

Original Paper

Glabrous skin reconstruction of palmar/plantar defects: A case for reconsideration

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Abstract

Background: One basic fact about a Negroid race is that the nonglabrous skin is much more pigmented compared to the glabrous skin. A major disadvantage of nonglabrous skin grafts when used for reconstruction of palmar/plantar defects is the poor cosmetic appearance of the grafted skin. Aside from its normalcy of appearance, glabrous skin grafts yield superior results with improved function and sensation, and increased durability.

Aim: To provide skin cover of palmar/plantar defects with acceptable cosmetic appearance.

Methods: A prospective descriptive study of consecutive patients with benign soft tissue palmar/plantar defects seen at the Usmanu Danfodiyo University Teaching Hospital, Sokoto over a 3 year period from January 2001 to December 2003. Split thickness glabrous skin was harvested either from the ulnar surface of the palm of the hand or from the instep of the foot using a pre-sterilized ordinary razor blade held on a straight artery forceps and laid on the wound surface.

Results: A total of 51 limbs in 49 patients were studied. There were 7 males and 42 females giving a male: female ratio of 1: 6. The ages ranged from 4 months to 26 years (mean = 11.4 years). Indications for grafting were for correction of flexion contractures in 33 (63.3%) limbs, and to cover granulating wounds in the remaining 18 (36.7%). Of the 51 limbs grafted, 43 (84.3%) involved the hands while the remaining 8 (15.7%) involved the feet. Graft take was over 85% in 44 (86.3%) limbs, and all patients had excellent cosmetic outcome. Of the 49 patients, 38 (77.6%) were managed as inpatients. The duration of hospital stay ranged from 3 to 17 days (mean = 9.2 days).

Conclusions: Glabrous skin graft is a simple procedure that can be accomplished with minimal facilities and training. It offers excellent cosmetic results when used in covering suitable soft tissue defects of the sole of the foot or the palm of the hand in blacks.

Keywords: Glabrous skin, palmar/plantar defects, black population

Introduction

The principle of reconstructing like to like has been a long-standing and useful concept for plastic surgeons. One arena in which this concept has not been put to its full use is that of reconstructing soft tissue defects of the sole of the foot, and to a lesser extent, of the palm of the hand¹. The definition of

glabroucity is a loose one in that the skin of the arm, for example, could be termed glabrous when compared to that of the scalp. In its strict sense however, glabrous skin refers to the non-hair bearing skin of the palm or the sole². One striking difference between glabrous and nonglabrous skin

is that the latter is much more pigmented than the former. This difference in colour is more pronounced in the Negroid race so that the darker the skin is, the more noticeable the colour difference between the two types of skin in an individual. In Caucasians, this difference is much less pronounced, or even unnoticeable. Graft take following glabrous skin reconstruction follows similar physiological processes as for nonglabrous skin grafting viz: plasmatic imbibition, inosculation and complete revascularization^{2,3}. The changes that take place following ordinary (nonglabrous) skin graft have also been observed after glabrous reconstruction. Consequently, the hyperpigmentation that results exaggerates the already existing colour difference in the black population. The sensibility and other characteristics of grafted glabrous skin have also been studied^{4,5}. Nonglabrous skin grafts have significant disadvantages when used for reconstruction of palmar/plantar defects. These include craters, contractures, tight subgraft fibrosis and painful build up at the periphery of the skin grafts¹. Glabrous skin grafting has been applied widely for coverage of smaller defects in the hand and has yielded superior results with improved function and sensation, more normalcy of appearance, and increase durability^{1,2}. Most commonly, palmar/plantar defects that are to be skin grafted are reconstructed with split- or full- thickness, nonglabrous skin grafts. At our practice, we have come across patients who had previously been grafted with nonglabrous skin but requested for re-graft due to unacceptable colour difference. Others have used temporary measures like tattooing to mask such patches of skin on the palm (figures 1a&b). The concept of reconstructing these defects by glabrous skin graft has probably been impeded by the vague and erroneous, but broadly held, belief that donor site healing (especially in the foot) would be problematic; that is, significant potential for excessive scarring, pain and functional deficit¹. We therefore, embarked upon glabrous skin grafting of palmar/plantar defects with the aim to achieve better cosmetic appearance than we had earlier observed following nonglabrous skin graft. In this report, we describe our experience with the method. Patients and methods

