

External Tissue Expansion for Difficult Wounds Using a Simple Cost Effective Technique

Vijayaraghavan Nandhagopal, Ravi Kumar Chittoria, Devi Prasad Mohapatra, Friji Meethale Thiruvoth, Dinesh Kumar Sivakumar, Arjun Ashokan

Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India

Address for correspondence: Dr. Ravi Kumar Chittoria, Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry - 605 006, India. E-mail: drchittoria@yahoo.com

ABSTRACT

Objective: To study and discuss role of external tissue expansion and wound closure (ETEWC) technique using hooks and rubber bands. **Materials and Methods:** The present study is a retrospective analysis of nine cases of wounds of different aetiology where ETEWC technique was applied using hooks and rubber bands. **Results:** All the wounds in the study healed completely without split thickness skin graft (SSG) or flap. **Conclusion:** ETEWC technique using hooks and rubber bands is a cost-effective technique which can be used for wound closure without SSG or flap.

KEYWORDS: External tissue expansion wound closure (ETEWC), hooks, rubber bands

REC Review:

Risk	: 5.0	0 = maximum risk,	5 = least risk
Efficacy	: 5.0	0 = minimum efficacy,	5 = maximum efficacy
Cost	: 5.0	0 = very expensive,	5 = least expensive

INTRODUCTION

One of the foremost duties of the plastic surgeon is to restore the lost tissue. And the dictum is to replace the like with like. In accordance with these principles, the technique of tissue expansion was introduced by Neumann^[1] and popularised by Radovan^[2] and Austad.^[3] The recent advancement in tissue expansion is the external tissue expansion. In this article we are discussing a novel indigenous technique of external tissue expansion wound closure (ETEWC) using skin hooks and rubber bands.

MATERIALS AND METHODS

This study is a retrospective analysis of cases where ETEWC technique using skin hooks and rubber

bands were performed during July 2012 to July 2014 in a tertiary care hospital (JIPMER, Pondicherry) in India. The inclusion criteria included all chronic non-healing wounds of more than three months duration with laxity of the surrounding skin and either unfit for surgery or not willing for reconstruction by skin graft or flap cover. Nine patients conformed to the inclusion criteria and were included in the study. Informed consent was taken. Easily available blouse hooks and rubber bands were sterilised and used for setting up external tissue expansion technique. Sterilisation of rubber bands was done with ethylene oxide gas. At bed side under local anaesthesia the skin hooks were sutured to the healthy skin edges of the wound using non-absorbable stitches. The hooks were fixed circumferentially around the wound. Then the rubber bands were applied over the hooks under appropriate tension to allow advancement of edges of the wound. The tension was maintained just enough as to avoid the cut through of the hooks. The necessary dressing and padding was done over the hooks. During the next dressing, new rubber bands were reinforced over the old ones to maintain the tension and continue advancement of the edges [Figures 1-4].

RESULTS

In our study cohort ($n = 9$ patients, 11 wounds), age of the patients ranged from 23 to 75 year (mean age

Access this article online

Quick Response Code:



Website:
www.jcasonline.com

DOI:
10.4103/0974-2077.155087

49.32 years). The male to female ratio was 3:1. The most common site was the sacral region. The most common aetiology was pressure ulcer followed by post traumatic non-healing wounds. The size of the

wounds varied from 3 × 2 cm to 20 × 10 cm. Wound healing duration varied from 3 to 8 weeks [Table 1] [Figures 5-13].

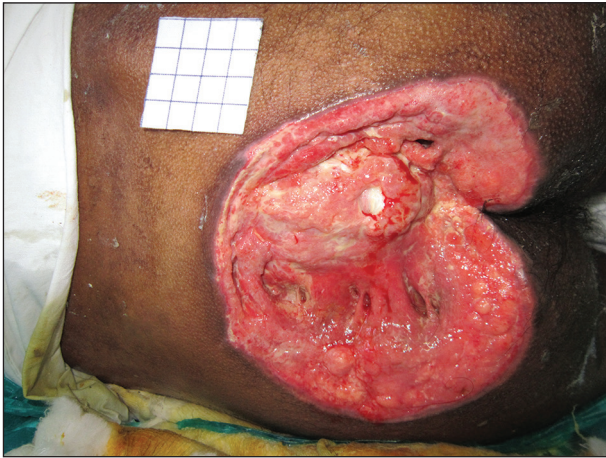


Figure 1: Wound after preparation



Figure 2: Step 2: After fixation of the hooks to the wound edges with non-absorbable sutures



Figure 3: Step 3: Application of the standard dressing

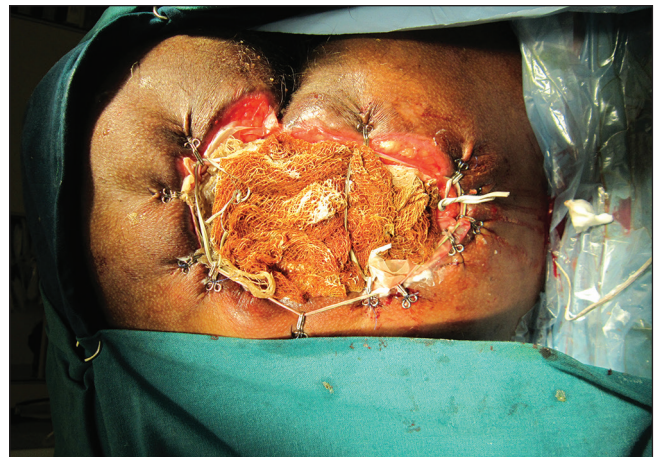


Figure 4: Step 4: Application of the rubber bands around the hooks



Figure 5: At admission



Figure 6: After complete wound healing in 4 weeks



Figure 7: At admission



Figure 8: ETEWC in position over the lower wound



Figure 9: Complete healing of the lower wound



Figure 10: Complete healing of the upper wound

Table 1: Summary of patient's age, gender, aetiology, site, size, treatment option and total duration of healing

