

Surgical Treatment of Olecranon Fractures Using a Medartis Screw-Locked H-Shaped Plate (Medartis Trilock Olecrane Plate) at the Moulins Yzeure Hospital Center (France)

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Abstract

Introduction: Olecranon fractures represent approximately 10% of upper limb fractures, orthopedic treatment is often doomed to failure and surgical treatment consists of fixing the fracture sites. **Patients and Methods:** This study retrospectively analyzed 130 patients, 90 men and 40 women, aged on average 48.7 ± 11.9 years (30 to 65) treated between 2018 and 2020 in the Orthopedics and trauma department at the Moulins-Yzeure hospital center, for olecranon fracture using the Medartis H-locked plate. The study aimed to evaluate the results of this surgical method, particularly with regard to post-operative complications. **Results:** Among the 130 patients, there were 90 men and 40 women, with an average age of 48.7 ± 11.9 years (30 to 65). 50% of all patients were aged over 51 years. The plate used was standard, the same for the 130 patients with the same operating technique. The left side was more affected at 53.8%, the dominant side was less affected at 46%; the majority of patients had been temporarily immobilized with a posterior cast splint before surgery. The average time between trauma and operation was 9 days with a minimum time of 1 day and a maximum of 30 days. At a maximum follow-up of 2 years postoperatively, all patients reported satisfactory results with a return to their previous activities within 60 days after surgery. **Conclusion:** Medartis H-locked plate osteosynthesis is a reliable solution for the surgical treatment of olecranon fractures.

Keywords

Olecranon Fracture, Treatment, Surgery, Locked Plate, Medartis

1. Introduction

The olecranon fracture is a break in bone continuity located at the proximal end of the ulna [1]. It occurs by a direct driving force or by indirect injury following tension of the triceps attachment on the proximal ulna [2]. In adults, olecranon fractures account for approximately 10% of upper extremity fractures and transverse fractures are the most common, with a rate of up to 85% of all olecranon fractures, falling in Mayo 2 [3] [4]. Olecranon fractures can be simple or complex and can present different types and different anatomical lesions, the most common are epiphyseal fractures of the olecranon with a variable number of fragments and those with sometimes severe comminution whose treatment is well documented and generally with good positive results [5] [6]. Proximal ulna fractures become more complex when associated with other injuries such as radial fractures, joint dislocations, and distal extension of the ulna fracture [7].

A variety of fixation techniques are available to surgeons in modern practice, but there is little comparative research to guide the clinician and the clinician should be alert to osteoporosis [8].

Various studies have reported promising results for plating proximal ulnar fractures using different conventional fixation devices [6] [9] [10] [11]. More recently, the use of locked plates is increasingly recommended [12]. The AO group, in accordance with the principles of fracture management and internal fixation, advocates the use of LCP compression locking plate using bi-cortical screws because this compression locking plate is preformed to match the anatomy of the proximal ulna and further adapt to its curvature, then closely conform to the anatomy of the olecranon. There is a contact limit but also there are left and right plates [13].

Whatever the operating technique, the plate is fixed on the posterior surface of the olecranon except in the case of using two plates which can direct the surgeon to place the plates posterolaterally and posteromedially.

The literature describes several types of treatment for olecranon fractures, including conservative (orthopedic) treatment for non-displaced or minimally displaced fractures. Regarding surgical treatment, the usual techniques consist of reduction of the fracture site and its containment by strapping tension band, nailing, longitudinal screwing using cancellous screws, by bracing and finally by the installation of plates locked compression screws, generally of the LCP type as recommended by the AO group because they allow good anatomical reduction to be obtained and good results [10].

Having been confronted several times with complaints from certain patients characterized by post-operative pain probably due to the thickness of the LCP plates putting tension on the skin and the advent of locked olecranon plates from the Medartis Laboratory, which are standard (which can be used on the left side as on the right side), less thick and less rigid than the LCP locked plates, the surgeons of the Moulins Yzeure Hospital Center have moved towards the use of locked olecranon plates from Medartis Laboratory.

The hypothesis was that the use of the Medartis screw-locked compression plate would make it possible to avoid the post-operative pain sometimes encountered by patients, when using the LCP screw-locked compression plate, for a low cost and zero morbidity.

The objective of this study was to evaluate the results and in particular the postoperative complications (pain related to the equipment and the exteriorization of this) at a minimum follow-up of 1 month and a maximum of 2 years (**Figure 1** and **Figure 2**).

