

## REVISITING 5TH TOE DEFORMITY CORRECTION

*Melissa F. Robitaille, DPM*

**INTRODUCTION**

Although deformity of the 5th toe is quite common, obtaining a perfect correction can be challenging. Historical corrections have been straight forward and not necessarily technically demanding, however, complications such as “floppy toe,” under-correction, recurrence of a painful lesion, or recurrence of deformity are surprisingly common. This is due to a combination of not properly evaluating the extent or nature of the deforming forces, as well as a tendency to trivialize the problem (i.e., “it’s just a little toe”). Unfortunately, this tendency to minimize the problem can ultimately bring frustration for the surgeon and the patient if the outcome is less than desired.

Deformity of the 5th toe is extremely common, especially in women. Although deformities can be congenital, the greatest numbers of deformities are the result of developmental problems. These are commonly related to biomechanics and shoe type. Shoe type would also explain why 5th toe problems are frequently seen in women. However, it is also important to have an understanding of how the anatomy plays a role in the etiology of deformity, so that the appropriate procedure providing the best outcomes are performed. Excellent, predictable results can be obtained by modifying the incision, thoroughly releasing all contractive forces, and by implementing a more judicious use of bone resection. This article presents reasons for the most common complications, as well as a technique that will avoid those complications and provide satisfactory outcomes.

**DISCUSSION**

When evaluating a 5th toe deformity, there are some anatomic variants that are important to consider. Synostosis of the DIPJ, for example, can result in a painful corn with inflammation dorsal laterally because of decreased motion in the joint and toe.

Anatomic forces that lead to adduction of the toe are also common and are usually the genesis of the problems that develop. A muscular imbalance can place the toe in an adduction position where the apex of the deformity is likely to develop irritation caused by modern shoe design. Adduction can also be the result of the absence of an

extensor brevis tendon to the toe which leads to an increase in flexor power. The lumbricles and the plantar interossei that insert medially on the base of the proximal phalanx can over-power abduction forces, again creating adduction deformity of the toe. In addition, the orientation and pull of the long flexor tendon can result in deformity. All of these structures are responsible for adducting the 5th digit. Likewise, a weakness in the abduction forces will result in deformity. The anatomic forces that abduct the toe are the flexor digiti quinti and the abductor digiti minimi which insert laterally on the base of the proximal phalanx.

A critical evaluation of the toe needs to be done to determine the planes of deformity that need to be addressed. As we know, there are 3 possible planes of deformity that need to be recognized when evaluating the 5th digit: frontal, transverse, and sagittal resulting in excessive varus, adduction, and flexion respectively. All 3 planes will exhibit deformity in varying degrees. In the author’s practice, frontal plane deformities are the most commonly encountered especially in those patients requesting surgical correction. It is possible that this could be used as a predictor of those likely to request or require surgery.

When evaluating the digit, it is important to always load the foot or visualize the foot in weight bearing. This will give one a more accurate idea in which plane the deformity is occurring because muscle and tendon pull on the digit can be appreciated. An evaluation of the toe in a seated or non-weight bearing position can not take into account the dynamic forces that are occurring when the patient is ambulating. The position of the nail is also a very good indicator of planar deformity. Excessive external rotation would indicate a greater degree of frontal plane deformity. Surgical planning and the ideal procedure would take this into account. One cannot overstate the need to load the foot preoperatively to prevent under-evaluation and consequent under correction of the deformity.

When performing the physical exam, the following questions need to be evaluated and documented. Is there a lesion present on the toe? Where is the lesion located on the toe? Is there a bony prominence associated with a lesion? What is the nature of the lesion (i.e., is it diffuse or is there a discrete porokeratosis)? Is there thickening of

the skin? What is the amount and extent of inflammation? and Is the deformity reducible?

Chronic irritation will result in hyperkeratosis of the skin. This can lead to the formation of scar tissue underlying the lesion that can lead to digital nerve entrapment. If this is the case, the patient may continue to experience a deep, chronic pain even after a bony prominence has been removed, or the deformity seemingly corrected. The keratosis is very commonly seen at the level of the PIPJ because this region receives maximum pressure from the curvature of the outer border of the shoe. This is also the apex of the deformity created by muscle imbalance.

