

Elbow Trauma. Review of Argentine Contributions: From 1956 to the Present Time Anniversary of the AAOT Library Service

Juan Martín Patiño

Orthopedics and Traumatology Department, Hospital Militar Central "Cirujano Mayor Dr. Cosme Argerich", Autonomous City of Buenos Aires, Argentina

ABSTRACT

The library service and the Journal are the pillars of the Argentine Association of Orthopedics and Traumatology. We provide national and international authors with international visibility through publication and indexing. The objective of this presentation is to discuss some of our country's peers' contributions and experiences with elbow surgery and conditions in the AAOT Journal and other international publications.

Keywords: Distal humerus fractures; elbow instability; elbow dislocation; olecranon fractures; total elbow arthroplasty; elbow trauma.

Level of Evidence: V

Traumatología de codo. Reseña de aportes argentinos: desde 1956 hasta la actualidad Aniversario del Servicio de Biblioteca de la AAOT

RESUMEN

El Servicio de Biblioteca y la Revista se constituyen en pilares de la Asociación Argentina de Ortopedia y Traumatología. Publicando e indexando se logra una exposición internacional para los autores nacionales e internacionales. El objetivo de esta presentación es reseñar algunos aportes de colegas de nuestro país a la cirugía y afecciones del codo en la RAAOT y otras publicaciones internacionales.

Palabras clave: Fracturas de húmero distal; inestabilidad de codo; luxación de codo; fracturas de olécranon; prótesis de codo; traumatología de codo.

Nivel de Evidencia: V

INTRODUCTION

It has been 40 years since the creation of the AAOT Library Service. I had the honor of chairing the Library Committee as it celebrated its 30th anniversary, between 2013 and 2017,¹ following Dr. Alejandro José Ramos Vértiz. In those days, I had the pleasure to observe directly the tireless effort of Veronica Mauceri and Silvina Dicranian. Among other things, they digitized the AAOT journal in its entirety, and collaborated with indexing by providing information to LILACS and other sources on a regular basis. Furthermore, they preserved and classified an invaluable collection of publications from all areas of the specialty.

The current Journal of the Argentine Association of Orthopedics and Traumatology (in Spanish, RAAOT), originally known as the Bulletin of the Argentine Society of Orthopedics and Traumatology, is one of the Association's pillars. It is currently published digitally in Spanish and English, with extensive indexing as a result of meeting numerous international standards. The metrics indicate that it reaches readers from all around the world. All of this is due to the efforts of the Editorial Committee, led by Dr. Ernesto Bersusky and Dr. Lidia Loterzo. National authors, as well as authors from various countries, have been publishing for almost 80 years and continue to rely on the AAOT Journal to promote their work.

Received on April 21st, 2024. Accepted after evaluation on April 21st, 2024 • Dr. JUAN MARTÍN PATIÑO • drpatinojm@gmail.com  <https://orcid.org/0000-0002-9036-0442>

How to cite this article: Patiño JM. Elbow Trauma. Review of Argentine Contributions: From 1956 to the Present Time. Anniversary of the AAOT Library Service. *Rev Asoc Argent Ortop Traumatol* 2024;89(3):322-328. <https://doi.org/10.15417/issn.1852-7434.2024.89.3.1945>

The objective of this article is to review some of our country's contributions on elbow surgery and pathology in the AAOT Journal and other international publications. Given the volume of content and the limited length of this article, we do not plan to cover all authors or topics. For example, the topic of stiff elbow has not been addressed. Perhaps this topic, along with others by different authors, will be the focus of future publications.

The elbow is one of the most recently studied joints, therefore, its interpretation for diagnosing and treating its numerous disorders has improved. Clinical and laboratory studies have contributed to the knowledge of the elbow's physiology, biomechanics, force transmission, mobility, and stability. These investigations led to the development of specific implants to treat different fractures (regional plates, screws with appropriate diameters, etc.), total and partial prostheses, and radial head prostheses, as well as surgical techniques for ligament reconstruction or joint release. In addition, arthroscopic techniques have been developed to aid or treat a wide range of diseases.

