

Bąk Marcin, Potoczniak Bartosz, Dziejdzic Artur, Kozak Łukasz, Blicharski Tomasz, Dziejdzic Urszula, Massalska–Malecka Teresa, Jarecki Jaromir. Nonunion of ulnar diaphysis after Monteggia fracture of a right forearm in a 55-year-old patient - Are all methods effective? Case report. *Journal of Education, Health and Sport*. 2019;9(2):367-380. eISSN 2391-8306. DOI <http://dx.doi.org/10.5281/zenodo.2578817>  
<http://ojs.ukw.edu.pl/index.php/johs/article/view/6629>

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).  
1223 *Journal of Education, Health and Sport* eISSN 2391-8306 7

© The Authors 2019;

This article is published with open access at Licensee Open Journal Systems of Kazimierz Wielki University in Bydgoszcz, Poland

Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author (s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike. (<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 30.01.2019. Revised: 30.01.2019. Accepted: 25.02.2019.

## **Nonunion of ulnar diaphysis after Monteggia fracture of a right forearm in a 55-year-old patient - Are all methods effective? Case report**

**Marcin Bąk<sup>1</sup>, Bartosz Potoczniak<sup>1</sup>, Artur Dziejdzic<sup>1</sup>, Łukasz Kozak<sup>1</sup>,  
Tomasz Blicharski<sup>2</sup>, Urszula Dziejdzic<sup>3</sup>, Teresa Massalska–Malecka<sup>4</sup>,  
Jaromir Jarecki<sup>1,2</sup>**

<sup>1</sup> Trauma and Orthopedic Ward with Spinal Surgery, Independent Public Province Specialist Hospital, Chełm, Poland

<sup>2</sup> Orthopedic and Rehabilitation Clinic, Independent Public Clinical Hospital No.4 in Lublin, Lublin, Poland

<sup>3</sup> The Pediatric Ward with the Pediatric Cardiology Unit, Specialist Hospital of the Holy Spirit, Sandomierz, Poland

<sup>4</sup> Human Physiology Department, Medical University of Lublin, Lublin, Poland

Correspondence: Marcin Bąk, Trauma and Orthopedic Ward with Spinal Surgery, Independent Public Province Specialist Hospital, ul. Ceramiczna 1, 22-100 Chełm, Poland.

E-mail: [botaurus@interia.pl](mailto:botaurus@interia.pl)

## **Abstract**

Fractures of the forearm make up about 10-14% of all fractures. Monteggia lesions account for 1-6% of the forearm fractures. The eponym “Monteggia fracture” is a term used for fracture of ulnar proximal shaft with concomitant dislocation of the radial head in the proximal radioulnar joint [1]. Its clinical symptoms are: pain, edema, local sensitivity, friction between bone fragments, deformation of the limb, loss of function in elbow joint and the forearm. Radiographs in AP and lateral views of the entire forearm, with wrist and elbow joint, are mandatory for successful diagnosis [2]. There are four types of fractures in the Bado classification system of the Monteggia lesion [3]. All Monteggia fractures in adults require surgical procedure of open reduction and internal fixation as a method of choice [4]. Delayed bone adhesion, nonunion, synostosis, instability of the radial head, nerve damage and restriction of movement are main complications of surgical intervention. We present a case of a 55-year-old patient with Monteggia fracture of a right forearm with a complication of a nonunion of the ulnar shaft, despite undergoing surgical procedure of open reduction and internal fixation. We describe consecutive methods of treatment that resulted in complete bone adhesion. Nonunion typically occurs due to technical mistakes in initial surgical intervention. Application of the correct reparative technique with autogenous bone graft and compression plates allows to fully heal nonunion of the bone.

**Keywords:** forearm shaft, Monteggia fracture, open reduction internal fixation, compression plate, nonunion, bone graft.

