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Research Article

DESCRIPTION OF THE ONE FLAP TECHNIQUE FOR THE SURGICAL TREATMENT OF SYNDACTYLY

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ABSTRACT

Syndactyly is a congenital defect of the fingers or toes that can cause aesthetic and functional problems. In this condition there is a defect in the separation of the parts, according to the Swanson Classification, determined between the sixth and eighth week of intrauterine life and representing approximately 20% of all hand malformations. This pathology is the second most common congenital anomaly of the hand and has an incidence of 1:2000 to 3000 live births. It is one of the most heterogeneous deformities known in the literature, with unilateral, bilateral, symmetrical and asymmetrical variations. It occurs twice as often in boys. The aim of this study is to describe a new skin flap design for the treatment of syndactyly. This is a descriptive study, as it aims to detail the surgical technique using different processes for the treatment of simple or complex, incomplete or complete syndactyly.The study maintains the principles of the digital commissure reconstruction approach, adequate skin coverage and reconstruction of the nail bed, presenting a new flap associated with polypropylene coverage, solving the disadvantages of using a skin graft, such as deformities at the recipient site and morbidity of the donor area.

KEYWORDS

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Syndactyly; Surgery; Complications; propylene.

INTRODUCTION

Syndactyly (from the Greek: Syn = together; Dactylos = fingers) is a congenital defect of the fingers or toes, which can cause aesthetic and functional problems(Dib, et al., 2009; Swanson, 1976). In this condition there is a defect in the separation of the parts (according to the Swanson Classification)(Swanson,1976), determined between the sixth and eighth week of intrauterine life and accounts for approximately 20% of all hand malformations(Malik, 2012; Chouairi et al., 2020).

Congenital syndactyly is the second most common congenital anomaly of the hand and has an incidence of 1:2000 to 3000 live births(Chouairi, et al., 2020; Bisneto, 2013; Sullivan, Adkinson, 2017) being one of the most heterogeneous deformities known in the literature, with unilateral, bilateral, symmetrical and asymmetrical variations. It occurs twice as often in boys(Malik, 2012; Chouairi, et al., 2020).

The term simple syndactyly is used if only the soft tissues are involved, and complex syndactyly if the adjacent bones of the fingers are fused (synostosis)(Chouairi, et al., 2020). The term incomplete syndactyly is used to describe a fusion that is proximal to the distal phalanx and complete if the syndactyly continues to the distal phalanx(Chouairi, et al., 2020).

Fifty percent (50%) of syndactylies are simple and bilateral and complex syndactyly accounts for only 16.5% of cases. It occurs most commonly between the middle and ring fingers (third commissure), accounting for 50% of cases, followed by the fourth commissure with 30%, the second commissure with 15% and the first commissure with 5%(Bisneto,2013; Kvernmo, Haugstvedt, 2013).

The treatment of this entity is essentially surgical and, if possible, surgery should be performed before the age of 2 to avoid angular deformity between the fingers(Dib, et al., 2009; Bisneto, 2013). Various techniques have been proposed for freeing the digits and reconstructing the interdigital commissure since Zeller in 1810, where they were developed with the aim of improving aesthetic and functional results. Various flaps and incisions have been described, with advantages and disadvantages in terms of complications, sequelae, healing and the need for grafting(Dib, et al., 2009).

The principles of treatment are: reconstruction of the digital commissure, adequate skin coverage of the fingers and reconstruction of the nail bed. There are several commissure flap designs described and each case must be planned in advance. Skin grafting is not always necessary but, if necessary, it can be obtained from graft donor areas such as the inguinal region, the hypothenar region, the antecubital region and the feet(Bisneto, 2013).

Historically, skin grafting has been the standard reference for covering areas with skin deficiency after finger separation. However, this procedure has been associated with several complications, including membrane deformation, hyperpigmentation, hair growth at the site of the recipient area, donor site morbidity and hypertrophic scarring(Sullivan, Adkinson, 2017).

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The goal of this paper is to describe a new skin flap design for the treatment of syndactyly. It recommends a single dorsal and volar flap, reducing tissue aggression and making the scar noticeable on only one of the fingers when viewed from the back and on the neighboring finger when viewed from the palm. Polypropylene prostheses are used in the residual raw areas, as described by Figueiredo, avoiding the possible aesthetic defects of a skin graft.

METHODOLOGY

It is a descriptive study because it aims to detail the surgical technique using different processes for the treatment of simple or complex, incomplete or complete syndactyly.

