



A PROSPECTIVE STUDY OF - SALVAGING EXPOSED COCHLEAR IMPLANTS

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ABSTRACT

Background: The cochlear implant procedure is one of the efficient surgical options for the management of patients suffering from severe bilateral sensorineural hearing loss. Cochlear Implant exposure is one of the commonly reported complications. With an increase in the number of cochlear implant surgeries there is bound to be an increase in the number of complications. Cochlear implant extrusion, which is a common complication of cochlear implants, is generally repaired by a well visualized soft-tissue flap. Herein, we report our experience in the management of patients with cochlear implants complicated by implant exposure.

Methods: In our prospective study -based case series of 12 patients with exposed cochlear implants requiring soft tissue coverage who were referred to plastic surgery care. These patients underwent their CI procedures at a tertiary care hospital specializing in ear, nose, and throat, after which they were referred for plastic surgery care at our hospital for reconstruction after exposure. Each patient was managed through different surgical techniques based on the size, site, and condition of the surrounding tissue with dual vascularised flap cover.

Results: Twelve patients with exposed cochlear implants were treated with different surgical techniques with dual flap. During the 2-year follow-up period, the patients made an uneventful recovery with fully functional cochlear implants.

Conclusions: In conclusion, this case shows that the cochlear implant exposed scalp defect could be reconstructed in a relatively easy and safe way with dual vascularised flap cover, in a short period of time, by using a TPF or pericranial or galeal flap with minimal donor morbidity and anatomical proximity to the cochlear implant site combined with second vascularised scalp skin flap for the defect.

KEYWORDS

Exposed cochlear implant, Cochlear implant salvage, Temporoparietal fascial flap

INTRODUCTION

Cochlear implants are being used as the latest treatment for sensorineural hearing loss. Wound breakdown is a one of most common complication after cochlear implant placement, occurring in up to 12% of cases(1). The causes of wound breakdown include an incorrect placement of the incision, local infection, skin flap tip necrosis, and external pressure over implant. Cochlear implant extrusion can be reconstructed using various methods, including postauricular pedicled flaps, scalp rotational flaps, pericranial flaps, microvascular flaps, and pedicled temporalis muscle flaps.

The temporoparietal fascia flap (TPFF) or Pericranial flap or galeal flap has the advantages of versatility and pliability. It is very useful for cochlear implant exposed area reconstruction(2). However, few cases of reconstruction of cochlear implant extrusion have been reported since the first use of the TPFF for this purpose by Beckenstein et al. in 1999. In previous studies, cochlear implant extrusion was covered by a TPFF. The area of ulcerated skin was reconstructed using primary closure or a scalp rotation flap, as the ulcers were small.

In this paper, a prospective study of case with cochlear implant exposed raw area covered with double flap(3). The cochlear implant was exposed as a complication of a skin ulcer and infection. The resulting defect was successfully reconstructed using a TPFF or Pericranial flap with the scalp rotation or microvascular free flap.

METHODS

In our prospective study of cases with cochlear implant exposed raw area covered with dual vascularised flap. The case series involves 12 patients aged between 3 and 12 years. All patients underwent surgery to salvage the Cochlear Implant extruded device in a tertiary care hospital. The consent of each patient's guardian was obtained before the study. The subjects were followed up for 2 year after the surgery.

RESULT

In our prospective study of cases with cochlear implant exposed raw area covered with dual vascularised flap. The case series involves 12 patients aged between 3 and 12 years the result were Table 1.

Details Of The Patients

No	Age	Side	Diagnosis	Duration of problem	Previous flap	Wound culture	Procedure	Result
1	2 year	Rt	Exp implant	8 weeks	Post scalp rotation	MRSA	Tpff, post scalp rotation	Successful
2	5 years	Lt	Exp implant	4 weeks	Nil	Staph epidermidis	Tpff, post scalp rotation	Successful
3	6 years	Rt	Exp implant	2 weeks	Sup scalp rotation	Staph epidermidis	Pericranialflap,Post scalp rotation	Successful
4	7 years	Rt	Exp implant	1 year	Nil	No organisms	Tpff, skin flap advancement	Successful
5	2 years	Rt	Exp implant	3 weeks	Nil	No organisms	Tpff, post scalp rotation	Successful
6	2 years	Rt	Exp implant	3 weeks	Nil	Staph aureus	Tpff, post scalp rotation	Successful
7	6 years	Rt	Exp implant	6 weeks	Sup scalp rotation	Staph epidermidis	Pericranialflap,Post scalp rotation	Successful
8	7 years	Rt	Exp implant	11 weeks	Nil	No organisms	Tpff, skin flap advancement	Successful
9	2 years	Rt	Exp implant	8 weeks	Nil	No organisms	Tpff, post scalp rotation	Successful
10	2 years	Rt	Exp implant	3 weeks	Nil	Staph aureus	Tpff, post scalp rotation	Successful
11	6 years	Rt	Exp implant	2 weeks	Sup scalp rotation	Staph epidermidis	Galeal flap,Post scalp rotation	Successful
12	9 years	Rt	Exp implant	1 year	Nil	No organisms	Tpff, skin flap advancement	Successful

