Increased meningococcal carrier rate after tonsillectomy

The meningococcal carrier state induces bactericidal serum antibodies which correlate with protection against meningococcal disease.¹ Colonisation of the nasopharynx by *Neisseria meningitidis*, however, also precedes invasive meningococcal disease. Factors determining the outcome of nasopharyngeal meningococcal colonisation are not known. As the palatine tonsils are the largest lymphoid organs in that area, we studied the effect of tonsillectomy on the meningococcal carrier rate.

Patients, methods, and results

Two specimens of throat flora (specimens 1 and 2) were collected three months apart from 160 patients admitted to hospital for tonsillectomy and from 107 healthy controls. All first specimens from the patients and first and second specimens from the controls were collected by us and incubated immediately; the second specimens from the patients were collected by their own doctors and sent to us by mail. Only specimens with a transport time shorter than 24 hours were included in the study. All specimens were cultured on a selective medium and meningococci identified and serogrouped according to standard procedures.

For ease of reporting we refer to meningococcal carriers as M+ and non-carriers as M-. Statistical analysis was by Fisher's exact test.

Of the 160 patients, 85 were excluded; in three tonsillectomy was cancelled, 41 did not attend for collection of their second specimen, and in 41 cases the transport time of specimen 2 exceeded 24 hours. The mean age of the remaining 75 patients (41 female) was 16.9 years. The mean interval between collections of specimens 1 and 2 was 100 days.

Of the 107 controls, 68 attended for collection of specimen 2. Their mean age was 17.9 years, and 49 were female. The mean interval between collections of the two specimens was 96 days.

Thirteen patients and six controls were initially M+, but during the observation period three patients and two controls became M- (table).

Number of meningococcal carriers (M+) and non-meningococcal carriers (M-) among 75 patients before (specimen 1) and three months after tonsillectomy (specimen 2) and among 68 healthy controls sampled at similar intervals

Meningococcal carrier state as determined from specimen 1	Patients			Controls		
	Specimen 2		Total	Specimen 2		Total
	M+	M-		M+	M-	
M+	10	3	13	4	2	6
M-	15	47	62	0	62	62
Total	25	50	75	4	64	68

By contrast, 15 of the 62 M- patients but none of the 62 M- controls converted to M+ ($p < 0.00001$). The number of patients converting from M- to M+ was significantly higher than the number converting from M+ to M- ($p < 0.0001$).

Twenty of the 25 strains of meningococci isolated from specimen 2 from the patients and three of the four strains from the controls were encapsulated; group B meningococcus was more frequently isolated than other groups.

Comment

A significantly higher number of patients with tonsillectomy than controls became meningococcal carriers during the observation period ($p < 0.00001$). Factors responsible for the difference are not clear. It is unlikely that differences between the two groups were accounted for by differences in the collection of specimens, because specimen 2 from the patients was subject to a transportation time of 18-24 hours before plating; if anything, this would be expected to decrease the number of viable meningococci. Hence removal of the tonsils presumably caused a local change in the mucous membranes, favouring their colonisation by *N meningitidis*.

It seems unlikely that changes in the microflora of the pharynx after tonsillectomy explain the increased meningococcal carrier rate because tonsillectomy apparently recreates the normal microflora of this area.² The possibility that immunological factors were implicated in the conversion from M- to M+ carrier state deserves consideration. Probably the most important immunological constituent of the mucus bathing these surfaces is secretory IgA, which seems to inhibit the adherence of micro-organisms to the mucosal epithelial cells.

A significant but transient decrease in the relative concentration of salivary IgA has been observed in the first few months after tonsillectomy.³ In addition, reduced concentrations of specific antibodies in nasopharyngeal mucus have been observed after tonsillectomy.⁴

Many questions raised by our study remain to be answered. Does tonsillectomy lower the amount of specific antimeningococcal IgA of the nasopharyngeal mucus? Does tonsillectomy decrease the host's resistance to invasive meningococcal disease?

