

RECONSTRUCTIVE SURGERY FOR A DEFECT IN THE SHAFT OF THE ULNA DUE TO OSTEOMYELITIS. LONG-TERM RESULT OF A CASE

J. M. KIRKOS, J. H. HARITIDIS

An eight and a half-year-old boy suffered from chronic osteomyelitis of the left ulna with sinuses, destruction of the middle three-quarters with the presence of necrotic bone and posterolateral dislocation of the radial head.

The operative treatment included sequestrectomy and gradual reduction of the radial head after application of an Anderson apparatus. In a second procedure a corticocancellous tibial bone graft was used to bridge the ulnar gap, and later the redislocated radial head was excised.

At the latest follow-up, 45 years postoperatively, the limb is fit with normal muscle strength and very satisfactory motion of the elbow and wrist joints, and the patient works as a hard manual laborer.

Key words : osteomyelitis ; reconstruction ; bone defect ; bone graft ; ulna.

Mots-clés : ostéomyélite ; reconstruction ; perte de substance ; greffe osseuse ; cubitus.

INTRODUCTION

Chronic osteomyelitis in children has rarely been described (10). It may either develop from an acute form, or be chronic from the onset. In both cases the chronicity of the infective process may depend on the virulence of the pathogen, the immune response of the patient, and/or the treatment (11).

The infection may extend through the entire length of a long bone and destroy all or part of it (3). Especially in neglected cases the infection may produce sinuses and a sequestrum with extensive cavitation.

The sequestrum will maintain the length and alignment of the limb while the periosteum lays down new bone around it. In cases with discharging sinuses, the sequestrum must be removed, and if the involucrum is incomplete a defect will be created.

The present paper discusses the long-term result of a patient suffering from a defect of the entire shaft of the ulna due to chronic osteomyelitis and the successful reconstruction of the ulna.

CASE REPORT

An eight and a half-year-old boy was transferred to the Orthopedics Department with active sinuses on the ulnar side of the left forearm. The history had begun nine months before admission with symptoms of acute osteomyelitis at the ulnar side of the forearm. The treatment started with oral antibiotics (penicillin) on a general practitioner's advice. Two weeks later despite the antibiotic treatment two sinuses appeared on the ulnar side of the left forearm. Nevertheless the oral antibiotic treatment was continued for the next six weeks. During the last seven months before we saw him, the patient had been admitted to different pediatric departments three times and was treated with intramuscular and oral antibiotic therapy.

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On admission to the orthopedics department the patient had two active sinuses on the ulnar side of his left forearm. There were no neurovascular problems of the limb, but there was marked painful restriction of the elbow and wrist movements. Moreover the radial head was palpable in a lateral and proximal dislocated position over the lateral aspect of the elbow. Active flexion of the elbow was -20° of normal, active extension was -50° of normal, while the rotational movements of the forearm were absent and any attempt at rotation was painful.

The xray control of the forearm (fig. 1) revealed destruction of the entire diaphysis of the ulna with presence of necrotic bone. Posterolateral dislocation of the radial head had occurred owing to the shortening of the ulna.

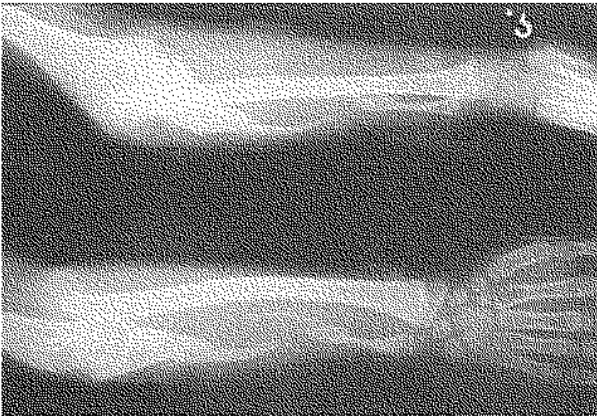


Fig. 1. — Radiographic appearance of the left forearm on admission in the Orthopedics Department. There is destruction of the entire shaft of the ulna with presence of necrotic bone. Note the posterolateral dislocation of the radial head due to the shortening of the ulna.

