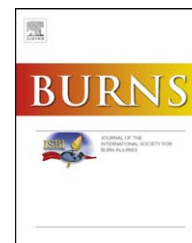


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Management of burn deformities using tissue expanders: A retrospective comparative analysis between tissue expansion in limb and non-limb sites

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ABSTRACT

The tissue expansion technique is in the armamentaria in reconstructive surgery. It provides donor skin that is an optimal match in terms of skin color, texture, sensation and hair-bearing characteristics. Literature shows its applications in all regions from the head to the feet. Tissue expansion in extremities, however, carries a high rate of complications. Fortunately, not every complication in tissue expansion means failure.

Objective: A retrospective comparative analysis between tissue expansion in limb and non-limb sites in burn deformities.

Materials and methods: Sixty expanders in 53 patients were included. These constitute the experience of a single surgeon. Forty expanders (66.6%) were applied to non-limb sites and 20 expanders (33.3%) to limb sites. Indications of tissue expansion were burn alopecia, scarring and contracture. Complications and failures were recorded.

Results: Non-limb expanders had 10% rate of complications and 2.5% of failure. Limb expanders showed 30% complications and 15% failure. Statistical analysis showed that the difference was non-significant at this statistical power.

Conclusion: The non-significant difference regarding complication and failure rates between limb and non-limb expanders in this study encourages the use of tissue expanders in extremities. Close follow-up of patients will prevent many expanders that develop complications from becoming failures.

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1. Introduction

Neumann [1] was the first to describe the use of a subcutaneous implant to reconstruct an external ear deformity. However, Radovan [2] was the first to gain extensive clinical experience with the tissue expansion technique. The technique was rapidly and widely applied to create new dimensions in reconstructive surgery [3–9].

Tissue expansion is based on the observation that all living tissues respond in a dynamic fashion to mechanical stresses placed on them [10]. The increase in skin surface area over the expander includes normal skin brought in from adjacent

areas, as well as new skin generated by increased mitosis [11]. Agris [12] wrote, “we are not just expanding, but creating new tissue”.

Tissue expansion provides donor skin that is optimal match in terms of skin color, texture, sensation and hair-bearing characteristics. Literature showed that the tissue expansion technique was used in almost all areas of the body from scalp to feet. It has achieved its most notable successes in the areas of breast and scalp reconstruction [2,4,5,13].

Tissue expansion in the extremities is associated with a high rate of complications [6,14–25]. A review of the literature showed that there is no previous study comparing tissue

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expansions used to manage post burn deformities in limb and non-limb sites. Pandya et al. [25] performed a comparative analysis study between the use of tissue expansion in limb and non-limb sites to manage various types of deformities.

The aim of this study is to provide a retrospective comparative analysis between limb and non-limb tissue expanders used for the management of post burn deformities.

2. Patients and methods

This retrospective study included the author's experience with 60 expanders in 53 patients who presented with burn deformities from May 2006 to May 2010. The frequency of various sites for application of tissue expanders is shown in Table 1. Indications for tissue expansions were the need to manage post burn scarring and contracture in 38 patients and post burn alopecia in 15 patients. One of the cases of scalp expansion was for creation of flap for post-burn beard reconstruction and not for management of post burn alopecia.

All patients underwent surgery with endo-tracheal, general anesthesia. The surgical procedures differed according to the site of application. For the scalp, the subgaleal plane was used and remote incisions were made, perpendicular to the long axis of the pocket of the expander. For the remaining areas of the body the subcutaneous or subfascial planes were used. Incisions in non-hair bearing sites were put in areas that would be discarded with the scar tissue after advancement of the flaps, or in inconspicuous areas. Ten percent of the expander volume was injected intra-operatively. After a two-week lag period, inflation of the expanders, using normal saline fluids, began. The frequency of injection was once a week. The injected amount depended on the tightening of the skin, the blanching, the pain and the presence of the sharp edge of the expander pushing on the overlying skin. Whenever there was evidence of the sharp edge of the expander pushing on the skin, the expansion was very slow until smoothing of the sharp edge occurred. Afterwards, expansion was fast. Every time, before the injection of normal saline, adequate disinfection of the site of injection was performed. While removing the injecting needle, any turbid fluid coming out of the puncture site at the skin was observed; this indicated the presence of infection. In all cases with infection, there were exteriorizations of the buried ports to drain infection from the pocket connecting the port to the expander [26]. Over-inflation



Fig. 1 – (a) Two tissue expanders were applied to manage post burn alopecia in the scalp and post burn scar in the face of 19 year old female patient. (b) The result after delivery of the two tissue expanders and advancement of the flaps.

Table 1 – Sites for application of the expanders.

Site	Number of patient	Number of expanders
Scalp	16	18
Face	1	1
Neck	11	13
Back	3	3
Abdomen	5	5
Thigh	4	5
Leg	1	2
Arm	8	9
Forarm	3	3
Hand	1	1
Total sites	53	60

of the expanders was the routine, except if the expanded amount was enough or if late exposure developed, necessitating immediate delivery. After full expansion, the expander remained two weeks without further inflation before delivery. Figs. 1a and 2a show expanders applied to the scalp, the face and the arm to manage post burn alopecia, scarring and contracture, respectively.

Whereas complications in this study meant problems in the postoperative course that threatened the achievement of all or part of preoperative plan, failure meant problems in the postoperative course that prevented the achievement of any of the preoperative plan.

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