Baha® JUNE 2008
clinical review

The focus of this issue is the surgical procedure of Baha. We summarise the most important points to consider and review four articles on surgical technique and outcome. If you would like more information or full copies of the articles please contact Fredrik Breitholtz..

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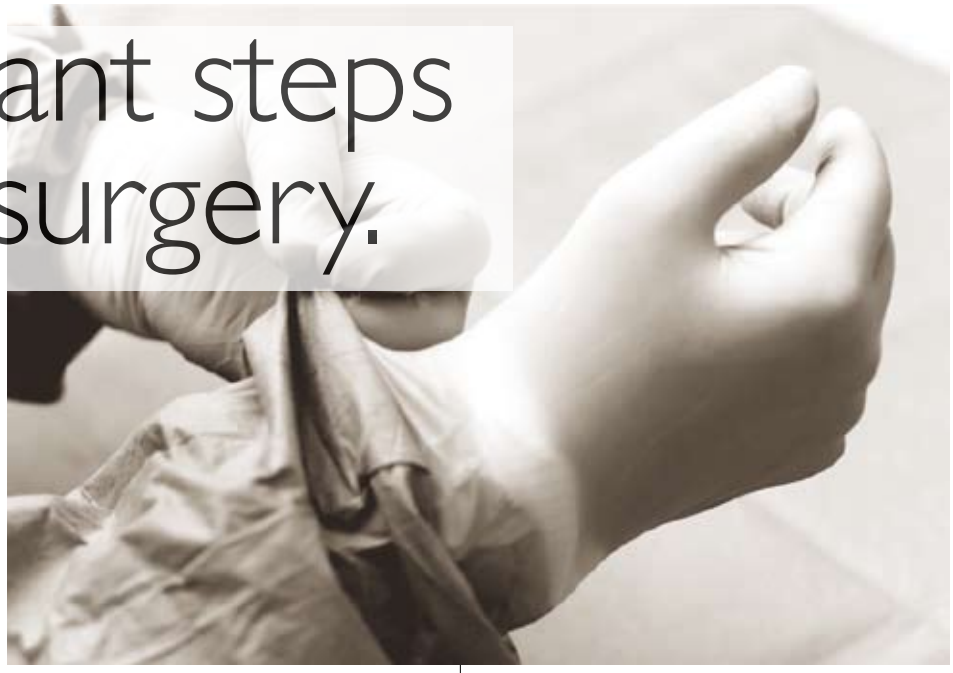
With best wishes, your BAS R&A team; Mark Flynn, Fredrik Breitholtz, Glenn Halvarsson, Agneta Rosengren and Andre Sadeghi

7 important steps in Baha® surgery.



The goal of Baha surgery is to have an osseointegrated implant and a reaction free graft area.

The surgery is minor but attention must be given to detail for a successful outcome. In this article we summarize some of the most important steps in the surgical procedure. For more detailed information please refer to the surgical manual.

1. Create a thin, hair free skin graft.
The thickness, or rather thinness of the skin graft is vital to achieve an immobile interface between implant and soft tissue[1] (Less than 1mm in thickness). Comparing to what the body itself does when something penetrates the skin can be quite insightful as a comparison. Check the tissue close to your nail, there is no hair growing here and you cannot lift or move the skin. This stops foreign objects from accumulating between the skin and nail, minimising the risk of infection. The creation of a thin immobile graft around the implant is the aim of Baha surgery. The Baha Dermatome is an excellent tool to create a thin skin graft (0.6mm thick). Also be sure to scrape any shaved hair from the graft before it is sutured back using a scalpel.

2. Make sure the soft tissue slopes gently down toward the graft site.
If the border between the graft site and surrounding soft tissue is too steep, soft tissue will creep in towards the implant creating a gentle slope.[2] This in turn will shrink the size of the graft site and lift the graft from the periosteum. In cases with thick soft tissue this can cause the entire graft to become mobile.

3. Do not decrease the size of the soft tissue reduction.
Sufficient soft tissue removal is of the utmost importance to create a stable graft. Follow the recommendation in the surgical manual. It may be tempting to minimise the size of the soft tissue reduction for cosmetic reasons, but this can lead to increased soft tissue problems. There are seldom any cosmetic problems related to the size of the soft tissue reduction after healing.

