

# Exposed Cochlear Implant Coverage with Temporalis Muscle Flap

Naveed Ahmad Khan, Abdul Hameed, Maria Khan

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### ABSTRACT

**Objective:** The purpose of this study is to evaluate the use of the temporalis muscle flap as second layer coverage after cochlear implant extrusion.

**Methodology:** This is a multicenter study in which cochlear implant extrusion complication was managed in eight patients by two layer closure; temporalis muscle flap used as salvage layer for cochlear implant coverage and scalp rotational flap as a routine coverage. Six months postoperative follow-up was observed.

**Results:** Total eight patients with cochlear implant extrusion were managed by using double layers closure; seven out of eight patients had no evidence of implant extrusion during 6 months follow-up. Except for one patient no complication was noticed. In one case implant was removed due to flap necrosis and another patient developed hematoma postoperatively, which was managed by surgical evacuation, later on flap healed uneventfully. The results showed that using temporalis muscle flap two layered closure had a significant role in salvage of secondary extruded cochlear implant.

**Conclusion:** Temporalis muscle flap as the first layer in combination with scalp rotational flap as secondary coverage of implant had superior results in secondary cochlear implant extrusion prevention.

**Keywords:** Cochlear implant. Temporalis muscle flap. Scalp rotational flap.

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### INTRODUCTION

For multiple face and skull defects, the pericranium is the source of multiple, dependable, well-vascularized flaps, which are of use for reconstructive surgeries. The temporalis muscle flap consists of loose connective tissue and periosteum of skull.<sup>1</sup> As a local flap this well vascularized tissue is useful for obliteration or coverage of facial skeleton and skull bony defects. Soft tissue augmentation coverage can be provided for bone graft or prosthesis.<sup>2</sup>

The temporalis muscle flap benefit has been described in much otolaryngologic, maxillofacial and plastic surgery literature. The benefit of the temporalis muscle flap is due to unique characteristic including good flexibility and mobility, very rich blood supply from several arterial sources, the design and easy separation of temporalis muscle flap. It is available at the surgical site and no additional surgical site or incision is required.<sup>3</sup> Double layer closure using both temporalis muscle flap and scalp rotational flap has proved adequate and secure coverage for treatment of cochlear implant extrusion.

### METHODOLOGY

Eight patients were operated for cochlear implant extrusion in multiple centers. The titanium implant encased inside silicone rubber cover was used in these patients. They were previously implanted with cochlear implant device at the temporal region. Seroma collection at the implanted site developed post-operatively during variable periods of surgery, later on, they ended with flap necrosis and implanted device extrusion. Pre and postoperative photographs were taken; the patient's age was 5-10 years.

A conservative management trial which included the local wound care, wound swab, systemic antibiotics and observation on weekly basis was started in the patients who developed small defect over the device. The conservative treatment did not benefit any of these patients and later on surgical treatment was adopted. Routine investigations were done preoperative which included complete blood count, activated partial thromboplastin time and prothrombin time.

All the patients were operated under general anesthesia, in the supine position, and with head tilted to other side according to the side of the defect. Hair shaving and sterilization were done intraoperative, with methylene blue ink the defect was outlined, 5ml adrenaline 1:200,000 with 2% xylocaine were infiltrated. Normal skin rim was included in the marking, the defect was created after necrotic and unhealthy tissue debridement, according to defect size scalp flap marking was done. Marking of the temporalis muscle was done and the incision was designed from the pre-auricular area and extended superiorly towards the

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Sharif Medical & Dental College, Sharif Medical City.  
Sharif Medical City Road, Off Raiwind Road, Jati Umra,  
Lahore 54000, Pakistan.

Correspondence: Dr. Naveed Ahmad Khan  
Assistant Professor Department of Plastic & Reconstructive Surgery  
Sharif Medical & Dental College  
E-mail: drnaveed.nk49@gmail.com

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head vertex. According to the marking incisions were made and carried deep to the dermis in pre-auricular area and along the scalp deep to the temporoparietal fascia. Superficial to the temporalis muscle fascia, scalp flap was elevated. After the elevation of anterior and posterior scalp flap muscle were exposed to the temporal crest as far anteriorly possible towards the muscle. In the muscle anterior incision was made and carried down to the bone.<sup>3,4</sup> At temporal crest muscle was elevated from its temporal crest and posterior incisions were made according to the desired width needed to repair the defect. The dissection was directed towards the preauricular area inferiorly and anterior ramus of the mandible and the insertion of the muscle in the coronoid process. Temporalis muscle then transposed to cover the defect.<sup>5,6</sup> The cochlear implant was covered by the rotational scalp flap as a second layer. To cover the large area the scalp can be made stretchable by scoring the galea with scalpel or electrocautery perpendicular to the direction of tension. Great care must be taken to avoid injuring vessels in

should not interfere. The parents were instructed that not to allow their children to sleep on the operative side. The drain was removed and dressing was changed after 24 hours. Third generation injectable cephalosporin antibiotics were given according to body weight for two days, later on, switched to the oral antibiotics till stitches removal usually at 14<sup>th</sup> postoperative day.

