How I Do It

SECTION EDITOR

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The 'bus stop' incision for bone-anchored hearing aid placement: a step-by-step approach to soft tissue preparation

There have been many descriptions of soft tissue preparation in the era when subcutaneous tissue was routinely removed with the Nijmegen technique [1] or with the dermatome [2]. More descriptions continue to evolve with the advent of tissue preservation techniques, like 'punch and drill' [3], and the minimally invasive ponto surgery (MIPS) [4]. In this article, **Adonye Banigo** and **Alex Bennett** describe a simple 'bus-stop incision', which combines the benefits of access and excellent wound healing.

The bone-anchored hearing aid (BAHA) is a percutaneous device composed of an implant, abutment and an audioprocessor which transmits sound vibrations directly into the inner ear via an osseointegrated titanium screw (see Figure 1). It was introduced in clinical practice in the 1970s in Sweden [5]. BAHA is the brand name for a specific device from Cochlear®. However, a similar device is also made by Oticon® called the Ponto. This article refers to a BAHA as any percutaneous bone integrated hearing aid with a visible abutment. Bone anchored hearing aid placement is considered a core competence for an ENT surgeon in the UK [7]. It is indicated for patients with conductive or mixed hearing loss, in whom a conventional amplification device is not suitable or contraindicated, and these patients should have adequate bone conduction pure-tone thresholds largely accepted as 45dBHL averaged over 0.5, 1, 2 and 4 kHz; although the most powerful BAHA sound processors can compensate for a sensorineural loss up to 65dBHL [8]. It is also indicated in patients with single-sided senorineural deafness (SSD) i.e. profound unilateral hearing loss (bone conduction on pure tone audiogram >90Dbhl [9]) where it acts like a surgically implanted version of the contralateral routing of signals (CROS) hearing aid, eliminating the head shadow of SSD and occlusion effects of CROS.

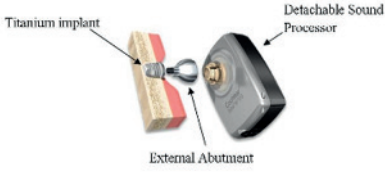

Figure 1. Components of the bone-anchored hearing aid [6]

Figure 2. (L-R) Drooping of skin from 2 o'clock to 6 o'clock with erythema and discharge, and tethering around abutment with some granulation tissue

Figure 3. Cruciate pattern of incision

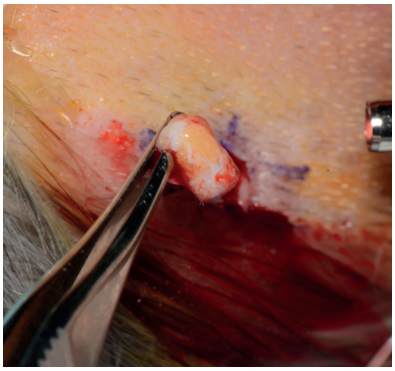

Figure 4. Cylindrical piece of skin removed with punch biopsy

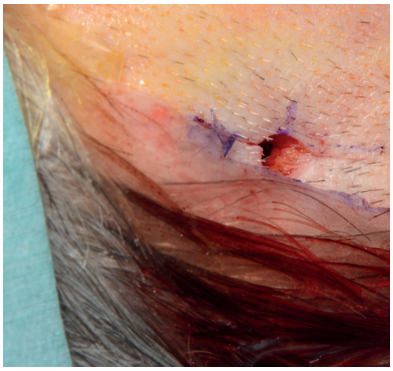

Figure 5. Circular defect created by punch biopsy

Soft tissue preparation

Soft tissue reactions around BAHA implants are a common occurrence, and prevalence rates have been quoted as high as 36% in children [10,11]. A review on skin complications associated with bone-anchored hearing aids concluded that the linear incision technique appears to be associated with lower skin complications [12]; however, in our experience, even this technique can give rise to skin tethering and drooping around the abutment leading to exposure of soft tissue resulting in infection (see Figure 2) [13].

Technique

The operation is performed under local anaesthetic as a one-stage procedure where the implant and abutment are fitted at the same time. The BAHA site is identified and marked as per the manufacturer's template, and the skin around this area is shaved. Skin thickness is measured before local anaesthesia infiltration to determine the correct length of abutment and the incision to be made over the implant site is marked with a cruciate pattern, with a 2-3cm vertical axis (cranio-caudal distance) (see Figure 3).

Local anaesthesia is infiltrated and a 5mm skin punch biopsy (which corresponds to the diameter of the abutment shaft) is performed down to bone. The small cylindrical piece of soft tissue and skin is removed (see Figures 4 and 5).

Skin incisions are made which transect through the centre of the wound (see Figure 6).

The skin is not thinned. A Plester self-retainer (see Figure 7), which is two-pronged on one side with a blunt blade on the other, is placed in the wound to enable access to the bone for drilling but also enables easy removal at the end of the procedure without snagging the wound edges.

"A Plester self-retainer, which is two-pronged on one side with a blunt blade on the other, is placed in the wound to enable access to the bone for drilling, but also enables easy removal at the end of the procedure without snagging the wound edges."

The implant and abutment are fitted as per the manufacturer's instructions, and the wound is closed with two interrupted nylon sutures (as shown in Figures 8 and 9) which are removed in seven days' time. The bus-stop incision ensures that all the soft tissue and skin fit snugly around the abutment without stretching the skin.

Discussion

Postoperatively, patients are followed up in a week for removal of sutures, and at six weeks for fitting of the processor. In our experience, this technique provides tension-free wound closure around the abutment and excellent cosmetic results.

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Figure 6. Skin incisions made along marked sites

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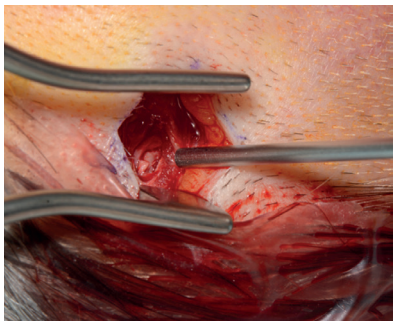

Figure 7. Plester self-retainer in-situ as implant site is being prepared

Figure 8. Abutment screwed onto implant with wound closed

Figure 9. Wound closed with abutment and implant in-situ

"In our experience, this technique provides tension-free wound closure around the abutment and excellent cosmetic results."

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ABOUT THE AUTHORS

Adonye Banigo is an ENT Registrar on the East of Scotland Training Programme. Although Adonye admits to having a particular interest in head and neck surgery and laryngology, he seems to be drawn to publications in otology and he completed and published a single blinded trial studying hearing outcomes with a politzerisation device in children with glue ear. He is also in the process of publishing an article on unusual non-surgical complications following mastoid surgery, which every otologist should be aware of. Amongst all the basic science domains in ENT, Adonye is most fascinated with ear anatomy and physiology and regular teaches medical students on this topic.

Alex Bennett has been a Consultant ENT Surgeon and Honorary Senior Lecturer at the Royal Infirmary of Edinburgh since 2010 where he has set up multidisciplinary 'balance' and 'hearing implant' services. As part of the Scottish National Ear Reconstruction team, he pioneered combining hearing implantation with autologous reconstruction in the UK. His current research interests concern the impact of congenital unilateral conductive hearing loss on childhood development, hearing implants, mastoid obliteration and intra-tympanic therapy for sudden hearing loss and Meniere's disease. He created the Complete Ear Surgery course which runs annually at the Royal College of Surgeons of Edinburgh.