

Clinical case

Hand reconstructive surgery secondary to giant cell tumor

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ABSTRACT. The giant cell tumor of the bone is a neoplastic low grade lesion that usually appears in the epiphyseal or metaphyseal region of the long bones. The lesion is usually solitary and becomes symptomatic when a considerable proportion of the bone has been destroyed. It is thought to represent approximately 19% of the benign bone tumors and 9% of all the primary bone tumors, according to a review by Schajowicz. The treatment of the giant cell tumor is controversial and the literature is confusing. The giant cell tumor is located mainly in the hand. Its potential aggressiveness makes us consider it in the differential diagnosis of the tumor lesions affecting the hand. The proposed treatment should try to preserve function to the extent possible but, at the same time, it needs to be radical enough to prevent a possible relapse. The purpose of this research work is to describe our experience with the treatment of the giant cell tumor in three cases that presented as a lytic, expansive lesion affecting the bones of the hand. They were treated with tumor resection and a bone graft to fill the defect. All three patients had a favorable course.

Key words: reconstruction, hand, giant cell tumor.

RESUMEN. El tumor de células gigantes del hueso es una lesión neoplásica de bajo grado que casi siempre aparece en la región epifisaria o metafisaria de huesos largos. La lesión normalmente es solitaria y se hace sintomática cuando se ha destruido una proporción considerable de hueso. Se considera que supone aproximadamente el 19% de tumores benignos del hueso y el 9% de todos los tumores primarios del hueso en la revisión de Schajowicz. El tratamiento del tumor de células gigantes es polémico y la literatura es confusa. El tumor de células gigantes se localiza raramente en la mano, su potencial de agresividad nos obliga a tenerlo presente en el diagnóstico diferencial de las lesiones tumorales que afectan la mano y plantear un tratamiento que intente conservar lo más posible la función pero que al mismo tiempo sea lo suficientemente radical como para prevenir una posible recidiva. El objetivo del presente trabajo de investigación es aportar nuestra experiencia en el tratamiento de tumor de células gigantes en tres casos que se presentan como una lesión lítica, expansiva que afectaba a los huesos de la mano los cuales fueron tratados mediante resección del tumor y sustitución del mismo por injerto óseo. La evolución de los tres pacientes fue favorable.

Palabras clave: reconstrucción, mano, tumor de células gigantes.

Level of evidence: IV (Act Ortop Mex, 2010)

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Introduction

The giant cell bone tumor is benign, but it has great potential for recurrence. It is frequently seen in the areas of the tubular bone epiphysis; these tumors are seldom located in the hand.¹⁻⁴

The giant cell bone tumor affects most often the patients with a mature skeleton, age 20-40 years; its peak incidence is the third decade of life. Females are affected slightly more frequently than males. When it affects the hand bones a central location is most frequent, unlike the usual eccentric location at other sites.⁵

Surgical treatment of giant cell tumors located in the hand bones is aimed at removing the tumor and protecting function; the aggressive nature of these tumors should be borne in mind. The surgical alternatives for radical treatment include broad resection, partial resection and amputation.²⁻⁴

The purpose of this case report is to analyze the evolution of the patients assessed and treated after a diagnosis of a giant cell tumor in the hand bones at the ISSEMyM Medical Center, Ecatepec, Mexico.

Clinical case presentation

Clinical case 1

Male, 18 year-old patient, student, without relevant medical history, whose condition began in 2007 with pain and inflammation of the index finger of the left hand, swelling and limitation of flexion and extension. He was examined at the medical oncology department, where a probable bone cyst was detected; after taking a biopsy, he

was referred to pediatric orthopedics with the diagnosis of giant cell tumor. The physical exam findings included a tumor in the proximal phalanx of the second finger in the left hand, slightly painful with well defined borders. Radiographically, an osteolytic image was detected in the mid third of the affected phalanx, so on 12/31/09 the tumor was resected, a graft was implanted and a mini-elongator was placed (*Figures 1 to 5*). The bone elongator was removed after three months and the patient's course was fine (*Figure 6*). Currently the ranges of motion of the left index finger with flexion of the proximal and distal interphalangeal joints are 70°, extension 0°, and the sensitivity remains unchanged. The rest of the exam showed no compromise related to his condition.

