Foot & Ankle Orthopaedics
2024, Vol. 9(1) 1–4

DOI: 10.1177/24730114241232979
journals.sagepub.com/home/fao

A Modified Dynamic Fixation Technique for Acute Syndesmotic Injuries

Walid Bouaicha, MD[1,2], Mohamed Jlidi, MD[1,2], Siwar Sbaihi, MD[2,3], Mohamed Hedi Gharbi, MD[1], Karim Mallek, MD[1], Salma Jaziri, MD[2,4], and Selim Daas, MD[1,2]

Keywords: Ankle fractures, syndesmosis injuries, dynamic fixation, suture button technique

Background

Ankle fractures are among the most common injuries treated by orthopaedic surgeons. This injury accounts for 10.2% of all skeletal fractures.[1] Rupture of the distal tibiofibular syndesmosis (DTFS) occurs in about 18% of these fractures.[2] If left untreated, unstable syndesmosis can progress to early tibiotalar osteoarthritis and poor clinical and radiologic outcomes. The classic and commonly used treatment option for these instable syndesmotic injuries is static fixation with 1 or more screws engaging 3 or 4 cortices.[7] However, the use of suture buttons has become increasingly popular for managing acute DTFS ruptures as it provides better physiological properties than traditional syndesmotic screw fixation methods.[5] Cadaveric studies have shown that suture button techniques offer comparable biomechanical strength to screw fixation.[6] This technique provides the necessary flexibility for the normal gliding movement of the DTFS, which may lead to a faster return to work with comparable outcomes to rigid syndesmotic screws fixation.

Many orthopaedic surgeons have recently shifted toward suture-button fixation because of its potential advantages, including quicker weightbearing and faster recovery, as well as superior functional outcomes compared with screw fixation.[4] Xie et al in 2018 in a meta-analysis comparing suture button fixation and syndesmotic screw fixation in the treatment of DTFS injury concluded that dynamic fixation might be superior to syndesmotic screw fixation, with better functional scores and a lower rate of postoperative complication and earlier return to work. However, he suggested that more randomized controlled trials be done to demonstrate the benefits of suture button fixation technique.[8] In 2021, Marasco et al[3] in a systemic review of the different meta-analyses focusing on comparing the 2 techniques found that the statistical significance was too "fragile" to be able to conclude.

One of the major drawbacks of suture button technique fixation in developing countries is the unavailability of the various commercially available implants because of obvious economic reasons.

Surgical Technique

We report an alternative cost-effective technique using readily available materials.

With the patient in the supine position, a sandbag under the ipsilateral buttock helped better exposing the lateral aspect of the ankle by medially rotating the operated limb. Surgery was done in a bloodless field using a tourniquet positioned around the proximal thigh. The first step of the surgical procedure was to stabilize the ankle fractures either using an open reduction and internal fixation or a closed reduction and percutaneous pinning. An intraoperative fluoroscopic control checks the quality of reduction and the state of the syndesmosis. At this stage, the integrity of the syndesmosis is tested by the Hook test. In the case of objective instability, surgical stabilization of the DTFS is undertaken, and Figure 1A shows the required instrumentation for the procedure. A reduction of the syndesmosis was

[1]Orthopedics and Traumatology Department, Mohamed Taher Maamouri Hospital, Nabeul, Tunisia
[2]Faculty of Medicine of Tunis, University of Tunis El Manar, Tunis, Tunisia
[3]Radiology Department, Mohamed Taher Maamouri Hospital, Nabeul, Tunisia
[4]Department of Anaesthesia and Intensive Care, Mohamed Bourguiba Hospital, Kef, Tunisia

Corresponding Author:
Walid Bouaicha, Orthopedics and traumatology department, Mohamed Taher Maamouri Hospital, Mrezgua, AFH city, Nabeul, Tunisia.
Email: walid_bouaicha@yahoo.fr

Figure 1. (A) Instrumentation for the modified suture button technique (star: wires guide, dot: suction tip to pass the suture via the hole, triangle: 2-hole mini plates and Ethibond Excel 6 (Ethicon, Inc). (B) Maisonneuve fracture of the ankle with medial clear space and syndesmotic widening. After reduction, (C) 2 parallel tunnels are drilled and (D and E) the Ethibond Excel 6 thread is inserted. The plates are secured after tightening the thread. (F) Fluoroscopic control.

