

## **Buried De-Epithelialised Island Subcutaneous Pedicle Flap with All-Through Dermis-to-Dermis Contact for the Management of Trap-Door Facial Scars: A Clinical Study on 12 Consecutive Patients**

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### **ABSTRACT**

The trap-door deformity is defined as an aesthetically unpleasing bulge of tissue among a curvilinear scar that is frequently encountered following facial procedures. Undrained lymphatic fluid due to scar contracture stands to be its main pathogenesis. The standard procedure for correction of the deformity is in the form of multiple small z-plasty revision of the scar. Based on many unsatisfactory reports, this study was designed to investigate an alternative approach to the deformity that consisted of a buried de-epithelialised island subcutaneous pedicle flap. For this purpose, 12 consecutive patients (5 females and 7 males) seeking revision for established trap-door facial scars of different aetiologies (8 post-traumatic, 2 post-surgical and 2 post-reconstructive) were enrolled in a prospective clinical study. The mean age was 22 years and the mean time of presentation from the primary procedure was 18 months. Evaluation was done through comparing pre-operative and post-operative patients' photographs at 4- and 12-weeks. The overall outcome revealed complete resolution of the deformity in 10 (83.33%) versus relapse in 2 (16.66%) patients. These data suggest that the described procedure can be considered as a reliable, versatile and easily reproducible approach to trap-door facial scars. Compared to z-plasty, the procedure is assumed to provide superior results with lower incidence of relapse presumably by more specific targeting of tissue lymphedema, without the addition of new facial scars. Accordingly, it should be introduced as a valuable alternative surgical modality to standard z-plasty revision for trap-door facial scars.

### **INTRODUCTION**

Trap-door (pin-cushion) scars constitute a common aesthetically unpleasing soft tissue deformity following facial trauma, surgery and flaps. Such deformity is classically described as variable degrees of asymmetry resulting from an elevated and redundant tissue abutting a curvilinear c-shaped, u-shaped, or v-shaped scar [1,2]. Several theories have been advocated for the pathogenesis of the deformity although lymphstasis due to fibrosis and scar contracture stands to be the most widely accepted hypothesis [2-5].

The standard surgical procedure for an established trap-door deformity consists of multiple

small z-plasties within the semicircular confines of the scar. The aim is obviously to release scar contracture and thus to resolve the deformity by promoting lymphatic drainage from the bulging tissue that may be concomitantly debulked in marked asymmetry [2,6,7]. However, the results of z-plasty revision with or without tissue debulking are often unsatisfactory. Therefore, the objective of the present study was to present and evaluate an alternative surgical approach to the deformity that consisted of a buried de-epithelialised island subcutaneous pedicle flap.

### **PATIENTS AND METHODS**

The study was conducted in the Plastic and Reconstructive Surgery Department at Ain Shams University throughout the period from April 2007 to April 2008 and included 12 consecutive patients seeking advice for established trap-door facial scars. The aim was to present and evaluate surgical revision of the deformity by means of a buried de-epithelialised island subcutaneous pedicle flap. Subjects enrolled were 5 females and 7 males having ages ranging from 14 to 46 with a mean of 22 years. The deformity was post-traumatic in 8, post-surgical in 2 and post-reconstructive in the 2 patients. The time of presentation from the primary procedure ranged from 6 months to 4 years with a mean of 18 months. A written consent and pre-operative photographs were obtained from all subjects prior to submission for the study.

Subjects enrolled were operated upon by the same surgical technique that consisted of a buried de-epithelialised island subcutaneous pedicle flap. Initially, a segment of the bulging tissue adjacent to the scar and ranging from 5 to 10mm depending on the extent of the deformity is de-epithelialised (Fig. 1B). Thereafter, subdermal and subcutaneous

dissection is performed to harvest the bulging tissue as an island subcutaneous pedicle flap. This is followed by subdermal dissection on the contralateral side of the scar in order to create enough pocket for the flap, which is then buried in such a way that enables dermis-to-dermis contact within the pocket and at the suture line (Fig. 1C,D). The buried flap is then fixed with 2-3 interrupted subcutaneous absorbable 5.0 sutures [Monocryl, Ethicon®, Johnson and Johnson Intl., USA]. Final

closure is achieved with a double layer of interrupted and continuous intradermal absorbable 5.0 sutures [Monocryl, Ethicon®, Johnson and Johnson Intl., USA]. The suture line is then secured with sterile adhesive strips [Steri-Strip™, 3M Health Care, USA] for 10-14 days. Evaluation of the outcome was done through comparing post-operative patients' photographs at 4-weeks and 12-weeks with those taken prior to surgery. Data were collected and statistically analysed.

