Hurley, R. and Iyer, A. (2020) Cavity obliteration in revision mastoidectomy leads to dry ear and improved quality of life: Our experience in 29 patients. *Clinical Otolaryngology*, 45(4), pp. 604-607. (doi: 10.1111/coa.13532) (PMID:32219983)

Keypoints

- Chronically discharging mastoid cavities can be troublesome and results of surgical management is variable
- Cavity obliteration at the time of revision mastoidectomy in our centre shows dry ear rate of 93% (28/30)
- This is the first study to show improvement in QoL in relation to otological symptoms using disease specific questionnaire (COMBI questionnaire)
- The benefit to general quality of life is comparable with other otological procedures.
- The biggest improvement was noted in improvement of 'smelly ears', 'ear discharge' and 'Need to take eardrops'

Introduction

The traditional aims of surgery for chronic otitis media have been to eliminate pathological tissue to produce a safe and dry ear; to prevent recurrent disease and if possible, to restore the normal function of the middle ear e.g. reconstructing the hearing mechanisms. In many cases this has primarily been via mastoidectomy.[1] **There are well documented pros and cons for both canal wall up (CWU) and canal wall down (CWD) mastoidectomies. CWD mastoidectomies are accepted to have lower rates of residual or recurrent choleasteatoma due to the improved exposure, however mastoid** cavities themselves can be problematic. Recurrent disease, otorrhea and the requirement for regular cleaning can be unpleasant, socially embarrassing and have an impact on the patient's working life[2].

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Revision mastoidectomy aims to resolve issues with recurrent cholesteatoma and troublesome cavities. Cavity obliteration is a relatively new practice **and can be performed at primary mastoidectomy or during revision surgery.** There are a variety of techniques and graft material available to obliterate mastoid cavities including fascial musculo-periosteal flaps, bone chips, bone pate, cartilage and hydroxyapatite. Most studies looking at the effectiveness of cavity obliteration use objective measurements such as dry ear rate[3–9]. There have been two studies looking at generic quality of life measurements in revision mastoidectomy with cavity obliteration. These both showed a good improvement in quality of life demonstrated by Glasgow Benefit Inventory (GBI) score in comparison to other general ENT procedures[10,11]. But there are no studies analysing the specific aspects of this improvement using disease specific tools. This information would be useful to counsel the patients before surgery and to convince the healthcare management about the usefulness of these procedures.

The GBI is a validated questionnaire to measure quality of life outcomes following an otolaryngological intervention, across three domains – general, physical and social[12]. However, it measures generic outcomes and is not specific to a disease process. Recently, Phillips et al validated the Chronic Otitis Media Benefit Inventory (COMBI) as a disease-specific patient reported outcome measure for chronic otitis media which includes questions relating to hearing, otorrhoea, tinnitus and dizziness as well as questions relating to daily activities and healthcare requirements[13]. This questionnaire has 12 questions and benefit is also measured from -100 to +100.

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The aim of this study was to measure the outcomes following revision mastoidectomy with cavity obliteration – both objectively in terms of dry ear rates and with regard to quality of life.

2 Methods

2.1 Ethical considerations – Prospective audit data from patients undergoing surgery was used and were sent anonymised questionnaires with a covering letter. There was no obligation for the patients to complete the questionnaires.

2.2. Study design quantitative data

Patients were identified who had revision mastoidectomy and cavity obliteration between 2010-2017. 30 were identified and all were invited to take part. All patients had presented to the clinic with troublesome, persistent otorrhea which failed to respond to conservative management. Basic demographic data were recorded including age and gender. Data regarding comorbidities such as diabetes mellitus were recorded. Operative data were recorded including operative side, method of access, materials used for obliteration as well as extent of recurrent disease. Furthermore, dry ear outcome on clinic review was recorded as well as duration of follow-up for all patients.

2.3 Study design qualitative data

A unique code was assigned to each patient and both GBI and COMBI questionnaires sent via post with a stamped address envelope for the patients to return their anonymised questionnaires. Returned questionnaires were matched to the unique patient code and recorded in Excel. Average benefit across each of the GBI domains

was calculated and overall average benefit on the COMBI questionnaire was calculated.

2.4 Surgical technique and follow-up

The operations were performed by the same surgeon by post auricular route. Both mucosal disease and cholesteatoma was encountered and the details of the type of materials used were recorded. Whether or not an ossiculoplasty was attempted was also recorded. **The follow-up schedule is at 3 months, 6 months then yearly until five years unless the patient wishes to remain under review. Diffusion weighted MRI is performed only if there is a clinical suspicion of cholesteatoma.**

2.5 Outcomes

Primary outcome measure was dry ear rate **and maximum length of time at which dry ear was recorded.** The secondary outcome measure was QoL measurement using GBI and COMBI questionnaire. Pre and post-operative audiograms were recorded, and pure tone averages were calculated as per AAO-HNS guidelines. Air-bone gaps were also calculated to assess pre-operative and post-operative hearing status. Wilcoxon matched-pairs signed rank test was used to assess statistical significance between pre-operative and post-operative results. This was performed using GraphPad Prism.

