



Full Length Research Article

AN INTERESTING CASE OF DEVASTATING BURN INJURY OVER SCALP WITH EXPOSED DURAMATER WITHOUT SKULL BONE IN FRONTO PARIETAL AREA OF 6 YEARS AGED CHILD FOR RECONSTRUCTION

***¹Dr. Prasanta Kumar Bhattacharyya, ²Dr. Manab Nandy, ³Dr. Sankar Chatterjee and ⁴Dr. Ananya Choudhuri**

¹Department of Plastic Surgery, KPC Medical College and Hospital, Jadavpur, Kolkata, India

^{2,4}Department of Pharmacology, Medical College, Kolkata; 88 College Street, Kolkata-700073, India

³Department of Surgery, Ram Krishna Mission Seva Pratishthan, Kolkata, India

ARTICLE INFO

Article History:

Received 25th January, 2015
Received in revised form
04th February, 2015
Accepted 02nd March, 2015
Published online 29th April, 2015

Key words:

Tissue expander,
Aesthetic,
Defect correction,
Calvarium.

ABSTRACT

Tissue expansion has become the most important armamentarium for aesthetic scalp reconstruction as it allows the surgeon to cover large defects using local tissue of appropriate colour, texture and adnexal structure with minimum donor site morbidity. It is commonly used in reconstruction of large defects created due to any trauma, electric burn over scalp, excision of tumors, carcinoma of breast following reconstruction of operation and in many other conditions. A child aged 6 years who came accompanied with her parents with injury to scalp from a devastating fire accident at the age of 2 years treated outside for 4 years she was having exposed area of skull with pulsating duramater with a thin layer of unhealthy skin without skull bone. She was subjected to the placement of a rectangular silicone tissue expander inside local hair bearing area of healthy tissue after the excision of unhealthy tissue. The frontoparietal defect of scalp with exposed visible pulsating duramater along with absence of outer calvarium was subjected to placement of tissue expander inside the healthy area of scalp to achieve required flap dimension. Excision of unhealthy tissue over the defect with exposed inner skull bone was done and defect was covered with flap created through tissue expander. The use of tissue expander yielded adequate flap coverage and also excellent aesthetic and cosmetic result at the end of 6 months of follow up.

Copyright © 2015 Dr. Prasanta Kumar Bhattacharyya et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The proper way of scalp reconstruction usually presents a challenge to plastic surgeon due to several factors including inelastic nature of scalp and special hairy nature of scalp skin (Fan and Yang, 1997). Neumann in 1956 followed by Radovan in 1976 recognized the potential of tissue expansion for reconstructive surgery (Bauer et al., 1987). Human skin has a property that can be stretched to many fold of its original size, while remaining phenotypically similar to its initial state, without any reported malignant transformation (DeFilippo and Atala, 2002). When skin is stretched beyond its physiological limit mechano-transduction pathways are activated which results in cell growth and increase in cell number (Gemperil

et al., 1991 and Friedman et al., 1996). So in the past four decades, tissue expanders have been widely used for reconstructions requiring skin gain. Thus tissue expander has added a new dimension to the world of plastic surgery since its development (Fan and Yang, 1997). It is used in a variety of cases to develop skin and tissue flaps for defect correction without undue tension. The tissue expander consists of a silicone elastomer expander with a remote silicone elastomer injection dome. The silicone expander is available in variety of shapes like elliptical, rectangular, round and crescent shaped. Now we would like to present a case of injury to scalp due to a devastating fire accident in a girl child when she was 2 years old with exposed Dura covering brain and with a loss of a portion of her skull bone in frontoparietal area which was treated outside. The child came to our Hospital at the age of six years with exposed portion of right frontoparietal area of scalp with exposed visible pulsating Dura covered with thin layer of skin. We decided to use a rectangular silicone tissue

*Corresponding author: Dr. Prasanta Kumar Bhattacharyya
Department of Plastic Surgery, KPC Medical College and Hospital,
Jadavpur, Kolkata, India

expander of 250ml capacity to cover the defect without calvarium and finally skin grafting was done over donor area to cover the defect in two sittings. Finally exposed dural portion was well covered with good aesthetic functional and cosmetic result. In future Calvarial bone graft may be needed for deficient calvarium.

