Dorsal Approach to Transfer of the Flexor Digitorum Brevis Tendon

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Background: Transposition of the flexor digitorum longus tendon has been widely reported for the correction of flexible claw and hammer toe deformities. Only transposition of the flexor digitorum brevis tendon has been reported in the literature in a cadaveric study that used the dorsal and plantar approach. A search of the literature revealed no reports of transposition of the flexor digitorum brevis tendon for treatment of these conditions through a unique dorsal cutaneous incision. We performed a cadaveric study to determine whether the flexor digitorum brevis tendon is long enough to be transferred to the dorsum of the proximal phalanx of the toe from its lateral or medial aspect through a unique dorsal cutaneous incision.

Methods: Transposition of the flexor digitorum brevis tendon was attempted in 156 toes of cadaveric feet (52 each second, third, and fourth toes) through a unique dorsal incision.

Results: The flexor digitorum brevis tendon was long enough to be successfully transposed in 100% of the second, third, and fourth toes by the dorsal incision approach.

Conclusions: Transfer of the flexor digitorum brevis tendon to the dorsum of the proximal phalanx can be performed for the correction of claw and hammer toe deformities, especially in the second, third, and fourth toes. The meticulous longitudinal incision of the flexor tendon sheath to expose the flexor digitorum brevis tendon is essential to the success of the procedure. (J Am Podiatr Med Assoc 101(4): 297-306, 2011)

Hammer toe is a toe deformity characterized by dorsiflexion of the metatarsophalangeal joint, plantarflexion of the proximal interphalangeal joint, and dorsiflexion of the distal interphalangeal joint. Claw toe is a similar deformity characterized by dorsiflexion of the metatarsophalangeal joint and plantarflexion of the proximal and distal interphalangeal joints. These terms are often used interchangeably because both types of deformity involve the metatarsophalangeal joint.

In 1969, Sarrafian and Topouzian1 demonstrated on cadavers that the common extensor tendon of the toes, or the extensor digitorum longus tendon, has an extensor action on the distal and proximal interphalangeal joints only when the proximal phalanx is held in plantarflexion through the action of the intrinsic or short musculature of the foot. Sandeman2 reported that when the proximal phalanx is in the dorsal position at the expense of metatarsophalangeal joint dorsiflexion, the axis of the intrinsic muscles shifts, causing a loss of competence of the intrinsic musculature of the foot, which, in turn, loses its capacity to maintain the proximal phalanx in a plantar position. When this happens and the flexor digitorum longus (FDL) tendon contracts, there is greater contraction of the intrinsic musculature, which loses its ability to

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plantarflex the metatarsophalangeal joint. In a closed kinetic chain, this causes pathologic dorsiflexion of the metatarsophalangeal joint, placing the proximal phalanx in a dorsal position and resulting in a claw or hammer deformity of the involved toe or toes. The causes of dorsiflexion of the interphalangeal joint have been described by various authors, including Coughlin and Mann, Richardson, Scheck, and Engle and Morton.

Correction of this type of flexible digital deformity by means of tendinous transposition of the flexor musculature to the extensor area of the toes has been described by Lutter, Cyphers and Feiwel, Parrish, Pyper, and Taylor. All of them performed two cutaneous incisions, one dorsal and one plantar. Only Barbari and Brevig performed an FDL tendon transfer to the dorsum of the extensor digitorum longus tendon through a unique dorsal incision. During the action or contraction of the plantarflexor musculature, plantarflexion of the metatarsophalangeal joint is thus achieved, keeping the proximal phalanx in a planter position on the surface of the floor and preventing the metatarsophalangeal joint dorsiflexion that occurs in claw or hammer toe deformity. This approach uses the action of the FDL tendon to transform the deforming forces into corrective forces.

Thus far, it has always been recommended that correction of claw and hammer toe deformities be performed by transferring the FDL tendon to the dorsum of the proximal phalanx. Transposition of the flexor digitorum brevis (FDB) tendon via the dorsal approach through a unique dorsal cutaneous incision has not been previously described. To determine the feasibility of transferring the lateral and medial tendinous fascicles of the FDB as an approach to correction of claw and hammer toe deformities, it is necessary to know whether these fascicles are long enough to allow for transposition to the dorsum of the extensor digitorum longus tendon in the dorsal area of the proximal phalanx and directly to the dorsum of the proximal phalanx of the second, third, fourth, and fifth toes.

