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Effect of Surgical Excision and Subdermal Injection of Triamcinolone Acetonide for Treatment of Keloid Scars after Cesarean Section

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ABSTRACT

Background: A keloid is a benign fibrous lesion that results from an abnormal response to wound healing, ten to fifteen percent of all wounds have keloid scars. They can persist for years beyond the initial injury and show up anywhere on the body.

Objectives: This study aimed to study the effect of surgical excision and subdermal injection of Triamcinolone Acetonide (TA) for treatment of Keloid scars after cesarean section (CS).

Methods: This prospective comparative study that was carried on 186 female patients with keloid scars after CS, pregnant patients at the time of recruitment and planned CS for the current pregnancy between 18 and 45 years old at Menoufia University Hospital and Itay El Baroud General Hospital.

Results: Depression, Anxiety and Stress Scale-21 (DASS-21) was insignificantly different at baseline, 1 month, 2 months, 3 months, 4 months, 5 months and 6 months between both groups. DASS was significantly lower at 1 month, 2 months, 3 months, 4 months, 5 months and 6 months than baseline in group 1 and group 2. Recurrence rate of keloid scar was significantly lower in group 1 than in group 2.

Conclusions: Subdermal injection of TA in combination with surgical excision is more effective than surgical excision alone for the treatment of keloid scars following CS. While both groups showed significant reductions in DASS (depression and anxiety) scores over time, patients received TA experienced more significant improvements in objective signs and subjective symptoms.

Keywords: Triamcinolone acetonide, Keloid scars, Depression, DASS-21, Cesarean section.

INTRODUCTION

Keloid formation is a common but overlooked issue following caesarean section (CS). Ten to fifteen percent of all wounds include keloid scars, which are benign fibrous lesions caused by an aberrant reaction to wound healing. They can persist for years beyond the initial injury and show up anywhere on the body. Individuals with darker skin tones and those under 30 are typically at risk for keloid scarring [1].

Melanocyte-stimulating hormone abnormalities increase the likelihood of keloids by 15–20 times, and darkly pigmented skin is the main risk factor. Asian, Black, and Hispanic people are more likely than Caucasians to get keloid scars. In addition to being visually deforming, keloid scars can cause discomfort and itching. They also frequently cause a great deal of mental pain [2].

Keloid scars are linked to worsened mental health in the postpartum phase and can exacerbate symptoms of sadness, poor romantic relationships, and bad body image. It has been noted that patients with keloid scars are dissatisfied with them because of the psychological link and perceived stigma associated with them [3]. Patients typically worry about the diagnosis and the scars' enduring nature. They also express unhappiness with the existing treatment and general physicians' insensitive handling of their condition [4].

Keloid scars can form invasively as a result of these alterations, which can also trigger persistent inflammation. Furthermore, keloid scars may be inflammatory disorders of the skin's reticular dermis, as evidenced by the elevation of proinflammatory factors in pathological scars [5]. Among the potential treatments for keloid lesions, intralesional triamcinolone acetonide (ITA) (a corticosteroid) injection, either alone or in combination with other treatments, is recommended. However, its effectiveness in treating CS keloids has not been shown [6].

The steroids' direct anti-inflammatory and vasoconstrictive actions are based on the cellular process of keloid development. When corticosteroids are administered, keloid scars whiten, which may indicate vasoconstriction reducing blood flow in the scar. Removing the scar surgically is another recommended therapy for keloid scars [7].

Nevertheless, many doctors conduct surgical excision of the keloid scar followed by subcutaneous corticosteroid injections since this procedure often only offers short-term cosmetic relief and invariability, and in 50 to 100% of instances, it is followed by even more violent regrowth of scar tissue. For individuals with modest or single site lesions, this has been proposed as a successful treatment [6]. In several trials, individuals with keloid and hypertrophic scars had excision and an immediate wound edge corticosteroid injection, followed by a routine corticosteroid injection [8].

The aim of the study was to study the effect of surgical excision and subdermal injection of Triamcinolone Acetonide (TA) for treatment of Keloid scars after CS.

PATIENTS AND METHODS

This prospective comparative study included 186 female patients with keloid scars after CS through the

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period from March 2024 to January 2025 at Menoufia University Hospital and Itay El Baroud General Hospital.

