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Water precautions and ear surgery: Evidence and practice in the UK

S BASU, C GEORGALAS, P SEN, AK BHATTACHARYYA

Abstract

Background: Patients are traditionally advised to refrain from exposing their ears to water after most otological procedures. However, recent evidence suggests that water does not adversely affect the outcome for children with tympanostomy tubes. The evidence behind the potential harmful effects of water on the outcome of other otological procedures is scarce.

Objective: The study was done to determine the current practice of otolaryngology consultants in the UK on the advice given to patients regarding swimming, diving and bathing in soapy water after myringotomy and tympanostomy tube insertion, mastoidectomy and myringoplasty.

Method: Questionnaire based survey mailed to 382 members (consultants only) of the British Association of Otolaryngologists - Head & Neck Surgeons in the UK.

Results: A total of 195 responses were received (reply rate 51 per cent). In all, 95.6 per cent of the respondents allowed their patients to swim after insertion of tympanostomy tubes, with 32.9 per cent insisting on the use of earplugs until extrusion of the tympanostomy tubes. However, 61.6 per cent of the respondents restricted diving in these patients. In comparison, the respondents were more conservative with water precautions following myringoplasty and mastoidectomy. More than half the respondents recommended earplugs for bathing after all the three operations.

Conclusion: This study reveals current national practice among UK otolaryngologists. There is no general consensus in post-operative advice following otolaryngological procedures indicating a need for national guidelines.

Key words: Earplugs; Otolgic Surgical Procedures; Middle Ear Ventilation; Swimming

Introduction

Infection plays a key role in determining the outcome of any surgery. For otological operations, water is thought to be a potential precipitating factor for causing infections in the operated ears.¹ Water, carrying microbes, can enter the middle ear through the external auditory meatus. Patients are warned against getting water into their operated ears during bathing, swimming and diving. Diverse methods are used to achieve this, ranging from total abstinence from swimming and diving to wearing earplugs. The source of advice is usually from the surgeons, but it is also available at the website of British Association of Otolaryngologists - Head & Neck Surgeons and other official websites that provide information for patients.

In this study, we determined the general consensus among UK otolaryngologists on the advice given to patients regarding protection of their ears from water in the post-operative period following three common ear operations: insertion of tympanostomy tubes, myringoplasty and mastoidectomy.

Materials and methods

A questionnaire (Appendix I) was mailed to all the members of ENT-UK (previously known as British Association of Otolaryngologists - Head & Neck surgeons) living in the United Kingdom. All replies were treated as confidential.

The post-operative advice regarding water protection during swimming, diving and bathing with soapy water was classified into four groups: (a) no precautions necessary (b) use earplugs (c) avoid in case of infection and (d) avoid until healed. Only one response was allowed per question. These questions were applied to the three most common ear operations – myringotomy and tympanostomy tube insertion, myringoplasty and mastoidectomy.

Results

Out of the total of 382 UK-based members of ENT-UK, we received a total of 195 answers (reply rate 51 percent).

The quality of completed questionnaires was adequate, with 70 per cent replying to at least 8 out of 9 questions. It is interesting that the majority of missing replies referred to questions on mastoidectomy, with as many as 20 per cent not indicating their current practice. Most respondents replied to questions on tympanostomy tubes and myringoplasty, with missing replies ranging from 10–13 per cent.

Ventilation tubes

Thirty seven point six per cent of respondents indicated that they would allow their patients to swim unrestricted after insertion of ventilation tubes, while another 24.1 per cent restricted them only in case of otorrhea. The vast majority of remaining surgeons (32.9 per cent) would advise children to use earplugs when swimming, while only nine (5.3 per cent) otolaryngologists advised against swimming. This trend is completely reversed in the case of bathing, where more than two thirds of respondents (69.1 per cent) advising the use of earplugs and only 30.3 per cent suggest that they can bathe without the need for any protection. An almost similar majority (61.6 per cent) advised parents not to let their children dive, while only 7 per cent would allow children to dive without restrictions and 17.4 per cent suggests the use of earplugs for diving. Figure 1 compares the limitations placed by the respondents in the various activities following tympanostomy tube placement.

