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Research Article

A Clinical Study on Role of Single Dose Intradermal Triamcinolone Infiltration in Preventing Hypertrophic and Keloid Scarring at Skin Grafting Donor Site

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Abstract: ***Background:*** "Hypertrophic scars" are excessive scars in which the dense fibrous tissue does not extend beyond the borders of the original wound or incision. They tend to be wider than necessary for normal wound healing to occur. Intraoperative and postoperative intralesional steroid therapy following excision has been shown to reduce recurrence to below 50 percentage. ***Materials and Methods*:** This is prospective and descriptive study conducted in the Department of General Surgery at Surabhi Institute of Medical Sciences over a period of 1 year. Patients who needed therapeutic split skin grafting for various elective and emergency plastic surgery procedures are considered in the study. 4 months is the study period. 30 patients who need more than 20X10 cm area of split skin grafting to resurface the defects are being included in the study. ***Results:*** Among the study group, 67% were post burn contracture raw areas, 30% posttraumatic raw areas and 3% post infective raw areas. Among 30 donor site steroid injection sites 9 are hyperpigmented(dark), 7 are hypo pigmented and 14 are similar in colour with surrounding skin compared to 15 (hyper),10 (hypo), 5 (iso) respectively at donor site control areas. Mean value of normal skin thickness is 1.69, test site skin thickness is 2.20 and at control site skin thickness is 2.60**.** Hypertrophic scar occurred in 46% cases at kenacort injection site & in 64% of cases at test site have scars comparable with adjacent normal skin. ***Conclusion:*** In our study showed reduced scar dimensions, height, better scar texture, color match, and better symptomatic improvement with minimal dose related drug induced side effects. There seemed to be a better aesthetic and symptomatic outcome in skin grafting donor sites by using per operative intra lesional triamcinolone acetate injection after harvesting skin grafting, with respect to pigmentation and thickness.

Keywords: Intradermal triamcinolone, Hypertrophic, Keloid scarring, Skin grafting.

INTRODUCTION

"Hypertrophic scars" are excessive scars in which the dense fibrous tissue does not extend beyond the borders of the original wound or incision. They tend to be wider than necessary for normal wound healing to occur. Histologically, hypertrophic scars have more organized collagen fibers than keloids, and scant mucoid matrix. Hypertrophic lesions are characterized by randomly distributed tissue bundles consisting of uni-axially oriented extracellular matrix and cells [1].

There is a strong familial tendency and slight female preponderance. The occurrence of keloids and hypertrophic scars has equal sex distribution and the highest incidence in the second to third decade. Incidence rates of hypertrophic scarring vary from 40% to 70% following surgery to up to 91% following burn injury, depending on the depth of the wound. Patients often present with severe itching, pain, sleep disturbance, disruption of daily activities, and aesthetic concerns [2].

Local steroid infiltration, pressure therapy with silicone gel/sheets or garments, surgical scar excision is the common well accepted, evidence based treatment modalities.

Local steroid injection is well documented secondary treatment modality both therapeutically, following failure of pressure therapy and prophylactically following surgical scar excision to prevent recurrence [3].

It has been noted in literature that the fibroblasts that present in keloid and hypertrophic scar tissue produce excess collagen, (predominantly type 1 and 3 collagens, though type 1 collagen predominates in keloids) compared to the normal fibroblasts. Thus, suppression or down regulation of this uncontrolled fibroblast invasion and proliferation, collagen

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deposition, pro inflammatory mediators in keloid and hypertrophic scar may be essential in their treatment using local steroid injection [4]. Triamcinolone acetonide at 10 mg/mL is generally tried initially, and if no response occurs, then a 40 mg/mL concentration is attempted. The triamcinolone is mixed with 2% plain lidocaine in a 50: 50 ratios. Injection into the dense scar is often painful and poses infiltration risk to the surrounding normal tissue. Early, rapidly proliferating lesions respond best to steroid injection while slowly growing, mature keloids respond poorly [5].

Intraoperative and postoperative intralesional steroid therapy following excision has been shown to reduce recurrence to below 50 percentages [6]. Described untoward effects seen with the use of intralesional triamcinolone local infiltration are delayed wound healing, thinned out skin, hypopigmentation, telangectasia and ulceration and rarely accelerated hypertension, blood sugar level fluctuations in diabetics [7]. The pruritis in keloids is believed to be due to the increased release of histamine from the mast cells, which are abundant in the healing wound [8].