The advantage of an FDB tendon transfer is that the FDL tendon does not have to be detached from the planter base of the distal phalanx and, therefore, does not lose its ability to plantarflex the distal interphalangeal joint, thus helping to maintain the stability of the foot during gait. We hypothesized that the FDB tendon has enough anatomical length to be transferred to the dorsal aspect of the proximal phalanx via the dorsal approach through a unique longitudinal dorsal cutaneous incision.

**Materials and Methods**

Fifty-two anatomical foot specimens (26 right, 26 left) from 26 cadaveric bodies were used. Fourteen foot specimens were fresh, and the other 38 had been embalmed. Transfer of the FDB tendon by the dorsal approach was attempted in 156 toes (52 each second, third, and fourth toes). The FDB tendinous fascicle was transferred to the dorsum of the proximal phalanx of the second, third, and fourth toes to facilitate the tendon transposition to the dorsal area.

**Technique**

The technique used was a modification of that described by Becerro de Bengoa Vallejo et al. The technique used to transfer the distal hemi-tendons of the FDB to the dorsal area of the proximal phalanx of the toe using a dorsal approach is described herein. To perform the tendinous transfer of the FDB, as usual, a longitudinal incision is made on the dorsal aspect of the toe, preserving the medial and lateral vessels and nerves of the toe.

A longitudinal incision is made on the dorsum of the proximal phalanx of the toe from its dorsal base to the proximal interphalangeal joint to expose the extensor digitorum longus tendon. Once this tendon is exposed, a tenotomy is performed and the tendon is released along with the transverse aponeurosis that shapes the digital extensor apparatus. Other associated surgical procedures may be performed if semirigid or rigid deformities are present. In this study, proximal phalanx arthroplasty and hood ligament and metatarsophalangeal joint release were performed by means of a dorsal, medial, and lateral capsulotomy, and sectioning of the collateral and suspensory ligaments was performed to reduce the fixed extension deformity of the metatarsophalangeal joint in the specimens with fixed claw or hammer toe deformities.

After arthroplasty of the proximal phalanx, the dorsal aspect of the digital segment of the distal tendon sheath of the FDL and FDB tendons is exposed (Fig. 1). Next, the vincula from the plantar aspect of the proximal phalanx to the dorsal aspect of the tendon sheath of the FDL and FDB tendons are released to expose more flexor tendon sheath (Fig. 2).

The tendon sheath is then incised to split it longitudinally proximal and distal to the base of the middle phalanx (Fig. 3A), and the medial and lateral hemitendons of the FDB are exposed dorsal to the FDL (Fig. 3B). A curved hemostat is inserted by
means of a blunt technique into the dorsal and medial area toward the FDB, and the medial fascicle of the FDB tendon is located and isolated (Fig. 4). Once the medial hemi-tendon of the FDB is isolated with a curved hemostat, it is cut through its insertion point as distally as possible, closer to the base of the medial aspect of the middle phalanx, to maximize the length of the free proximal tendinous stump to have hemi-tendons of the FDB long enough to transfer to the dorsal aspect of the proximal phalanx, which is then clamped at its free proximal end (Fig. 5).

The operation is repeated on the lateral fascicle of the FDB tendon, which is located and isolated, cut distally, and clamped at its free tendinous end for later transfer (Fig. 6). Both free proximal FDB distal tendons are then exposed between the plantar aspect of the proximal phalanx and the dorsal

Figure 1. Dorsal aspect of the third toe after arthroplasty of the proximal phalanx and release of the metatarsophalangeal joint. The base of the middle phalanx is exposed. The proximal phalanx with the head resected is shown, and plantarly is the digital segment of the distal tendon sheath of the flexor digitorum longus and brevis tendons.

Figure 2. A, The plantar vincula are sectioned to release the flexor tendon sheath. B, The tendinous sheath of the plantarflexor musculature is exposed between the curved hemostat.

Figure 3. A, The tendinous sheath is cut longitudinally proximal and distal to the base of the middle phalanx. B, The tendinous sheath is opened, and the flexor digitorum brevis hemi-tendons are exposed between the curved hemostat.
aspect of the FDL tendon (Fig. 7A). Once the medial and lateral fascicles of the FDB tendon have been clamped, they are transferred to the dorsal area of the medial and lateral aspects of the proximal phalanx, respectively (Fig. 7B).