achieved using indirect maneuvers of medial translation and internal rotation of the talus under fluoroscopic guidance. The reduction is temporarily maintained with a large pointed forceps applied over the tibia and fibula (Figure 1, B and C). Under fluoroscopic guidance, a 2.7-mm drill-bit is used to drill 2 tunnels approximately 2 cm above and parallel to the distal tibia joint line. The tunnels are drilled from lateral to medial through separate adjacent holes of the plate, if possible, otherwise, the superior tunnel is made through the distal hole whereas the lower tunnel lies outside the plate (Figure 1C). A 2-cm skin incision is made medially at the exit point of the 2 wires. A thin metallic thread is used to feed the Ethibond Excel 6 (Ethicon, Inc; Spain) surgical thread through the tunnel from medial to lateral. The other end of the thread is passed through the holes of the mini plate and then through the second tunnel from medial to lateral (Figure 1, D and F). The 2 ends of the Ethibond Excel 6 thread are now on the lateral side, where a surgical knot is used to secure the construct, firmly applying the mini plate on the medial tibial cortex (Figure 2F). After achieving a satisfactory syndesmosis fixation, the forceps is removed and the stability controlled under fluoroscopy.

A below-knee posterior splint was applied in the operating room and kept for 3 weeks. After removing the cast, a progressive rehabilitation program was initiated with partial progressive weight bearing. Figure 2 shows a clinical case where the modified suture button technique was used.

In our opinion, this technique, based on the principles of ankle syndesmotic dynamic fixation, tries to replicate comparable results to the commercially available suture button devices using low-cost readily available materials. However, a major drawback is the necessity of a medial approach to insert the medial miniplate. This might not be an issue when an open reduction is required to fix the medial malleolus; however, for fractures like the Maisonneuve lesion, this results in an additional incision that is not required by conventional suture button devices.

Figure 2. A right pilon fracture treated by open reduction and internal fixation with the modified suture button technique with consequent posttraumatic arthritis of the ankle despite a well-reduced syndesmosis.

Ethical approval

Ethical approval for the study was granted by the Ethical Committee of Mohamed Taher Maamouri Hospital. Written informed consent was obtained from all patients for the use of personal information and medical file for the study purpose.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. ICMJE forms for all authors are available online.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Walid Bouaicha https://orcid.org/0000-0003-4837-1954

References

1. Court-Brown CM. *Rockwood and Green's Fractures in Adults*, vol. 8. Wolters Kluwer; 2015.
2. Lin CF, Gross ML, Weinhold P. Ankle syndesmosis injuries: anatomy, biomechanics, mechanism of injury, and clinical guidelines for diagnosis and intervention. *J Orthop Sports Phys Ther*. 2006;36(6):372-384. doi:10.2519/jospt.2006.2195
3. Marasco D, Russo J, Izzo A, et al. Static versus dynamic fixation of distal tibiofibular syndesmosis: a systematic review of overlapping meta-analyses. *Knee Surg Sports Traumatol Arthrosc*. 2021;29(11):3534-3542. doi:10.1007/s00167-021-06721-6
4. Naqvi GA, Shafqat A, Awan N. Tightrope fixation of ankle syndesmosis injuries: clinical outcome, complications and technique modification. *Injury*. 2012;43(6):838-842. doi:10.1016/j.injury.2011.10.002
5. Schepers T. Acute distal tibiofibular syndesmosis injury: a systematic review of suture-button versus syndesmotic screw

repair. *Int Orthop*. 2012;36(6):1199-1206. doi:10.1007/s00264-012-1500-2

6. Soin SP, Knight TA, Dinah AF, Mears SC, Swierstra BA, Belkoff SM. Suture-button versus screw fixation in a syndesmosis rupture model: a biomechanical comparison. *Foot Ankle Int*. 2009;30(4):346-352. doi:10.3113/FAI.2009.0346
7. Tourné Y, Molinier F, Andrieu M, Porta J, Barbier G. Diagnosis and treatment of tibiofibular syndesmosis lesions [published correction appears in Orthop Traumatol Surg Res. 2022 Apr;108(2):103237]. *Orthop Traumatol Surg Res*. 2019;105(8S):S275-S286. doi:10.1016/j.otsr.2019.09.014
8. Xie L, Xie H, Wang J, et al. Comparison of suture button fixation and syndesmotic screw fixation in the treatment of distal tibiofibular syndesmosis injury: a systematic review and meta-analysis. *Int J Surg*. 2018;60:120-131. doi:10.1016/j.ijsu.2018.11.007