

Exposure of Titanium Mesh after Cranioplasty for Microvascular Decompression Surgery: Two Case Reports

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Two cases of exposed titanium mesh occurred after implantation for cranioplasty after repeated procedures for microvascular decompression (MVD). Case 1 was a 62-year-old female who underwent MVD for left hemifacial spasm followed by repair of cerebrospinal fluid leak after the surgery, and Case 2 was a 75-year-old female who underwent MVD twice for right trigeminal neuralgia. Both patients visited our hospital again with complaints of postauricular lesion. Titanium mesh was visible through the operative scar and was successfully removed with no complication in both cases. Both patients were underweight females, and combined with multistep surgery may have contributed to the pathology. The present cases suggest that use of titanium mesh should be avoided for cranioplasty of posterior fossa surgery, especially for repeated procedures.

Keywords: titanium, cranioplasty, implant exposure, complication

Introduction

Cranioplasty is the surgical repair of a skull defect regardless of its etiology. Many materials have been used for cranioplasty, but currently three main nonbiological materials, polymethylmethacrylate, hydroxyapatite, and titanium mesh or plate, are widely used. Titanium is biologically inert and does not cause the tissue reactions that are induced by the other two materials.^{1,2} Furthermore, titanium is relatively inexpensive and radiolucent,³ so is widely used as the material for cranioplasty.^{4,5} However, titanium implants may be associated with a significant rate of complications, most commonly infection, and re-operation was sometimes necessary.^{6–9} Exposed implant is an important but less understood complication which can lead to both infection and cosmetic problems.

The latest review of titanium cranioplasty found that the overall complication rate was 26.4% and titanium plate removal rate was 10.3%.⁶ This data is comparable with several recent studies.^{7,8} The exposed implant rate in titanium cranioplasty was recently reported as 13.9% (15 of 108 cases).⁹ That series included cases of moderate to large supratentorial skull defect resulting from operations such as decompressive craniectomy after trauma or stroke. Cranioplasty of the retrosigmoid approach has been evaluated,^{10–12}

but the complications of titanium cranioplasty for small skull defect caused by the lateral suboccipital approach, particularly microvascular decompression (MVD) surgery, have not been investigated.

From April 2008 to November 2013, 417 titanium cranioplasties for small suboccipital craniectomy were performed in our institution. Four hundred and nine cases were treated with titanium cranioplasty after MVD primarily and eight cases were treated for repeated procedure after MVD. In this report, we present two cases of exposed titanium mesh. Both patients suffered from complications after repeated procedures.

Case Reports

I. Case 1

A 62-year-old underweight female (height 157 cm, weight 45 kg, and BMI 18.3 kg/m²), who had undergone MVD for left facial spasm and repair of cerebrospinal fluid leakage 5 years before at our hospital, visited again because she felt a strange projection under the left postauricular skin. The titanium mesh implanted at the second surgery was exposed from the operative scar (Fig. 1A). Computed tomography (CT) revealed exposure of the titanium mesh with no evidence of intracranial pathology (Fig. 1B, C), which indicated the need for removal of the titanium mesh. After obtaining informed consent, primary skin closure was completed after removal of the titanium mesh and debridement of the affected skin. No gross evidence of infection was observed. She was treated with intravenous cefazolin sodium hydrate (CEZ) 2 g/day for 5 days and discharged from our hospital with no evidence of further complication.

II. Case 2

A 75-year-old underweight female (height 150 cm, weight 38.6 kg, and BMI 17.2 kg/m²), who had undergone MVD for right trigeminal neuralgia 10 years and 5 years before, visited our hospital again because she noticed mucus on the operative scar. The shape of titanium mesh that had been implanted at the second surgery was visible at the operative scar (Fig. 2A). CT showed that the titanium mesh was exposed with partial absence of the skin. There was no evidence of subcutaneous or intracranial pathology (Fig. 2B, C). Removal of the titanium mesh was indicated and after obtaining informed consent, primary skin closure was completed using the same procedure as in the previous case. No definitive infection was observed around the affected wound

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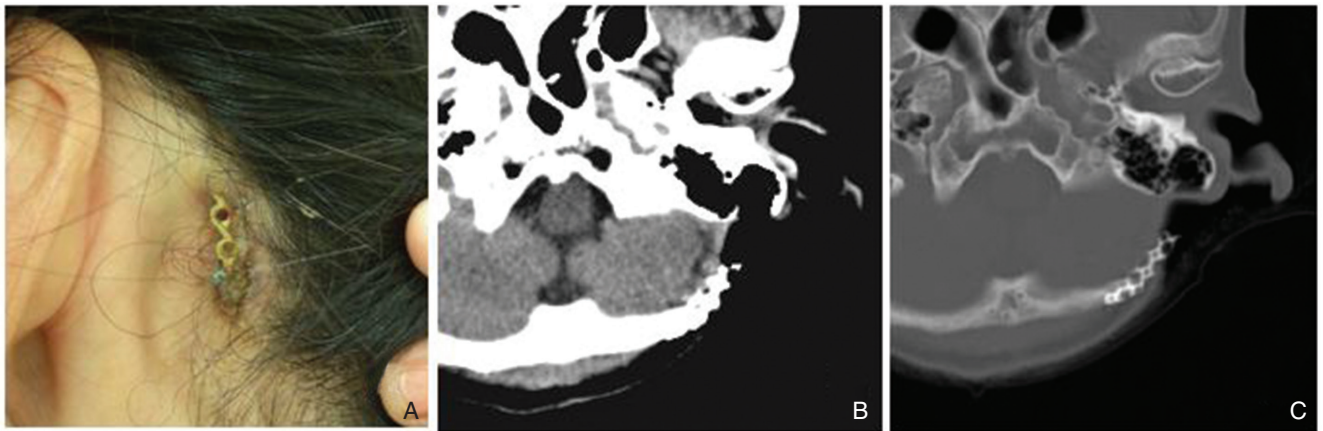


Fig. 1 Case 1. Photograph (A) showing exposed titanium mesh along the left postauricular operative scar. Computed tomography scans showing the titanium mesh perforating the skin (B), but no intracranial pathology (C).