It is reported that only 60% of pressure garments fit perfectly the first time, and 40% require adjustments. Reported compliance for head and neck pressure garments is only 44%, and patients usually apply the garments no more than 10 to 14 hours of the prescribed 23 hours a day [9].

MATERIALS AND METHODS

This is prospective and descriptive study conducted in the Department of General Surgery, Surabhi Institute of Medical Sciences over a period of 1 year after approval of ethical committee.

Inclusion criteria

- Males and females in the age group between 18 and 60 years were included in this study.
- The split thickness skin graft was harvested from a normal thigh where no skin graft had been harvested earlier.
- Indications for skin grafting were both elective and emergency.

Exclusion criteria

- Children below 18 years and adults above 60 years.
- Patients contraindicated for steroid use like diabetics, hypertensive, epileptics, benign intracranial hypertension, peptic ulcer, chronic nephritis, tuberculosis etc.
- Patients not willing to give the written consent.

Patients who needed therapeutic split skin grafting for various elective and emergency plastic surgery procedures are considered in the study. 4 months is the study period.

30 patients who need more than 20X10 cm area of split skin grafting to resurface the defects are being included in the study;

10X10 cm skin graft donor site (half of the original area) is marked as the test site and 10X10 cm skin graft donor site is marked as the control site.

Thigh is the donor site in all cases and Humbys knife used for harvesting uniform thickness skin graft in all cases.

The strength of triamcinolone acetonide used for this study is 40 mg / ml. 1 ml is diluted to 10 ml with addition of 9ml of normal saline and with a maximum of 1-2 ml per dose i.e. maximum of 80 mg per dose. 0.01–0.02 mL is injected per square cm of marked test area of skin graft donor site.

Local care of the healed donor site at the end of 3 to 4 weeks is followed by application of lubricant in the form of coconut oil rubbed into the thigh. No compression garments are prescribed.

Technique and procedure

General or Regional anesthesia, uniform thickness skin graft measuring more than 20 × 10 cm is harvested from thigh with hand driven dermatome.

10 cm X10 cm size donor site was marked as test site.

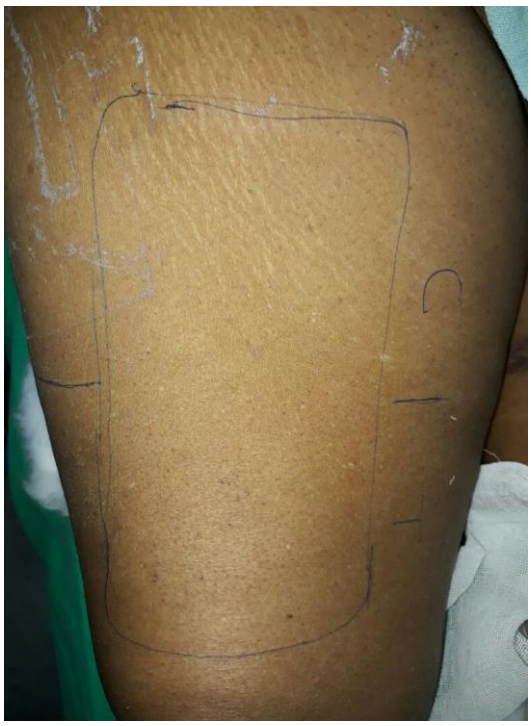


Fig-1: C- Control site T- Test site (10*10cm)

After the harvest of the uniform thickness skin graft (using a hand held dermatome), oozing was

controlled by the application of normal saline soaked sponge with pressure; after 5 minutes the wound was separated into the test and control areas.

The prepared steroid solution was then injected intra-dermally along the marked test site, leaving control site using a 20-gauge cannula mounted on a 10-ml syringe-10 ml for the entire 100 square cm area; dressing was done using Vaseline gauze followed by gauze and gamgee pads and regular roller bandages. Elasticated bandages were avoided.