Myringoplasty

The majority of the respondents advised their patients to refrain from swimming (63 per cent) (See Table I) or diving (62 per cent) (see Table II) following myringoplasty until healing is complete. The remaining are almost equally divided between

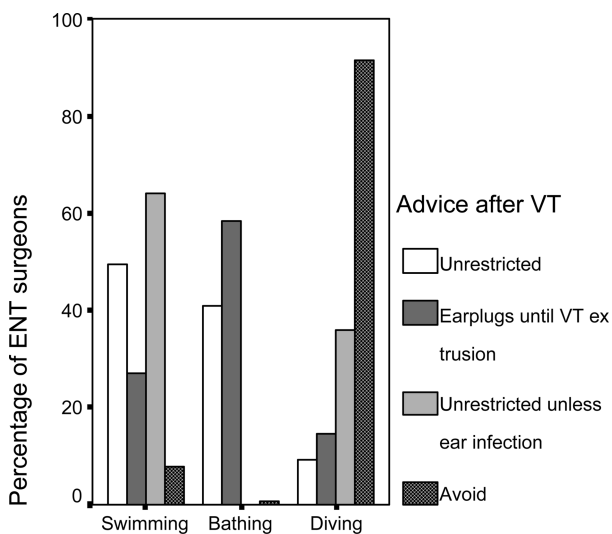


FIG. 1

Advice provided by ENT surgeons following ventilation tube insertion. VT = ventilation tube

TABLE I

ADVICE PROVIDED BY ENT SURGEONS IN THE UK TO PATIENTS ABOUT SWIMMING AFTER MYRINGOPLASTY

	Frequency (n)	Valid Per cent (%)
Unrestricted	34	19.9
Use earplugs	26	15.2
Unrestricted unless ear infection	3	1.8
Avoid until healing	108	63.2
Total	171	100.0
Missing	24	
Total	195	

TABLE II

ADVICE PROVIDED BY ENT SURGEONS IN THE UK TO PATIENTS ABOUT DIVING AFTER MYRINGOPLASTY

	Frequency (n)	Valid Per cent (%)
Unrestricted	31	18.3
Use earplugs	23	13.6
Unrestricted unless ear infection	2	1.2
Avoid until healing	105	62.1
Never	8	4.7
Total	169	100.0
Missing	26	
Total	195	

those who advocate no restriction in swimming and those who suggest the use of earplugs. None of the respondents advised the patients to refrain from swimming indefinitely after myringoplasty although 5 per cent would advise them to refrain indefinitely from diving. An even greater majority of doctors (74 per cent) would advise their patients to use earplugs while bathing until the perforation has healed completely, while the remaining would not advise any restrictions (Table III).

Mastoidectomy

Fourteen per cent of the respondents placed no restrictions on swimming after mastoidectomy (Table IV), with another 20 per cent allowing their patients to swim unless they have an ear infection. The majority of the respondents (79 per cent) allowed their patients to swim with earplugs. About

TABLE III

ADVICE PROVIDED BY ENT SURGEONS IN THE UK TO PATIENTS ABOUT BATHING AFTER MYRINGOPLASTY

	Frequency (n)	Valid Per cent (%)
Unrestricted	45	26.0
Use earplugs	128	74.0
Total	173	100.0
Missing	22	
Total	195	

TABLE IV

ADVICE PROVIDED BY ENT SURGEONS IN THE UK TO PATIENTS ABOUT SWIMMING AFTER MASTOIDECTOMY

	Frequency (n)	Valid Per cent (%)
Unrestricted	21	14.3
Use earplugs	79	53.7
Unrestricted unless ear infection	30	20.4
Avoid	17	11.6
Total	147	100.0
Missing	48	
Total	195	

TABLE V

ADVICE PROVIDED BY ENT SURGEONS IN THE UK TO PATIENTS ABOUT BATHING AFTER MASTOIDECTOMY

	Frequency (n)	Valid Per cent (%)
Unrestricted	53	34.6
Use earplugs	100	65.4
Total	153	100.0
Missing	42	
Total	195	

two-thirds recommended the use of earplugs to their patients while bathing while the remaining do not advise any precautions (Table V). Regarding diving, they are considerably more conservative, however, with the majority (54.4 per cent) recommending total abstinence from diving while 21.2 per cent suggest the use of earplugs (Table VI).

Table VII gives a comparison of the answers provided. Overall, it appears that there were specific patterns within the answers: ENT surgeons who recommended a particular advice for tympanostomy tubes tended to give similar instructions for myringoplasty ($p = 0.031$, Spearman's $Rho = 0.171$) and mastoidectomy ($p = 0.05$, Spearman's $Rho = 0.161$). The correlation between answers was much higher for advice after bathing ($p < 0.001$) for all three operations, while similarly high correlation was observed for the advice regarding diving.

