatment was completed by a plaster bandage. The results reported were good in most of the 38 cases. However, the author himself reported that in part of the cases full reposition could not be maintained. The method is simple and the results appear to be superior to those obtained with other earlier methods.

The operative intervention in this type of fracture usually deals

not with fresh fracture but with the resulting disability. In aiming at adjusting the position of the subluxation Aulhorn (1905), Weizel (1931), Pettrignani (1932) attempted capsulorrhaphy from the dorsal side of the joint. Michele, Skinner and Kreuger (1950) presented a method with strengthening of the joints dorsal structure with fascia lata. Lenggenghager (1937) as well as Stamm (1939) and Wink (1936) joined the metacarpal with the greater multangular by a coarse silk suture with the same intention. Pattersson (1933) removed the joint capsule, callus and bone fragment and placed fascia lata material around the base of the metacarpal to obtain an articulating surface. Fontaine and Eck (1946) joined both skeletal parts together by means of a screw. Eggers (1945) and Wahren (1946), in a different way, used the tendon of the extensor carpi radialis longus to prevent subluxation and Kestler (1946) has used the tendon of the extensor pollicis brevis for the same purpose. Schläpfer (1918) has tried arthrotomy with exstirpation of the free fragment. Bunnell has attempted restoration of the configuration of the base by freeing the misplaced united fragments with subsequent fixation in a better position by a Kirschner wire. In old united cases with deformity he does an arthrodesis of the joint. Vasko has similarly freed the unfavourably attached fragments and after reposition fixed them with sutures. Lemaitre (ref. Weitzel), Müller (1949), Macey and Murray (1949) have described an operation which aims at an arthrodesis of the carpo-metacarpal joint in order to obtain stability and freedom from pain. Finally, in 5 cases of secondary arthritis Gervis extirpated the greater multangular. He has not reported about the strength and freedom from pain in the cases so treated but has only established that mobility is good. All these various methods for secondary operation show, as indicated earlier, that in Bennett's fracture the results with the present primary methods of treatment are by no means constantly favourable. Most authors report cases, in which disability is present following the primary treatment. However, no thorough follow-up examination seems to have been made except for that of Spotoft, who reported the late results in 22 cases treated with Böhler's method.

OUR OWN STUDY

The uncertain prognosis is well confirmed by a follow-up examination (Gedda) of the cases with this fracture, numbering 83, which have been diagnosed and treated in Sahlgren's Hospital since 1940. The results of this study which will soon be published in detail, show how in many cases troublesome conditions arise; the injured patients

*Fig. 1.*

are obliged to change work or other grave handicaps may be caused to their earning capacity. It is significant that not only the fracture, but also the resulting subluxation are responsible for the remaining trouble and for the secondarily arising deforming arthritis. Many surgeons have been led to think that the joint surface, through the loss of the "hook" due to the fracture, has lost its saddle form, and that this saddle form is the mechanical factor which holds the joint surfaces in position (Bennett, Böhler, Runnell, Watson-Jones).

Clinical observations, dissections and studies under operative treatment of this fracture have meanwhile shown us that this interpretation is not tenable. The saddle form of the joint surface of the metacarpal, especial with its cartilage intact, is not shaped so that the position can be maintained by this alone. Unless the position in the joint is maintained by other factors the joint will immediately become subluxated through the combined action of the abductor pollicis longus and certain of the thenar muscles. This observation has led us to a new interpretation which is completely divergent from the previous one in regard to the fundamental lesion in a Bennett's fracture. Basically there is an injury with an avulsion of the ligament and its bony attachment which can involve a greater or lesser part of the joint surface. Dislocation or subluxation of the joint is prevented predominantly by the joint's strong ligaments, primarily the anterior oblique ligament and secondarily the posterior oblique and the radial ligaments. The former is attached to the "hook". Rupture of this ligament occurs nearly always in such a way that a bigger or smaller bony fragment is attached to the ligament. This piece constitutes the joint fragment in a Bennett's fracture and can include a markedly variable part of the joint surface. In extreme cases it may take along practically all of the joint surface, but one may see examples in which the fragment is minimal. Rarely, one sees cases in which a ligamentous

40 year old man.

