

# Day-case management of chronic suppurative otitis media with cholesteatoma with canal wall down technique surgery: long-term follow-up

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## Abstract

The overall number of day-case otologic surgery cases is increasing; however, there is limited experience about performing canal wall down tympanoplasty in patients with chronic suppurative otitis media with cholesteatoma in this setting. The objective of this study was to assess the success of this technique as day-case surgery in terms of results and complications over an 8-year follow up period. We included in this study 42 patients undergoing canal wall down technique tympanoplasty surgery for chronic suppurative otitis media with cholesteatoma performed as day cases during a 2-year period. 30 cases (71.4%) were discharged on the day of surgery, whereas 12 cases (28.6%) were hospitalized and discharged the day after. The principal reasons for failure of discharge on the day of surgery were asthenia (6 cases), vertigo and asthenia (4 cases), undetermined (2 cases). Based on our experience, with a proper preoperative selection, assessment and screening of the patients, mastoidectomy with tympanoplasty for chronic suppurative otitis media with cholesteatoma can be carried out in a day surgery setting without affecting results, complications and long-term relapse.

## Introduction

Many procedures that in the past typically required overnight

hospital stay are now being performed in a day surgery setting. Management of specific conditions using day-case surgery has several advantages over inpatient surgery, such as reduced risk of hospital infection, better quality of life, shorter waiting time, and economic savings for the National Health Service. The American Academy of Otolaryngology - Head and Neck Surgery has published a suggested list of procedures deemed appropriate for outpatient settings, including most otologic procedures such as myringoplasty, tympanoplasty, simple mastoidectomy, stapes surgery, middle ear exploration and reconstruction of the external ear.<sup>1</sup> The overall number of day-case otologic surgery cases is increasing despite the complexity of same day hospital discharge, especially for stapes surgery,<sup>2,3</sup> myringoplasty,<sup>4,5</sup> and tympanomastoid surgery.<sup>6,7</sup> There is less experience in day-case surgery for chronic suppurative otitis media (CSOM) with cholesteatoma.<sup>8</sup> The type of surgical procedure is one variable that can significantly influence the nature of the postoperative course and the rate of postoperative complications; complex procedures, such as tympanomastoid surgery, may have a different postoperative course compared to other surgical procedures.<sup>9</sup>

The three main reasons for failure of patient discharge on the day of surgery after otologic surgery are vertigo, vomiting, and asthenia.<sup>2</sup> The incidence of postoperative nausea and vomiting (PONV) in patients undergoing day surgery is approximately 35%;<sup>10</sup> however, for patients undergoing otologic surgery it can be as high as 80%.<sup>11</sup> Various experiences highlight that prophylactic administration of antiemetic drugs does not seem to influence the incidence of vertigo and vomiting requiring hospital admission. Other factors associated with the management of otologic surgery in a day case setting are the length of general anesthesia ( $\geq 2$  h), the distance between home and hospital, age, poor health and asthma or breathing difficulties as coexisting conditions.<sup>11,12</sup>

In this paper, we report our experience on canal wall down (CWD) tympanoplasty in patients with CSOM with cholesteatoma performed in the day surgery unit (DSU) of a large Italian hospital with an 8-year follow up. This study included only cases of cholesteatoma treated with a standardized canal wall down tympanoplasty technique and managed as day-case surgery cases. The aim of this paper is to assess the success of this technique in a day case setting in a large Italian hospital with a long-term follow-up.

## Materials and Methods

Forty-two consecutive patients with CSOM with cholesteatoma undergoing canal wall down tympanoplasty performed as day-case surgery during a 2-year period (2008-2010)

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were included in the study.

Before admission to the DSU of our hospital, all patients underwent anamnestic interview, full ENT examination, pure tone audiometry (PTA), computed tomography (CT) scan of mastoid and middle ear without contrast. Diagnosis was based on otoscopy, audiometric and CT scan findings.<sup>13</sup> After admission, surgery was performed the same morning by the same surgical team; it was always possible to extend the period of hospitalization if required by patient's conditions. All the patients underwent a CWD mastoidectomy with tympanoplasty. The Italian Version of the Chronic Ear Survey (CES-I) questionnaire<sup>14</sup> was administered to all patients before and 10 days after surgery. Informed consent was obtained from all individual participants included in the study; all procedures were in accordance with the ethical standards of the Hospital Ethical Committee's.