Case Report

A girl child came accompanied with her parents In our hospital with a history of injury to scalp from a devastating fire accident at the age of six years thereby practically leaving her brain covered with Dura and thin layer of burnt skin exposed with a loss of a portion of her skull bone. The right side of face and the scalp were badly burnt in the fire. The patient was brought to our hospital in a condition with a loss of a portion of her skull bone and the outer membranous covering of the brain which was the duramater, pulsating just below a thin layer of skin tissue in that exposed portion (Fig. 1).



Fig. 1.

To repair the defect, we initially needed a thick skin to cover the exposed pulsatile brain defect covered with duramater and finally wanted to do skin flap coverage in the front portion of the scalp so that when the hair would grow up on that portion, it could be brushed back to cover the scar. In fact we, not only wanted to give the little girl as much of a normal look as possible but also wanted to provide a cushioning of hair on the affected area. In order to achieve this we needed thick skin which we wanted to take from the unaffected portion of the child's scalp. So to create excess skin flap, a silicone tissue expander was inserted under the normal area of the scalp. The silicone tissue expander was placed through a small incision over the healthy hair bearing area of scalp and the injected port was placed in the left parietal area of scalp. Initially 30 ml of normal saline was introduced to expand the skin through the port. Gradually 15 ml of normal saline was injected every weekly as an outdoor basis through a port which was also placed under the scalp bearing area of skin. Along with the gradual administration of normal saline the skin ballooned outward and finally it was adequate to cover the right parietal defect. It took 3 months to achieve the required dimension (Fig. 2). At the second operation, after obtaining the desired expansion the silicone bag was removed along with the capsule through the same skin incision (Fig-3).



Fig. 2.



Fig. 3.

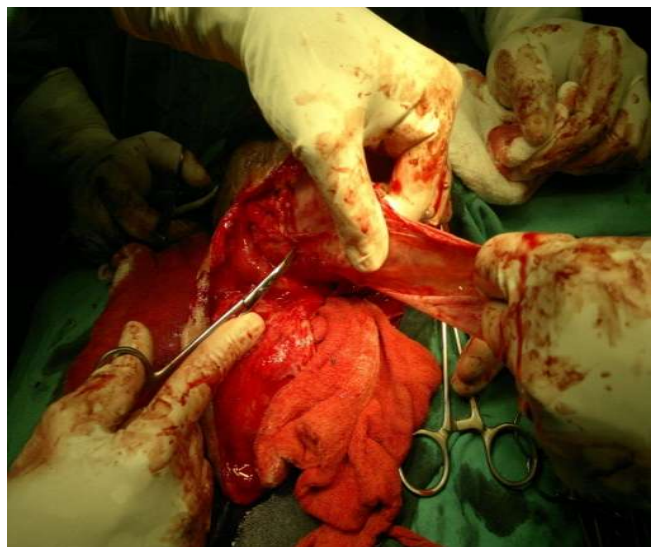


Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.

The expanded skin and soft tissue of scalp was raised as a rotational flap and the flap was advanced to cover the scalp wound and the dural pulsation was well covered (Fig -4,5,6). However an elevated dog ear like portion of skin still remained at the base of flap which was later corrected after three months (Fig- 7). The operative and post operative courses were uneventful .The final outcome was cosmetically and aesthetically excellent at the end of 6 months follow up.

RESULTS

The use of silicone tissue expander yielded adequate flap coverage with hair bearing area in front and also excellent aesthetic result at the end of 6 months.

DISCUSSION AND CONCLUSION

We can conclude that tissue expander is useful method of achieving scalp reconstruction where there is little available tissue. The best results depend on careful patient selection, meticulous attention to details of surgical maneuver including good homeostasis, adequate pocketing and fine handling of expander. However skin displays an impressive functional plasticity, which allows it to adapt gradually to environmental changes (Zollner *et al.*, 2012). Since the technique of tissue expansion was popularized by Radovan 1978, cutaneous expansion used increasingly in reconstructive surgery (Chun and Rohrich, 1998).