In addition, there are other important questions that need to be answered. It is important to determine the amount of motion available in the toe joints. Is the deformity reducible, semi-reducible, or rigid? Is there pain on palpation of the toe that is associated with the deformity? Is there any pain when the digit is reduced or pain over the joint? Is the pain correlated to arthritic changes, inflammation, or a combination of both? Are there any contractures at the level of the metatarsophalangeal joint (MTPJ)? Sometimes the contracture at the MTPJ is not immediately noticeable; therefore, it is important, while evaluating the deformity, to palpate the base of the proximal phalanx to feel if the phalanx is in a dorsiflexed attitude. This would suggest that a contracture of the MTPJ is present.

Once you have determined the answer to these questions, you can formulate which procedure(s) will be necessary. Traditional procedures done for 5th toe correction include arthroplasty at the PIPJ, de-rotational skin plasty, MTPJ release, hemi-phalangectomy, and excision of the corn/hyperkeratotic lesion. The important thing to realize is that while individually these procedures may be adequate for some deformities, they will not address all deformities. At times it will be necessary to combine procedures to achieve the desired appropriate correction. For that reason, it is important to understand the limitations and possible complications of each procedure.

The PIPJ arthroplasty is intended to relax the flexor contracture at the PIPJ. As part of the preoperative planning, you need to determine whether you are dealing with a weak flexor tendon (e.g., a cock-up toe.) If there is weakness preoperatively in the flexor tendon and you perform an arthroplasty in isolation, it will augment the weakness and long-term, you will create a very unstable 5th toe resulting in lack of toe purchase and recurrence of deformity. This condition may require a flexor tendon transfer to re-establish plantar flexion of the digit. Unfortunately, a common complication of the

arthroplasty is over-aggressive resection of the head of the proximal phalanx. This inadvertently increases the length of the long flexor tendon and can lead to a non-purchasing or floppy toe. This trap is easy to fall in to, but can be avoided. Following excision of the head of the proximal phalanx, the surgeon may notice that the toe remains contracted, or that the deformity does not completely reduce. If the surgeon decides to resect more bone from the proximal phalanx in order to correct the remainder of the deformity, the risk of destabilizing the joint by removing too much bone is very likely to occur. Instead, a re-evaluation of the MTPJ should be considered because this is where the deformity most likely remains. A MTPJ release should be performed, not the resection of additional bone from the proximal phalanx.

A de-rotational skin plasty is intended to correct a sagittal and frontal plane deformity. A skin wedge from proximal, plantar, and lateral to distal, dorsal, and medial will result in de-rotation, or eversion and dorsiflexion, of the toe. If a wedge is placed more dorsally, with less angulation, one can achieve greater abduction of the toe. This modification is helpful if the adduction component of the deformity is more pronounced.

As mentioned previously, a metatarsophalangeal joint release can be used to correct deformities in the sagittal plane. This procedure tends to be under-utilized when correcting 5th toe deformities. This is somewhat ironic given the fact that contracture deformities of the other lesser digits (usually 2nd, 3rd, or 4th) are evaluated for MTPJ contractures, with a release frequently performed. Correction of 5th toe contractures should include a similar, stepwise approach. The author tends to perform a MTPJ release frequently because I find that there is almost always some amount of contracture at this joint. In an effort to limit the amount of dissection performed, this important aspect of correction is frequently omitted. Just as one would not attempt to correct a contracture of the 2nd toe without evaluating the extent of MTPJ contracture, the same amount of consideration needs to be given when correcting the 5th toe.