Inclusion criteria: Pregnant patients at the time of recruitment and planned CS for the current pregnancy between 18 and 45 years old.
Exclusion criteria: Being primi gravida, having a previous CS with no keloid scar, refusal to participate, hypersensitivity to the drug and other abdominal scars.

Grouping: Patients divided into 2 equal groups: **Group I (n=93)** received surgical excision and subdermal injection of TA**, Group II (n=93):** received only surgical excision of the keloid.

All patients were subjected to demographic data {age, weight, height & body mass index (BMI)}, previous past medical history including number of previous CSs and family history of keloid scars and gestational age at the time of baseline assessment that a subjective symptom score was graded by the patient for pruritus, pain and swelling on a 3-point scale (0=none, 1=occasionally, 2=all the time). The scar was photographed and measured using a ruler for length and width in millimeters. Also, elevation, hardness and erythema were graded by the assessor on a 3-point scale).

Depression, Anxiety and Stress Scale-21 (DASS-21), which is a shortened version of the DASS-42 questionnaire. It consisted of three self-report measures intended to assess anxiety, sadness, and stress during pregnancy and after childbirth. Each of the three DASS-21 scales includes seven items. The depression scale measured dysphoria, despair, life appraisal, self-deprecation, a lack of interest/involvement, and lethargy. For depression, normal (0-9), mild (10-13), moderate (14-20), severe (21-27) and extremely severe (> 28). For anxiety, normal (0-7), mild (8-9), moderate (10-14), severe (15-19) and extremely severe (> 20). For stress normal (0-14), mild (15-18), moderate (19-25), severe (26-33) and extremely severe (+34) [9].

The keloid scar was surgically removed from the control group at the start of the process when the skin was cut. Regular wound closure was carried out in compliance with the following National Institute for Health and Care Excellence standards after the baby was born normally: Using continuous sutures with 1-Vicryl (Johnson & Johnson), the uterus was closed in two layers, and then the rectus sheath was closed. Two centimeters apart, interrupted simple gut sutures were used to seal the fat layer. 3-0 Proline was then used subcutaneously to seal the skin layer. Following baby birth, the keloid scar was surgically removed from the intervention group. As previously mentioned, the rectus sheath, the fat layer, and the uterine layers have all been closed.

A subcutaneous injection of triamcinolone acetone was administered. A single dosage of TA was given in two ampules, each containing 10 mg/1 ml of active drug. A 25 G needle was used to inject one ampule along the whole length of the scar's top edge and another along the entire length of its bottom edge. One week after giving birth, a follow-up was conducted to evaluate any possible infection, treatment-related local problems, and any acute adverse drug reactions. The patients were then seen for their sixth week postpartum check up at the hospital's women's health clinic. Up to the sixth month after giving birth, the follow-up was done every month. The scar was photographed once again for the results in the follow-up.

Outcome:

- Primary outcome included evaluation of keloid alterations, as well as adverse effects after medicine injection.
- Secondary outcome included assessment of the physiological and social problems (depression & anxiety) and participants' satisfaction.

Ethical approval: The patients gave their signed informed permissions. The Ethics Committee of Menoufia University's Faculty of Medicine gave its clearance for the study. Throughout its implementation, the study complied with the Helsinki Declaration.

Statistical analysis

SPSS version 26.0 was used for the statistical analysis. The mean ± SD of the quantitative variables were shown, and the unpaired Student's t-test was used to compare the two groups. When applicable, the X^2-test or Fisher's exact test was used to examine the qualitative variables, which were shown as frequency and percentage (%). Statistical significance was defined as a two-tail P value ≤ 0.05.

RESULTS

Age, sex, weight, height, BMI, number of previous CSs and family history of keloid scars were insignificantly different between both groups (Table 1).

