

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

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## 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.<sup>1,2,3</sup>
- 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 Endosonographic approach which utilizes a distal to proximal technique.<sup>4</sup> During this technique we have noticed 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<sup>5</sup>.
- 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

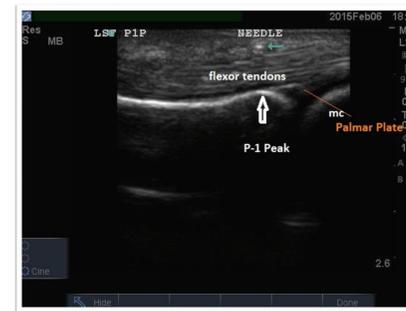
- The purpose of the study was to identify the anatomic relationship (if any) between the distal extent of the A-1 Pulley and the insertion of the palmar plate into the base of the proximal phalanx at the so called “P-1 peak” (a bony acoustic landmark easily identifiable on sonography of the finger).

## 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-1) 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).

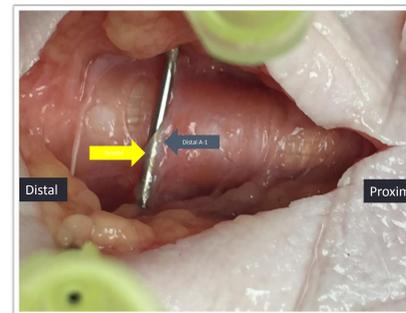
## FIGURE 1

- High Resolution US of finger after placement of 21 ga needle at level of P-1-Peak.



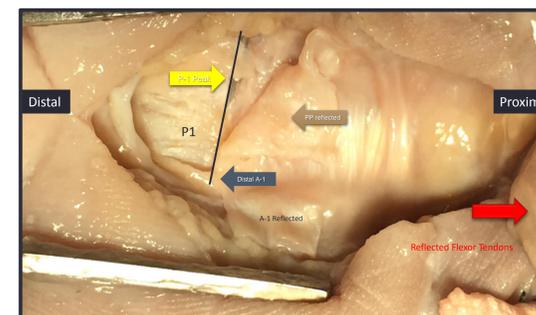
## FIGURE 2

- 21 ga needle placed above tendon sheath at P-1 peak showing location of distal A-1 pulley.



## FIGURE 3

- Location of P-1-Peak after dissection



## TABLE 1

- D-1 = Actual Distance (measured) between needle placed at P-1 under US guidance and distal A-1
- D-2 = Actual Distance (measured) between distal A-1 and P-1-Peak after dissection.

	D-1 (Ave mm)	D-2 (Ave mm)
Index	0.50	0.27
Middle	0.54	0.23
Ring	0.50	0.19
Small	0.46	0.33
Average	0.51	0.26
Range	0 to 1	0 to 0.50

## 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 was 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 needed 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

1. Wilhelmi BJ, Snyder N IV, Verbesey JE, Ganchi PA, Lee WP. Trigger finger release with hand surface landmark ratios: an anatomic and clinical study. *Plast Reconstr Surgery* 2001; 108:908–915.
2. Hazani R, Engineer NJ, Zeineh LL, Wilhelmi BJ. Assessment of the distal extent of the A1 pulley release: a new technique. *Eplasty*. 2008;8:e44
1. Fiorini HJ, et al. Anatomical study of the A1 pulley: length and location by means of cutaneous landmarks on the palmar surface. *J Hand Surg Am* 2011;36:464-8.
3. Jurbala BM. Minimally Invasive High Resolution Ultrasound Guided Trigger Finger Release. Paper Presented at: AAHS 2-14. American Association of Hand Surgery 2014 Annual Meeting; 2014 Jan. 8-11; Kauai, Hawaii
4. De Maeseneer M, Marcelis S, Cattrysse E, Shahabpour M, De Smet K, De Mey J. Ultrasound of the elbow: a systematic approach using bony landmarks. *Eur J Radiol*. 2012 May;81(5):919-22.