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## ORIGINAL ARTICLE

# Long-term clinical results in patients treated for recurrent posterolateral elbow joint instability using an ipsilateral triceps tendon graft

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**Background:** The aim was to report the long-term functional and radiologic outcomes in patients treated for recurrent posterolateral elbow joint instability using an ipsilateral triceps tendon graft.

**Methods:** We included 18 patients previously treated for posterolateral elbow joint instability and evaluated for clinical results in 2003. Fifteen patients were examined with a mean follow-up period of 19 years (range, 17-22 years). We performed the clinical follow-up with clinical examination of stability, range of motion, pain score on a visual analog scale, Mayo Elbow Performance Score, and Danish version of Oxford Elbow Score. Furthermore, conventional anteroposterior and side-view radiographs of the elbow were obtained to evaluate osteoarthritis, calcifications in the ligaments, and joint subluxation. We evaluated the radiographs by the size of osteophytes, joint space narrowing, and subchondral sclerosis and classified the findings into 3 categories: no osteoarthritis, osteoarthritis, and severe osteoarthritis.

**Results:** All patients had a clinically stable elbow. None had pain while inactive or locking of the joint, and 4 had decreased range of motion. Two patients had a positive pivot-shift stress test, indicating laxity. The mean Mayo Elbow Performance Score was 93 (range, 70-100). The mean Oxford Elbow Score was 45. We observed 5 patients with osteoarthritis and 1 patient with severe osteoarthritis.

**Conclusion:** The technique reported by Olsen and Søjbjerg in 2003 gives good long-term results in the treatment of symptomatic posterolateral elbow joint instability, though the development of elbow joint osteoarthritis may decrease the surgical result in the coming years.

**Level of evidence:** Level IV; Case Series; Treatment Study

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**Keywords:** Elbow surgery; osteoarthritis; ligamentous reconstruction; long term; posterolateral instability; triceps graft

The Ethical Committee of Denmark approved the study (study 03193).

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Posterolateral instability (PLI) of the elbow is the most common presentation of post-traumatic elbow joint instability.<sup>14</sup> The pathologic condition is external rotation of the radius and ulna as a unit that leads to posterior displacement of the radius relative to the humerus (capitellum), ultimately leading to

elbow joint dislocation.<sup>5,8,19</sup> Insufficiency or laxity of the lateral collateral ligament (LCL), as the key ligament in PLI,<sup>3,19</sup> was originally described by O'Driscoll et al<sup>15</sup> in 1991. Patients complain of lateral elbow pain in forearm supination, a sensation of posterior radial head subluxation, or recurrent elbow dislocations.<sup>1</sup> Different surgical procedures have been described including bone block methods,<sup>10,11</sup> tendon transfer, and reconstruction of the LCL.<sup>6,18,22</sup> The studies have reported similar and good functional outcomes in the short term.<sup>6,10,11,18,22</sup>

Reconstruction of the LCL is often performed in young patients with a long life expectancy. The patients have high demands regarding the functional outcome of the surgical procedure to maintain both jobs and physical activities. No other study has reported long-term clinical outcomes after surgery for treatment of PLI of the elbow.

The aim was to report the long-term functional and radiologic outcomes in patients treated for recurrent posterolateral elbow joint instability using an ipsilateral triceps tendon graft. We hypothesized that the stability and performance of the operated elbows would be maintained in the studied period despite the possibility of post-traumatic osteoarthritis.

