Respiratory tract infections and concomitant pericoronitis of the wisdom teeth

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Abstract

Objective—To discover if there is an association between respiratory tract infections and pericoronitis of erupting third molars in young adults.

Design—Data from male military conscripts' medical records were collected over five years and the incidence of respiratory tract infection before and after acute pericoronitis (191 cases) and before and after standard (722 cases) and operative (741) extractions compared with that in controls (n=703) who had no infections in the third molar regions.

Subjects—14 500 male military conscripts aged 20.

Setting—Garrisons in Valkeala and Kouvola, Finland.

Results—The incidence of respiratory tract infection was significantly higher during the two weeks before acute pericoronitis was diagnosed compared with that in controls. The highest incidence was observed in the three days before pericoronitis (odds ratio 6.8; 95% confidence interval 3.0 to 15.0). The incidence was also increased in the first week after pericoronitis (odds ratio 3.7; 1.6 to 8.4) and three days before (odds ratio 2.6; 0.9 to 7.5) and during the first week after extraction of third molars (odds ratio 2.6; 1.3 to 5.3).

Conclusions—Respiratory tract infection may precipitate and occur concomitantly with acute pericoronitis. Third molar surgery for pericoronitis, on the other hand, may trigger respiratory tract infection.

Introduction

Adults in industrialised countries have two to four episodes of respiratory tract infections a year.^{1,3} Pharyngitis and tonsillitis are common.⁴ Over 40 million patients a year go to their doctors for sore throat in the United States alone.⁵ In Finland in 1992, 40 500 cases of respiratory tract infection were recorded in 22 000 male military conscripts during national service lasting 8–11 months.⁶ Acute pericoronitis of partly erupted third molars is the commonest⁷ or second commonest^{8,9} acute dental problem in army personnel, characteristically affecting 20 to 25 year olds.^{10,11} Mandibular third molars, which may never erupt completely,¹² are affected in at least 95% of cases.^{10,13}

Reportedly, pericoronitis of mandibular third molars may be associated with respiratory tract infection, emotional and physical stress, and excessive physical fatigue.^{10,14} This has not been studied formally, however, and we sought to determine if there was an association between respiratory tract infection and acute pericoronitis in conscripts of the Finnish defence forces.

Subjects and methods

The sample consisted of 14 500 Finnish male conscripts in the Valkeala and Kouvola garrisons from 1986 to 1990. Each conscript served 8–11 months. On average 2700 national service conscripts were based in the two garrisons at any time.

One thousand six hundred and ninety two conscripts underwent treatment or exploration of their third

molars. Data on 182 subjects (11%) were not available because records were missing at the time of study. Data were ultimately collected from 1510 conscripts, who attended on 3710 occasions for third molar related problems at the dental units of the two military hospitals. The mean age of the patients was 20.5 (SD 1.2) years (range 17.5–29.7).

Details of upper and lower respiratory tract infections were extracted from patient records one month before and two weeks after acute pericoronitis and one month before and one month after third molar extractions. Respiratory tract infection was diagnosed by army physicians and classified according to the International Classification of Diseases¹⁵ as pharyngitis, nasopharyngitis, tonsillitis, otitis, sinusitis, unspecified upper respiratory tract infection, laryngitis, tracheitis, bronchitis, or pneumonia.

Acute pericoronitis and extractions of third molars were recorded by army dentists. The first study group comprised all cases of acute pericoronitis (191 patients; 183 (96%) with pericoronitis of lower third molars) requiring antibiotics (92; 48%), other drugs, or anti-septic mouthwashes. Patients who were symptom free or who had more diffuse, chronic pericoronitis were not included. The second study group comprised all cases of standard (722) or operative (741) extractions of third molars; a total of 1881 teeth were extracted. Removal of upper third molars accounted for 491 (68%) standard extractions. Lower third molars accounted for 704 (95%) operative extractions, defined as removals that required a gingival flap to be raised and the alveolar socket to be sutured. In 422 (57%) operative extractions tooth sectioning or bone removal with surgical drills was also required.

The incidence of respiratory tract infection before acute pericoronitis was compared with that in 703 controls with abnormal position or caries as their only diagnosis relating to third molars.

The incidence of respiratory tract infection after acute pericoronitis and before and after extraction of third molars was compared with that among the same controls. Respiratory tract infection was recorded only once if patients were examined several times in one week. When medical appointments were more than seven days apart diagnoses were recorded separately. Third molar extractions were recorded only once if teeth were extracted in two appointments in one week. Periods for recording respiratory tract infection before and after acute pericoronitis episodes and before and after extractions were three days, one week, two weeks, and three to four weeks.

Statistical analysis—Odds ratios with 95% confidence intervals relating to incidences of respiratory tract infection were calculated for study groups and controls. In addition, Fisher's exact test was used in comparisons between study groups and controls. P values of <0.05 were taken as significant. The SAS statistical package was used.

