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Original article

Wrist arthrodesis with intercalated iliac crest graft in mutilans rheumatoid arthritis

Arthrodèse de poignet avec greffon iliaque intercalé dans la polyarthrite rhumatoïde mutilante

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Abstract

In mutilans rheumatoid arthritis (RA) patients with major wrist destruction, wrist arthrodesis is recommended. This type of arthrodesis needs carpal reconstruction and stable fixation. The goal of this study was to assess the functional and anatomical outcomes of an iliac crest graft and internal fixation with two medullary pins. Six wrists in three patients suffering from RA were reviewed clinically and radiologically at an average follow-up of 25 months. We assessed the fusion of the iliac graft with the radius and the metacarpus, the preoperative and postoperative carpal height, and the bone stock in front of the thumb. All the patients had improved functionally. The iliac graft fused with the radius in all cases and fused with the metacarpus in 5 out of 6 cases; the non-union occurred in the wrist where only one pin was used. Restoration of carpal height was associated with improvements in hand function. The bone stock was sufficient to allow implantation of a trapezial cup during a total arthroplasty of the thumb trapeziometacarpal (TMC) joint. No major complications occurred. An iliac graft and two pins through the 2nd and 3rd metacarpals were used to reconstruct the carpal height and to obtain wrist fusion. Internal fixation with only one pin is not recommended. Functional improvement can be attributed to the normal tension within the extrinsic flexors and extensors of fingers and thumb being restored because the carpal height was restored. A secondary TMC arthroplasty is theoretically possible.

Keywords: Arthritis mutilans; Rheumatoid arthritis; Wrist; Arthrodesis; Bilateral; Bone graft; Internal fixation

Résumé

Dans les arthrites rhumatoïdes mutilantes s'accompagnant de destruction majeure du carpe, une arthrodèse du poignet est requise. Cette arthrodèse nécessite la reconstruction du carpe et une ostéosynthèse stable. Le but de ce travail était d'évaluer le résultat fonctionnel et anatomique d'une greffe iliaque intercalée et d'une ostéosynthèse par clous centromédullaires. Six poignets chez 3 patients polyarthritiques ont été revus cliniquement et radiologiquement au recul moyen de 25 mois. Nous avons étudié la fusion du greffon iliaque avec le radius et le métacarpe, mesuré avant et après l'intervention la hauteur du carpe, mesuré l'épaisseur antéro-postérieure de la greffe osseuse en regard de la colonne du pouce. La fonction de tous les patients a été améliorée. La fusion du greffon avec le radius a été obtenue dans tous les cas, avec le métacarpe dans 5 cas sur 6 ; une pseudarthrose est survenue dans le cas où un seul clou a été utilisé. L'augmentation de la hauteur du carpe a permis une amélioration très nette de la fonction de la main. Le stock osseux restitué était suffisamment épais pour permettre la mise en place de l'implant trapézien d'une PTTM. Nous ne déplorons aucune complication majeure. Un greffon iliaque et 2 clous introduits par le 2e et le 3e métacarpiens permettent d'obtenir régulièrement la reconstitution d'un carpe de hauteur satisfaisante et d'obtenir la fusion. Une ostéosynthèse avec un seul clou est déconseillée. L'amélioration fonctionnelle des doigts longs pourrait être due à la restitution d'une tension normale aux muscles longs des

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doigts et du pouce, via l'augmentation de la hauteur du carpe. L'implantation ultérieure d'une prothèse trapézo-métacarpienne serait théoriquement possible.

Mots clés : Arthrite mutilante ; Polyarthrite rhumatoïde ; Poignet ; Arthrodèse ; Bilatéral ; Greffe osseuse ; Ostéosynthèse

1. Introduction

Arthritis mutilans is a severe form of chronic inflammatory arthropathy that occurs mainly in patients with rheumatoid arthritis (RA) [1] or juvenile onset of rheumatoid arthritis [1,2], but can also occur in patients with psoriatic arthritis [3–6], scleroderma [7] or overlapping systemic lupus erythematosus and RA [8].