We thank Dr Odd Aalen, of the University of Oslo, for the statistical analyses.

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(Accepted 22 December 1983)

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Transtracheal injection of saline in the investigation of pneumonia

One problem when investigating pneumonia and lower respiratory tract infections is that sputum may not be obtainable, even after physiotherapy. In recent studies 50-60% of patients could not produce sputum for examination.¹⁻³ In such cases transtracheal aspiration, bronchoscopy, or percutaneous lung aspiration may be used to obtain lower respiratory secretion.⁴ Many clinicians, however, particularly in Britain, are unhappy about using such invasive techniques, especially for the investigation of community acquired pneumonia. We have investigated prospectively the usefulness of transtracheal saline injection for aiding the collection of lower respiratory tract secretions in patients with community acquired pneumonia.

Patients, methods, and results

Over 13 months 127 consecutive adults admitted to our hospital with community acquired pneumonia were included in a detailed clinical and laboratory study of the causes and outcome of pneumonia.⁵ An attempt was made to collect sputum from all patients on admission by voluntary coughing, usually with the aid of a physiotherapist. When sputum was unobtainable a transtracheal injection of saline was performed by the following method. The procedure was explained to the patient, who lay back at about 45° in bed and extended the neck. The cricothyroid membrane was identified and the overlying skin cleaned. A 19 gauge needle attached to a 5 ml syringe filled with sterile isotonic saline was inserted through the membrane into the tracheal lumen. Air was withdrawn to confirm placement and then the contents of the syringe instilled briskly into the trachea and the needle withdrawn immediately. Invariably the patient sat forward, coughed deeply, and produced a specimen of lower respiratory tract secretions into a wide mouthed specimen container. Premedication and local anaesthesia were not used, the whole procedure taking less than one minute.

Of the 127 patients studied, 70 (55%) produced sputum specimens. Forty two of the remaining 57 patients were given a transtracheal injection of saline, and all except one produced specimens of lower respiratory tract secretions. Examination of these specimens by culture, and by counterimmunoelectrophoresis for pneumococcal antigen,⁶ yielded evidence of pneumococcal infection in 26 patients (table). Supporting evidence of pneumococcal infection was available for 23 of these patients by the culture of *Streptococcus pneumoniae* from serum (five cases) and/or by the detection of pneumococcal antigen in serum (six cases), pleural fluid (three cases), lung tissue (three cases), and/or concentrated urine (20 cases). Thirteen patients had no pathogens isolated on culture and no pneumococcal antigen detected in their lower

Results of testing of specimens produced by transtracheal saline injection for 42 patients with community acquired pneumonia

No of patients	Result of testing lower respiratory tract secretion*
22	Pneumococcal antigen positive: no pathogens on culture
13	Pneumococcal antigen negative: no pathogens on culture
4	Pneumococcal antigen positive: <i>Str pneumoniae</i> on culture†
2	Pneumococcal antigen not tested: no pathogens on culture
1	No specimen obtained

* Pneumococcal antigen detected using countercurrent immunoelectrophoresis.⁵

† *H Influenzae* also cultured from two specimens.

respiratory tract secretions. Of these, five were subsequently diagnosed as having legionnaires' disease, four pneumococcal pneumonia, two psittacosis pneumonia, one Q fever pneumonia, and one pulmonary tuberculosis. Troublesome complications of transtracheal injection did not occur. Occasionally blood streaking of the specimen was noted. Three of the 42 patients subsequently had transtracheal aspirations performed and legionnaires' disease was diagnosed in two and *Haemophilus influenzae* infection in one.

Comment

Transtracheal injection of saline proved to be a safe and effective method of obtaining lower respiratory tract secretions from patients with pneumonia who were unable to produce sputum spontaneously. Examination of such specimens by culture and by countercurrent immunoelectrophoresis for pneumococcal antigen was particularly useful for diagnosing pneumococcal infection in our series. Other supporting evidence of pneumococcal infection was found for the majority of patients diagnosed in this way. The low success rate for culturing *Str pneumoniae* was probably related to frequent use of antibiotics before hospital admission.