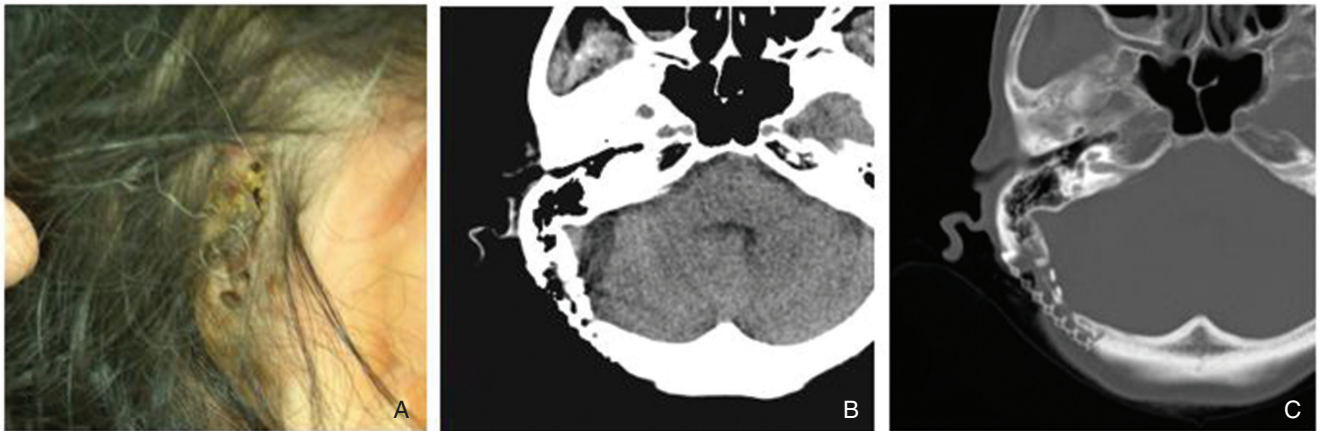


Fig. 2 Case 2. Photograph (A) showing exposed titanium mesh along the right postauricular operative scar. Computed tomography scans showing the exposed titanium mesh (B), but no intracranial pathology (C).

during the operation. She was treated with intravenous CEZ 2 g/day for 6 days. She was discharged from our hospital with no evidence of further complication.

Discussion

In general, MVD surgery can be achieved with small suboccipital craniotomy, and cosmetic problems are rare after the surgery. In our institution, initial craniotomy uses one burr hole followed by rongeur or drilling to the lateral margin of the sigmoid sinus, with the bone dust and bone pieces collected during the procedure to cover the bone defect at cranioplasty. However, the bone of posterior fossa varies in thickness, and the recess of the wound can become prominent during a longer follow-up period. Therefore, we covered with titanium mesh over the replaced bone pieces in the most cases. For the repeated procedure, additional exposure was necessary because healthy bone edge and dura must be confirmed. Our policy is not to replace the bone to avoid the risk of infection because the bone covering the initial craniotomy may be susceptible to infection, and the skin

covering the skull may become atrophic with repeated procedures. Such factors can create a large postauricular depression after the second operation. Therefore, we routinely used titanium mesh to avoid postauricular local depression and achieve better cosmetic appearance.

Durability of the supporting tissue over the skull is important in this complication. Temporal muscle atrophy is a well-known cosmetic problem after fronto-temporal craniotomy.^{13,14} For the retrosigmoid approach, the sternocleidomastoid muscle, digastric muscles, and some capitis muscles covering the postauricular area may also become atrophic with the dissection process. The fatty layer is often very thin in the postauricular area and anterior to the mastoid area.¹⁵ In addition, aging results in thinning of the dermis, epidermis, and fat, and the presence of prior surgery can devascularize the soft tissue. In our cases, such factors combined with multiple procedures are likely to have affected the durability of the tissues against titanium mesh. Furthermore, both patients were underweight females whose supporting tissues are less developed compared to males.

Our experience indicated that the rate of implant exposure in the cases who underwent repeated procedure was statistically significant compared to the cases who was treated with cranioplasty primarily (25% and 0%, respectively: $p = 0.0003$, Fisher's exact test). This highlights that although exposure of titanium mesh is rare in cranioplasty for small suboccipital defect, the risk is much higher in cases who underwent repeated procedures.

The optimum method of cranioplasty for MVD surgery that overcomes the problems of cosmetic appearance and foreign body reaction remains unestablished, despite the reasonably small craniotomy. However, even a small skull defect can lead to prominent cosmetic deformity with time, and ideally the head would be symmetrically shaped postoperatively. Therefore usage of a foreign material for the better cosmetic appearance may be useful. On the other hand, removing the titanium implant is absolutely hazardous for patients, so we ceased the use of titanium cranioplasty in reoperation after MVD after experiencing the present two cases. Other materials can be chosen, but the best material is still unknown, especially for repeated posterior fossa craniotomy.

Conclusion

Two cases of exposure of titanium mesh occurred after repeated lateral suboccipital small craniotomy. Implantation of titanium mesh should be avoided, especially in cases of repeated surgery. The application of other foreign materials should be carefully evaluated.

Conflicts of Interest Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or findings specific to the article. All authors who are members of The Japan Neurosurgical Society (JNS) have registered online Self-reported COI Disclosure Statement Forms through the website for JNS members.

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