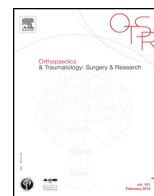




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Original article/Work of the SOO (the Orthopedics and Traumatology Society of Western France)

Chronic instability of the thumb metacarpo-phalangeal joint: Seven-year outcomes of three surgical techniques[☆]

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ARTICLE INFO

Article history:

Received 21 November 2016
Accepted 11 May 2017

Keywords:

Thumb
Metacarpophalangeal joint
Instability
Gamekeeper's thumb
Skier's thumb

ABSTRACT

Background: Severe sprain of the thumb metacarpo-phalangeal joint (TMCPJ) is a common injury whose functional outcome is good when repair is performed at the acute stage. The diagnosis is often missed, however, leading to chronic instability. The optimal treatment of chronic TMCPJ instability is controversial. The objective of this study was to compare the clinical outcomes of the three main surgical techniques used to treat chronic TMCPJ instability.

Hypothesis: Arthrodesis is the best surgical option when ligament repair is not feasible.

Material and methods: This single-centre retrospective study included all patients managed surgically between 2000 and 2012 for chronic post-traumatic TMCPJ instability using any of the three following techniques: primary repair, ligament reconstruction, and arthrodesis. Subjective and objective outcomes and complication rates at last follow-up were compared across these three techniques.

Results: Of 67 included patients, 55 were re-evaluated, after a mean follow-up of 84 months (range: 24–164 months). Among them, 48 (87.3%) were satisfied or very satisfied with the outcome. Pain relief was significantly better in the arthrodesis group. Mean Quick-DASH scores were 17.4 (range: 0.0–89.5) with primary repair, 25.7 (range: 0.0–58.3) with ligament reconstruction, and 17.8 (range: 0.0–50.0) with arthrodesis. Mean pinch-test strength compared to the normal side was 89% with primary repair, 84% with ligament reconstruction, and 94% with arthrodesis. In the ligament reconstruction group, 6 of the 10 patients had instability at last follow-up and the proportion of patients describing themselves as fully recovered was significantly smaller than in the other groups. Four failures were recorded at last follow-up.

Conclusion: Surgery to treat chronic TMCPJ instability produces good outcomes. Primary repair deserves preference whenever possible. In contrast to previous reports, outcomes after ligament reconstruction were not better compared to arthrodesis.

Level of evidence: IV, retrospective study.

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1. Introduction

Injuries to the ligaments of the thumb metacarpo-phalangeal joint (TMCPJ) account for 86% of all thumb injuries [1] but are frequently overlooked [2]. They were first described under the designation 'gamekeeper's thumb' by Campbell in 1955 [3], who noticed chronic TMCPJ instability in Scottish gamekeepers. In 1962,

Stener [4] reported the first pathophysiological explanation of TMCPJ instability.

Early surgical treatment of TMCPJ instability provides good or very good functional outcomes in over 90% of patients [5–11]. However, a delayed diagnosis or inappropriate treatment can lead to chronic TMCPJ instability, whose optimal surgical management remains debated. The many surgical techniques reported to date include delayed ligament repair [12,13], static [5,8,14–19] and dynamic [20] ligament reconstruction procedures, and arthrodesis [21–23]. Few data are available on the medium and long-term outcomes of surgery to treat chronic TMCPJ instability.

The objective of this study was to conduct a retrospective study of the clinical outcomes of the three main surgical techniques, with the goal of defining the role for each in the treatment of chronic TMCPJ instability.

[☆] Article issued from the SOO (the Orthopedics and Traumatology Society of Western France).

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<http://dx.doi.org/10.1016/j.otsr.2017.05.007>

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Table 1
Classification of ulnar collateral ligament injuries according to Hintermann et al. [25].

Type	Lesion	Clinique
I	Non-displaced fracture	Stable in flexion (< 30°)
II	Displaced fracture	Unstable in flexion (> 30°)
III	No fracture	Stable in flexion (< 30°)
IV	No fracture	Unstable in flexion (> 30°)
V	Fracture-avulsion of the palmar plate	Stable in flexion (< 30°)

2. Patients and methods

2.1. Study design and patients

This single-centre multi-surgeon retrospective study included all patients managed surgically for chronic TMCPJ instability between 2000 and 2012. Senior hand surgeons performed all procedures. The main inclusion criterion was a clinical diagnosis of symptomatic TMCPJ instability grade IV in the Palmer classification [24], as modified by Hintermann [25] (no fracture and TMCPJ instability in flexion > 30°) (Table 1), with symptoms of more than 6 weeks' duration. Exclusion criteria were concomitant hyperextension instability, instability due to degenerative or inflammatory disease, and follow-up shorter than 2 years.

Of 67 included patients, 12 were lost to follow-up and the remaining 55 were re-evaluated after a mean of 84 months (range: 24–164 months). There were 39 females and 28 males with a mean age at surgery of 50.8 years (range: 15–80 years). The involved thumb was on the dominant side in 42 (64.2%) patients.