DISTAL HUMERUS FRACTURE

For much of the twentieth century, the debate over distal humerus fractures centered on conservative treatment versus osteosynthesis. Non-surgical treatment was based on reductions, skeletal tractions and casts. On the other hand, surgical outcomes were variable and constrained by a scarcity of appropriate implants.²⁻⁴

Over the last two decades, distal humerus osteosynthesis has advanced in terms of available implants, such as locking plates and screws that are anatomically premolded to the complex bone anatomy.

In 2005, a study of 16 patients treated with different types of osteosynthesis was published. An average humeroulnar joint range of motion of 98° was obtained. Elbow flexion averaged 117°, while loss of elbow extension averaged 22°.⁵

In 2008, Gallucci et al. published a series of distal humerus fractures treated with nonanatomic locking plates. In their study, they retrospectively evaluated 17 patients (average age 59 years) with a minimum follow-up of one year. Twelve had type C AO fractures, and five had type A fractures. The average follow-up was 23 months. The range of motion obtained was between 15° and 135°, with a total arc of motion of 120°. The results were excellent in 11 patients, good in five, and fair in one.⁶

In recent years, different authors have reported their outcomes with locking regional plates.

In a special issue of 2022 in collaboration with the Asociación Argentina de Hombro y Codo, Muñoz and Rosso Guiñazu evaluated 19 cases treated with premolded locking plates. In that series, consolidation of all fractures was achieved. The Alonso Llamas approach was used in seven patients (37%) and olecranon osteotomy in 12 cases (63%). The average DASH (Disabilities of the Arm, Shoulder and Hand) score was 11.31, indicating mild disabilities. The MEPS (Mayo Elbow Performance Score) obtained was excellent in one patient (5.26%), good in 10 (52.6%), fair in seven (36.84%) and poor in one (5.26%).⁷

To achieve successful outcomes in these complex fractures, surgical technique should be focused not only on the right use of implants, but also on technique and rehabilitation.^{8,9}

We evaluated a series of cases in which we performed osteosynthesis using the paratricipital approach as an alternative to olecranon osteotomy for some fractures. This approach was useful for supracondylar fractures, but also for simple articular fractures. With a mean follow-up of 3.4 years, the mean flexion-extension range was 138.3°; mean MEPS was 85.8; mean DASH score was 11.8; and mean visual analog pain scale score was 1.3. All fractures healed (Figure 1).¹⁰

OLECRANON FRACTURE

Numerous authors have studied olecranon fractures, which are articular fractures that also involve one of the elbow's stabilizers (the humeroulnar joint). Dr. Eduardo Cossavella Senac proposed the use of an intramedullary screw 11 to 15 cm long and 5 to 5.5 mm in diameter in 1974, citing his experience with 27 patients.¹¹

On the other hand, conservative treatment has been proposed in patients >70 years of age and with low functional demand, with mostly satisfactory outcomes. Eighteen patients were evaluated of whom 24 progressed to nonunion; however, flexion-extension was 142°-15°. Muscle strength was M5 in 17 patients and M4 in nine. A fist strength of 93% was obtained on the contralateral side. Pain according to the visual analog scale was 1. Satisfaction with treatment, according to this scale, was 9. According to the Mayo Clinic score, the outcomes were excellent in 22 patients and good in six. The average DASH score was 15.¹²



Figure 1. **A.** View of the fracture through the paratricipital approach. **B.** View of the medial distal humerus. **C.** View of the lateral distal humerus. **D.** View after placement of two plates in orthogonal arrangement.