The patient was treated operatively. After exposure on the ulnar side, the necrotic tissue and the sequestrum were excised. An Anderson apparatus was applied (fig. 2) in order to reduce the dislocated radial head. The sequestrectomy was followed by primary wound healing and disappearance of the sinuses. The distraction started a week after application of the apparatus with one millimeter each day and the reduction of the radial head was

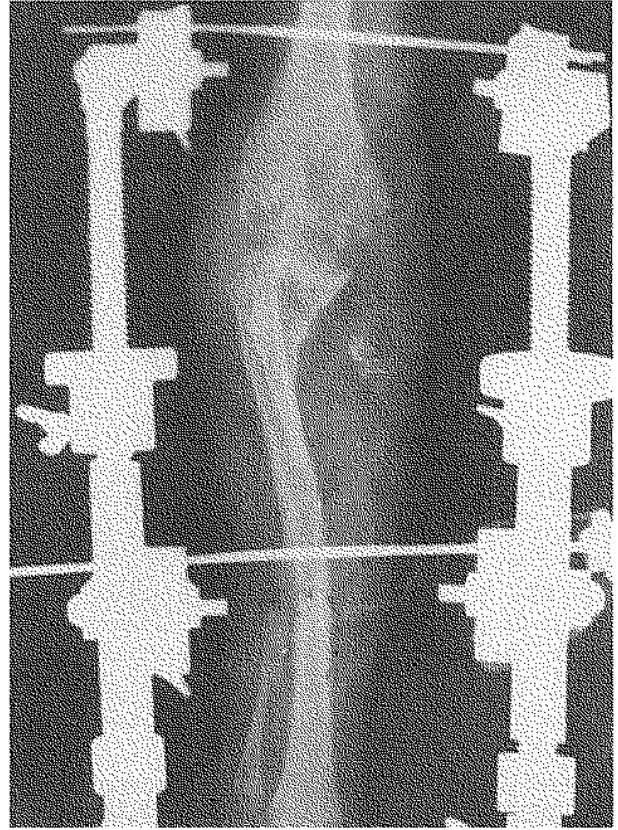


Fig. 2. — After removal of necrotic tissue and sequestrum, the radial head was reduced using an Anderson apparatus.

achieved. Unfortunately the apparatus had to be removed during the second month owing to pintract infection, and the limb was protected in a long-arm plaster cast with the elbow flexed to 90° . Four months later, the ulnar gap was still present while the radial head had gradually redislocated.

Another four months later, the ulnar gap was bridged with a tibial bone graft fixed on both sides with single screws (fig. 3), and the limb was immobilized for three months in a long-arm plaster cast. The bone graft was taken from the anteromedial surface of the left tibia; it was corticocancellous and the size was 15 cm in length and one cm in thickness and width. The bone graft was incorporated, and one year later the radial head was excised (fig. 4) in order to improve the elbow movements.

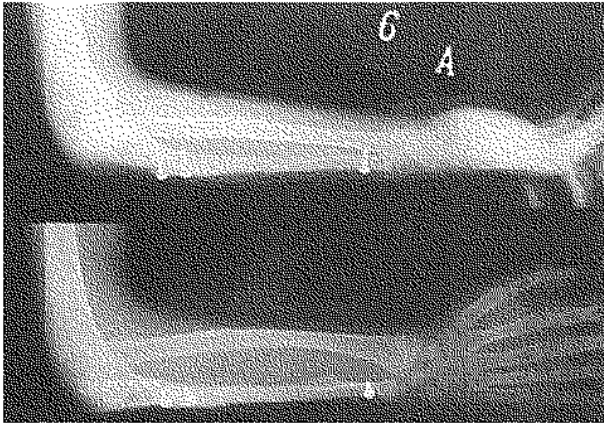


Fig. 3. — Radiographic appearance of the forearm four months after bridging of the ulnar gap with a tibial bone graft.



Fig. 4. — Radiographic appearance after excision of the radial head.

During follow-up, two years after removal of the radial head, the limb had recovered normal muscle strength. Active flexion of the elbow was normal, active extension was -40° of normal and the rotational movements of the forearm were half of normal. The movements of the wrist joint were normal.

The patient at the age of 18 years served in the Greek Army and later started to work as a hard manual laborer.

