Int. Adv. Otol. 2012; 8:(2) 271-275

ORIGINAL ARTICLE

Impact of Pediatric Obesity on the Surgical Results of Ventilation Tube Insertion: A Case–control Study

Byung Don Lee, Kyu Hoon Kim, Jong Dae Lee, Chi Kyu Lee, Gye Hoon Park, Moo Kyun Park

Department of Otolaryngology-Head and Neck Surgery, SoonChunhyang University College of Medicine, Seoul, Korea (BDL, KHK, JDL, CKL, GHP, MKP)

Objective: The aim of this study was to investigate the effects of obesity on the surgical results of ventilation tube insertion for otitis media with effusion (OME) in pediatric patients.

Materials and Methods: We conducted a case–control study on children who underwent ventilation tube insertion. We examined differences in surgical outcomes of ventilation tube insertion between the case group (obese patient: body mass index of ≥95% of standard growth curve for children) and the control group (non-obese patients). A total of 187 patients (349 ears in total) who underwent ventilation tube insertion for OME were included in this study.

Results: The duration of ventilation tube insertion was significantly shorter in obese children than in non-obese children (odds ratio: 2.85 95% confidence interval: 1.03–7.89, P = 0.04). However, the recurrence rate of otitis media and tube-related otorrhea were not different between the two groups of patients.

Conclusion: Pediatric obesity is related to the surgical results of ventilation tube insertion. Pediatric obesity was correlated with the duration of ventilation tube retention in otitis media.

Submitted : 9 September 2011 *Accepted : 25 March 2012*

Introduction

Pediatric obesity has become a major public health concern in many parts of the world. The prevalence of pediatric obesity, defined as a body mass index (BMI) ≥95th percentile for age and sex, tripled to 16.9% from 1980 to 2008 in the United States.[1] Obesity is a well-known risk factor of diabetes, cardiovascular disease, and certain cancers. Obese children often become obese adults.[2] It has been demonstrated that obesity in childhood is associated with elevated lipid concentrations, high blood pressure, vascular fatty streaks, and premature mortality in adulthood.[3, 4]

Otitis media with effusion (OME) is defined as the presence of fluid in the middle ear without signs or symptoms of acute ear infection. OME is one of the most frequent reasons for visiting a physician.[5, 6] At least 80% of children will have experienced one or more episodes of OME by the age of 3 years.[7] About 2.2 million diagnosed episodes of OME occur annually, and the annual cost of OME has been estimated at $3 to $5 billion in the United States.[8, 9] Management of OME includes watchful waiting, medication, and surgery. The most common surgical procedure for otitis media in children is insertion of a ventilation tube, which is also one of the most frequent surgical procedures performed on children.[10] About 20–50% of children who have had ventilation tube insertion experience relapse following tube extrusion.[10, 11]

The prevalence of otitis media and obesity has been increasing over the past few decades in children.[12, 13] As the prevalence of pediatric obesity continues to rise, the number of obese children requiring ventilation tube insertion is expected to increase. Additionally, pediatric obesity has an impact on OME development.[14, 15]

Corresponding address:
Moo Kyun Park,
Department of Otorhinolayngology-Head and Neck Surgery, Bucheon hospital, Soonchunyang university colleage of medicine
1174 Jung-dong, Wonmi-gu, Bucheon, Gyonggi-do, 420-767, KOREA
Phone: 82-32-621-5054 , Fax: 82-32-621-5440
E-mail: aseptic@schmc.ac.kr

However, few data are available concerning the effect of obesity on surgical results or surgery-related complications related to ventilation tube insertion. The aim of this study was to compare the surgical outcomes of ventilation tube insertion in obese and non-obese children.

Materials and Methods

Patient Selection

A case–control study was conducted between June 2001 and June 2011. The medical records of children aged 2–12 years with a diagnosis of OME who underwent ventilation tube insertion at the department of Otorhinolaryngology-Head and Neck Surgery at Soonchunyang University Bucheon Hospital were included.

The following information was obtained from clinic records of the identified patients: age, sex, BMI, adenoidectomy, duration of tube retention, and recurrence of otitis media and tube-related otorrhea within 1 year of ventilation tube insertion.

Children with a previous history of ventilation tube insertion, use of ventilation tubes other than Paparella type I, head and neck anomalies, and chronic or systemic disease were excluded from this study.

Case Definition

Case patients were obese patients with BMI >95% of age- and gender-specific cut-off values.[16] Control patients were non-obese patients. Body weight and height were measured before ventilation tube insertion at the hospital. BMI was calculated using the formula weight/height^2 (kg/m^2).

OME was diagnosed by the presence of fluid in the middle ear on otoscopy or tympanometry according to clinical practice guidelines.[10] The diagnostic findings of pneumatic otoscopy and otomicroscopy include tympanic membrane dullness, impaired mobility, or an air-fluid level or bubble. Additionally, a type B or C tympanogram was considered positive for OME. To reduce clinician bias, the tympanic membrane findings were photo-documented using color slides at all follow-up visits.

