



Case Report

Bryan and Morrey type IV intra-articular fracture of the distal extremity of the humerus treated surgically with anterior access: case report[☆]



Hugo Bertani Dressler*, Ricardo Nunes Borges de Paula

Santa Casa de Belo Horizonte, Belo Horizonte, MG, Brazil

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ABSTRACT

Within the context of elbow-level trauma, fractures with a coronal line at the distal extremity of the humerus are rare and result from indirect axial trauma with the arm extended. These are difficult-to-treat intra-articular fractures, since they require stable anatomical reduction in order to maintain joint congruence and diminish complications such as stiffness. This paper reports a case that occurred in a young man who suffered a fall from a ladder that resulted in a Bryan and Morrey type IV intra-articular fracture of the humerus. The injury was treated surgically by means of an anterior access, using osteosynthesis with two Herbert screws that were inserted from anterior to posterior.

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Fratura intra-articular da extremidade distal do úmero tipo IV de Bryan e Morrey tratada cirurgicamente com acesso anterior: relato de caso

RESUMO

No contexto dos traumatismos ao nível do cotovelo, as fraturas com traço coronal da extremidade distal do úmero são raras e resultam de trauma axial indireto no membro superior estendido. São fraturas intra-articulares de difícil tratamento por demandar redução anatômica e estável para a manutenção da congruência articular e redução das complicações como rigidez. Reporta-se neste artigo um caso ocorrido em um jovem do sexo masculino, vítima de queda de escada que resultou em uma fratura intra-articular do úmero distal tipo IV de Bryan e Morrey e que foi submetido a tratamento cirúrgico por via de acesso anterior e osteossíntese com dois parafusos de Herbert inseridos de anterior para posterior.

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[☆] Work developed at the Orthopedics and Traumatology Service of Santa Casa de Belo Horizonte, Belo Horizonte, MG, Brazil.

* Corresponding author.

E-mail: hugobertani@hotmail.com (H.B. Dressler).

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Introduction

Fractures of the capitellum and their variants extending to the trochlea are rare and account for around 1% of the fractures at elbow level and 6% of the fractures at the level of the distal humerus.^{1,2} This injury pattern results from a shearing force transmitted from the proximal extremity of the forearm bones to the proximal extremity of the humerus by means of axial loading. These are intra-articular fractures that require careful treatment and anatomical reduction in order to diminish the complications, such as joint stiffness.³

Case report

The patient was a 16-year-old right-handed male who suffered a fall from a ladder in which his left hand took the force of the impact on the ground. This resulted in axial transmission of energy through the extended left arm. In the admission examination at the emergency service, significant local pain was noted, with increased volume and limitation of left elbow movement. There were no skin injuries. Neurovascular examination of the extremity did not demonstrate any abnormalities. The initial radiographic evaluation revealed fracturing of the distal extremity of the left humerus, without good characterization of the pattern (Figs. 1 and 2). In lateral view, the “double arch sign” could be seen (Fig. 2).⁴ To define



Fig. 1 – Anteroposterior radiographic view, which does not show the fracture pattern clearly.



Fig. 2 – Lateral radiographic view showing fracture with displacement and double-arch sign.

the fracture pattern and enable better preoperative planning, a tomographic evaluation was made. This defined the coronal outline, extending from the capitellum to the trochlea in a single fragment (Figs. 3 and 4). In the light of the imaging study, the fracture was classified as type IV according to the classification of Bryan and Morrey,¹ as modified by McKee et al.,⁴ or as type 13 B3.3 according to the AO classification.⁵

After the initial evaluation had been made, from which provisional plaster-cast immobilization was performed and other injuries and comorbidities were ruled out, surgical treatment was indicated. The patient was kept in hospital for care, and to await scheduling of the operation at the same public orthopedic and traumatology service.

After a hospital stay of 14 days, the surgical treatment was performed. It was decided to use an anterior access in the elbow, on a proximal internervous plane between the



Fig. 3 – Three-dimensional tomographic reconstruction in anterior view showing displaced bone fragment.