The proposed procedure was developed after assessing the need for a specific skin flap surgical technique to follow the use of the original Figueiredo Technique(Figueiredo, et al., 2017), previously described and published in the literature, to reduce the disadvantages related to techniques using skin grafts. This led to the development of this new flap.

Six cases using the technique described below were brought to this study, in patients with varying clinical conditions. There were five male patients and one female, aged between 2 and 14 years (average 5.1 years). Diagnoses were simple or complex syndactyly, partial (incomplete) or complete, single commissure or multiple commissures and one case of recurrence of syndactyly treated in the past with another surgical technique.

RESULTS AND DISCUSSION

Technique description

To implement the technique, general and loco-regional anesthesia is used on the patients. In all patients, venous emptying is performed with the placement of a Smarch strip, which is maintained to block blood flow. This is followed by the marking of the affected digit using the new technique in this study, for the design of the skin flaps using methylene blue.

It starts on the dorsal side, where the drawing consists of a rectangular island of skin, which originates at the level of the metacarpal head and progresses distally to half of the proximal phalanx of the digits involved to form the future commissure, centered on half of each finger. From this point, a single skin flap is marked on the dorsum of the fingers: the beginning of the trace is made on the opposite side to the extension, for example, the trace begins on the fourth finger, and the flap is extended towards the third finger (Picture 01). The shape of this single flap is triangular and it should extend to the midline of the finger, with the apex at the level of the proximal interphalangeal joint, and it should end at the distal interphalangeal joint. From then on, it runs in a straight line between the fingers, until the end of the syndactyly.

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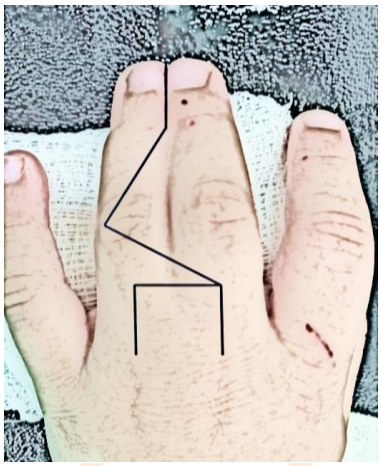
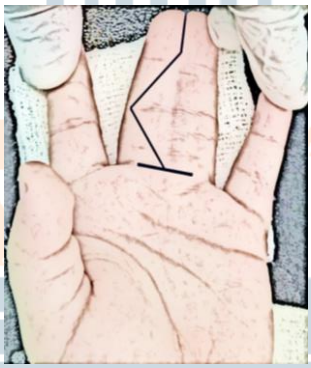


Picture 1.

Subsequently, the volar flap is drawn: A line is drawn at the level of the commissures in the proximal flexion fold of the fingers, with the limit at the midline of the digits. From the center point of this line, the single volar flap is drawn, progressing to the side opposite the extension of the dorsal flap, with the same rule, forming a mirror image on both sides of the fingers in order to fill the entire length of the fingers at the end of the separation (Picture 2).



Picture 2.

For fingers of different sizes, the volar apex should be on the smallest finger, while the dorsal apex should be on the largest finger (Picture 3 and 4).

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Picture 3. Picture 4.

Dorsal and volar access is carried out on the previous markings with dissection and release of the fingers, protecting the vascular-nervous bundle of the digits involved. It is important at this stage to dissect the skin flap, starting from the apex and going only as far as the midline of the syndactyly, both on the dorsum and the palm. This is less damaging to the base of the flap, reducing its suffering. After releasing the tissues and making the flaps, they are sutured, starting at the angles. Next, a proximal area of the affected digits without skin coverage is observed, which should be sized (Picture 5 and 6) and prepared for the final stage.

Picture 5. **Picture 6**

In the final stage, the polypropylene prosthesis is placed in areas that need covering, as described by Figueiredo (Picture 7). Simple stitches are enough to fix the plastic to the edge of the intact skin so that the prosthesis fits perfectly without pressing on the wound. Preference should be given to moncryl 4.0. Vicryl should be avoided as there is early loosening of the stitches. Once the suturing is complete, the Smarch bandage is removed to assess the blood return and peripheral perfusion of the extremity.

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Picture 7.

The dressing is made with sterile gauze, a bandage and micropore tape. The first dressing change only takes place seven days after the operation. During this first period, transudate is formed, which moderately moistens the dressing. From the second week on, the transudate is replaced by fibrin and then by granulation tissue, which fills the entire area occupied by the polypropylene prosthesis, until complete epithelialization is achieved.

