Case Report

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Treatment of hard-to-heal wound after huge scalp tumor resection and reconstruction: a case report

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Introduction and importance: Free skin flap transplantation and titanium mesh reconstruction can effectively repair the scalp and skull defects caused by massive scalp tumour resection. Postoperative flap infection is a common complication. Due to the presence of titanium mesh, once infection occurs, a second operation is required to remove the titanium mesh, which brings a great physical and economic burden to the patient.

Case presentation: In this case of postoperative infection, the authors used a conservative treatment based on dressing change, preserved the titanium mesh and flap, avoided secondary surgery, and successfully controlled the infection.

Clinical discussion: The treatment strategy is mainly divided into three steps: the first stage is to control infection, the authors use complexed iodine to repeatedly disinfect wounds, subcutaneous dead space, exposed titanium mesh, and antibiotic treatment for bacterial culture results; the second stage is to promote granulation growth, After infection control, the authors remove old granulation after each wound disinfection, and then instill fibroblast growth factor to promote subcutaneous granulation growth to fill dead space, and also provide a base platform for epidermal growth; the third stage is mainly epidermal healing, Change the dressing every day to observe the growth of the epidermis.

Conclusion: This case suggests that conservative treatment strategy based on dressing change is also a potential treatment option for postoperative infection of the flap with exposure of the titanium plate.

Keywords: free flap transplantation, huge scalp tumour, infection, wound dressings

Introduction

Malignant tumours of scalp have the characteristic of highly invasive, Invading the scalp, skull, dura and even brain tissue[1–3]. Radical surgery is helpful to prevent tumour recurrence *in situ* and distant metastasis[4,5]. After maximal resection of giant scalp malignancies, it is often accompanied by extensive scalp and skull defects, resulting in exposure of the dura and brain tissue[6]. Large scalp and skull defects are common secondary to scalp malignant resection. Currently, Free flap transplantation combined with titanium mesh reconstruction is a reliable method for cover the defects[7,8]. However, the complication of this reconstruction techniques includes flap failure, vascular pedicle thrombosis, wound dehiscence and infection[9–11]. Once infection occurs, the titanium mesh has to be removed and the transplanted flap needs to be reevaluated. It is a double whammy to the patient physically and financially. In this case of postoperative infection, we used a conservative treatment based on dressing change, preserved the titanium mesh and flap, avoided secondary surgery, and successfully controlled the infection.

HIGHLIGHTS

- This case suggests that conservative treatment is also a potential treatment option for postoperative infection of the flap with exposure of the titanium plate.
- We present the case of a 53-year-old female with infection after free flap transplantation and titanium mesh reconstruction that was treated wound dressings.
- The comprehensive treatment strategy based on dressing change was adopted to save the flap and avoid the second operation.

Case presentation

A 53-year-old female came to the Department of Neurosurgery due to a cauliflower-like mass on the right parietal occipital that had developed 2 years before admission. MRI showed an scalp lesion with skull destruction, the mass was mostly isointense on both T1-weighted and T2-weighted images and homogeneously enhanced. An extensive excision of the tumour, underlying the parieto-occipital bone and right cervical lymph node, was performed, forming an 9 ×9 cm bone window and a 15 ×15 cm

