A Variant of Kaplan’s Accessory Branch of the Dorsal Cutaneous Branch of the Ulnar Nerve: A Case Report and Review of the Literature

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Kaplan’s accessory branch is an aberrant branch of the dorsal cutaneous branch of the ulnar nerve that arises proximal to the styloid process of the ulna and courses ulnar to the pisiform. Variations of this anomaly have been described as having an end point of connection to the sensory branch of the ulnar nerve, to the motor branch of the ulnar nerve (rare), to the digital nerve at the level of the midhypothenar eminence, or to the proximal interphalangeal joint of the small finger or as running as an independent branch to the volar aspect of the small finger. We report a variant of Kaplan’s accessory branch that coursed through the insertion of the flexor carpi ulnaris, a groove on the ulnar aspect of the pisiform, and connected to the ulnar nerve trunk proximal to its bifurcation into its motor and sensory branch. Based on the findings of the case presented and a review of the literature we offer a classification system for this anomaly. (J Hand Surg 2005;30A: 1231–1235. Copyright © 2005 by the American Society for Surgery of the Hand.)

Key words: Hand surgery, Kaplan’s connection, ulnar nerve.

Kaplan1 originally described an anomalous branch of the dorsal cutaneous branch of the ulnar nerve that crossed the ulnar head from the dorsal to the volar side, coursing to the ulnar aspect of the pisiform to join the proximal volar sensory branch of the ulnar nerve. Since this description in 1963 many other variations of this anomaly have been described,2–4 differing in their distal point of connection: either distal to the bifurcation of the ulnar nerve in Guyon’s canal or one of the more distal branches of the sensory branch.

The variant in our patient was noted to course through the flexor carpi ulnaris tendon, a groove on the ulnar aspect of the pisiform, and connected to the ulnar nerve trunk proximal to its bifurcation into the sensory and motor branches. We offer a classification system of this anatomic variation based on the observation of the anomalous branch described in this report and a review of the literature. Because iatrogenic injury to this branch may result in considerable morbidity for the patient it is imperative that hand surgeons are familiar with the known variations of this anomaly when performing surgery in the vicinity of the pisiform.
Case Report

A 45-year-old, right-handed woman presented with intermittent paresthesias of the right ring and small fingers. Examination showed weakness of the adductor pollicis of the right thumb with preservation of abduction and adduction of the fingers. No other abnormalities were noted. Nerve conduction study results of the ulnar nerve were within normal limits at the level of the elbow and wrist using the inching technique. The digital nerves were intact. Electromyographic study results of the deep ramus of the ulnar nerve also were within normal limits but showed slowing of conduction of the motor branch to the abductor digiti minimi with evidence of reinnervation.

Because the symptoms, physical findings, and test results were consistent with an incomplete compressive neuropathy within Guyon’s canal, surgical exploration was performed. Guyon’s canal was opened completely from the distal volar wrist to a level distal to the bifurcation of the nerve. An aberrant branch from the dorsal cutaneous branch of the ulnar nerve joined the main trunk of the ulnar nerve adjacent to the pisiform proximal to the bifurcation of the ulnar nerve. The aberrant branch was noted to course in a groove on the ulnar aspect of the pisiform and through the flexor carpi ulnaris (FCU) tendon en route to joining the main trunk (Fig. 1). The aberrant branch was freed from the FCU tendon by meticulous dissection. This resulted in a 50% division of the FCU tendon. The ulnar aspect of the tendon was sutured to the radial part of the tendon. The anomalous branch was traced sufficiently proximally to determine that it originated from the dorsum of the hand (large black arrowhead). The main trunk of the ulnar nerve is shown by the small black arrowheads, the groove of the pisiform is shown by the white arrow, and the junction of the anomalous branch with the ulnar nerve is shown by the small white arrowheads.

Discussion

At the junction of the middle and distal thirds of the forearm the ulnar nerve courses ulnar to the ulnar artery. Both structures are subjacent to the FCU. The dorsal cutaneous branch of the ulnar nerve separates from the main nerve, passes ulnar to the FCU to pierce the fascia overlying the muscle, and enters the dorsal ulnar aspect of the distal forearm. The exact point where this branch pierces the fascia is variable but it usually is 3 to 5 cm proximal to the ulnar head. This branch, however, may perforate the fascia as far distally as the ulnar head. At the level of the carpus the branch normally divides into an ulnar and radial branch superficial to the fascia of the hand to supply sensation to the dorsal aspect of the hand and the small and ring fingers. The main or volar trunk of the ulnar nerve continues distally subjacent to the pisohamate ligament before its bifurcation into the motor and sensory
branches. Between the ulnar aspect of the pisiform and the ulnar aspect of the base of the fifth metacarpal there normally are no important branches of the ulnar nerve.1

In 1963 Kaplan1 described an anomalous branch of the dorsal cutaneous branch of the ulnar nerve (DCU) that connected with the sensory branch of the ulnar nerve. In a cadaver Kaplan1 noted this branch of the DCU to pass ulnar to the pisiform bone and speculated that this pattern likely was responsible for persistent pain near the pisiform. As a result of this report the anomaly bears Kaplan’s name. A similar but not identical anomaly is attributed to Camper in 1760 in which a branch of the DCU connected more distally to the ulnar digital nerve of the finger in the midhypotenar eminence.2 This aberrant branch is analogous to both the Martin5 and Gruber6 connection and the Riche7 and Cannieu8 connection in that it carries fascicles that normally would run in the main trunk of the nerve.

