

Immediate Intraoperative Tissue Expansion in Cranioplasty

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Abstract

Craniectomy following head injury is a common surgery with a high rate of complications. Postoperative infection following cranioplasty leads to shortening of the scalp flap and leads to problems in closure. Various techniques have been described like local flaps, wide tissue mobilization and tissue expansion. Another technique, not so well described in literature, is Intraoperative expansion.

We present a case of similar calvarial defect managed by intraoperative expansion to enable tension-free closure of the scalp.

Keyword: Cranioplasty; Calvarial defect.

Introduction

Craniectomy usually includes preservation of the resected bone flap in the subcutaneous plane typically in the abdomen.¹ Calvarial defects are related with issues like headache, irritability, and epilepsy because of direct pressure on the defect.²⁻⁴

The cranioplasty procedure secures the underlying brain, gives the correct cranial esthetic which are fundamental for the quality of life of the patient.²

Both autologous bone and prosthesis have been used as a reconstructive measure.

Cranioplasty is one of the oldest neurosurgical procedures being practiced, several materials have been used as the bioprosthetic including coconut shells, resins, ceramics.⁵ The literature reports complication rates in cranioplasty of up to 20%, with infection, skin atrophy and implant exposure cited as the most common.

Most authors describe lack of planning or problems obtaining soft tissue cover over the alloplastic material as the most frequent causes for postoperative complications.

Expansion of the native skin is a simple technique to avoid these complications. Controlled tissue expansion provides a valuable means to provide local tissues to cover surgical defects. Classically this technique requires two stages. The first stage involves placement of the tissue expander(s) followed by slow filling of the device during the ensuing weeks. In the second stage the expander(s) are removed and the defect is closed with the stretched skin for coverage leading to increased survival of flaps. Controlled tissue expansion also has disadvantages. Two operations are required: the first to place the tissue expander and the second to remove the expander and complete the reconstructive effort. Immediate intraoperative tissue expansion takes advantage of the skin's ability to stretch and increase in surface area immediately.

We would like to share our experience of using intraoperative tissue expansion to recruit the native

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scalp and ensure a tension-free closure of the scalp for cranioplasty.

Materials and Methods

Thirty-four-year-old male presented to the Plastic surgery OPD with a complaint of right side calvarial defect of four months duration (Fig. 1) following decompressive craniotomy for post-traumatic right subdural hematoma. The patient had the bone flap presented in the abdominal wall in the subcutaneous plane.

Patient was a known diabetic since 4 months on oral hypoglycemic drugs. Patient had history of 2 seizure episodes 4 months back after the decompressive craniectomy and was on oral anti-epileptic drugs. Patient had no other neurological weaknesses and was freely ambulant. He had history wound infection following the initial decompressive craniotomy wound. Due to predicted difficulty in closure of the scalp flap, pt was planned for intraoperative tissue expansion using expander (Fig. 2). On the surrounding scalp around the calvarial defect, 50 ml saline was infiltrated in the subgaleal plane for hydrodissection and minimal expansion.

Subsequently 5 cm incision was given on the previous surgical scar and a pocket was made on the surrounding uninvolved scalp. A pocket was created and a 240 ml rectangular expander was inserted. The port was taken out through the incision wound (Fig. 3). The wound was closed with skin stapler (Fig. 4). The expander was filled with 200 ml saline till blanching of the skin flap and left for 20 minutes. During this time the bone flap was harvested from the abdomen. The bone flap was subsequently fixed to the calvarial defect using plates and screws and tension-free closure of the scalp flap was achieved (Fig. 5). Drain was inserted. The drain was removed on 7th postoperative day and clips were removed on postoperative day 10.



Fig. 1: Preoperative.



Fig. 2: Expander used.



Fig. 3: Expander being inserted.



Fig. 4: Intraop expansion.



Fig. 5: Flaps opposing following expansion.

Results

Well approximation of scalp flaps was achieved with expansion. Postoperatively, patient had no complications. The postoperative result was satisfactory (Fig. 6).



Fig. 6: Postoperative.

Discussion

Cranioplasty, though a simple procedure, requires immaculate preoperative planning to attain the desired result. The rate of complications after cranioplasty has varied from 12 to 45% in various studies.^{6,7} The accurate assessment of surface tissue needed before cranioplasty is as essential as the choice of the material used for bone reconstruction. Most of the time, the native scalp tissue allows a reconstruction under good conditions. However, when a tissue retraction occurs, in particular after an infected cranioplasty or a delayed reconstruction of large defects, scalp tissue expansion should be proposed to the patient.⁸ Tissue expansion allows scalp wounds to be closed with minimum tension, damaged scalp to be removed, reduces additional scars and eliminates flap failure. The scalp is an excellent hair-bearing site for tissue expansion—generally well vascularized, with a clear plane and a hard, underlying base. Immediate intraoperative tissue expansion is in an early stage of development, and further research is needed to understand and define this technique better.⁹ Sasaki¹⁰ noted that blood flow in immediate intraoperative expanded tissue decreased rapidly during expansion but recovered to near-normal levels within a minute after deflation. Complications resulting from immediate intraoperative tissue expansion, reported in 120 cases by Sasaki,¹⁰ are lowest in the head and neck region (2%) and highest in the lower extremity (26%).

Conclusion

We found that intraoperative expansion of the cranioplasty scalp flaps is useful in tension-free closure. However much randomized control trials are required to know the true efficacy of intraoperative expansion in such patients.

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