Recently, Dr. Cabrera and Dr. Caló proposed associating high-strength sutures with cannulated screws instead of wires, and the outcomes obtained were satisfactory. Six months after the operation, the average flexion was 143° (range 90° - 160°) and the average extension was 19° (0° - 55°).¹³

In 2020, we investigated the long-term complications of surgically treated olecranon fractures. We assessed 42 cases, with an average follow-up of 43.64 months. Eighteen patients (42.86%) were treated with regional locking plates, 21 (50%), with traction-absorbing wiring, and three (7.14%) with 7 mm cannulated screws and traction-absorbing wiring. Six of these patients (14.29%) required implant removal. There were no cases of nonunion. More complex fractures were associated with osteoarthritic changes (14 cases, 33.3%), but these did not influence clinical outcomes, as they were not significantly associated with scores (MEPS, DASH), residual pain (visual analog scale) or loss of range of motion.¹⁴

MONTEGGIA FRACTURE

In 1956, Dr. José Luis Bado, a Uruguayan surgeon, described his classification of Monteggia's fractures and dislocations in the Bulletin of the Argentine Society of Orthopedics and Traumatology. He classified them into four groups and identified injuries that he considered equivalent. This classification was based on the observation of 55 cases. This classification is still recognized in the international literature on the subject.¹⁵ Dr. Alberto Caneva first reported the reduction maneuvers for these complex injuries in 1966.¹⁶

TRAUMATIC SEQUELAE. MALUNION. NONUNION

Posttraumatic cubitus varus is a long-term complication of supracondylar humerus fractures in children. In 1966, Dr. Carlos Ottolenghi published, in detail, the lateral closed wedge osteotomy technique for the treatment of cubitus varus.¹⁷

Late ulnar nerve neuritis has been reported as a complication related to cubitus varus.¹⁸ We have also observed posterolateral rotatory instability as a late complication of varus malposition of fractures healed in infancy.¹⁹

A few years ago, a report on treatment for cubitus valgus as a sequelae using closed osteotomy was published. In five patients with an average follow-up of 17 months, the average valgus was corrected from 30° (contralateral of 11°) to 13°. The Oppenheim scale indicated that the outcome was excellent in four cases and good in one.²⁰

Undoubtedly, distal humerus nonunion, especially when it is recalcitrant, is one of the most difficult complications to solve. Dr. Carlos Zaidenberg proposed a technique involving vascularized bone grafting. In an average of 16 months, consolidation was achieved in the seven cases evaluated.²¹

In 2008, Dr. Allende et al. reported their long-term outcomes (average 46 months) in 24 cases of distal humerus nonunion treated with different types of osteosynthesis. Consolidation was achieved in all cases within five months after surgery.²²

DISLOCATIONS AND INSTABILITY

Acute or chronic elbow ligament injuries have been better diagnosed and treated in recent decades, as research has increased. Identifying the stabilizers and their injuries is critical for therapeutic planning.²³

Chronic posterolateral rotatory instability, as described in 1991 by O'Driscoll, must be suspected in order to diagnose it and plan its treatment. In these cases, ligament reconstruction is necessary.²⁴ In certain cases, depending on the time of evolution and the number of episodes of dislocation, it is accompanied by an impaction fracture of the capitellum, as described by Osborne and Cotterill in 1966. It is not always necessary to treat this bone defect with a graft and reconstruction, even if the radius is locked following dislocation (Figure 2).²⁵

Different techniques have been developed for ligament reconstruction in cases of chronic medial elbow instability. In 2010, Slullitell and Glasberg proposed a medial reconstruction with a new technique using the fascia of the extensor carpi ulnaris in 12 cases.²⁶