Patients underwent a standard anesthesia procedure with tracheal intubation. A pre-anesthesia with atropine and clonidine, 1 hour before the induction, was used to reduce reflexes caused by the stimulation of the external auditory canal. Once in the operating room the patients received 2 mg of midazolam and 1 mcg/kg of fentanyl, associated to ondansetron and pantoprazole. Then anesthesia was induced with propofol 1 mg/kg and rocuronium 0.3-0.4 mg/kg, and maintained with propofol 5 mg/kg/h + remifentanyl 0.10-0.30 gamma/kg/min. Before the surgical incision patients were treated with paracetamol and steroids to reduce PONV and the release of pain factors. 9 patients underwent a balanced anesthesia, while 33 patients were administered an intravenous anesthesia. In 12 patients, we managed general anesthesia with intraoperative morphine. Intraoperative antiemetic drugs were used in 12 patients to reduce the incidence of post-operative nausea and vomiting whereas their use was left to the discretion of the otologist performing the surgery.

All procedures were performed using a postauricular approach. Surgery followed the basic principle of CWD tympanoplasty that consists in the eradication of the cholesteatoma and the exteriorization of the mastoid antrum in continuity with the external auditory canal. In addition to removing all diseased air cells, a trouble-free mastoid cavity was ensured by an adequate saucerization, an adequate lowering of the facial ridge, the management of the mastoid tip, and an adequate meatoplasty. In 18 patients, we used Silastic sheeting in the ear cavity. At the end of the surgery all the patients had a pressure dressing in the form of a head bandage. For same day discharge, patients must feel generally well, have eaten and drank without vomiting, and passed urine. Any pain must be within acceptable limits and controllable with simple analgesia.

Follow up visits were performed every year for an 8-year period (min: 7 years, max 9 years).

Statistical analysis was performed on the results from the CES-I questionnaire. Mean and standard deviation (SD) before and 10 days after surgery was calculated for each CES-I subscale. Before and after surgery data was compared for statistical difference using t-test; P-value less than 0.05 was considered the cut off for statistical significance. The statistical analysis was conducted using SPSS 22.0.

## Results

Forty-two consecutive patients, 24 males and 18 females, aged between 17 and 67 years old (mean 44.8) were included in this study. Patients reported episodes of recurrent otorrhea (30 cases), worsening hearing loss (6 cases), or both (21 cases). The otoscopy findings revealed a marginal perforation of the tympanic membrane in all subjects.

The CT scan of ear and mastoid showed an involvement of the tympanic cavity and ear bones with extension to the mastoid antrum in all the cases. CSOM involved the right ear in 19 cases, the left ear in the other 23 patients. Otoscopy examination and radiological imaging were suggestive of CSOM with cholesteatoma in all patients.

Preoperative audiometric evaluation of the ear involved by the cholesteatoma showed a mean PTA of 50.6 dB HL with a mean gap of 28.2 dB HL; postoperative audiometric evaluation, performed 2 months after surgery, showed a mean PTA of 46.8 dB HL with a gap of 24.6 dB HL.

Before surgery, the average total score of CES-I questionnaire was 58.44 (SD: 14.88); subscale scores were 57.56 (SD=25.73) for the activity restriction-based subscale (AR), 57.58 (SD=15.6) for the symptom subscale (ST), and 58.47 (SD=21.52) for the medical resource utilization subscale (MR). There were improvements in the total score and in each subscale score in postoperative CES evaluation. The improvements in the AR and MR subscales and in the total score were not significant but with P value slightly higher than 0.05; the symptom subscale showed a significant improvement after surgery with  $P=0.048$  ( $P<0.05$ ) (Table 1). Patient satisfaction test (customer satisfaction) gave following day case major ear surgery is good and comparable with that following in-patient surgery.<sup>15</sup>