Stretches beyond the skin's physiological limit involve several mechano-transduction pathways, which increase mitotic activity and collagen synthesis ultimately resulting in a net gain in skin surface area (Buganza Tepole *et al.*, 2014). Now tissue expansion became the most important armamentarium for aesthetic scalp reconstruction as it allows the surgeon to cover large defects using local tissue of appropriate colour, texture and adnexal structure with minimum donor site morbidity. Also we find no relation between complication rate and type of expander or specific site in the scalp. A tissue expander is commonly used in reconstruction of large defects created due to any trauma, electric burn over scalp, excision of tumors, carcinoma of breast following reconstruction of operation and in many other condition (Bonaparte *et al.*, 2011 and Earnest *et al.*, 2005).

However the tissue expander needs a step-by-step inflation, often in a weekly or bi-weekly schedule. Complications include infection, extrusion, haematoma, flapschaemia and expander perforation (Dotan *et al.*, 2009). Anatomical region for the expander implantation and the total volume for tissue expansion are factors that influence the complication rate and outcome (Bozkurt *et al.*, 2008). The expander is placed in the adjoining tissue of the area to be excised. After creation of a flap which is adequate to cover the anticipated defect, it is removed with the formed capsule. Subsequently after defect is created by excision it is covered with the flap to achieve excellent cosmetic and aesthetic outcome. So we concluded that tissue expansion is a useful method of achieving scalp reconstruction where there is little available tissue. The complications are generally less and manageable.

REFERENCES

- Fan, J. and Yang, P. 1997. Aesthetic reconstruction of burn alopecia by using expanded hair bearing scalp flaps. *Rev. Stomatol. Chir. Maxillofac. Aug*; 98(2):104-8.
- Bauer, B.S., Johnson, P.E. and Lovato, G. 1987. Application of soft tissue expansion in children. *Clin. Plast. Surg*; 14:549.
- DeFilippo, RE. and Atala, A. 2002. Stretch and growth, the molecular and physiologic influences of tissue expansion. *Plast Reconstr Surg*; 109:2450-62.
- Gemperil, R., Ferreira, M.C. and Manders, E.K. 1991. O uso de expansores de tecidos no courocabeludo. *Rev. Hosp. Clin. Fac. Med. S Paulo*; 46:112-15.
- Friedman, R.M., Ingram, A.E. and Rohrich, R.J. 1996. Risk factors for complications in paediatric tissue expansion. *Plast. Reconstr. Surg*; 98:1242.
- Zollner, Alexander, M., Buganza Tepole, Adrian, Kuhl, Ellen, 2012. On the biomechanics and mechanobiology of growing skin. *Theoretical Biology*; 297:166-75.
- Chun, J.T. and Rohrich, R.J. 1998. Versatility of tissue expansion in head neck burn reconstruction. *Br. J. Plast. Surg. Apr*; 51(3):186-90.
- Buganza Tepole, Adrian, Ploch, Christopher Joseph, Wong, Jonathan, Gosain, Arun K., Kuhl, Ellen, 2014. Growing skin, Tissue expansion in pediatric forehead reconstruction. *Biomechanics and Modeling in Mechanobiology* (<https://www.google.co.in/webhp?sourceid>) [Last accessed on 15.2.2014].
- Bonaparte, JP., Corsten, MJ., Allen, M. 2011. Healing time of radial forearm free flap donor sites after preoperative tissue expansion ,Randomized controlled trial. *Journal of Otolaryngology*; 40(1):S20-7.
- Earnest, LM. and Byrne, PJ. 2005. Scalp reconstruction. *Facialplast Surg Clin North Am*; 13(2):345-53.
- Dotan, L., Icekson, M., Yanko-Arzi, R., Ofek, A., Neuman, R. and Margulis, A. 2009. Pediatric tissue expansion: Our experience with 103 expanded flap reconstructive procedures in 41 children. *Isr Med Assoc J*; 11:474-9. [PubMed]
- Bozkurt, A., Groger, A., O'Dey, D., Vogeler, F., Piatkowski, A., Fuchs, PC. *et al.* 2008. Retrospective analysis of tissue expansion in reconstructive burn surgery: Evaluation of complication rates. *Burns*; 34:1113-8. [PubMed]