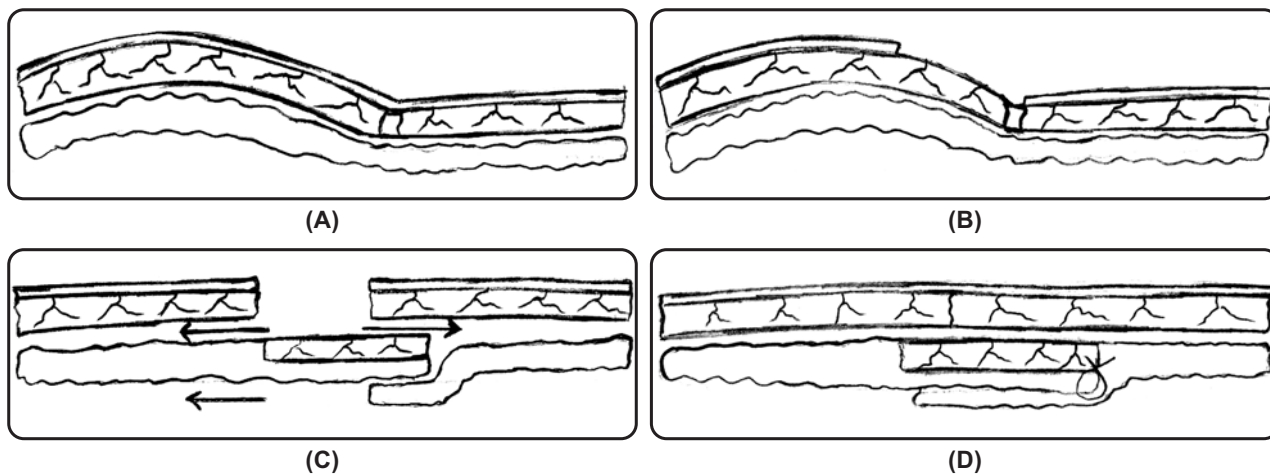


Fig. (1): (A): The deformity. (B): De-epithelialisation of a segment (5-10mm). (C): Elevation of the bulging tissue as an island subcutaneous pedicle flap and pocket creation. (D): Insetting the flap and final closure with dermis-to-dermis contact within the pocket and suture line.

**RESULTS**

Twelve consecutive patients (5 females and 7 males) seeking revision for established trap-door facial scars were enrolled in a prospective clinical study that was conducted in the Plastic and Reconstructive Surgery Department at Ain Shams University from April 2007 to April 2008. The objective was to evaluate a surgical approach that consisted of a buried de-epithelialised island subcutaneous pedicle flap. The mean age of patients was 22 years and the mean time of presentation was 18 months. Fig. (2) and Table (1) respectively illustrate the aetiology and anatomical localisation of the deformity among enrolled subjects.

Preliminary assessment of the procedure revealed uneventful healing in all subjects. Assessment of the outcome at 4-weeks revealed complete resolution of the deformity in 11 subjects (91.66%) and relapse in one case of cheek trauma (8.33%). Re-assessment at 12-weeks revealed relapse in a case of rhomboid flap (8.33%). This makes the overall outcome a cure rate of 83.33% and a relapse rate of 16.66%. These data are summarised in Figs. (3-6) illustrate pre- and postoperative photographs of patients treated with the procedure.