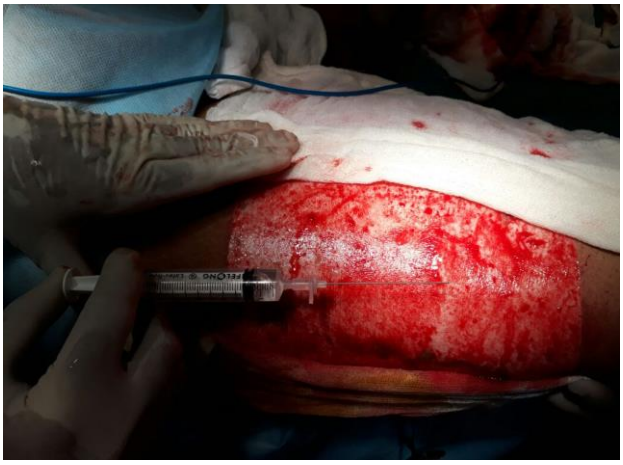


Fig-2: Technique of drug infiltration

The skin graft donor sites were examined Patients are followed at 1st month, 2nd and 4th month, for a detailed examination of the scar at the skin graft donor site. The following parameters were assessed.

1. In the 1st month
- at 14, 21 days and
- weekly after that till complete donor site healing (in those patients where healing had not been complete)

2. The following scar characteristics measured at subsequent monthly visits:

The consistency of the scar is classified as either hard, soft or consistency similar to the surrounding skin. Scar suppleness compared with normal adjacent thigh skin.

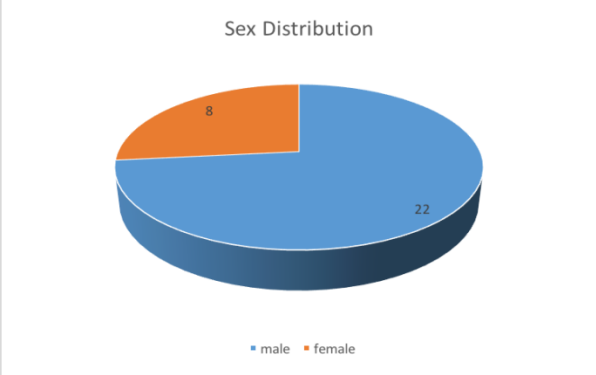
Other features like skin atrophy, erythema, ulceration, skin necrosis at steroid injection site is also recorded. Healing time is the time taken for complete epitheliastion of the skin grafting donor site.

RESULTS

Table-1: Distribution of Age group

Age Group	Number
18 to 20 years	10
21 to 40 years	14
41 to 60 years	06

In table 1, among the study group, predominant group are between 21-40 years of age



Graph-1: Distribution of gender of patients

In graph 1, among the study group 22 were males and 8 were females

Table-3: Therapeutic indication for skin grafting:

Burn contracture release	20
Acute lower limb trauma	09
Post Cellulitis raw area	01

In table 3, among the study group, 67% were post burn contracture raw areas, 30% posttraumatic raw areas and 3% post infective raw areas.

Table-4: Pigmentation: in comparison to the adjacent normal skin:

Parameter	Test area	Control area
Iso pigmentation	14	05
Hyper pigmentation	09	15
Hypo pigmentation	07	10

In table 4, among 30 donor site steroid injection sites 9 are hyperpigmented(dark), 7 are hypo pigmented and 14 are similar in colour with surrounding skin compared to 15(hyper), 10(hypo), 5(iso) respectively at donor site control areas.

Table-5: Comparison of scar thickness at test and control site (in mm)

	1.0 TO 1.5	1.5 TO 2.0	2.1 TO 2.5	2.5 TO 3.0	3.1 TO 3.5
TEST	0	18	9	3	0
CONTROL	0	0	16	10	4
NORMAL SKIN	4	26	0	0	0

In table 5, mean value of normal skin thickness is 1.69, test site skin thickness is 2.20 and at control site skin thickness is 2.60

Table-6: Pain: (Visual analogue scale--mild-1-3, moderate 4-7, severe 8-10)

	None	Mild	Moderate	Severe
Test site	12	18	0	0
Control site	0	16	14	0

In table 6, 60% cases have mild pain at test site, 40% cases have no pain at test site and 47% have moderate pain at control site in the post-operative period.

