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Original article

Compression plate arthrodesis for osteoarthritis of the first carpometacarpal joint: A retrospective study of 77 cases

Arthrodèse par plaque de compression pour arthrose de la première articulation carpométacarpienne : étude rétrospective de 77 cas

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ABSTRACT

Osteoarthritis of the first carpometacarpal joint (CMCJ1) is a common, painful condition with positive radiological findings in up to 32% of people over 50 years of age and up to 91% of people over 80 years of age. Currently, there is insufficient evidence to recommend one surgical treatment option over the others. We conducted a retrospective review of 77 patients treated for CMCJ1 osteoarthritis with plate arthrodesis between 1979 and 1996. The review included physical examination, including range of motion (ROM) of the thumb interphalangeal joint, metacarpophalangeal joint and CMCJ1, pinch grip, key grip and power grip strength, and a questionnaire on subjective outcomes (appearance, dexterity, load bearing, pain, strength, subjective overall result and if patients would choose the procedure again). The complication rate was 26%. However, the general patient satisfaction was high with 88% of patients saying they would choose to have the procedure done again. There was a significant decrease (side-to-side difference) in the ROM for palmar and radial abduction as well as opposition when compared to the opposite hand. Furthermore, there was a significant reduction (side-to-side difference) in pinch, key grip and power grip strength. ROM did not seem to have any influence on pain (and vice versa), load bearing, and the subjective overall result. No gender differences were noted. Despite the high complication rate, CMCJ1 arthrodesis remains a viable option for the treatment of CMCJ1 osteoarthritis in select patients requiring good thumb stability.

Mots clés :
Arthrodèse
Première articulation carpométacarpienne
Articulation trapézo-métacarpienne
Arthrose
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RÉSUMÉ

L'arthrose de la première articulation carpométacarpienne (CMC1) est une affection douloureuse fréquente. Une corrélation radiologique se manifeste chez 32 % des personnes âgées de 50 ans et jusqu'à 91 % de celles de plus de 80 ans. Il n'y a actuellement pas de niveau d'évidence suffisant pour préconiser un traitement chirurgical particulier. Nous avons conduit une étude rétrospective de 77 patients souffrant d'une arthrose CMC1, traités par arthrodèse par plaque entre 1979 et 1996. L'examen comprenait une évaluation du statut clinique : amplitudes de la mobilité (ROM) des articulations interphalangienne, métacarpophalangienne et CMC1, force de la pince, force de poigne, force de la prise de clé (*key grip*). Un questionnaire y était adjoint pour évaluer le résultat subjectif (cosmétique, dextérité, capacité de charge et force) ainsi qu'une évaluation globale — à savoir si le patient referait cette opération. Le taux de complications s'élevait à 26 %. Malgré cela, la satisfaction globale de la plupart des patients était très élevée, 88 % de ceux-ci estimant qu'ils referaient le choix de cette opération. Nous avons pu montrer une diminution significative de la mobilité par rapport au côté opposé en ce qui concerne l'abduction radiale et palmaire ainsi que celle de

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l'opposition du pouce, et une diminution également significative de la force de la pince, de poigne et du *key grip*. La ROM ne semblait pas avoir d'influence sur la douleur, sur la capacité de charge ou sur le résultat subjectif global. Il n'y avait pas de différence entre les patients de sexe différent. Malgré un taux de complication élevé, l'arthrodèse CMC1 offre un traitement de choix pour l'arthrose CMC1, surtout chez les patients recherchant une stabilité du pouce.

1. Introduction

Osteoarthritis of the first carpometacarpal joint (CMCJ1) is a common, painful condition with positive radiological findings in up to 32% of people over 50 years of age [1] and up to 91% of people over 80 years of age [2]. Women are more commonly affected than men, with one study finding a female to male ratio of 4.4:1 [3]. Treatment options consist of conservative treatment (e.g. splinting) with or without anti-inflammatory drugs [3] or surgical options such arthrodesis, implant arthroplasty [4,5] or various kinds of arthroplasty combining trapeziectomy [6] with or without ligament reconstruction and/or tendon interposition [7–12]. Surgery for CMCJ1 osteoarthritis is the most common surgery for osteoarthritis of the upper extremity [13].

