

Factors Associated With Cholesteatoma in 45,980 Children

Source: Spilsbury K, Miller I, Semmens JB, et al. *Factors associated with developing cholesteatoma: a study of 45,980 children with middle ear disease. Laryngoscope.* 2010;120(3):625-630; doi:10.1002/lary.20765

Researchers from Western Australia assessed the factors associated with developing cholesteatoma in children after ventilation tube insertion (VTI). The Western Australian Data Linkage System enabled access to hospital records of all children undergoing VTI from 1980 to 2004. The main outcome was the percentage of study children developing cholesteatoma six or more months after VTI.

Overall, 45,908 children had at least one VTI during the study period, at a mean age of 3 years. There were a total of 460 (1%) cases of cholesteatoma which developed an average of 3.8 years after the VTI. Increasing number of VTIs was associated with an increased incidence of cholesteatoma, from 0.7% in children with one VTI to 3.6% after four VTIs ($P < .001$). Other factors associated with an increased rate of cholesteatoma included older age at first VTI, increasing time interval between VTIs, rural living, and cleft palate. After adenoidectomy, the rate of cholesteatoma dropped 27%.

The authors conclude that children with persistent or refractory middle ear disease who require multiple VTIs are at increased risk of cholesteatoma. First VTI at an early age and adenoid removal are associated with a reduced rate of cholesteatoma.

Commentary by

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Dr Preciado has disclosed no financial relationship relevant to this commentary. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

Acquired cholesteatomas are characterized by migration of keratinized squamous epithelium from the external aspect of the tympanic membrane into the middle ear and mastoid cavity. They are thought to arise from chronic negative middle ear pressure and tympanic membrane retraction. Due to their low incidence, most cholesteatoma studies have been retrospective cohort series or reported aggregate data. The strength of the current study is that it reports data from a very large population of patients at risk for cholesteatoma over a long study period. The observed 1% incidence of cholesteatoma in children with a history of VTI is in line with previous reports.^{1,2}

The increasing risk of cholesteatoma associated with increased number of VTI procedures might lead one to conclude that VTI may cause cholesteatomas.² In fact, the increased number of VTI procedures likely reflects worse underlying chronic middle ear disease

and longer-standing Eustachian tube dysfunction, which are causal factors. Children with a history of cleft palate, who inherently have poor Eustachian tube function and significant rates of chronic middle ear disease, have up to 1,000-fold higher rates of cholesteatoma.^{3,4} The observation by the current study's investigators that children who had VTIs in quick succession had a significantly lower rate of cholesteatoma compared to those who had the same number of tubes placed but at longer time intervals suggests it is the long-standing negative middle ear pressure, and not the VTI, that predisposes to cholesteatoma. This hypothesis is supported by the finding that a history of adenoidectomy, and presumably resultant better Eustachian tube function, was protective against cholesteatoma. Further, an older age at first VTI placement (presumably from delayed treatment) also was associated with an increased cholesteatoma incidence, which argues that longer periods of untreated negative middle ear pressure may result in higher rates of cholesteatoma. Finally, rural patients (with presumably less access to longitudinal care) also were found to have increased rates of cholesteatoma. Taken together, the study's findings make a compelling, but not definitive, argument that longstanding undertreated negative middle ear pressure may result in an increased risk for cholesteatoma.

Despite the very large number of patients, the study has several limitations. First, the authors do not report on the *overall* incidence of cholesteatoma in a general Western Australian population (including patients without a history of VTI). Generally in Caucasians these rates are reported to be 6 to 9/100,000 children.^{3,4} Because children of Aboriginal ethnicities have comparatively higher rates of chronic middle ear disease, it is possible they also have higher rates of cholesteatoma at baseline. Second, there was no ability to determine whether the type of ventilation tube used or the severity of underlying disease had any effects on the rate of cholesteatoma. Finally, a definite correlation between VTI and cholesteatoma ear laterality in all cases (although most VTI are done bilaterally), could not be established. Regardless, the robust nature of the review, coupled with the main findings, reinforce the conclusion that longstanding untreated Eustachian tube dysfunction, and not VTI itself, leads to a subsequent long-term increased cholesteatoma incidence.

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Key words: cholesteatoma, middle ear disease, ventilation tube insertion

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AAP Grand Rounds 2010;24;20

DOI: 10.1542/gr.24-2-20

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