A hemi-phalangectomy is another useful procedure that is best used in combination with other procedures. A hemi-phalangectomy is typically done when there is a keratosis that develops over the PIPJ that extends to the DIPJ. This is typically caused by an enlarged middle phalanx. Failure to address an enlarged middle phalanx or to resect an appropriate amount of bone laterally and/or medially, commonly results in recurrence of a painful lesion. It is helpful to use a burr to aggressively remove adequate bone. However, one needs to be careful not to be over-aggressive; otherwise one might inadvertently

perform a middle phalangectomy. If a middle phalangectomy were done in combination with an arthroplasty of the PIPJ, it would result in an extremely unstable, floppy toe. The author prefers to add a hemiphalangectomy procedure for women who have a preference for fashion shoes, or anyone who has a tendency to wear more narrow type shoes.

Because the patient typically equates the pain in the toe to the formation of a hyperkeratotic lesion, these lesions are frequently excised. The majority of lesions tend to be dorsal lateral; however, sometimes you will encounter a keratosis on the distal medial aspect of the 5th toe. The author prefers to remove the medial lesion with the de-rotational skin plasty. If the lesions are large, it is important not to be too aggressive and attempt to remove all the lesions with a skin wedge, as this will create difficulty when closing the wound. If the lesion can not be excised in its entirety, one should trim down the remaining keratosis. If you examine the skin under the lesion, you will commonly find that the skin is scarred and thick. Thinning it down will help closure and subsequent healing.

Incision placement is also an important consideration. Either a dorsal, linear or S-shaped incision can result in dorsal scarring with possible extensor contracture. This can result in the recurrence of dorsal irritation, even if the deformity does not recur. With patients who have concomitant, asymptomatic lesser digit hammertoes, it is important to educate that only correcting the 5th toe may potentially unmask and magnify the deformities of those other toes. Also, they may notice that the other digits become symptomatic.

## AUTHOR'S TECHNIQUE

The author would like to present her technique for a complex, multi-plane deformity of the 5th toe. To allow for adequate exposure and to correct in 3 planes, my incision is a modified V-Y plasty. I use a double semi-elliptical incision across the dorsal aspect of the PIPJ. I prefer a longer, more diagonal skin wedge. Next, I make a linear incision extending from the tip of the previous incision distally along the lateral aspect of the 5th digit. Because of the lateral incision placement, the scar will have a tendency to abduct the digit. Caution must be used not to make the lateral incision over or against the nerve in this area. For this reason, I am careful to place the incision dorsal to the nerve, and therefore never encounter it. Also, care must be taken when manipulating the tip of the skin flap. The use of a single hook can be helpful to prevent excess manipulation and subsequent failure of the flap.

To perform the arthroplasty, I prefer to use a sharp, double-hinged bone cutter and burr to smooth any rough edges. Because of the exposure obtained with this incision, it is easy to perform a hemiphalangectomy. If it has been determined that a MTPJ release is required, I will extend the lateral incision proximally across the MTPJ (Figure 1).

For closure, the medial and lateral collateral ligaments are reapproximated along with the extensor tendon. I repair the collaterals because I feel this provides better support and stability for the toe. I do not place any subcutaneous tissue sutures. Instead, I will approximate the skin using 4-0 nylon. I first re-approximate the proximal lateral part of the incision. Next, I will repair the tip of the skin flap. I like to use an Algower type stitch through the tip of the skin flap so that I am less likely to cause trauma, which could lead to wound dehiscence. Third, I will close the dorsal skin wedge, and last, I will repair the distal lateral part of the incision. It is important to have your assistant hold the toe in rectus position while closure is performed. This will ensure alignment of digit and better outcome (Figure 2).

Postoperatively, I use a betadine gauze splint for one week, and then apply long 1/8 inch steri-strips to hold the toe in the desired, rectus position for an additional 3 weeks. After that, I will commonly continue to splint the toe with silk tape for an additional month. This ensures that the toe will remain stable in a rectus position throughout the healing phase and lessens the chance for recurrence. One has to make sure that the digit is plantar flexed and abducted at the level of the MTPJ with a splint for 3-4 weeks. If you are not careful, you will abduct the toe at the level of the PIPJ. This is where the toe is weakest after surgery. You want the toe to heal in plantar flexion and abduction to prevent loss of toe purchase.

