CLINICAL EXAM PREDICTORS 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

- Plantar plate tears can cause significant pain and deformity of the forefoot.
- Previous research has suggested that pain, edema, a positive drawer sign and crossover toes are highly correlated with plantar plate pathology\textsuperscript{1-3}.
- This pathology is often missed on initial diagnosis as previous discussions of clinical diagnostic parameters have not been well established for the plantar plate tear that exists without a crossover toe\textsuperscript{4}.

- Therefore, the \textbf{purpose of this study} is to:
  - Clarify which common clinical findings have a correlation to observed intra-operative plantar plate pathology.
  - Compare diagnostic statistics of commonly observed clinical parameters and commonly performed clinical tests using observed intra-operative pathology as the gold standard of reference.
METHODS

- Records were reviewed for 90 patients (109 feet) who underwent plantar plate repair for the following information:
  - Parameters from Patient History
    - Onset (sudden or gradual)
    - Time to diagnosis
    - Previous first ray surgery
    - Previous diagnosis for this problem
    - Previous cortisone injection in the area of the 2nd MTPJ
  - Parameters from Physical Exam
    - Pain
    - Edema
    - Instability of the 2nd MTP (+/- Drawer Sign)
    - Crossover toes
    - Pain with 2nd MTP ROM
    - Concurrent first ray pathology
    - 1st MTPJ ROM

- These findings were analyzed utilizing the observed intra-operative pathology as the gold standard of reference.
RESULTS — PATIENT HISTORY PARAMETERS

- Of the 109 feet inspected intra-operatively, 100 were found to have plantar plate pathology. Sensitivity, specificity, positive predictive values (PPV), negative predictive values (NPV) and odds ratios were calculated.

<table>
<thead>
<tr>
<th>Exam Parameter</th>
<th>Incidence (%)</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudden Onset</td>
<td>7%</td>
<td>7%</td>
<td>100%</td>
<td>100%</td>
<td>8.9%</td>
<td>n/a</td>
</tr>
<tr>
<td>Gradual Onset</td>
<td>93%</td>
<td>93%</td>
<td>0%</td>
<td>91.2%</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Pain &gt; 6 months</td>
<td>69%</td>
<td>73.4%</td>
<td>28.6%</td>
<td>93.2%</td>
<td>7.4%</td>
<td>1.104</td>
</tr>
<tr>
<td>Previous 1st ray surgery</td>
<td>18%</td>
<td>100%</td>
<td>0%</td>
<td>94.7%</td>
<td>0%</td>
<td>n/a</td>
</tr>
<tr>
<td>Cortisone Injection</td>
<td>21%</td>
<td>22.1%</td>
<td>62.5%</td>
<td>87.5%</td>
<td>6.3%</td>
<td>0.473</td>
</tr>
</tbody>
</table>

- An odds ratio >1 = more likely to be diagnosed with plantar plate tear.
- An odds ratio <1 = less likely to be diagnosed with plantar plate tear.
RESULTS – PHYSICAL EXAM PARAMETERS

- Of the 109 feet inspected intra-operatively, 100 were found to have plantar plate pathology. Sensitivity, specificity, positive predictive values (PPV), negative predictive values (NPV) and odds ratios were calculated.

<table>
<thead>
<tr>
<th>Exam Parameter</th>
<th>Incidence (%)</th>
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<th>NPV</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain at 2&lt;sup&gt;nd&lt;/sup&gt; metatarsal head</td>
<td>98%</td>
<td>98.0%</td>
<td>11.1%</td>
<td>92.5%</td>
<td>33.3%</td>
<td>6.125</td>
</tr>
<tr>
<td>Edema at 2&lt;sup&gt;nd&lt;/sup&gt; metatarsal head</td>
<td>92%</td>
<td>95.8%</td>
<td>11.1%</td>
<td>92.0%</td>
<td>20.0%</td>
<td>2.875</td>
</tr>
<tr>
<td>Positive Drawer Sign</td>
<td>75%</td>
<td>80.6%</td>
<td>99.8%</td>
<td>92.6%</td>
<td>10.0%</td>
<td>1.389</td>
</tr>
<tr>
<td>Pain 2&lt;sup&gt;nd&lt;/sup&gt; MTPJ ROM</td>
<td>28%</td>
<td>31.5%</td>
<td>77.8%</td>
<td>93.3%</td>
<td>10.3%</td>
<td>1.607</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; MPTJ ROM &gt;60°</td>
<td>53%</td>
<td>71.6%</td>
<td>40.0%</td>
<td>94.6%</td>
<td>8.7%</td>
<td>1.682</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; MPTJ ROM &lt;60°</td>
<td>21%</td>
<td>28.4%</td>
<td>60.0%</td>
<td>91.3%</td>
<td>5.4%</td>
<td>0.594</td>
</tr>
<tr>
<td>Crossover toes</td>
<td>8%</td>
<td>8.0%</td>
<td>88.9%</td>
<td>88.9%</td>
<td>8.0%</td>
<td>0.696</td>
</tr>
</tbody>
</table>

- An odds ratio >1 = more likely to be diagnosed with plantar plate tear.
- An odds ratio <1 = less likely to be diagnosed with plantar plate tear.
DISCUSSION

- When taking a patient history, the following parameters should lead one to suspect plantar plate pathology:
  - Gradual onset of pain
  - Pain unresolved for more than 6 months

- Patient physical exam parameters that should lead one to suspect plantar plate pathology include:
  - Pain at the 2\textsuperscript{nd} metatarsal head
  - Edema at the 2\textsuperscript{nd} metatarsal head
  - Positive drawer sign
Crossover toes were not a consistent finding in these patients, likely because the crossover toe represents an end stage deformity\(^4\).

As this condition is now being recognized earlier, the progression to end stage deformity has decreased in incidence.
CONCLUSION

- A good patient history with a thorough clinical exam can heighten the suspicion for plantar plate pathology when the data is interpreted correctly.

- When pain, edema, a positive drawer sign and gradual onset of pain unresolved after 6 months are combined, this will correctly identify 95% of patients with plantar plate pathology.
REFERENCES


