SYNDACTYLY AND DESYNDACTYLY

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SYNDACTYLY

Syndactyly in the digits of the foot has historically been reported less frequently than syndactyly of the hand. The podiatric and plastic surgery literature has recently been more attentive to the surgical treatment of such deformities. Surgical release of syndactyly of the toes has been advocated in cases of first interspace involvement, complex deformity involving the soft tissue and bone of the interspace, and for cosmetic reasons.

ETIOLOGY

Syndactylism is defined as a congenital or acquired deformity in which webbing persists between adjacent digits. Congenital syndactyly is transmitted either as an autosomal dominant or recessive trait. This deformity is widely accepted as a developmental defect occurring between the sixth and eighth week of fetal growth. Normally, lower limb development begins at the fourth week with digital differentiation commencing at the fifth week. A very rapid period of growth occurs through the end of the eighth week of fetal development at which time the interdigital web tissue diminishes and results in the formation of the digital clefts. If, for any reason, this growth period is halted, normal digital cleft development is adversely affected resulting in syndactyly of the involved digits. Interestingly, the normal development and disappearance of the second interdigital web space occurs last, which can explain the increased tendency for syndactylism of the second and third toes.

INCIDENCE

The incidence of syndactylism varies, but is generally accepted as ranging between 1:1000 to 1:3000 live births. This deformity appears more commonly in males, with a range of incidence between 56% to 84%. It is also reported to occur ten times more frequently in white patients than in black patients, and is found to occur equally in unilaterally and bilaterally patterns. Syndactylism is frequently associated with other deformities or as a component of another specific disease state. (Table 1)

Table 1

DISEASE STATES WITH ASSOCIATED SYNDACTYLISM

Harelip	Apert's Syndrome
Oculodentodigital dysplasia	Orodigitofacial Syndrome I and II
Cleft Palate	Trisomy 18
Trisomy 13	Trisomy 21
Clubfoot	Craniofacial Syndromes
Metatarsus Varus	Poland's Syndrome
Mongolism	Klippel-Trenaunay Syndrome

CLASSIFICATION

Many classification systems for upper and lower extremity syndactyly have been presented in the

literature. Temtamy-McKusick, (Table 2) and Davis-German are the most frequently used systems. (Table 3)

Table 2

TEMTAMY-McKUSICK CLASSIFICATION

Type 1	Zygodactyly - consisting of complete or incomplete webbing of the third and fourth fingers and/or the second and third toes. Other digits may be involved.
Type 2	Sympolydactyly or Polysyndactyly - consisting of fusion of the third and fourth fingers and associated with a partial or complete reduplication of the third or fourth fingers within the web. In the feet, it is manifested by a fusion of the fourth and fifth toes with a duplication of the fifth toe.
Type 3	Consisting of webbing of the fourth and fifth fingers.
Type 4	Complete syndactyly of all fingers.
Type 5	Syndactyly associated with metacarpal or metatarsal synostosis.

Table 3

DAVIS-GERMAN CLASSIFICATION

Incomplete -	webbing does not extend to the distal most aspect of involved digits.
Complete -	webbing extends to the distal most aspect of involved digits.
Simple-	no phalangeal involvement.
Complicated-	phalangeal bones are abnormal.
Combination-	Complete-Simple, Complete-Complicated, Partial-Simple, Partial-Complicated.

CLINICALLY ILLUSTRATED DESYNDACTYLY

A 7-year-old black female, along with her mother, presented with a complaint of discomfort at the hallux and second digit, as well as concern over cosmesis and future function of the great toe. A desyndactyly of this nature necessitates an appreciation of the difference in girth and circumference of the hallux and second toes. Preoperative planning must precisely address these differences to ensure a successful clinical result.

