Survivability of the 8.5 mm Osseointegrated Abutment and Its Utility in the Obese Patient

Michael D Darley, Anthony A Mikulec, MD
Department of Otolaryngology, Saint Louis University
St Louis, MO

Abstract

Objective: Review outcomes of patients who received Baha implants and create a model comparing mechanical forces acting upon combinations of fixture and abutment lengths.

Study design: Retrospective case series and mathematical modeling.

Setting: Tertiary referral center in an ambulatory setting.

Patients: Pediatric and adult patients who received at least one osseointegrated implant for a Baha device.

Intervention(s): Surgical placement of osseointegrated implants with either the 5.5 mm or 8.5 mm abutment lengths for a Baha device.

Main outcome measures: Patient BMI, post-operative complications, and number of follow-up visits.

Results: The mean BMI of patients receiving the 5.5 vs. the 8.5 mm abutment was 25.3 and 27 respectively. Patients that received the 5.5 mm abutment developed tissue overgrowth in 37.5% (6/16) of the implants and one, 10% (1/10), 8.5 mm abutment implant developed tissue overgrowth. In this population, dermatome use was found to be associated with tissue overgrowth when compared with other surgical approaches (55.5% vs. 12.5% respectively, p=0.034). The mean number of follow-up visits in the first and second 90 day period post-operatively for patients that received the 5.5 mm abutment vs. the Baha dermatome was 1.6 and 1.8 vs. 1.8 and 1.6 visits respectively. Applying the principle of a rigid body, the 5.5 mm abutment in combination with the 4 mm fixture provided the greatest calculated mechanical advantage.

Conclusions: Patients who received the 8.5 mm abutment tended to have a greater BMI, developed tissue overgrowth complications less frequently, and had essentially the same number of post-op visits as those who received the standard length abutment. 71.4% (5/7) of the patients that developed a soft tissue overgrowth complication had a Baha dermatome surgical approach. The 8.5 mm abutment has a calculated mechanical disadvantage over the 5.5 mm abutment, but it is not yet clear if this is clinically important.

Introduction

Most of the literature regarding osseointegrated implantation for hearing rehabilitation focuses on the 5.5 mm abutment. Experience with the 8.5 mm abutment has been reported but long term results remain unclear. The goal of this study is to add to the data available on the survival of the 8.5 mm abutment and to describe its utility in obese patients. One concern regarding use of a longer abutment, is that the underlying fixture needs to withstand higher torque from lateral forces applied to the abutment, which might increase extrusion rate (see Fig. 1). Myriad soft tissue approaches are utilized for osseointegrated hearing implant placement (see Fig. 4). The best technique remains unclear. One of the hallmarks of successful implantation, irrespective of incision design or skin flap use, is adequate undermining of subcutaneous soft tissue. Obese patients tend to have copious soft tissue of the scalp, which makes trouble free implantation more challenging. The authors reside in an area of high obesity prevalence and describe a soft tissue technique that, in combination with an 8.5 mm abutment, can be utilized successfully even in obese patients.

Figure 1. Model of mechanical advantage of various abutment and fixture lengths. Force vectors and torque are symbolized by arrows and circles respectively. Blue arrows represent relative force necessary to counteract F1. Shorter arrows indicate less force and greater mechanical advantage.

Figure 2. BMI classification of the study patient population (WHO definitions for adults, CDC BMI-for-age and gender percentile for pediatric patients.)

Survivability and loss of implants

Survive = 6,7

Discussion

Osseointegrated implantation for hearing augmentation continues to evolve. Soft tissue techniques have been refined in an attempt to minimize tissue overgrowth of the abutment, which is the most common complication. In our experience, abandoning the dermatome approach and using a longer abutment combined to significantly decrease tissue overgrowth rate. Use of a longer abutment, provides more soft tissue clearance, but due to the force vectors involved, puts the underlying osseointegrated fixture under greater stress. This study showed a greater extrusion rate of the longer 8.5 abutment when compared to the 5.5 mm abutment, but it is unclear if this difference will persist over time. The fact that all extrusions occurred in patients with relatively low or normal weight is an intriguing finding of unclear significance (see table 2). The use of the longer 8.5 mm abutment does allow successful implantation of obese patients.

Table 1. Summary of complications “One patient had 2 abutments for a total of 10 abutments in 9 patients”

References