## RESULTS

Two layers closure (Temporalis muscle Flap as a 1<sup>st</sup> layer and scalp rotation flap as a 2<sup>nd</sup> layer) was done in eight patients who developed extrusion of a cochlear implant. Two out of eight patients who had developed implant extrusion were operated using only local scalp rotational flap, after second postoperative month. Size of defect, chief complaint and the time intervals of presentation of patients after their initial cochlear device implantation are shown in the Table 1.

Those patients who developed hematoma postoperatively, surgical evacuations of the hematoma was done, there was no further complications in these

**Table 1: Showing size of defect, chief complaint and the time intervals of presentation of patients**

Size of the defect	Chief complaint	Time intervals of the presentation
2x4 cm	Wound dehiscence and flap necrosis	3 months
2x3 cm	Wound dehiscence and flap necrosis	2 months
2x2 cm	Wound dehiscence and flap necrosis	5 months
2x3 cm	Wound dehiscence	2 months
2x2 cm	Wound dehiscence	2 months
3x3 cm	Serum collection	3 months
2x4 cm	Wound dehiscence and flap necrosis	4 months
4x5 cm	Serum collection	1 month

supragaleal plane. Suture line should not lie immediately adjacent to each other so as to reduce the chance of wound dehiscence.<sup>7-10</sup> During the surgery bipolar electrocautery was used so that implant polarity

cases. In one patient wound dehiscence and flap necrosis took place, implant was removed and scheduled for second implant placement.



## DISCUSSION

Cochlear implant has become a routine procedure for the management sensorineural hearing loss worldwide. The cochlear implant is an electronic device that replaces the function of the damaged or absent hair cells in the organ of corti in the cochlea.<sup>10,11</sup> The most common and major complication of cochlear implant surgery was wound breakdown as the devices were very large in size, the skin was sutured under tension. Designing a flap which is adequate in size and blood supply avoids such a complication. Flap necrosis and implant extrusion is still a challenge in such cases.<sup>9</sup>

Cochlear implant late extrusion is an infrequent surgical complication. Initial incision placement is the first and most important factor in implant extrusion complication. Initial incision scar was noticed very close to the overlaid edge of the implant extrusion in previous studies. Pressure on the skin or scar is the second important factor. This pressure may be exerted by the implant itself by either elevation of antenna portion, or by sheet bulk of the implant.<sup>10-11</sup>

Minimal treatment like topical and systemic antibiotics is required for minor scalp flap complications, like flap infection. Extrusion of the device can result from local flap necrosis and infection transmitted from the mastoid. This situation may require a rotational temporalis muscle flap to fill the defect and enhance implant coverage, as was adopted in this study.<sup>12</sup>

The hematoma formation was the early complication at 1st postoperative day in one patient which was managed by surgical evacuation, later on, flap survived and healed uneventfully. One patient developed wound dehiscence and flap necrosis 1 month later. This patient had been previously operated on for recurrent extrusion and had large size defect (4x5 cm), this patient was explanted later on. In six out of eight patients there were no complication and showed no evidence of extrusion during the 6 months of follow-up period. In a large study which was conducted by Charles et al. at Otolaryngology Department, Louisiana state University Medical center. They reviewed cochlear corporation's database of 8665 implants in North and South America from 1984 through December 1996, it has shown that a total of 80 implants had exhibited delayed extrusion or breakdown of the skin flap over the implant that occurred one month after initial implant surgery.<sup>18</sup>

In our study, we elevated the temporalis muscle flap, with average size about 3 x 5 cm, in fold over technique with a base to maintain its vascular supply. We used scalp rotation flap for the outer layer. The defect was triangulated and the flap is constructed so that the leading tip will rotate around the circumference of the circle in which the triangle defect lies. Similar

technique was used in another study.<sup>19</sup>

We attributed wound dehiscence and flap necrosis which occurred in one of our patients to the large defect and inadequate temporalis muscle coverage. This is because of lack of sufficient temporalis muscle layer due to fibrosis and scarring that was the result of the previous operation. By combining a temporalis muscle flap with scalp rotation flap a double closure is provided over the convexity of the cochlear implant.

## CONCLUSION

Temporalis muscle flap as the first layer in combination with scalp rotational flap as secondary coverage of implant had superior results in secondary cochlear implant extrusion prevention.

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