Original Article

SUCCESS OF GLABROUS SPLIT THICKNESS SKIN GRAFT FOR SOFT TISSUE DEFECTS OF PALMAR ASPECT OF HANDS: A CONCEPT OF REPLACING HISTOLOGICALLY SAME TISSUE.

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ABSTRACT:

BACKGROUND: Hands (palmar aspect) and the feet (plantar aspect) have glabrous skin which has special concerns.

OBJECTIVE: To determine success of glabrous split thickness skin graft from sole of foot in terms of graft take and color match for soft tissue defects of palmar aspect of hand.

METHODS: In this study forty five patients having soft tissue defects of hand (palmar aspect) were selected. After informed consent, demographic data (name, age, sex, address) and size of defect were recorded. Patients underwent surgery with glabrous split thickness skin grafting on their palmar aspects of hand in general anaesthesia. The patients were then followed up at 5th day, 2 weeks, 1 month and 2 months to determine the cosmetic outcome, defined as color match which was either Normal (close to palmar skin) or Hyper pigmented (close to dorsum skin). Finally success was considered yes if graft take was > 85%.

RESULTS: The graft take observed at the end of 2 weeks post operatively was more than 85% in 40 patients (88.9%) and less than 85% in 5 patients (11.1%).The normal color match as compared to surrounding skin observed at the end of 2 months post operatively was 100% in those patients where graft take was complete (>85%). The procedure was successful in 40 patients (88.9%).

CONCLUSION: The results of this study revealed that glabrous split thickness skin graft for coverage of soft tissue defects of hand (palmar aspect) was successful. The concept of replacing histologically same tissue was correct.

KEY WORDS: Glabrous skin. Glabrous split thickness skin graft.

INTRODUCTION:

Hands are more involved in performing daily activities thus rendering them to trauma or other injuries. Hand injuries are the most frequent, ranging up to 40% according to occupational injury statistics. [1] Injuries to hand are very frequent in routine surgical practice in developing countries. Limited specialist care is available for these injuries.[2] These injuries can be as trivial as minor cuts to more complex ones that encompass soft tissue defects, tendon cuts, fractures or even amputations.[3] Detailed account of these injuries must be made before embarking on to their treatment in order to

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restore the anatomy and physiology of fingers.[4] Various options exist for treating soft tissue defects of hand (palmar aspect). Skin grafts as well as skin substitutes are considered a useful option for reconstruction of certain defects.[5] Skin graft is skin of varied thickness (full or split) that is removed from the donor site and is placed on the recipient site. Split thickness skin graft contains the epidermis and part of dermis. Advantages of split thickness grafts include its usage for larger defects, easy take and simple procedure. Grafts of any kind require vascularization from the bed onto which they are placed for survival.[6] Hands (palmar aspect) and the feet (plantar aspect) have glabrous skin which has special concerns. Glabrous skin is different from other skin present on the body. It has a thicker epidermis. Well defined stratum lucidum is present. Stratum corneum and spinosum are also thickened. Merkel cells are abundant in stratum basale. Dermis is more compact with less elasticity. Due to all these features, glabrous skin can withstand greater shears, pressure and force. Glabrous skin lacks hair follicles and sebaceous glands. Sweat glands and dermal papillae are abundant. It has fewer melanocytes. These features make the glabrous skin different from the rest of the skin.[7]

