The Journal of International Advanced Otology

Int Adv Otol 2014; 10(1): 30-2 • DOI:10.5152/iao.2014.006

Original Article

Evaluation of Skin Scars Following Cochlear Implant Surgery

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OBJECTIVE: The understanding of speech is the most important outcome parameter after cochlear implantation. However, due to the excellent functional results of cochlear implantation in most patients, there is recently also a growing focus on patient comfort issues, e.g., aesthetic results.

MATERIALS and METHODS: This study evaluated 34 skin scars after cochlear implant surgery in adults using the Stony Brook Scar Evaluation Scale, a well-validated instrument with a high interrater reliability and construct validity for evaluating the aesthetic outcome of skin scars.

RESULTS: The mean follow-up time was 62 months. Using a retroauricular incision, the scars had an excellent to good aesthetic appearance in 85% of the cases. Revision surgery was the main factor for aesthetically unsatisfactory scars.

CONCLUSION: The aesthetic outcome of skin scars after cochlear implant surgery is excellent or good for the majority of the patients. The most important risk factor for an unsatisfactory aesthetic outcome is revision surgery, an issue that should be communicated in preoperative counselling.

KEY WORDS: Skin scars, incision, cochlear implant, patient satisfaction, Stony Brook Scar Evaluation Scale

INTRODUCTION

The main goal of cochlear implantation is, without any doubt, to restore a better understanding of spoken language and thus improve the patients' quality of life [1]. In the last years, a growing number of cochlear implant surgeons have focused on establishing minimally invasive techniques: besides atraumatic electrode insertion to spare residual hearing capabilities of the cochlea, different skin incisions were chosen with the wish for an improved aesthetic outcome and to prevent implant extrusion. Preauricular incisions were formerly performed to maximise the distance between the sutures and the implant bed, intending to reduce infections, but cannot be recommended due to the fully visible scars [2]. In retroauricular incisions, the course of the superficial temporal artery and the branches of the posterior auricular artery should be considered (Figure 1). While large incisions extending to the temporal squama were quite common in the past; nowadays many surgeons have had good experiences with rather small retroauricular incisions [3-6]. Scar outcome measures are important for patients and clinicians, since not only the long-term aesthetic impairment can be estimated, but long-term outcomes of the surgical techniques and postoperative complications like wound infections are also reflected.

MATERIALS and METHODS

The study was approved by the clinic's data protection officer. The skin scars of 27 consecutive adults (Caucasians) seen for regular check-ups of their cochlear implant in our department were evaluated using the Stony Brook Scar Evaluation Scale (SBSES) introduced by Singer and colleagues, a well-validated instrument with a high interrater reliability and construct validity for evaluating the aesthetic outcome of skin scars (Table 1) [7]. Additionally, the length of the scars was measured. Due to bilateral cases, 34 scars were evaluated in total. Data were entered into a statistical spreadsheet for calculation of descriptive statistical values such as means, medians (less vulnerable to statistical outliers), and data ranges, as well as Fisher's exact probability test with SPSS v.17.0 (SPPS Inc., Chicago, Illinois, USA).

RESULTS

The collective consisted of 27 patients (Caucasians; 17 women, 10 men) with a mean age of 61 years (median 66, range 22-85). The mean follow-up time between the operation (in case of revisions, the most recent operation) and the scar evaluation was 62 months (median 66, range 13-139). Cochlear implantation had been performed by four different surgeons; from the medical record, there was no history of severe wound infections in all cases. Implants were either manufactured by Cochlear (Sydney, Australia) or Med-El (Innsbruck, Austria). 4-0 non-absorbable sutures (single stitches) had been used and removed 7-10 days postoperatively.

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Submitted: 25.08.2013 **Accepted:** 22.12.2013

