International Journal of Pediatric Otorhinolaryngology 73 (2009) 1076–1079

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

Bone-anchored hearing aid A single-stage procedure in children

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ARTICLE INFO

Article history:
Received 6 August 2008
Received in revised form 21 March 2009
Accepted 28 March 2009
Available online 26 May 2009

Keywords:
BAHA
Paediatric
Implantation
Audiology
Outcomes

ABSTRACT

Objective: The bone-anchored hearing aid (BAHA) is an essential part of the armamentarium of the modern otolaryngologist dealing with ear disorders. A two-stage approach for implantation in children is recommended by the manufacturers. In our practice we implant BAHA in children as a single procedure. We describe our technique and results.

Method: We performed a review of all children having a BAHA between 1997 and 2005. Surgery was performed by taking a post-auricular split skin graft and excising the underlying soft tissues. Drilling, tapping and fixture placement were performed as per the manufacturer's instructions. The skin graft was then sutured in place and perforated in its centre and the abutment placed. Ten to twelve weeks were allowed for osseointegration before the hearing aid attachment.

Results: Thirty children were implanted. Age at implantation ranged from 3 to 15 years (mean 9.1 and median 8.1 years). Main indications included recurrent otorrhoea, conductive hearing loss and aural atresia. Follow-up was at 4–6 weeks review initially, curtailing to 6 monthly reviews and then annual review. Early complications of skin infection occurred in two patients. Late complications such as skin hypertrophy and chronic infection occurred in two patients. Two patients lost the fixture due to trauma, both were subsequently reimplanted. There was no incidence of implant failure to osseointegrate. Twenty-eight children (93%) implanted wear their BAHAs.

Conclusion: Our results show that a single-stage technique is associated with a low rate of early complications, with no reports of fixture loss due to osseointegration failure.

1. Introduction

The bone-anchored hearing aid (BAHA) is an essential part of the armamentarium of the otolaryngologist dealing with disorders of the ear. It is a bone-conduction hearing device secured to the skull by the process of osseointegration using a titanium fixture. The implant propagates sound directly to the inner ear through the bones of the skull, bypassing the impedance of the skin and subcutaneous tissues. It can be used to rehabilitate those with a conductive or mixed type of hearing impairment. Patients who are unable to wear a conventional hearing aid are the primary beneficiaries: in the paediatric population this is commonly patients with aural malformation or atresia.

Most surgeons implant BAHA in adults as a single-stage procedure. A two-stage approach for implantation is recommended by the manufacturers for children, because of fears of poorer osseointegration than compared to adults [1]. However, it has been our practice to implant BAHA in children as a single stage. The aim of this study is to describe our technique and present our early results in the support of single-stage surgery for paediatric BAHA insertion.

2. Methods

All children undergoing BAHA surgery in our unit are operated upon by a single surgeon (NKG). Their details are recorded in a database prospectively. We reviewed the clinical records of 30 children fitted with BAHA consecutively over a period from 1997 to 2005. We recorded patient demographics, indication for surgery, associated co-morbidity, initial and late complications, the long-term stability and audiologic thresholds.

2.1. Surgical technique

The first step in BAHA implantation is to mark the site. The ideal position is identified 5 cm behind and above the external auditory meatus (unless the child has microtia, when it is preferable to place the BAHA more posteriorly so as to avoid damaging the skin envelope for any possible future auricular reconstruction). After the area is shaved and cleaned, the site is then marked with methylene blue and infiltrated with 2% lignocaine with 1:80,000 adrenaline (Fig. 1). A split skin graft (in order to ensure hairless area

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doi:10.1016/j.ijporl.2009.03.028

Fig. 1. Site marking and infiltration.

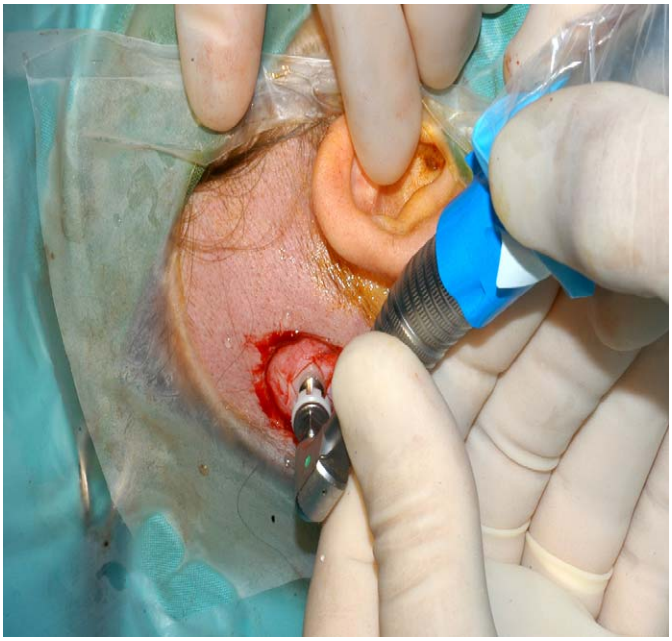

Fig. 3. Bone drilling.

