



Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en



Technical note

A novel two-step surgical technique for bone-anchored hearing aid conversion surgery

A. Cakır Cetin*, E.A. Guneri

Department of Otorhinolaryngology, Dokuz Eylul University Medical School, Kulak Burun Bogaz Anabilim Dalı, Balçova, 35340 Izmir, Turkey



1. Introduction

Bone-anchored hearing aids (BAHAs) help patients with conductive or mixed hearing loss due to a variety of middle or external ear pathologies, which restrict the use of conventional hearing devices [1,2]. Among these devices, BAHA (Cochlear Bone Anchored Solutions AB, Mölnlycke, Sweden), is well-known and widely marketed with two major abutment styles:

- a previously introduced percutaneous (Dermalock) system and;
- a recently announced transcutaneous one (Attract).

According to current data, the most common complications of the percutaneous implant are skin related issues [1–4], which are sometimes resistant to medical treatments and thus require revision surgery or conversion to a transcutaneous system [5]. When the surgeon decides to convert the implant to a transcutaneous system, a serious concern about the skin emerges. It is an intricate task to heal the skin that was meticulously thinned in the previous surgery and is subsequently injured due to infections. Additionally, placing a magnet under such a thin and an unhealthy skin layer can lead to much more severe skin complications in the future. Therefore, we designed a two-step surgical approach using a temporalis muscle flap as a novel and safe route for conversion of BAHA surgery and aimed to share our clinical experience in the current report.

2. Case Report

A 34-year-old male with no known adverse skin conditions was rehabilitated with a BAHA Dermalock (BIA400 Implant 4 mm w Abutment 12 mm) implantation in July 2013. We obtained a written informed consent from the patient.

During the surgery, a 3 mm linear skin incision was performed and subcutaneous fatty tissue was carefully reduced. Initially, the wound healed well, but after fitting the sound processor in the sixth week, he was re-admitted several times because of periaabutment dermatitis and granulation tissue problems. He was

treated each time with a local wound dressing with antibiotic and corticosteroid-containing ointments in addition to systemic antibiotics. In addition, he had to undergo a scar revision, but it did not entirely solve the issue. During clinical follow-ups, the patient has presented in a state where the processor could no longer be used. Thus, we decided to revise the case with a BAHA conversion surgery in January 2017. Unfortunately, the patient's scalp adjacent to the abutment was seriously damaged and atrophic. Therefore, it had to be healed before the implant revision.

For this purpose, we planned a two-step surgical procedure: first to detach the abutment and utilise a local flap for revascularizing the skin, followed by a brief wait to assure skin recovery. Thereafter, we placed the BAHA Attract in the second procedure. In the first stage, a postauricular inferiorly based U-shaped skin flap was elevated approximately 5 cm away from the abutment centre. The granulation tissue around the abutment was debrided, the abutment was detached and an inferiorly based temporalis muscle flap of 3 × 3 cm in dimensions was rotated to cover the medial aspect of the scarred skin area (Fig. 1) and sutured. Three months postoperatively, we confirmed the perfect healing of the wound and the second step was performed using the old incision to attach the magnet of the BAHA Attract. The patient underwent fitting of his processor six weeks postoperatively. He did not report any subjective discomfort from the device and continues to wear it 22 months post-operation (Fig. 2).

3. Discussion

Though some authors advocate the audiological superiority of percutaneous osseointegrated hearing aids [6,7], chronic or treatment-resistant skin complications may bring transcutaneous systems into prominence. The incidence of adverse skin reactions related to percutaneous implants was reported to be as high as 25% [1] in adults and the elderly. Skin complications may sometimes require an implant revision in as many as 34% of patients [2]. Iseri et al. [6], compared percutaneous and transcutaneous BAHA surgery in a multicentric study, and observed adverse skin events in 14% of patients in the Dermalock group, but not in any patients in the Attract group (except for erythema in one patient). Cedars et al. [5] reported a series of four cases, which required conversion to the transcutaneous system because of skin problems.

* Corresponding author.
 E-mail address: aslicakir84@hotmail.com (A. Cakır Cetin).

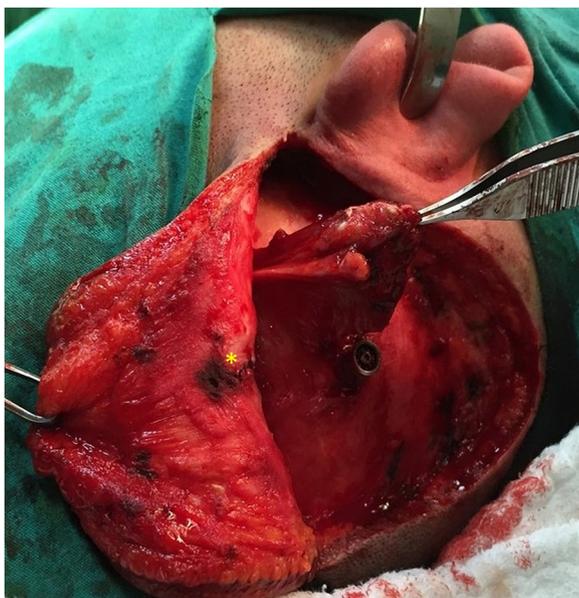


Fig. 1. Intraoperative surgical view of the temporalis muscle rotation flap (The Adson tweezer indicates the temporalis muscle flap, and the yellow asterisk refers to the sutured abutment hole on the skin).



