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Original article

Prevalence of knee stiffness after arthroscopic bone suture fixation of tibial spine avulsion fractures in adults

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ABSTRACT

Background: Tibial spine avulsion fractures (TSAFs) occur chiefly in adolescents. Few published data are available on outcomes after arthroscopic surgical treatment of TSAFs in adults.
Objectives: To evaluate outcomes of consecutive patients with TSAFs managed by arthroscopic bone suture followed by a standardised non-aggressive rehabilitation programme.
Hypothesis: Arthroscopic bone suture followed by non-aggressive rehabilitation therapy reliably produces satisfactory outcomes in adults with TSAF.
Methods: Thirteen adults were included. Outcomes were evaluated based on the Tegner score, International Knee Documentation Committee (IKDC) score, anterior-posterior knee laxity, passive and active motion ranges, and radiological appearance.
Results: After a mean follow-up of 41 ± 27 months (12–94 months), all 13 patients had healed fractures without secondary displacement. No patient had knee instability. Post-operative stiffness was noted in 5 patients (2 with complex regional pain syndrome and 3 with extension lag), 1 of whom required surgical release. The mean IKDC score was 91.3 ± 11.7. The mean Tegner score was 5.46 ± 1.37 compared to 6.38 ± 0.70 before surgery. Mean tibial translation (measured using the Rolimeter) was 1.09 ± 1.22 mm, compared to 5.9 ± 1.85 mm before surgery.
Conclusion: The outcomes reported here support the reliability of arthroscopic bone suture for TSAF fixation. Nevertheless, a substantial proportion of patients experienced post-operative stiffness, whose contributory factors may include stunning of the quadriceps due to the short time from injury to surgery and the use of a gentle rehabilitation programme.
Level of evidence: IV, retrospective study of treatment outcomes.
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Tibial spine avulsion fractures (TSAFs) are uncommon injuries with an annual incidence of about $1/10^5$ [1]. The mechanism may be either a direct impact or deceleration during sports such as football or skiing [2]). Adolescents are predominantly affected, and few published studies address the arthroscopic surgical treatment of TSAFs in adults [3–5].

The objective of this study was to evaluate the functional outcomes after TSAF treatment using arthroscopic non-absorbable bone suture followed by a standardised, non-aggressive, specific rehabilitation programme. The working hypothesis was that this management strategy reliably produced satisfactory outcomes in adults.

1. Material and methods

1.1. Patients

The study inclusion criteria were as follows: displaced TSAF type II/III/IV according to the modified Meyers and McKeever classification [6], radiographic appearance indicating fully closed physes, and a follow-up since surgery of at least 6 months. Between January 2007 and November 2013, 13 patients meeting these criteria were included. Two senior surgeons performed the arthroscopic procedures.

1.2. Assessments

The pre-operative work-up included anterior-posterior and lateral radiographs of the knee and either computed tomography (CT) or magnetic resonance imaging (MRI). The Tegner score, IKDC score,

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and laxity measured using the Rolimeter (Aircast, DJO Global, Vista, CA, USA) were recorded before and after surgery. A goniometer was used to measure motion ranges. Fracture healing was assessed on radiographs taken 3 months after surgery.

1.3. Operative technique

Mean time from injury to surgery was 19.1 days (5–65 days). In all 13 patients, a surgical technique similar to that described by Berg [7] was used (Fig. 1). After reduction, the fracture was fixed provisionally using two K-wires measuring 2 mm in diameter and inserted percutaneously. A ligamentoplasty aiming device was inserted under arthroscopic guidance and used to drill two tunnels, each 2.7 mm in diameter, whose exit sites were located medial and lateral to the fracture, respectively.

