

# The Proximity of Neural Structures in Hallux Valgus Incisional Approaches: A Cadaveric Study

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## INTRODUCTION

Neurological complications in hallux abductovalgus (HAV) surgery may be associated with the incision placement. The dorsal approach was used in the original method for HAV surgical intervention, but this approach increased the risk to the extensor hallucis tendon (EHL) tendon and neurovascular structures<sup>1</sup>. Surgeons began opting for the dorsomedial (DM) incision, which has become the standard approach for HAV intervention. However, various texts and publications have noted the high anatomic variability of the neurovascular structures using this approach. Studies have reported several complications with this incision method.

A common complication of the DM incision is injuring of the dorsomedial cutaneous nerve (DMCN)<sup>3,5</sup>. Incidents of DMCN injury have been reported up to 45% of cases<sup>2,3,5</sup>. Complications can include a neuroma, painful scar, and decreased sensation on the medial aspect of the hallux<sup>4</sup>.

The DMCN origin has been found 8-61 mm from the metatarsocuneiform joint<sup>4</sup>. As the nerve transcended distally, the nerve was found 6-15 mm medial to the EHL at the first metatarsal midshaft and 9-16 mm medial to the EHL tendon at the first metatarsophalangeal joint<sup>4</sup>.

The use of a midmedial (MM) approach has been illustrated in several texts to decrease the rate of neural injury, painful scarring, and give a more favorable cosmetic result. However, it makes access to the lateral aspect of the hallux more troublesome. Despite the listed advantages, the MM approach has gained little acceptance among foot and ankle surgeons for this reason.

## OBJECTIVES

The purpose of this study is to quantify the location of the DMCN in HAV incisional approaches to provide surgeons with reliable calculations at which they may encounter the structures. The risk to neural structures using various incisional approaches will be compared to determine if using the MM approach endangered the DMCN to a lesser extent than DM approach or dorsal approaches.

## MATERIALS

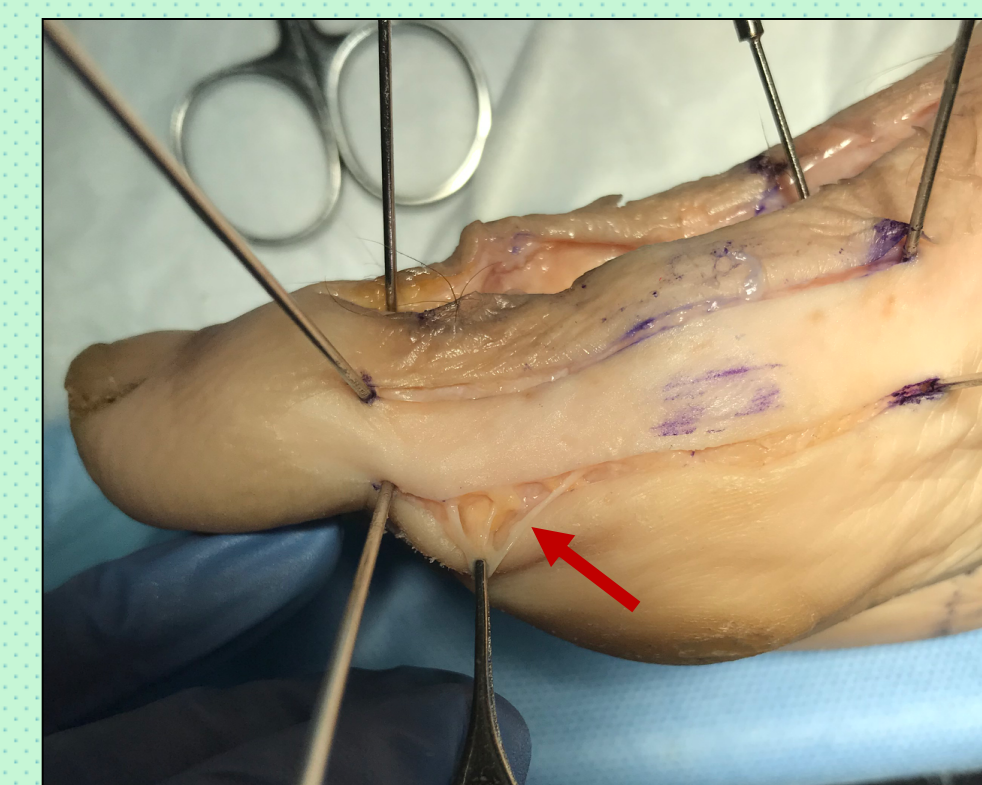
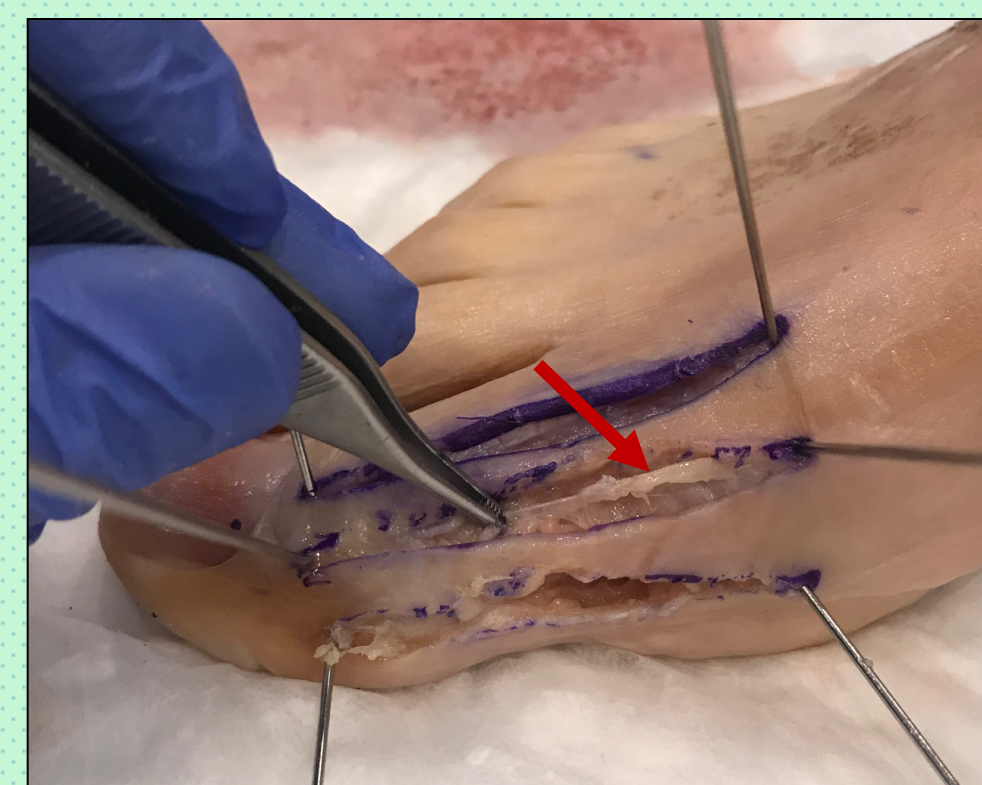
Anatomical mapping was conducted on 9 limbs during cadaver labs in South Florida facilities. All limbs were below the knee amputations with ankles placed in a 90-degree neutral dorsiflexed position.

