

Tissue Expansion in Reconstructive Surgery: A 10-Year Experience in Kosovo

Violeta Zatriqi^{1,2}, Skender Zatriqi^{1,2*}

¹Alma Mater Europaea, Campus College "Rezonanca", Pristina, Kosovo

²Surgery Clinic, University Clinical Centre of Kosovo, Pristina, Kosovo

Abstract

Background: Tissue expansion (TE) is one of the major developments in reconstructive surgery. The objective of this research was a retrospective analysis of our 10-year experience in correcting burn sequelae, traumas, and scars by the method of TE.

Methods and Results: A retrospective study was conducted at the Clinic of Plastic and Reconstructive Surgery at the University Clinical Center of Kosovo (UCCK, Prishtina) from January 2009 to December 2019. The sample included 67 patients (43[64.2%] females and 24[35.8%] males) treated with tissue expanders for reconstructive purposes. The most common indication for TE was burn sequelae, trauma, and scars from previous surgery. One hundred and thirty-five expanders were placed on 67 patients, and 128 operative interventions were performed. Burn sequelae (55.2%) were the main reason for TE. The age of patients was in the range of 0-50 years (mean age of 20.5 years). The predominant age groups were 11-20 years (49.2%) and 21-30 (40.3%). The most common anatomical region for TE was the head, including the face and neck (47.8%), followed by the trunk (22.4%), the lower extremities (16.4%), and the upper extremities (13.4%). Most patients underwent only one (61.2%) or two surgical interventions (31.3%); three surgical interventions were performed in 7.5% of cases. One expander was placed in the vast majority of our patients (83.6%), two expanders in 13.4% of cases, and three expanders in 3.0%. Patients with expanders on the head and neck experienced more major complications (12.5%), which ended with the removal of the expander, than those with expanders on the trunk (6.7%) and lower extremities (9.1%). Minor complications most often (18.2%) occurred on the lower extremities. These complications were evidenced by pain and transient ischemia, which did not preclude the attainment of reconstructive goals. Patients of 0 to 10 years of age had only minor complications. Occurrences of major complications were the most frequent in the age groups of 11-20 (9.1%), 21-30 (11.1%), and 31-40 (33.3%) years.

Conclusion: The results of our retrospective study on the efficacy of cutaneous expansion procedures are broadly in line with other research reported in the literature. Attention to different aspects of TE, including careful patient selection and meticulous attention to intervention detail, are the main conditions for the success of this reconstructive surgery. (*International Journal of Biomedicine*. 2023;13(2):269-272.)

Keywords: tissue expansion • complication • burn sequelae • scar

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Introduction

Tissue expansion (TE) is one of the major developments in reconstructive surgery. In 1956, Neumann was the first to recognize the potential of tissue expanders in this type of surgery. He placed a balloon beneath the temporal region

to reconstruct the absent ear. In 1976, Radovan developed the concept of implanted silicone balloons as expanders for breast reconstruction after mastectomy. Subsequently, TE has become a treatment method for many anomalies, as well as congenital and acquired defects in children and adults.⁽¹⁻³⁾

TE uses customized artificial implants in the tissue planes below the skin. Most tissue expanders are designed and made using inflatable balloons or osmotically active hydrogel, and the expansion rate is controlled by fluid entry or various porosities.⁽⁴⁻⁶⁾ The inflation of the implant exerts constant pressure on the skin, causing it to expand. Skin expansion

*Corresponding author: Skender Zatriqi. Alma Mater Europaea, Campus College "Rezonanca", Pristina, Kosovo. E-mail: zatriqi@yahoo.com

allows the surgeon to generate additional amounts of precious tissue, thin the flap, and increase its vascularity.^(7,8)

TE allows surgeons to close the defects using the skin around them, which has the same color, texture, and adnexal structure. This is important in the case of aesthetic face corrections when damaged skin can be replaced with the skin of identical or similar qualities to avoid using the donor skin tissue. Sensitive and hairy skin can be extended and used for specific areas of the head and face to ensure adequate reconstruction that fully meets the texture of the regions. Despite the great benefit of the TE technique, complication rates are 20% to 40% when TE is performed in children.⁽⁹⁾ Patients who have a high risk of complications should always be identified.^(10,11)

The objective of this research was a retrospective analysis of our 10-year experience in correcting burn sequelae, traumas, and scars by the method of TE.