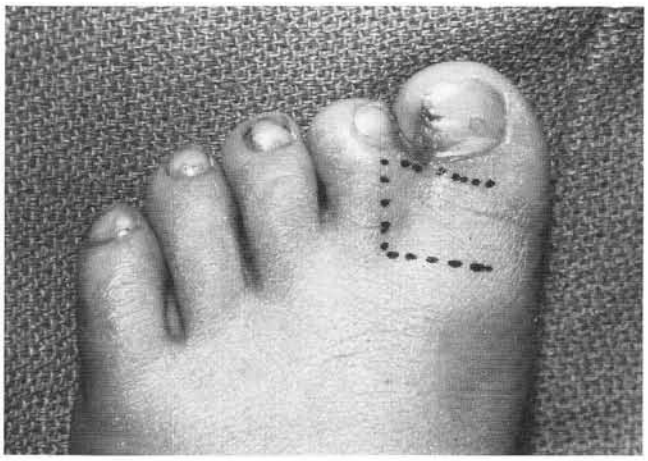

Figure 1. A preoperative DP view of the left foot demonstrating congenital syndactyly between the hallux and the second digit. A medially-based flap is created dorsally which will be brought down to the plantar surface of the hallux. This is illustrated by the proposed incision placement.

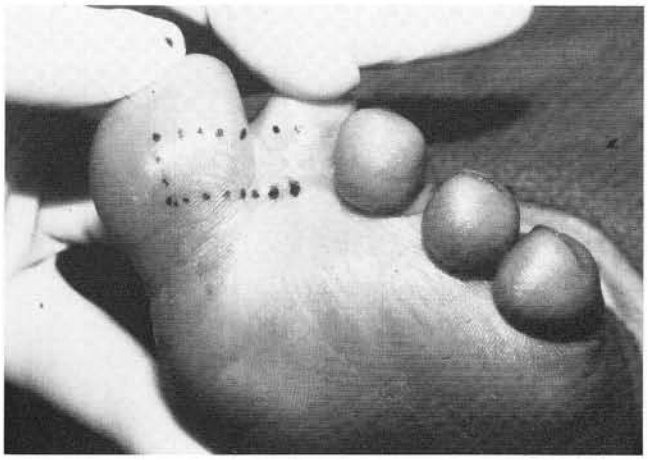

Figure 2. A plantar view of the surgical site demonstrates the laterally-based rectangular flap which will be brought dorsally, creating the plantar commissure to the desyndactylized hallux and second digit.

Figure 3. The dorsal skin flap with its subcutaneous tissue is raised from its medial base. Meticulous care is taken to gently dissect this delicate flap atraumatically preserving its inferior subcutaneous blood supply. Notice that 5-0 nylon is used as a retractor instead of handling the tissue with forceps.

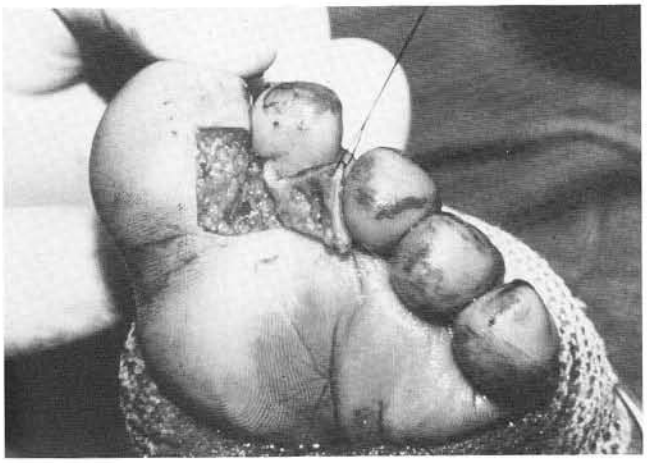

Figure 4. The plantar view demonstrates the laterally-based skin flap which will be transported to cover the medial and dorsal aspect of the second digit, effectively filling-in the defect created by the dorsal skin flap.

Figure 5. The flaps are advanced to their respective dorsal and plantar positions. Attention is directed to both the plantar and dorsal aspects of the involved surgical site. The skin flaps should adequately cover the defects created with minimal tension. Minor adjustments are made at this time, if necessary, to position the skin appropriately.

