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 on 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 as 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 Office of Population Census and Surveys Classification of Surgical Operations and Procedures (OPCS-4) codes. Cohorts of children (under the age of 15 years) undergoing tonsillectomy and/or adenoidectomy were identified by OPCS-4 codes F34.1 to F34.9 and E20.1 to 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 mellitus register has prospectively recorded newly-diagnosed children under the age of 15 years since 1989 (5). The register is estimated (using capture re-capture methodology) to be 99% complete over the period 1989 to 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 (ONCA) 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 the earlier of their 15th birthday or the 31st December 2003. Published period (in five year categories), age (in five year categories) and sex specific rates of type 1 diabetes in Northern Ireland (6) were used to calculate the expected number of new cases (E) in the cohort. A power calculation (8) prior to analysis estimated that a cohort of sufficient size to have 38 expected cases would have approximately 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 (lower quartile = 4.9, upper quartile = 10.0) years and adenoidectomy was 5.6 (lower quartile = 4.3, upper quartile=7.5) years.

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The person years of follow-up, observed cases (O), expected cases (E) and standardised 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 (SIR=114) or either procedure (SIR=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 (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 due to 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 which may be related to the risk of diabetes. Finally, the expected numbers of cases were based upon Northern Ireland wide incidence rates despite four hospitals, three from one Health Board, not contributing data. However, re-calculation of expected numbers of cases based only upon 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 as 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.

**ACKNOWLEDGEMENTS**

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REFERENCES
Table 1. Person years follow-up, observed cases (O), expected cases (E) and standardised incidence ratio (SIR) of childhood onset type 1 diabetes after tonsillectomy and/or adenoidectomy.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Person years</th>
<th>O</th>
<th>E</th>
<th>SIR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonsillectomy</td>
<td>109,546</td>
<td>38</td>
<td>33.0</td>
<td>115 (82, 158)</td>
</tr>
<tr>
<td>Adenoidectomy</td>
<td>103,038</td>
<td>35</td>
<td>30.7</td>
<td>114 (79, 158)</td>
</tr>
<tr>
<td>Tonsillectomy or adenoidectomy</td>
<td>136,292</td>
<td>44</td>
<td>41.0</td>
<td>107 (78, 144)</td>
</tr>
</tbody>
</table>

* Expected numbers of cases adjusted for age (in five year categories), period (in five year categories) and sex.