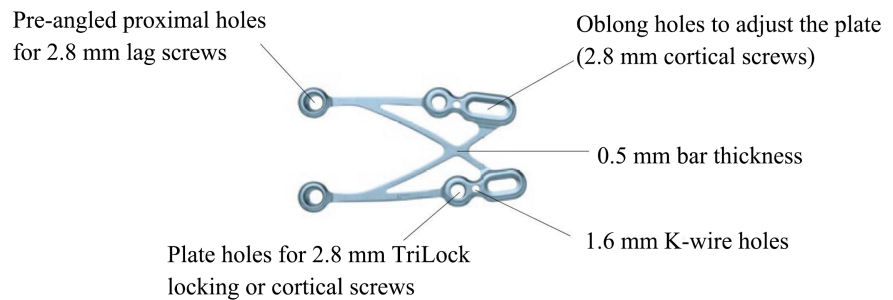


Figure 1. Presentation of the H-plate from the Medartis laboratory.



Figure 2. Didactic image of Medartis plate plating.

2. Patients and Methods

2.1. Patients

There were 130 patients operated on between 2018 and 2020 for an olecranon fracture. All had pain near the olecranon, on the posterior side of the elbow with limitation of flexion-extension movements, the main reason for the consultation. When they arrived at the emergency room, they had all taken a standard X-ray of the elbow (face and profile) which showed the fracture line on the olecranon (**Figure 3**).

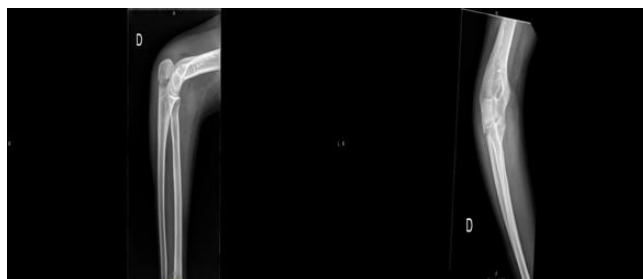


Figure 3. X-ray of the elbow, face and profile showing the presence of the fracture line on the olecranon.

2.2. Methods

2.2.1. Operating Technique

The patient was placed in 90° lateral decubitus position, the arm resting on a support, the elbow flexed to 90° and the forearm hanging, the pneumatic tourniquet at the root of the upper limb. Champagne according to the operating protocol, the upper limb in sterile jersey, inflation of the tourniquet according to the patient's blood pressure. The incision was posterior median, centered on the elbow with the opening of the periosteum allowing immediate access to the fracture site and cleaning of it with physiological saline, also removing the peri-fracture hematoma. Identification of the fracture site and the reduction criteria, anatomical reduction using a pointed forceps, then maintaining the reduction and stabilization of the site using one or two longitudinal pins of diameter 15 passing through the site of fracture. Placement of the Medartis plate on the posterior aspect of the proximal end of the ulna after it is pre-molded by hand, applying two hooks at the level of the end of the olecranon and maintaining the plate with two transverse pins of diameter 15 in the holes provided for this purpose. Placement of two longitudinal screws of diameter 2.8, bridging the fracture site on either side, they are tightened moderately, the pins are then removed, then tightening of the screws until the fracture site is compressed. The plate is reapplied to the cubital crest and remolded correctly, then two unlocked screws are placed. Carrying out a fluoroscopic check showing an anatomical reduction then skin closure plane by plane on suction drainage. The sterile dressing is made and the upper limb is immobilized in a BABP type cast splint, elbow flexed at 90° for a period of approximately 15 days (**Figure 4**).

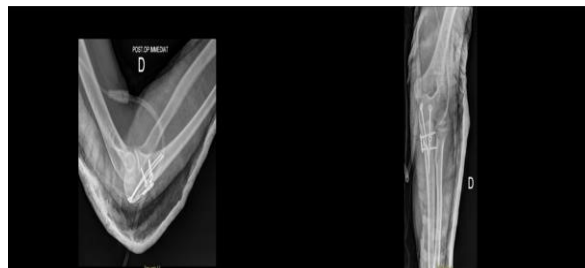


Figure 4. Frontal and lateral radiograph of the elbow showing the placement of the Medartis screw-locked compression plate after reduction of the olecranon fracture.

2.2.2. Aftermath of Surgery

All patients were hospitalized for 2 days and the Redon was removed before discharge. They kept the posterior cast splint, with the elbow in 90° flexion for 15 days, followed by passive elbow rehabilitation from the fifteenth postoperative day.

2.3. Evaluation Methods

All patients were reviewed clinically and radiologically by the operator with a minimum follow-up of 1 month until healing. The skin condition, the surgical scar and the elbow movements were examined.

3. Results

3.1. Series

Among the 130 patients, there were 90 men and 40 women, with an average age of 48.7 ± 11.9 years (30 to 65). 50% of all patients were aged over 51 years. The average time between trauma and operation was 1 day.

The plate used was standard, the same for the 130 patients with the same operating technique. There was as much left side as right side.

60 patients (46%) initially had immobilization with a BABP which ended in failure.

Radiographically, there was a transverse fracture line. In total, all 130 patients had a standard X-ray.

