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Research Article

Skin Grafts Vs. Local Skin Flaps in Management of Contracted Scar Finger

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Abstract

Purpose: In our study, we reviewed the outcome of using skin grafts and different regional flaps of the hand in order to correct flexion contractures of the Proximal Interphalangeal (PIP) joints of fingers. In both techniques, vigorous postoperative exercises were advised for an interval of time between 3-6 months.

Patients and Methods: 16 patients were included in our study. All the scar tissue was excised, and the resultant raw area was covered. In Group A consisting of 8 patients, skin grafts were used. Split thickness grafts were selected in 3 cases and full thickness grafts in 5 cases. While in group B, Z-plasty and Cross finger regional flaps were used in 4 cases per each flap. The cause of the contracture was thermal burn in 8 patients, mechanical trauma in 7 cases, and a case of contracture secondary to dupytrene's disease. The mean follow-up period was 6 months.

Results: The mean flexion contracture/further flexion in the joints were improved markedly at the last follow-up. More extension was gained by exercising after the operation. Near full ROM was achieved in 15 cases with strong hand grip and cosmetic satisfaction. There were no major complications.

Conclusion: Wise selection between different skin grafts and regional skin flaps is important, in order to achieve best outcome in managing finger contractures and gain satisfactory ROM. Choosing the best reconstruction method depend on the size, extent and depth of the raw area. Exposure of the deep structures is an indication to use skin flaps over grafts. Vigorous extension exercise is mandatory to have the best results.

Keywords: Flexion contracture, finger, surgical release, skin grafts, regional skin flap, Vigorous extension exercise

Introduction

The Hand is a very vital part of the human body. A full functioning hand should be supple (moving with ease) and sensate. Hand injuries represent 5-10% of the A&E visits with a risk of serious handicap as an outcome that will in turn affect the quality of life for the patient. Thus, there should be good understanding of the hand anatomy and mechanism of its function. It is important to do proper initial physical examination and take wise decision regarding the timing and method of reconstruction [1].

Longstanding and severe flexion contractures of the proximal interphalangeal (PIP) joint of fingers significantly impair hand function. Several anatomical structures, including the skin layers, long flexors of the hands, palmar plate, and collateral ligaments, become foreshortened. Usually, surgery is required to regain the hand function. The human body is liable to different modes of injury; penetrating, blunt and thermal. The outcome of the healing process results in scar tissue with migration of specialized cells into the wound site [2]. Hand injuries account for 10% of the hospital trauma area. Lacerations contribute to the vast majority by (45%), followed by contusion (30%), then fractures and infections by 20% and 5% respectively. Contractures are defined as a chronic deformity with inability to perform full range joint movement [3].

The goal of reconstruction is maximum restoration of the full hand function with cosmetic acceptance after excision of the contracting scar. The aim of our work is to restore the hand function with cosmetic satisfaction of the surgical outcome after the excision of the scar tissue and achieve full functioning mobile

interphalangeal and metacarpophalangeal joints with adequate strength to resist the forces of other fingers. Plus, correcting the posture of the fingers with a wide web space and the intrinsic muscles to aid comprehension [4]. Wide range of surgical methods have been assigned to cover the raw area left after excising the scar tissue ,and reconstruct the finger functions after flexion contractures of the PIP joints.

These techniques can be divided in to 2 groups; different thickness-skin grafts and locally used skin flaps. Recently, some surgeons have achieved accepted outcomes by utilizing a gradual distraction using an external fixator to fix flexion contracture secondary to traumatic injuries. However, they excluded patients with flexion contractures combined with scar tissue around the joints. However, in these patients, surgery is mandatory in order to restore function and the raw gap should be covered with stable skin to prevent recurrence [5]. The aim of this study was to evaluate the results of both main techniques (grafts and regional flaps) after excision of contracted tissue, followed by strong course of postoperative extension exercise in order to gain of adequate degree of extension and range of movement (ROM).