A dedicated 45° hook (SutureLasso™, Arthrex, Naples, FL, USA) loaded with non-absorbable suture (Fiberwire, Arthrex; #2) was inserted through the antero-medial port, passed through the

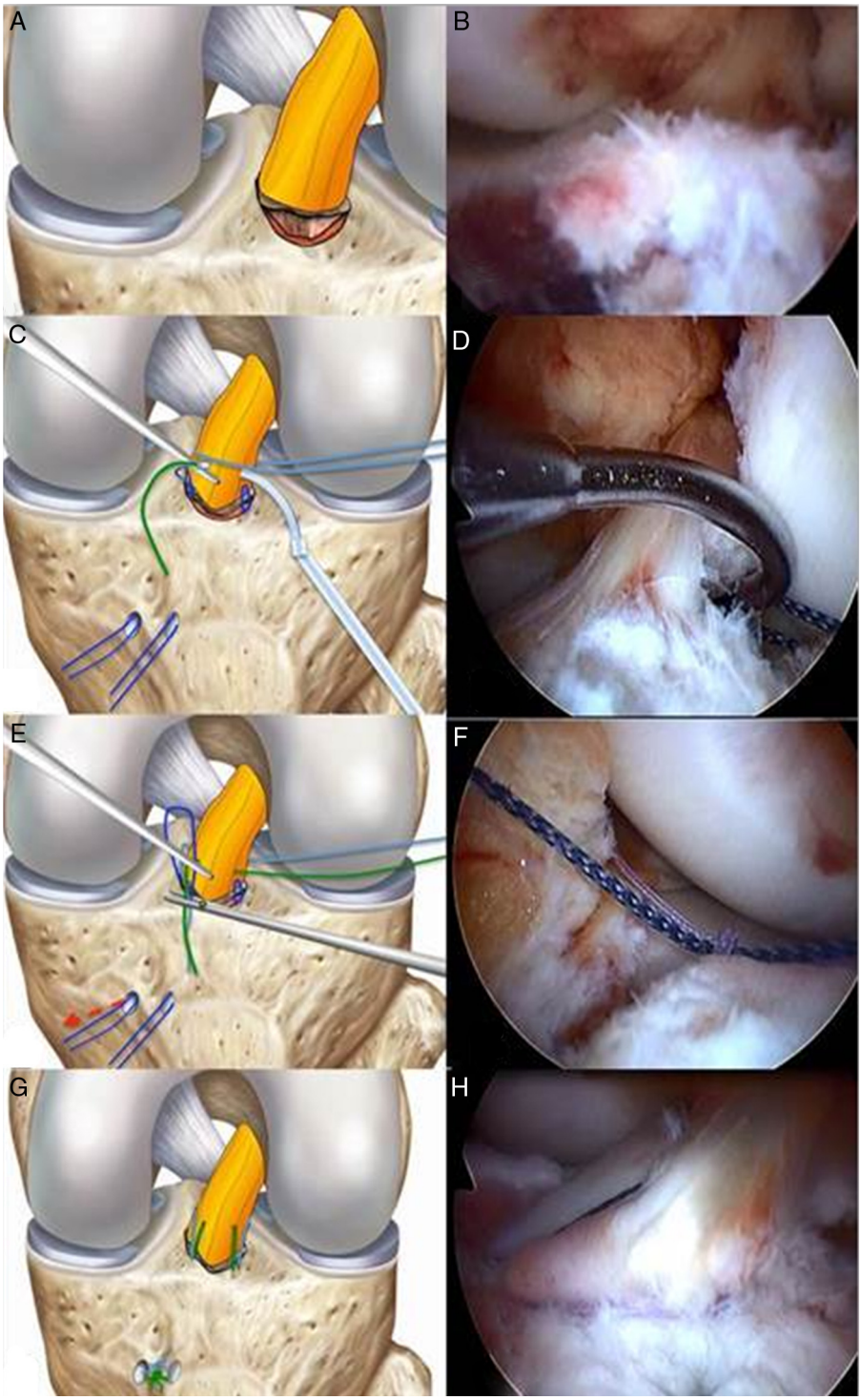

Fig. 1. Operative technique for arthroscopic reduction and bone suture of tibial spine avulsion fractures. A, B: appearance of the fracture; C, D: the reduced fragment is fixed temporarily using two U-shaped sutures (one positioned anteriorly and the other posteriorly) passed through the anterior cruciate ligament; E, F: passers are then used to thread the sutures through the bone tunnels; G, H: Final appearance.

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