Indications for ventilation tube insertion included a history of OME lasting 3 months or longer, OME that recurred at a frequency of more than six times per year, structural changes to the tympanic membrane or middle ear, and risk for speech, language, and learning difficulties. Adenoidectomy was performed in those who had nasal obstruction and adenoid hypertrophy that filled >51% of the nasopharynx on a lateral X-ray.

Early extrusion was defined as ventilation tube extrusion from the tympanic membrane <6 months following insertion. Recurrence of OME was defined as that observed within 12 months after tube extrusion. Children were followed up every 3 to 6 months until 12 months after tube extrusion. Parents of children were instructed to re-visit the clinic if children had otorrhea, ear fullness, or otalgia during the study.

Statistical Methods

Results are expressed as mean ± standard deviation or percentage. Pearson's chi-square test was performed for the comparison of categorical data. To determine differences between the means of continuous data from the two groups, the independent two-sample t-test and Wilcoxon's rank-sum test were used. Binary logistic analysis was used to determine the effect of obesity on outcomes of ventilation tube insertion. A p value of <0.05 was considered statistically significant. Statistical analysis was carried out using SPSS version 11 (SPSS, Inc., Chicago, IL, USA). This study was approved by the Soonchunhyang University Bucheon Hospital Institutional Review Board.

Results

The sample comprised 187 children (349 ears in total) including 112 (59.9%) male and 75 female (40.1%) pediatric patients aged between 2 and 12 years (mean, 5.22 ± 2.03 years). Unilateral ventilation tube insertion was performed in 25 patients (13.4%). Demographic data according to BMI classification are shown in Table 1. The rate of adenoidectomy and age were not different between the obese and non-obese groups.

The rate of early extrusion was significantly higher in the case group than in the control group. However, recurrence of OME after tube extrusion and otorrhea

after tube extrusion did not differ significantly between the case and control groups. Details of the surgical results of obese and non-obese group of ventilation tube insertion are outlined in Table 2.

Discussion

This study demonstrated that obesity affects certain surgical outcomes of otitis media in children. Ventilation tube extrusion occurs after a shorter period of time in obese than in non-obese children.

Direct associations between obesity and several diseases including diabetes mellitus, hypertension, dyslipidemia, and ischemic heart disease are well known. Obesity-related diseases extend to gall bladder stones, obstructive sleep apnea, cancer, asthma, and Alzheimer's disease.[17] Obesity is associated with increased risk of perioperative adverse events. Additionally, obesity often affects the outcome of abdominal surgery, spinal surgery, renal transplantation, and total hip and knee arthroplasty.[18, 19] Obese and overweight children presenting for adenotonsillectomy have a higher incidence of perioperative complications, are more likely to be admitted, and stay longer in the hospital than non-obese children.[20, 21]

This study showed that obese children have a shorter duration of ventilation tube retention than do non-obese children. The exact effect of obesity on the duration of ventilation tube retention is not clear. Obesity may increase fatty deposition in the eustachian tube in children, affecting its function. Additionally, tube extrusion may be associated with obesity-related inflammation, as increased tumor necrosis factor-α (TNF-α) in obesity induces airway constriction and inflammation.[22]

Our study showed that the recurrence rate of OME after tube extrusion was not significantly different

Table 1. Demograpic data of obese and non-obese group of otitis media with effusion according to standard body mass index for children

Group	Cases (Obese)	Controls (Non-obese)	P value
Ear (%)	35 (7.7%)	314(92.3%)	
Persons	18	169	
Sex (boys:girls)	6:12	106:63	0.016
Age	5.94±2.40	5.15±1.94	0.053
BMI (Kg/m^2)	21.30±2.04	15.55±1.56	<0.000
Adenoidectomy (%)	30 (85.7%)	220 (70.1%)	0.051

Obese: Body mass index (BMI) ≥ 95 % of standard growth curve of children
BMI: Body mass index

Table 2. Surgical results of obese and non-obese group of ventilation tube insertion

	Cases (Obese)	Controls (Non-obese)	OR (95%CI)	P value
Early extrusion	18 (51.4%)	94 (26.9%)	2.85 (1.03-7.89)	0.04
Recurrence	8 (22.9%)	67 (21.3%)	2.09 (0.60-7.33)	0.25
Otorrhea	1 (2.9%)	14 (4.5%)	2.09 (0.16-26.97)	0.57

Obese: Body mass index (BMI) ≥ 95 % of standard growth curve of children
OR: odds ratio
CI: confidence interval

between obese and non-obese patients. This result corresponds to that obtained in an earlier study that reported that the frequency of ventilation tube insertion was not correlated with BMI distribution.[14] Adenoidectomy shows a significant benefit in resolution of OME. Longer-term studies are needed to elucidate the long-term effects of obesity on recurrent otitis media after ventilation tube insertion.

Otorrhea is the most common complication of ventilation tube insertion in children.[23] Our study showed that the rate of otorrhea did not differ between obese and non-obese patients. Some studies have shown that obesity increases postoperative infection.[24] However, the rate of otorrhea in this study was too small to detect such effects. Studies encompassing larger cohort sizes are needed to investigate the relationship between obesity and otorrhea after ventilation tube insertion.