Materials and Methods

A prospective study was done; it included 16 patients presented to the plastic outpatient clinic with contract fingers were managed over one year from the 1 September 2015 to 1st of September 2016, at Cairo University hospital. The average interval of time for their presentation in clinic was ranged one year to two years from the primary injury. They were 9 males and 7 females .8 of them came after thermal burn, while 7 cases had traumatic lacerations in the hands.one boy, 17 years old had dupytren's disease as a cause for his flexion contracture. It was notice that the 9 out of 16 patients injured their no dominating hands with percentage 57%, while 43% of the injured their dominant hand. It was found that 7 males were injured in their working field .On the other hand; the seven females got injured during their domestic activities.

Figure 1: The risk of complications and its severity are much higher than those for skin grafts.

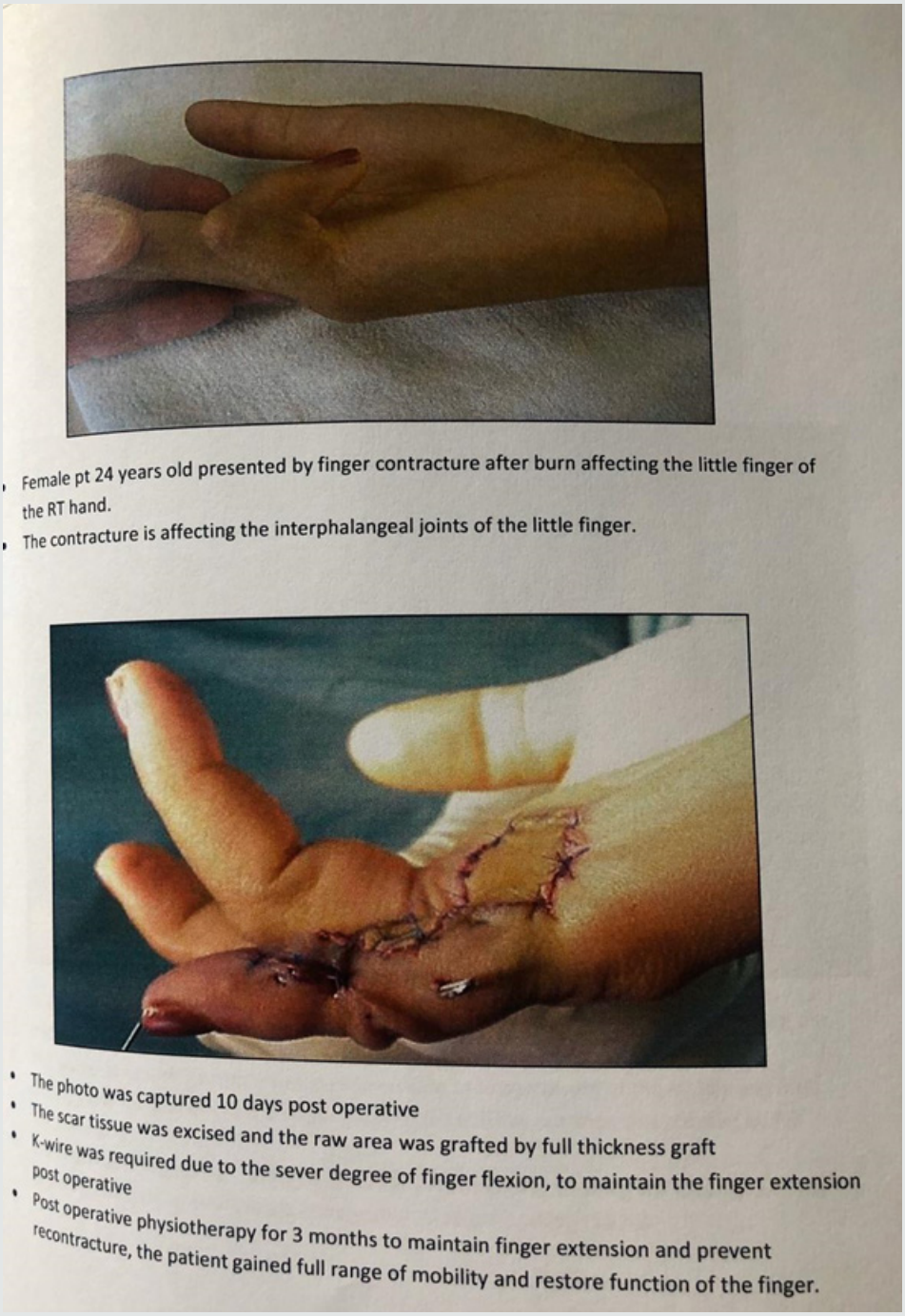

Figure 2: The regional accepted functional and cosmetic results in respect to skin elasticity and skin texture and colour.

Excision of the scar tissue was done. Then, intraoperative decision for the reconstruction was made based on, the size of the defect, the depth of the tissues affected and the exposure of the underlying structure. Group A, are those 8 patients whose raw areas were covered by grafts, full thickness graft was used in 5 patients and split thickness for the other 3 cases. While in group B, Z-plasty was utilized in 4 patients and cross finger flap was used in the same number of patients.

Results

The results were assessed based on, the cosmetic results, patient satisfaction, and regain of finger function with full range of flexion and extension, plus good hand grip. Another factor was the resultant complications and the graft take and the donor site complications. In Group A, 5 patients with full thickness graft and 3 patients with split thickness graft, the mean angle of flexion contractures has improved markedly .It was 68.4 preoperatively

and that was improved was 26.8.While the further flexion of the PIP was 81.2 before the correction ,and this became 91.5 after the graft application.