## Methods

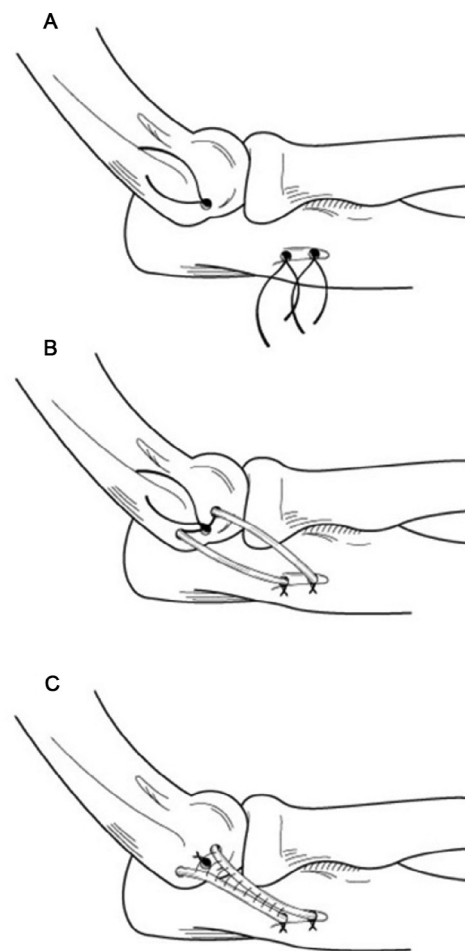
Between 1993 and 2000, 19 consecutive patients with PLI after traumatic dislocation of the elbow were treated with reconstruction of the LCL. An ipsilateral triceps tendon graft was tunneled through the lateral condyle and inserted on the ulna using 2 Mitek anchors (Surgical Products Inc, Westwood, MA) (Fig. 1). One patient (patient 1) was treated with an alternative bone anchor. The bone anchor placement and the surgical technique were otherwise the same. The surgical technique and primary treatment were previously described in further detail by Olsen and Søjbjerg.<sup>18</sup>

All elbows were initially treated for a simple elbow dislocation with a closed reduction. Three patients underwent no immobilization, whereas 2 underwent a short immobilization period of 1 day or 3 days. The rest wore a plaster cast for a minimum of 3 weeks followed by mobilization.

Preoperatively, all patients reported a sensation of instability of the elbow, which prevented their usual sporting activities or work. All complained of pain on the radial side of the joint and snapping of the elbow during supination of the forearm.<sup>18</sup> All patients were evaluated for stability by the elbow pivot-shift stress test.<sup>15</sup> Under anesthesia, all patients had posterior displacement of the radial head. None of the patients had preoperative signs of medial instability. One patient emigrated before the first follow-up examination. The remaining 18 patients were clinically evaluated between 2000 and 2001 with a mean follow-up time of 44 months (range, 14-88 months), and the short-term to midterm outcomes were reported in 2003.<sup>18</sup>

For this study, 15 of the 18 patients examined in 2000 and 2001 were re-examined in 2015. One patient had died of unrelated causes, one had emigrated, and one was not willing to participate. None of these 3 patients were treated in a Danish hospital for any elbow complaint in the index elbow after the primary procedure.

There were 3 male and 12 female patients with a mean age of 34 years (range, 13-48 years) at the time of surgery. The mean time from elbow dislocation to surgery was 37 months (range, 7-96 months). The mean follow-up time was 19 years (range, 17-22 years).



**Figure 1** Operative technique.

The patients were evaluated for pain, range of motion (ROM), and elbow joint stability. Pain was evaluated using a visual analog scale (VAS),<sup>12</sup> in which a score of 0 indicated no pain and 10 indicated the worst possible pain. ROM was evaluated systematically using a handheld goniometer. The center of the goniometer was placed at the lateral epicondyle, and the stationary arm was pointing on the tip of the acromion process. The mobile arm was pointing at the middle portion of the wrist. Normal ROM of the elbow was defined as extension to 0° and flexion to 140°. Stability to forced valgus and varus was performed in neutral forearm rotation. Stability to forced rotation was performed in 90° of elbow flexion. Then, a moving valgus test,<sup>16</sup> a pivot-shift test,<sup>15</sup> and an armchair push-up test<sup>21</sup> were performed.

Furthermore, the patients were evaluated using the Oxford Elbow Score (OES),<sup>20</sup> which is a patient-related outcome measure, quantifying the quality of the elbow in regard to function, social-psychological status, and pain.<sup>4</sup> An OES of 0 to 19 indicates severe elbow impairment; 20 to 29, moderate to severe impairment; and 30 to 39, mild to moderate elbow impairment. An OES of 40 or greater indicates satisfactory joint function.<sup>20</sup> The OES has been translated into Danish according to the guidelines of Guillemin et al<sup>7</sup> and validated using classical test theory and Rasch analysis.<sup>20</sup>

The Mayo Elbow Performance Score (MEPS) was used to quantify the quality of the patient's elbow regarding pain, ROM, stability,

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