Although patients will want to resume their activities as quickly as possible, it is important to stress a need to limit activities initially following surgery, in order to allow the soft tissue adequate time to heal. There is a tendency on the part of both patient and surgeon to minimize the repair of the 5th toe. However, to provide for the best long term correction with the least chance for recurrence and loss of toe purchase, it is important not to rush the patient back into regular shoe gear or their regular activity levels (Figure 3). To prevent postoperative edema, I have found that the use of a Coban wrap significantly controls expected swelling. The application is not technically demanding, and the patient can use this as long as they need it.

One technique that is mentioned in the literature but which I have not used to prevent a non-purchasing



Figure 1. Technique (incision placement or modified Y-V skin plasty) for correction of multi-plane 5th digit deformity. A) Double semi-elliptical incision is made across the dorsal aspect of the PIPJ.

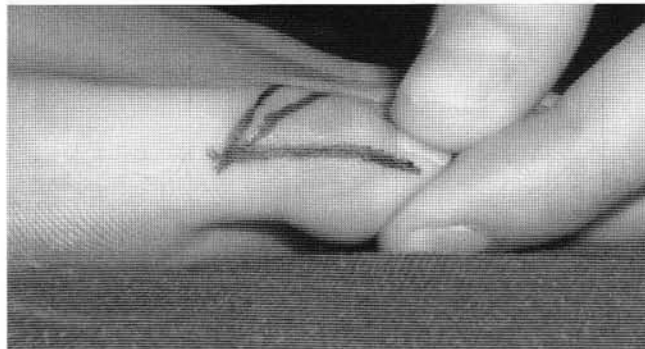


Figure 1B. Linear incision extending from the tip of the previous incision distally along the lateral aspect of the 5th digit. Notice the dorsal placement of the lateral incision to avoid the digital nerve. Because of the exposure obtained with these 2 incisions, an arthroplasty and a hemi-phalangectomy can be performed.



Figure 1C. If MTPJ release is required, extend the lateral incision proximally across the MTPJ as shown.

5th digit or to correct a cock-up toe deformity, is to create a plantar skin wedge from medial to lateral under the base of the fifth toe just distal to the weight bearing aspect of the 5th metatarsal head/MTPJ and just proximal to the flexor crease. This will result in a significant increase in plantar purchase, providing that any dorsal contractures have been released. It is important to note that the plantar skin wedge should not include subcutaneous tissue, so there should not be any compromise of the plantar blood supply to the toe, even when done in conjunction with dorsal incisions. One may consider using a k-wire to hold the toe down for the first 3 to 6 weeks following surgery to help allow the plantar skin wedge to heal without tension. When closing a plantar skin wedge, it is very helpful to have an assistant hold tension on the skin with a skin-hook in each end of the ellipse. Otherwise, closure will be unnecessarily challenging and difficult.

## CONCLUSION

A complete evaluation of 5th toe deformity, along with a thoughtful stepwise surgical approach as discussed here, is essential to achieve predictable satisfactory results.

In general, here are some tips to avoid the most common problems or complications following 5th toe

correction. Limit resection of the PIPJ to prevent either a loose or floppy toe. Prevent excessive or prolonged edema following surgery by having patients use a coban splint/wrap. You can help prevent instability in the toe at the PIPJ by repairing the medial and lateral collateral ligaments. Prevent loss of toe purchase by aggressive, long-term splinting, restricting rapid return to activities and shoe gear, and avoiding excessive resection of the proximal phalanx. To prevent the recurrence of a painful skin lesion, add a hemi-phalangectomy to the arthroplasty procedure. If an arthroplasty is performed without a hemi-phalangectomy, you will get retraction of the middle and distal phalanges, and the possibility of recurrence of a painful skin lesion due to pressure and irritation is high. To avoid the recurrence of toe contracture, make sure that a complete release is performed. This may need to include release at the MTPJ to correct all aspects of the contracture. Finally, it is important to note that scar tissue can work for or against us. By placing the incision more laterally on the toe, this will act to abduct the toe, rather than a dorsal incision which may lead to dorsal contracture.