At the latest follow-up, at the age of 54 years (45 years postoperatively), the active movements of the wrist joint were normal. The active movements of the elbow were : normal flexion, extension limited to about 35° , normal supination and pronation limited to about 25° (figs. 5, 6).

There was about 3-cm shortening of the left forearm. Moreover the radial "head" is palpable at the lateral aspect of the elbow joint.

The muscle strength is normal both for flexors and extensors of the wrist and elbow joint, the limb is fit, the patient works as a hard manual laborer and he is very satisfied with the final result.

DISCUSSION

Despite advances in treatment, occasional cases of osteomyelitis still are difficult to resolve, especially those with extensive cavitation and sequestration (6). In most patients with osteomyelitis with

extensive destruction and sequestration, radical excision of infected bone and necrotic connective tissue is an accepted method of treatment (6).

Yet, if diagnosis and treatment are delayed, the disease, despite antibiotics, may show all its former complications and may run the same unfavorable course as described by earlier surgeons (9).

If, after primary diaphysectomy, no signs of regeneration appear within six months the gap is likely to be permanent (1). If a sequestrum has been present for a long time, but without involucrum, conservative treatment is futile (4). Early sequestrectomy not only allows sinuses to heal and makes subsequent reconstruction possible, but may also help to preserve the epiphysal growth zone from the adverse effects of continuing infection. Removal of a sequestrum will not be followed by spontaneous bone regeneration. Therefore reconstruction should be undertaken early because removal of the sequestrum, which can support the soft tissues, will increase deformity, especially in the forearm (4).

Today it is unusual for a patient to present with an established defect or with a large chronic sequestrum without an involucrum. Moreover there is little to be gained by delaying reconstruction longer than necessary for healing of wounds and sinuses.

In general, the choice of treatment of a shaft defect in a long bone lies between :

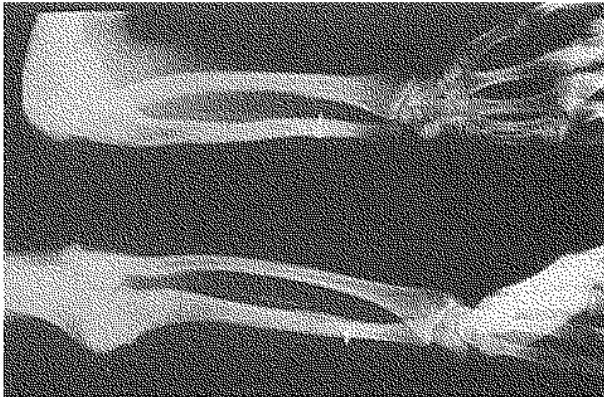


Fig. 5. — Radiograph taken 45 years postoperatively. The ulna consists of a normal bone radiographically while the radial “head” is redislocated posterolaterally.

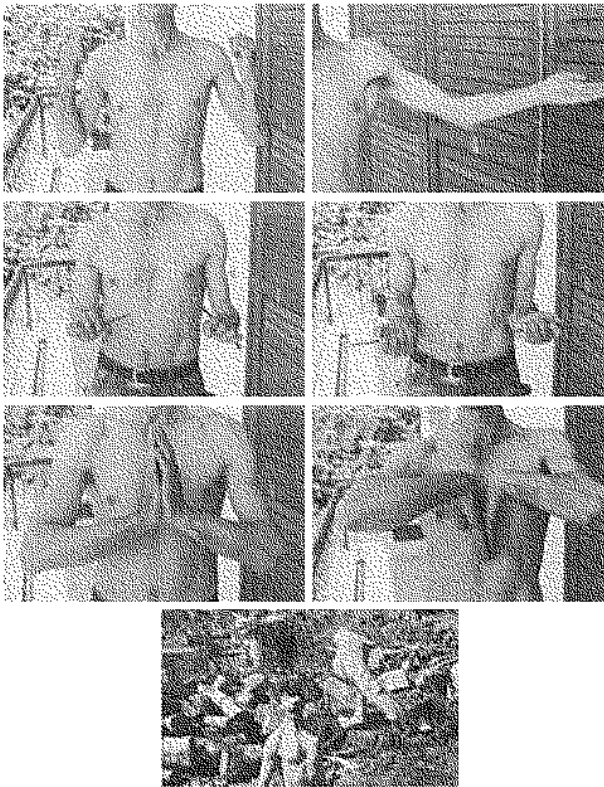


Fig. 6. — Active movements of the elbow and wrist joints 45 years postoperatively. The patient still works as a hard manual laborer.

