

## Solitary osteochondroma of the proximal humerus: direct posterior-medial surgical approach

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**After commenting on the incidence, etiology, clinical history, imaging and management of solitary osteochondroma, the authors present the clinical history of one of these neoplasias that was very particular because of its location at the level of the humeral proximal diaphysis and behind and medially in an 8-year-old boy. The symptomatic neoplasia, however, due to its dimension and histogenesis, was removed using a posterior-medial surgical approach described by Bergher in 1989, with a large, rewarding and finest and total view of the neoplasia. The authors emphasise the facility of this surgical approach in comparison with every other suggestion recommended by different authors, on the subject of the anatomical structure of this part of the arm or on the many vascular and nervous structures that are very valuable.**

**Key words: Surgical approaches - Humeral proximal diaphysis - Osteochondroma.**

Osteochondroma, also called exostosis bone cartilage, is defined as solitary because it is different from multiple exostosis.

It's a benign tumor of the bone and is quite frequent.

Its diagnosis is often fortuitous during radiographical exams performed for other

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pathologies, because it isn't commonly symptomatic. Sometimes or rarely, diagnosis is confirmed by a tough tumor in the typical sites of first appearance. Rarer is the diagnostic onset of a painful or functional disturbance for the patient. In this case the symptoms are caused by the pain owing to the presence of a reactive bursitis inside the osteochondroma and the soft tissue. Adverse to this case is the cause of functional trouble that is due to a big tumor in a particular localization, where it can be in conflict with elements of muscular frame, tendons or other nearby structures.

The solitary osteochondroma accounts for almost 9% of all neoplasia of the bone and almost 35% of all benign tumors. Only 1% of all these neoplasias has a malign degeneration toward Chondrosarcoma.<sup>1</sup>

The typical seats are distal meta-physis of the femur and proximal meta-physis of tibia and humerus, but it's also possible that this neoplasia can be found in other parts of the skeleton.

However the age which is most likely to see an osteochondroma is the second decade of life, and its growth is finished, certainly, dur-



Figure 1.— Anteroposterior X-Ray exam of the humerus confirms a proximal and posteromedial big exostosis.

ing the third. The real incidence of this neoplasia isn't known, because commonly many of these tumors have a clinical history without any particular symptom and for this reason they are underestimated. In any case there is a sure prevalence in the male sex, in a ratio of 3 to 1 in comparison with the female.

The real aetiology of osteochondroma is unknown: it is like a "hernia" of the growth cartilage of the physis;<sup>1</sup> it is rarely found after a history of trauma in the same site. However genetical studies have shown a hereditary aetiology as autosomal dominant as for the multiple exostosis disease. Some authors<sup>2</sup> have found the presence of the same genes in patients with solitary osteochondroma.<sup>3</sup>

This kind of "hernia" of cartilage that is osteochondroma, has the same growth as bone in the same lapse of time until it becomes like a round swelling sessile or pedunculate, with its typical centrifugal growth in comparison with the original meta-physis and it is inclined to extend itself from the physis.

In any case there is a typical diagnostic sign besides the standard radiography in two projections, possibly when there is a case with a functional symptom, for having a correct evaluation of the anatomical relations, and MRI is correct in case of a very fast growth, for evaluating a possible malign evolution of the same neoplasia.

The management of solitary a-symptomatic osteochondroma is only observed in a controlled follow up: surgical excision is suitable only in a case which is symptomatic or presents rapid growth. The right time to execute surgical excision is at the end of skeletal growth, because it is possible to reduce the risk of relapse, that is considered almost 4<sup>th</sup> in previously treated cases.<sup>4</sup>

### Case report

In January 2004, an Egyptian boy aged 7 years and 9 months old, with a big tumefaction at the posterior proximal third of the right arm that was tough, movable on the superficial plane but not on the deep ones, was referred to us. The boy and his parents reported local pain produced during movement of the right arm. An X-Ray exam (Figure 1) showed a voluminous exostosis at the proximal third of the humeral diaphysis in posterior-medial site. A very careful clinical and radiographic evaluation of the entire skeleton excluded the hypothesis of multiple exostosis disease. Clinical diagnosis indicated solitary osteochondroma; but for the painful trouble, the big dimension of swelling added to the functional origin it was decided to proceed immediately to surgical excision of the neoplasia.

MRI was carried out and a scanner reconstruction for study with precision, relation between neoplasia and the vascular and nervous elements and its eventual invasion of neighbouring soft tissues. The tumor shows a proximal part, that is posterior and medial, and another with a partial relation with the axillary nerve and the posterior circumflex humeral artery; on the contrary it has no connection with the radial nerve or humeral artery (Figure 2).