Results

Thirty two (17%) patients in the first study group had a respiratory tract infection during 14 days before acute pericoronitis versus 44 (6.3%) controls

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($P < 0.001$). During the preceding seven days numbers with infection were 22 (12%) patients versus 29 (4.1%) controls ($P < 0.001$), and in the three days before pericoronitis 17 (8.9%) patients versus 10 (1.4%) controls ($P < 0.001$). Increased incidences were also found when cases of tonsillitis and pharyngitis were combined during two weeks, one week, and three days before diagnosis of acute pericoronitis. Significantly more cases of respiratory tract infection were diagnosed in the first study group during the first week after pericoronitis than in controls (18 (9.4%) patients versus 19 (2.7%) controls; $P = 0.002$). Odds ratios relating to the incidence of respiratory tract infection in the study and control groups are given in the table, with all respiratory tract infections and episodes of tonsillitis and pharyngitis listed separately.

Risk of respiratory tract infections in subjects with and without third molar related problems. Results expressed as odds ratios and confidence intervals with respect to time before and after diagnosis of pericoronitis or extraction of third molars

Days of observation	Odds ratio (95% confidence interval)	
	All respiratory tract infections	Tonsillitis and pharyngitis
Before pericoronitis:		
30-15	1.0 (0.5 to 2.1)	2.1 (0.6 to 7.3)
14-8	2.5 (1.1 to 5.7)	6.9 (2.3 to 20.8)
7	3.2 (1.8 to 5.6)	4.3 (1.6 to 11.3)
3	6.8 (3.0 to 15.0)	8.9 (2.3 to 34.7)
After pericoronitis:		
3	7.7 (2.1 to 27.7)	6.6 (1.4 to 32.0)
7	3.7 (1.6 to 8.4)	6.4 (1.7 to 23.4)
8-14	0.4 (0.1 to 1.3)	0.5 (0.1 to 4.1)
Before extractions:		
30-8	1.2 (0.7 to 1.8)	1.8 (0.6 to 5.6)
7	1.7 (0.9 to 3.1)	3.2 (0.7 to 14.3)
3	2.6 (0.9 to 7.5)	2.7 (0.3 to 22.9)
After extractions:		
3	4.2 (1.3 to 14.0)	1.6 (0.3 to 7.7)
7	2.6 (1.3 to 5.3)	2.6 (0.8 to 9.0)
8-30	0.6 (0.4 to 1.0)	0.6 (0.2 to 1.6)

In the three days before the 722 standard extractions the incidence of respiratory tract infection was 3.0% (22 cases) whereas that among controls was 1.3% (nine) (NS). During the first week after extractions the incidence of infection increased to 6.8% (49 patients) versus 2.7% (19 controls) ($P = 0.008$). Before and after the 741 operative extractions, however, the incidence of respiratory tract infection was not significantly greater in the study group (3.4% (25 cases before, 3.1% (23) after the one week observation period)) than in controls (4.0% (28 cases before, 2.7% (19) after)).

Discussion

Our results show that respiratory tract infection may indeed trigger acute pericoronitis. Plainly the risk of pericoronitis is increased if patients are weakened by respiratory tract infection. Whether the reverse is true is a matter for debate. In this study the incidence of respiratory tract infection was also greater in the first week after acute pericoronitis.

Our findings also show that third molar extractions can trigger respiratory tract infection. In addition, we observed an increased incidence of respiratory tract infection in the three days before standard extractions (second study group). This can partly be explained by existing pericoronitis, many such infections of the lower third molars being treated by extraction of the respective upper third molars in order to avoid their traumatising the pericoronitis site.¹⁶ The incidence of respiratory tract infection was not significantly correlated with operative extractions but was significantly correlated with standard extractions. This could be explained by the frequent use of antibiotics in operative extractions in Finland to prevent postoperative discomfort.¹⁷ In this series antibiotics were

Key messages

- Infections around wisdom teeth are common in young adults
- A possible link between respiratory tract infections and pericoronitis of the wisdom teeth has not been studied before
- Respiratory tract infection and pericoronitis seem to occur concomitantly
- Partly erupted wisdom teeth which are unlikely to erupt should be extracted before pericoronitis develops and to avoid a possible episode of respiratory tract infection

prescribed postoperatively in 90% (667) operative extractions but in only 5% (36) of standard extractions.