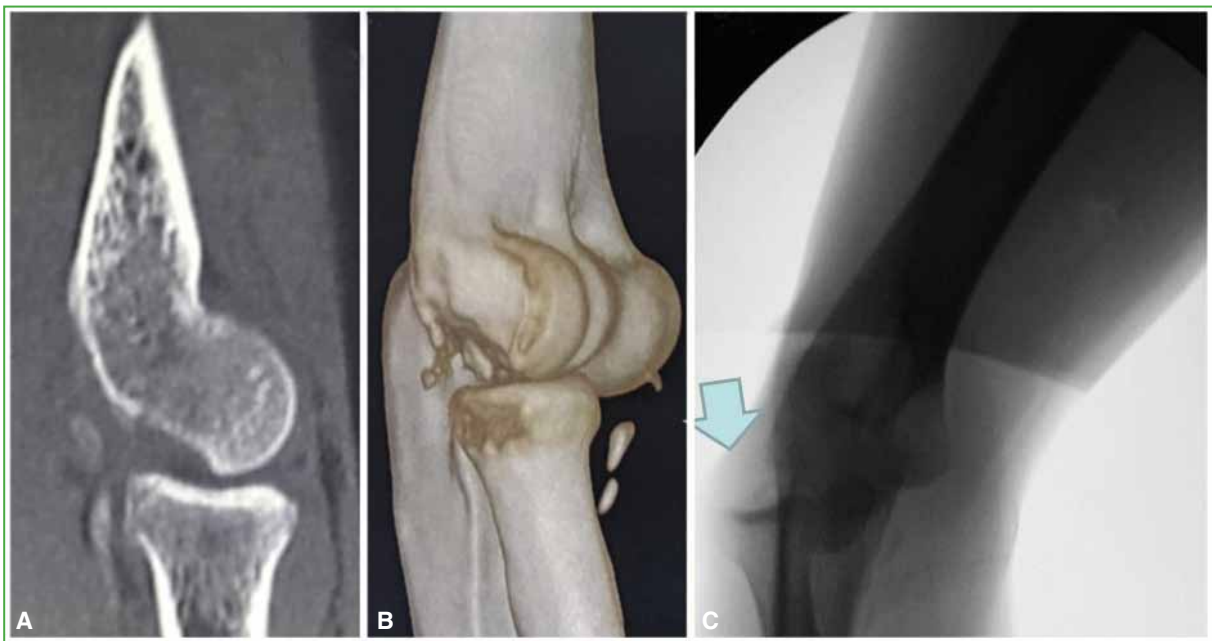


Figure 2. A and B. Computed tomography. Impaction fracture of the capitellum after posterolateral dislocation. C. Fluoroscopy. The locking of the proximal radius is seen during a *pivot shift* maneuver due to posterolateral rotatory instability.

DISTAL BICEPS

In recent years, the incidence of complete distal biceps tears appears to have increased. In young, active patients, superior outcomes have been achieved with repair than with conservative treatment. The options for single or double approaches and fixation are varied (harpoons, transosseous sutures, bio-tenodesis, buttons).

Capomassi et al. evaluated a series of 17 cases treated with double fixation using an anterior approach with an extracortical button and bio-tenodesis screw. With an average follow-up of 12 months, the outcome was excellent in 15 patients and good in two (according to DASH and Andrews-Carson scores). All patients achieved M5 strength for forearm flexion and supination.²⁷

TOTAL ARTHROPLASTY

The complication rate of total elbow arthroplasty was high with the first models and was an option only in cases of severe sequelae.^{28,29} In the first published series, the outcomes were lower than with resection arthroplasties.³⁰ The advent of semi-constrained designs with the possibility of lateral motion in addition to flexion-extension improved long-term outcomes.³⁰

The initial indications were degenerative diseases, such as primary osteoarthritis and rheumatoid arthritis, but, as reported in a review we published in 2012, the indication in unreconstructable fractures of the distal humerus has increased exponentially, mainly in the United States, Canada and Europe (Figure 3).³¹ There appears to be a consensus and predictable outcomes for the treatment of unreconstructable distal humerus fractures with total elbow arthroplasty in patients >65 years of age.³²