for the implant) is taken from the site using a Silver's knife. Removal of soft tissue is carried out down to periosteum (Fig. 2). The area is drilled with a 3 mm burr, followed by a 4 mm burr if the thickness of bone allows (Fig. 3). At times the dura was exposed, but that did not alter the technique employed. The hole is tapped (all children in this series were implanted before the use of the self-tapping fixture was adopted). A single fixture is placed with no irrigation (Fig. 4). The split skin graft is placed over the fixture and sutured with 5/0 silk (Fig. 5). A 4 mm skin biopsy punch is used to perforate the centre of the skin graft. The abutment is placed onto the fixture. A healing cap is placed on the abutment and antibiotic ointment-impregnated ribbon gauze is wound around the abutment as a pressure dressing to stabilise the skin graft (Fig. 6). The dressing was removed and the wound reviewed at 2 weeks. At this stage training in caring for the implant for the child's carer is started by an audiologist with special interest in BAHA (AC). The wound is further reviewed at 4–6 weeks in the clinic, and the implant left to osseointegrate for 10–12 weeks before BAHA fitting. Thereafter, the patient is seen for review at 6 months and then annually.

3. Results

3.1. Patient group

Thirty children were implanted, 15 boys and 15 girls. Age at implantation ranged from 3 to 15 years (mean 9.1, median 8.1 years). Patients receiving BAHA had conductive and mixed hearing losses. In some patients there was co-existing problems such as recurrent otorrhoea in five patients, aural atresia/malformation in seven patients, and a bilateral cholesteatoma in one patient.

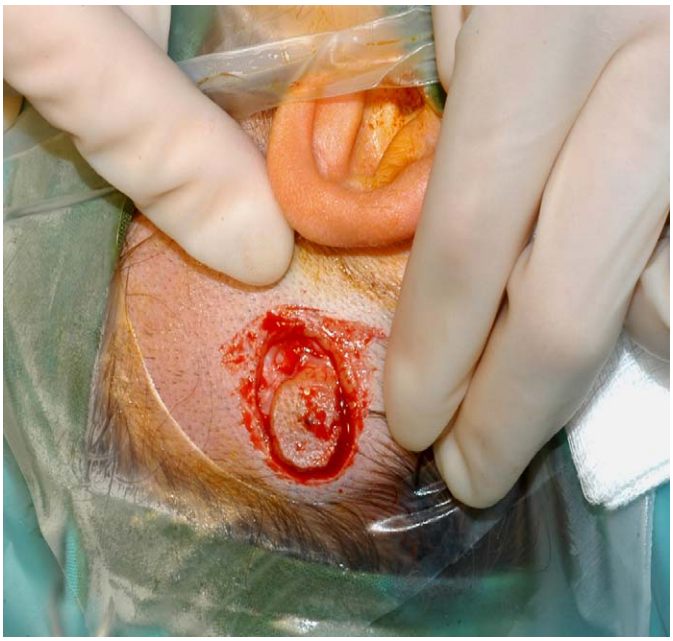

Fig. 2. Excision of subcutaneous soft tissue.

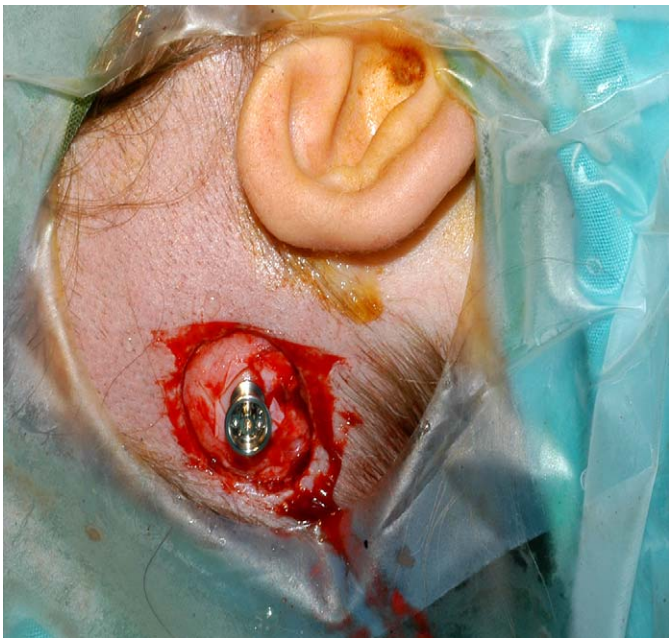

Fig. 4. Fixture placement.