## **1. Introduction**

Here we present a case of a 55-year-old patient who suffered a Monteggia fracture of the right forearm. Statistically this type of fracture is more common in children population, however in adults more often occurs in men. Monteggia lesion is usually associated with high energy traumas such as: car accidents, falls from height, as well as beating and contact sports. Patient underwent a surgical procedure, despite which the reduction was not obtained, delayed bone adhesion, then nonunion of the ulnar diaphysis was observed. Monteggia lesion is a specific type of fracture, that requires care and precision in the undergoing therapy. It allows for good results such as bone adhesion in 96% patients as well as patient satisfaction [5,6,7]. Main aim of the early surgical intervention is the anatomical reduction of the ulnar shaft, restoration of its length, rotation and curvature, and radial head reposition. This and complete stability, allows for early mobility of the patient and avoidance of complications [8]. Definite stability of the fracture is obtained using compression plates, radial head is then typically repositioned spontaneously. Annular ligament very rarely requires amendments [9].

## 2. Case report

A 55-year-old patient was admitted to the Trauma and Orthopedic Ward with Spinal Surgery in Chelmsford due to closed Monteggia fracture of the right forearm, to undergo surgical procedure. Obtained injury was caused by the beating, patient was admitted to the Ward approximately 4 hours since the incident. He also suffered concussion to the head, however computed tomography scan performed in the Accident and Emergency department, showed no signs of trauma to the brain and the skull. Patient complained of the pain in the right forearm and elbow, exacerbated at movement, he described the pain at 9 in 0 to 10 VAS score. Initial clinical examination of the right upper limb revealed: malpositioning with forced flexion of the elbow and pronation of forearm without disruption to the skin, massive edema without compartment syndrome, tenderness at examination of the forearm and the elbow, pathologic mobility of ulna, complete loss of active movement of elbow as well as loss of pronation and supination of forearm [10,11]. Due to excessive pain at examination, passive movement of the injured forearm was observed only in minimum range, feeling and blood supply of the distal arm was evaluated as good. Patient was estimated at 10 points in Mayo Elbow Performance Score with range from 5 to 100, the result was noted as poor.

Radiographs of the right forearm with wrist and elbow in AP and lateral views taken on admittance, revealed type I fracture in Bado classification, or type 2U2B2(b,m) in AO Foundation and Orthopaedic Trauma Association (AOOTA) classification [13] (Fig. 1, 2).



Fig. 1. Radiograph of right forearm with wrist and elbow in AP view (day of the injury).



Fig. 2. Radiograph of right forearm with wrist and elbow in lateral view (day of the injury).

Radiographs show comminuted fracture of right ulnar diaphysis in middle third of its length, with apex of the fracture pointing to the front and anterior dislocation of the radial head- type I in Bado classification [3]. In A&E department, under short intravenous sedation, patient

underwent a closed reduction of the ulnar shaft fracture and dislocation of the radial head. An arm cast was applied, that was then split due to edema to the forearm (Fig 3, 4).



Fig. 3. Radiograph of right forearm with wrist and elbow in AP view after closed reduction, with split arm cast (day of the injury).



Fig. 4. Radiograph of right forearm with wrist and elbow in lateral view after closed reduction, with split arm cast (day of the injury).

Acceptable reduction of ulnar bone fragments and reposition of the radial head was obtained. Arm cast provided temporal stabilization of the right upper limb until surgical intervention, that was unfortunately postponed due to massive edema of the forearm. Three days after the injury, under general anesthesia, with use of tourniquet and dynamic X-ray imagining, patient underwent a surgical intervention. An open reduction and internal fixation of ulna, with use of Rush intramedullary nail and two wire loops was performed. Radial head repositioned spontaneously (Fig. 5)



Fig. 5. Postoperative radiograph of right forearm in AP and lateral view (day 4).

An arm cast was applied for a period of four weeks [14]. Surgical wound healed correctly. After removal of the cast, patient was referred for rehabilitation of the limb. Second control visit to the outpatient clinic happened two months after surgery. Patient then complained of permanent pain (VAS score 6), limitation of movement in elbow and the right forearm. Physical examination revealed flexion contracture up to 30 degrees, 30 degrees flexion deficit, 40 degrees deficit in pronation and supination of right forearm. Patient was evaluated in Mayo Elbow Performance Score at 55 points (poor performance). Control radiographs did not show bone adhesion (Fig. 6, 7).