Table (1): Demographic data of the studied groups

		Group 1 (n=93)	Group 2 (n=93)	P value
Age (years)	**Mean ± SD**	31.56 ± 4.75	32.69 ± 4.77	0.530
	Range	20 - 40	21 - 43	
Weight (kg)	**Mean ± SD**	75.3 ± 8.92	76.1 ± 10.44	0.577
	Range	60 - 90	59 - 92	
Height (m)	**Mean ± SD**	167.53 ± 4.89	168.62 ± 6.05	0.176
	Range	159 - 177	158 - 179	
BMI (kg/m^2)	**Mean ± SD**	26.91 ± 3.6	27.02 ± 4	0.843
	Range	19.5 - 34.8	19.9 - 36.4	
Number of previous CSs	**1**	3 (3.23%)	2 (2.15%)	0.428
	2	82 (88.17%)	81 (87.1%)	
	3	8 (8.6%)	10 (10.75%)	
Family history of keloid scars		17 (18.28%)	19 (20.43%)	0.711

***:** Significant.

DASS (depression & anxiety) was insignificantly different at baseline, 1 month, 2 months, 3 months, 4 months, 5 months and 6 months between both groups. DASS (depression & anxiety) was significantly lower at 1 month, 2 months, 3 months, 4 months, 5 months and 6 months than baseline in group 1 and group 2 (P value<0.001) (Table 2).

Table (2): DASS (depression & anxiety) of the studied groups

		Group I (n=93)	Group II (n=93)	P value
Depression	**Baseline**	18.57±1.22	18.71±1.64	0.510
	1 month	17.53±1.5	17.71±1.86	0.462
	P^	**<0.001***	**<0.001***	--
	2 months	15.81±1.71	16±1.76	0.448
	P^	**<0.001***	**<0.001***	--
	3 months	12.35±1.74	12.55±2.56	0.548
	P^	**<0.001***	**<0.001***	--
	4 months	9.94±1.81	10.24±2.43	0.340
	P^	**<0.001***	**<0.001***	--
	5 months	7.27±1.79	7.78±2.25	0.085
	P^	**<0.001***	**<0.001***	--
	6 months	4.15±2.06	4.74±2.26	0.064
	P^	**<0.001***	**<0.001***	--
Anxiety	**Baseline**	17.34±1.43	17.51±1.1	0.389
	1 month	16.75±1.5	16.88±1.4	0.545
	P^	**<0.001***	**<0.001***	**--**
	2 months	14.88±1.64	15.3±2.02	0.121
	P^	**<0.001***	**<0.001***	**--**
	3 months	11.32±1.9	11.78±2.29	0.136
	P^	**<0.001***	**<0.001***	**--**
	4 months	9.91±1.54	10.15±2.27	0.407
	P^	**<0.001***	**<0.001***	**--**
	5 months	6.99±1.64	7.26±2.15	0.338
	P^	**<0.001***	**<0.001***	**--**
	6 months	4.43±2.09	5.02±2.27	0.066
	P^	**<0.001***	**<0.001***	0.389

***:** Significant, **P^:** P value compared to baseline.

Objective signs and subjective symptoms were insignificantly different at baseline, 1 month, 5 months and 6 months between both groups and were significantly lower at 2 months, 3 months and 4 months in group 1 than group 2 (P value<0.05). Objective signs and subjective symptoms were significantly lower at 1 month, 2 months, 3 months, 4 months, 5 months and 6 months than baseline in group 1 and group 2 (P value<0.001) (Table 3).

Table (3): Objective signs and subjective symptoms of the studied groups

		Group I (n=93)	Group II (n=93)	P value
Objective signs	**Baseline**	1.65±0.48	1.69±0.47	0.536
	1 month	1.09±0.62	1.15±0.77	0.528
	P^	**<0.001***	**<0.001***	**--**
	2 months	0.6±0.63	0.85±0.83	**0.023***
	P^	**<0.001***	**<0.001***	**--**
	3 months	0.38±0.57	0.6±0.74	**0.021***
	P^	**<0.001***	**<0.001***	
	4 months	0.25±0.48	0.45±0.63	**0.014***
	P^	**<0.001***	**<0.001***	
	5 months	0.16±0.42	0.27±0.49	0.112
	P^	**<0.001***	**<0.001***	
	6 months	0.1±0.3	0.15±0.39	0.291
	P^	**<0.001***	**<0.001***	
Subjective symptoms	**Baseline**	1.54±0.5	1.62±0.49	0.237
	1 month	1±0.75	1.18±0.75	0.099
	P^	**<0.001***	<0.001*	
	2 months	0.53±0.58	0.81±0.76	**0.005***
	P^	**<0.001***	**<0.001***	
	3 months	0.26±0.46	0.6±0.71	**<0.001***
	P^	**<0.001***	**<0.001***	
	4 months	0.17±0.38	0.33±0.6	**0.029***
	P^	**<0.001***	**<0.001***	
	5 months	0.1±0.3	0.15±0.36	0.268
	P^	**<0.001***	**<0.001***	
	6 months	0.05±0.23	0.11±0.31	0.180
	P^	**<0.001***	**<0.001***	