Microsurgical reconstruction (2, 13): This can be performed only by experienced surgeons and teams in a limited number of centers.

Segmental bone transport technique (5) with an external fixation device if there is enough bone left (bone stump) to adapt the fixator.

Direct grafting, except in the forearm or leg where transfer of the unaffected bone is possible. Fortunately it is rare for both bones to be affected at once (4). When possible, bone transfer is preferable to direct grafting unless the bone defect is small (4).

In the forearm the results of bone transfer for either a radial or an ulnar defect are good. Loss of pronation and supination is inevitable whatever method is used, because of dislocation either of the inferior or of the superior radioulnar joint (7). Another solution to treat large shaft defects of the ulna is radioulnar fusion (12), with a loss of rotation of the forearm.

When part of the shaft of the radius or ulna is deficient in young children a deformity results from unequal growth of the two forearm bones. If the ulna is absent in part there is relative overgrowth of the radius, with consequent dislocation of the radiohumeral joint and ulnar deviation of the hand. The amount of deformity will depend on the cause of the defect, its extent and the age of onset (8).

Among the pathological conditions causing unequal growth of the radius and ulna are congenital absence of part of the radius or ulna, osteomyelitis with sequestration of the diaphysis of one or the other bone, benign bone tumors, and injury.

The site of old infection is a risky area for bone grafting, and the remaining upper and lower ends of the bone are often too small and atrophic to receive a graft satisfactorily (8).

Despite the above, the surgical technique of filling the gap which had been performed in the patient reported is a simple method and gave an excellent functional result after a long-term follow-up.

Moreover in contrast to radioulnar fusion (8) and despite the redislocation of the radial “head”, this technique permitted satisfactory rotational movements of the forearm resulting in a better function of the limb.

Of course modern microsurgical techniques (2, 13) promise better results, but these techniques can be performed only by specialized experienced

surgeons and staff. Until microsurgery becomes a common reality, the technique described seems to be a successful method of treatment for such difficult and uncommon cases.

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SAMENVATTING

J. M. KIRKOS, J. H. HARITIDIS. Reconstructie voor botdefect in de ulnarschacht wegens osteomyelitis. Laattijdige follow-up.

Een 8,5 jarige jongen werd indertijd gezien wegens osteomyelitis van de linker ulnarschacht met fistelvorming, vernietiging en sekwestratie van een groot deel van de schacht, naast dorsolaterale luxatie van de radiuskop. In de eerste tijd gebeurde een sekwestrotomie, gevolgd door geleidelijke reductie van de radiuskop met het apparaat van Anderson. In een tweede tijd werd het botdefect opgevuld met een corticospongieuse tibiagreffe. Achteraf moest toch de radiuskop worden verwijderd wegens recidief van de luxatie.

Bij een recent onderzoek, 45 jaar na de operatie, bleek de toestand van het lidmaat aanvaardbaar, met normale spierkracht en een zeer bevredigende beweeglijkheid van elleboog en pols. Patiënt deed trouwens zwaar werk.

RÉSUMÉ

J. M. KIRKOS, J. H. HARITIDIS. Reconstruction d'une perte de substance de la diaphyse cubitale due à une ostéomyélite. Résultats d'un cas suivi à long terme.

Un jeune garçon de huit ans et demi a présenté une ostéomyélite du cubitus gauche avec fistules, destruction étendue de la diaphyse avec présence d'os nécrosé et luxation postéro-latérale de la tête du radius.

Le traitement chirurgical initial a comporté une séquestrectomie avec réduction progressive de la tête du radius à l'aide d'un appareil d'Anderson. Dans un deuxième temps, une greffe osseuse cortico-spongieuse prélevée au tibia a été utilisée pour compléter la perte de substance du cubitus et, ultérieurement, la tête du radius qui s'était relâchée, a été excisée.

Au dernier examen, 45 ans après l'opération, le membre opéré est satisfaisant avec une force musculaire normale et une mobilité du coude et du poignet très satisfaisante. Le patient pratique un travail manuel lourd.