MUSCULOSKELETAL ULTRASOUND EVALUATION OF THE PLANTAR PLATE FOR IDENTIFICATION OF PLANTAR PLATE TEARS

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Erin E. Klein, DPM, MS

My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
INTRODUCTION

- MRI has been shown to have an accuracy as high as 95% for imaging tears of the plantar plate\(^1,^3\).

- Previous studies have investigated the accuracy of musculoskeletal ultrasound on the diagnosis of plantar plate pathology\(^1\)\(^-\)\(^2\), however, this has not yet been assessed in patients where pathology has been observed intra-operatively for every patient enrolled in the study\(^2\).

- Therefore, the **purpose of this study** is to:
  - Investigate the ability of the ultrasound to both identify and localize plantar plate pathology.
METHODS

- 50 consecutive patients with unilateral forefoot pain and scheduled to undergo surgical intervention were included in this study.

- All ultrasound exams were performed by a single examiner who was blinded to clinical exam findings, radiographic exam findings and MRI results.

- Longitudinal ultrasound images were reviewed and graded as one of the following:
  - Intact
  - Ruptured

- Transverse ultrasound images were reviewed and graded as one of the following:
  - Intact
  - Partial medial rupture
  - Partial lateral rupture
  - Complete rupture
  - Unable to identify location
**RESULTS — LONGITUDINAL IMAGES**

- **“Tear Accuracy,”** defined as the ability of the ultrasound to correctly identify the presence of plantar plate pathology, was calculated from longitudinal ultrasound images.
- Longitudinal ultrasound was **90.0%** accurate identifying the presence of pathology.

<table>
<thead>
<tr>
<th></th>
<th>Intra-op Torn</th>
<th>Intra-op Not torn</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSK US – Ruptured</td>
<td>41</td>
<td>4</td>
</tr>
<tr>
<td>MSK US – Intact</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

- Sensitivity – **91.1%**
- Specificity – **25%**
- Positive Predictive Value – **91.1%**
- Negative Predictive Value – **25%**

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RESULTS – TRANSVERSE IMAGES

- “Localization accuracy,” defined as the ability of the ultrasound images to correctly identify the location of the pathology, was calculated from transverse ultrasound images.
- Transverse ultrasound was 38.0% correct in identifying the location of pathology.

<table>
<thead>
<tr>
<th></th>
<th>Tear localized on US</th>
<th>Same location as intra-op exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>US - Intact</td>
<td>14/50</td>
<td>1</td>
</tr>
<tr>
<td>US - Partial medial rupture</td>
<td>7/50</td>
<td>4</td>
</tr>
<tr>
<td>US - Partial lateral rupture</td>
<td>19/50</td>
<td>11</td>
</tr>
<tr>
<td>US - Complete rupture</td>
<td>3/50</td>
<td>3</td>
</tr>
<tr>
<td>US - Unable to identify location</td>
<td>7/50</td>
<td>--</td>
</tr>
</tbody>
</table>

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RESULTS

- "Overall accuracy," defined as the ability to correctly identify and localize plantar plate pathology, was calculated.
- The overall accuracy of the ultrasound in correctly identifying AND localizing plantar plate pathology was 40.0%

Longitudinal US – torn plantar plate

Transverse US – medial tear

Intra-operative exam – medial tear
DISCUSSION

Advantages of MSK US:
- Inexpensive, fast

Disadvantages of MSK US:
- Highly technician dependant
- Steep learning curve
- Decreased accuracy

The accuracy of identifying plantar plate pathology with MSK US is significantly less than reported in the literature for MRI\(^3\).
CONCLUSION

- Musculoskeletal ultrasound may be useful to identify if plantar plate pathology exists, however; the inability to accurately localize this pathology may make this an inferior imaging modality to MRI.

- In order for this to be a useful imaging modality for the plantar plate, the technician must be knowledgeable and experienced in the anatomy and imaging of this problem.
REFERENCES

