

# Intra-Operative Considerations With the Dorsal Approach to Plantar Plate Repair

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## INTRODUCTION

Plantar plate tears are a common forefoot pathology that can produce significant pain and deformity of the lesser toes. The plantar plate and collateral ligament complex has been identified as the primary stabilizing force across the lesser metatarsophalangeal joints and recent literature has been focused on the role of anatomic plantar plate repair in lesser metatarsophalangeal joint deformity (1,2). Both dorsal and plantar approaches have been described for direct repair of the plantar plate; however the dorsal approach has several advantages including reducing the risk of compromising the plantar digital arteries, the principle blood supply to the affected digits (3), avoiding a plantar scar and disrupting the flexor tendons and plantar fascia (4), and the ability to extend the incision to perform a metatarsal or phalangeal osteotomy (5).

## INTRA-OPERATIVE CONSIDERATIONS

Most of the current literature describes performing a concurrent Weil osteotomy with a dorsal plantar plate repair because it offers several advantages. A long second ray (described as a metatarsal protrusion index of less than -4 mm) has been associated as an independent risk factor for plantar plate pathology due to increased plantar loading of the joint, and in these patients it should be considered to prevent recurrence (6). The addition of a Weil osteotomy increases surgical exposure to the plantar plate. Cooper and Coughlin demonstrated that with a Weil osteotomy after a sequential release of the joint, the distraction obtained increased by a minimum of 2 mm aiding in the ease of repair (7). Although rare, when performing a distal metatarsal osteotomy, the dissection for exposure of the plantar plate should be considered to reduce the risk of avascular necrosis. Peterson et al described the vascular supply to the metatarsal head with the nutrient arteries to the head having a close relationship to the origins of the medial and lateral collateral ligaments (8). Cooper and Coughlin showed no difference in exposure whether the collateral ligaments were transected at the metatarsal head or phalangeal base (7). This would seem to favor transecting the collateral ligaments from the proximal phalanx base to preserve the nutrient arteries of the metatarsal head.

Despite its prominence in current literature, a Weil osteotomy is not mandatory for anatomic repair as several

studies have also shown it both anatomically feasible and technically possible to perform an anatomic plantar plate repair without the metatarsal osteotomy. With a dorsal approach and subsequent release of the dorsal capsule, collaterals, and plantar plate from the proximal phalanx Jastifer and Coughlin have demonstrated a mean exposure of 5.3 mm in cadaver models without a Weil osteotomy (9). More importantly, they had successful passage of two sutures through the plantar plate in all specimens. Recently, Phisiktul et al utilized a cadaveric study to show that with transecting the only lateral collateral ligament and lateral half of the plantar plate allowed for 6 mm of exposure with successful suture passage with a joint distractor, which may be an option to avoid disruption of the entire plantar plate when only lateral pathology is present (10).

Another consideration is what suture construct to use as they are varied across the different medical device companies. Sutures are most often found in a horizontal mattress or “luggage tag” orientation. In a cadaver study, Finney et al found no significant differences between either suture orientation with respect to peak load to failure, number of cycles to significant displacement, or stiffness of the repair (11).

In summary, anatomic plantar plate repair has become more popular over the last few years as its role in lesser metatarsophalangeal joint stability is better understood. The literature on this topic is constantly evolving and with the proper anatomic considerations, the dorsal approach has been shown to provide versatile and reproducible exposure to anatomic plantar plate repair.

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