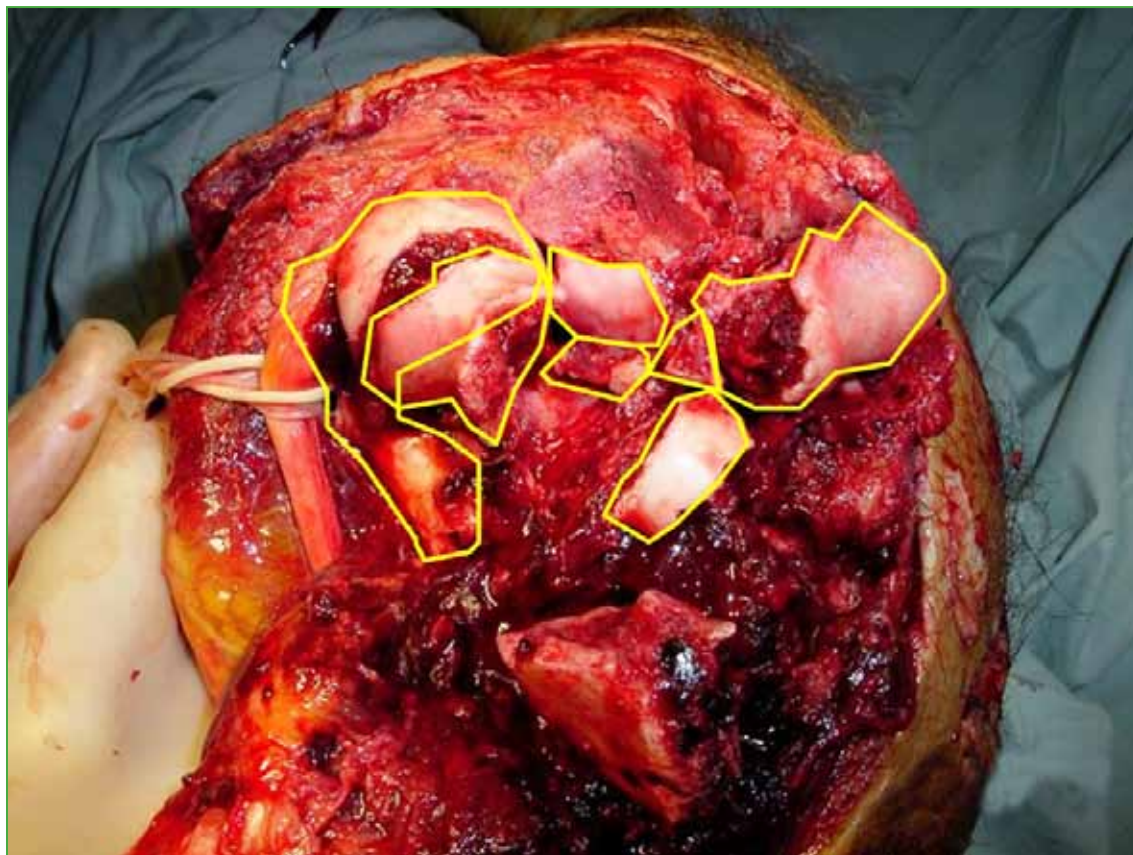


Figure 3. Complex fractures in the elderly: prosthesis or osteosynthesis? Intraoperative image of a comminuted fracture of the distal humerus.

The annotated articles are available in the AAOT library. In addition, AAOT Journal articles can be freely accessed at: <https://raoot.org.ar/index.php/AAOTMAG/index>

Conflict of interests: The author declares no conflicts of interest.