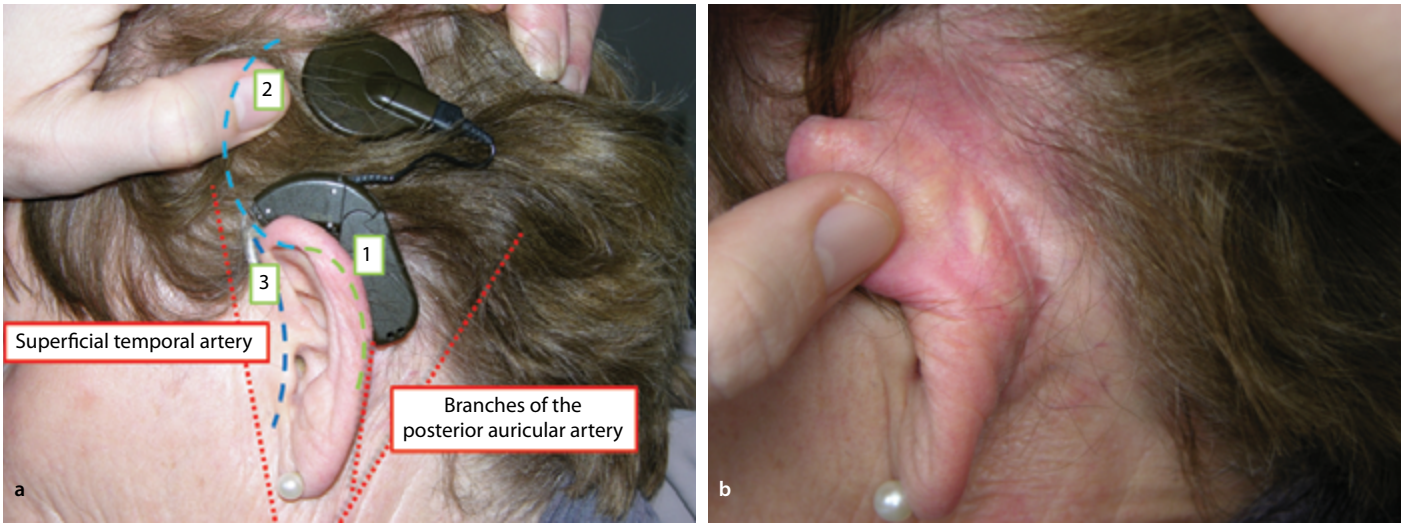

Figure 1. a, b. Schematic drawings of a small retroauricular incision (1) with possible cranial extension (2) and a preauricular incision (3, not recommended for aesthetic reasons) (a), A small incision in the retroauricular sulcus, sufficient in most cases, usually results in a small, aesthetically appealing scar (b)

Table 1. Stony Brook Scar Evaluation Score [7]

Scar category	No. of* Points
Width	
>2 mm	0
≤2 mm	1
Height	
Elevated or depressed in relation to surrounding skin	0
Flat	1
Color	
Darker than surrounding skin (red, purple, brown, or black)	0
Same color or lighter than surrounding skin	1
Hatch marks or suture marks	
Present	0
Absent	1
Overall appearance	
Poor	0
Good	1

*Total score=sum of individual scores; range, 0 (worst) to 5 (best)

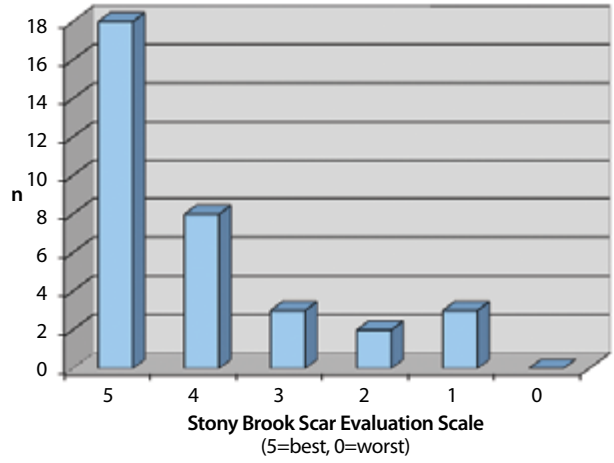

Figure 2. Histogram of the aesthetical appearance of skin scars after cochlear implant surgery using the validated Stony Brook Scar Evaluation Scale

Figure 2 shows a histogram of the obtained SBSES scores. The majority of the patients had a scar with an excellent or good aesthetic appearance.

The mean length of the scars was 6.7 cm (median 6.1, range 3.3-11.0). Since the distribution between high and low SBSES scores was very skewed, no correlation could be found between the length of the incision and the resulting aesthetic appearance.

The five patients with unsatisfactory scars (SBSES scores 0-2) included three patients who had undergone revision surgery due to implant failure (in one case, one revision following the initial implantation; in two cases, two revisions). In the 29 scars with excellent to good results (SBSES scores 3-5), there were only two cases of revision surgery, resulting in a significant difference between these Groups (Fisher's exact probability test, p=0.015).

DISCUSSION

All incisions penetrating the dermis result in some extent of scar formation [8]. Therefore, it is not possible to avoid scar formation totally in cochlear implantation as it is currently performed.

It is a concern to the authors to clearly state that of course, the functional benefit after cochlear implantation, i.e., understanding of speech, is the most important outcome parameter. However, due to the excellent functional results of cochlear implantation in most patients [1], there is recently also a growing focus on patient comfort issues; e.g., current developments in cochlear implantation are the establishment of minimally invasive techniques not even needing mastoidectomy or posterior tympanotomy [9-13], the development of fully implantable devices [14], and the use of absorbable skin sutures [15] for maximising patient comfort and benefit.

In the experience of the authors, many patients listed for cochlear implantation are concerned about receiving an incision on their skull. In contrast to a preauricular incision, a scar after retroauricular incision will usually only be visible when leaving hair-bearing skin, but can be

clearly visible over its whole course when the (male) patient has developed alopecia or the hair is very short or light. The present study shows that skin scars after cochlear implant surgery do not cause an aesthetic impairment for the majority of the patients, since high SBSES scores were reached in 85% of the cases after an adequate follow-up time. However, patients must be informed in preoperative counselling that a skin scar will result, and especially in cases of revision surgery, there is a substantial risk that the aesthetic outcome can be annoying.

This study also shows that the SBSES, to the best knowledge of the authors the only well-validated instrument currently available, is also useful in the evaluation of scars on the skull and in hair-bearing skin. When evaluating other patient collectives, e.g., children, or comparing different surgical techniques, it seems advisable only to use validated tools such as the instrument of this study.

In conclusion, using a retroauricular approach, the aesthetic outcome of skin scars after cochlear implant surgery is excellent or good for the majority of the patients. The most important risk factor for an unsatisfactory aesthetic outcome is revision surgery, an issue that should be communicated in preoperative counselling.

Data Protection Approval: The study was approved by the clinic's data protection officer.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - T. B., E.K.; Design - T.B.; Supervision - E.K., A.B.; Data Collection and/or Processing - T.L.; Analysis and/or Interpretation - T.B.; Literature Review - T.B.; Writing - T.B.; Critical Review - E. K., A.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

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