Age	Gender	Aetiology and Site	Size of Wound	Total Duration of Healing
36	Male	Post-traumatic raw area left foot with osteomyelitis	15×10 cm	5 weeks
45	Male	Post-traumatic raw area left forearm	12×5 cm	6 weeks
75	Female	Grade 3 sacral pressure sore	5×7 cm	4 weeks
54	Female	Non-healing ulcer left leg with dm	3×2 cm	3 weeks
60	Male	Post-traumatic raw area right leg	4×4 cm and 3×3 cm	4 weeks
24	Male	Grade 4 right ischial pressure sore with paraplegia	5×5 cm	4 weeks
23	Male	Grade 4 sacral pressure sore	15×10 cm	8 weeks
52	Male	Paraplegia with grade 4 sacral pressure sore	10×8 cm	5 weeks
32	Female	Warfarin-induced skin necrosis of left thigh	20×10 cm and 8×6 cm	8 weeks

DISCUSSION

Tissue expansion is based on the principle that all living tissues respond in a dynamic fashion to mechanical stress placed on them. Tissue expansion incorporates the phenomena of biological creep and physiological creep. Ever since the technique was introduced by Neumann and popularised by Radovan and Austad, the utilisation of this technique has been on the rise. These principles are not only limited to the skin but even been replicated in the bone.^[4,5] But the process of internal tissue expansion is not without

complications. The most important factors are the prolonged duration, cosmetic deformity and the need for the field to be free of infection. Because of this, internal tissue expansion is of limited use for cover of raw areas. This paved the way for the development of external tissue expansion. Many techniques of external tissue expansion were published including negative pressure^[6] and other expansion devices like Wise Bands,^[7] DermaClose.^[8] The practical limiting factor of these commercially available devices is the cost. So we started using easily available, cost-effective (Rs 5/-)

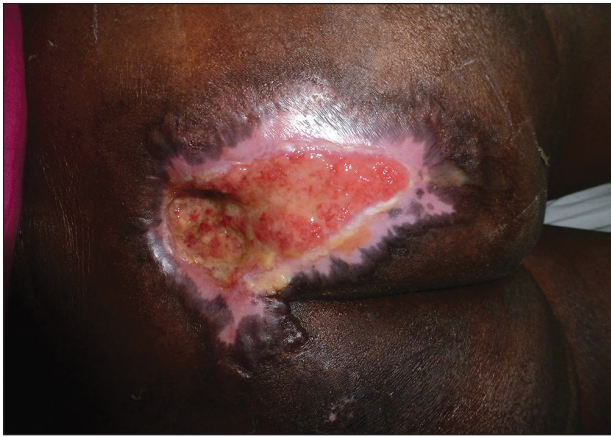


Figure 11: At admission



Figure 12: ETEWC in position



Figure 13: Complete wound healing after 4 weeks

materials like blouse hooks and rubber bands. These can be applied bed side by nurse or doctor. Using this device we were able to achieve results comparable with those of the commercially available devices. In future, we will plan controlled study with statistical analysis.

The main drawback of this procedure is that it cannot be used in inflamed and indurated skin around the wound. It cannot be used in areas without surrounding skin laxity.

CONCLUSION

ETEWC using hooks and rubber bands is easy to apply, cost-effective, can be applied bed side and results are comparable with commercially available ETEWC devices. A controlled, large sample size study with statistical analysis is required to substantiate the results.

REFERENCES

1. Neumann CG. The expansion of an area of skin by progressive distension of a subcutaneous balloon; use of the method for securing skin for subtotal reconstruction of the ear. *Plast Reconstr Surg* 1957;19:124-30.
2. Radovan C. Breast reconstruction after mastectomy using temporary expander. *Plast Reconstr Surg* 1982;70:195-208.
3. Austad ED, Rose GL. A self-inflating tissue expander. *Plast Reconstr Surg* 1982;70:588-94.
4. Matev I. Thumb reconstruction after amputation at the metacarpophalangeal joint. *J Bone Joint Surg Am* 1970;52-A:957-65.
5. Codvilla A. On the means of lengthening, in the lower limbs, the muscle and tissues which are shortened through deformity. *Am J Orthop Surg* 1905;2:353-69.
6. Lasheen AE, Salim A, Hefny MR, Al-Bakly E. External tissue expansion successfully achieved using negative pressure. *Surg Today* 2004;34:193-6.
7. Barnea Y, Gur E, Amir A, Leshem D, Zaretski A, Miller E, *et al.* Delayed primary closure of fasciotomy wounds with Wisebands, a skin- and soft tissue-stretch device. *Injury* 2006;37:561-6.
8. Nielson DL, Wu SC, Armstrong DG. Delayed primary closure of diabetic foot wounds using the DermaClose RC Tissue Expander. *Foot Ankle J* 2008;1:3.

How to cite this article: Nandhagopal V, Chittoria RK, Mohapatra DP, Thiruvoth FM, Sivakumar DK, Ashokan A. External tissue expansion for difficult wounds using a simple cost effective technique. *J Cutan Aesthet Surg* 2015;8:50-3.

Source of Support: Nil. **Conflict of Interest:** None declared.