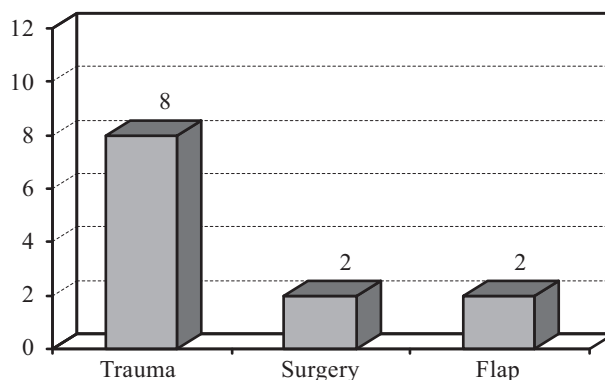


Fig. (2): Aetiology of trap-door deformity in 12 subjects.

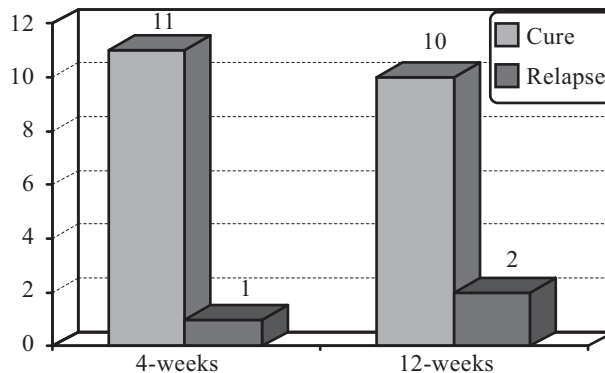


Fig. (3): Cure and relapse rates at 4- and 12-weeks in 12 subjects.



