

Original article

Treatment of Madelung's deformity

Traitement de la maladie de Madelung

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Abstract

Treatment of Madelung's deformity is still controversial. We reviewed retrospectively 19 patients with Madelung's deformity (two bilateral, 21 cases) who underwent surgery to the radius and ulna to improve range of motion, decrease pain and improve appearance of the wrist. Nineteen patients underwent 21 distal radial osteotomy procedures using three different techniques: subtraction, addition or dome osteotomy. Ulnar shortening and redirection of the distal ulna was performed in 12 cases; a long oblique osteotomy was used in 10 of these cases. The Sauvé-Kapandji technique was performed in five cases, an ulnar distal epiphysiodesis in two cases and a combination of osteotomy and epiphysiodesis in one case. The aim was to reduce the distal radial slope and to restore the orientation and congruity of the distal radio-ulnar joint and to improve its function. Pain was reduced as a result of the procedure: more than 75% of the cases had no or intermittent pain at the review. Pronation improved from 63° to 68° ($P = 0.467$, not significant) and supination improved from 48° to 72° on average ($P = 0.034$, significant). Grip strength increased from 11 to 18 kgf ($P = 0.013$, significant). Madelung's deformity is not always a benign condition and it responds well to corrective osteotomies. © 2015 SFCM. Published by Elsevier Masson SAS. All rights reserved.

Keywords: Madelung's deformity; Treatment; Pronation–supination; Double osteotomy; Ulna shortening

Résumé

Le traitement de la maladie de Madelung est encore débattu. Nous avons revu rétrospectivement 19 patients présentant une maladie de Madelung (deux cas bilatéraux, soit 21 opérations) ayant subi une chirurgie du radius et de l'ulna pour améliorer la mobilité, diminuer la douleur et améliorer l'aspect esthétique. Dix-neuf patients ont bénéficié de 21 ostéotomies distales du radius utilisant trois techniques différentes : soustraction, addition ou ostéotomie en dôme. Un raccourcissement de l'ulna et une réorientation de son extrémité distale ont été réalisés dans 12 cas, utilisant une ostéotomie oblique longue dans 10 cas ; une intervention de Sauvé-Kapandji a été réalisée dans cinq cas, une épiphysiodèse distale de l'ulna dans deux cas et une association d'ostéotomie et d'épiphysiodèse dans un cas. Le but était de réduire la pente de l'extrémité distale du radius et de restaurer l'articulation radio-ulnaire distale dans son orientation et sa congruence, et d'améliorer la fonction. La douleur a été améliorée : dans plus de 75 % des cas, il n'y avait plus de douleurs ou des douleurs intermittentes. La pronation a été améliorée de 63° à 68° ($p = 0,467$, non significatif) et la supination de 48° à 72° en moyenne ($p = 0,034$, significatif). La force de poigne a été améliorée, passant de 11 à 18 kgf ($p = 0,013$, significatif). La déformation de Madelung n'est pas toujours une situation bénigne et répond bien aux ostéotomies de correction. © 2015 SFCM. Publié par Elsevier Masson SAS. Tous droits réservés.

Mots clés : Maladie de Madelung ; Traitement ; Pronation–supination ; Double ostéotomie ; Raccourcissement de l'ulna

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1. Introduction

This rare deformity was described by Madelung in 1878 as a volar, spontaneous and progressive “wrist subluxation”. It can be either congenital or acquired. The congenital disease is transmitted by a hereditary autosomal dominant gene with incomplete penetration. Females are four times more affected than males. The condition may be unilateral or bilateral but is often asymmetrical. A number of different techniques have been proposed to treat this deformity when surgery is indicated.

A radial osteotomy aims to better align the radio-carpal joint. An ulnar osteotomy, the Sauvé-Kapandji procedure or distal epiphysiodesis can be used to improve pronation–supination and the appearance of the wrist.

The purpose of this study was to assess retrospectively the results of treatment by radial osteotomy combined with an ulna procedure in 19 patients. The goal of treatment was to decrease pain, improve pronation–supination and the appearance of the wrist.

2. Materials and methods

2.1. Patients

2.1.1. Clinical review

This was a retrospective study: a cohort of 19 symptomatic patients was reviewed; two had undergone a bilateral procedure (21 procedures in all). Three patients had previously been operated on the same forearm: two had a radius osteotomy and one an ulnar epiphysiodesis. There were 17 females and two males. There were 14 right wrists and seven left wrists.

The patients’ pain, range of motion and strength were assessed preoperatively. Pain was evaluated using a five-point scale (Table 1). Range of motion was measured using a goniometer and strength measured using a Jamar[®] dynamometer.

2.1.2. Radiographs

Several X-rays were taken and analyzed: anterior–posterior (AP) and lateral views of the wrist, comparative views with the other side, and AP and lateral overall views of the forearms including the wrist and elbow. Pre- and postoperative X-rays were available for 18 of the 19 patients.

Measurements of the radial slope, lunate coverage and lunate subsidence were made on these X-rays. The radial slope was measured according to McCarroll’s recommendations [1]: the radial slope is defined as the angle between the longitudinal axis of ulna and a line tangent to the surfaces of scaphoid and lunate. The reliability of the ulnar axis definition was better than that of the radial axis, which is often significantly altered in

Madelung’s deformity. Because of similar concerns about reliability and reproducibility, a line tangent to the surface of scaphoid and lunate was selected instead of a line tangent to the articular surface of the radius.

For the five cases where the Sauvé-Kapandji (SK) technique was used, the ulna reference was not reliable. Instead, we calculated the radial slope using the classical method of the angle between the radial longitudinal axis and a line tangent to the proximal scaphoid and lunate.

Proximal migration of the lunate was assessed determining the percentage of the lunate’s articular surface lying opposite to the articular surface of the distal radius [2].

Several authors have pointed out the difficulty of analyzing the lateral views in Madelung’s deformity [1,3]. We attempted to calculate the radial slope on the lateral views and found reliable landmarks in seven cases, although McCarroll claims that this measurement is not reliable.

Any associated deformities were noted: short forearm, increased radius curvature.

2.2. Surgical procedures

2.2.1. Procedures on the radius

The aim was to better align the distal articular surface of the radius. All patients except two underwent a wedge subtraction osteotomy of the radius; two cases had an additional dome osteotomy. The bone was fixed by plate or K-wires.

One female patient with a severe form of Madelung’s deformity had a diaphyseal osteotomy and wedge subtraction osteotomy in both wrists (Fig. 1). A certain amount of distal



Fig. 1. Preoperative radiograph of a severe form of Madelung’s deformity with dysplasia of the entire radius (a). Postoperative radiograph of the same patient after double radial osteotomy (b).

Table 1
Assessment of the pain level using a five-point scale.

0	No pain
1	Weather-related or intermittent pain
2	With heavy exertion
3	With any exertion
4	Continuous

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