REFERENCES

1. Patiño JM. Comité de Biblioteca 2013. *Rev Asoc Argent Ortop Traumatol* 2013;78(3):164-5. <https://doi.org/10.15417/336>
2. Del Sel JM, De Paoli J, Abecasis L. Fracturas supraintercondíleas del codo. *Bol Trab Soc Argent Ortop Traumatol* 1968;33(9):387-96;27-33.
3. Sanz E, Aguilera F. Fracturas supracondíleas de codo: nuestra conducta. *Bol Trab Soc Argent Ortop Traumatol* 1974;39(5):395.
4. De Paoli J, Abecasis L. Fracturas supracondíleas de codo. *Bol Trab Soc Argent Ortop Traumatol* 1973;38(4):306-21; 325-30; 395-6; 469-70.
5. Allende C, Pioli I, Gastaud M, Ortiz N, Marangoni L, Allende BT. Fracturas intraarticulares conminutas del extremo distal del humero. *Rev Asoc Argent Ortop Traumatol* 2005;70(4):295-9. Available at: https://aaot.org.ar/wp-content/uploads/2021/10/Rev-Asoc-Argent-Ortop-Traumatol-2005-70-4-295a299_Allende.pdf
6. Gallucci G, López Ovenza JM, Boretto J, Donndorff A, Alfie V, De Carli P. Tratamiento quirúrgico de las fracturas del húmero distal con placas de bloqueo angular. *Rev Asoc Argent Ortop Traumatol* 2008;73(2):165-70. Available at: https://www.aaot.org.ar/revista/2008/n2_vol73/art12.pdf
7. Muñoz FE, Rosso Guñazu E. Osteosíntesis de fracturas complejas de húmero distal. Nuestra experiencia. *Rev Asoc Argent Ortop Traumatol* 2022;87(4):517-25. <https://doi.org/10.15417/issn.1852-7434.2022.87.4.1548>
8. Maiorano M, Arguelles S, Pereira E, Zaidenberg C. Fracturas articulares complejas del húmero distal. Recomendaciones para optimizar los resultados y disminuir las complicaciones. *Rev Asoc Argent Ortop Traumatol* 2022;87(2):259-72. <https://doi.org/10.15417/issn.1852-7434.2022.87.2.1477>
9. Firpo CAN, Mosquera J, Graziano G, Serrano A, Vallone M, Duncan C, et al. Método de evaluación retrospectiva de los resultados del tratamiento de las fracturas distales cerradas del húmero tipo C. *Rev Asoc Argent Ortop Traumatol* 2008;73(3):242-7. Available at: <https://pesquisa.bvsalud.org/portal/resource/pt/lil-506211>
10. Patiño JM, Rullan Corna AF, Abdon IM, Michelini AE, Mora Pulido DA. Paratricipital approach for distal humerus fractures. *Musculoskelet Surg* 2021;105(2):155-60. <https://doi.org/10.1007/s12306-020-00640-4>
11. Cossavella Senac E. Nuestro temperamento en las fracturas de olecranon. *Bol Trab Soc Argent Ortop Traumatol* 1974;39(4):334-42; 538.
12. Gallucci G, Piuze N, Slullitel P, Boretto J, Alfie V, Donndorff A, et al. Tratamiento funcional de fracturas desplazadas de olecranon en pacientes mayores de 70 años. *Rev Asoc Argent Ortop Traumatol* 2015;80(2):76-84. Available at: <https://raoot.org.ar/index.php/AAOTMAG/article/view/304/242>
13. Cabrera MN, Caló LN. Fracturas de olecranon. Nueva alternativa terapéutica. *Rev Asoc Argent Ortop Traumatol* 2022;87(4):526-33. <https://doi.org/10.15417/issn.1852-7434.2022.87.4.1608>
14. Patiño JM, Rullan Corna AF, Michelini AE, Abdon IM, Marinucci B. Olecranon fractures: Do they lead to osteoarthritis? Long-term outcomes and complications. *Int Orthop* 2020;44(11):2379-84. <https://doi.org/10.1007/s00264-020-04695-7>
15. Bado JL. Lesión de Monteggia. *Bol Trab Soc Argent Ortop Traumatol* 1956;21(5):123-6.
16. Cánova A. Lesión de Monteggia. Maniobras de reducción. *Bol Trab Soc Argent Ortop Traumatol* 1966;31(10):491-9.
17. Ottolenghi C, Frigerio E. Codo varo postraumático. *Bol Trab Soc Argent Ortop Traumatol* 1964;29(5):181-91; 224-6.
18. Firpo CAN. Neuritis cubital tardía por cubito varo postraumático. *Bol Trab Soc Argent Ortop Traumatol* 1959;24(2): 22-33.
19. Patiño JM, Rullan Corna A, Michelini A, Abdon I, Pruyas P, et al. Inestabilidad posterolateral tardía del codo como secuela de fracturas de la infancia. *Rev Asoc Argent Ortop Traumatol* 2011;76(3):268-72. Available at: [https://www.aaot.org.ar/revista/2011/n3/Rev_Asoc_Argent_Ortop_Traumatol_2011_76\(3\)_268.pdf](https://www.aaot.org.ar/revista/2011/n3/Rev_Asoc_Argent_Ortop_Traumatol_2011_76(3)_268.pdf)