In RA, it corresponds to an unstable Type III wrist in the Simmen and Huber classification [9] and to stage Va of the modified Larsen classification, namely the loss of all joint spaces with articular surface destruction, distal radio-ulnar joint dislocation and instability [10]. This condition was further defined by Namiki [11] as highly resorptive bone destruction with joint instability. He determined that arthritis mutilans was definitely present if more than three joints had severe bone resorption and joint instability, and suspected if one to two joints were unstable. Interleukin-2 (IL-2) levels are elevated in the iliac bone marrow serum of patients with mutilans-type RA, but this elevation is not related to systemic inflammation, as there was no correlation with other inflammatory factors [12]. The mutilans form of RA is rare, with a prevalence of 4.4% among RA patients [13]. It is often associated with extensor tendon ruptures.

One of its hallmark features is severe bone resorption, which shortens the affected bone segments and completely destabilizes the involved joint. In the hand, it leads to the opera glass hand deformity, which usually affects all the finger joints but not always evenly [14]. In the wrist, the carpus is partially or completely destroyed; the shortening and joint instability cause a significant loss of strength. This condition must be recognized early on and treated surgically to avoid the development of severe bone loss [9,14]. In these forms, synovectomy with or without the Sauvé-Kapandji procedure is not effective [15]. Radiolunate arthrodesis or total arthrodesis is recommended instead. In cases where the resorption is so extensive that the lunate is completely gone, radiolunate fusion is impossible, thus total wrist arthrodesis is the only option.

But surgical fusion is challenging. The poor bone quality and cortical thinning due to endosteal resorption are not conducive to the insertion of plates and screws. The extensive bone resorption leaves the surgeon with a choice between performing an arthrodesis that will greatly shorten the wrist without improving strength or performing the arthrodesis procedure with a bone graft to restore normal carpal height.

Despite the risk of functional deficits [16], we prefer performing a bilateral arthrodesis with a massive autologous iliac crest bone graft and internal fixation using Rush pins introduced through the metacarpal heads in these cases. Variations of this technique have been used in other indications [17] including failed wrist implant arthroplasty [18,19].

The clinical results of our reconstructive arthrodesis procedures are reported here in three RA patients with bilateral arthritis mutilans. The goal of this retrospective study was to evaluate the fusion rate between the graft and radius and between the graft and metacarpus.

2. Patients and methods

2.1. Patients

Six wrists in three patients (all bilateral) were operated by the same surgeon (CF) and reviewed by a surgeon (SM) who was not involved in the surgery. The three patients were right-handed women with an average age of 51.3 years (range 41–67) at the time of surgery. The RA had been present for an average of 19.5 years (range 18–22). The mutilans form was severe (Fig. 1). The average patient age at the time of review was 53.4 years (range 44–68). The average follow-up was 2.1 years (range 1.5–3.6).

The surgical indication was made based on findings of instability and lack of wrist strength; none of the patients had ruptured extensor tendons. In five of the wrists, the arthrodesis was a primary procedure. The sixth wrist had undergone synovectomy–realignment–stabilization with the Sauvé-Kapandji procedure 10 years earlier (Fig. 2), which did not stabilize the carpus [15]. Two of the wrists had undergone flexor tendon synovectomy and carpal tunnel release 7 and 8 years previously.

2.2. Surgical technique

The procedure was performed under general anesthesia because a bone graft also had to be harvested from the patient's iliac crest. Patients were placed supine with a cushion under the buttock on the side where the bone graft was being harvested, which was opposite to the side of the operated wrist. This separated the two surgical fields, making them easier to access and allowing two teams to work simultaneously, if needed. The upper limb was placed on an arm board and a pneumatic tourniquet was used (without an Esmarch bandage) and inflated according to the patient's blood pressure.

A massive corticocancellous bone graft was harvested first from the anterior iliac crest. A small amount of cancellous bone was also harvested to fill any gaps between the carpus, massive graft and radius. The harvest site was then closed over a suction drain.

An S-shaped incision was made on the dorsal side of the wrist; the extensor retinaculum was reflected from medial to lateral. Extensor tenosynovectomy, partial denervation (resection of posterior interosseous nerve) and distal radio-ulnar