All the cases were first time surgery except two patients who already underwent a canal wall up mastoidectomy with tympanoplasty respectively 4 and 7 years before and were then considered revision cases. 30 cases (71.4%) were discharged on the day of surgery, whereas 12 cases (28.6%) were hospitalized and discharged the day after. The principal reasons for failure of discharge on the day of surgery were asthenia (6 cases), vertigo and asthenia (4 cases), undetermined (2 cases). These reasons still represent minor post-operative problems. Within hospitalized patients, 6 subjects received intraoperative morphine and antiemetic drugs. There were no surgical complications such as bleedings or hematoma as well as no cases of inner ear injuries, temporary or permanent facial nerve paralysis, labyrinthitis, fistulae, gushers, cerebrospinal fluid leaks. None of the patients who were discharged the same day were readmitted to the hospital within 1 month after discharge. No sign of recurrence of cholesteatoma was found in all patients after a follow-up period of 7 to 9 years.

**Table 1. CES-I results before and 10 days after surgery.**

P-value	After surgery	Before surgery	CES-I subscale
0.057	70±23.1	57.5±25.7	Activity restriction-based subscale
0.048	65.8±15.5	57.5±15.6	Symptom subscale
0.075	67.8±17.9	58.4±21.5	Medical resource utilization subscale
0.067	64.8±17.9	58.4±14.8	Total score

## Discussion

Day-case surgery has gained widespread acceptance in the last years thanks to new drugs to treat postoperative pain and nausea. Financial factors have also contributed. Currently, the possibility to perform ear surgery such as cochlear implants and stapes surgery in a day-case surgery setting is elevated thanks to standardized surgery techniques, experienced surgery team, and adequate anesthesia. Dickins *et al.* published a paper on the possibility to perform otological surgical procedures in an outpatient surgical setting showing their results on 640 otologic surgical procedures including tympanoplasty, stapedectomy, mastoidectomy and labyrinthectomy. The Authors reported a percentage of discharging on the same day, for the procedures performed in the outpatient surgical setting, of 23% for tympanomastoidectomy and of 31% for mastoidectomy, whereas most of the patients were hospitalized. Most of the patients were revision cases.<sup>1</sup>

Postoperative nausea and vomiting is one of the most common complications after day-case surgery, and it occurs following local, regional, and general anesthesia. Factors affecting PONV include age, sex, type of surgery, anxiety, history of motion sickness, postoperative pain, and use of opioids. The incidence of PONV is particularly common in patients undergoing otologic surgical procedures, for which it has been described an incidence as high as 80%.<sup>16,17</sup> Megerian *et al.* reported that a history of motion sickness can be predictive of PONV and increased hospital length of stay in adults undergoing tympanomastoidectomy.<sup>9</sup>

In our patient series, there were no cases of iatrogenic inner ear injury leading to complications such as sensorineural hearing loss or vertigo. Preoperative bone lines were preserved in all patients. Therefore, PONV was most likely due to other factors such as preoperative medications and the stress induced on the ear by a combination of prolonged exposure, caloric and suction-irrigation, and high-speed drilling of the bones surrounding the labyrinth.

Physical stimulation following drilling and irrigation adjacent to the inner ear has been correlated to the development of PONV after tympanomastoid surgery. It has been shown that stimulation of inner ear structures by low-frequency sounds causes postural instability in patients undergoing middle ear surgery for chronic otitis media. Suction and irrigation during surgery also stimulate the vestibular apparatus, which can further increase the incidence of PONV. Thus, it has been postulated that one of the major causes of PONV after tympanomastoid surgery may be represented by physical stimulation.<sup>18-20</sup>

Megerian *et al.* demonstrated that prophylactic administration of antiemetic drugs did not positively influence PONV incidence. The Authors did not use dolasetron or other 5-HT<sub>3</sub> receptor antagonists; however, they did use other antiemetics, primarily droperidol, in 45% of their patients. Megerian also reported that up to 33% of patients undergoing tympanomastoidectomy were discharged from the Post-Anesthesia Care Unit (PACU). The mean age of patients in that study was 34.5 years (range: 2-73 years).<sup>9</sup>

The results of literature for mastoid surgery are less promising compared to other ear procedures. Dornhoffer published the results of the University of Arkansas, USA for patients up to the age of 18 undergoing tympanomastoidectomy; the Authors reported that 14/75 (18.6%) patients required overnight hospital stay.<sup>21</sup> A study of Rowlands *et al.* on ear surgery in a pediatric DSU showed that 100% of the children (7 cases) who underwent surgery for cholesteatoma were dismissed on the same day of surgery, whereas 1 patient was admitted to DSU the following day requiring antiemetic drugs and i.v. hydration.<sup>22</sup> Because of the retrospective nature of the study, other important factors, such as concurrent medical conditions and poor family support were not assessed.

