Anatomical Variations of the Extensor Pollicis Brevis Tendon and Abductor Pollicis Longus Tendon – Relation to Tenosynovectomy –

By

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Key Words: Anatomical variations, First extensor compartment of the hand, De Quervain’s disease, Extensor pollicis brevis tendon (EPB), Abductor pollicis longus tendon (APL)

Summary: Sufficient improvement in De Quervain disease, is not always archived even by tenosynovectomy, and the reason for this appears to be anatomical variation in the first extensor compartment of the hand.

In this study we examined the first extensor compartment of 159 hands of 80 human cadavers. Hiranuma and colleagues documented four anatomical types of first compartment, and in this study type A was observed in 76 (47.8%) of the 159 hands, type B in 49 (30.8%), and type C in 21 (13.2%). No type D compartments in which the extensor pollicis brevis tendon is absent, were observed. There were 13 hands that did not fit any of Hiranuma’s categories, and we classified them into three new types: E, F, and G.

The numbers of extensor pollicis brevis tendons in the first compartment varied from one to three, and the number of abductor pollicis longus tendons varied from one to seven.

Successful tenosynovectomy in the treatment of De Quervain disease requires to pay close attention to accessory tendons of the extensor pollicis brevis tendon and abductor pollicis longus tendon, branching of the tendons, and the presence of an atypical septum in the first compartment.

Methods

After widely exposing the extensor compartments, the tendon sheathes of the first compartment was cut to expose the tendons within it. The abductor pollicis longus tendon (APL) and extensor pollicis brevis tendon (EPB) were then separated from the tendon sheath and photographed. When more than one accessory tendon was present, all of the tendon were separated and counted. When a septum was present, its morphology was examined.

Results

The 159 hands of the 80 cadavers were classified according to the system of Hiranuma and colleagues (Fig. 1).

1) Anatomical Variations

Of the 159 hands, 76 (47.8%) were classified as type A, 49 (30.8%) as type B, and 21 (13.2%) as
type C. No type D compartment, in which EPB is clearly absent, were observed. The remaining 13 first compartments (8.1%) did not fall into any of Hiranuma’s categories.

2) Morphology of the 13 First Compartments that did not Fit into any of Hiranuma and Colleagues’ Categories

The 13 hands that did not fit into types A through D were examined more closely and classified into one of three new types, E, F, or G, as defined below.

In type E, the EPB and APL are completely separated, and there is no septum between the two tendons. Five (3.1%) type E compartments were identified (Fig. 2).

In type F, the EPB and APL are anatomically close, but there is no septum between the two tendons. Three (1.9%) type F compartments were identified (Fig. 3).

In type G, the EPB is located inside the APL, rather than being absent as in type D. Five (3.1%) compartments met the definition of type G (Fig. 4), and two were in the same cadaver. The APL and EPB of that cadaver in the left hand were almost completely fused into a single tendon.

3) Gender Difference in Tendon Distribution

A t-test was used to assess the significance of the gender differences in each tendon type, but no significant differences were found (p < 0.05).

4) Left-right Difference in Tendon Distribution

Left-right differences were assessed for each tendon type, but no significant differences were found (p < 0.05).

5) Age Differences in Tendon Distribution

No clear correlations were found between age and tendon type.

The Numbers of EPBs and APLs were Counted in 30 of the 80 Cadavers

6) Numbers of APL

The numbers of APL ranged from one to seven: one APL was present in 1 compartment (1.7%), two in 8 compartments (13.3%), three in 23 compartments (38.3%), four in 13 compartments (21.7%), five in 7 compartments (11.7%), six in 3 compartments (5.0%), and seven in 5 compartments (8.3%). The numbers of APL were the same bilaterally in 10 cadavers (33.3%), and differed in 20 cadavers (66.6%).

7) Numbers of EPB

The numbers of EPB ranged from one to four: one EPB was present in 51 compartments (85.0%), two in 6 compartments (10.0%), three in 1 compartment (1.7%), and four in 1 compartment (1.7%). The numbers of the EPB was the same bilaterally in 25 cadavers (83.3%), and differed in 5 cadavers (16.7%).
Fig. 2. Type E (Cadaver Number 1522, right hand).
While the hand at first appeared to be type D, the EPB and APL were completely separated, and no septum was present between the two tendons.

Fig. 3. Type F (Cadaver Number 1587, left hand).
While the hand at first appeared to be type D, the EPB and APL were very close, and no septum was present between the two tendons. In this photograph the EPB and APL have been placed outside the tendon sheath to make it easier to differentiate the tendons.
Discussion

Hiranuma and colleagues anatomically classified tendon alignments in the first compartment into types A through D (Fig. 1)\textsuperscript{2,3}).

In type A, the APL and EPB are located in the same tendon sheath, and this is the most common type. In type B, a complete septum is present between the APL and EPB, in other words, each tendon lies within a separate tendon sheath. In type C, the septum is incomplete, and only a segment of the tendons is separated. In type D, there is no septum, and the EPB is absent.

Horiuchi examined the EPB and APL of cadavers, and documented the following distribution of tendon types according to this classification sys-
tem: type A, 43%; type B, 26%; and type C, 31%. The incidence of type B was slightly higher in the present study, and the incidence of type C was lower. Horiuchi's study also reported observing one to three EPBs with one being the most common at 93%, consistent with the result of our study (85%). However, Horiuchi found at least three APLs in 40% of the hands, whereas in the present study at least three APLs were observed in 85% of hands (n = 51), with three being the most common number.

The results of the present study confirmed variation in the numbers of accessory APLs and EPBs tendons and compartment variations, and as a result it is necessary to pay close attention to anatomical variations during initial surgery. In particular, the number of the accessory APLs varies considerably, and it is sometimes difficult to differentiate them from EPBs. Moreover, it is impossible to identify these anatomical variations preoperatively by the Finkelstein test. In Hirunuma’s type D and in type G defined in the present study, the EPB is missing or fused to the APL, and as a result diagnosis based on Iwahara and Nozue’s sign, which is specific to tendinitis of the EPB, may not be correct. When performing surgery, therefore, it is important to dissect the hand subcutaneously in the direction of the second extensor compartment, or towards the dorsum of the hand, and to visually confirm tendon movements by abducting and extending the thumb.

References

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