In this prospective descriptive study, consecutive patients with benign soft tissue palmar/plantar defects seen at the Usmanu Danfodiyo University Teaching Hospital, Sokoto, over a 3 year period from January 2001 to December 2003 were included. Each patient's consent was sought and the necessary information entered into a proforma. The decision to admit the patient (or treat on out patient basis) was based

mainly on the nature of the defects. Anaesthesia was either by facemask, intubation or intravenous ketamine as determined by the consultant Anaesthetist. Split thickness glabrous skin was harvested either from the ulnar aspect of the palm of the hand or from the instep of the foot. The skin grafts were taken using ordinary razor blade (pre-sterilized in methylated spirit for a minimum of 10 minutes) and held in a long, straight artery forceps. On occasions, the stratum conium of the skin and avoid technical difficulties in laying it on its bed. In most cases, the laid skin was stabilized with interrupted chromic 4/0 or 5/0 sutures in addition to tie- over dressings. Both the grafted skin and donor sites were dressed with sufratulle gauze, saline-soaked gauze, cotton wool, dry gauze and crepe bandage in that order. Where contractures were released (or anticipated postoperatively), appropriate splintage was applied by using strong nylon through the nail and/or external splintage with Plaster Of Paris (POP). The clinical course and postoperative complications were carefully documented. Graft inspection was effected on the 4th day after surgery where granulating wound was covered, and on the 10th day where a fresh wound was covered. Inspection was carried out earlier if graft infection was suspected before the designated time of inspection. Graft was considered 'taken' if there was good adherence between the graft and its bed even without the aid of sutures at the time of inspection. Graft take was measured in percentages compared to the original size laid, according to known standards². A graft was considered infected if there was spontaneous discharge of pus either through the dressing or on inspection of the graft. Samples of wound discharge were to be obtained for bacteriological culture and sensitivity testing. Donor site inspection was effected at two weeks after surgery except there was any suspicion of infection. The cosmetic outcome was considered excellent if both the doctor and patient (or relation/parent) were satisfied; good if only one party was satisfied and poor if both parties were not satisfied.

Results

In this report, 51 limbs in 49 patients were studied. There were 7 males and 42 females giving a male: female ratio of 1: 6. The ages range from 4 months to 26 years (mean = 11. 4 years). Figure 2 shows the age/ sex distribution of patients. Indications for grafting were for correction of flexion contractures (fresh wounds) in 33 (63. 3%) limbs, and to cover granulating wounds in the remaining 18 (36.

7%). The latter resulted mainly from burns and road traffic accidents (R T A). Of the 51 limbs grafted, 43 (84. 3%) involved the hands while the remaining 8 (15. 7%) involved the feet. Graft take was between 75 - 85% in 7 (13. 7%) limbs, and over 85% in 44 (86.3%) limbs. Of the 49 patients in this study, 38 (77.6%) were managed as in-patients, the while remaining 11 (22. 4%) were treated on out-patient basis. Appropriate splintage was applied in 45 (88. 2%) limbs using Plaster Of Paris (POP) as skin grafting over these limbs involved joint surfaces. After graft healing, splintage in these patients was continuous for a minimum of three weeks before being converted, in most cases, to nocturnal splintage (using a removable POP slab). The duration of splintage ranged from 3 - 12 weeks (mean = 7.4 weeks).

Discussion

It is worrisome that in Africa, where most of the world's black population lives, no study of this nature has been conducted, nor any literature on it found by the authors. This may mean either that the people have not previously been cosmetic-conscious or have been pre-occupied and overburdened with poverty related diseases. At our center, we encountered over the years, increasing demand by patients (or patients' relations) to revise previously grafted nonglabrous skin on the basis of poor unacceptable cosmetic appearance. The female preponderance in our study is in agreement with studies elsewhere¹ and possibly proofs a higher cosmetic-consciousness in females compared to males. Children and adolescents constitute a majority in this study. This group of individuals could suffer long periods of psychological trauma and low self esteem in the event of poor cosmetic outcome attendant to nonglabrous skin graft¹. In our study, only split thickness glabrous skin was used. Full thickness glabrous skin harvest will usually require nonglabrous skin graft over the secondary defect, which usually cannot be closed by direct suturing. In the authors' view, this is cumbersome on one hand, and negates the cosmetic desires on the other. Furthermore, full thickness skin graft will not survive (take) on granulating wound, which was the indication for skin cover in 18 (36. 7%) limbs in our series. The high percentage of graft take observed in the study may be attributed to the fact that such grafts were laid (in 63. 3% of the limbs) on freshly created wounds (e.g. following release of contractures) which provide

The cosmetic outcome of the grafted skin was excellent in all the limbs (figure 3a &b). Complete donor site healing was achieved between 12 - 19 days (mean = 17. 2 days). Morbidity was minimal. There were residual or newly developing contractures in 7 (13. 7%) limbs, which necessitated prolongation of splintage. Five (9. 8%) limbs suffered graft infection (from staphylococcus aureus) that resulted in partial graft loss. No donor site infection was recorded. There was no mortality recorded during the period of the study. The duration of hospital stay ranged from 3 - 17 days (mean = 9.2 days) in the 38 patients that were admitted and managed as in-patients. Follow up after surgery(or discharge) was impressive, ranging from 3 weeks to 12 months (mean = 10.3 months).

