A Comparison of Quality of Life Outcomes Following Different Techniques of Mastoid Surgery

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Abstract

Background

Mastoid surgery carried out to treat chronic otitis media (COM) can lead to an improvement in objective and subjective measures post-operatively. This study aims to look at the subjective change in quality of life using the Glasgow Benefit Inventory relative to the type of mastoid surgery undertaken.

Method

A retrospective multi-centre postal questionnaire survey of 157 patients who underwent mastoid surgery from 2008-2012.

Results

83 questionnaire responses were received from patients having the surgery at 3 different hospitals (a response rate of 53%).

57% of patients had a Glasgow benefit Score of 0 indicating no change in quality of life post-operatively. 35% scored +50 indicating a significant improvement. The only significant difference found was that women fare worse after surgery than men.

Conclusions

The choice of mastoid surgery technique should be determined by clinical need and surgeon preference. There is no improvement in quality of life for most patients.

Key Words: mastoid, surgery, quality of life

INTRODUCTION

Mastoid surgery is performed to treat both mucosal and squamous chronic otitis media (COM) with the primary aim to give a dry, healthy and stable ear, however any hearing improvement is also welcome. Objective measures of successful surgery are easy to evaluate; for example, cessation of otorrhoea and improvement in hearing. However, the disease also has a significant impact on a patient's quality of life. In addition to the physical burden of the disease, there are other factors to consider. These include repeated hospital visits, the application of multiple courses of topical medication, poor communication due to reduced hearing and its impact on a patient's social and professional interactions, as well as the psychological impact of a foul smelling ear. The literature reports an improvement in patients' quality of life post-operatively[1,2,3]. This study takes a closer look at post-operative quality of life relative to the type of surgery performed, in particular comparing canal-wall-up versus canal-wall down surgery, using the Glasgow Benefit Inventory, a validated tool for assessing ear symptoms.

METHOD

Participants and recruitment

Adults undergoing mastoid surgery from 2008-2012 were included in the study. The patients were chosen consecutively using theatre logs to identify them. The surgery was performed by three consultants and their specialist registrars at one of three Ear, Nose & throat (ENT) departments in the South-East of England (Southend University Hospital, Whipps Cross University Hospital and the Royal National Throat, Nose & Ear Hospital). Surgery was carried out for mucosal or squamous chroic otitis media (COM).

Local research and development approval was obtained without the requirement for ethical approval.

Measures

Primary outcome

We performed a multicentre retrospective quality of life survey. The Glasgow Benefit Inventory (GBI) questionnaire was posted to 157 patients. The GBI is an 18-item validated tool for measuring outcomes after ENT surgical procedures[4]. It measures quality of life in three domains: social, physical and general. Each question is based on a five point Likert

scale; where 5 denotes the most favorable outcome, and 1, the poorest results, whereas a response of 3 denotes no change. The average Likert score for the whole questionnaire is calculated. This then has 3 subtracted from it (no change) and the result is multiplied by 50. The resultant score ranges from -100 (maximum detriment after surgery) to +100 (maximum improvement after surgery). A score of zero indicates no change in quality of life following the intervention.

Predictors and participant characteristics

The main predictor was type of surgery. This was collected from theatre logs and confirmed by reviewing the patient notes.

The following were potential covariates:

- Disease type - Mucosal or squamous COM.
- Disease stage - The following classification system for COM, adapted from the staging of middle ear cholesteatoma proposed by the Japan Otological Society[5]: Grade 1 - Disease limited to the mesotympanum/hypotympanum. Grade 2 - epitympanic involvement. Grade 3 - extension to the mastoid antrum. Grade 4 - extension beyond the mastoid antrum.
- Disease location - Left or right
- Grade of operating surgeon
- Hospital site
- Primary or revision surgery.
- Age
- Gender

These were all recorded from the medical records.

Sample size

Our sample size was calculated to detect a medium effect size (w = 0.30) with alpha = 0.05 and power = 0.80 between two groups – combined approach tympanoplasty (CAT) surgery vs. other (df=1). A total sample size of 88 was required. This calculation was done using the software G*Power version 3.1.

Statistical Analysis

Logistic regression was used to examine univariate and multivariate predictors of surgical outcome ('worse' or 'the same' vs 'better') using the statistical package SPSS version 20. The categories 'worse' and 'the same' were combined because only a small number of people reported a worse outcome following surgery.