Patients with low or no comorbidity and excellent family support are more likely to leave the hospital earlier.

According to Dickins *et al.* more than 60% of the patients who undergo otologic procedures can be managed in a day-case surgery basis, including tympanomastoidectomy.<sup>23</sup> In a UK study from 2002, 40.6% of pediatric patients were discharged on the day of surgery. The same study showed that minor mastoid procedures such as atticotomy could be performed as day cases. The number of more complex mastoid operations (including modified radical mastoidectomy) performed in a day-case surgery setting in that study was 75%, however the number of patients enrolled (12 children) were too small to convincingly show that they could be safely and routinely performed in this way.<sup>24</sup>

Powell *et al.* performed 52 middle ear operations, including 10 mastoidectomies, in a day-case setting on a pediatric population, with a 40% incidence of PONV and 30% of postoperative pain, reaching great results with a good follow-up. In this study the most common anaesthetic induction agents used were fentanyl (1 mg/kg) and propofol (2 mg/kg) with maintenance of anaesthesia using a combination of sevoflurane, oxygen and nitrous oxide. All patients received intra-operative anti-emetic prophylaxis with ondansetron and/or cyclizine and/or dexamethasone.<sup>25</sup>

In another study on a pediatric population, Hasan *et al.* included 89 cases of cholesteatoma on 152 tympanomastoid surgical procedures for 144 children.<sup>6</sup> In 4 cases, they observed the facial nerve involvement by cholesteatoma. Patients who underwent mastoid procedures had a greater length of anesthesia and surgery, were more likely to receive intraoperative cefazolin sodium and IV morphine sulfate in the PACU, and were less likely to be discharged from PACU compared with patients who underwent middle ear procedures. Dolasetron Mesylate was used as a prophylactic antiemetic toward the end of surgery in 113 cases (74%) and did not have a statistically significant effect on the occurrence of PONV ( $P=0.60$ ). A higher percentage of patients who underwent mastoid procedures received Dolasetron Mesylate as a prophylactic antiemetic during surgery compared with patients who underwent middle ear procedures; however, there was no statistically significant difference ( $P=0.30$ ) between the 2 groups regarding the occurrence of PONV that required postoperative antiemetic drugs. Patients who underwent mastoid procedures required a higher number of doses of antiemetics to control PONV in the PACU. In this group, the presence of cholesteatoma and the need for i.v. morphine sulfate for pain at the time of admission to Day Surgery Unit were associated with a higher risk of PONV. Also, in this group the presence of a pain score of 5 or greater at the time of admission to DSU, which was treated with i.v. morphine sulfate, was associated with failure to discharge from the hospital on the day of surgery. The occurrence of PONV and the hospital length of stay was not different between canal wall up and canal wall down procedures. On 84 mastoid procedures (tympanoplasty with atticotomy/antrotomy or mastoidectomy), only 15 cases were discharged home from the DSU. The principal reasons for failure of discharge on the day of surgery were PONV and postoperative pain.

All patients underwent a long-term follow-up period of 7 to 9 years. No sign of recurrence of cholesteatoma was found in all patients during follow up, demonstrating long-term effectiveness of day-case management of CSOM with cholesteatoma also in term of recurrences, that did not significantly differ from overnight hospital stay management of this condition.

## Conclusions

Our experience demonstrates that with a proper preoperative



selection, assessment and screening of the patients and a well-staffed and equipped surgical facility, most adults can be discharged home from the hospital within 23 h after mastoidectomy with tympanoplasty for CSOM with cholesteatoma surgery with no significant effects on effectiveness of surgery, post-operative symptoms and relapse of disease even in the long term. Adults who undergo more complex middle ear surgical procedures are more likely to require an overnight observation. Postoperative pain requiring i.v. opioids and PONV are the two principal reasons for failure to discharge from the hospital on the day of the surgery. Adults with an underlying CSOM with cholesteatoma are at a higher risk of PONV.

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