Fig. 6. AP radiograph of the right forearm two months after surgery.



Fig. 7. Lateral radiograph of the right forearm two months after surgery.

Upon third control visit to the outpatient clinic, patient's condition did not improve, radiographs showed delayed bone adhesion. Eight months after the surgery radiographs showed nonunion of the forearm fracture (Fig. 8, 9). Patient was still undergoing rehabilitation therapy, with VAS score 4, Mayo Elbow Performance Score 60 (fair outcome), 10 degrees flexion deficit, rotation movements of the forearm were limited to 30 degrees. Patient was then referred to the Trauma and Orthopedic Ward with Spinal Surgery in Chełm, to undergo a surgical intervention of ulnar diaphysis nonunion.



Fig. 8. AP radiograph of the right forearm (eight months after surgery). Nonunion of right ulna.

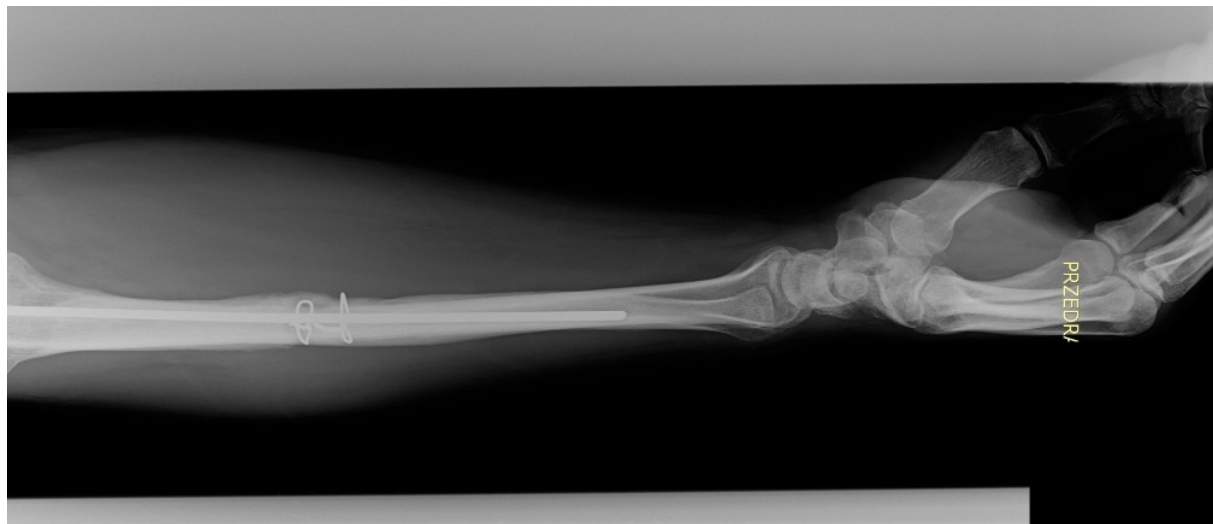


Fig. 9. Lateral radiograph of the right forearm (eight months after surgery). Nonunion of right ulna.

On the 29.07.2016, our patient underwent a surgical procedure. Rush nail and wire loops were removed, the bed of the nonunion was cleaned from fibrous tissue and a Judet-Forbes decortication was performed. Rush intramedullary wire with wider diameter was then applied once again, nonunion bed was filled with allogenic bone graft and platelet rich plasma (PRP) was applied [15]. Arm cast was applied for a period of 4 weeks. Patient was then monitored in the outpatient clinic every two months, while still undergoing rehabilitation therapy. Despite extensive surgical intervention, patient was permanently complaining of pain to the right forearm (VAS score 3), that exacerbated while performing everyday activities, movement limitation was also noted. His Mayo Performance Score was 60 (fair outcome). Additionally, patient started to complain of pain in site of the Rush wire insertion in the olecranon. Consecutive radiographs showed atrophic nonunion of the right ulnar shaft (Fig. 10. 11).