During this procedure, the length of the tendinous fascicles of the FDB tendon is evaluated to ascertain whether it is sufficient to allow for their transposition over the dorsal area of the proximal phalanx. If there is not enough length, a major incision is made in the flexor tendinous sheath proximally. The medial and lateral FDB tendinous stumps are sutured in the dorsum of the proximal phalanx (Fig. 8).

The toe is then pinned using a double-pointed 0.54-mm Kirschner wire in a retrograde manner driven antegrade from the proximal interphalangeal joint, out the tip of the toe, and then retrograde into the proximal phalanx and the metatarsal head (Fig. 9). The extensor digitorum longus tendon stumps are sutured over the FDB tendon transfer, and cutaneous suture is performed (Fig. 10).

Results

The FDB tendon transfers by the unique longitudinal dorsal approach attempted on 156 cadaveric toes (52 second toes, 52 third toes, and 52 fourth toes) were successful in 100% of the cases.

Discussion

Transposition of the flexor to the extensor musculature through a dorsal cut, with FDL tendon transfer to the dorsolateral area of the proximal phalanx, was performed by Girdlestone in 1947 and developed by Taylor. In his study, Taylor included 68 patients with claw or hammer toe deformity treated with this technique and associated procedures, such as dorsal capsulotomy of the metatarsophalangeal joint; occasionally, he also performed plantar capsulotomy of the interphalangeal joints and stabilization of the proximal phalanx using an external splint.

Sgarlato, in 1970, reported 53 cases of FDL tendon transfer through three skin incisions. Pyper performed the technique described by Taylor on 45 feet in 23 patients. To correct the digital deformity, he combined it with lengthening of the extensor digitorum longus tendon and dorsal capsulotomy of the metatarsophalangeal joint. Subsequently, Parrish modified this technique by detaching the FDL tendon and dividing the proximal tendinous stump longitudinally, repositioning its medial and lateral aspects in the extensor area. He performed FDL and FDB tendon transfer on the first...
Marcinko et al. described the FDL tendon transfer using two incisions in the toe, one plantar and one dorsal. Barbari and Brevig performed 39 FDL transpositions to the extensor area in 31 patients, stating that “the FDB tendon had a smaller calibre and its length was insufficient for the transposition.”

Figure 7. A, Dorsal view of the stumps of the flexor digitorum brevis tendon dorsal to the flexor digitorum longus tendon. B, The medial and lateral fascicles of the flexor digitorum brevis tendon are transferred to the medial and lateral aspects of the proximal phalanx, respectively.

Figure 8. A, The distal tendinous stumps of the flexor digitorum brevis tendon are approximated to ensure sufficient length before suturing. B, The stumps are sutured with 3–0 resorbable suture. C, The flexor digitorum brevis stumps are approximated with no tension. D, Suture of both tendons at the dorsal aspect of the proximal phalanx.
patients; 11 of the 39 procedures were performed in accordance with the technique of Taylor,13 with the remaining 28 following the modified technique described by Parrish.11 The approach used a dorsolateral incision over the metatarsophalangeal joint extending approximately 3 cm distally from the neck of the metatarsal bone. Dissection was then performed on each side of the proximal phalanx. The sheath of the flexor tendons was located, and the long flexor was then isolated, drawn out using a blunt hook, and divided near its distal insertion. It was then sutured end to end to the extensor tendon.

Coughlin18, 19 performed an FDL tendon transfer by making a transverse incision at the metatarsophalangeal joint first and then a second incision at the dorsal aspect of the toe. Kuwada20 performed 81 procedures to transfer the FDL tendon via a dorsolateral incision along the digit beginning proximally at the metatarsophalangeal joint and extending distally at least to the proximal phalangeal joint. Thompson and Deland21 performed transfer of the FDL tendon in 13 toes following the indications of Coughlin18 via the plantar and dorsal approach. In 11 feet, Gazdag and Cracchiolo,22 performed an isolating tendon transfer of the FDL through the 2-cm longitudinal midline incision on the plantar side of the base of the proximal phalanx and performed another dorsal incision at the base of the proximal phalanx. Recently, Boyer and DeOrio23 treated 70 toes with fixed or flexible hammer toes with a flexor-to-extensor tendon transfer making a longitudinal incision on the plantar aspect of the proximal phalanx and at the dorsal aspect of the toe.