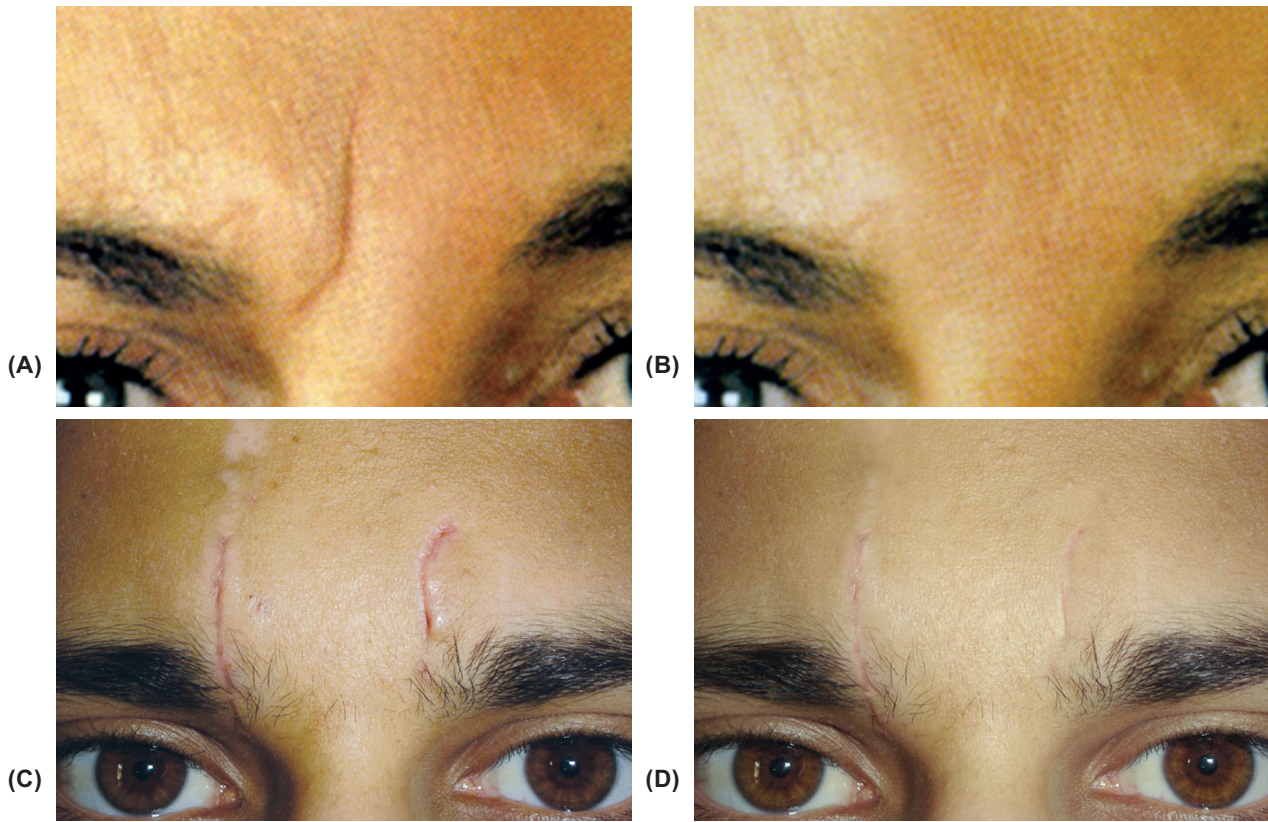


Fig. (4): (A) and (C): Post-traumatic trap-door forehead scars. (B) and (D): 12-weeks postoperative appearance with complete resolution of the deformity.

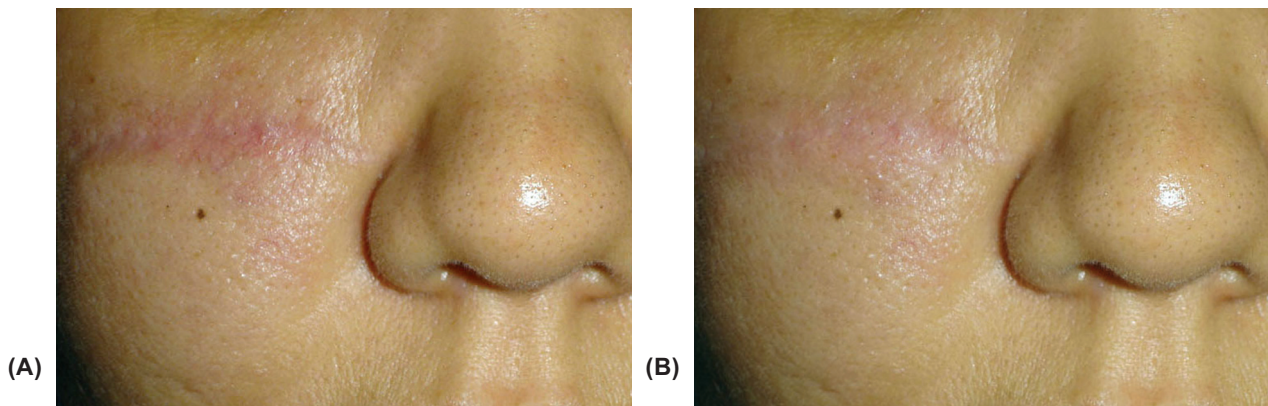


Fig. (5): (A): Post-traumatic trap-door cheek scar. (B): 12-weeks postoperative appearance with complete resolution of the deformity.