The polypropylene prosthesis should remain in place for approximately 4 to 6 weeks, which is the period needed for the epithelialization process to begin in the area without coverage, which will be completed a few days after the plastic falls off spontaneously, due to the failure of the Monocryl stitches. If Monocryl is used, it can be removed after the sixth week, when the epithelialization process is complete. In this case, there will be the inconvenience of the surgeon removing the stitches.

CONCLUSION

This study maintains the principles of the syndactyly approach (reconstruction of the digital commissure, adequate skin coverage and reconstruction of the nail bed) and presents a new flap for treatment, associated with polypropylene coverage, to solve the disadvantages of using a skin graft, such as deformities at the recipient site and donor site morbidity. The cases reported showed surprising final aesthetic results, as the single flaps only caused a noticeable scar on the back of one of the fingers and on the palm of the other finger involved. The polypropylene prosthesis, however, promotes healing of the raw areas, with the same local skin tone and no unusual hair growth, which is common in cases of skin grafting.

CLINICAL CASES

Five cases with different types of syndactyly will be demonstrated. In all of them it was used the technique described in this article and obtained similar results, which suggests its wide applicability.

Case 01

Patient with syndactyly between fingers 4 and 5 of the right hand (Picture 8 and 9). Pictures show the flap marking sequence (Picture 10 and 11), the resulting skin coverage defect after suturing the flaps (Picture 12 and 13) and the evolution at one week (Picture 14 and 15) and 30 days (Picture 16 and 17).

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Picture 8 and 9


Picture 10 and 11


Picture 12 and 13


Picture 14 and 15

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Picture 16 and 17

Case 02

Patient with syndactyly between fingers 3 and 4 of the right hand (Picture 18 and 19). Pictures show the sequence of marking the flaps (Pictures 20 and 21), covering the skin defect with poplin after suturing the flaps (Pictures 22 and 23) and the progress of the treatment after 6 weeks (Picture 24).


Picture 18 and 19


Picture 20 and 21

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Picture 22 and 23

Picture 24

Case 03

Patient with syndactyly between fingers 2, 3, 4 and 5 of the right hand (Picture 25 and 26), with bone fusion of the distal phalanges (Picture 27). Pictures show the sequence of marking the flaps (Pictures 28 and 31), covering the skin defect with polypropylene after suturing the flaps (Pictures 32 and 33) and the progress of the treatment after 6 weeks (Pictures 34 and 35).


Picture 25 and 26

Picture 25

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Picture 28 to 31

Picture 32 and 33

Picture 34 and 35

REFERENCES

1. Bisneto, E. N. F. (2013). Deformidades congênitas dos membros superiores. Parte II: falhas de formação e duplicação. Revista Brasileira de Ortopedia, 48(1), 3-10.
2. Chouairi, F., Mercier, M. R., Persing, J. S., Gabrick, K. S., Clune, J., & Alperovich, M. (2020). National patterns in surgical management of syndactyly: a review of 956 cases. Hand, 15(5), 666-673.
3. Dib, C. C., Monteiro, C. G. Z., Vieira Filho, J. G. C., & Arzuaga, M. M. (2009). Sindactilia: técnica de Marumo modificada. Rev Bras Cir Plast, 24(1), 110-4.
4. Figueiredo, L. A. D., Ribeiro, R. D. S., Melo, A. L. B. D., Lima, A. L., Terra, B. B., & Ventim, F. C. (2017). Uso da prótese de polipropileno para o tratamento das lesões em ponta de dedo. Descrição de técnica cirúrgica e resultados☆. Revista brasileira de ortopedia, 52, 685-692.
5. Kvernmo, H. D., & Haugstvedt, J. R. (2013). Treatment of congenital syndactyly of the fingers. Tidsskrift for Den norske legeforening.
6. Malik, S. (2012). Syndactyly: phenotypes, genetics and current classification. European Journal of Human Genetics, 20(8), 817-824.
7. Sullivan, M. A., & Adkinson, J. M. (2017). A systematic review and comparison of outcomes following simple syndactyly reconstruction with

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Publisher: The USA Journals

skin grafts or a dorsal metacarpal advancement flap. The Journal of Hand Surgery, 42(1), 34-40.

8. Swanson, A. B. (1976). A classification for congenital limb malformations. The Journal of Hand Surgery, 1(1), 8-22.