3.2. Results Themselves

The postoperative course was simple, with no immediate complications. At a minimum follow-up of 1 month and a maximum of 2 years, we found no exteriorization of the materials (plate and/or screws) and neither did we receive complaints from patients about skin pain caused by the materials. The male gender was predominant at 69%, the left side was affected in 53.8% but was not the dominant side. 53.4% of cases had been temporarily immobilized by a posterior plaster splint before surgery, the average time between the trauma and the operation was 9 days with the extremes of (1 and 30).

4. Discussion

Among the complications of plate osteosynthesis, skin pain and exteriorization of the plate are rare and can occur even months later. Once the plaque is bothered by pain or becomes external, its removal is indicated according to the literature.

Concerning the incidence of appearance of pain or exteriorization of the plate, during the duration of our study, out of the 130 cases operated on for fractures of the proximal end of the ulna with the Medartis H-plate, none of them did not present in the distant postoperative period cutaneous pain due to the material nor the exteriorization or migration of it, however Kiviluoto *et al.* found a low incidence of symptomatic protrusion of the material during fixation of the fracture by plate [14]. But also C had noticed a migration of equipment following osteoporosis and skin fragility which had led to the dismantling of equipment [15].

We studied 130 patients who were surgically treated with Medartis H-plate between 2018 and 2020 for displaced proximal ulna fractures. Our series, even if monocentric, is inferior to other authors; Regan W *et al.* studied 163 cases collected in the emergency departments of 5 hospitals of the Trauma Study Group (GETRAUM), presenting a proximal ulna fracture, with a follow-up of more than 6 months after reconstruction [16]. Hak D.J. also carried out a survey over two years, between 2007 and 2009, in 15 patients with a fracture of the proximal

ulna treated surgically with anatomically preformed 3.5 mm LCP olecranon plate in order to report their experience on the use of this one [17]. Delsole EM on the other hand had studied 20 patients in 2 years [24].

In our series, men (69%) were more fractured than women (31%), this male predominance is similar to Sanchez-Sotelo who in his study, men represented 63% and women 37% [18] [19], on the other hand Kloen P found a female predominance, women were affected at 60% and men at 40%.

The average age of our patients, 48.7 years, is lower than other series in the literature: 55 years for Kloen P with the extremes of 28 - 83 years [20], 50 years for Veillette CJH [21] and 49.9 years for Ring DC (extremes 16 - 97) [22]. We can therefore see that the age is less than 10 years younger than the usual series of olecranon fracture reconstruction. We cannot say that the younger the patient is, the less likely he is to have a fracture of the proximal end of the ulna.

The left elbow was more traumatized in our series in 70 out of 130 patients, *i.e.* a rate of 54%, this result is similar to that of Cabanela ME whose left elbow was involved in 8 out of 15 patients, *i.e.* a rate of 53% [23].

Concerning the dominant arm, it was less injured in our series in 60 out of 130 patients or 46%, these results are similar to those of Delsole EM who in his study found that the dominant arm was injured in 9 out of 22 patients or a low rate of 41% [24], but lower than Kloen P who found involvement of the dominant arm in 9 out of 15 patients, *i.e.* a rate of 60% [20].

The operating technique in our series differs from that of Anderson M in the manipulation of the plate [6]. With our technique, it is obligatory to mold the Medartis olecranon plate to give it the shape of the olecranon, however Kloen P contraindicates the bending of the plate so as not to deform the threaded locking head holes [20].

Postoperative immobilization of the upper limb, elbow flexed to 90° in a posterior splint before starting physiotherapy was 15 days in our series. This duration is less than that of Kivuluoto O which immobilized the elbow postoperatively for 23 days on average [5]. On the other hand, Kloen P immobilized the upper limb postoperatively in a posterior splint, the elbow being in flexion of 90° but the passive and active exercises assisted by gravity outside the splint had been started under the supervision of the Therapist on the second postoperative day.

The follow-up of patients who underwent surgery for displaced olecranon fracture was at least 3 months in our series. It was closer to the operation but Kloen P describes the follow-up of patients up to 24 months after the operation [20].

5. Conclusion

Olecranon fracture is due to a direct driving force or indirect injury, it can be simple or complex and is characterized by pain in the posterior aspect of the elbow as well as functional impotence. Standard radiography is the reference ex-

amination to confirm the diagnosis. Surgical treatment with a thinner plate such as Medartis is a good therapeutic option because it allows good reduction of the focus and promotes good bone consolidation without skin complications. (Externalization of materials and pain due to skin stretching by materials) which are more encountered when using a thick plate. They generally occur a few months after the surgical procedure. The thickness and rigidity of the plaque influence the occurrence of complications. Men are more affected and the right side is predominant. Immobilization in a BABP is not an absolute preoperative treatment.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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