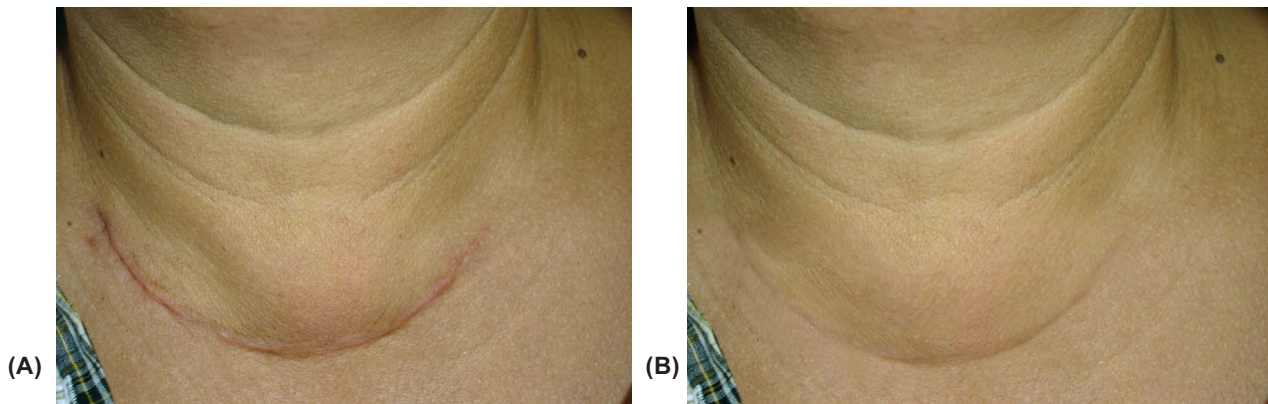


Fig. (6): (A): Post-surgical trap-door neck scar. (B): 12-weeks postoperative appearance with complete resolution of the deformity.

Table (1): Anatomical localisation and distribution of trap-door deformity in 12 subjects.

Aetiology	Site	Number	Percent (%)
Trauma	Forehead	3	25
	Cheek	4	33.3
	Neck	1	8.3
Surgery	Neck (Thyroid)	1	8.3
	Neck (Mandible)	1	8.3
Flap	Cheek (Rhomboid)	1	8.3
	Cheek (Nasolabial)	1	8.3

## DISCUSSION

The bulge of tissue among a curvilinear scar (trap-door deformity) is not invariably unsightly as it may give the near-natural rounded contour that is considered desirable for the reconstruction of particular aesthetic facial sub-units such as the nasal ala, nasal lobule and ear concha [8-10]. Otherwise, the deformity commonly poses an obvious controversy among aesthetic surgeons as concerns its pathogenesis, prevention and proper management. Although there exist no confirmed measures to avoid trap-door deformity, yet it can be significantly lessened by extending undermining at the recipient site of facial flaps [2].

An early deformity that becomes evident prior to scar maturation may resolve or partially improve under conservative modalities including massage, pressure, silicon (gel or sheeting) and triamcinolone acetonide (topical or intra-lesional). All these measures, either alone or in combination, are intended to achieve a sort of "physical" or "pharmacologic" z-plasty that would help to reduce scar contracture and thereby improve the deformity by promoting lymphatic drainage [2,11,12]. Mild established deformities that commonly result from bevelled injuries can significantly improve by resurfacing the confines of the scar with dermabrasion [13].

For more marked deformities, undergoing multiple small z-plasties that aim to reduce scar contracture and thereby lymphstasis has been mentioned as the procedure of choice in many clinical reports [2,6,7]. However, besides its inherent drawback in adding more facial scars, the outcome of z-plasty has often been deceiving due to frequently encountered relapse and residual deformity. These unsatisfactory results were thoroughly investigated in a study by Warren and Slavin in 2007 that aimed to trace lymphatic flow across z-plasty for trap-

door scars. By means of radiocolloid lymphoscintigraphy using technetium-99m, there was no evidence of lymphatic channels traversing or bridging the z-plasty flaps. Therefore, the study clearly demonstrated that impaired lymphatic drainage continues to be the main contributor to the pathogenesis of trap-door deformity. Furthermore, it was also concluded that as lymphatics do not re-establish themselves across scars, then attempts at improving lymphatic flow with z-plasty might not succeed in patients with established trap-door scars [14].

Based on these findings, there was obviously the need for an alternative surgical modality that would enable to achieve better approach to the issue of lymphstasis in trap-door deformity. Therefore, the present study was designed to prospectively evaluate revision of trap-door facial scars by means of a buried de-epithelialised island subcutaneous pedicle flap. Twelve consecutive patients with established trap-door facial scars of different aetiologies (post-traumatic, post-surgical, post-reconstructive) were enrolled. Results were promising with an overall cure rate of 83.33% versus a relapse rate of 16.66%. Although the island subcutaneous pedicle flap has gained much popularity in primary and secondary reconstructive facial procedures, yet there exist no previous reports on its use for the revision of trap-door deformity. The data obtained in this study suggest preliminary superior results to what has been formerly mentioned on the surgical correction of the deformity including standard z-plasty revision [2,6,14]. This may be explained by the fact that the bulging tissue is buried in a subdermal pocket rather than excised. In this way, the deformity is addressed by tissue re-distribution instead of debulking that is often coupled with z-plasty and has been condemned to worsen the deformity by inducing more scarring and thus further lymphedema [3]. Moreover, the dermis-to-dermis contact that is made in the pocket is designated to promote lymphatic drainage by potential bridging and cross-linking of micro-lymphatic channels. Similarly, it is possible that the reduced scar contracture by virtue of double dermal support at the suture line might give a reasonable explanation for the maintained lymphatic drainage and consequently the low incidence of relapse. However, further research on the impact of the procedure on micro-lymphatic flow is eventually required in order to provide better understanding of its improved clinical outcome.

