Hearing Preservation After Adult Cochlear Implantation Using the FLEXsoft Electrode

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ABSTRACT

Background/objective: Hearing preservation (HP) in the context of cochlear implantation (CI) is indicative of atraumatic insertion and could potentially offer a clinical advantage to performance. However, if residual hearing is lost due to surgical trauma or from natural deterioration, HP that was achieved from the insertion of a short electrode would then compromise any future performance that would have been obtained through a full-length implant. Our goal was to determine the degree of HP after implantation with a full-length electrode (the FLEXsoft).

Method: Prospective within-subject repeated measure study performed on adult CI patients with residual low-frequency hearing preserved at a tertiary referral centre between 2008-2010.

Results: Of the 29 included patients, 18 (62%) maintained HP throughout the follow up period (avg 317 days). Lower preoperative hearing threshold levels at 250 Hz were associated with HP.

Conclusion: Low-frequency HP is at least initially possible in patients implanted with the FLEXsoft electrode. Longer follow up is required to determine if results are maintained over time, and if such preservation is in fact advantageous to clinical outcomes.

INTRODUCTION

Over the past decade, patients with severe-to-profound high frequency SNHL with residual hearing in the low frequencies have become candidates for cochlear implantation (CI).

However, if residual hearing is lost due to surgical trauma or from natural deterioration, HP that was achieved from the insertion of a short electrode would then compromise any future performance that would have been obtained through a full-length implant. Our goal was to determine the degree of HP seen after CI with the FLEXsoft electrode.

RESULTS

Twenty-nine patients met the inclusion criteria and were implanted between March 2008 and November 2010 (table 1). Full electrode insertion was achieved in the majority of patients, with an average insertion depth of 469 degrees. The mean postoperative follow-up was 317 days (43-792).

18 patients (62%) maintained HP throughout their follow-up. 4 had complete HP, or HTLs within 10 dB of preoperative levels at all frequencies (table 2).

Immediately after surgery, hearing had been lost in 6 patients (21%) and preserved in 23 (79%). 5 of 23 patients whose hearing was initially preserved subsequently lost their hearing during follow-up.

The median pure-tone HTLs increased for the entire group between the preoperative and postoperative periods (figure 1).

The median pure-tone HTLs were 82 dB HL at 250 Hz, 75 dB HL at 500 Hz, and 68 dB HL at 1K Hz. HP was defined as hearing preservation (HP) with lower postoperative HTLs < 90 dB at 250, 500 or 1000 Hz with postop speech discrimination scores.

The results indicate that HP is possible using a full length electrode. This corroborates a report on the FLEXsoft from Europe published in 2007. In that study, which used less strict criteria for HP, 50% of patients had HP at 1 month, dropping to 25% at 12 months.

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Hearing preservation was defined as the maintenance of HTLs < 90 dB HL at 250, 500 or 1000 Hz.

DISCUSSION

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No randomized controlled studies have been performed comparing hearing preservation outcomes between different electrodes. Comparisons based on published reports are difficult because of variability in patient populations and reporting methods. For example, in studies of the Iowa/Nucleus (10 mm), Nucleus 24 Contour Advance (17 mm) and Med-El Combi 40+ Medium (22 mm) electrodes, patients had better preoperative pure-tone HTLs than did patients in the current study. Better preoperative hearing may result in better HP outcomes, as was seen in our study. In addition, different definitions of HP exist in the literature, and there are different follow up periods in different studies. Patients with shorter electrodes have been shown to have good initial HP outcomes in studies with short follow-up periods. However, it is not true that they will perform better overall than patients with longer electrodes. The importance of atraumatic surgical technique and electrode design. Research into these areas should continue.

METHODS AND MATERIALS

Adults with bilateral, severe to profound SNHL with preoperative pure tone hearing threshold levels (HTLs) < 90 dB at 250, 500 or 1000 Hz in the implanted ear were included. All patients received a Med-El Soneta T100 cochlear implant carrying the FLEXsoft electrode. The OPUS2 speech processor using Fine Structure Processing was used.

All procedures were performed with a round-window, soft-surgery technique. All subjects received middle application of steroid (Dexamethasone 10 mg/ml) prior and during electrode insertion. All subjects received systemic Dexamethasone (6-10 mg) during surgery, and some patients were prescribed oral steroid without a standardized protocol. Three surgeons participated in this study.

A prospective within-subject repeated measures study was performed with pre-op data used for controls was performed. Follow-up was scheduled at 1, 3, 6, 12 and 24 months.

Hearing preservation was defined as the maintenance of HTLs < 90 dB HL at 250, 500 or 1000 Hz.

CONCLUSIONS

Preservation of low frequency HTLs < 90 dB was possible in 62% of patients implanted with the FLEXsoft electrode over an average follow-up period of 317 days. We believe HP is indicative of atraumatic electrode insertion which will surely be an industry standard. However, its relative merit with regards to long-term outcomes and response to fine-structure processing can only be ascertained through a more rigorous appraisal which is now underway.

REFERENCES