Most respiratory tract infections are viral. Degré suggested that viral infections may damage mucous membranes and predispose tissues to secondary invasion or superinfection by bacteria.¹⁸ Associations between respiratory tract infection, acute pericoronitis, and extractions of third molars can be considered mainly on a bacteriological basis, the virology of pericoronitis being unknown. It has been suggested that Gram negative anaerobic microorganisms such as spirochetes, fusobacteria, *Prevotella intermedia*, *Actinobacillus actinomycetemcomitans*, *Peptostreptococcus micros*, and *Veillonella* species^{13 19-21} may be incriminated in pericoronitis. Many aerobic and anaerobic organisms have also been found in alveolar bone sockets after extraction of teeth.²²

The proximity of the nasopharynx to the third molars favours the hypothesis that they may have common pathogenic aspects. Thus we analysed cases of tonsillitis and pharyngitis separately. In the time intervals studied both before and after pericoronitis was diagnosed the risk of tonsillitis and pharyngitis was in some cases greater than when all respiratory tract infections were taken into account. Unpublished data show that the tonsils and lower third molar regions harbour similar anaerobic bacterial species. These may play a part both in pericoronitis and in tonsillitis. Anaerobes have been linked particularly with recurrent tonsillitis in children.²³

A five month to one year cyclical recurrence is typical of acute pericoronitis when the affected tooth is not extracted after the first episode.¹⁰ The cycle can be explained by the recurrence pattern of respiratory tract infection. All partly erupted third molars are at risk of acute pericoronitis,¹² and it is generally accepted that a weakened general condition increases the risk. Based on our findings we emphasise the particular role of sore throat in triggering pericoronitis. In clinical military practice young soldiers commonly have acute pericoronitis and tonsillopharyngitis simultaneously. Many such patients say that their sore throat followed prolonged tenderness in a lower third molar region. These cases together with our results emphasise the need for rethinking: pericoronitis may also precede respiratory tract infection. Furthermore, when a tooth affected by pericoronitis is extracted an episode of respiratory tract infection may follow.

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Breast feeding and acute appendicitis

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Acute appendicitis is the commonest reason for abdominal surgery in many countries, but its cause is unknown.¹ The hygiene hypothesis attributes the rise in appendicitis that occurred in the United Kingdom at the beginning of this century to improvements in sewage disposal and water supplies in the late 19th century.² These improvements in hygiene greatly reduced the exposure of infants to enteric organisms that programme the immune system of the gut, thereby rendering the bowel more susceptible to triggering infection later in life. Knowledge about risk factors for appendicitis is, however, poor, and the roles of diet,³ housing, and amenities such as hot water and bathroom facilities are doubtful.⁴ Because breast feeding can modify the exposure or the type of immune response to some microbial agents during infancy, we investigated the relation between infant feeding and acute appendicitis in a case incident, population based case-control study.

Patients, methods, and results

All 222 children admitted to Santobono Paediatric Hospital, Naples, between 1 January and 30 November 1993 with histologically confirmed acute appendicitis were recruited for the study. All these children were living in the Naples area. Their mothers were interviewed during the stay in hospital by two nurses unaware of the objectives of the study. Controls were 222 children randomly selected from around 3000 attending 10 randomly selected primary schools in the Naples area that had been enrolled in a child health survey. All the mothers sampled agreed to be interviewed at home by the same two nurses during 1993.

Relative risk was calculated by odds ratios with confidence intervals by Cornfield's method. Confounding and effect modification were investigated by stratified analysis. The table shows the characteristics of the groups.

The mean duration of breast feeding was 96.9 days (SD 115.6) for cases and 130.2 days (134.8) for controls (Mann-Whitney U test; two-tailed P value 0.001).

Stratified analysis showed that no factor among those we analysed (birth weight, sex, type of delivery, maternal education, and number of other children in the household) confounded or modified the association between feeding and illness.

Comment

Our data indicate that children with acute appendicitis were less likely than controls to have been breast fed for a prolonged length of time.

There are several reasons why prolonged breast feeding may be associated with a decreased risk of acute appendicitis. The immune components of human milk provide an antigen avoidance system that can decrease the severity of infection and probably the inflammatory reactions associated with it.⁵ This milder inflammatory response could programme the immune system of the infant, its effects lasting for several years, and it could be associated with a more tolerant lymphoid tissue at the base of the appendix. Alternatively, prolonged breast feeding may be a marker of some unknown socioeconomic characteristic that could be associated with a low risk of illness.

Acute appendicitis may represent another case in

Characteristics of cases and controls. Values are numbers of subjects unless stated otherwise

Characteristic	Cases (n=222)	Controls (n=222)
Sex:		
Male	147	129
Female	75	93
Mean (SD) age (years):	7.5 (3.0)	8.1 (1.7)
Birth weight (g):		
>2500	211	208
<2500	11	14
Type of delivery:		
Vaginal	169	153 (69)
Caesarean	53	69 (31)
No of other children in household:		
0	15	14
1	105	116
2	66	70
≥3	36	22
Maternal education (years):		
<8	145 (65.3)	146 (65.8)
≥8	61 (27.5)	74 (33.3)
Unknown	16 (7.2)	2 (0.9)
Hot water and bathroom at home at time of interview	222	222
Breast feeding (months)*:		
Never	65	63
0-3	80	51*
4-	45	53†
7-	32	55‡

*Odds ratio in comparison with those who had never been breast fed 1.5 (95% confidence interval 0.9 to 2.6).

†Odds ratio 0.9 (0.5 to 1.4).

‡Odds ratio 0.6 (0.3 to 1.0).