For surgical excision, under general anesthesia, the patient was placed in lateral decubitus with the right arm free and hanging down like a "fishing rod". The surgical incision was longitudinal and posterior, it started approximately 4 cm from the acromion, and was extended distally above the tumor for about 10 cm.

Having isolated the sub-cutaneous tissue and incised the muscle plane, it is possible to see the muscle fibers of the deltoid and of the lateral triceps, to

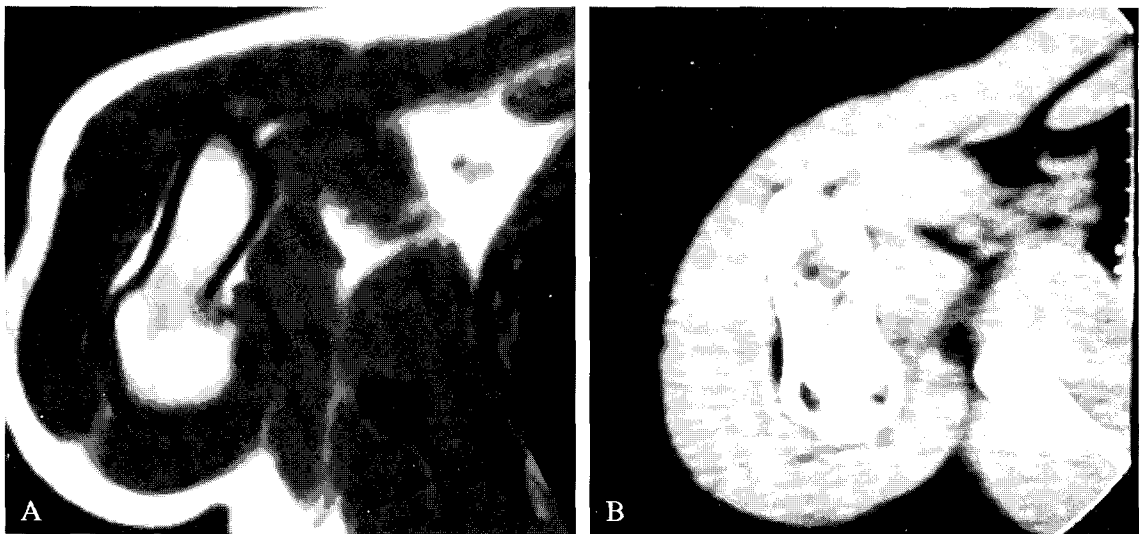


Figure 2A, B.—MRI, T2 weigh, (A) and CT scanning (B) confirm the posterior-medial site of the osteochondroma in the proximal humeral diaphysis. The osteochondroma is in partial contact with the axillary nerve and posterior humeral circumflex artery; there is no contact with the radial nerve and profunda brachii artery. Moreover MRI and CT Scanning rule out invasion of the soft tissues and confirm the benign bone tumor.

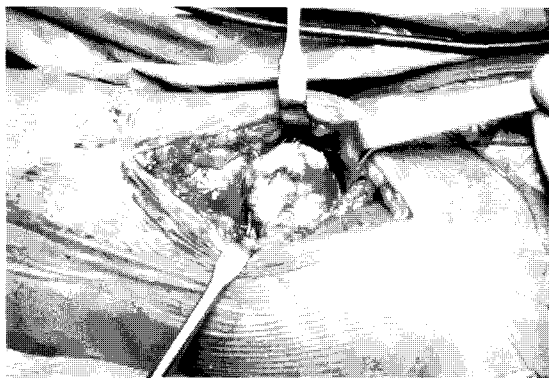


Figure 3.—The osteochondroma during surgical approach before resection.



Figure 4.—Big osteochondroma specimen (cm 6x5) at the time of resection.

smooth the way through the two muscles inside the inter-muscle band until the neoplasia is reached<sup>14</sup> (Figure 3); the deltoid muscle was displaced laterally, and the triceps medially.

Disunited the soft tissue of neoplasia, till it was isolated completely; it was possible to see the base of installation of the lesion; this operation was made easier by the internal and external rotation of the humerus. The nervous elements axillary and radial, the vascular ones as deep and posterior humeral artery, was covered and protected by the muscles to be pulled as little as possible to avoid injuring the nerve (neuroapraxia type). It was possible to execute an osteotomy of the pedunculate base of the osteochondroma with a snip and completely remove

the lesion (Figure 4). The suture, after placing an aspirant drainage, was limited to the superficial muscle plane, with subcutaneous tissues and cutaneous ones, this last suture made with re-absorbable intra-dermal sewing thread.

The anatomical-pathological examination has confirmed the suspected diagnosis of osteochondroma.

In the postoperative period the patient presented no other peripheral neurological deficit; he returned home on the twelfth day after excision with his arm free; and he started using the arm very quickly (two weeks) without any restriction.