Since Kaplan’s1 description several variations of an anomalous branch of the DCU have been described. Wulle2 cited a series of 4 patients in whom an aberrant branch of the DCU connected with the ulnar digital nerve of the small finger at the level of the proximal interphalangeal joint or slightly more distally than previously described. Wulle2 referred to the anomalous branch found in these 4 patients as “Kaplan’s anastomosis.” We suggest that the term connection or aberrant branch is more appropriate than anastomosis because the latter term is derived from the Greek word anastomoien: “to provide a mouth.” The latter term thus is reserved more appropriately for the description of connections of blood

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Figure 2. Dorsal origin of the branch (small arrowhead). The ulnar artery is shown by the arrows and the ulnar nerve is shown by the large arrowheads.

Figure 3. The groove of the ulnar aspect of the pisiform can be appreciated readily from the removed specimen (arrow).
vessels, ducts, or bowel segments. All 4 patients in the series by Wulle\(^2\) had surgery for Dupuytren’s contracture of the small finger. None of the patients had reported symptoms of nerve compression.

Hoogbergen and Kauer\(^3\) described an anomalous branch of the DCU that in contrast to all prior examples connected with the motor branch of the ulnar nerve rather than the sensory branch or one of its branches. On its course the nerve was noted to arise 2.5 cm proximal to the styloid process of the ulna and give off 3 branches to the radiocarpal joint, the abductor digiti minimi, and the fifth carpometacarpal joint and to course ulnar to the pisiform before joining the motor branch of the ulnar nerve.

McCarthy and Nalebuff\(^4\) reported an anomalous branch of the DCU that adhered tightly to the pisiform but had no demonstrable connection to the sensory branch or one of its branches. On its course the nerve was noted to arise 2.5 cm proximal to the styloid process of the ulna and give off 3 branches to the radiocarpal joint, the abductor digiti minimi, and the fifth carpometacarpal joint and to course ulnar to the pisiform before joining the motor branch of the ulnar nerve.

In the case presented in this report the accessory branch of the DCU is noted to pass through the substance of the FCU tendon and through a groove in the ulnar aspect of the pisiform and to connect to the main trunk of the ulnar nerve proximal to its bifurcation into motor and sensory branches.

There is 1 report of posttraumatic ulnar neuropathy caused by an aberrant insertion of the FCU tendon noted at the time of surgical exploration.\(^9\) In 2 reports\(^10,11\) a loop of fascicles was noted to leave the main trunk of the ulnar nerve and to travel a short distance distally to rejoin the nerve through a split in the FCU tendon; it did not involve one of Kaplan’s\(^1\) accessory branches. In our case the anomalous branch was traced sufficiently proximally to confirm that the nerve had originated from the dorsal aspect of the wrist, excluding the 2 aforementioned anom-

Figure 4. Kaplan’s anomaly type 1, branch courses to the common trunk of the ulnar nerve proximal to its bifurcation into the sensory and motor branches; type 2, branch courses to the proximal sensory branch; type 3, branch courses to the proximal motor branch; type 4, branch courses to the ulnar digital nerve to the small finger at the midportion of the hypothenar eminence; type 5, branch courses to the ulnar digital nerve of the small finger at the level of the proximal interphalangeal joint; type 6, branch courses to the radial aspect of the volar surface of the small finger (point of destination not described).
alies. Once confirmation of the dorsal origin of this branch was achieved further dissection was not performed because no clinical benefit would have been realized with the risk for increased patient morbidity.

As a result of the dissection of the anomalous branch and the removal of the pisiform approximately 50% of the width of the FCU tendon was divided. Because the FCU is a major flexor of the wrist and no further dissection was necessary for exposure the tendon was repaired, leaving the patient with a fully reconstituted tendon.

There is no absolute proof that the anomalous branch was carrying the compressed fibers. It is plausible, however, that the anomalous branch may have contained motor fibers in addition to sensory fibers. There were no objective findings of compression of the main trunk or superficial or deep rami of the ulnar nerve from any anatomic structure including the pisiform. The patient’s symptoms resolved completely after surgery.

In all case reports of Kaplan’s anomaly to date the diagnosis was made during surgery as an incidental finding. We do not know of any clinical findings that would enable a definitive preoperative diagnosis.

Although Kaplan’s accessory branch has been considered a rare anatomic variant it was shown in the course of 2 anatomic studies to occur at a rate of 2% to 4%, which warrants bearing these anomalies in mind when performing surgery in the region of the ulnar styloid process or pisiform, when performing FCU insertion, in fasciectomy in the ulnar aspect of the small finger, in fractures of the pisiform, or in the case of posttraumatic or postsurgical paresthesias in the ulnar aspect of the hand.

A review of the literature showed the variations of Kaplan’s accessory branch. It consistently arises from the DCU, courses ulnar to the pisiform, and has a variable course distally. At the time of this report a total of 5 subtypes had been described. The variation described in this report constitutes a sixth subtype (Table 1). These variations are shown in Figure 4.

When performing surgery in the area of the pisiform the hand surgeon should be cognizant of this anomaly and its subtypes to prevent inadvertent iatrogenic injury to the branch and subsequent patient morbidity.

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References