Table-7: Itching

	None	Mild	Moderate	Severe
Test site	12	18	0	0
Control site	0	06	02	22

In table 7, 73% have at control site, severe itching and half of them with sleep disturbances.

Table-8: Scar classification

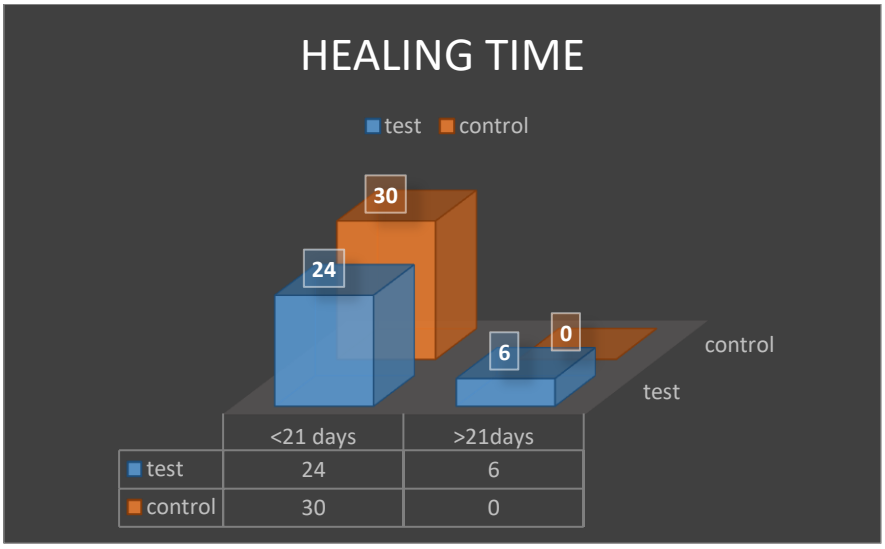
	Test site	Control site
Hypertrophic	14	26
Normal	16	04

In table 8, Hypertrophic scar occurred in 46% cases at kenacort injection site& in 64% of cases at test site have scars comparable with adjacent normal skin.

Table-9: Donor site healing

Test site	--	less than 21 days	24
		More than 21 days	06
Control site	--	all healed within 21 days	

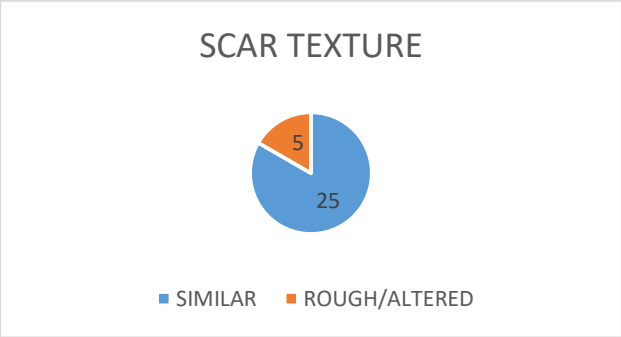
In table 9, in 80% cases test site healed before 21 days and 20% cases healed by 4 weeks.



Mean healing time at test site 20 days and at control site 17.5 days.

Scar texture

Better scar texture in terms of elasticity and pliability noticed in steroid injected skin graft donor sites and comparable to adjacent skin in 25 cases.



No systemic side effects like hypertension, diabetes, Cushing's reported in the study group. Post-operative follow up photographs of skin graft donor site thighs, showing the results at 4 months post-surgery

DISCUSSION

Scar hypertrophy seems to be inevitable when any wound heals; it varies in degree depending on factors like skin pigmentation, individual tendency, specific body locations and degree of local trauma, they are of aesthetic concern to the patient and the surgeon and also can cause troublesome symptoms of tenderness and itching [10].

Intra-lesional steroid injection has been described as well accepted and recommended treatment modality for the therapy of hypertrophic scarring; it has been variously used with or without the addition of compression bandages. There are few studies on the prophylactic use of steroid injection to control scar formation [11-14]. Evidence based accepted doses of triamcinolone 40mg/ml for a thick keloid scar, 10mg/ml for hypertrophic scar with total dose should not normally exceed 1-2 ml per dose, and intra muscular dose is 60-100mg /dose.