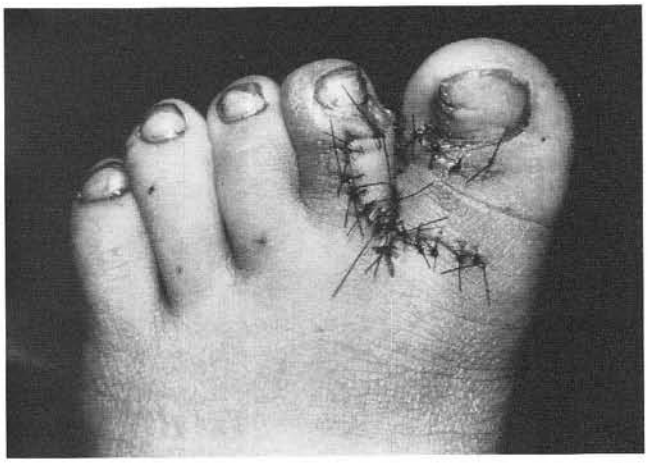

Figure 6. A 5-0 or 6-0, non-absorbable suture (Nylon or Prolene) is used to secure the flaps to their respective positions. Care is taken to exactly oppose the skin flaps to achieve an acceptable surgical result.

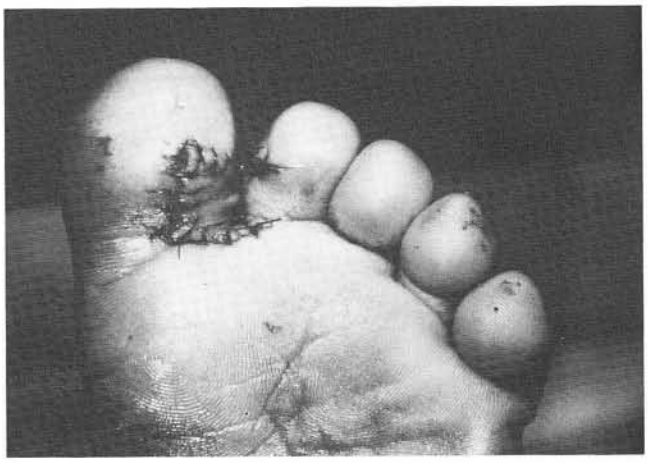

Figure 7. The immediate plantar postoperative result showing successful flap placement and creation of the first interspace.

SURGICAL SYNDACTYLY

Syndactylization of two adjacent digits is a useful procedure for the correction of an unstable digit. The faculty of the Podiatry Institute uses this procedure when confronted with an iatrogenic deformity resulting in a flail digit. Syndactylization is used either as an adjunctive procedure or as an isolated measure to regain stability to a toe.

CLINICALLY ILLUSTRATED SURGICAL SYNDACTYLIZATION

A 53-year-old white female presented with a complaint of significant pain while standing and ambulating. This patient had undergone multiple previous surgical procedures and presented with

a significant iatrogenic deformity involving her left forefoot. The second digit was dorsally dislocated and laterally displaced. Syndactylization of the second and third digits was used as an adjunctive procedure in correcting the unstable digit.

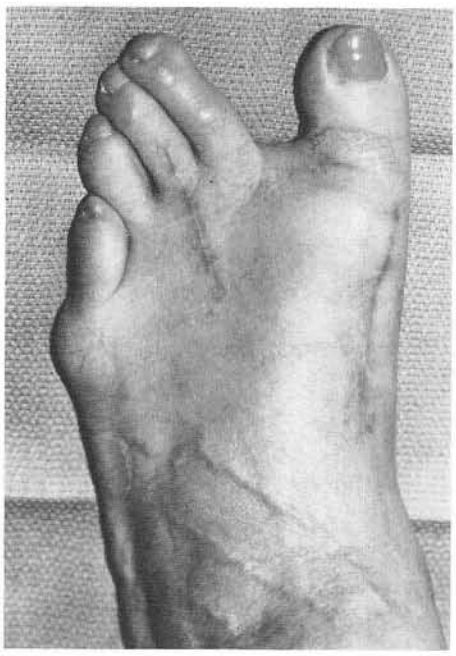

Figure 8. Preoperative DP view demonstrating second digit dislocation, as well as other forefoot derangement. The preoperative plan was to reduce the dislocation by resecting the base of the proximal phalanx, and syndactylizing the second and third digits to enhance the stability of the second toe and prevent shortening.