DISCUSSION

The Cochlear implants are a safe and effective treatment for severe sensorineural hearing loss. Common non-device related complications include skin flap necrosis, infection, dehiscence, and device extrusion in 1.9% to 12% of cases. There are many local and systematic risk factors that might play a role in CI exposure, including factors related to the surgical technique, the patient's medical history, and/or the postoperative course.(4) Migration of skin tension and the device caused by the bulk of the receiver can lead to flap erosion as a possible

cause of implant extrusion. Additionally, tight compression dressings, head trauma, or hematoma collection may also induce flap necrosis, leading to exposure of the cochlear implant.(5) Furthermore, some studies have suggested that the pressure created by external devices, such as hats or eyeglass frames, may contribute to cochlear implant device extrusion. Cochlear implant insertion complications are treated with antibiotics as the first step in all patients, followed by revision surgeries with or without explantation or reimplantation. According to previous studies, using an anteriorly-based C-shaped flap for cochlear

implantation can block the blood supply from the occipital artery, causing flap-related complications. Therefore, an inferiorly-based U-shaped flap is often recommended. The use of intravenous antibiotics is recommended in cases where the tissue surrounding the device becomes infected or the device is exposed with local antibiotic solution irrigation. Implant explantation is advised only in severe cases wherein primary revision surgery has failed or when severe allergic reaction/infection or device failure has occurred.

The elasticity of the scalp is limited due to the underlying galea and pericranium. In general, primary closure can be an option for small and flat defects (<2 cm²), while a local flap is required for defects measuring 2–25 cm². Reconstruction could be conducted using a free flap if the flap condition is poor or if the defect is too large. For severe defects that develop after cochlear implantation, a temporalis myofascial flap might be used. Otherwise, two-stage surgery using an anterolateral thigh flap or tissue expander can be conducted.

The TPFF described in this case report was initially used by Brown in 1898 for reconstruction of ears using the superficial temporal artery as the pedicle.(6) It is thin, flexible, and easily visualized. Thus, it has also been used in reconstruction of the head and neck. It is used both for eyebrow reconstruction with a tunneled fasciocutaneous hair-bearing flap, and for the reconstruction of non-hair-bearing defects, such as those on the eyelid or nasal ala, with a superficial temporal artery-based preauricular island flap. The TPFF or the Pericranial flap has been introduced as a method to reconstruct cochlear implant extrusion due to its low morbidity at the donor site and anatomical proximity to the implant insertion site with second rotation or vascularised second free flap cover.(7)

Extrusions have been minimized with the advancements in implant design and surgical approaches, avoidance of excessive scalp thinning, and the use of smaller incisions.(8) Additionally, the placement of the implant near the incision is avoided. Pocket fashioning during implant insertion may also play a major role in minimizing device extrusion.

Several types of flaps have been used to salvage CIs. Locoregional reconstruction includes postauricular pedicled skin flaps, rotational scalp flaps, pericranial flaps, pedicled temporalis muscle flaps, and temporoparietal fascia flaps(9). Additionally, the use of microvascular free tissue transfer has been reported to be successful, especially for larger defects. Moreover, the utilization of rotation flaps from the nape has been reported. However, the indications for using each type of flap to cover CI device extrusion scalp defects are not well defined. Various factors, such as proximity, vascularity, thinness, and ease of reach, are considered in choosing the flap type.(10)

In our study, we used dual vascularised flap, fascial flap with cutaneous flap as the defect area was relatively large after extensive debridement. Moreover, it provides a wide base that adheres to the 1:2 principle for random flaps. However, it posed a few disadvantages with regard to our two cases, such as difficulty in drawing the flap geometry and angle and deciding the donor site.

The three main types of scalp flaps are advancement, rotational, and transposition. The limited elasticity of the scalp is its main disadvantage, which constrains the use of advancement flaps. Scalp flaps have a robust blood supply, which facilitates harvesting and promotes healing. These flaps can be based anteriorly (supratrochlear artery), laterally (superficial temporal artery), or posteriorly (occipital artery).

In our study, there is a successful salvaging of 12 cases with a two-layer coverage consisting of an inner temporoparietal fascial flap or pericranial flap and an outer scalp skin flap or microvascular free flap.

CONCLUSION

The management of Cochlear Implant extrusion with local scalp flaps can constitute an effective and reliable option to salvage the implant with a good prognosis and a lower incidence of exposure recurrence. Optimal results for establishing effective soft tissue coverage can be achieved by choosing the appropriate technique according to the clinical presentation. In conclusion, this case shows that the cochlear implant exposed scalp defect could be reconstructed in a relatively easy and safe way with dual vascularised flap cover, in a short period of time, by using a TPFF or pericranial or galeal flap with minimal donor morbidity and anatomical proximity to the cochlear implant site

combined with second vascularised scalp skin flap for the defect.

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