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Treatment of Solitary Cysts of the Humerus

Treated by Diaphyseal Resection and Bone Grafting

D. Chaves

Av. Atlântica 1440, 8° andar, Palacete Atlântico, Copacabana, Rio de Janeiro, Brazil

Summary. *The 'classical' surgical treatment of unicameral bone cysts of the humerus with curettage and bone grafting is unreliable with approximately 40% failure rate. The author describes a technique of subperiosteal diaphyseal and metaphyseal resection and replacement with a section of fibula maintained in position with an intramedullary nail and further supported by massive tibial cortical and cancellous grafting. Consistent incorporation of the graft and excellent remodelling were observed in 36 patients so treated. No complications or recurrence were reported.*

Résumé. *Le traitement chirurgical «classique» des kystes solitaires de l'humérus par curettage et greffe osseuse ne donne pas des résultats constants, puisqu'il comporte environ 40% d'échecs. L'auteur décrit une technique de résection sous-périostée, diaphysaire et métaphysaire, avec remplacement par un fragment de péroné maintenu par enclouage centro-médullaire et complété par des greffons tibiaux cortico-spongieux. Une parfaite incorporation de la greffe et un excellent remodelage ont été obtenus dans les 36 cas traités de cette manière. Il n'y a eu ni complications, ni récidives.*

Key words: *Cyst, Humerus*

Bone cysts in the humerus are frequently treated by extensive curettage and packing of the cavity with autogenous bone graft [1] but the results are not reliable since there is a 40% recurrence rate [7]. Other methods of treatment, as for example, instillation of corticosteroid preparations into the cavity are as yet of unproven value.

It is often thought that a pathological fracture through the cavity may initiate spontaneous obliteration of the cyst, but this has not been our experience since the cyst frequently persists in spite of rapid union of the fracture [2]. Nevertheless, immediately after a fracture, is a favourable time to carry out the operative procedure we shall describe because continuity of the bone has already been interrupted and the healing phase is favourable for osteogenesis and incorporation of the autogenous bone graft.

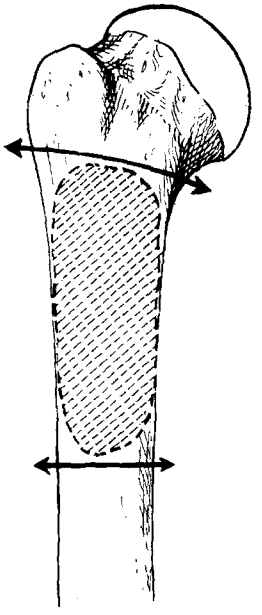

Fig. 1. Typical segment of humerus to be resected after Judet [5]

Due to the unreliability of other methods of treatment we now favour subperiosteal resection of the diaphysis of the humerus and replacement with bone graft material taken from the fibula and tibia of the same patient.

Operative Technique

An anterior approach to the humerus via the deltopectoral groove is made and the periosteum is incised longitudinally, sometimes as far as the distal third of the bone. Limited transverse incisions in the peri-

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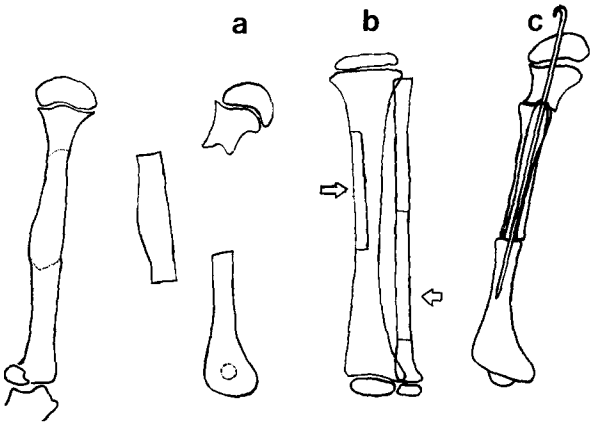


Fig. 2 a–c. Diagram to explain the surgical technique: **a** Resection of the segment bearing the bone cyst. **b** The donor sites of bone graft from the ipsilateral tibia and fibula. **c** Placement of the fibular graft and transfixion with a Rush nail

osteum facilitate circumferential stripping of the periosteum from the bone prior to resection of the entire abnormal portion of the humerus using a Giglí saw (Fig. 2a–c).