Figure 9. A dorsal linear incision is made overlying the second digit, and anatomic dissection is carried to the level of the base of the proximal phalanx.

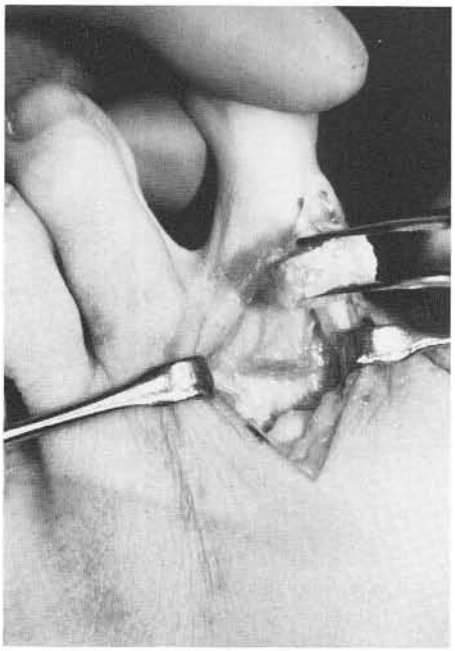

Figure 10. A 4 mm wedge of the base of the proximal phalanx is removed to reduce the dorsal and lateral dislocation of the second toe. The amount of bone resected should be just enough to restore alignment to the digit without excessive shortening.

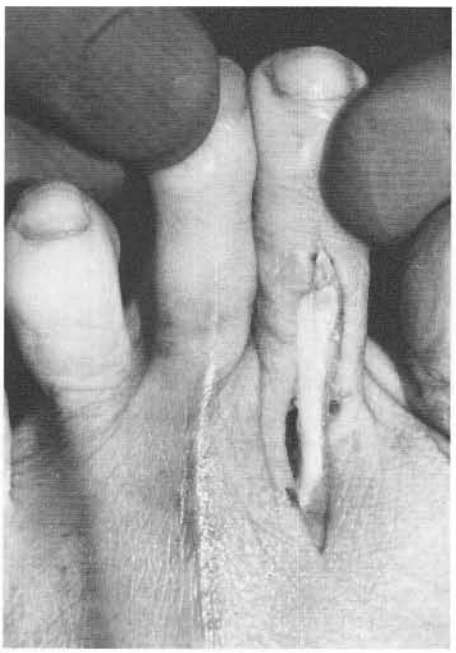

Figure 11. At this time the digit is easily held in a rectus position, and attention is directed to the syndactylization. Notice the restoration of a normal parabola or length relationship of the second and third toes.

Figure 12. A skin marker is used to outline the area of skin wedge to be removed from the adjacent stable third digit. To ensure optimal cosmesis, the dorsal extent of the skin incision should be placed just inferior to the bisection of the toe when the digit is viewed from a medial and lateral direction. The scar will be undetectable when looking down on the foot.

Figure 13. The digits are then compressed, transferring the skin outline to the adjacent unstable second digit. This technique ensures congruent positioning of the digits when syndactylized.

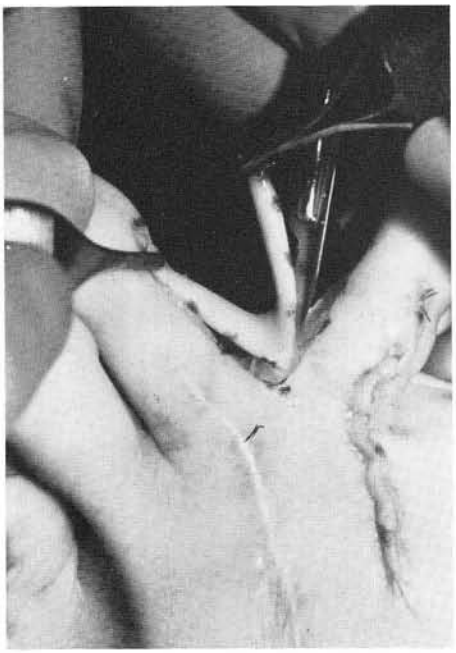

Figure 14. The integument is removed from the respective digits taking care to control the depth of the incision. The skin should be incised only through the level of the dermis, preserving the underlying vascular subcutaneous layer.