a good bed for graft survival and eventual take. Where granulating wounds were covered, such procedures were carried out only when the granulating wound was adjudged healthy enough to sustain a skin graft. Although we achieved good results with external splintage using POP, the use of kirshner wires is behaved by some workers to be technically less demanding and equally effective^{2,6}. External splintage using thermoplastic materials have obvious advantages over POP: lighter, look better and do not soak/soften when in contact with water. Such thermoplastic splints were not available at our center at the time this study was conducted. We noted as with other split thickness skin grafts, residual or newly developing contractures in 7 (13. 7%) limbs. This included four of the five patients who had graft infection. This was a result of skin contraction and fibrosis from healing by secondary intension, which followed partial graft loss after infection. In addition, infection in these patients necessitated regular graft dressings thereby limiting the effective use of external splintage. Prolongation of duration on splintage in this particular group of patients became necessary. However, this (prolonged splintage) did not lead to joint stiffness since majority were children, and splintage was applied only at night after a while. Thus allowing both passive and active mobilization exercises during the day. We had the need to use both feet as donor sites at the same time in some patients (especially in children) without unnecessarily prolonging the period of recumbence. Mobilization in such patients was possible within 72 hours because the donor sites (instep) were

away from the weight-bearing area; and also because of the good, occlusive (well padded) dressing that was applied postoperatively. Contrary to the popular belief(though erroneous), we did not notice such morbidity like scarring and pain on the foot following skin harvest. In the absence of da Silva knife, the authors encountered no difficulty using a sterile razor blade for skin harvest. When the stratum conium is thick, as may be encountered on the foot, the user soon discovers the need to excise (and discard) the upper layer in order to include part of the dermis and yet, still obtains a flexible graft that is easy to handle/lay. Glabrous skin grafts have also been used in the repair of complete

syndactyly by tissue expansion and composite grafts⁷. Since the number of patients in this study is few and our experience so far limited, it becomes difficult to make definite conclusions. The study has however pointed out that this technique is simple, has minimal morbidity but excellent cosmetic results and can be accomplished with minimal facilities and training. We recommend it for the covering of suitable palmar/plantar defects in blacks especially if such defects do not cross joint surfaces that may necessitate prolong splintage. Further prospective studies are required in this area to authenticate these observations and also look into new horizons (like the acceleration of skin graft healing by growth factors, reinnervation and sensibility of such grafts), which are currently unclear

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fig1a



fig1b

Fig1a: Dark coloration of the proximal and middle interphalangeal joints of the left hand in a young Nigerian girl following nonglabrous skin graft.

fig1b Tattooing to conceal the pigmented patch

1. Banis J. C. Glabrous skin grafts for plantar defects. *Foot Ankle Clin* 2001; 6: 827 – 837.
- 2.

References

- Place M. J., Herber S. C., Hardesty R. A. Basic techniques and principles in plastic surgery. In: Aston S. J., Deasley R. W., Thorne C. H. M.(eds). *Grabb and Smith's plastic surgery*, 5th edition. Lippincott-Raven Publishers. 1997; 13 – 25.
3. McGregor I. A. Fundamental techniques of plastic surgery and their surgical applications. 8th edition, Churchill Livingstone. 1990; 39 – 63.
4. Dykes R. W., Terzis J. K., Strauch B. Sensations from surgically transferred glabrous skin; central versus peripheral factors. *Can J Neurol Sci* 1979; 6: 437 – 439.
5. Haro J. J., del Valle M. E., Calzada B., Perez J. L., Vega J. A. Human glabrous skin autografts partially reinnervated without sensory corpuscles. An immunohistochemical study. *Scand J Plast Reconstr Surg Hand Surg*. 1994; 28: 25 – 31.
6. Hackett M. E. J. Restoration of skin cover: the use of free grafts. In: Barclay T. L. and Kernahan D. A. (eds). *Rob and Smith's operative surgery (plastic surgery)*. 4th edition, Butterworths. 1986; 13 – 27.
7. Shikura N., Heshiki T., Kimura T. Tsukada S. Repair of complete syndactyly by tissue expansion and

- composite grafts. *Br J Plast Surg.* 1995; 48: 396 – 400.
8. Wang H. J., Wan H. L., Yang T. S., Wang D. S., Chen T. M., Chang D. M. Acceleration of skin graft healing by growth factors. *Burns.* 1996; 22: 10 – 14.



Legend to figure 3a:

Same patient in figure 1, with contracture of the right hand affecting mainly the ring and little fingers.

Legend to figure 3b:

Same hand in figure 3a, after glabrous skin graft. Note the colour match between the grafted and the surrounding skin.