Use of earplugs

We received responses from 124 surgeons (63.58 per cent) on their preference for earplugs. Some of

TABLE VI

ADVICE PROVIDED BY ENT SURGEONS IN THE UK TO PATIENTS ABOUT DIVING AFTER MASTOIDECTOMY

	Frequency (n)	Valid Per cent (%)
Unrestricted	12	7.7
Use earplugs	33	21.2
Unrestricted unless ear infection	25	16.0
Avoid	85	54.5
Total	156	100.0
Missing	39	
Total	195	

them have given two to three names. Out of 124 respondents, 88 (70.96 per cent) preferred use of cotton wool and vaseline. Other earplugs recommended are shown in Table VIII.

Discussion

The aim of an operation is not only to treat the underlying medical condition but also to avoid complications. Infection is a major cause of morbidity among patients undergoing ear surgery. The source of infection in an ear with a perforation or in an ear with defective defensive mechanisms can be from the nasopharynx via the eustachian tube or the external ear.¹ When tympanostomy tubes are inserted, it is traditionally assumed that the chances of middle-ear infections are increased by creating a passage for water into the middle ear. This is the rationale behind the advice to patients regarding precautions with water-based activities.

However, although the rationale is sound, it has never been clearly demonstrated that it is a common occurrence in everyday clinical practice. A practical exposure model² showed that it is very unlikely for water to enter into the middle ear through grommets during swimming. Five clinical prospective studies,³⁻⁷ a case control study on the prophylactic use of antibiotic ear drops,⁸ and a randomized trial⁹ have all demonstrated that swimming does not increase the incidence of otorrhea. These results are also reflected in three reviews,¹⁰⁻¹² and a meta-analysis¹³ on water precautions following tympanostomy tube insertion. A depth of more than 60 cm of water² or a pressure of 12-23 cm of H₂O¹¹ is needed to overcome surface tension and make clear water enter the middle ear through

TABLE VII

PERCENTAGE OF POSITIVE RESPONSES FOR EACH WATER PRECAUTION IN THE THREE EAR OPERATIONS

	Tympanostomy tubes			Myringoplasty			Mastoidectomy		
Advice of respondents	swimming	bathing	diving	swimming	bathing	diving	swimming	bathing	diving
Unrestricted	37.6	30.3	7.0	19.9	26	18.3	14.3	34.6	7.7
Unrestricted unless otorrhea	24.1		13.4	1.8		1.2	20.4		16.0
With ear plugs	32.9	69.1	17.4	15.1	74	13.6	53.7	65.4	21.2
Avoid until healing	5.3		61.6	63.2		62.1	11.6		54.5
Never						4.7			

TABLE VIII
CHOICE OF EARPLUGS PREFERRED BY RESPONDENTS

Earplug preferred	Number of respondents
Cotton wool and vaseline	88
Custom made	14
Silicone	9
Silicone putty	9
Ear plugs issued by audiology department	7
Blue talc	5
Moulded wax	4
Boot wax	2
Silicone cap, rubber, foam, ear seal	1 each
Hearing aid mould	1
Kapiseal	1
Speedo Swimming hat	1
Swimming mould	1
No preference	12

typanostomy tube. On the contrary, a non-significant increased incidence of otorrhea has been demonstrated in non-swimmers with typanostomy tube.¹¹ Precautions needs to be taken while bathing in soapy water, swimming in chlorinated water or stagnant ponds and diving^{2,8,12} but not when bathing in tap water, hair rinsing or surface swimming in the sea.^{2,12} Prophylactic topical antibiotic eardrops do not give any extra benefit to these patients.⁸

In our study we found no general consensus on water precautions following typanostomy tube insertion among the ENT surgeons in the UK. On the basis of the current literature, no restrictions are indicated for swimming in clean water. Precautions are necessary for diving and bathing in soapy water though the nature of precautions cannot be suggested from the available evidence.

Interestingly, different patient advice or even professional websites also give contradicting advice: The Royal National Institute for Deafness, Patient UK (a DOH accredited patient information website), NHS direct all give 'correct' advice, while interestingly BUPA as well as the official websites of ENT-UK both advise the use of earplugs during swimming (although ENT-UK admits that there may be considerable difference of opinion among surgeons).¹⁴⁻¹⁸

This non-uniformity in practice regarding water precautions following typanostomy tube insertion also applies to other studies done worldwide suggesting the need for guidelines.^{19,20}

Similarly, there is hardly any research-based evidence on the importance of water precautions during the post-operative period following other ear operations such as mastoidectomy and myringoplasty. A study from the UK²¹ showed that patients with epithelialized mastoid cavities can swim without special water precautions provided they do not suffer from caloric effect.