Materials and Methods

A retrospective study was conducted at the Clinic of Plastic and Reconstructive Surgery at the University Clinical Center of Kosovo (UCCCK, Prishtina) from January 2009 to December 2019. The sample included 67 patients (43[64.2%] females and 24[35.8%] males) treated with tissue expanders for reconstructive purposes. The most common indication for TE was burn sequelae, trauma, and scars from previous surgery. The medical records and operative reports of all patients were analyzed for such characteristics as gender, age, anatomical regions, types of expanders, number of expanders applied during an operating session, complications by age group, and anatomical regions.

Results were statistically processed using Microsoft Office Excel. Baseline characteristics were summarized as frequencies and percentages. Group comparisons were performed using chi-square tests or, alternatively, Fisher’s exact test when expected cell counts were less than 5. A probability value of $P < 0.05$ was considered statistically significant.

Results

One hundred and thirty-five expanders were placed on 67 patients, and 128 operative interventions were performed. Table 1 shows that burn sequelae (55.2%) were the main reason for TE.

Table 1.
Indications for TE.

Indications	n	%
Burn sequelae	37	55.2
Trauma	14	20.9
Scar	11	16.4
Other	5	7.5
Total	67	100.0

The age of patients was in the range of 0-50 years (mean age of 20.5 years). The predominant age groups were 11-20 years (49.2%) and 21-30 (40.3%). The age groups of 0-10 years and over 40 years were the smallest (3.0% and 3.0%, respectively) (Table 2). The most common anatomical region for TE was the head, including the face and neck (47.8%), followed by the trunk (22.4%), the lower extremities (16.4%), and the upper extremities (13.4%) (Table 3). The most common type of expander applied to our patients was crescent (43.3% of the cases), followed by round (29.8%) and rectangular (26.9%) (Table 4). Most patients underwent only one (61.2%) or two surgical interventions (31.3%); three surgical interventions were performed in 7.5% of cases. One expander was placed in the vast majority of our patients (83.6%), two expanders in 13.4% of cases, and three expanders in 3.0% (Table 5).

Table 2.
The age groups.

Age (yrs)	n	%
0-10	2	3.0
11-20	33	49.2
21-30	27	40.3
31-40	3	4.5
41-50	2	3.0
Total	67	100.0

Table 3.
Anatomic region for TE.

Anatomical region	n	%
Head and Neck	32	47.8
Trunk	15	22.4
Upper extremities	9	13.4
Lower extremities	11	16.4
Total	67	100.0

Table 4.
Type of expander and number of surgical interventions.

	n	%
Type of expander		
Crescent	29	43.3
Round	20	29.8
Rectangular	18	26.9
Surgical interventions		
1	41	61.2
2	21	31.3
3	5	7.5

Table 5.**Number of expanders used in patients.**

Number of expanders	n	%
1	56	83.6
2	9	13.4
3	2	3.0
Total	67	100.0

Patients with expanders on the head and neck experienced more major complications (12.5%), which ended with the removal of the expander, than those with expanders on the trunk (6.7%) and lower extremities (9.1%) (Table 6). Minor complications most often (18.2%) occurred on the lower extremities. These complications were evidenced by pain and transient ischemia, which did not preclude the attainment of reconstructive goals. Differences between groups were not statistically significant.