Fig. 2. Late post-operative image of the patient's scalp taken one month after the second step of the conversion surgery. Note the perfect healing of the defected skin area.

Several surgical principles have been identified to promote or prevent skin complications. To the best of our knowledge, the linear incision [1], the skin flap technique [3], the puncture method [8] and soft tissue preservation strategies [9] offer more favourable postoperative skin outcomes. Additionally, some authors have highlighted the protective effect of sealing the outer aspect of the abutment with hydroxyapatite rather than titanium on dermal complications [9], but contrary opinions have also been given [10].

As far as we know, there is a lack of reported data describing a suitable surgical approach for BAHA conversion surgery in the context of severely injured skin. Likewise, there is a lack of literature that offers a large patient series on this subject. Therefore, we submit a new technique in this regard. Our case was the first unique patient in whom we experienced a treatment-resistant dermal complication and it was an opportunity to premier our novel two-step BAHA conversion surgery. The temporalis muscle rotation

flap is not a novel, but a familiar local flap for otolaryngologists. In this case, it was beneficial to obtain a healthy and thick enough dermis. However, our single case study may not be indicative that this procedure will become standard. There is a need for large research studies on this topic in other clinics to confirm our findings.

4. Conclusion

We suggest that the temporalis muscle rotation flap is a safe, simple and successful choice to ensure healthy skin cover over the magnet and recommend waiting a couple of months before placing the magnet. We achieved complete success in our patient using this two-stage surgery. In conclusion, we hope that our result may inspire BAHA surgeons who experience persistent skin complications with BAHA Dermalock to consider a conversion procedure.

Funding or Financial Support

None.

Disclosure of interest

The authors declare that they have no competing interest.

Acknowledgments

The authors would like to thank Enago (www.enago.com) for the English language review.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.anorl.2019.09.008>.

References

- [1] Calvo Bodnia N, Foghsgaard S, Nue Moller M, Caye-Thomasen P. Long-term results of 185 consecutive osseointegrated hearing device implantations: a comparison among children, adults, and elderly. *Otol Neurotol* 2014;35:e301–6.
- [2] Kiringoda R, Lustig LR. A meta-analysis of the complications associated with osseointegrated hearing aids. *Otol Neurotol* 2013;34:790–4.
- [3] Fontaine N, Hemar P, Schultz P, Charpiot A, Debry C. BAHA implant: implantation technique and complications. *Eur Ann Otorhinolaryngol Head Neck Dis* 2014;131:69–74.
- [4] Penaranda D, Garcia JM, Aparicio ML, Montes F, Baron C, Jimenez RC, et al. Retrospective analysis of skin complications related to bone-anchored hearing aid implant: association with surgical technique, quality of life, and audiological benefit. *Braz J Otorhinolaryngol* 2018;84:324–31.
- [5] Cedars E, Chan D, Lao A, Hardies L, Meyer A, Rosbe K. Conversion of traditional osseointegrated bone-anchored hearing aids to the Baha[R] attract in four pediatric patients. *Int J Pediatr Otorhinolaryngol* 2016;91:37–42.
- [6] Iseri M, Orhan KS, Tuncer U, Kara A, Durgut M, Guldiken Y, et al. Transcutaneous bone-anchored hearing aids versus percutaneous ones: Multicenter Comparative Clinical Study. *Otol Neurotol* 2015;36:849–53.
- [7] Hol MK, Nelissen RC, Agterberg MJ, Cremers CW, Snik AF. Comparison between a new implantable transcutaneous bone conductor and percutaneous bone-conduction hearing implant. *Otol Neurotol* 2013;34:1071–5.
- [8] Gordon SA, Coelho DH. Minimally invasive surgery for osseointegrated auditory implants: a comparison of linear versus punch techniques. *Otolaryngol Head Neck Surg* 2015;152:1089–93.
- [9] van Hoof M, Wigren S, Duimel H, Savelkoul PH, Flynn M, Stokroos RJ. Can the hydroxyapatite-coated skin-penetrating abutment for bone conduction hearing implants integrate with the surrounding skin? *Front Surg* 2015;2:45.
- [10] Hogsbro M, Agger A, Johansen LV. Bone anchored hearing implant surgery: 1 year follow-up data shows no effect of hydroxyapatite coating on soft tissue reaction after loading at 1 week. *Otol Neurotol* 2017;38:e152–8.