The fibula is exposed from a point two to three fingers' breadths above the lateral malleoulus, as far as the level where the bone becomes more extensively covered by muscle [3]. A length of the fibula, adequate to bridge the defect created in the humerus, is then resected subperiosteally followed by closure of the periosteum with interrupted sutures.

The fibular graft is placed in the defect in the humerus and secured by a suitably sized Steinmann pin or Rush nail passed through the upper and lower portions of the humerus and the medullary cavity of the graft. The nail should have a bend at its upper end

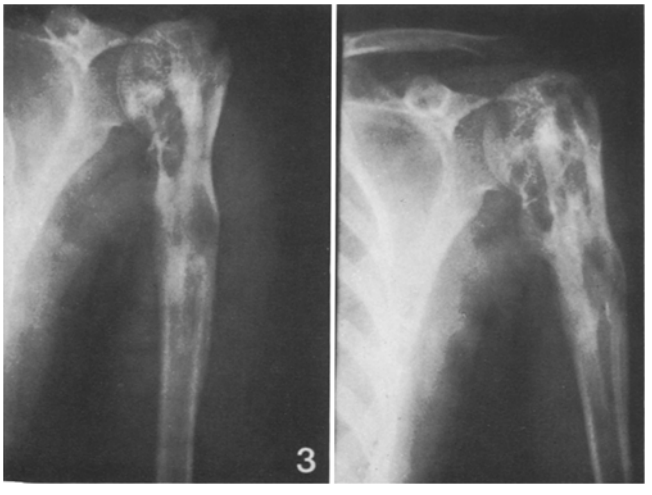
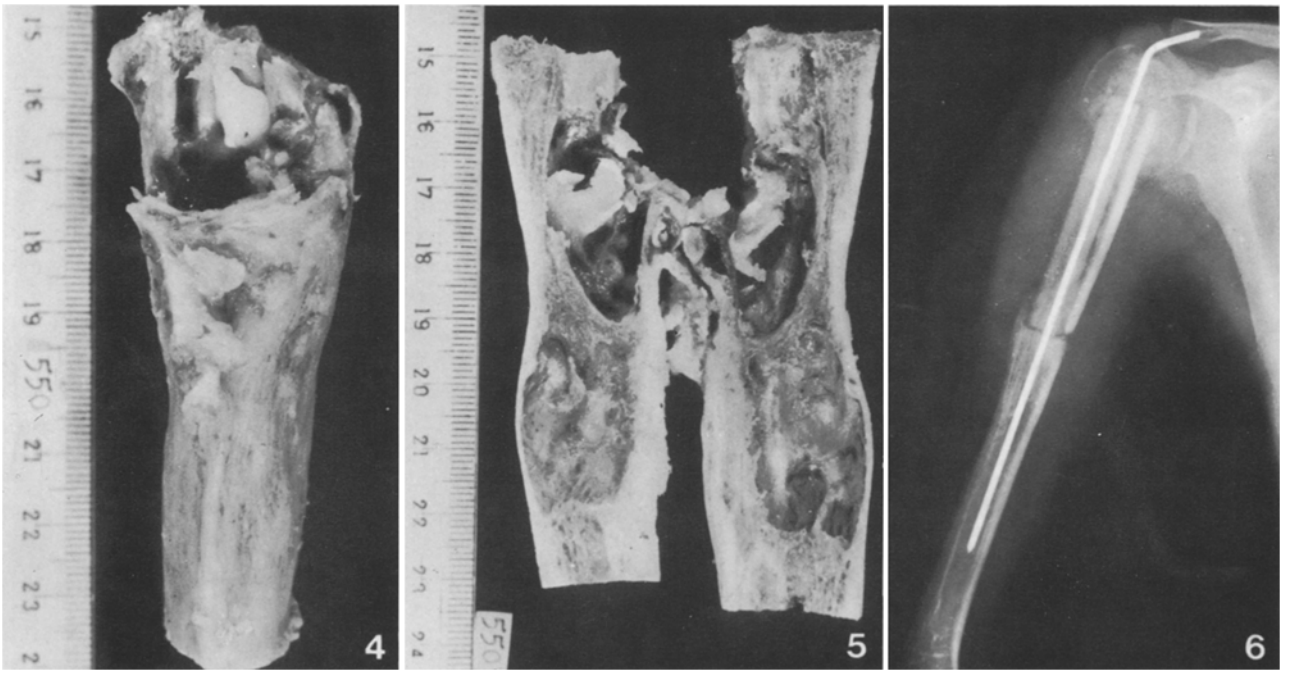


Fig. 3. Typical result following simple curettage and cancellous bone grafting. Note the multilocular form of the cyst and areas of sclerosis

Fig. 4. Resected specimen showing considerable deformity caused by the humeral cyst

Fig. 5. Section of a specimen resected that had previously undergone several operations of the 'classical' type. Note the well-formed septa, sclerosis and multilocular nature of the lesion

Fig. 6. To show incorporation of the graft



to resist migration and care must be taken to avoid damage to the epiphyseal cartilage in the proximal humerus.