Our study also showed lack of consensus among ENT surgeons on this subject. For example 14 per cent of the responders believed in no restriction for swimming following mastoidectomy, 20 per cent

advised no restrictions unless there is coexistent ear infection, 53.7 per cent preferred earplugs while 11.6 per cent totally restricted their patients from swimming. Similar discrepancy of opinion exists for bathing and diving after mastoidectomy.

In theory a successful myringoplasty allows patients with perforated eardrums to resume swimming without ear protection. Our study shows that 15.2 per cent of the surgeons advised their patients to use earplugs during swimming after myringoplasty. As there is lack of research-based evidences in this area, it is difficult to suggest best practice for mastoid surgery and myringoplasty. Further research is imperative in order to achieve uniformity in the practice and advice to patients regarding water precautions following otologic procedures.

- **The study investigates the current practice of otolaryngology consultants in the UK on the advice given to patients regarding swimming, diving and bathing in soapy water after myringotomy and typanostomy tube insertion, mastoidectomy and myringoplasty**
- **Swimming is widely permitted after typanostomy tube insertion, although a third of respondents would recommend ear plugs**
- **After middle-ear surgery the use of ear plugs is recommended by more than half of respondents**

Our study also showed a wide variation in the type of earplugs recommended by ENT surgeons in the UK to protect the ears of their patients during swimming. Cotton wool coated with paraffin jelly BPC has been shown to be the best in preventing water from getting into ears compared with most other conventionally used methods.²² Although some of the responders have justified the use of special earplugs in special situation like meatoplasty, we can conclude from our study that opinion among surgeons about the best earplugs are also variable. More studies need to be done in this field to find the most cost-effective earplugs for these patients, if earplugs are proven to be necessary for water protections.

Conclusion

The role of water as a traditional risk factor for causing and aggravating ear infections is being challenged by various case controlled studies. However, recommendations for water precautions are still a recognised part of post-operative care after ear operations. This survey shows the non-uniformity of opinions among significant numbers of UK otolaryngologists regarding this aspect of clinical practice. This lack of uniformity can potentially confuse patients and lead to differing standards of care and

indicates the need for national guidelines to address this issue.

Drawback

The response rate of this study is only 51 per cent which fails to make it a scientifically valid study. Also no material attempt has been made to prove that responders are no different from non-responder except for the fact that all of them (responders and non-responders) belong to same grade (consultants) and are currently practising in UK. In spite of that we can see that there are differences in opinion among significant number of responders, which is probably reflected in their practice also. So this can be considered as a pilot study and a bigger study needs to be done to formulate a national guideline to avoid confusion among patients and protect them from the potential threat of receiving the wrong advice from surgeons as well as websites. Also this study can help its readers to practice evidence-based medicine.

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Dr S Basu takes responsibility for the integrity of the content of the paper.

Competing interests: None declared

Appendix I

THE QUESTIONNAIRE

INSTRUCTIONS FOLLOWING VENTILATION TUBE INSERTION

- | | |
|--------------------------|--|
| 1. Swimming | Unrestricted
Use earplugs until tube extrusion (type of ear plugs ___)
Avoid only if patient develops an ear infection
Avoid until tube extrusion |
| 2. Bathing in soap water | Unrestricted
Use earplugs until tube extrusion (type of ear plugs___) |
| 3. Diving | Unrestricted
Use earplugs until tube extrusion (type of ear plugs ___)
Avoid only if patient develops an ear infection
Avoid until tube extrusion |

INSTRUCTIONS FOLLOWING MASTOIDECTOMY

- | | |
|--------------------------|---|
| 1. Swimming | Unrestricted
Use earplugs (type of ear plugs ___)
Avoid only if patient develops an ear infection
Avoid indefinitely |
| 2. Bathing in soap water | Unrestricted
Use earplugs (type of ear plugs ___) |
| 3. Diving | Unrestricted
Use earplugs (type of ear plugs ___)
Avoid only if patient develops an ear infection
Avoid indefinitely |

MYRINGOPLASTY

- | | |
|--------------------------|--|
| 1. Swimming | Unrestricted
Use earplugs until complete healing (type of ear plugs ___)
Use earplugs indefinitely (type of ear plugs ___)
Avoid until complete healing
Avoid indefinitely |
| 2. Bathing in soap water | Unrestricted
Use earplugs until complete healing (type of ear plugs___)
Use earplugs indefinitely (type of ear plugs ___) |
| 3. Diving | Unrestricted
Use earplugs until complete healing (type of ear plugs ___)
Use earplugs indefinitely (type of ear plugs ___)
Avoid until complete healing
Avoid indefinitely |
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