In conclusion, the buried de-epithelialised island subcutaneous pedicle flap for the surgical revision of established trap-door facial scars proved to be



reliable, versatile and easily reproducible. In contrast to the standard z-plasty, the procedure does not entail the addition of new scars and its obviously superior and more lasting results are probably attributed to better handling of lymphstasis. Accordingly, it should be introduced as a valuable alternative surgical modality to z-plasty revision in the armamentarium of management of trap-door facial scars.

### REFERENCES

- 1- Ausin A.: The trap-door scar deformity. *Clin. Plast. Surg.*, 4 (2): 255-61, 1977.
- 2- Koranda F.C. & Webster R.C.: Trapdoor effect in nasolabial flaps. Causes and corrections. *Arch. Otolaryngol. Head Neck Surg.*, 111 (7): 421-26, 1985.
- 3- Hosokawa K., Susuki T., Kikui T., Masada Y. and Hashimoto H.: Sheet of scar causes trapdoor deformity: A hypothesis. *Ann. Plast. Surg.*, 25 (2): 134-5, 1990.
- 4- Withey S., Pracy P., Vaz F. and Rhys-Evans P.: Sensory deprivation as a consequence of severe head and neck lymphedema. *J. Laryngol. Otol.*, 115 (3): 62-64, 2001.
- 5- Clodius L.: Lymphoedema common sense. *European J. Plast. Surg.*, 25 (2): 66-80, 2002.
- 6- Webster R.C., Benjamin B.J. and Smith R.C.: Treatment of trapdoor scar deformity. *J. Aesthetic Plast. Surg.*, 17 (1): 67-71, 1993.
- 7- Aya H., Hisao S., Masakatsu F., Masayuki K., Teru Y., Akio T., Munenori K., Yuko H. and Hideaki S.: Two cases which were operated by z-plasty against scar tissue of head and neck. *J. Meikai Univ. Sch. Dent.*, 31 (1): 144-148, 2002.
- 8- Baker S.: Major nasal reconstruction. In: Papel I.D., Frodel J. (ed.). *Facial plastic and reconstructive surgery*. New York: Thieme, p. 602, 2002.
- 9- Dolan R.W.: Facial and skin surface analysis. In: Dolan D., Dolan R.W. (ed.). *Facial plastic, reconstructive and trauma surgery*. New York: informa Health Care, p. 21, 2003.
- 10- Lynch J., Mahajan L. and Regan P.: The trapdoor flap for reconstructing defects of the concha. *British J. Plast. Surg.*, 56 (7): 709-711, 2003.
- 11- Lee S.E., Burm J.S., Chung C.H. and Oh S.J.: Silicon Thermoplastic Splinting (Silon-STS) for problem scars. *J. Korean Soc. Aesthetic Plast. Surg.*, 5 (2): 252-257, 1999.
- 12- Szolnoky G., Mohos G., Dobozy A. and Kemeny L.: Manual lymph drainage reduces trapdoor effect in subcutaneous island pedicle flaps. *Internat. J. Dermatol.*, 45 (12): 1468-1470, 2006.
- 13- Ilteris M.E.: Effect of Dermasanding (Manual Dermabrasion) with sandpaper on the appearance of postsurgical and burn scars. *J. Aesthetic Plast. Surg.*, 31 (5): 608-611, 2007.
- 14- Warren A.G. and Slavin S.A.: Scar Lymphedema: Fact or Fiction?. *Ann. Plast. Surg.*, 59 (1): 41-45, 2007.