The literature up to now reveals no attempts to discover why Parrish11 found it so difficult to perform the FDB tendon transfer and gave up on this technique. His opinion seems to have been accepted by the scientific community without confirmation or challenge, and many of the authors cited, except Barbari and Brevig,9 performed the double incision, plantar and dorsal, as performed by Girdlestone in 1947.13

In a cadaveric study,14 we found, that it is possible to correct flexible claw or hammer toe deformity by means of transposition of the FDB tendon to the extensor or dorsal area of the base of the proximal phalanx, a modification of the procedure used by Parrish11 via the plantar approach and another dorsal incision of the toe. We sought to transfer the FDB tendon to the dorsal aspect of the proximal phalanx via the dorsal approach through a unique incision, as described by Barbari and Brevig.9

A search of the indexed literature found no previous reports of this procedure. A literature search was performed to identify any anatomical variations in the insertion of the FDB tendon. Three such variations were found: 1) absence of the tendon; 2) absence of the lateral and medial tendinous fascicles but presence of a single tendon running parallel to the FDL tendon; and 3) fusion of the FDB tendon to the FDL tendon.24-27 LeDouble24 and Nathan and Gloobe25 found the FDB tendon to be absent in the fifth toe in 21.5% of cases. Testut27 found the FDB tendon to be absent in the fourth and fifth toes in 3% of the dissections performed. This same author, in an 1884 study,26 along with the one he performed later in 1892,27 found that the FDB medial and lateral fascicles are not divided and run parallel to the FDL tendon before inserting into a side of the intermediate phalanx of the fifth or fourth toe in 5% of patients. Although he did not specify individual percentages for each of these

Figure 9. The toe is pinned in a retrograde manner driven antegrade from the proximal interphalangeal joint, out the tip of the toe, and then retrograde into the proximal phalanx and the metatarsal head.

Figure 10. The extensor digitorum longus tendon stumps are sutured over the flexor digitorum brevis tendon transfer.
toes, he established that the FDB tendon of the fifth toe is fused to the FDL tendon in 2% of cases. Thus, the anatomical variations found occur more frequently in the FDB tendon insertion of the fifth toe.

Anomalies or variations in the insertion of the FDB tendon in the third and second toes have not been found; our findings are consistent with those results. These findings should be taken into account in assessment of the length of the FDB tendinous fascicles before their transposition to the dorsum of the extensor apparatus limits the motion of the FDB tendon in the third and second toes, and the FDB tendon occurred in the fifth toe: the FDB tendon was absent in 3 of 45 toes (7%), which was a known anatomical variation. This is the reason we performed the dorsal FDB tendon transfer via the dorsal approach in the second, third, and fourth toes.

After arthroplasty, the tendon sheath is exposed and opened longitudinally, and the hemi-tendons of the FDB are identified just over the FDL tendon, which runs plantar to the FDB tendon. Once the hemi-tendons of the FDB are identified, they are carefully detached by cutting them from the distal insertion at the base of the middle phalanx to have enough length to be transposed to the dorsal aspect of the proximal phalanx. When the metatarsophalangeal joint was dorsiflexed, it was necessary to perform a dorsal capsulotomy and metatarsophalangeal joint release to relocate the proximal phalanx in its anatomical position, without the need for plantar capsulotomies in the interphalangeal joints, as described by Barbari and Brevig.

If there is any difficulty in transferring the distal stumps of the FDB tendon to the dorsal aspect of the proximal phalanx of any toe, the clinician needs to cut the proximal flexor tendon sheath longitudinally to expose more FDB hemi-tendons. We transferred the FDB tendon via the dorsal approach in 100% of second, third, and fourth toes only by making a unique longitudinal dorsal incision. We found that transfer of the FDB tendon via the dorsal approach to the dorsum of the extensor digitorum longus tendon is extremely difficult because the clinician cannot make the incision in the tendon sheath proximal enough to have adequate length of the FDB tendons because the anatomical structures are too deep. When performing the FDB tendon transfer via the plantar approach, as by Parrish, we found that the free ends of the FDB lateral and medial hemi-tendons were too short, making it impossible to transfer them to the dorsal area of the extensor digitorum longus tendon, exactly as described by Parrish in 1973 because the “tunnel” in the extensor apparatus limits the motion of the FDB tendinous fascicles, which are trapped in the extensor’s transverse aponeurosis. Cutting this transverse aponeurosis provides sufficient length to the tendinous fascicles for them to be transferred to the dorsum of the extensor digitorum brevis tendon.