An additional slab of cortical bone taken from the tibia is attached to the fibular graft to provide additional strength, using two or three sutures of chromic catgut and the grafted area is further supplied with cancellous bone taken from the same tibia.

For the comfort and convenience of the patient the graft donor sites are usually on the same side as the humeral defect. Sometimes it is necessary to enlarge the medullary canal of the fibula using a suitable drill.

The wounds are reconstituted in layers and a Velpeau plaster of Paris cast is applied to the upper limb and a below knee walking cast applied to the donor limb. Early weight bearing in the plaster cast is permitted and both casts are removed three to four months after surgery.

Six to eight months after the operation, the bone grafts should be satisfactorily incorporated and the Steinmann pin or Rush nail may be removed at that time (Fig. 7) although if it is not obtrusive or causing limitation of movement of the upper limb it may remain for a longer period.

Fig. 7. End result following removal of the intramedullary nail

Results

In the course of 15 years the technique has been employed on 36 patients, the youngest was 4 years and the oldest 16 years old. The greatest length resected was in the oldest patient and measured 16 cm. All the patients have been reviewed after a period of at least 18 months and the extent of bone regeneration and remodelling was better than we had anticipated (Figs. 8–11).

It was interesting to note that the fibula and tibia donor areas reformed some months after the operation (Fig. 13).

To date there have been no complications in the form of infection, resorption of the graft, pseudoarthrosis, fracture, shortening, bending of the graft, or further disorder of bone growth.

Discussion

The so-called conventional method of treating a single bone cyst ('unicameral bone cyst') [8, 9], by curettage of the cavity and packing with cancellous and solid bone graft frequently proves unsatisfactory.

In 1965, Agerholm and Goodfellow (quoted by De Palma [4]) described a more aggressive and radical method of treatment employing subperiosteal resection of the lesion and filling the resulting defect surrounded by the periosteal sleeve, with bone chips. This technique led to a significant reduction in the rate of recurrence. In six cases De Palma [4] reported no recurrence, fracture or pseudoarthrosis. The method although an improvement on the previous techniques, had the disadvantage of requiring a large quantity of bone chips which were not readily obtainable in young children even from the iliac crest, the relative shortage of suitable graft material we considered lead to a risk of failure.

Matthiass and Immenkamp [6] describe a technique of subperiosteal resection and replacement similar to that used by ourselves which exploits the high osteogenic potential of the periosteum in children and adolescents. Points of difference, however, which we consider important are that two autogenous grafts are employed and the fibular graft is placed accurately between the resected ends of the humerus rather than being impaled in the medullary cavity of the latter. A thicker, Steinmann pin or Rush nail is favoured in place of the Kirschner wire and we consider these modifications provide greater mechanical stability.

Originally we were cautious in our indication for the operation described and tended to use it only in patients where the cyst was poorly demarcated and difficulty was anticipated in performing adequate curettage, or in patients who had already undergone previous ineffectual surgery leading to sclerosis, dystrophia and multilocular cyst formation. However, the consistently satisfactory using the technique we have described together with the high recurrence rate of approximately 40% following simple curettage and grafting [7] now leads us to favour the more radical technique as the optimum form of primary treatment.