Today 14 months after the operation, the patient is living normally and a radiographic control confirmed the complete excision of the neoplasia and

showed the transformation in cortical bone in the same site.

### Discussion

The particular site of neoplasia, posterior and medial at the medial third of the humeral diaphysis, has created some problems in relation to the connection with the vascular and nervous elements that are placed in the same site. At this level there are from the proximal to transversal extension and so from lateral to the median site, the axillary nerve (nervus axillaris), the posterior branch of the brachial plexus (fasciculus posterior plexus brachialis), and the posterior circumflex humeral artery (arteria circumflexa humeri posterior), branch of humeral artery (arteria brachialis); in the adult man it is about 6.1 cm from the humeral head.<sup>5</sup> A little bit below and medially there is the passage, with a little more vertical direction, of radial nerve (nervus radialis), the deep humeral artery (arteria profunda brachii), below the lateral insertion of the triceps muscle (triceps brachii); in adults about 9.6 cm from the axillary nerve and the lateral septum between muscle.<sup>5</sup> The literature contains no studies about the mean distances between the nervous and vascular elements in the infant at different ages; but it is necessary to consider the mean distance reported in the adult man. The surgical approach to the proximal posterior-medial part of the humeral diaphysis isn't very useful in orthopedic and trauma surgery. This surgical approach is rarely described in the literature<sup>1-9</sup> because it is used only in orthopedic surgery in oncological practice and because neoplasia in this site that are very rare.

The clinical case that we describe is very interesting for many reasons; first for the very big dimensions of the tumor and its unusual symptomatology, and also for the very young age of the patient and for the atypical location (posterior-medial at the proximal third of humeral diaphysis).

The dimensions of the tumor (cm 6x5) are surely worthy, in comparison of the age of the patient (he was younger than 8 years old at

the moment of surgical intervention). About the disabled symptomatology felt by the patient is more painful instead of the functional one; this reason led us to make the surgical excision.

Another very interesting reason of our clinical case is the seat of the lesion that is proximal and posterior-medial of the humeral diaphysis and it is the determinant element for the choice of direct surgical approach.

There is a posterior surgical approach, that is rarely used and with a high risk of damage owing to the presence of many very important vascular and nervous elements: the axillary nerve, the posterior circumflex humeral artery in the proximal site and in the distal and medial one the radial nerve and the deep humeral artery.

This surgical approach was described for the first time in the literature by Bergher in 1989,<sup>4</sup> this anatomical way, that is simple and fast, that must be done with the caution of well protecting the axillary nerve and the posterior circumflex humeral artery in site proximal and in distal and medial site the radial nerve and the deep humeral artery.

### Conclusions

Some authors<sup>7-9</sup> have suggested many different surgical approaches at the posterior proximal humeral part like the broad deltoid-pectoral one proposed by Cogan in 2002.<sup>9</sup> We think that this surgical approach is more difficult and complicated, more aggressive and can be more destructive [requiring in effect the tenotomy of grand pectoral (pectoralis maior), grand dorsal (latissimus dorsi), grand round (teres maior) and subscapular (subscapularis) and it is more at risk of damaging more nervous and vascular elements that are in this site. In our clinical case, the exposition of proximal humeral diaphysis in the part posterior-medial was large and complete enough for a good and total vision of the lesion; as a matter of a fact it is possible that this is made easier by the age of the patient (8 years old), unlike the Cogan clinical case that is in a adult man.

In our opinion the posterior surgical direct access by Bergher seems to be the right way for an excision of this neoplasia in this area.

delle numerose strutture vascolari e nervose che sono molto importanti.

Parole chiave: Osteocondroma - Approccio chirurgico diretto postero-mediale.

### Riassunto

*Osteocondroma solitario della parte prossimale dell'omero: approccio chirurgico diretto postero-mediale*

Dopo aver commentato l'incidenza, l'eziologia, la storia clinica, gli aspetti relativi alla diagnostica per immagini e la gestione dell'osteochondroma solitario, gli Autori illustrano la storia clinica di una di queste neoplasie in un bambino di 8 anni, che è stata molto particolare a causa della sua localizzazione a livello della parte prossimale dell'omero, coinvolgendo la diafisi ed estendendosi posteriormente e medialmente. La neoplasia sintomatica, a causa delle sue dimensioni e degli aspetti istologici, è stata asportata utilizzando l'approccio chirurgico postero-mediale descritto da Bergher nel 1989 che ha consentito una visualizzazione intraoperatoria migliore, più completa della neoplasia.

Gli Autori sottolineano la facilità di questo approccio chirurgico rispetto a qualsiasi altro raccomandato da Autori diversi, tenendo conto della struttura anatomica di questa parte dell'arto superiore o

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