Fig. 4 – Three-dimensional tomographic reconstruction in medial view showing displaced bone fragment.

brachioradialis muscle (innervated by the radial nerve) and the brachialis muscle (innervated by the musculocutaneous nerve), and distally between the brachioradialis and the pronator teres muscle (innervated by the median nerve),⁶ under left brachial plexus block in association with sedation. The patient was positioned in dorsal decubitus with the left arm abducted and supinated on a lateral support table. After performing rigorous antisepsis and preparation of the skin using a chlorhexidine solution, and placement of sterile fields, the pneumatic tourniquet was inflated. After layer-by-layer dissection and identification of the fracture focus, anatomical reduction was performed, with fixation using two Herbert screws that were inserted from anterior to posterior.⁷

Discussion

Since this was an intra-articular fracture pattern with significant displacement, a surgical approach became necessary in order to reestablish the anatomy and joint congruence. In this regard, open reduction with stable internal fixation because imperative.⁸ Since the usual radiographic views do not allow detailing of the fracture pattern, tomographic assessment plays an important role in understanding the injury and enables better surgical planning.⁹

In most of the series,^{2-4,7} the surgical approach was lateral, medial or posterior and the synthesis material was positioned from posterior to anterior. However, in the case reported here, given that the treatment was implemented 14 days after the fracture occurred, the possibility of reduction by means of an anterior access was considered to allow for the possibility of osteoclasia ("calloclasis"), thereby explaining the choice.

After anatomical reduction with satisfactory positioning of the bone fragment in its bed had been achieved, fixation was performed using two Herbert screws (Zimmer, Warsaw, Indiana) inserted from anterior to posterior. This



Fig. 5 – Anteroposterior radiographic view showing positioning of the synthesis material.

could be observed in the postoperative radiographic evaluation (Figs. 5 and 6).

Although the surgical method used in this case was not the one chosen by the majority of the surgeons who treat this type of injury, there is backing for our approach in the



Fig. 6 – Lateral radiographic view showing positioning of the synthesis material and anatomical reduction of the joint surface.

literature.^{1,3,4,6-8,10} Its disadvantage is its technical difficulty, given the risk of neurovascular injury to the structures of the cubital fossa cubital. On the other hand, it enables extensive viewing of the focus of the fracture, which is especially helpful for anatomical reduction, and this is a decisive factor for good evolution of the case.¹⁰

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Bryan RS, Morrey BF. Fractures of the distal humerus. In: Morrey BF, editor. *The elbow and its disorders*. Philadelphia: Saunders; 1985. p. 302-39.
2. Dubberley JH, Faber KJ, Macdermid JC, Patterson SD, King GJ. Outcome after open reduction and internal fixation of capitellar and trochlear fractures. *J Bone Joint Surg Am*. 2006;88(1):46-54.
3. Sen RK, Tripahty SK, Goyal T, Aggarwal S. Coronal shear fracture of the humeral trochlea. *J Orthop Surg (Hong Kong)*. 2013;21(1):82-6.
4. McKee MD, Jupiter JB, Bamberger HB. Coronal shear fractures of the distal end of the humerus. *J Bone Joint Surg Am*. 1996;78(1):49-54.
5. Rüedi TP, Murphy WM. *Princípios AO do tratamento de fraturas*. São Paulo: Artmed; 2002.
6. Pollock JW, Athwal GS, Steinmann SP. Surgical exposures for distal humerus fractures: a review. *Clin Anat*. 2008;21(8):757-68.
7. Singh AP, Singh AP, Vaishya R, Jain A, Gulati D. Fractures of capitellum: a review of 14 cases treated by open reduction and internal fixation with Herbert screws. *Int Orthop*. 2010;34(6):897-901.
8. Simpson LA, Richards RR. Internal fixation of a capitellar fracture using Herbert screws. A case report. *Clin Orthop Relat Res*. 1986;(209):166-8.
9. Ring D, Jupiter JB, Gulotta L. Articular fractures of the distal part of the humerus. *J Bone Joint Surg Am*. 2003;85(2):232-8.
10. Hoppenfeld S, de Boer P. *Surgical exposures in orthopaedics – the anatomic approach*. 4th ed. Philadelphia: Lippincott; 2009.