Clinical case 2

Male, 15 year-old patient, student, with relevant personal history of neonatal hypoxia with sequelae of right hemiplegia, umbilicoplasty at 6 months of age due to a strangled hernia with intestinal resection, epilepsy up to age 7. His condition began on June 2008 upon sustaining a contusion of the right hand; he was managed with a cast. Upon removal of the cast, at 4 weeks, swelling of the hand dorsum was detected, with pain and limited ranges of motion of the fingers and wrist. He was referred to the oncologic surgery department, where a biopsy of the tumor was taken on 01/06/09; a giant cell tumor was reported, and the patient was referred to the pediatric orthopedics department where the tumor was resected on 04/07/09. The tumor comprised the entire carpal area so the carpal bones had to be removed; a bone graft was put in place and fixed with Kirschner nails (*Figures 7 and*



Figure 1. Left hand X-ray (dorsopalmar) showing a tumor in the proximal phalanx of the index finger.



Figure 2. AP X-ray of the left index finger with an osteolytic image in the mid third of the proximal phalanx.



Figure 3. Clinical image of the left hand (palmar aspect) after tumor resection and the placement of a bone graft and an external fixator.

8), which were removed 4 weeks later. Osteotomy and elongation of the 3rd metacarpal bone were performed on 11/12/09 by placing a mini-elongator and a bone graft. (Figure 9). The patient has had a proper course, without fixators (Figures 10 and 11), wrist flexion is 45°, extension 0°, the flexion of the fingers is limited but they are functional, hand strength is 4/5. The sensitivity is preserved. The rest of the exam showed no compromise related to his condition.

Clinical case 3

Female, 38 year-old patient with a history of bilateral inguinoplasty at 2 months and 7 years of age, 2 cesarean sections, 6 ERCPs secondary to exchange of a biliary stent, cholecystectomy 7 years ago, resection of a synovi-

al cyst in the right wrist at 14 years of age, cervical papilloma virus treated and in remission. The patient's condition began in May 2006 with pain and swelling of the second finger of the right hand; the X-rays showed a well defined tumor with cortical thinning and an osteolytic appearance (Figure 12). The patient was examined at the oncologic surgery department on December of the same year; on 12/06/06 the tumor was resected and the specimen was sent to pathology; the pathologic report was giant cell tumor. Then in 11/22/07 a bone graft was placed with centromedullary fixation with a Kirschner nail (Figure 13). In March 2010 a bone distractor was placed in the involved finger (Figure 14) and later, on 04/15/10 the Kirschner nail and the bone graft were removed and a tailor-made metacarpophalangeal tumor prosthesis was implanted (Figures 15 and 16). The patient is currently



Figure 4. Postoperative X-ray of the left hand (dorsopalmar) after tumor resection, and placement of a bone graft and a bone elongator.



Figure 6. Left hand X-ray (oblique) showing appropriate bone ingrowth of the graft in the proximal phalanx.



Figure 5. Clinical image (oblique of the left hand) showing the hand with the bone elongator.



Figure 7. Postoperative X-ray of the right hand (dorsopalmar, oblique) showing the resection of a row of carpal bones and the 3rd metacarpal plus a bone graft fixed with Kirschner nails.

asymptomatic, with 50° of flexion, 0° of extension of the second finger of the right hand, and preserved sensitivity (Figures 17 and 18).

Discussion

Giant cell tumors affecting the hand bones are rare lesions that are usually diagnosed at an advanced stage. The precise diagnosis requires a clinical evaluation, imaging tests and a histopathologic assessment.⁶ These tumors are infrequent in young adults. In the absence of adjuvant treatment, the literature reports a strong potential for local recurrence of 75-86%. These tumors also have the risk of progressing to sarcomatosis and lung metastasis.^{7,8}

The differential diagnosis should include the aneurysmatic bone cyst. These conditions have traditionally been considered as benign lesions that may behave aggressively at the local level.⁹

The objectives of salvage surgery of the thoracic limbs are tumor resection and preservation of the hand function without the risk of local recurrence. The amputation of the hand, wrist and forearm used to be the treatment of choice of a neoplasia, but the limb salvage procedures have been possible to a great extent thanks to the advances in imaging diagnosis, reconstructive surgery, radiotherapy and adjuvant chemotherapy.^{10,11}

