A New Fixation Method for Avulsion Fracture of Calcaneal Tuberosity

Shimozono Y, Miyamoto W, Yasui Y, Sasahara J Matsui K, Miki S, Innami K, Takao M

Department of Orthopaedic Surgery Teikyo University School of Medicine
No CONFLICT TO DISCLOSE

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Yoshiharu Shimozono, MD

My disclosure is in the Final AOFAS Mobile App. I have no potential conflicts with this presentation.
Background

- Avulsion fracture of calcaneal tuberosity accounts for 1% to 3% of all calcaneal fractures.\(^1\)
- The fracture fragments are often small and osteoporotic. It can be challenging to achieve sufficient fixation to resist the pull-out tension of the triceps surae.
- The most widely accepted technique is the use of lag screw fixation.
- A cadaveric study revealed that fixation by means of lag screws alone could resist around 250 N of tensile strength, which would seem to be too weak to neutralize the force of the Achilles tendon; for example, 489 to 661 N during riding a bicycle.\(^3\)
We introduce a novel technique that provides rigid fixation using these techniques.
1. 2 USP 2 braided polyethylene and polyester suture threads applied to the distal part of the Achilles tendon
2. By pulling the suture threads manually, anatomical reduction is achieved
3. Cancellous screws of 3.5 or 4.0 mm are inserted
4. Two lateral threads are introduced through a small lateral incision.

5. The suture-retriever grasps the 2 lateral threads and 2-0 nylon loop, and these are extracted medially by pulling the suture-retriever.

6. Medially, the 2 medial suture threads are put into the nylon loop outside, and the nylon loop is pulled so that the 2 threads are extracted laterally. The 2 threads at each side are introduced into subcutaneous tissue around calcaneus.
7. Each suture threads are tied at ventral side of the Achilles tendon using an Anti-slip knot.
First, a surgeon’s knot is made using each side of the threads. Then, both ends are made with 3 throws in the manner of a reef knot.

4 patients 4 feet

Minimum of follow up : 12months

All fractures were united within 3 months without any complications (no limited ROM)
Discussion

Problems of other procedures

**Oblique lateral tension band wire**[^1] → *soft tissue damage and irritation*

**Suture anchors**[^2][^3][^4] → *could not resist the pull-out tension in osteoporotic bone & need for fragment resection*

**Pull-out technique**[^5] → *need for a plantar incision*

Our method is a possible solution to these problems
Discussion

• The estimated strength of this fixation through past literature is approximately **640N** (single SLLS technique: 320.19N).\(^{12}\) It makes active ROM\text{ex} possible early after surgery.

• Even if the fragment is too small, use of the double SLLS technique alone will afford sufficient fixation.

• In addition, anti-slip knots located on the ventral side of the Achilles tendon prevent from irritation pain from the knots.
Conclusion

This technique is a rigid fixation and has advantages over other operative procedures which have reported previously.

Further study with a larger study population followed over the long term is necessary for the presented technique.
References

2. Hazen GE et al. Fixation of calcaneal avulsion fractures using screws with and without suture anchors: a biomechanical investigation. Foot Ankle Int. 2007