

Tonsillectomy and Adenoidectomy Are Not Associated With an Altered Risk of Childhood-Onset Type 1 Diabetes

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Type 1 diabetes results from the autoimmune destruction of the pancreatic β -cells. As various studies have shown that tonsillectomy and adenoidectomy, particularly in childhood, impact the function of the immune system (1), it is possible that these procedures could increase a child's risk of type 1 diabetes. Conversely, the hygiene hypothesis (2) suggests that frequent exposure to infections in early life may protect against type 1 diabetes. Therefore, children undergoing tonsillectomy and adenoidectomy may be expected to have a reduced risk of type 1 diabetes because they are likely to have experienced higher rates of respiratory and ear infections in early childhood than other children. Previously, a Finnish case-control study (3) of type 1 diabetes with adenoidectomy reported a modest though not significant increase in the risk of diabetes, while a possible association with tonsillectomy has been investigated only in a small Canadian case-control study (4). The aim of this study was to investigate, for the first time in a cohort setting, the risk of type 1 diabetes after tonsillectomy and/or adenoidectomy in children identified from hospital records.

RESEARCH DESIGN AND METHODS

Northern Ireland hospitals routinely record the name, date of birth, and hospital number of each individual undergoing a surgical procedure. The type of procedure is recorded using OPCS-4 (Office of Population Census and Surveys Classification of Surgical Operations and Procedures-4) codes. Cohorts of children (aged <15 years) undergoing

tonsillectomy and/or adenoidectomy were identified by OPCS-4 codes F34.1–F34.9 and E20.1–E20.9, respectively. The majority of tonsillectomies and adenoidectomies are performed at 13 hospitals in Northern Ireland. All were invited to provide data from 1990 to 2003.

In Northern Ireland, a type 1 diabetes register has prospectively recorded newly diagnosed children aged <15 years since 1989 (5). The register is estimated (using capture-recapture methodology) to be 99% complete over the period 1989–2003 (6).

Individuals in the tonsillectomy and adenoidectomy cohorts were identified on the type 1 diabetes register to determine their diabetes incidence. Records were linked by matching on forename, surname, and date of birth. Additional searches allowed the identification of matches despite spelling mistakes (by matching on names converted to Oxford Name Compression Algorithm codes [7]), inaccurately recorded dates of birth (by matching on year of birth or day and month of birth), or both (by matching on hospital number).

The person-years at risk for each child in the cohort was accumulated from the date of their procedure (adenoidectomy and/or tonsillectomy) until their 15th birthday or 31 December 2003—which ever occurred earlier. Published period (in 5-year categories), age (in 5-year categories), and sex-specific rates of type 1 diabetes in Northern Ireland (6) were used to calculate the expected number of new cases in the cohort. A power calculation (8) before analysis estimated that a

cohort of sufficient size to have 38 expected cases would have ~80% power to detect as statistically significant ($P < 0.05$; two tailed) a 50% increase in the risk of diabetes in the cohort relative to the general population. The study was approved by Queen's University of Belfast research ethics committee.

RESULTS— Seven hospitals provided data from 1990 to 2003, one from 1993 to 2003, and another from 1996 to 2003. The study cohort included 25,488 children undergoing tonsillectomy and/or adenoidectomy (21,227 tonsillectomies and 16,625 adenoidectomies). The median age at tonsillectomy was 6.7 years (lower quartile, 4.9; upper quartile, 10.0) and at adenoidectomy 5.6 years (lower quartile, 4.3; upper quartile, 7.5).

The person-years of follow-up, observed cases, expected cases, and standardized incidence ratios (SIRs) of type 1 diabetes after tonsillectomy and/or adenoidectomy are shown in Table 1. Overall, there was little evidence of a difference in the incidence of type 1 diabetes in children after tonsillectomy (SIR 115), adenoidectomy (114), or either procedure (107).

CONCLUSIONS— To our knowledge, this is the first investigation of the incidence of childhood-onset type 1 diabetes in a cohort of children after tonsillectomy or adenoidectomy. The identification of the cohort from routinely recorded hospital admissions limited the possibility of recall or selection bias. Also, the size of the cohort under investigation ($n = 25,488$) allowed the calculation of relatively precise estimates of diabetes risk.

A potential weakness is that type 1 diabetes incidence may have been underestimated, as cases may not have been identified because of incorrectly recorded patient-identifying details, but various searches were conducted to reduce this possibility. Another weakness is that the analysis could not be adjusted for confounding variables, such as deprivation (6,9), which may influence the likelihood of tonsillectomy or adenoidectomy and

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Received for publication 4 April 2007 and accepted in revised form 28 June 2007.

Published ahead of print at <http://care.diabetesjournals.org> on 9 July 2007. DOI: 10.2337/dc07-0655.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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Table 1—Person-years of follow-up, observed cases, expected cases, and SIRs of childhood-onset type 1 diabetes after tonsillectomy and/or adenoidectomy

Procedure	Person-years	Observed cases	Expected cases*	SIR (95%CI)
Tonsillectomy	109,546	38	33.0	115 (82–158)
Adenoidectomy	103,038	35	30.7	114 (79–158)
Tonsillectomy or adenoidectomy	136,292	44	41.0	107 (78–144)

Data are *n* unless otherwise indicated. *Expected numbers of cases adjusted for age (in 5-year categories), period (in 5-year categories), and sex.

may be related to the risk of diabetes. Finally, the expected numbers of cases were based on Northern Ireland-wide incidence rates despite four hospitals (three from one health board) not contributing data. However, recalculation of expected numbers of cases based only on the three remaining boards produced identical findings.

This study demonstrated little evidence of any difference in the risk of childhood-onset type 1 diabetes after tonsillectomy or adenoidectomy. This study is consistent with a previous finding for tonsillectomy from a small case-control study (4) but does not support any role for adenoidectomy as a risk factor (3).

Our findings provide little support for the hygiene hypothesis because we found no evidence of a lower risk of type

1 diabetes in a cohort of children who are likely to have increased experience of recurrent respiratory or ear infections. However, the hygiene hypothesis suggests that infancy is the critical period for the developing immune system (2), and the excess infections in these children may have occurred after infancy.

Acknowledgments—We thank the nurses and pediatricians who help compile the Northern Ireland register, Kay Andrews, and Rosie Kearney.

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