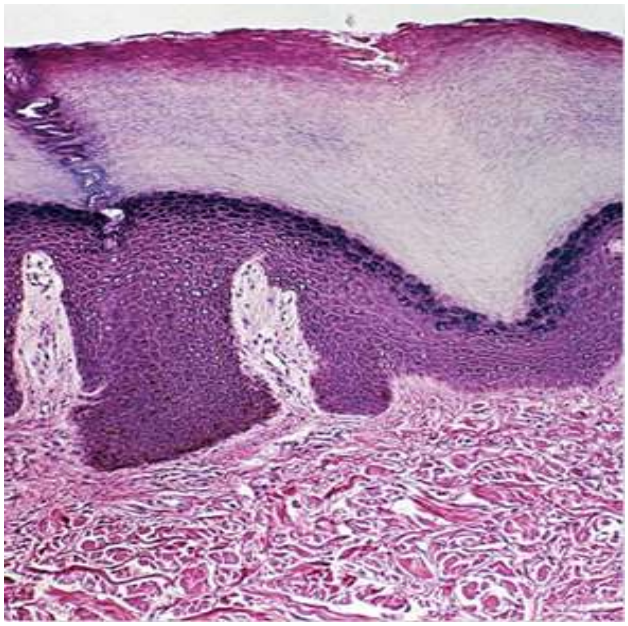

Fig. 1. Histological picture of glabrous skin showing thick epidermis above

Whenever there is a glabrous skin defect, ideally replacement is the histologically similar skin. Graft donor sites for harvesting glabrous skin include hypothenar eminence of hand and plantar aspect of foot.[7] The purpose of this study was to determine the success in terms of graft take and color match of glabrous split thickness skin graft for soft tissue defects of hand (palmar aspect).

PATIENTS AND METHODS:

It was a descriptive case series study. Non probability purposive sampling was done. Sample size of 45 cases was calculated with 95% confidence level, 10.5% margin of error and taking expected percentage of success about 86.3% in patients presenting with soft tissue defects of hand (palmar aspect) undergoing glabrous split thickness skin grafting.[8]

Study was carried out at indoor department of Plastic Surgery, Services hospital Lahore from December 3rd, 2010 to July 26th, 2011. Patients of both gender from five to fifty-five years of age, palmar aspect of hand with soft tissue defect of measuring < $3cm^2$, resulting after release of post burn contractures or excision of post burn scarred tissue. Soft tissue defects with exposed neurovascular bundle, tendons or bone and patients having infected wounds i.e. presence of slough, were excluded. Hospital ethical committee approved the study. Informed consent from the patients was taken for the procedure and using their data for this research. Demographic data including name, age, sex, address and telephone number for all the cases was obtained. Physical examination included evaluation of size of defect with measuring tape. Patients then underwent surgery with glabrous split thickness skin grafting on their palmar aspect of hand in general anesthesia. The skin graft was taken from instep of foot with help of humby's knife blade. Postoperatively the dressing of recipient site was opened on fifth post-op day and final graft take was assessed at 2 weeks. Graft was declared as taken if it had showed good adherence with its bed. Take of the graft was determined in percentages as compared to the original size of the wound, according to known

standards[9]. The patients were then followed-up at 1 and 2 months post-operatively to determine the cosmetic outcome, defined as colour match which was either normal (close to palmar skin) or hyper pigmented (close to dorsum skin). Finally success was considered yes if graft take was > 85% with normal colour match after two months. The donor site dressing was opened after two weeks. Information was saved in a proforma. The data analysis was done by using SPSS version 23. Descriptive statistics were calculated. Quantitative variables were the age and size of defect. These variables were presented as mean, +/- standard deviation. Qualitative variables were gender and success. These were presented as frequencies and percentages. Data was stratified for size of defect (less than one cm^2, more than one cm^2) to address effect modifiers.

RESULTS:

A total of 45 patients with soft tissue defects of hand (palmar aspect) were studied. Frequency and percentage of male gender was 34 (76%) and female gender was 11 (24%). The frequency of age was highest in age group of 5-15 yrs with frequency of 20 (44.4%) and was least in the age group of 49-55 yrs with frequency of 1 (2.2%) with a mean of 20.8667, SD 12.1179. The frequency and percentages for size of defect was 26 (57.8%) for 0-1cm^2 and 19 (42.2%) for defects of 1-3cm^2 (mean 1.4377 & SD 0.7625). Success of this procedure was noted in 40 patients (88.9%). (Table I, Fig. 2).
The chi-square value was found to be 7.697 along with P-value that is 0.006 which depicts that the association was quite significant statistically between graft take and size of defect.