In Group B, Z-plasty was used in 4 cases; the mean angle of flexion improved from 65.8 to 25.The further flexion was released from 82 to 95. Cross finger flaps, this was used for the other 4 cases. The mean angle of flexion decreased from 63.4 to 26.5 and the further flexion from 86.7 to 94. Near full ROM was obtained in 15 cases. All patients were satisfied with the final results, functionally and cosmetically .This was achieved by the vigorous extension exercise for average 6 month period of time. There were no major complications documented such as neurovascular injury or recurrence of the pathology, or graft rejection or flap ischemia. Three patients had mild infections at the recipient site. This was treated by topical creams and antibiotics for 5 days. A small hematoma was observed in 1 patient in group B, which healed with no intervention at postoperative6 days. In group A, one patient complained of pain an serous discharge at the donor site of full thickness graft

Discussion

The hand anatomy is very unique with complex sophisticated moves in order to put the fingers in different positions hands also must be coordinated in order to perform fine tasks precisely. The structures that form and move the fingers require proper alignment and control for full normal hand function. The skin is the largest organ of the human body. It contributes to 16% of the total body weight with different forms of functions. On the other side, wound healing goes through three stages, these are inflammatory, proliferative and remodeling. Collagen is exposed in the wound, thus, it activates the clotting cascades which trigger the inflammatory process and scar formation [6].

Contracture is the inability to perform full range of joint movement due to abnormal scar tissue formation. This puts the patients at risk for medical and functional problems and alters the quality of their lives in a negative aspect. Scar Contracture is defined as impairment caused by replacement of the skin by a pathological in scar tissue of insufficient extensibility and length which in turn hinder the mobility and result in loss of tissue alignment of the associated joint or the anatomical structures at the affect region [7]. Finger contracture has many etiologies: Burn and trauma are the leading causes, While inflammatory factors, such as scleroderma, rheumatoid arthritis, other autoimmune factors and tumors contribute as well [7].