Of the 67 patients, 34 were heavy manual workers, 20 light manual workers, 9 office workers, and 4 retirees. The injury was related to a fall in 35 (52.2%) patients, a direct impact in 13 (19.4%) patients, a sporting activity in 12 (17.9%) patients, and a road accident in 7 (10.4%) patients. The trauma was work-related in 22 (32.8%) patients.

Table 2 reports the main features in the three treatment groups. Subjective and objective outcomes and the complication rate at last follow-up were compared across the three groups.

2.2. Treatment indications

Treatment indications were as follows. When the collateral ligament seemed reparable, the distal fibrous scar tissue was removed and the ligament reattached to an anchor (Microfix Quickanchor, DePuy Mitek Inc., Johnson and Johnson Co., Raynham, MA, USA). Otherwise, and provided there was no irreducible subluxation or osteoarthritis, the autograft ligament reconstruction technique described by Guelmi et al. [19] was performed. In patients with irreducible subluxation and/or cartilage lesions, arthrodesis at 15°–20° of flexion was performed and fixed by two longitudinal K-wires stabilised by figure-of-8 tension band wiring.

2.3. Data collection

The patients were re-evaluated by an independent examiner at least 24 months after surgery. The following parameters were assessed on both sides: range of flexion and extension of the metacarpo-phalangeal joints and inter-phalangeal joints (IPJ), in degrees; first web space angle (M1–M2 angle), in degrees; thumb opposition graded according to Kapandji [26], tip-pinch (thumb pad to forefinger pad) strength measured using a spring dynamometer (hydraulic pinch, Kit Baseline® AREX, Palaiseau, France), and grip strength measured using a hydraulic dynamometer (hydraulic hand dynamometer, JAMAR®, Jackson, MI, USA).

Each patient completed the short version of the disabilities of the arm, shoulder, and hand questionnaire (Quick-DASH) [27], as well

as a visual analogue scale (VAS) for pain [28]. Patient satisfaction was assessed as very satisfied, satisfied, not particularly satisfied, and dissatisfied. Finally, complications and surgical revisions with their reasons were recorded routinely.

Antero-posterior and lateral radiographs centered on the TMCPJ were examined. Osteoarthritis of the TMCPJ was assessed in four grades: no osteoarthritis and a centred joint, no osteoarthritis but subluxation of the metacarpal head, osteoarthritis involving less than 50% of the joint line, and osteoarthritis involving ≥ 50% of the joint line.

2.4. Statistical analysis

Quantitative data were described as mean (SD) or (range) and compared using the non-parametric Kruskal-Wallis and Mann-Whitney tests. Comparisons of qualitative variables relied on contingency tables and Fisher's exact test. Values of $P < 0.05$ were considered significant. Statistical tests were done using Stat View 5.0 software (Abacus Concepts Inc., Berkeley, CA, USA, 1992).

3. Results

3.1. Complications and failures

Complex regional pain syndrome type 1 developed in 7 patients: 2 of 20 (10%) in the primary repair group, 3 of 10 (30%) in the ligament reconstruction group, and 2 of 25 (8%) in the arthrodesis group. All 7 patients had achieved a full recovery at last follow-up.

Treatment failure with persistent symptomatic instability occurred in 4 patients: 1 in the primary repair group, 2 in the ligament reconstruction group, and 1 in the arthrodesis group. This last patient had failed to comply with post-operative care instructions. All 4 patients were managed by revision TMCPJ arthrodesis.

3.2. Clinical outcomes

Table 3 reports the objective outcomes at last follow-up. Age was significantly older in the arthrodesis group than in the other two groups ($P < 0.02$). Symptom duration at surgery was significantly associated with the surgical technique ($P = 0.0050$): duration was significantly longer in the arthrodesis group than in the ligament reconstruction group and varied widely in the primary repair group.

Thumb opposition and M1–M2 angle values were significantly smaller in the arthrodesis group ($P = 0.001$ and $P < 0.002$, respectively). Tip-pinch strength and grip strength were non-significantly lower in the ligament reconstruction group ($P = 0.31$ and $P = 0.99$, respectively). IPJ range of motion showed no significant difference across the three groups ($P = 0.42$). TMCPJ range of motion was non-significantly lower after ligament reconstruction than after primary repair ($P = 0.35$).

At last follow-up, 5 (25%) of the 20 patients managed by ligament repair had 10° to 20° of TMCPJ instability. None of these patients had a greater than 50% decrease in TMCPJ range of motion. Of the 10 patients managed by ligament reconstruction, 6 (60%) had TMCPJ instability at last follow-up, which was between 10° and 20° in 4 patients and greater than 20° in the remaining 2 patients. Among the other 4 patients, 2 had a greater than 50% range-of-motion decrease compared to the other side.

Table 4 reports the VAS pain scores, Quick-DASH scores, patient satisfaction assessments, and failures at last follow-up. The VAS pain and Quick-DASH scores were non-significantly higher in the ligament reconstruction group ($P = 0.5$ and $P = 0.2$, respectively). Pain relief was significantly greater in the arthrodesis group ($P = 0.02$). Subjective functional impairment was not significantly different across the three groups ($P = 0.23$). The proportion

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