Table I- Success of procedure

Success		Frequency	Percentage
Valid	Graft take >85% and normal colour match	40	88.9
	Graft take <85%	5	11.1
	Total	45	100.0

The normal colour match as compared to surrounding skin observed at the end of 2 months post operatively was 100% in those 40 patients where graft take was complete (>85%). The normal colour match did not have significant association with the size of defect in cases where graft take was complete.
Complete graft take was observed in 26 patients (57.8%) whose size of defect was less than 1cm^2 and 14 patients (31.1%) whose size of defect was between 1-3cm^2.

Table II- Graft take Vs Size of defect

Graft take * Size of defect (cm2) Cross tabulation

			Size of defect (cm2)		
			0-1	1-3	Total
Graft take	>85%	Count	26	14	40
		% within Graft take	65.0%	35.0%	100.0%
	<85%	Count	0	5	5
		% within Graft take	0.0%	100.0%	100.0%
Total		Count	26	19	45
		% within Graft take	57.8%	42.2%	100.0%

The chi-square value was found to be 7.697 along with P-value that is .006 which depicts that the association was quite significant statistically between graft take and size of defect.

Fig. 3. Picture on 5th post op day (graft visible on proximal palm)

Fig. 4. Picture after 2 months (with complete graft take and normal colour match)

DISCUSSION:

Glabrous skin is considered unique as it has specialized look and function.[7] Perception of sensations is better by glabrous skin as compared to other skin. Due to its thicker epidermis, it protects well. Its all functions are due to its specialized anatomy. Glabrous skin defects should be replaced with like tissue. Non glabrous skin has more pigmentation than glabrous skin. Whenever the reconstruction of hand defects (palmar aspect) is done by non glabrous skin grafts, a big disadvantage of poor cosmetic appearance results. Other significant disadvantages include painful build ups at the edges of the skin grafts, tight subgraft fibrosis and contractures.[8]

First glabrous skin graft (split-thickness) was introduced by LeWorthy in 1963.[9] Glabrous skin grafts demonstrate results which are superior, with normal appearance, without hyperpigmentation and hyperkeratosis, increased durability and improved function and recovery of sensations.[10,11] Same physiological mechanisms are observed in graft take after glabrous skin as well as non glabrous skin reconstruction i.e plasma imbibition, inosculation and re-vascularization. Study by Legbo JN. showed that in 86.3% limbs, there was over 85% graft take. Excellent cosmetic outcome was observed.[12] According to Wu. Liza C. all glabrous grafts showed recovery of sensation. Glabrous grafts had good colour match with the skin all around.[7]

In present study glabrous skin (split thickness) was applied and a significant number of patients (88.9%) showed complete graft take i.e > 85% with 100% normal colour match when compared to the surrounding area. This study showed that 11.1% of patients suffered graft infection that ended in partial loss of graft. Infection at donor site infection was not observed and there was no significant morbidity in terms of pain, discomfort or difficulty in walking as the donor area was non weight bearing instep of foot. No complications such as significant hypertrophic scarring, hyperpigmentation or hypopigmentation were noted. Mortality was nil in the study. Mobilization was encouraged in these patients within 72 hours. Study revealed the simplicity of the technique and its minimal morbidity. It demonstrated excellent cosmetic results. It requires minimal training and facilities.

CONCLUSION:

The results of this study showed complete graft take and normal colour match with the surrounding area in significant number of patients (88.9%) that had undergone glabrous split thickness skin grafting for coverage of soft tissue defects of hand (palmar aspect). It was concluded that it was always better to replace

the lost tissue with histologically same tissue. So this procedure can be used to benefit the patients in terms of simplicity of procedure and cosmetic outcome. To look for the possible role of growth factors, further studies may be required.

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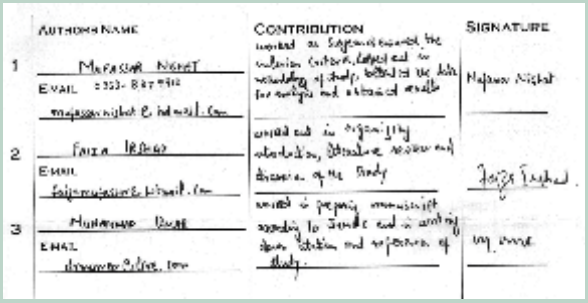

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