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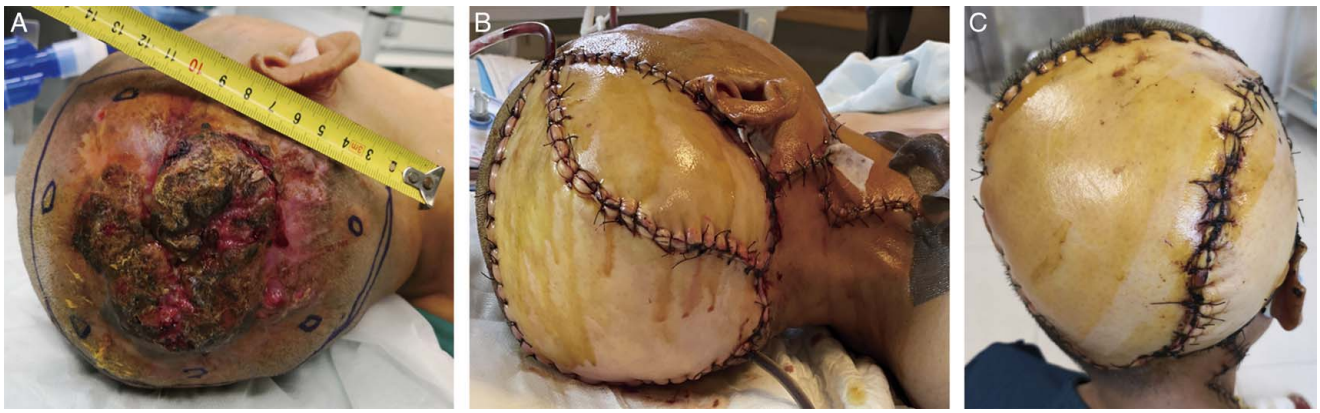

Figure 1. A free anterolateral thigh Kiss flap was used to reconstruct the complicated scalp and calvarial defects of a female patient after massive scalp tumour resection. (A) A patient presented with giant scalp tumour and the tumour with the invaded skull bone was resected. (B) An anterolateral thigh Kiss flap was adopted to reconstruct the scalp defect (a titanium mesh was used to reconstruct the skull defect). (C) The flap maintained the scalp contour with coverage of the defect.

scalp defect (Fig. 1A). The skull defect was reconstructed using titanium mesh and the scalp defect was transplanted using a free anterolateral thigh Kiss flap (Fig. 1B-C).

Five days after the operation, the distal edge of the flap gradually became flushed and cracked, subcutaneous liquefaction and necrosis was found after removing the wound sutures. The subcutaneous cavity under flap-skin junction was composed of liquefied adipose and necrotic tissue surrounded by red, swollen skin (Fig. 2A). The titanium plate was exposed and the cloudy fluid appeared to come out of the wound (Fig. 2B). The patient have a fever, with a peak temperature of 39.1°C.

Debridement was performed in the wound infections and suspected sites, removal of subcutaneous necrosis and granulation tissue. there was two infected cavity wounds in left parietal and occipital regions measuring $5 \times 2.5 \times 1$ and $2 \times 1.5 \times 1$ cm, respectively (Fig. 2C, D). Thoroughly disinfect cavity wounds with povidone-iodine, and then fill the subcutaneous cavity with petrolatum gauze and form a continuous drainage. This therapy was performed twice a day. Antibiotics was initially used based on the result of aerobic culture and resistance.

At 7 days after the debridement, the fever began to subside, suggesting that this therapy was able to effective destroy the infecting bacteria, even in this difficult-to-access cavity. Fresh granulation tissue was formed on the side wall and bottom of the wound cavity, and the redness and swelling of the surrounding skin gradually subsided (Fig. 2E, F). After infection was controlled, the next treatment is to rapidly grow granulation tissue to fill the cavity and form a base for epidermal cells to attach and crawl. Povidone-iodine was used to irrigate the cavity wound and then normal saline. The basic fibroblast growth factor was left inside the cavity, which was not washed with normal saline. Then Vaseline gauze fills the cavity and pressure bandages to eliminate the dead space and make the granulation tissue close to the skin. This therapy was performed once a day.

After the patient underwent three weeks of treatment, the wound was evaluated. The left occipital wound has been completely healed, and the left top cavity is significantly smaller than three weeks ago. In the left parietal part of the head, there was an irregularly shaped cavity measuring $2.5 \times 1 \times 0.5$ cm (Fig. 2G, H). Thick granulation tissue has grown in the cavity, and the granulation at the base gradually embeds the titanium plate at the bottom. The wound volume was reduced by more than 90% after 6 weeks (Fig. 2I), and final wound closure was achieved after 8 weeks (Fig. 2J). This case report has been reported in line with the SCARE Criteria[12].