As regard to reconstruction after excision of the scar tissue, the decision is guided by the depth of the found, the surface area of the defect and the exposure of the deep structures like bones, tendons and neurovascular bundles [8]. The Skin grafts choice is influenced by the vascularity of the bed as of at most importance for the survival of the grafts, with some exceptions as rarely skin grafts taken to be placed on bones, cartilages or tendons without the presence of periosteum or perichondrium [9]. Split thickness graft can tolerate less ideal conditions for survival and it has much broader range of application. On the other side, it's fragile and delicate especially when it is placed over areas with small soft tissue bulk and it cannot withstand subsequent radiotherapy. They contract more during the healing phase and tend to be soother and shiner than normal surrounding skin because of the absent skin appendages. As for the full thickness grafts, they retain more of the normal skin characters like color, texture, thickness and undergo less contraction while healing [10].

The use of the skin flaps not only imports its vascular tissue, but also allow for the integration of fascial layers between the mobile gliding structures, which in turn improves the mobility of the finger due to decreased adhesions formation between the skin layers and the tendons. Local skin flaps such as Z-plasty and V-Y plasty are frequently used. But other random pattern flaps were proven to be useful and provide aesthetically and functionally excellent outcome. Cross finger flaps can be used in sever flexion contractures with scarring of the proximal interphalangeal joint of the fingers followed by postoperative exercise to obtain satisfactory degree of joint extension. The first dorsal metacarpal artery flap has its constant anatomy and easy dissection. It has low donor site morbidity, with god functional and aesthetic outcme.it is considered the best choice for defects at the proximal phalanx and the proximal part of the distal phalanx of the thumb (zone 4) [11-14].

In our study, 16 patients were selected with severe flexion contractures of the PIP joints combined with palmer scarring. In these patients, tethering by the scar tissue and contractures of the palmer plates and the collateral ligaments were the main cause of contracture. Patients were evaluated by history taking, physical examination, investigation, consent taking, photographs and surgical intervention. In all patients, surgical excision of the scar tissue was inevitable to obtain maximal extension of the joint during the operation [15-18]. The resultant skin defect was covered by grafts (split thickness/ full thickness) or local flaps. The decision whether to use grafts or flaps in covering the raw area was according to the depth of the raw area. When bone, tendons, or the neurovascular bundle was exposed, the decision was to choose local skin flaps for covering the defect. Skin grafts were saved for the shallow defects. The group A of eight patients in which the defect area was covered by grafts, full thickness graft was used in five patients, and it was harvested from the inner side of the arm. As for the split thickness graft, it was used in three patients, and it was harvested from the anteromedial surface of the thigh. The graft size ranged from (2-8cm in width and same for length) according to the defect size. Local skin flaps were used for eight patients in group B.Z-plasty used in four patients. In the other four patients of group B, cross finger flap was selected. Postoperative physiotherapy was

advised immediately after sutures removal after first week. The vigorous exercise had a great role in improving the flexion angle. Thus we believe that early exercise is an adjunct to the surgical reconstruction in order to obtain excellent clinical exercise [19].

The management of the patients and the decision making by the clinician, in this series, was affected by the cultural and environmental background. Most of the patients lived remotely in peripheral rural areas and they commute long distance to our tertiary center. Thus the compliance with physiotherapy sessions and follow up clinics was therefore likely to be poor. Thus, the surgical option options were with a view to providing a robust result in a single hospital admission, and urge on the patient to follow up in outpatient clinic and physiotherapy sessions [20].

It is important to stress on the importance of good adequate management of thermal injuries in the acute stages by multidisciplinary team with intensive inputs from the surgeon, physiotherapist and the occupational therapist.97% of the patients with superficial burns and 81% of deep dermal injuries will have normal hand function at the end of their treatment. Adjuncts, such as electro physical agents, diathermy, ultrasound waves, transcutaneous electric nerve stimulation, laser therapy and thermotherapy, can be used. Combination of one or more of these modalities to the physiotherapy plus patient increased awareness regarding the regular lifestyle physical exercise , will have positive impact on the outcome and decrease the risk of recurrence and possible joint comorbidities.