In summary, pediatric obesity is associated with the surgical results of ventilation tube insertion. We have shown that pediatric obesity correlated with the duration of ventilation tube retention in otitis media patients. Obese children with ventilation tubes require earlier follow-up than do non-obese children for detection of tube extrusion.

References

1. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM: Prevalence of high body mass index in us children and adolescents, 2007-2008. Jama 2010; 303:242-249.

2. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T: Do obese children become obese adults? A review of the literature. Prev Med 1993; 22:167-177.

3. Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH: Cardiovascular risk factors and excess adiposity among overweight children and adolescents: The bogalusa heart study. J Pediatr 2007; 150:12-17 e12.

4. Engeland A, Bjorge T, Tverdal A, Sogaard AJ: Obesity in adolescence and adulthood and the risk of adult mortality. Epidemiology 2004; 15:79-85.

5. Rovers MM: The burden of otitis media. Vaccine 2008; 26 Suppl 7:G2-4.

6. Gerceker. D, Tezcaner. ÇZ, Sahin. F, Saran. B, Yenice. S, R.Saatçi. M: The role of chlamydia pneumoniae and mycoplasma pneumoniae in the etiology of otitis media with effusion. . Int Adv Otol 2010; 6:263-268.

7. Teele DW, Klein JO, Rosner B: Epidemiology of otitis media during the first seven years of life in children in greater boston: A prospective, cohort study. J Infect Dis 1989; 160:83-94.

8. Capra AM, Lieu TA, Black SB, Shinefield HR, Martin KE, Klein JO: Costs of otitis media in a managed care population. Pediatr Infect Dis J 2000; 19:354-355.

9. Shekelle P, Takata G, Chan LS, Mangione-Smith R, Corley PM, Morphew T, Morton S: Diagnosis, natural history, and late effects of otitis media with effusion. Evid Rep Technol Assess (Summ) 2002: 1-5.

10. Rosenfeld RM, Culpepper L, Doyle KJ, Grundfast KM, Hoberman A, Kenna MA, Lieberthal AS, Mahoney M, Wahl RA, Woods CR, Jr., Yawn B: Clinical practice guideline: Otitis media with effusion. Otolaryngol Head Neck Surg 2004; 130:S95-118.

11. Yaman H, Yilmaz S, Guclu E, Subasi B, Alkan N, Ozturk O: Otitis media with effusion: Recurrence after tympanostomy tube extrusion. International Journal of Pediatric Otorhinolaryngology 2010; 74:271-274.

12. Auinger P, Lanphear BP, Kalkwarf HJ, Mansour ME: Trends in otitis media among children in the united states. Pediatrics 2003; 112:514-520.

13 Troiano RP, Flegal KM, Kuczmarski RJ, Campbell SM, Johnson CL: Overweight prevalence and trends for children and adolescents. The national health and nutrition examination surveys, 1963 to 1991. Arch Pediatr Adolesc Med 1995; 149:1085-1091.

14. Kim JB, Park DC, Cha CI, Yeo SG: Relationship between pediatric obesity and otitis media with effusion. Arch Otolaryngol Head Neck Surg 2007; 133:379-382.

15. Lee SK, Yeo SG: Relationship between pediatric obesity and otitis media with effusion. Curr Allergy Asthma Rep 2009; 9:465-472.

16. Pediatrics KAo: Physical growth of children and adolescents of korea KCDC(Korea centers for disease control and prevention), 2007.

17. Malnick SDH: The medical complications of obesity. Qjm 2006; 99:565-579.

18. Armstrong KA, Campbell SB, Hawley CM, Johnson DW, Isbel NM: Impact of obesity on renal transplant outcomes. Nephrology 2005; 10:405-413.

19. Stukenborg-Colsman C, Ostermeier S, Windhagen H: [what effect does of obesity have on the outcome of total hip and knee arthroplasty. Review of the literature]. Orthopade 2005; 34:664-667.

20. Nafiu O, Green G, Walton S, Morris M, Reddy S, Tremper K: Obesity and risk of peri-operative complications in children presenting for adenotonsillectomy. International Journal of Pediatric Otorhinolaryngology 2009; 73:89-95.

21. Ye J, Liu H, Zhang G, Huang Z, Huang P, Li Y: Postoperative respiratory complications of adenotonsillectomy for obstructive sleep apnea syndrome in older children: Prevalence, risk factors, and impact on clinical outcome. J Otolaryngol Head Neck Surg 2009; 38:49-58.

22. Chinn S, Jarvis D, Burney P: Relation of bronchial responsiveness to body mass index in the ecrhs. European community respiratory health survey. Thorax 2002; 57:1028-1033.

23. Garcia P, Gates GA, Schechtman KB: Does topical antibiotic prophylaxis reduce post-tympanostomy tube otorrhea? Ann Otol Rhinol Laryngol 1994; 103:54-58.

24. Sohail MR, Khan AH, Holmes DR, Jr., Wilson WR, Steckelberg JM, Baddour LM: Infectious complications of percutaneous vascular closure devices. Mayo Clin Proc 2005; 80:1011-1015.