Also, we found that the difficulty in transposing this tendon via the plantar approach stems not from the length of the FDB medial and lateral tendinous fascicles but rather from the transverse aponeurotic fibers originating from the extensor digitorum longus tendon that surround the metatarsophalangeal joint capsule and join in the plantar area with the glenoid plate, the deep metatarsoplantar ligament, and the sheath of the flexor tendons to insert distally into the plantar base of the proximal phalanx. These aponeurotic fibers and the sheath of the flexor tendons must be cut to allow the FDB lateral and medial tendinous fascicles to be repositioned on the dorsal area of the proximal phalanx of the toe. By detaching the hemi-tendons, the FDB can be sutured on the dorsal area of the proximal phalanx.

Before stitching both tendinous stumps, the position in which the pertinent joints must be placed should be assessed, bearing in mind that because of the FDB tendon point of origin, the position of the ankle during suturing will have no effect on the traction of this muscle on the proximal phalanx. In contrast, when performing FDL tendon transfer, the ankle position during stitching is very important: if the ankle is in plantarflexion, the tendon is long enough to allow it to be sutured on the dorsal area of the proximal phalanx without difficulty. When the patient is weightbearing or walking, however, the ankle is in dorsiflexion, shortening the FDL tendon and forcing the metatarsophalangeal joint into plantarflexion.

Correction of a flexible claw or hammer toe deformity by means of transposition of the FDL tendon involves its detachment from the plantar aspect of the distal base of the distal phalanx of the toe and relocation on the extensor apparatus. This detachment is accompanied by loss of plantarflexion of the distal interphalangeal joint, which is important in the propulsive phase of gait and for stabilization of the distal phalanx against the ground
to obtain proper balance. Thus, cutting the FDL tendon results in this joint’s loss of competence during the take-off stage of gait, with subsequent dorsiflexion of the interphalangeal joint caused by the weight of the body. Over time, this will cause hyperextension and distal interphalangeal joint instability, increasing in proportion to the number of tendinous transfers that have been performed on that foot to correct this flexible digital deformity. The clinical consequences will be greater in younger people, who are more active and have a greater incidence of this type of flexible deformity than older people.

Transfer of the FDB tendon allows the FDL tendon to maintain its capacity to enable plantarflexion of the distal interphalangeal joint, contributing to stability during the take-off stage of gait and to proper balance. Transfer of the FDB tendon to the extensor apparatus in the area of the proximal phalanx also enables plantarflexion of the metatarsophalangeal joint, which was previously achieved with the FDL tendon transfer. The FDL tendon should be sutured in its anatomical position to avoid flexion or extension of any involved joint. We believe that transfer of the FDB tendinous fascicles can be performed on all of the toes via a unique dorsal incision when the flexor tendon sheath is incised longitudinally enough to expose the FDB tendons. The possible exception is the fifth toe, in which the FDB tendon was absent in three cases (7%), and this is why we do not try to perform the dorsal approach. We think that the indications for FDB tendon transfer are the same as those for the FDL tendon transfer that other authors are using for the correction of sagittal plane lesser metatarsophalangeal joint instability and loss of digital purchase.

Any hammer toe or claw toe deformity that has a semirigid or rigid metatarsophalangeal joint requires sequential reduction and maintenance of that reduction. This maintenance of reduction can be accomplished via proximal interphalangeal joint fusion or FDL tendon transfer, which moves the lever arm of the flexor to the metatarsophalangeal joint, or via FDB tendon transfer, which keeps the proximal phalanx plantarflexed at the metatarsophalangeal joint.

Results of a recent finite-element simulation of FDL or FDB tendon transfer for the treatment of claw toe deformity show that FDB transfer maintains the metatarsophalangeal joint reduction and allows flexion of the toes at the distal interphalangeal joint via the long flexors through the midstance and propulsion phases of gait. The procedure is easy to perform, and access to the FDB tendon through the arthroplasty site makes it ideal for this transfer technique.

Chen et al. examined 20 foot specimens focusing on the second, third, and fourth toes. The plantar metatarsal artery originated from the deep plantar arch in 97.5% of cases and from the superficial plantar arch in 2.5% of cases. Distally, within the web space, each plantar metatarsal artery bifurcated to form a medial plantar and a lateral plantar digital artery. At the point of bifurcation, a distal communicating artery formed an anastomosis between the plantar arteries and the dorsal metatarsal artery in all of the web spaces (Fig. 11).