Table 6.**Complications according to anatomical regions.**

Anatomical region	n (%)	Major complications n (%)	Minor complications n (%)	Total complications n (%)
Head and neck	32 (47.8)	4 (12.5)	2 (6.2)	6 (18.8)
Trunk	15 (22.4)	1 (6.7)	1 (6.7)	2 (13.3)
Upper extremities	9 (13.4)	1 (11.1)	1 (11.1)	2 (22.2)
Lower extremities	11 (16.4)	1 (9.1)	2 (18.2)	3 (27.3)
Total		7 (10.4)	6 (9.0)	13 (19.4)

Patients of 0 to 10 years of age had only minor complications. Occurrences of major complications were the most frequent in the age groups of 11-20(9.1%), 21-30(11.1%), and 31-40(33.3%) years. No complications were found in ages over 40 (Table 7). Differences between groups were not statistically significant.

Table 7.**Complications and age groups.**

Age group (yrs)	n (%)	Major complications n (%)	Minor complications n (%)	Total complications n (%)
0 – 10	2 (3.0)	0	1 (50)	1 (50)
11 – 20	33 (49.2)	3 (9.1)	3 (9.1)	6 (18.2)
21 – 30	27 (40.3)	3 (11.1)	2 (7.4)	5 (18.5)
31 – 40	3 (4.5)	1 (33.3)	0	1 (33.3)
41 – 50	2 (3.0)	0	0	0

Discussion

TE is one of the major achievements in plastic surgery.⁽¹²⁾ Pediatric and burned populations have been the most studied patients. The present study analyzed a population in the range of 0-50 years (mean age of 20.5 years). The most common indication for TE was burn sequelae, trauma, and scars from previous surgery. These epidemiological factors are similar to those in other series.

In our study, female patients were predominant (64.2%), as in investigations by Almeida et al.⁽¹³⁾ and Nakamoto et al.,⁽¹⁴⁾ perhaps due to a stronger concern about aesthetics. Yeşilada et al.⁽¹⁵⁾ analyzed their clinical experience in the treatment of burn scars and complex defects by TE in 25 patients (14 females and 11 males) with a mean age of 9.26 years.

The anatomical region most involved in our study was the head and neck (47.8%). Cunha et al.⁽⁸⁾ reported that the scalp was the site of TE in 22.8% of cases. In a study by Mohanty et al.,⁽¹⁶⁾ the scalp, face, and neck were involved in 71.7% of cases.

The selection of the shape of the tissue expander is very important. Motamed et al.⁽¹⁷⁾ used rectangular tissue expanders and claimed that using these expanders might increase the options for flap design. The rectangular-shaped expanders were used in 69.6% of cases in a study by Mohanty et al.⁽¹⁶⁾ and 58.82% in a survey by Motamed et al.⁽¹⁷⁾ In contrast, in our study, rectangular-shaped expanders were used only in 26.9% of cases; at the same time, crescent and round expanders were used in 43.3% and 29.8% of cases, respectively.

In our study, the overall, minor, and major complication rates were 19.4%, 9.0%, and 10.4%, respectively, as in other reported series. Expander complication rates in pediatric burn patients range from 9% to 37%.⁽¹⁸⁾ Friedman et al.⁽⁹⁾ showed that major and minor complications each occurred in 9% of children who underwent TE. Between two of our children aged 0-10 years, a minor complication was found in one case, amounting to a complication rate of 50%.

In a study by Tavares Filho et al.,⁽¹⁹⁾ the rate of complications was 24.07%, of which 30.8% were considered to be absolute and 69.2% relative. In a study by Yeşilada et al.,⁽¹⁵⁾ out of 25 patients with TE, minor and major complications occurred in 1(4%) and 5(20%) cases, respectively. In our study, patients with tissue expanders on the head and neck experienced more major complications (12.5%) than those with expanders in other anatomical regions, and this rate was in line with the data of Cunha et al.⁽⁸⁾

In conclusion, the results of our retrospective study on the efficacy of cutaneous expansion procedures are broadly in line with other research reported in the literature. Attention to different aspects of TE, including careful patient selection and meticulous attention to intervention detail, are the main conditions for the success of this reconstructive surgery.

Competing Interests

The authors declare that they have no competing interests.

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