# Pros and Cons of Skin Expansion In the Limbs

**Thesis**

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# ***ABSTRACT***

The incision for the insertion of the expanders were placed 1cm from the margin of the scar on the scar side in stable tissue that is expected to heal, The level of dissection was always subcutaneous and over the deep fascia of the underlying muscles. Suction drains and prophylactic antibiotics were routinely used.

KEY WORESD

Pros _sikin_ limbs

# LIST OF Contents

# LIST OF Tables

# LIST OF Photos

# LIST OF Figures

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# Aim of Work

The aim of this study is to evaluate and to refine the use of Tissue Expanders in Both upper and lower limbs and to detect the best types and sites of skin incisions and plane insertion for the expander and the number of expanders can be used for each case and to detect the Complication rates and to Evaluate the Cosmetic as well as the Functional benefits for each case.

# Historical Perspective:

Tissue expansion is the response of living tissue to the application of a mechanical stretching force ***(Radovan, 1984).***

The ability of human tissue to expand and stretch has been observed and documented through history. Dr.William Grapp wrote in 1982, "Heaven only knows that the principle of skin expansion has been staring us the face, the loose skin of the Abdominal wall following pregnancy and body skin following massive weight loss have been there for all to see."

***(Grapp WC 1982)***

Tissue expansion techniques have probably been used for centuries by other cultures for different aesthetic purposes. For Examples, women in Ethiopia and Chad have used progressive surgical placements of plates in their lips to stretch them to enormous sizes. ***(Weeks 1956)***

Human tissue readily adapts to the physiologic expansion without thinning of the overlying skin. If adaptation did not occur, significant functional and aesthetic deformities would result during the individual's growth phases. Although human skin is often described as an "anisotropic elastic membrane" living integumentary tissue in vivo responds to gradual stress stimuli by increasing mitotic activity to maintain its thickness and protective integrity. In a true anisotropic state the material becomes thinner as stretching proceeds, i.e. as a rubber band reduces its diameter as it elongates. In contrast, the enlarging fetal brain stretches the calvaria at suture lines to accommodate the rapid growth of the cerebral hemispheres. Nevertheless, during puberty breast tissue responds to hormonal stimuli by slowly

enlarging the overlying skin to produce the ptotic breast mound. In pregnancy the enlarging fetus and uterus stretch the abdominal and pelvic structures over 9 months to accommodate fetal growth and facilities parturition. All these tissue increase or maintain their thickness with growth.

***(Gordon Sasaki 1998).***

As early as 1905 attempts at distraction technique for bone lengthening resulted in concomitant but unrecognizable expansion of soft tissue.

***(Mater 1970)***

Neumann is credited with the first clinical report of a latex balloon to reconstruct an ear. He presented his findings to the American Society of Plastic and Reconstructive Surgeons in October 1956 and published "The expansion of an area of Skin by progressive distension of a subcutaneous balloon" in 1957. ***(Neumann 1957)***

He inserted a "collapsed rubber balloon" introduced beneath the skin of the side of the head in the region of the missing portion of the ear. A flexible polyethylene tube, through which the balloon could be inflated, was allowed to pass from the balloon via a subcutaneous tunnel. The tubing was exteriorized behind the ear, connected to a stopcock and filled gradually with air for 2 months. After expansion a 50% increase in the skin's surface area was achieved. At a second stage a cartilaginous graft was inserted and covered with the expanded bipedicle flap for a successful reconstruction. ***(Charles G. Neumann 1973)***

Radovan conceived of inserting a silicone balloon and two separate valve systems under the skin as a closed system. One valve was for filling saline and the second valve withdrew fluid. Radovan inserted his first expander in January 1976 at Georgetown University to resurface a 7x 11 cm defect on a patient's arm. This flap was expanded for only 3 weeks. A second patient had surgery 2 months later to cover an exposed fracture tibia. ***(Radovan C 1976)***

The modern area of soft tissue expansion actually began following the pioneering efforts of Dr. Chedomir Radovan who converted natural observed phenomena into an application for reconstructive surgery. ***(Manders et al., 1984).***

