Sonographic Location of Distal A-1 pulley by means of a bony acoustic landmark on the proximal phalynx: an anatomic study

Brian M. Jurbala, MD
Highland Center for Orthopaedics, Lakeland, FL

INTRODUCTION

- Previous studies have described means of predicting both the proximal and distal margins of the A-1 Pulley using skin surface landmarks in order to facilitate minimally invasive and percutaneous trigger finger release techniques. 1-4
- High Resolution Ultrasound (HRUS) can be useful in identifying pertinent anatomy in the pulley system and guiding a minimally invasive trigger finger release procedures.
- We have developed a percutaneous method of release of the A-1 pulley via an Endoscopic approach which utilizes a distal to proximal technique. 5 During this technique we have refined that the appearance on HRUS of the A-1 and A-2 pulley interval can be variable such that it is sometimes difficult to tell where the A-1 ends and the A-2 begins. This makes it difficult to assure complete release of A-1 pulley distally other than verifying release clinically or relying on skin surface landmarks previously described.
- Bony Sonographic landmarks can be helpful in identifying soft tissue anatomy in other areas including the elbow. 6
- We theorized that the bony landmark represented by the flare at the junction of the shaft and base of the proximal phalynx, which we deemed the “P-1-Peak”, could be useful in predicting the location of the distal A-1 pulley.

PURPOSE

- The purpose of the study was to identify the anatomic relationship (if any) between the distal to 0.50 mm of the P-1 Peak and actual location of the distal A-1 pulley.

METHODS

- We studied 48 fingers from 12 fresh frozen human cadaver hands; 12 index, 12 long, 12 ring and 12 small fingers.
- A HRUS of each finger was performed using an 18MHz probe. The insertion of the palmar plate at the MP joint was located sonographically in the long Axis at the P-1 peak area and marked with a transverse needle with each finger in neutral flexion/extension (Figure 1).
- Dissection of the fingers proceeded and measurement of the actual distance between the needle and the distal edge of the A1 pulley (D-2) was performed (Figure 2). Further dissection was performed to elevate the palmar plate and identify the actual location of P-1 peak.
- The distance between the P-1 Peak and actual location of the distal A-1 pulley (D-2) was measured (Figure 3).

RESULTS

- We were able to place a 21 ga needle under ultrasound guidance at the level of the P-1 Peak in all specimens. The actual distance between the needle and the distal A-1 pulley found to be 1 mm or less in all specimens.
- The actual distance from the P-1 Peak to the distal edge of the A-1 pulley was measured 0.50 mm or less in all specimens studied.
- In all specimens, the actual distal A-1 pulley was found either at, or proximal to the needle placed.
- In no case was the distal edge of the A-1 pulley found to extend distal to the P-1 Peak.

CONCLUSIONS

- The P-1 Peak is a readily visible bony echogenic landmark that reliably predicted the distal A-1 Pulley on ultrasound to within 1 mm.
- Based on the results of this study of the P-1 Peak we would recommend releasing the tendon sheath at or just distal to this bony echogenic landmark when performing percutaneous A-1 pulley release under ultrasound guidance in order to assure a complete release of the pulley distally.

REFERENCES

5. (Image 1667x151 to 2320x531) Endosonographic Location of Distal A1 pulley distally other than verifying release clinically or relying on skin surface landmarks previously described.

TABLE 1

<table>
<thead>
<tr>
<th></th>
<th>D-1 (mean mm)</th>
<th>D-2 (mean mm)</th>
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<tbody>
<tr>
<td>Index</td>
<td>0.50</td>
<td>0.27</td>
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<tr>
<td>Middle</td>
<td>0.54</td>
<td>0.21</td>
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<tr>
<td>Ring</td>
<td>0.50</td>
<td>0.35</td>
</tr>
<tr>
<td>Small</td>
<td>0.46</td>
<td>0.33</td>
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<tr>
<td>Average</td>
<td>0.52</td>
<td>0.30</td>
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TABLE 2

<table>
<thead>
<tr>
<th></th>
<th>D-1 (mean mm)</th>
<th>D-2 (mean mm)</th>
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</thead>
<tbody>
<tr>
<td>Range</td>
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<td>0-1.50</td>
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