Results

83 questionnaire responses were received from patients having the surgery at 3 different hospitals (a response rate of 53% [83/157]). Response rate was not significantly associated with either gender (OR: 1.031; 95% CI: 0.541 to 1.965; p=0.927) or hospital site (Wald=3.268, df=2, p=0.195), but was significantly associated with age, with a higher response rate from older patients (OR: 1.044; 95% CI: 1.024 to 1.065; p<0.001; average age among responders vs. non-responders of 45 vs. 31 years). The demographic and clinical characteristics of responders are shown in Table 1; 31 (37%) at Southend University Hospital (SUH), 21 (25%) at Whipps Cross University Hospital (WXUH) and 31 (37%) at the Royal National Throat, Nose and Ear Hospital (RNTNEH). The average age was 44.5 (range from 15 to 76) with 61% being male.

All the operations at RNTNEH (31) were performed by a consultant and were always a combined approach tympanoplasty (CAT), whether as a primary or revision procedure. This technique was never performed at WXUH and only twice at SUH (total 33). In these latter 2 centres modified radical mastoidectomy (MRM) was performed on 24 patients, 16 patients had atticotomy/atticoantrostomy, 9 patients had a cortical mastoidectomy, and 1 had a mastoid exploration and obliteration.

63 (76%) operations were carried out by consultants and 20 (24%) by specialist registrars. In 59 (71%) cases cholesteatoma was found, with the other 24 (29%) cases showing evidence of mucosal chronic otitis media (COM). 58 (70%) cases were primary procedures and 25 (30%) cases were revisions, of which 3 were the second revision and 3 were the third revision. In 12 of the revision cases, cholesteatoma was present.

The average Glasgow benefit score was 14.2. The overall scores for the patients were categorized into the following groups: -100, -50, 0, +50 or 100. A score within (+/-) 25 of each category led to the assignment into each group. 47 (57%) patients scored 0 indicating no overall benefit as a result of the surgery. 29 (35%) patients scored +50 indicating a significant benefit, 6 (7%) scored -50 indicating a significant deterioration following surgery, and 1 (1%) patient scored +100 indicating excellent improvement with no negative consequences at all. The Glasgow benefit score following each individual procedure is shown in Table 1.
The patient who had a mastoid exploration and obliteration scored +50.

There were no significant associations between the outcome of surgery and any of the other variables examined such as surgery type, disease type or disease stage (see Table 2). When the Glasgow benefit score is broken down into its different subscales, the physical subscale showed a non-significant trend towards greater improvement in the canal wall down groups versus the CAT group (p=0.061). However a Bonferroni correction due to multiple comparisons (i.e. group difference on the three subscales) means a p value of 0.02 would need to be observed for the difference to be considered significant. In addition, inspection of the means and standard deviations for the physical subscale across the two groups (CAT vs. other type of surgery) shows the difference was less than 0.5 of a standard deviation, which is considered the minimal important clinical difference (MID).

The only significant finding in the statistical analysis was that women fare worse after surgery than men (OR: 0.260; 95% CI: 0.091-0.738; p=0.011). Women were more likely to have revision surgery but there were still significant gender differences when this (OR: 0.302; 95% CI: 0.103-0.886; p=0.029), and when all of the other variables shown in Table 2 were entered into the analysis (OR: 0.216; 95% CI: 0.063-0.744; p=0.015).

Discussion

Chronic otitis media (COM) carries a significant burden of disease for many sufferers. In those who do not respond to conservative and medical treatments, or who have active squamous disease, surgical treatment is often recommended. Broadly speaking, surgical options include canal-wall-up surgery or canal-wall-down surgery with or without primary

bony obliteration. It has been shown that there are no significant differences in hearing outcomes between the techniques in COM patients[6]. However, there is great debate over the relative benefits of these techniques. These include the effectiveness of disease eradication, the need for further surgery, the frequency of aural toileting required and hearing outcomes.

A complication rate of 28% following mastoid surgery has been found with the most common one being residual or recurrent disease. Most of the other complications such as meatal stenosis, moist cavity and tympanic membrane perforation occur within the first 6 months. Regular outpatient attendance can prevent these complications or pick them up early so they can be treated.[7]

Both canal wall up and canal wall down mastoidectomy is felt to be a safe operation even in the only hearing ear. At 48 months, 79% of patients were shown to have stable or improved hearing thresholds.[8]

We present the first study comparing patient reported outcomes following different surgical techniques for mastoid surgery.