Dr. Eric Austad also presented his limited clinical experience with an osmotically driven, self inflating expander at the University of Michigan. Austad performed his first clinical cases and published with the self inflating expander in 1982. ***(Austad 1982)***

Following the successful clinical application of inflatable expanders for reconstruction, efforts to comprehend the biomechanical, molecular, and light microscopic properties of expanded skin have been undertaken. These research studies have now documented biochemical changes occurring in the dermis and epidermis, including a statistically significant dermal thinning and epidermal thickening. Vascular studies have revealed a microcirculation in the capsule of expanded flaps that exceeds that of the subdermal plexus. More recent investigations have emphasized the selection of suitable animal models for the study of the skin expansion process and an elucidation of the skin's intrinsic biomechanical responses of elasticity and stress relaxation.

How quickly skin can actually be expanded, and under what conditions of pressure are current subjects of intense interest ***(Slavin and Colen, 1990).***

Endoscopic expansion surgery, although recently introduced, has shown to be very beneficial. A few series are already available and document the advantages of this technique. Further improvements in the endoscopic technique associated with better instrumentation and more sophisticated devices make this approach the ideal way to perform safer expansion surgery with smaller scars and less morbidity ***(Eaves III et al., 1997).***

Tissue expansion has been used in the treatment of many patients over the last 15 years at the A.V. vishneresky institute of surgery, Moscow by endoscopic technique with low rate of complication than the traditional technique ***(Shurobora et al., 2004).***

Actual histological changes and ultrastructural information describing tissue expansion phenomenon is still scanty in comparison to the rapid increase in clinical application.

Most of information regarding the biology of tissue expansion has been delivered from animal experiments, since human tissue is difficult to obtain.

There are sporadic data in the literature about histomorphology at expanded skin and soft tissue in the human.

***(Argenta et al., 1985, Grossman et al., 1985).***

***Austad and Rose, 1982, Leighton et al., 1986*** and ***Pasky et al., 1988*** have published preliminary studies on expanded human tissue based on light and electron microscopical studies in experimental animals.

## Epidermal Changes:

Histological examination of human expanded skin thickness revealed a significant increase in epidermal thickness after expansion than before this procedure. There appeared to be no relationship between epidermal thickness and the factors of expansion time, expander volume, location of expander, or age of the patient ***(Pasyk et al., 1988 & Wang Y. et al, 2006).***

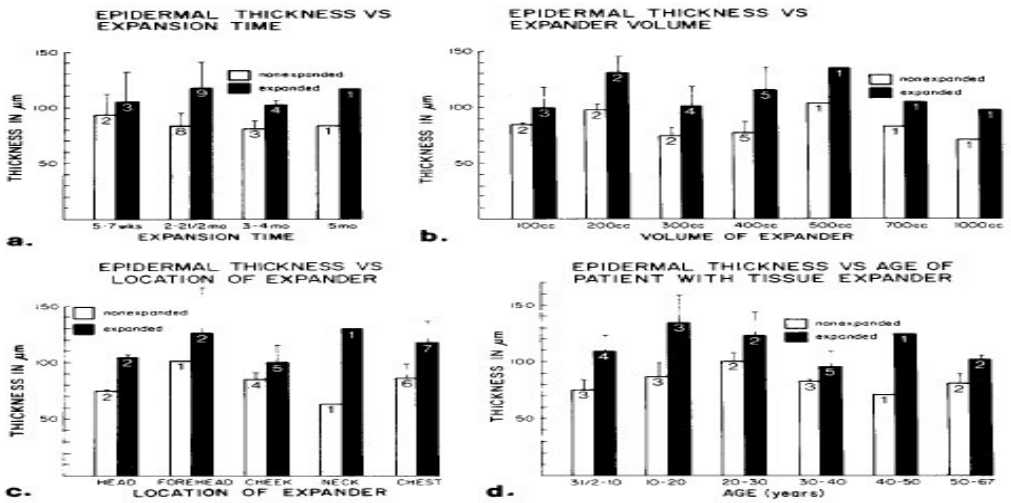


Fig ( 1 ) Thickness of the epidermis in normal and expanded skin in relation to expansion time, expander volume, location of expander and age of patients.