The Effect of a Bone Tunnel During Ligament Reconstruction for Trapeziometacarpal Osteoarthritis: A 5-Year Follow-up

Kim R. Spekreijse, MD,*† Guus M. Vermeulen, MD, PhD,† Muhammed A. Kedilioglu, BSc,† Harm P. Slijper, PhD,† Reinier Feitz, MD,† Steven E. Hovius, MD, PhD,* Ruud W. Selles, PhD*

Purpose To compare in trapeziometacarpal (TMC) osteoarthritis the effects of trapeziectomy with tendon interposition and ligament reconstruction (LRTI) with or without a bone tunnel after a mean follow-up of 5 years.

Methods We randomized 79 women (aged 40 years or older) with stage IV TMC osteoarthritis to either trapeziectomy with LRTI using a bone tunnel (Burton-Pellegrini) or a tendon sling arthroplasty (Weilby). Before surgery and at 3 months and 1 year after surgery, patients were evaluated for pain, function, strength, satisfaction, and complications. Of these patients, 72% were evaluated after a mean follow-up of 5 years (range, 3.8–6.4 years).

Results There were no significant differences in function and pain (Patient-Rated Wrist and Hand Evaluation) between treatment groups after a mean follow-up of 5 years. In addition, grip and pinch strength, satisfaction, and persisting complications did not differ between groups. Three patients in the Weilby group had repeat surgery (2 for symptomatic scapho-trapezoidal osteoarthritis and 1 elsewhere) and one in the Burton-Pellegrini group operated on again elsewhere. Furthermore, 3 patients who were first conservatively treated for a trigger finger or neuroma were operated on again because conservative therapy failed. Two more patients were operated on again because of de Quervain tendinitis and carpal tunnel syndrome. The overall treatment effect of both groups together showed no significant differences between results at 1 and 5 years after surgery, except for grip strength, which improved for both groups.

Conclusions This study showed that improved function, strength, and satisfaction obtained at 1 year after trapeziectomy with LRTI with or without the use of a bone tunnel for stage IV TMC thumb osteoarthritis was maintained after 5 years. *(J Hand Surg Am. 2015;40(11):2214–2222.*

Type of study/level of evidence Therapeutic I.

Key words LRTI, trapeziectomy, trapeziometacarpal, osteoarthritis, thumb.

*From the *Department of Plastic, Reconstructive and Hand Surgery, Erasmus Medical Center, Rotterdam; and the †Xpert Clinic, Hilversum, The Netherlands.*

Received for publication March 29, 2015; accepted in revised form July 13, 2015.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Kim R. Spekreijse, MD, Department of Plastic, Reconstructive and Hand Surgery, Erasmus Medical Center, Dr Molewaterplein 50, Room EE 15.91b, 3015 GE Rotterdam, The Netherlands; e-mail: k.r.spekreijse@gmail.com.

0363-5023/15/4011-0015$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2015.07.011

For patients presenting with Eaton and Glickel[1] stage IV thumb base osteoarthritis (OA) at multiple levels (ie, the trapeziometacarpal [TMC] joint and the scaphotrapezium-trapezoid [STT] joint), there is little evidence about the effectiveness of different surgical techniques.[2–6] Most thumb OA trials have concerned stage II and III OA patients (OA only at the TMC joint) and have indicated that ligament reconstruction with tendon interposition (LRTI) does not provide additional benefit compared with simple

trapeziectomy.[7,8] However, because stage IV OA is characterized by more cartilage (multiple levels) and ligament damage,[9] LRTI after trapeziectomy could still be beneficial in patients with stage IV disease.