Results

3.1 Patient demographics

The average age of the patients was 39 (age range 15 – 71). 43.3% of participants were male; 56.7% were female. The average length of follow-up was 44.7 months (range 6 – 90 months). 10 (33.3%) were smokers and one (3.3%) was diabetic

showing a low level of co-morbidity. One patient did not wish to participate in the questionnaire and thus was excluded from questionnaire analysis.

3.2 Surgical findings and techniques

Seven patients (24.1%) had mucosal disease intraoperatively. Twenty-three patients (79.3%) had recurrent cholesteatoma. Various materials were used for cavity obliteration – cartilage in 18 patients (62%), calcium sulphate pellets in 6 patients (20.6%), cartilage and bone paste in 3 patients (10.3%) and cartilage and calcium sulphate pellets in 2 patients (6.9%). Ossiculoplasty was attempted in eleven patients (37.9%).

3.2 Dry ear rates, recurrence and follow-up

Dry ear was achieved at final follow-up in 27 patients (93.1%). Average length of follow-up was 48.8 months (range 6 – 108 months). Four patients were lost to follow-up before five years (range 6-48 months).

Two (6.8%) patients experienced discharge at 12 and 24 months respectively and follow-up is ongoing. There were no recurrences of cholesteatoma at clinic follow-up.

The dry ear rate as a survival curve over 60 months is shown in Figure 1.

3.3. Pure tone averages

Pre and post-op audiograms were available in 28 patients. The average pre-operative dbHL for air conduction was 27.34 and the average post-operative

dBHL recorded at the first post-operative visit (3 months) was 27.35. The difference between the pre and post-operative bone conduction results was no statistically significant (p=0.6571).

The average pre-operative dbHL for air conduction was 52.6 and the average post-operative dBHL was 46.33. There was no statistically significant difference between the pre and post-operative air conduction results (p=0.1835).

More recently performed audiograms were available in 22 patients which more closely coincided with this study. These occurred at an average interval of 49 months. The average dBHL for bone conduction was 24.125 dbHL. The difference between this and the pre-operative bone conduction pure tone averages was not statistically significant (p=0.2791). The average dbHL for air conduction was 52.6 dbHL. The difference between this and the pre-operative air conduction pure tone averages was not statistically significant (p=0.1494).

3.4 Airbone gap

The average change in airbone gap was 5.94dB at first audiogram. The change in air-bone gap was not found to be statistically significant (p=0.4375). (See Figure 1). With regards to the audiograms performed later, the average change was 3.24dB compared with pre-operatively. This was not found to be statistically significant(p=0.9134).

3.5 General QoL

Twenty-five patients returned their questionnaires, giving a response rate of 83.3%. In the GBI scores, average total benefit for revision mastoidectomy with cavity obliteration was +27.2 (95% CI +13.75-+40.2). Benefit by different domains of GBI is shown in Table 1. The GBI shows a positive impact on all domains of QoL.

3.6 Disease specific QOL

With regards to scores in the COMBI questionnaires, the average total benefit was +24.5. (95% CI +8.2 - +41.1) A breakdown per question asked is shown in table 1. The biggest improvements were relating to otorrhea – 'ear discharge', 'smelly ear' and the 'need to take eardrops'.

Discussion

Synopsis of key findings

The response rate for this study was high. This may signal that patients have a positive view of their surgery and our results show an objective improvement in symptoms based on reported dry ear rate at clinic follow-up. This is the main symptom that should be addressed by performing revision mastoidectomy with cavity obliteration. Quality of life is subjective but important as this provides surgeons with a perspective on how a procedure can affect a patient. Revision mastoidectomy with cavity obliteration shows a good improvement in both GBI and COMBI scores.

With regard to the COMBI questionnaire, patients report that the primary aim of surgery is mostly achieved, in that patients report reduced otorrhea and less need for topical treatment for their ears. Unsurprisingly, hearing is the only domain which does not show an improvement. Although it is ideal to be able to reconstruct the hearing

mechanism, the main aims of surgery remain to achieve a safe dry ear and to eradicate disease. The possibility of improving hearing also depends on other factors such as condition of the ossicular chain and middle ear aeration. In our group of patients who had data available, half had a reduction in air-bone gap but this was not statistically significant. There was no significant reduction in bone conduction in our patients. Clearly, the level of hearing will have an impact on patients as it affects their daily social and working lives.

Comparison with other studies

With reference to the GBI, revision mastoidectomy with cavity obliteration compares favourably with a study looking at a variety of tympanomastoid techniques to address chronic otitis media[14], but scores less well than BAHA and cochlear implant[12,15]**. The GBI average total benefit of +27.2 in this group is comparable to other studies looking at GBI in primary and revision cavity obliteration[5,6].**

The dry ear rate is comparable with other studies looking at canal obliteration in either primary or revision mastoidectomy[3–9].

Clinical applicability of study

These results show the benefit of the technique of cavity obliteration in tackling the chronically discharging ear after previous mastoid surgery. They may also help the consent process in terms of providing a realistic picture of potential outcomes – in that a dry ear is certainly achievable but an improvement in hearing is less likely – and thus manage patient expectations.

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