The average Glasgow Benefit Inventory (GBI) score was calculated as 14.2. This correlates well with the large scale quality of life outcomes study in Scotland by Swan et al[9] which gave an average GBI score of 13.8 for patients undergoing surgical treatment. They also showed a significant gain in the Health Utilities Index mark 3 (HUI-3) score for surgical treatment of active middle ear disease (+0.156) and inactive middle ear disease (+0.139). The HUI-3 is a generic questionnaire widely used in health economic evaluations across all domains of healthcare.

Dornhoffer et al[1] found an average post-operative GBI score of 28.9. This correlated well with hearing outcomes and levels of ear discharge. However, the cohort of patients studied were all revision cases undergoing mastoid exploration and obliteration.

Merchant et al[2] investigated a similar cohort of patients to our study with larger numbers (272 patients). The only outcome they recorded was control of infection with an overall success rate of 95%. As in our study, they found no difference between the type of surgery, extent of disease or whether the surgery was primary or revision. However patients with cholesteatoma fared better than those with just granulation tissue. This difference, as well as the gender differences in our study, could be explained by the fact that we used a

subjective outcome questionnaire, whereas Merchant et al used clinical examination as the outcome measure.

A cost utility analysis of tympanomastoid surgery has been carried out. It was found to be a cost-effective treatment, particularly in discharging ears[3]. This aspect of mastoid surgery was not explored in our study.

The surgical aims of creating a safe and dry ear, by eradicating squamous disease, will frequently not be perceived by the patient. It is the prevention of future disease-related morbidity that is often the motivation for mastoid surgery in the presence of cholesteatoma. This helps explains the low GBI score reported in our study compared to surgical interventions in other specialties[8].

This study is also limited by relatively small numbers, although we have shown that there is adequate power to detect a large effect size.

While others have found improved health related quality of life using the chronic ear survey (CES) questionnaire in the surgically managed COM, they also note other independent factors associated with worse outcomes. These include occurrence of complications, diabetes mellitus, a high level of education and low post-operative air conduction thresholds.[10]

Surgical technique, disease stage and disease type has no impact on patient reported quality of life as indicated by the Glasgow Benefit Score responses we received. A non-significant trend towards improvement in the canal wall down group for the physical subscale was found. Greater numbers may have led to a significant finding in this subscale of the GBI.

The implication of this is that the surgeon should not feel constrained towards a particular type of operation in order to treat COM due to perceived improved outcomes. The surgeon should choose the technique which they feel is most appropriate for the patient in view of disease stage, co-morbidities and follow up requirements. The lack of a significant difference in outcome between disease types and stages suggests that in general an appropriate operation has been performed. This also supports the view that the surgeon should choose the technique he/she feels most comfortable with and is most appropriate for each case.

There is no clear explanation for the poorer outcomes in women compared to men. COM as a disease process shows no predilection for either gender; and the Glasgow benefit score is validated for both sexes. The increased revision rate in women in this series correlates with

poorer patient reported outcomes. This effect is most likely to be due to the relatively small numbers in this study, although it could also represent a differing impact of COM and mastoid surgery, along with a difference in expectations, between the sexes.

Further work with increased patient numbers would provide more information.

Summary

- Chronic otitis Media (COM) as a disease entity causes significant morbidity and occasional mortality.
- Treatment is surgical but patient reported outcomes show minimal changes in quality of life.
- There have been no studies showing patient reported outcomes that compare different surgical techniques to treat this disease.
- This study indicates that differing surgical techniques do not produce significantly different quality of life outcomes measured using the Glasgow Benefit Inventory (GBI) score.
- Disease type and stage also does not affect outcome; however women showed significantly poorer scores post-operatively.
- Surgical technique should be determined by the extent of disease, patient co-morbidities and follow up requirements and operator choice.

