



# Comparison of Two Methods of Joint Distraction for Arthrodesis of the Foot



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## BACKGROUND

Surgical exploration and arthrodesis of various joints of the foot has many indications.<sup>1</sup> Whether for stabilization, relief of arthritis or correction of structural or positional deformity, the technique is the same: the articular surface is visualized, cartilage is removed and /or the joint resected and the bones are fixated to encourage osseous union.<sup>2</sup> To accomplish this, the surgeon must have unobstructed access to the joint space.

The use of many instruments in gaining joint exposure has been described.<sup>3</sup> One common method employs the Inge Laminar Spreader (ILS) (K-Medic, Northvale, NJ) which provides joint exposure by inserting the blades into the joint. Because the blades of the instrument are placed within the joint, the surgeon must frequently reposition the instrument while performing portions of the key steps in joint preparation for fusion. The Tarsal Joint Distractor (TJD) (Orthovation, LLC, Sealy, TX) provides distraction through manual separation of temporary pin fixation placed in adjacent bones without inserting blades into the joint. While this may theoretically provide better visualization of joint surfaces, there have been no reported studies comparing the efficacy of these methods.

## PURPOSE & HYPOTHESIS

- > Institutional Review Board approval to conduct this study was obtained.
- > A cadaveric surgical model was used to compare the efficacy of the two devices.
- > The null hypothesis was that no difference exists between the two methods in achieving articular exposure or distance between distracted surfaces.



Fig 1. Comparison of instruments to demonstrate size: Inge Laminar Spreader (left) and Tarsal Joint Distractor (right). Ruler is 20cm in length.

## MATERIALS AND METHODS

- > Six unembalmed cadaver limbs were obtained through the Pathology department.
- > On each specimen, a single investigator (S.H.) performed standard incisions and dissection as typically performed for surgical arthrodesis of the first metatarsocuneiform joint, naviculocuneiform joint, medial intercuneiform joint, talonavicular joint, calcaneocuboid joint, and subtalar joint, in that order.
- > Each joint was exposed and distracted once with each device.
- > Distraction of any given joint was carried out with both devices before proceeding to the next joint. In three feet, the ILS was used first to distract all six joints. In the other feet, the TJD was used first.
- > The order of instrument use for a given foot was random, as determined by the Experimental Design Generator And Randomizer (John Innes Center, Norwich, England).
- > Once a given joint was distracted, a calibrated digital photograph of the exposed joint was taken from an angle best representing the surgeon's view of the articular space.
- > Digital images were analyzed with the Image Measurement 4.01 computer software program (Bersoft, Ottawa, Ontario) to calculate the maximum distance between articular surfaces and the total area of articular surfaces exposed while distracted.
- > A statistical analysis was performed using Student's t-test (SAS Version 8.02, Cary, NC) to discern differences between the two distraction methods.
- > Statistical significance was defined as  $P < 0.05$ .



Fig 2. Image computation of talonavicular joint area exposed with the Inge Laminar Spreader.



Fig 3. Image computation of talonavicular joint area exposed with the Tarsal Joint Distractor.



Fig 4 and 5. Comparison of instruments to demonstrate application for talonavicular distraction: Inge Laminar Spreader (left) and Tarsal Joint Distractor (right).

## RESULTS

- > Thirty-six joints involving six feet were distracted with each device.
- > Range of articular exposure
  - 83.8-331.5mm<sup>2</sup> with the TJD
  - 64.7-258.1mm<sup>2</sup> with the ILS
- > Mean area of articular exposure
  - 178.3mm<sup>2</sup> for the TJD
  - 116.4mm<sup>2</sup> for the ILS
- > This difference was found to be statistically significant ( $P=0.0001$ ).
- > Range of distance between distracted surfaces
  - 4.8-11.5mm with the TJD
  - 2.4-9.7mm with the ILS
- > Mean distance of distraction
  - 8.1mm for the TJD
  - 6.5mm for the ILS
- > This difference was also statistically significant ( $P=0.0001$ ).
- > An average of 53.1% more exposure and 25.2% more distance between distracted surfaces was achieved when using the TJD as compared to the ILS.

## CONCLUSIONS

The TJD provides significantly better visualization of articular spaces typical of midfoot and rearfoot arthrodesis procedures as compared to the ILS. Theoretically, increased exposure should help to decrease surgery time and the rates of non-union during these procedures, however additional prospective investigation is warranted.

## REFERENCES

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