Discussion

Free flap transplantation and cranioplasty can be complex surgical measures in patients with scalp and skull defects due to massive scalp tumour resection[13,14]. Postoperative complications such as surgical site infection, scalp flap atrophy and titanium mesh exposure often occur[15,16]. The main reasons for these complications are: (1) postoperative titanium mesh will exert stress on the transplanted skin flap, thereby affecting the local blood supply of the skin flap, resulting in poor healing of the suture[17]; (2) because the titanium mesh is much thinner than the normal skull, dead space is easily formed after reconstruction, and the muscle and fat carried by the flap are difficult to fill[18]; (3) In the first-stage scalp and skull reconstruction, the attachment and growth of the skin flap is hindered because the free skin flap is directly covered on the titanium mesh without the blood supply and nutritional support of the skull; (4) Some studies put forward the hypothesis of the mechanism of pressure gradient fluctuation: After cranioplasty, the intracranial pressure fluctuation becomes larger, and the tissue around the mesh becomes thinner due to repeated pressure on the titanium mesh and the lower layer[15,19].

Titanium mesh is a commonly used material for cranioplasty because of its light weight, high strength and good biocompatibility[20,21]. However, there were postoperative complications such as site infection, scalp flap atrophy, and titanium mesh exposure[21,22]. Infection is the main cause of postoperative titanium mesh exposure, and the removal rate of titanium mesh after infection is about 28.6%[20]. In clinical practice, the principle of surgical infection control is debridement. Therefore, it is necessary to remove not only the infective foci but also the foreign bodies that induce or promote infection, especially titanium mesh[23].

For patients with exposed titanium mesh and infection, conservative anti-infection methods are difficult to effectively remove bacteria on the surface of titanium mesh, and the infection control is poor[23]. At present, the commonly used treatment strategy is to remove the titanium mesh to achieve the purpose of completely

