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Comparison of methods of evaluating hearing benefit of middle ear surgery

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Abstract

The objective of this paper is to compare two methods of predicting the level of subjective patient benefit following reconstructive middle ear surgery. This should have always been an important consideration in advising patients regarding surgery, but assumes even more relevance in these days of clinical audit and cost benefit analysis. The two methods studied were the '15/30 dB rule of thumb' (Smyth and Patterson, 1985) and the 'Glasgow plot' (Browning *et al.*, 1991). The predictions of benefit for each of the two methods were compared to the assessment of actual benefits by the patient post-operatively. The results of this comparison in 153 patients were analysed, the rule of thumb was found to be somewhat more sensitive in predicting patient benefit.

Key words: Surgery, ear, middle; Hearing loss, conductive.

Introduction

The ability to advise patients pre-operatively regarding the likely benefits of the proposed surgery would appear both clinically desirable and a requirement of fully informed consent. Middle ear surgery for hearing gain has been commonplace for over thirty years yet methods of assessing the benefit from the patient's perspective have been slow to emerge.

The principal objective of this study was to compare two methods of predicting the degree of hearing benefit produced by middle ear surgery, with the patient's own assessment of the benefit. The two methods of predicting patient benefit studied are the '15/30 dB rule of thumb' (Smyth and Patterson, 1985) and the 'Glasgow plot' (Browning *et al.*, 1991).

The usual parameter employed to report the results of reconstructive surgery has been closure of the air-bone gap in the operated ear, taking no account therefore of the function of the contralateral ear. However, since normal hearing is binaural, it seems only logical that in assessing surgical attempts to reduce hearing disability that the function of both ears should be evaluated. Therefore the important feature of both the methods studied is the consideration given to the contralateral ear—thereby assessing the patient's overall hearing status.

The rule of thumb was devised by Smyth and Patterson (1985) following their analysis of the correlation between subjective patient benefit and the post-operative audiometric changes. This analysis indicated that the patient was likely to report significant benefit if the average air conduction (AC) threshold (for 0.5, 1, 2 and 4 KHz) was ≤30 dB or if the interaural difference was reduced to ≤15 dB. This finding is the basis of the '15/30 dB rule of thumb'. The second method studied was the 'Glasgow plot' developed by Browning *et al* (1991). This is a graphical device (Fig. 1) where the pre- and post-operative AC thresholds are plotted and the patient benefit predicted according to the area in which the post-operative plot lies. The pre-operative status is divided into groups 1–3 as shown in Figure 1 and the post-operative results determined as falling into one of four groups (a–d). Result categories 'a' and 'b' being regarded as of significant patient benefit, whereas those in 'c' and 'd' of marginal or no benefit.

The device is used by plotting the pre-operative and

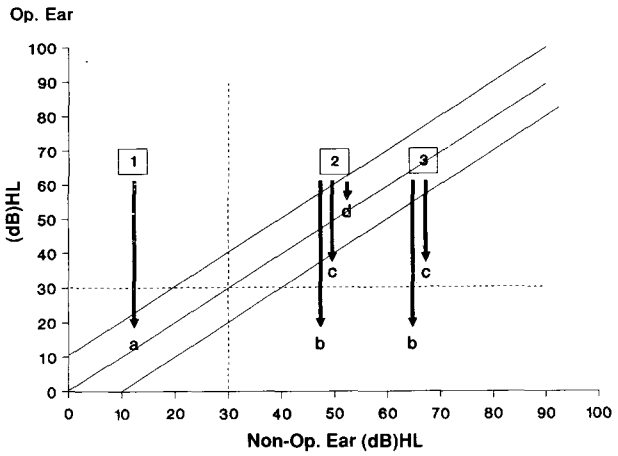

FIG. 1

The pre-operative area is divided into three areas 1—unilateral hearing loss 2—bilateral asymmetric hearing loss 3—bilateral hearing. The post-operative categories are represented by areas 'a'–'d' as follows a—Normal hearing, b—Normal hearing unilaterally, c—Bilateral impairment operated ear better, d—Symmetrically impaired hearing.

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post-operative air conduction average of the patient. This will produce a vertical line (assuming no change in the non-operated ear), the length of which represents the change in the air conduction, but the benefit to the patient depends on the area in which the line ends. For example a 30 dB change from position '1' would not change the overall auditory status, whereas from '3' the same change would result in unilateral 'normal' hearing for the patient. The outcome of the surgical intervention may also be predicted if one knows the likely improvement in air conduction from the proposed surgery by the surgeon in question.

Materials and methods

One hundred and fifty-three patients who underwent middle ear reconstructive surgery were included in this study. The patients assessment of the outcome of the surgery in terms of hearing, were surveyed using a questionnaire. In this, patients were asked to grade the hearing benefit postoperatively as 'much', 'moderate', 'little' or 'none' in noisy and quiet surroundings and then overall. A final question was whether or not the operation was worthwhile in terms of hearing benefit. The patient's assessment was then compared with the outcome as predicted by each of the two assessment methods outlined above. One hundred and twenty eight of these patients were part of the original study (Smyth and Pattenson, 1985), the remainder were additional patients surveyed for this study.

Results

The percentage agreement between the rule of thumb and the patient's assessment is 78 per cent and the agreement between the patient's assessment and the Glasgow plot is 62 per cent. The placement of the intersecting axises at 30 dB is somewhat arbitrary, dictated by the level at which hearing is considered to be socially adequate. However relocating these axises to 40 dB on the Glasgow plot, which represents a less stringent assessment of socially adequate hearing, and repeating the analysis increased the agreement to 71 per cent of patients. The patient questionnaire allowed the patient to comment on the hearing in quiet and noisy situations and also an overall assessment of hearing. A further analysis of this more detailed data translated into a scoring system did not demonstrate any better correlation with either of the predictive methods.

Conclusions

The outcome of reconstructive surgery from the patients point of view should always have been an important consideration. However in the current climate of increasing emphasis on clinical audit and cost-benefit analysis it is even more important to have validated methods of evaluating patient benefit of surgical procedures. Both these methods provide a significant degree of correlation with the patients estimate of benefit. If the axises are moved to 40 dB for the Glasgow plot the degree of agreement between both methods and the patient's assessment is comparable.

The authors find the rule of thumb simpler to use in the routine clinical situation. Although not demonstrated in this study it may be that application of the more sophisticated Glasgow plot to larger series will yield more precise predictive data than the rule of thumb.

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