Conflict Of Interest

None

Table 1: Demographic and clinical characteristics of the sample: overall and by quality of life

		Glasgow benefit score		
	Overall	**Worse**	**No change**	**Better**
Age (mean and SD)	44.5 (16.7)	45.5 (13.7)	44.8 (18.1)	44.0 (15.4)
Gender (%)				
Male	61.4 (n=51)	5.9 (n=3)	47.1 (n=24)	47.1 (n=24)
Female	38.6 (n=32)	9.4 (n=3)	71.9 (n=23)	18.8 (n=6)
Disease (%)				
Cholesteatoma	71.1 (n=59)	4.2 (n=1)	58.3 (n=14)	37.5 (n=9)
Non cholesteatoma, NCSOM or retraction pocket	28.9 (n=24)	8.5 (n=5)	55.9 (n=33)	35.6 (n=21)
Disease stage				
0	4.8 (n=4)	0 (n=0)	75.0 (n=3)	25.0 (n=1)
1	25.3 (n=21)	4.8 (n=1)	57.1 (n=12)	38.1 (n=8)
2	22.9 (n=19)	0 (n=0)	68.4 (n=13)	31.6 (n=6)
3	19.3 (n=16)	6.2 (n=1)	56.2 (n=9)	37.5 (n=6)
4	27.7 (n=23)	17.4 (n=4)	43.5 (n=10)	39.1 (n=9)
Side (%)				
Left	51.8 (n=43)	2.3 (n=1)	67.4 (n=29)	30.2 (n=13)
Right	48.2 (n=40)	12.5 (n=5)	45.0 (n=18)	42.5 (n=17)
Grade (%)				

Specialist registrar	24.1 (n=20)	5.0 (n=1)	45.0 (n=9)	50.0 (n=10)
Consultant	75.9 (n=63)	7.9 (n=5)	60.3 (n=38)	31.7 (n=20)
Hospital site (%)				
RNTNE	37.3 (n=31)	6.5 (n=2)	58.1 (n=18)	35.5 (n=11)
SUH	37.3 (n=31)	6.5 (n=2)	67.7 (n=21)	25.8 (n=8)
WX	25.3 (n=21)	9.5 (n=2)	38.1 (n=8)	52.4 (n=11)
Type of surgery (%)				
Atticotomy or atticoantrostomy	19.3 (n=16)	6.2 (n=1)	56.2 (n=9)	37.5 (n=6)
Any type of CAT	39.8 (n=33)	6.1 (n=2)	57.6 (n=19)	36.4 (n=12)
MRM or radical mastoid	28.9 (n=24)	8.3 (n=2)	58.3 (n=14)	33.3 (n=8)
Cortical and mastoid obliteration	12.0 (n=10)	10.0 (n=1)	50.0 (n=5)	40.0 (n=4)
Revision surgery (%)				
No	69.5 (n=57)	3.5 (n=2)	56.1 (n=32)	40.4 (n=23)
Yes	30.5 (n=25)	16.0 (n=4)	60.0 (n=15)	24.0 (n=6)

Table 2: Univariate predictors of outcome of surgery: worse or no change vs. better (odds ratios and 95% confidence intervals)

Demographics	Univariate associations
Gender	
Male:	[1.00]
Female:	0.260 (0.091-0.738); p=0.011
Age	0.997 (0.970-1.024)
Disease characteristics	
Disease	
Cholesteatoma:	[1.00]
Other (e.g. NCSOM):	1.086 (0.406-2.902)
Disease stage	
Stage 0 or 1:	[1.00]
Stage 2:	0.821 (0.231-2.910)
Stage 3:	1.067 (0.291-3.916)
Stage 4:	1.143 (0.355-3.681)
Side	
Left:	[1.00]
Right:	1.706 (0.691-4.211)
Surgery	
Grade	
Consultant:	[1.00]
Specialist registrar:	2.150 (0.772-5.990)
Hospital site	
RNTNE:	[1.00]
SUH:	0.632 (0.213-1.881)
WX:	2.000 (0.647-6.185)
Type of surgery	
CAT:	[1.00]
Atticotomy/ Atticoantrostomy:	1.050 (0.305-3.614)
MRM:	0.875 (0.290-2.645)
Obliteration:	1.167 (0.274-4.976)
Type of surgery	
CAT:	[1.00]
Non-CAT (Atticotomy/ Atticoantrostomy, MRM,	0.984 (0.394-2.457)

Obliteration)	
Revision surgery No: Yes:	 [1.00] 0.467 (0.162-1.347)

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