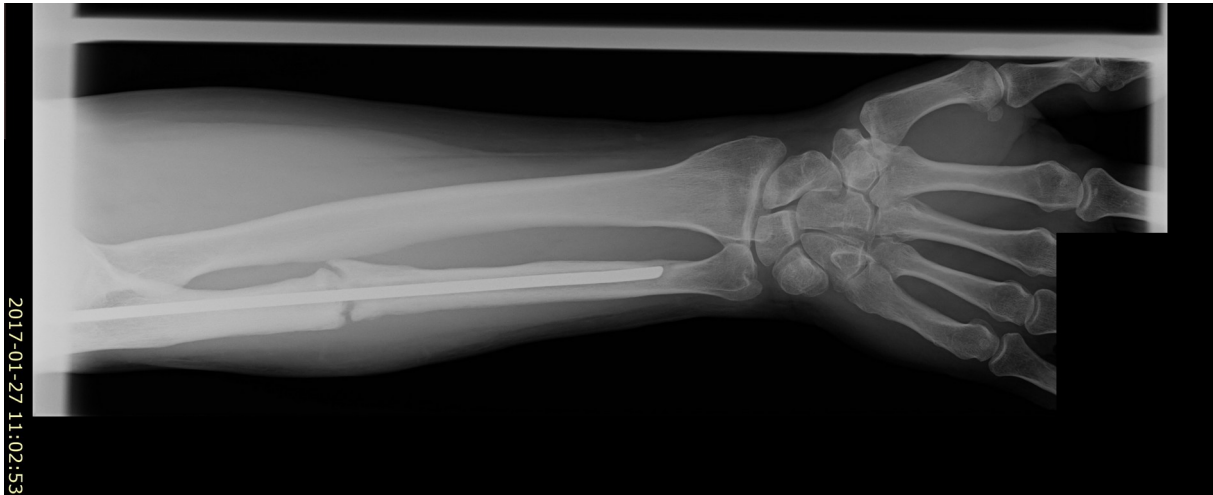


Fig. 10. AP radiograph of the right forearm (six months after second surgery, 14 months after the initial injury). Nonunion of right ulna.



Fig. 11. Lateral radiograph of the right forearm (six months after second surgery, 14 months after the initial injury). Nonunion of right ulna.

15 months after obtaining the injury, on the 15.02.2017, patient underwent third surgery. Rush wire and fibrous tissue from nonunion bed were removed, Judet- Forbes decortication was performed. Cast was not applied this time. Further control visits were conducted irregularly, due to patient's work abroad. During first visit to the outpatient clinic, in July 2017, 5 months after third surgery, patient was still complaining of pain exacerbated at movement (VAS score 3). Physical examination revealed improvement of active movement of the right forearm: extension deficit 5 degrees, flexion deficit 10 degrees, 15 degrees rotation deficit. Mayo Elbow Performance Score 75 (good performance). Radiographs showed ulnar shaft nonunion. Upon control visit to the outpatient clinic in August 2018, patient reported intensification of pain in last three months (VAS score 5). Patient claimed he is not able to work because of it. Performed physical examination showed same range of movement as before, this time accompanied with pain. Radiographs showed nonunion of right ulnar shaft (Fig. 12, 13).





Fig. 12. AP radiograph of the right forearm (17 months after third surgery, 24 months after second surgery, 32 months after the initial injury). Nonunion of right ulna.



Fig. 13. Lateral radiograph of the right forearm (17 months after third surgery, 24 months after second surgery, 32 months after the initial injury). Nonunion of right ulna.