The medial and lateral plantar digital arteries were present in 100% of the lesser toes and extended distally to the toe pulp. The first dorsal metatarsal artery was present in 100% of the specimens, the second in 90%, the third in 85%, and the fourth in 75%, similar to the findings described by Murakami. The second, third, and fourth dorsal metatarsal arteries originated from plantar perforating branches in the proximal aspect of each web space. Each dorsal metatarsal artery bifurcated to form a medial dorsal and a lateral dorsal digital artery (Fig. 11) distal to the distal communicating artery. At the level of the proximal interphalangeal joint, the medial and lateral plantar digital arteries and the medial and lateral dorsal digital arteries terminated at the level of the metatarsal heads.

Figure 11. A dorsomedial view of the consistent distal communicating artery (DCA) between the dorsal metatarsal (DMTA) and plantar metatarsal (PMTA) arteries. The medial (MDDA) and lateral (LDDA) dorsal digital arteries originate from the DMTA. The dorsal digital arteries usually terminate at the proximal transverse arch (PTA) of the proximal interphalangeal joint. The medial (MPDA) and lateral proper digital arteries provide the dominant flow to the system of arches. Similar to the plantar longitudinal arches, the medial (MDLA) and lateral dorsal longitudinal arteries connect the transverse arches. Note the location of the PTA and the distal transverse arch (DTA) in relation to the metaphysis of each respective phalanx. Reprinted with permission from Elsevier and Chen et al.38
digital arteries are connected by a circumferential system of transverse and longitudinal arches at the proximal interphalangeal joint.

The proximal transverse arch of the proximal interphalangeal joint surrounded the distal metaphyseal segment of the proximal phalanx (Fig. 11) and delivered antegrade nutrient arteries to the distal articular surface of the proximal phalanx, the flexor and extensor tendons, the joint capsule, the volar plate, and collateral ligaments. This proximal transverse arch was present in 100% of specimens. Ninety-two percent of the dorsal arteries of the second, third, and fourth toes terminated proximal to the proximal transverse arch of the proximal interphalangeal joint. His dissection demonstrated that the predominant arterial supply of the lesser toes is the plantar digital arteries.

Findings from the study by Chen et al. suggest that the plantar circulation is predominant in the second, third, and fourth toes, unlike the dorsal digital arteries from the first dorsal metatarsal artery for hallux. The distal transverse arch (Fig. 11) of the proximal interphalangeal joint surrounded the proximal diaphyseal segment of the middle phalanx and delivered retrograde nutrient arterial branches to the periarticular structures. Four longitudinal arches, two dorsal and two plantar, formed a communication between the two transverse arches. The two plantar longitudinal arches were present in 45% of the specimens, and the two dorsal longitudinal arches were present in 65% of specimens. In all of the specimens, a combination of two more longitudinal arches was present.

Chen et al. stated that the plantar digital arteries of the lesser toes provide the predominant arterial supply of the proximal interphalangeal joint through a system of transverse and longitudinal arches. In a claw toe or hammer toe deformity, for transfer of the FDB tendon or FDL tendon by the plantar approach, a significant amount of surgery may be performed, and a decision must be made regarding whether to continue or discontinue surgery when there is a risk of vascular compromise to the digit due to two necessary incisions, one plantar and one dorsal.

Coughlin recommended that it is far better to offer a 2-stage repair of the toe deformity than to incur a vascular insult with excessive surgery on a digit. The plantar vascularization of the lesser toes is more predominant than the dorsal aspect arterial supply, so we thought that the plantar approach should not be used owing to the compromise of the principal blood supply, and any surgical injury via the plantar approach could potentially compromise the plantar blood supply. We found that the dorsal approach has less risk of compromising the blood supply due to the dorsal digital artery end proximal to the proximal transverse arch, and distal to this proximal transverse arch the main blood supply comes from plantar digital arteries.

Conclusions

The results of this study confirm that the FDB tendon can be transferred to the dorsum of the proximal phalanx after cutting the extensor digitorum longus tendon, performing arthroplasty, and releasing the metatarsophalangeal joint when it is dorsiflexed, cutting longitudinally the flexor tendinous sheath, which provides sufficient length to the medial and lateral FDB tendinous fascicles. Moreover, this procedure can be performed in any of the toes, except in cases where the FDB tendon is absent as an anatomical variation, which has been observed in the fifth toe. This technique can provide increased stability for correction of claw and hammer toe deformities. Also, the plantar vascularization of the lesser toes is more predominant than the dorsal aspect arterial supply, so we thought that the surgical approach should not be plantar owing to the compromise of the principal blood supply, and any surgical injury via the plantar approach could potentially compromise the plantar blood supply.

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