***:** Significant, **P^:** P value compared to baseline. Objective signs: Including redness, hardness, elevation and Subjective symptoms: Including pruritus, pain and swelling.

Infection, skin atrophy and hyperpigmentation were insignificantly different between both groups. Recurrence rate of keloid scar was significantly lower in group 1 than in group 2 (P value < 0.001). Patient satisfaction was significantly different between both groups (P value=0.022) (Table 4).

Table (4): Side effect, recurrence rate of keloid scar and patient satisfaction of the studied groups

			Group 1 (n=93)	Group 2 (n=93)	P value
Side effect	**Infection**		4 (4.3%)	2 (2.15%)	0.682
	Skin atrophy		3 (3.23%)	0 (0%)	0.246
	Hyperpigmentation		4 (4.3%)	1 (1.08%)	0.368
Recurrence rate of keloid scar	**Recurrence rate of keloid scar**		21 (22.58%)	85 (91.4%)	**<0.001***
	Patient satisfaction	**Very dissatisfied**	0 (0%)	0 (0%)	**0.022***
		Dissatisfied	0 (0%)	3 (3.23%)	
		Neutral	3 (3.23%)	7 (7.53%)	
		Satisfied	35 (37.63%)	52 (55.91%)	
		Very satisfied	55 (59.14%)	31 (33.33%)	

*: Significant.

Figure (1) showed the TA injection, and figure (2) showed surgical removal of keloid CS scar only without TA injection.

Figure (1): (A) before, (B) after TA injection.

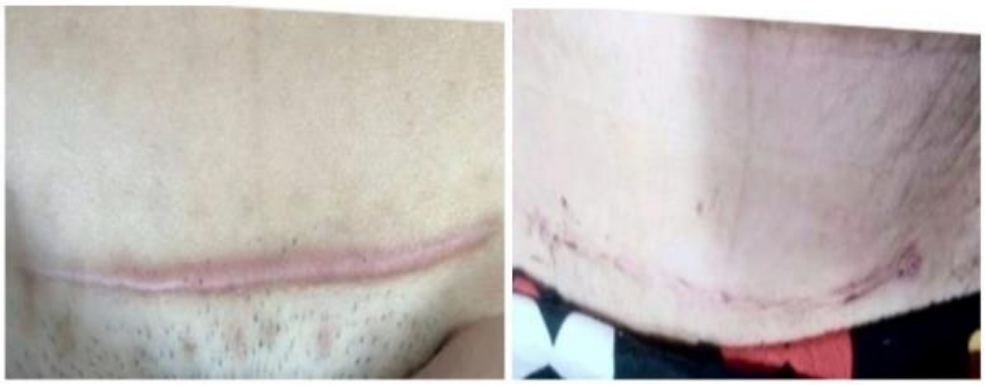

Figure (2): (A, B) surgical removal of keloid CS scar only without TA injection.

DISCUSSION

One of the most frequent operations done on women is CS. Predisposed individuals may get keloids after CS [10]. Pathological scars known as keloids are brought on by excessive collagen deposition in the dermis as a result of ongoing inflammation. The fibrinogen that is overproduced by collagen throughout the healing process is what gives keloids their elevated, rigid scars [11, 12]. The best and most common therapy for mature keloids is intralesional TA injection. With differing outcomes, TA, a synthetic corticosteroid, has been administered either by itself or in conjunction with radiation, pressure, or surgery. Recurrence rates for resected keloids alone range from 45% to 100%, however when postoperative TA injection is added, the percentage drops to less than 50% [13].