The choice between arthroplasty and arthrodesis depends very much on the patient's wishes and requirements. Arthrodesis has historically been recommended for younger patients (< 50 years) who need a stable thumb and high strength [14], e.g. manual laborers. Trapeziectomy with ligament reconstruction and/or tendon interposition is mostly recommended for elderly, low-demand patients and patients who rely more on range of motion (ROM) than on grip strength in their daily lives [14–16]. Direct comparison between trapeziectomy with ligament reconstruction and arthrodesis so far has shown better hand strength with reduced ROM in arthrodesis and vice versa in trapeziectomy with ligament reconstruction [17]. Though arthrodesis has been reported to have a higher rate of complications than trapeziectomy with ligament reconstruction, this does not seem to impact the overall outcome [17,18]. Furthermore, a recent review published with the Cochrane collaboration found insufficient evidence to recommend one surgical modality over the others [19].

The objective of this study was to assess the objective results and patient reported outcomes of CMCJ1 fusion performed over a 17-year period.

2. Patients and methods

2.1. Patients

We reviewed the medical records of 104 patients who were treated for primary and posttraumatic osteoarthritis of the CMCJ1 from 1979 to 1996. At this time, arthrodesis was the treatment of choice at our hospital for patients with the indication for surgery, i.e. patients with CMC1 osteoarthritis who had failed to achieve satisfactory results with conservative therapy. The physical examinations took place between March and August 1999. Institutional review board approval was not required at our hospital at the time of the study was conducted.

Of those 104 patients, we identified 93 patients who underwent arthrodesis on one side only. Patients with CMCJ1 arthrodesis on both sides were excluded, as they do not allow the non-treated side to be used as a control. Of those, 89 patients underwent arthrodesis by plate fixation, three with screw fixation and one with K-wire fixation. We excluded these four cases from further analysis to improve the homogeneity of the study population since no meaningful statistical analysis of this small cohort was possible. Of the 89 patients who underwent arthrodesis by plate fixation, 77 agreed to a physical examination and to answer a simple questionnaire on their condition (adapted from the original questionnaire used by Epping and Noack for assessing CMCJ1 arthroplasty [20]). Written consent was obtained from all patients.

2.2. Assessments

In the questionnaire, patients were asked to evaluate the postoperative result in terms of subjective strength, dexterity and appearance (each: better, unchanged, worse), pain (none, rarely, often, constant), load bearing (full, partial, minor, none), overall result (very satisfied, satisfied, unsatisfied) and if they would choose to have the procedure done again.

The physical examination consisted of range of motion (ROM) for the interphalangeal joint (IPJ) and metacarpophalangeal joint (MPJ), radial and palmar abduction of the thumb. Thumb opposition was defined as the minimal achievable distance between the thumb's tip and the fifth finger's tip as well as the fifth MPJ on the operated side, since healthy individuals can be expected to reach the fingertip and MPJ with their thumb. Grip strength was measured using a ball Vigorimeter (Werkstätten für Medizinzechnik H.C. Ulrich, Ulm, Germany). Pinch strength and key grip strength were measured using a Mannerfelt-Ulrich Intrinsicmeter (Werkstätten für Medizinzechnik H.C. Ulrich, Ulm, Germany).

2.3. Statistical analysis

Descriptive statistics (mean, minimum, maximum, standard deviation) were calculated for all numerical parameters. Frequency counts were calculated for all ordinal and nominal parameters.

The one-sample Kolomogorov-Smirnov test for normality was performed on all numerical parameters. It revealed that most parameters significantly ($P < 0.05$) differed from the normal distribution. Thus, we decided to use the Mann-Whitney *U*-test for subgroup comparisons, and the Wilcoxon signed rank test for paired comparisons between the operated and non-operated side.

Unilateral opposition measurements were compared to the expected normal value (0 cm) with a one-sample *t*-test.

Correlations were analyzed using Pearson's Chi^2 test for comparisons between ordinal and nominal parameters and Spearman's Rho for correlations between scale and ordinal parameters.

Differences between sides were calculated as [operated] − [non-operated].

Minimal significance level was set at $P < 0.05$.

3. Results

The gender and side distributions are shown in Table 1, with Pearson's Chi^2 confirming an even distribution. Mean age was 55.75 years (SD 8.68; range 25–73 years) and mean follow-up was 7.85 years (SD 4.01; range 2.48–19.63 years).

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