## METHODS

A surgical marker was used to delineate the 5cm dorsal, DM, and MM HAV incisions. The midpoint of the incisions was the 1<sup>st</sup> metatarsophalangeal joint, with 2.5cm extending above and below the midpoint. The incisions were performed in this order.

The dorsal incision was located directly medial to the EHL tendon. The DM incision was midway between the EHL tendon and the medial eminence of the 1<sup>st</sup> metatarsal. The MM incision was located midway between the dorsal and plantar glabrous junction on the medial aspect of the 1<sup>st</sup> metatarsal. 0.045 Kirschner wires (K-wires) were drilled into the bone of the first metatarsal and proximal phalanx of the hallux at the incisions' most proximal and distal aspects. Dissections were performed with a 15-blade and pick-ups, going superficial to deep.

The distance from where the DMCN entered and exited the incision site and length of the nerve's transition through the incision were recorded, using the proximal K-wire (0cm mark) as a consistent landmark. None of the structures were disturbed from their natural anatomical positions during dissection.

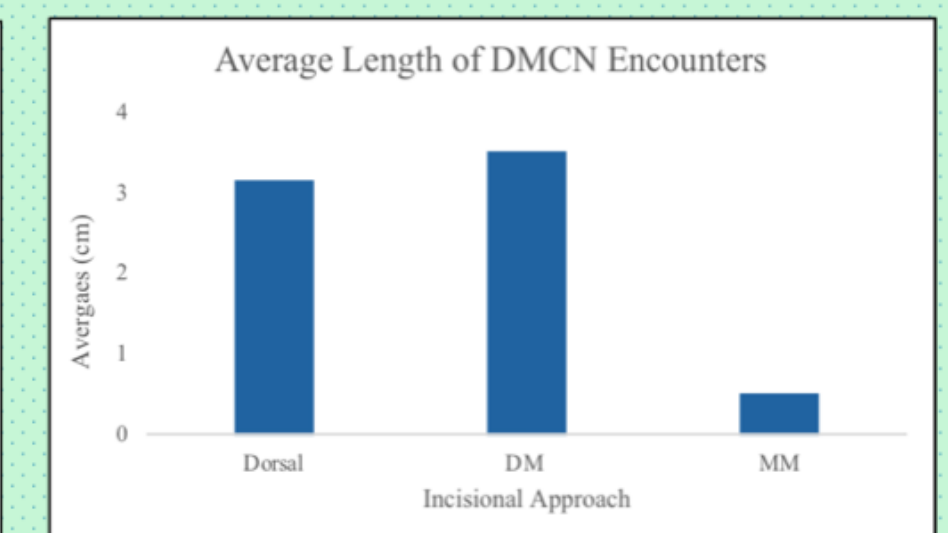
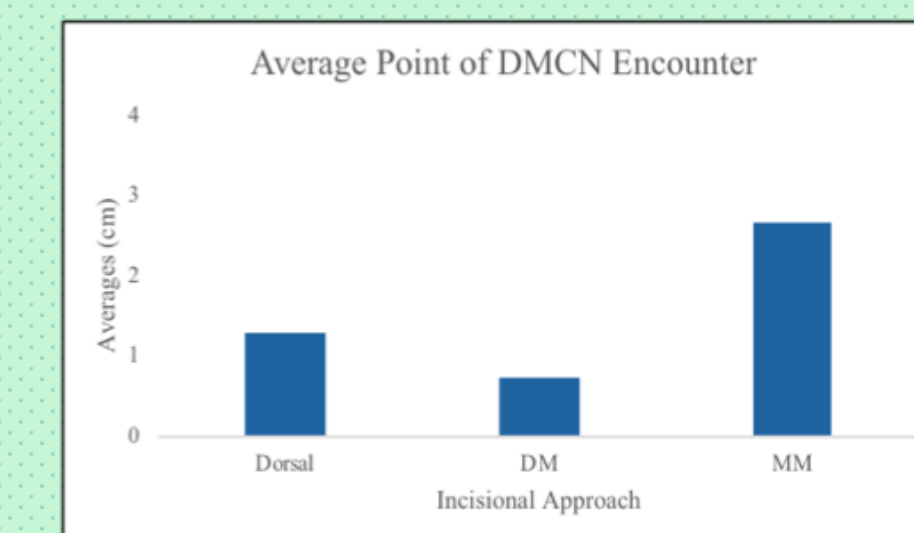
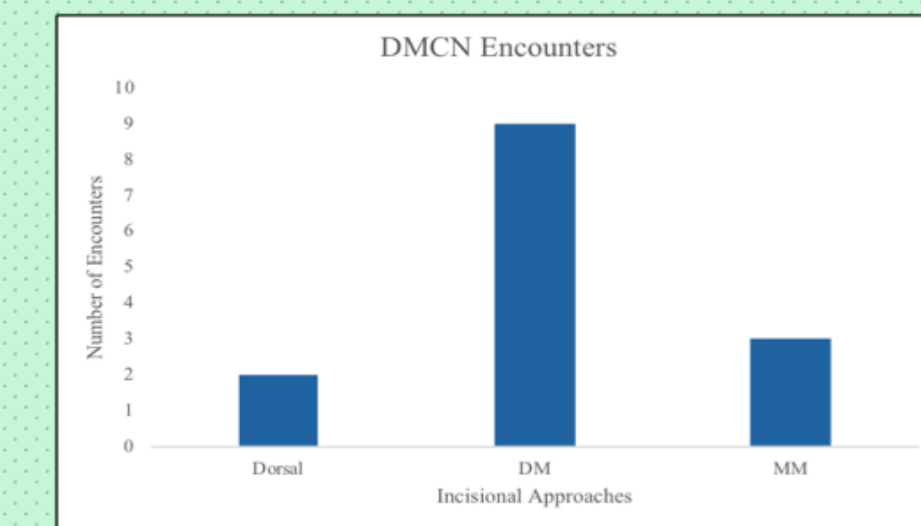


DMCN identification in the DM (left) and MM (right) incisions.

## RESULTS

The DMCN was identified in 2 dorsal approaches, 3 of the MM approaches, and 9 of the DM approaches.

In the dorsal incision, the DMCN was found at an average distance of 1.30cm from the proximal aspect of the incision, with the average length of the nerve being 3.15cm. In the DM incision, the average distance to encounter was 0.73cm from the proximal K-wire, with an average length of 3.50 cm. In the MM approach, the DMCN was encountered at an average distance of 2.67cm from the proximal K-wire, with an average nerve length of 0.53cm.



## CONCLUSIONS

The DMCN was most encountered using the DM incision and at the distal aspects of the incisions. These findings are in agreement with previous literature<sup>4</sup>. Based on our results, the DM incision is most likely to endanger the DMCN. The MM approach endangers the nerve to a lesser extent, and the dorsal approach is the least likely to endanger the nerve.

Although further investigation is warranted, use of the MM approach may mitigate the risk of postoperative DMCN dysfunction and improve cosmesis over the DM approach for HAV correction.

## REFERENCES

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