In our study, DASS (depression) and DASS (anxiety) were insignificantly different at baseline, 1 month, 2 months, 3 months, 4 months, 5 months and 6 months between both groups. DASS (depression) and DASS (anxiety) were significantly lower at 1 month, 2 months, 3 months, 4 months, 5 months and 6 months than baseline in group 1 and group 2.

In the present study, objective signs that included redness, hardness and elevation and subjective symptoms including pruritus, pain and swelling were insignificantly different at baseline, 1 month, 5 months and 6 months between both groups and were significantly lower at 2 months, 3 months and 4 months in group 1 than in group 2. Objective signs and subjective symptoms were significantly lower at 1 month, 2 months, 3 months, 4 months, 5 months and 6 months than baseline in group 1 and group 2. Supporting our findings, **El-Talhawi *et al.*** [14] reported that 3 months following the third treatment, the Vancouver scar evaluation scale showed a substantial statistical decrease as compared to the baseline and following each injection session. In terms of symptoms, they observed that at the conclusion of follow-up, the majority of their patients who complained of pain and itching said that Triamcinolone significantly reduced their discomfort and itching.

In the current study, infection, skin atrophy and hyperpigmentation were insignificantly different between both groups. Comparable with our findings, **Chua *et al.*** [6] reported that no side effects were detected with ITA injections, which supports the hypothesis that ITA treatment can be a low risk intervention to treat CS keloid lesions. The nil rate of reported side effects could be because ITA generally has a local effect only, and the procedure can be carried out at the time of the subsequent CS.

In the present study, the recurrence rate of keloid scar was significantly lower in group 1 than in group 2. Patient satisfaction was significantly higher in group 1 than in group 2. Supporting our findings, **El-Talhawi *et al.*** [14] found that after the final follow-up of Triamcinolone injection, no recurrence was recorded. Comparable with our findings, **Chua *et al.*** [6] reported that most patients (86%) had a high level of treatment satisfaction: 86% reported that the treatment was worthwhile and 93% stated they would recommend the

treatment to others, which indicates their trust in the success of the ITA treatment. Also, **Walsh *et al.* [15]** performed an evidence-based systematic evaluation of current developments in keloid treatment. They stated that intralesional corticosteroid therapy resulted in a unanimous clinical improvement in keloids. However, there were differences in the extent of improvement and how it related to treatment features including injection time, frequency, and dose. In a study conducted by **Gomaa *et al.* [16],** they demonstrated statistically significant improvement in triamcinolone injected scars which support our findings. Moreover, **Berman *et al.* [13]** conducted a study and concluded that with a 6-month follow-up, immediate TA injection following keloid excision proved a safe and successful method for treating auricular keloids. Its benefits include a reduced recurrence rate than the delayed TA injection group and no problems. At the final follow-up, both groups had similar Vancouver Scar Scale (VSS) and pliability and the Observer Scar Assessment Scale (POSAS) ratings. The immediate TA injection group had greater VSS height and POSAS thickness scores in the first several months. Another research, carried out by **Khalid *et al.* [17]** concluded that excision and intralesional 5-FU/TAC is an effective therapy for keloids on the ears with higher frequency of efficacy and beneficial for our local population compared to radiotherapy. These results are in line with studies in other specialties, when ITA was associated with the highest scores for aesthetics and overall satisfaction. [18]

LIMITATIONS

The study's limitations included a single center design that might lead to different outcomes than those found elsewhere, a limited sample size that could provide negligible results, and the failure to assess the effects of various medications in various combinations on Keloids scars to determine whether Triamcinolone was safer than Triamcinolone alone.

CONCLUSION

Subdermal injection of TA in combination with surgical excision is more effective than surgical excision alone for the treatment of keloid scars following CS. While both groups showed significant reductions in DASS (depression and anxiety) scores over time, patients received TA experienced more significant improvements in objective signs and subjective symptoms. Therefore, this study recommended to subdermal injection of TA in combination with surgical excision as an effective treatment of keloid scars following CS. Further studies in other centers to compare findings and with large sample size to produce significant results, in order to make triamcinolone safer than triamcinolone alone and to determine the ideal time for TA injection following keloid excision. Additional research including various medications in various combinations on keloids scars is required.

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