20. Gallucci G, Altube G, Boretto J, Donndorff A, Zaidenberg E, Rellan I, et al. Osteotomía en cuña sustractiva supracondílea para el tratamiento del codo valgo del adulto. *Rev Asoc Argent Ortop Traumatol* 2021;86(3):316-23. <https://doi.org/10.15417/issn.1852-7434.2021.86.3.1165>
21. Zaidenberg C. Seudoartrosis recalcitrante del humero distal. Injerto óseo vascularizado del radio distal. Nueva técnica quirúrgica. *Rev Asoc Argent Ortop Traumatol* 2008;73(1):6-12. Available at: https://www.aaot.org.ar/revista/2008/n1_vol73/art02.pdf
22. Allende C, Allende BT. Post-traumatic distal humerus non-union: Open reduction and internal fixation: long-term results. *Int Orthop* 2009;33(5):1289-94. <https://doi.org/10.1007/s00264-008-0650-8>
23. Varaona JM, Simone JP. Inestabilidad del codo. *Rev Asoc Argent Ortop Traumatol* 2006;71(4):353-61. Available at: https://www.aaot.org.ar/revista/2006/n4_vol71/art10.pdf
24. Gallucci G, Rellan I, Boretto J, Alfie V, Donndorff A, De Carli P. Inestabilidad posterolateral crónica de codo. Reconstrucción ligamentaria. *Rev Asoc Argent Ortop Traumatol* 2016;81(4):294-301. <https://doi.org/10.15417/580>
25. Patiño JM, Torres Moirano JM. Engaging posterior capitellum fracture and elbow posterolateral rotatory instability: Is it always necessary to treat the bone defect? *Case Rep Orthop* 2020;2020:3260106. <https://doi.org/10.1155/2020/3260106>
26. Slullitel MH, Glasberg AE. New technique of reconstruction for medial elbow instability. *Tech Hand Up Extrem Surg* 2010;14(4):266-9. <https://doi.org/10.1097/BTH.0b013e3181fb5459>
27. Capomassi MÁ, Gardenal RM, Slullitel M, Suárez E, Benedetto I. Rotura del bíceps distal. Evaluación de resultados con técnica de doble fijación. *Rev Asoc Argent Ortop Traumatol* 2013;78:171-9. <https://doi.org/10.15417/241>
28. Firpo CAN, Kusminsky J, Calvo Gonzalez A. Reemplazo endoprotésico total del codo: operación de rescate. *Bol Trab Soc Argent Ortop Traumatol* 1971;36(7):349-51.
29. Defilippi Novoa E. Artroplastia de codo con prótesis cementada. *Bol Trab Soc Argent Ortop Traumatol* 1971;36(6):288-9.
30. De Paoli J, Varaona O. Artroplastias de codo. *Bol Trab Soc Argent Ortop Traumatol* 1982;47(2):214-21.
31. Patiño JM. Complex distal humerus fractures in elderly patients: open reduction and internal fixation versus arthroplasty. *J Hand Surg Am* 2012;37(8):1699-701. <https://doi.org/10.1016/j.jhsa.2011.11.020>
32. Gallucci G, Larrondo Calderon W, Boretto J, Castellaro Lantermo J, Teran J, et al. Artroplastia total de codo para el tratamiento de fracturas de húmero distal en pacientes mayores de 65 años. *Rev Asoc Argent Ortop Traumatol* 2016;81(2):84-92. <https://doi.org/10.15417/521>