Patient was then offered another surgical procedure of open reduction internal fixation with use of compression plate and autogenous bone graft. Patient agreed and on the 09.08.2018, thirty-three months after the injury, underwent fourth surgery. Surgery was performed under general anesthesia, with use of tourniquet and dynamic X-ray imaging. Ulnar diaphysis nonunion was radically resected along with fibrous tissue. We then opened sclerotic ends of the right ulnar shaft by deep drilling, then we scarified them. Autogenous cortico-cancellous bone graft from left iliac crest was retrieved and inserted into the previous

nonunion bed. Additionally, cancellous bone graft from left iliac crest was retrieved and inserted between cortico-cancellous bone graft and the right ulnar diaphysis. 5.0 LCP compression plate with cortical and locking screws were used to reduce the fracture, allowing us to obtain full stability [16, 17]. An arm cast was applied for a period of four weeks (Fig. 14).



Fig. 14. Postoperative radiograph of right forearm in AP and lateral view (3 days after third surgery, 33 months since the injury)

Postoperative radiograph shows correct positioning and compression of the LCP plate on the right ulnar shaft, with thorough fulfillment of the previous nonunion bed with the bone graft. After fourth surgery, patient visited the outpatient clinic every 4 weeks. Upon last control visit on the 09.01.2019 patient did not complain of pain, VAS score 0, Mayo Elbow Performance Score 100 (excellent performance). Patient was satisfied with the outcome of the treatment. Physical examination revealed full, painless, flexion and extension of right elbow as well as pronation and supination movements in right forearm (Fig. 15-18).



Fig. 15. Full extension in the right elbow.

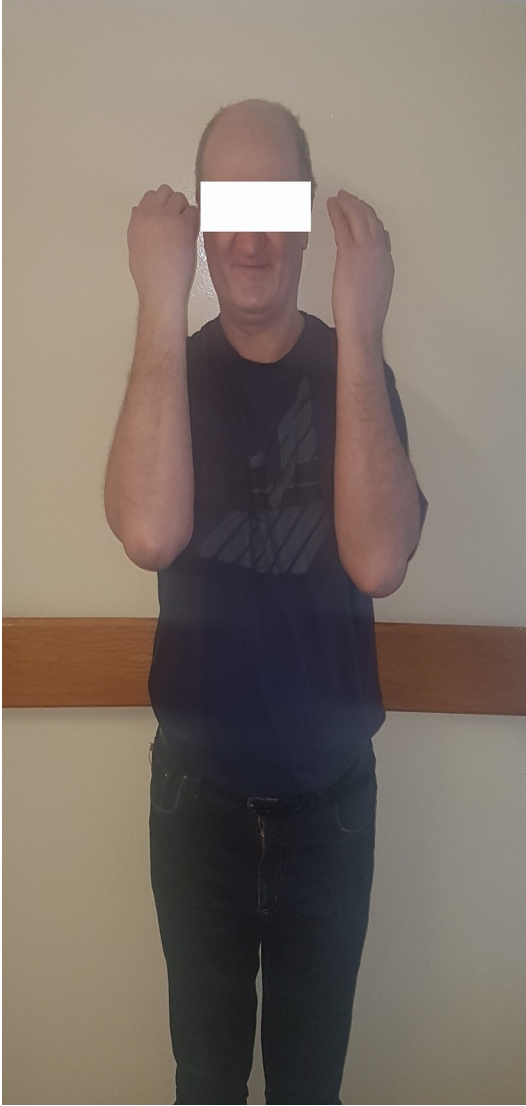


Fig. 16. Full flexion in the right elbow.



Fig. 17. Full pronation of right forearm.



Fig. 18. Full supination of right forearm.

Current radiograph shows good bone adhesion with plentiful callus in the site of previous nonunion of the right ulnar diaphysis (Fig. 19).



Fig. 19. Postoperative radiograph of right forearm in AP and lateral view. (5 months after fourth surgery, 38 months since injury) Bone union of the right ulnar diaphysis.