Conclusion

Skin grafts are the reliable for release of the contractures involving the hand fingers. They offer satisfactory functional and cosmetic outcome with donor site shows minimal morbidities. On the other side, Local skin flaps are excellent for finger contractures that affect deeper tissues and the excision exposes bones, tendons and neurovascular bundles. The regional accepted functional and cosmetic results in respect to skin elasticity and skin texture and color. But the risk of complications and its severity are much higher than those for skin grafts. It is also highly recommended to add postoperative physiotherapy exercise to gain the best outcome.

References

1. Diao E, Eaton RG (1993) Total collateral ligament excision for contractures of the proximal interphalangeal joint. J Hand Surg Am 18: 395-402.
2. Houshian S, Chikkamuniyappa C (2007) Distraction correction of chronic flexion contractures of PIP joint: comparison between two distraction rates. J Hand Surg Am 32: 651-656.
3. Watson HK, Light TR, Johnson TR (1979) Checkrein resection for flexion contracture of the middle joint. J Hand Surg Am 4: 67-71.
4. Chasmar Leslie R (2007) The versatile rhomboid (Limberg) flap. Can J Plast Surg 5(2):67.
5. Ulkür E, Acikel C, Karagoz H, Celikoz B (2005) Treatment of severely contracted fingers with combined use of cross-finger and side finger transposition flaps. Plast Reconstr Surg 116: 1709-1714.
6. Ghidella SD, Segalman KA, Murphey MS (2002) Long-term results of surgical management of proximal interphalangeal joint contracture. J Hand Surg Am 27:799-805.
7. Bayat A, Mc Grouther DA, Ferguson MWJ (2003) Skin Scarring. BMJ 326: 88-92.
8. Friedrich JB, Katolik LI, Vedder NB (2009) Soft tissue reconstruction of the hand. J Hand Surg Am 34(6):1148-1156.
9. Lorea P, Medina Henriquez J, Navarro R, Legaillard P, Foucher G (2007) Anterior tenoarthrolysis for severe flexion contracture of the fingers (the "TATA" operation): a review of 50 cases. J Hand Surg Eur 32: 224-229.Curtis RM (1970) Surgical restoration of motion in the stiff interphalangeal joints of the hand. Bull Hosp Joint Dis 31:1-6.
10. Curtis RM (1964) Capsulectomy of the interphalangeal joints of the fingers. J Bone Joint Surg Am 36(A): 1219-1232.
11. Curtis RM (1964) Treatment of injuries of proximal interphalangeal joints of fingers. Curr Pract Orthop Surg 23:125-139.
12. Gibraiel EA (1977) A local finger flap to treat post-traumatic flexion contractures of the fingers. Br J Plast Surg 30: 134-137.
13. Gould JS, Nicholson BG (1979) Capsulectomy of the metacarpophalangeal and proximal interphalangeal joints. J Hand Surg Am 4: 482-486.
14. Harrison DH, Newton J (1991) Two flaps to resurface the basal flexioncrease of the finger area. J Hand Surg Br 16: 78-83.
15. Houshian S, Gynning B, Schrøder HA (2002) Chronic flexion contracture of proximal interphalangeal joint treated with the compass hinge external fixator. A consecutive series of 27 cases. J Hand Surg Br 27: 356-358.
16. Jackson IT, Brown GE (1970) A method of treating chronic flexion contractures of the fingers. Br J Plast Surg 23: 373-379.
17. Sprague BL (1976) Proximal interphalangeal joint contractures and their treatment. J Trauma 16: 259-265.
18. Harrison DH (1977) The stiff proximal interphalangeal joint. Hand 9: 102-108.
19. Brüser P, Poss T, Larkin G (1999) Results of proximal interphalangeal joint release for flexion contractures: midlateral versus palmar incision. J Hand Surg Am 24: 288-294.
20. Houshian S, Schrøder HA (2004) Distraction with external fixator for contractures of proximal interphalangeal joints: good outcome in 10 cases. Acta Orthop Scand 75: 225-228.

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