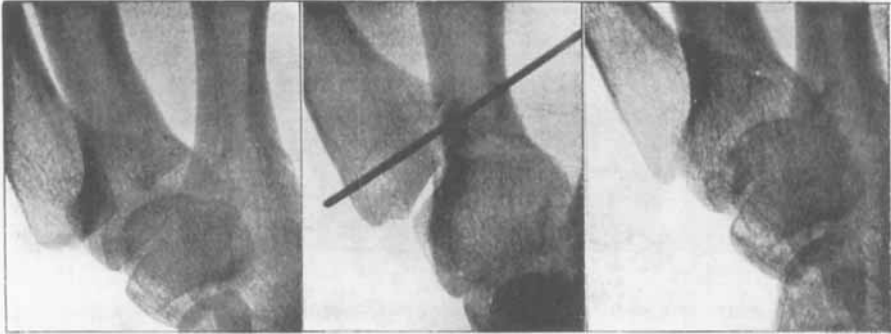


Fig. 2 a.
Before operation.

Fig. 2 b.
After operation.

Fig. 2 c.
Following
up examination.

24 years old man.



Fig. 3 a.
Before operation.

Fig. 3 b.
After operation.

Fig. 3 c.
Following
up examination.

rupture without a bone fragment is accompanied by typical dislocation. These cases one would like to call paradoxically "Bennett's fracture without fracture". The radial ligament and the related dorsal oblique ligament ruptures most often without skeletal injury to the metacarpal bone.

The fundamental injury is thus a rupture of the ligament with subluxation. When, however, the joint fragment is of considerable size an irregularity in the joint surface occurs with the later appearance of changes due to arthritis deformans. Even a rotation of the first metacarpal due to injury may be of importance with this bone in a position of greater opposition than before. The application of extension (arrow 1, fig. 1) together with pressure in an ulnar direc-

which one reaches the joint. The innervation to the thenar muscles is thus not endangered, since they are a good 2 centimeters distal to the incision. When the carpo-metacarpal joint is opened one finds the line of fracture between the joint fragments and, if necessary, the little piece can be loosened from the shaft with a small flat spatula (a dental instrument). With a Kirschner wire inserted through the palmar skin and soft parts, the small fragment with its attached ligament can be caught and pierced. In the fracture a fine steel wire is laid around the tip of the Kirschner wire and with this steel wire sling, together with the free part of the Kirschner wire, the fragment can be manoeuvred into the position of exact replacement. When this is done, the Kirschner wire is bored on through the base of the metacarpal until this wire can be palpated subcutaneously. The fragments are pressed together, the small traction wire is removed and the Kirschner wire cut off subcutaneously on each side. Osteosynthesis is completed and the important ligamentous attachment is restored. With a few small sutures the thenar muscles are fixed again to their origin. The skin edges are carefully approximated. Immobilization is obtained with a circular plaster bandage around the forearm and between the hand and thumb in the functional position of the hand. After 6-8 weeks the plaster is removed and the Kirschner wire is easily withdrawn through a small skin incision. The injured patient is as a rule ready for work some weeks later without particular after-treatment. This method is the only one in which exact reposition can be carried out under visual control and which permits reposition of a widely separated dislocated fragment or a tip fragment fixed by impaction.

With this method 24 fresh cases of Bennett's fracture have been operated on. Primary healing has been obtained in all. In two cases no mentionable improvement in position was obtained, while in the majority a quite exact or much improved position was obtained and maintained with a corresponding functional result. In the oldest case, from 1947, it is thus now 5 years since operation. The postoperative examination of this material will shortly be published in detail.

SUMMARY

In an attempt to decrease the number of cases of marked disability following an intraarticular fracture on the base of the first metacarpal bone, a technique for anatomic restitution of the joint is presented here.

R É S U M É

En vue de diminuer la fréquence des cas chez lesquels on constate des troubles prononcés après fracture intraarticulaire de la base du métacarpe I, les auteurs présentent une technique opératoire tendant à rétablir les conditions anatomiques de l'articulation.

ZUSAMMENFASSUNG

Die Verfasser haben, mit der Absicht die Häufigkeit der ausgesprochenen Beschwerden nach intraartikulärer Fraktur der Basis des ersten Metacarpus herabzusetzen, eine Operationstechnik zur Wiederherstellung der anatomischen Verhältnisse des Gelenkes vorgelegt.

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