### 3. Discussion

All Monteggia fractures in adult population should be treated surgically. Urgent surgical procedure is highly recommended, as postponement worsens the functional outcome. Open reduction with internal fixation should be the method of choice [18]. The use of compression plate with lag screw should be pursued whenever possible to obtain absolute stability. Bone grafts, preferably autogenous, should be used in comminuted lesions and fractures without stable contact of the cortical layers [18]. Only precise and correct surgical technique minimalizes the risk of complications. Main complications of Monteggia fractures are: synostosis, instability of the radial head, nerve damage, restriction of movement, delayed bone adhesion and nonunion. Technical mistakes are usually responsible for the nonunion occurrence. Insufficient fragment compression with use of inappropriate implants, results in nonunion of the fracture. Surgical treatment with use of autogenous cortico-cancellous or cancellous bone graft as well as use of compression plate results in good clinical and radiological outcome.

### Acknowledgments

Declared none

## References

1. Thomas P. Rüedi, Richard E. Buckley, Christopher G. Moran *AO Principles of Fracture Management*. Vol. II, Thieme. - 2007. p. 490
2. Kenneth A. Egol, Kenneth J. Koval, Joseph D. Zuckerman *Handbook of Fractures*. Vol. I, Lippincott Williams & Wilkins. - 2010. p. 328
3. Bado JL. *The Monteggia lesion*. Clin Orthop Relat Res 50. -1967. pp. 71-86.
4. James P. Stannard, Andrew H. Schmidt, Philip J. Kregor *Surgical Treatment of Orthopaedic Trauma*. Vol. II, Thieme. - 2007. p. 447
5. Chapman MW, Gordon JE, Zissimos AG. *Compression – plate fixation of acute fractures of the diaphyses of the radius and ulna*. J Bone Joint Surg Am. - 1989, 71. pp. 159-169
6. Grace TG, Eversmann WW Jr. *Forearm fractures treatment by rigid fixation with early motion*. J Bone Joint Surg Am. -1980, 62, pp. 433-438
7. Ross ERS, Gourevitch D, Hastings GW, Wynn – Jones CE, Ali S. *Retrospective analysis of plate fixation of diaphyseal fractures of the forearm bones*. Injury. - 1989, 20. pp. 211-214
8. Perren SM. *Evolution of the internal fixation of long bone fractures: review article*. J Bone Joint Surg Br. - 2002, 84. pp. 1093-1110
9. Boyd HB, Boals JC. *The Monteggia lesion. A review of 159 cases*. Clin Orthop. - 1969, 66. pp. 94-100
10. McQueen MM, Gaston P, Court – Brown CM. *Acute compartment syndrome: who is at risk?* J Bone Joint Surg Br. - 2000, 82. pp. 200-203
11. Ghobrial TF, Eglseder WA Jr, Bleckner SA. *Proximal ulna shaft fractures and associated compartment syndromes*. Am J Orthop. - 2001, 30. pp. 703-707
12. Morrey BF, An KN. *Functional evaluation of the elbow*. In: Morrey BF, editor. *The elbow and its disorders*. 3rd ed. Philadelphia: WB Saunders. -2000. p. 82.
13. Kellam James F, Meinberg Eric G, Agel Julie, Karam Matthew D, Roberts Craig S. *Introduction: Fracture and Dislocation Classification Compendium—2018 International Comprehensive Classification of Fractures and Dislocations Committee*. Journal of Orthopaedic Trauma. - January 2018. 32. S1-S10
14. Gebuhr P, Holmich P, Orsnes T. *Isolated ulnar shaft fractures: comparison of treatment by functional brace and long arm cast*. J Bone Joint Surg Br. - 1992, 74. pp.757-759
15. Memeo A, Verdoni F, De Bartolomeo O, Albisetti W, Pedretti L. *A new way to treat forearm post-traumatic non-union in young patients with intramedullary nailing and platelet-rich plasma*. Injury. - 2014 Feb, 45(2). pp.418-423
16. Sisk, Sisk TD. *Compression-plate fixation for fractures of the radius and ulna*. Strat Orthop. - 1982, 2:1
17. Simpson NS, Goodman LA, Jupiter JB. *Contoured LCDC plating of the proximal ulna*. Injury. -1996. 27. p.411
18. Ring D, Jupiter JB, Simpson S. *Monteggia fractures in adults*. J Bone Joint Surg Am. - 1998. 80. pp. 1733-1744