This study was done to find whether the prophylactic administration of local steroid has any benefit in reducing the incidence of hypertrophic scarring and the symptoms that it induces. The skin graft donor site was divided into two parts designated as the test and control site. To avoid the possibilities of diffusion across the border between the test and donor sites, the readings were taken at least 5 cm away from the Centre.

In this study group, same region (thigh) chosen both as test and control site and uniform skin thickness graft harvested at both sites. Since both test and control sites are same region avoiding several biases of inter individual & region variations. No form of pressure garment or compression therapy had been used; once the area had healed routine care had been advised specifically instructing against massage to avoid obfuscation of any therapeutic effect noticed.

Pigmentation of the test and control areas were compared to the surrounding normal skin and the incidence of hyperpigmentation were 9 in the test site and 15 in the control site; hypopigmentation was noticed in 7 of the test sites and 10 of the control sites. It implies better Scar color & matched with adjacent normal thigh. One of the side effects of the use of local steroids is skin hypopigmentation and atrophy; in fact it is this noticeable use effect that is put to use in the treatment of hypertrophic scars and keloids.

Measurements of scar thickness were taken at the test and control site and normal site for reference.18 of 30 test sites had skin thickness less than 2.0 mm (all 30 normal skin thickness was less than this value) whereas 16 of the control sites had thickness more than 2.0mm and none were less than 2.0mm.

The mean scar thickness values were 2.20 for the test site and 2.60 for the control site and 1.69 for the normal skin. When we classified the scars as normal (mean values nearer to 1.69) and hypertrophic (mean values closer to 2.60) there were 16 hypertrophic scars in the test group and 14 in the control group and 26 normal scars in the test group as against 4 in the control group. None of the patients has scar atrophy. Hence more of the hypertrophic scars formed in the control than the test group.

18 of the 30 patients had mild pain at the test site where as 14 of the 30 patients had moderate pain at the control site. 18 of the 30 patients had mild itching at the test site where as 22 of the 30 patients had severe itching with sleep disturbances at the control site. Mild pain and less severe pruritus noticed at steroid injection site compared to control site. No systemic side effects like hypertension, diabetes, Cushing's reported in the study group and it implies single dose triamcinolone shown may have little post-operative or no long term systemic absorption effects. Better scar texture in terms of elasticity and pliability noticed in steroid injected skin graft donor sites.

Uniform results with respect to color, thickness at test sites not achieved, may be due to lack of uniformity in the amount of drug injected per each square centimeter with syringe and intravenous cannula. 6 of the 30 patients had delayed wound healing beyond 21 days at the test site whereas all the control areas had healed before 21 days. Healing was complete in these 6 patients after a further period of 1 week. This delay may be due to associated nutritional deficiency and low hemoglobin level. There was no incidence of necrosis or ulceration. It implies no significant impact on healing time with single dose steroid intradermal infiltration.

Insufficient evidence of clinical benefits and cost effectiveness, poor patient compliance of pressure garment therapy and as prophylactic measure to prevent

hypertrophic scarring, demands search of additional prophylactic regimen to prevent hypertrophic scar incidence.

In contradiction to the difficulties facing with pressure garment therapy like assessment amount of pressure, patient compliance, cost effectiveness of PGT, per-operative single dose triamcinolone have better patient compliance (under anesthesia), ease of assessment of regimen effectiveness and better cost effectiveness of kenacort injection, single dose triamcinolone prophylactic infiltration with or without pressure garments, might be the better alternative in prevention of hypertrophic scarring.

Surgical excision of scar especially wide areas skin graft donor site is cumbersome and high chances of recurrence is common, so per operative single dose triamcinolone infiltration found to be better scar preventive regimen & is supported with our study results.

CONCLUSION

Results of the study showed reduced scar dimensions, height, better scar texture, color match, and better symptomatic improvement with minimal dose related drug induced side effects. There seemed to be a better aesthetic and symptomatic outcome in skin grafting donor sites by using per operative intra lesional triamcinolone acetate injection after harvesting skin grafting, with respect to pigmentation and thickness. In addition, there is some improvement in pain and itching on the scar with the use of the drug. This therapeutic effect can be obtained with a minimal incidence of delayed wound healing.

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