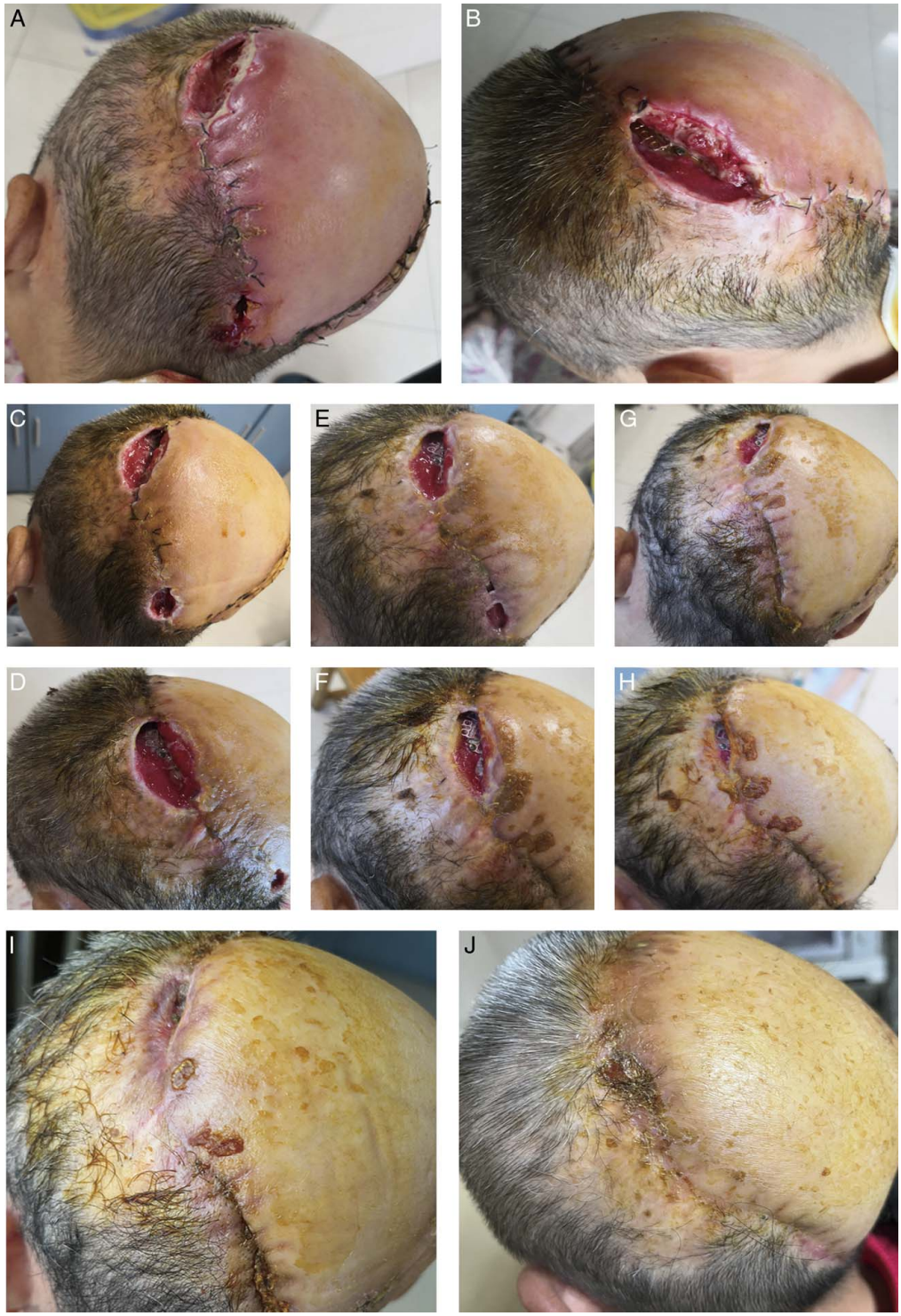

Figure 2. The growth process of subcutaneous cavity under flap-skin junction. (A-B): Five days after surgery, severe infection of the wound developed; (C-D): After debridement,there was two infected cavity wounds in left parietal and occipital regions measuring 5 × 2.5 × 1cm and 2 × 1.5 × 1cm respectively; (E-F) 7 days after the debridement; (G-H): 3th week of treatment; (I): The wound volume was reduced by more than 90% after 6 weeks: (J): The final wound closure was achieved after 8 weeks.

removing the source of infection[24]. Following treatment strategy, the titanium mesh needs to be removed and the second stage repair should be performed after infection control[25]. The lack of physical support restricts the growth of the flap and has a negative effect on the appearance of the patient. In the worst case, if the transplanted flap is necrotic due to infection, a second free flap transplantation is required. This strategy imposes a substantial psychological and financial burden on patients.

In combination with the patient's poor financial situation and her desire for conservative management, a conservative management strategy based on wound dressing change was adopted. The treatment strategy is mainly divided into three steps: the first stage is to control infection, we use complexed iodine to repeatedly disinfect wounds, subcutaneous dead space, exposed titanium mesh, and antibiotic treatment for bacterial culture results; the second stage is to promote granulation growth, After infection control, we remove old granulation after each wound disinfection, and then instill fibroblast growth factor to promote subcutaneous granulation growth to fill dead space, and also provide a base platform for epidermal growth; the third stage is mainly epidermal healing, Change the dressing every day to observe the growth of the epidermis.

This case suggests that conservative treatment is also a potential treatment option for postoperative infection of the flap with exposure of the titanium plate. However, before treatment, the patient's physical conditions should be comprehensively considered, such as the degree of infection of the flap, the sensitivity of infected bacteria to antibiotics, the blood supply of the flap, and the presence or absence of cerebrospinal fluid leakage.

Ethical approval

The study was approved by the Ethics Committee of Hunan Cancer Hospital with the ethics registration number KYJJ-2021-225.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

L.W. wrote the manuscript and N.R., Z.T., H.Z., and Z.H. substantially revised the manuscript. All authors read and approved the final manuscript.

Conflicts of interest disclosure

The authors declare that they have no competing interests.

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Availability of data and materials

All the data are available.

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