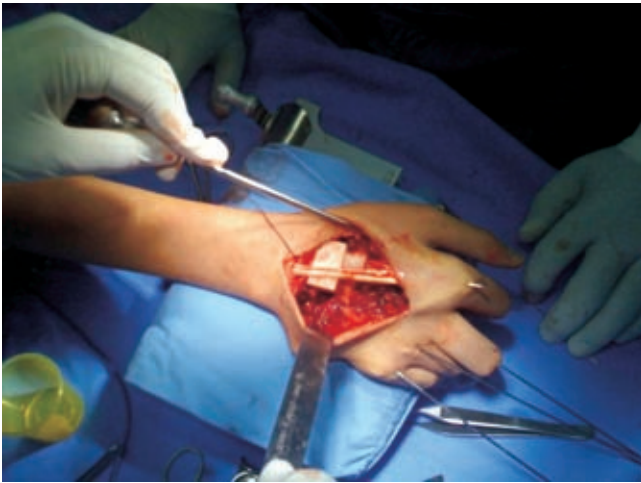


Figure 8. Intraoperative clinical image showing the absence of the carpal bones and the placement of a bone graft stabilized with Kirschner nails.

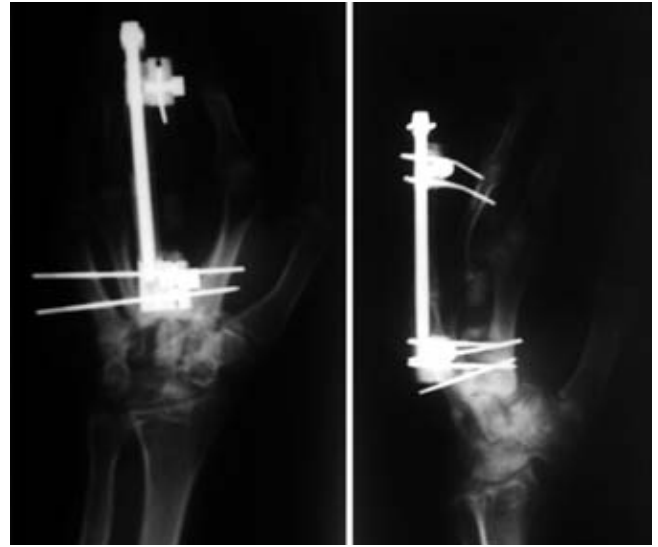


Figure 9. Left hand X-ray (oblique dorsopalmar) showing the integration of the bone graft at the level of the carpus and the elongation of the 3rd metacarpal bone graft.



Figure 10. Clinical image of the final left hand (dorsal and palmar aspects) showing a proper healing, a shortened 3rd finger of the left hand, but with appropriate function.

Giant cell tumors of the distal forearm are more frequently recurrent and difficult to treat, mainly due to the proximity of the carpus and the range of diminution resulting from the movement of the hand and forearm.¹²

There are many treatment modalities, such as curettage, cryosurgery and cementing to prevent amputation.^{2,13,14}

Radiologically, the advanced disease usually has a specific presentation. Thirty-six percent of local relapses have

been associated with tumor resection plus the use of a bone graft.¹⁵ Giant cell tumors, giant cell granulomas and aneurysmatic bone cysts seldom produce defects in the hand bones; their treatment is difficult and has a high relapse rate.^{16,17}

Conclusions

Patients with a giant cell tumor of the hand have had a difficult course in terms of local recurrence and the need for subsequent surgeries to avoid treatment failure. The final results with the use of a bone graft and/or a tumor prosthesis after tumor resection have been appropriate in the cases studied.



Figure 11. X-ray of the final left hand (dorso-palmar) showing an appropriate bone ingrowth of the graft at the carpal level and the shortened 3rd metacarpal.



Figure 13. X-ray of the right hand (dorsopalmar) after resection of the 2nd metacarpal and placement of a bone graft stabilized with a Kirschner nail.



Figure 12. X-ray of the right hand (dorsopalmar-lateral-oblique) showing an osteolytic image in the head of the 2nd metacarpal.



Figure 14. X-ray of the right hand showing lysis of the bone graft that led to the placement of a bone elongator, to later remove the graft and preserve the length of the 2nd metacarpal.



Figure 15. Clinical image of the right hand (intra-operative) after removal of the lysed bone graft and the bone elongator and placement of a tumor prosthesis for the 2nd metacarpal designed by Dr. Henry Vergara Fernández.



Figure 16. X-ray of the right hand (palmar) showing the design of the tumor prosthesis for the 2nd metacarpal.



Figure 17. X-ray of the right hand (oblique) showing the mobility of the tumor prosthesis.



Figure 18. Clinical picture of the right hand showing appropriate healing of the skin with shortening of the second finger.

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