A retrospective review of SER type ankle fractures treated with fixation using a posterior antiglide plate

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Statement of Purpose
SER type ankle fractures are among the most common fractures treated by foot and ankle surgeons today. These types of fractures are associated with a posterior spike of the fibula and are often fixed with a traditional lateral plate and anterior to posterior lag screw. However, the use of a posterior antiglide plate has been shown to be a stronger biomechanical construct. The purpose of the present investigation is to evaluate the results obtained from performing a fixation technique using a posterior antiglide plate for SER type fractures on the lateral malleolus. We will review the surgical technique and illustrate the approach used by a single surgeon with extensive experience in the application of this technique.

Methodology & Hypothesis
Radiographs and clinical notes of 27 patients were retrospectively reviewed from a single surgeon treated from November 2013 to June 2015. These patients were treated with a posterior antiglide plate technique on the lateral malleolus. We focused on four areas of importance including radiographic union, wound dehiscence, peroneal tendon irritation, and ankle joint ROM on final follow-up visit.

We hypothesize that the posterior antiglide technique applied to the lateral malleolus provides a reliable option with good outcomes for reduction/fxation for SER type ankle fractures.

Procedure
Twenty-seven patients underwent ORIF for an SER type ankle fracture using a posterior antiglide plate on the lateral malleolus. A linear incision is made posterior and parallel to the fibula. Great attention is placed on limiting skin retraction and careful incision through the overlying peroneal muscles/tendons fascia layer, which serves as an important layer for closure. Once the fracture is visualized and cleaned of any soft tissue or bony fragments for reduction - point to point reduction clamps were used to reduce the fracture. At this time an appropriate 1/3 tubular plate of usually 5 or 6 holes is chosen and placed. The first screw is placed through the plate about 2-3 mm from the tip of the defect on the proximal fibula where the posterior spike should go. This serves as the antiglide screw. This bicortical screw helps reduce the fracture with the plate to near anatomic alignment as it acts as a buttress. The lag screw is then placed through the hole distal to the antiglide screw from a posterior distal to anterior lateral direction. The proximal most screw is then placed following the lag screw. Further screws are then placed through the plate if necessary based on the cantilever effect. Likewise, further fixation was placed if the syndesmosis, posterior malleolus, or medial malleolus required them. Final ankle x-rays were taken for verification of proper plate placement and anatomical reduction before a three layer closure is then performed. All patients were placed in a posterior splint for 1 week followed by a NWB cast for 3 weeks, and then a walking boot for 4 weeks (NWBF first 2 weeks, PWB second 2 weeks).

Figure 1/2/3 (from left to right) show 3 separate patients that were treated with posterior antiglide plate technique on the lateral malleolus.

These radiographic images above depict some of the types of SER ankle fractures that would be treated with a posterior antiglide plate technique on the lateral malleolus.

Literature Review
Lateral malleolus fractures associated with SER type ankle fractures are often fixated with a neutralizing plate on the lateral aspect of the fibula. However, some of the complications that can result in a lateral neutralizing plate fixation include prominent hardware, possible intra-articular screw placement, poor distal fixation, and peroneal tendinitis due to the lag screw being directed anterior-posteriorly. In 1981-1982, Brunner and Weber described fixing a fracture of the lateral malleolus with a posterior antiglide plate. Some of the advantages of using a posterior antiglide plate include a stronger biomechanical construct with lower incidences of peroneal tendinitis and hardware removal (1).

Wissing et al, in a retrospective study reported that a posterior plate is more advantageous than the use of a traditional lateral plate for fibular fixation when soft tissue integrity is compromised. The variability in the anatomy of the fibula also plays a role in choosing a posterior plate over a lateral plate as the base of the cortex in the fibula is often thin (6).

Nonetheless, there have been reports of frequent operations for removal of hardware for posterolateral plate fixation of peroneal tendon lesions caused by distal screw placement for a posterior plate. Likewise, there have been reports of reports of hardware removal procedures due to peroneal tendon lesions. If they were able to correlate these findings to a prominent screw head in the distal most hole of the plate. Therefore, their study recommended that the distal screw placement for a posterior plate should be avoided (2). Likewise, there are a few studies that also make this same recommendation (2, 3, 6).

Analysis & Discussion
In our retrospective study, we reviewed 27 patients treated with a posterior antiglide plate on the lateral malleolus. Our goal was to review the radiographs of 27 patients to determine what type of fixation was used and to determine if they correlated to any clinical findings post-operatively.

The results illustrate that the posterior plate fixation technique performed in this study resulted in favorable outcomes. None of the 27 patients had surgical wound dehiscence, non-unions, or painful ankle joint ROM. Only 1 patient out of 27 (3%) had peroneal tendon irritation. This low incidence can be correlated to the fact that the last hole in the posterior antiglide plate was left unfilled in a majority of our patients. In our study, 2007 patients (74%) did not have the last hole in their plates fixated. The average distance of the distal screw head was 3.02mm and the average distance of the distal screw head to the tip of the lateral malleolus was 33.63mm.

This study does have limitations. These include the retrospective nature of this study, lack of randomization, lack of comparison groups, and short follow-up time.

Results
There were 6 males and 21 females. The average age was 54 years old. There were 3 patients that had diabetes including 1 patient with diabetes and neuropathy. All patients healed on final clinic follow up visit with good outcomes including radiographic union, no surgical wound dehiscence, and non-painful ankle joint ROM for resuming daily activities. There was 1 patient (3%) in our study that had peroneal tendon irritation at their 6 month follow-up.

Table 1: Data

| Fixated | Fixated medial malleolus = 8/27 (29.6%) |
| Fixated w/ 5 hole plate = 15/27 (55.5%) |
| Last hole of plate filled = 7/27 (25.9%) |

| Table 2: Data |
| Medial malleolus fixation classification |
| Fixated = 3/27 (11.0%) |
| Non Fixated = 24/27 (100.0%) |


Analysis of Medial Screws

Figure 1/2/3 (from left to right) show 3 separate patients that were treated with posterior antiglide plate technique on the lateral malleolus.

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