Figure 15. With the skin ellipse now removed from the surgical site, the digits are opposed for syndactyly. Single skin hooks can be utilized to maintain symmetrical positioning of the syndactylization.

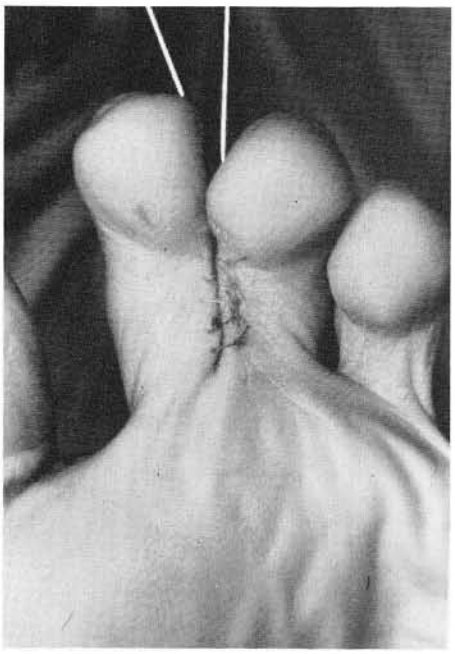

Figure 16. The syndactylization should be started proximally with alternating simple interrupted sutures dorsally and plantarly. It is advantageous to place the suture in this sequence, and leave it untied until the entire incision has been approximated.

Figure 17. Completion of the syndactylization as an adjunctive procedure for correction of iatrogenic digital deformity.

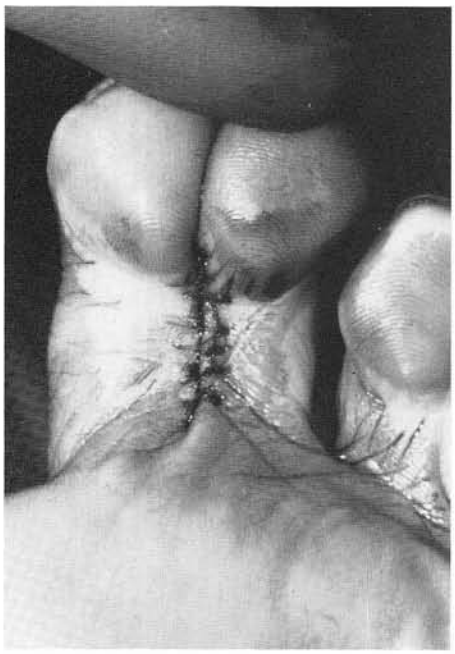

Figure 18. Plantar view of syndactyly of adjacent digits illustrating an excellent postoperative result.

SUMMARY

Informed consent should address the possible complications resulting from these digital procedures including both function and cosmesis. The need for possible skin grafting, secondary procedures and loss of the digit(s) should also be clearly explained.

Whether performing a desyndactyly or surgical syndactylization, several factors are important for obtaining long-term satisfactory results. Preoperative planning is critical to the successful outcome of any surgical procedure, and is especially important in these cases. Syndactylized digits can share osseous and neurovascular structures as well as conjoined skin. Appropriate measures need to be undertaken to evaluate the neurovascular status of each digit involved. Radiographs should be studied to rule out polydactyly as well. Special attention is emphasized when performing a desyndactyly between adjacent digits of varying circumference, length and girth.

The procedures demonstrated can be rewarding to the surgeon and patient. A comprehensive understanding of anatomy and digital function are a prerequisite for successful desyndactyly and surgical syndactylization. These procedures can be technically demanding to perform and adequate preparation will optimize results.

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