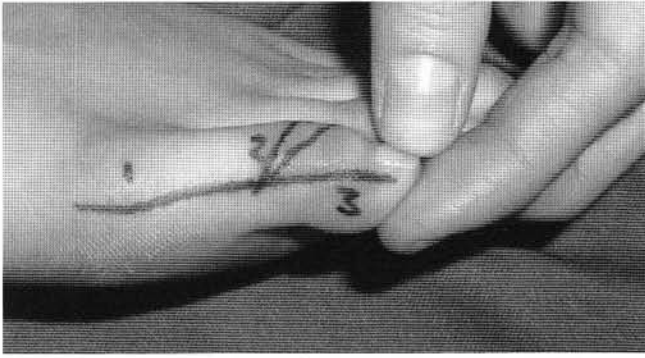


Figure 2. Reapproximate the proximal, lateral part of the incision. Next, repair the tip of the skin flap and close the dorsal skin wedge. The author uses an Algower type stitch through the tip of the skin flap. Third, repair the distal lateral part of the incision. 4-0 nylon is used for skin closure.

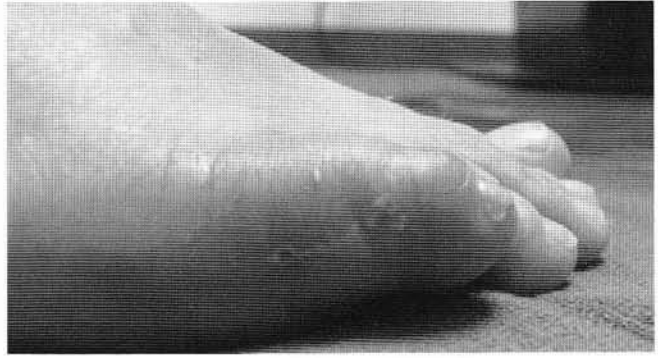


Figure 3A. Right foot at 4 weeks postoperative. Notice mild loss of toe purchase. The patient did not complain about this being a problem.

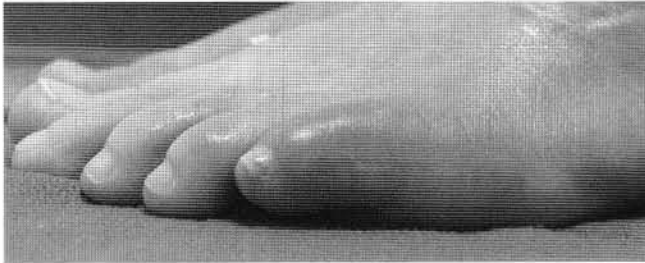
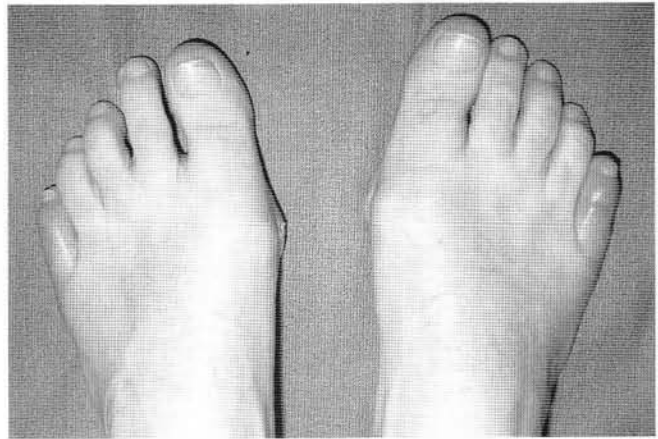


Figure 3B. Postoperative view of the left foot of the patient in figure 3A. This procedure was performed after the right foot surgery, with a change in the postoperative treatment protocol. Notice the improved toe purchase. The patient was restricted in performing normal activities postoperatively.



3C. AP view of the postoperative result.