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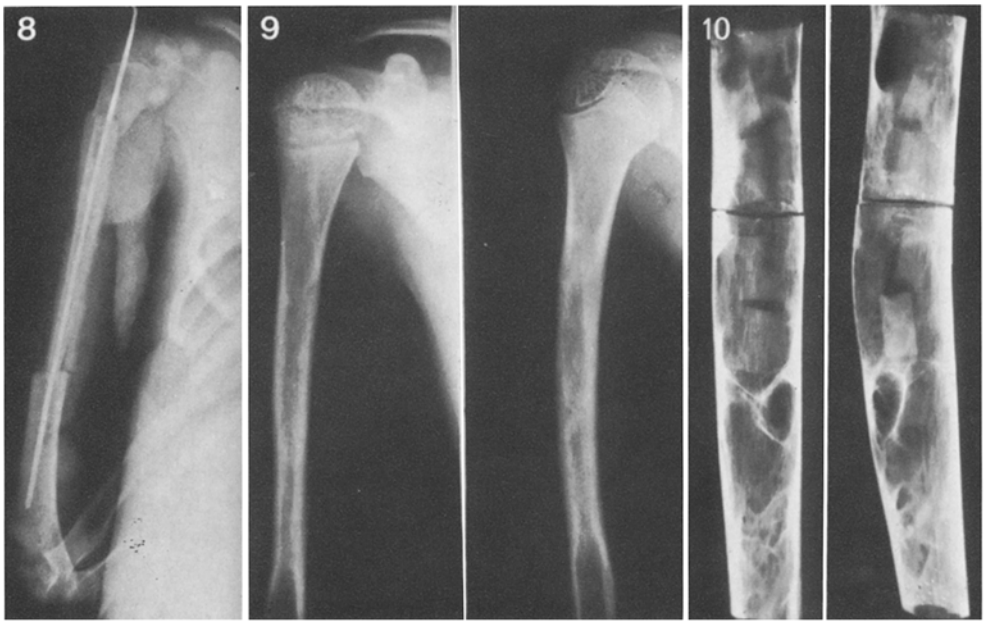

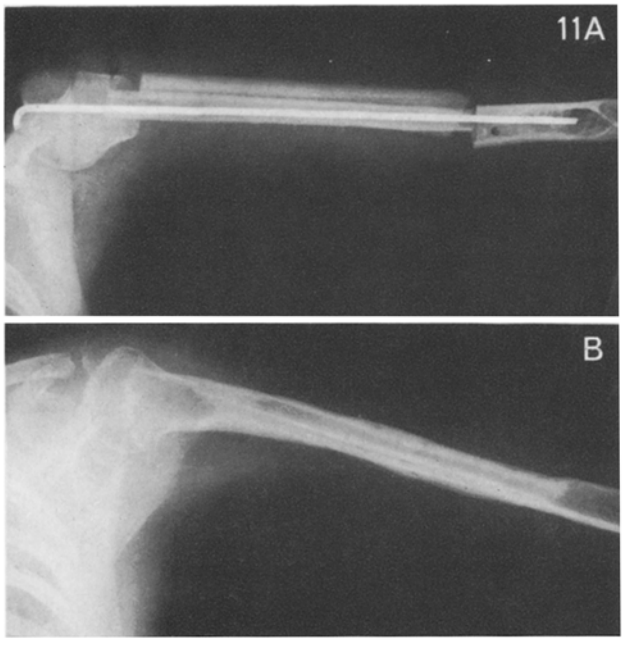

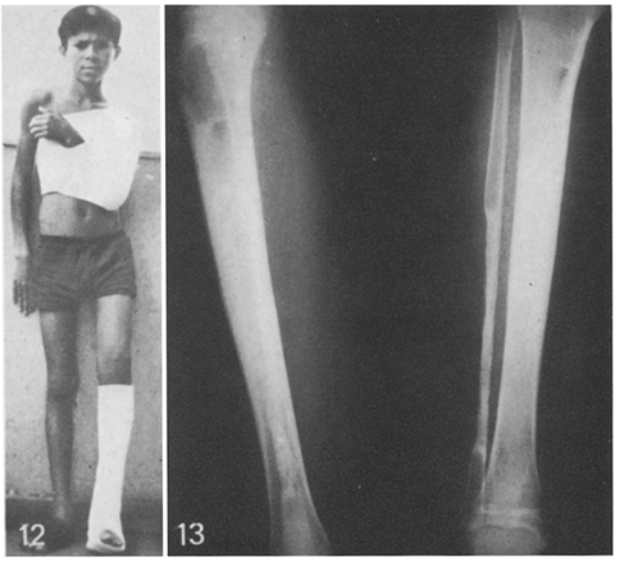

Fig. 8. Immediate postoperative appearance of another patient

Fig. 9. Shows the excellent remodelling which can occur

Fig. 10. The longest section resected (16 cm)

Fig. 11 A and B. The same patient, postoperative appearance

Fig. 12. To show the type of plaster immobilisation employed

Fig. 13. To show the extent of regeneration of the tibia and fibula donor sites 6 months after operation

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