Because it was not clear which type of ligament reconstruction results in the best functional outcome and the least complications, we recently reported the results of a randomized controlled trial[9] comparing 2 trapeziectomy and LRTI techniques in patients with stage IV OA of the thumb: the Burton-Pellegrini (BP) technique[10] with a bone tunnel in the thumb metacarpal base and the Weilby technique without a bone tunnel.[11] In this previous trial, we found no significant differences between groups in pain relief, function, strength, and patient satisfaction 1 year after surgery. However, at 3 months' follow-up, the BP technique had better outcomes, indicating a faster recovery.[9] We conducted this 5-year follow-up randomized, controlled trial to compare the functional outcome of both techniques. We hypothesized that the different techniques would result in a different functional outcome after 5 years.

The few medium- or long-term follow-up studies about this topic report an increase in Disabilities of the Arm, Shoulder, and Hand questionnaire (DASH) score and a drop in tip and key pinch strength after 5 years compared to 1 year after surgery.[7,12] Grip strength was reported not to deteriorate. However, these studies included mostly patients with stage II to III OA. Although surgery for patients with stage IV OA generally shows good results at 1 year after surgery,[2,6,9] owing to progression of the scaphotrapezoidal OA, strength and function may decrease over time and pain may increase. Therefore, we also compared the overall functional outcome at 5 years with the outcome after 1 year for the whole group.

MATERIALS AND METHODS

Study population

With approval of the scientific committee, the study was conducted as a single-center, single-blinded, randomized, controlled trial at the Department of Hand and Wrist Surgery, Diakonessenhuis, Zeist, The Netherlands. As reported earlier, patients were included from 2008 to 2011 at the outpatient clinic if they had symptoms of stage IV OA (Eaton and Glickel[1] and Eaton and Littler[13] radiological classification, objectified by independent radiologists) of both TMC and STT joints with functional impairment of daily activities after failure of conservative therapy. We obtained written consent. After inclusion, patients were randomly assigned to treatment with LRTI based on the original technique of Burton and Pellegrini[10,14] or LRTI based on the original technique of Weilby.[11,15] To create a homogeneous study population, we included only women older than age 39 years who were experiencing unilateral or bilateral primary OA. We excluded patients with previous thumb surgery or those in whom OA was posttraumatic or in whom rheumatic disease was present.

Randomization, registration, and sample size calculations

We used software-based randomization and a block size of 20 patients to ensure a balanced sample size for both groups over time.[16] We used consecutively numbered envelopes containing the assigned treatment. Sample size calculations were reported earlier, estimating a need for approximately 45 patients/treatment group to detect a difference of 15 points (SD, 25 points)[17,18] between groups in the Patient-Rated Hand and Wrist Evaluation (PRWHE) score.

Surgical techniques

For the BP technique, we incised the radial border of the thumb metacarpal, preserving the radial superficial nerve as described by Wagner,[19] and removed the trapezium. We harvested a 10-cm-long tendon graft of approximately one half the flexor carpi radialis (FCR) tendon and tunneled it to the FCR insertion at the index finger metacarpal base. Then, we created a bone tunnel with the use of a 3.5-mm drill bit perpendicular to the nail but with an oblique orientation through the TMC joint surfaces and passed the tendon graft through the tunnel. The graft was fixed firmly at the radial side of the first metacarpal and TMC joint capsule with polydioxanone monofilament synthetic absorbable 3-0 sutures (Ethicon, Amersfoort, The Netherlands). The excess length of the graft was rolled up into a ball, sutured, and positioned in the trapezial cavity.[10,14]

For the Weilby technique, removal of the trapezial bone and harvesting of the FCR tendon split was similar to the BP technique. However, in the Weilby technique, the FCR tendon was woven in a figure-of-eight structure (at least twice) around the insertion of the abductor pollicis longus tendon and then around the remaining half of the FCR, and locked with PDS 3-0 sutures. In this way, both tendons were pulled together into the trapezial cavity, creating the ligament reconstruction. The tendon excess was again placed in the trapezial cavity.[11,15]

Although all patients had STT OA, we did not perform standard additional treatments such as partial trapezoid resections. The reason for this was that preoperatively, it could be difficult to evaluate whether patients experienced pain only from TMC OA or from