4. Remove any mobile periosteum close to the implant site.
If the periosteum can be lifted with forceps it should be removed. A mobile layer of periosteum will make the skin graft mobile as it heals.

5. Drill with care.
The bone must not be heated above 42° C. To avoid overheating, drill in short bursts and allow time for cooling as you drill the guide hole. When using the countersink, remove accumulated bone chips from the cutting flutes. As the Baha implant relies on osseointegration with the skull, living bone close to the implant is a prerequisite for a successful outcome. Temperature may reach over 100° C at High Speed (2000rpm) if the proper technique is not used.

6. Irrigate
Use the irrigation system included in the drill. This will ensure that sufficient irrigation is provided. Also drill in a circular movement when the guide drill is used to allow irrigation fluid to enter the drilled hole. This will also allow visual inspection into the hole. (The guide drill is 1.85mm in diameter and the countersink and implant have a diameter of 3.75mm.)

7. Suture the skin graft down to the periosteum.
By suturing the perimeter of the skin graft down to the periosteum you will stabilise it during the healing process[1]. This will decrease the amount of pressure needed under the healing cap and may in turn reduce the risk of flap necrosis. The suturing also applies to the pedicle edge of the graft, see Surgical Manual.

Implant survival was better with the 4mm implant when compared to the 3mm. (7% loosening compared to 28% for the 3mm implant).

The Articles

Long term complications of bone-anchored hearing aids: a 14 year experience (3)
A retrospective study of 165 patients who had undergone a total of 177 bone-anchored hearing aid implantations in Chester UK.

Key statements:

- Implant survival was better with the 4mm implant when compared to the 3mm. (7% loosening compared to 28% for the 3mm implant)
- Osseointegration may be improved by using the 4mm implant and by adopting the one-stage technique.
- Dermatome surgery resulted in a promisingly low rate of skin complications.
- Skin reactions were less likely to occur as time progressed..

Bone-anchored hearing aids: Incidence and management of postoperative complications (2)
A retrospective study of 149 patients operated on between 2001 and 2005 at the House Ear Institute, USA.

Key recommendations:

- To prevent skin overgrowing the abutment:
  -Undermine wound edges 1-2 cm
  -Remove all subcutaneous tissue down to thin periosteal layer.
  -Keep healing cap in place for at least one week.
  -Frequently clean around the abutment.
  -Treat local infections in a timely fashion.
- To prevent implant extrusion
  -Use copious irrigation when drilling
  -Allow 3 months osseointegration time after surgery before fitting the speech processor.
  -Avoid trauma
- To avoid local wound infections
  -Frequently clean around abutment
  Treat local infections in a timely fashion.
  Consider titanium allergy if persistent inflammation is present.

How we do it: Frequency of skin necrosis after Baha surgery (1)
Review of surgical technique to minimize the frequency of skin necrosis after Baha surgery..

Key recommendations:

- To establish a lasting, reaction free skin penetration, the skin must not move in relation to the abutment.
- The skin should be free of hair follicles in order to facilitate every day cleaning.
- By applying a very gentle pressure on the flap the risk of skin necrosis during the healing process is reduced.

Ten years of experience with the Swedish bone-anchored hearing system (4)
A retrospective study of 147 patients who had undergone a total of 167 Baha implantations.

Distribution of skin reactions:

• 0 - No reaction	93,3%
• 1 - Slight reaction	4,1%
• 2 - Red and moist tissue	1,3%
• 3 - Granulation tissue	1,3%
• 4 - Infection + revision	0,1%

Questions and answers

Q A Baha user rides equestrian for Special Olympics and a helmet must be worn. His parents have modified his helmet, but the committee suggests that the integrity of the helmet has been compromised due to the modification. Does anyone have any advice regarding riding with Baha? The problem with the helmet today is that it will prevent his hearing and may cause feedback if contact is made with the Baha.

A I can understand the concern, and yes the child needs to hear, but the feedback issue remains when wearing the device under the helmet. Wearing the Sound Processor on a Baha Soft band outside the area of the helmet could be a good solution when riding.
Answer by Margaret Price, Cochlear Ltd

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3. Badran K, Arya AK, Bunstone D, Mackinnon N. Long-term follow up of bone-anchored hearing aids: a 14-year experience. The Journal of Laryngology & Otology 2008 May 20: 1-7
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