We have used a similar technique for several years for giving intratracheal lignocaine anaesthesia before fiberoptic bronchoscopy. No troublesome complications have been noted after over 2400 such injections, confirming the safety of this technique. A detailed post-bronchoscopy questionnaire survey of 166 consecutive patients disclosed that 140 found the transtracheal injection aspect of the bronchoscopy "all right" or "a little unpleasant," 15 "unpleasant," and 11 "extremely unpleasant." Both of us have experienced a transtracheal injection of saline and neither found it painful or particularly distressing.

We also find the technique useful for the investigation of suspected pulmonary tuberculosis. When sputum is unobtainable the injection may obviate the need for gastric washings or bronchoscopy.

Although invasive techniques such as transtracheal aspiration and percutaneous lung aspiration provide specimens of lower respiratory tract secretions uncontaminated by oropharyngeal commensals, reports of serious complications and occasional deaths suggest that they should not be used routinely.⁴

When investigating a patient with pneumonia or a lower respiratory tract infection we suggest that a transtracheal injection of saline should be performed when a sputum specimen is required but is not available. Only if examination of the resulting specimen is unhelpful should more invasive techniques such as transtracheal aspiration be performed.

We thank our clinical and laboratory colleagues for their help and co-operation.

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(Accepted 22 December 1982)

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Recurrent bleeding from idiopathic ulceration of small bowel

Ulceration of the small bowel other than that seen in peptic ulcer disease and Crohn's disease is rare. Its causes include the Zollinger-Ellison syndrome, tuberculosis, syphilis, typhoid, fungal infections, enteric coated drugs such as potassium, steroid treatment, intestinal lymphoma, polyarteritis, and non-specific ulceration associated with malabsorption.^{1,2} We report two cases of idiopathic small-bowel ulceration not associated with villous atrophy. Both cases were diagnosed during investigations for recurrent gastrointestinal bleeding.

Case reports

Case 1³—A woman aged 57 presented with heart failure and mitral incompetence and was treated with digoxin and diuretics but no potassium supplements. She was found to have anaemia with occult blood in her stools. Full endoscopy, radiology, angiography, and scintigraphy showed no cause. At diagnostic laparotomy two years later inspection and transillumination of the bowel showed no abnormality: her small bowel was inspected with a fiberoptic colonoscope (Olympus CFLB3R) introduced by mouth. Multiple superficial ulcers, all less than 1 cm in diameter and bleeding slowly, were found in the ileum (figure). Full thickness biopsy specimens showed

Endoscopic view of ulcer of small bowel with slow bleeding (a); and section through ulcerated mucosa (b) (haematoxylin and eosin) × 16.

congestion and superficial ulceration with no underlying inflammation or vasculitis and no evidence of villous atrophy or Crohn's disease (figure). After various empirical and unsuccessful medical treatments she underwent a second laparotomy in 1982 with a view to ileal resection to control the bleeding. Enteroscopy showed similar ulcers confined mainly to the jejunum. Resection of the most severely affected segment failed to control the blood loss.

Case 2⁴—A 71 year old man was treated for cardiomyopathy with digoxin, diuretics, and potassium supplements for six years until 1980 (no potassium was given after early 1980). In 1980 worsening heart failure coincided with the finding of anaemia and occult blood in his stools. Full endoscopy, radiology, angiography, and scintigraphy failed to show a cause. In 1983 worsening anaemia and heart failure warranted diagnostic laparotomy. Inspection and transillumination of the bowel showed no abnormalities, but enteroscopy showed jejunal ulcers similar to those seen in case 1. Biopsy specimens were also of similar appearance. He had a stormy postoperative course and died of heart failure 36 days later. The bowel was unsuitable for detailed examination at necropsy.

Comment

Both patients were extensively investigated for blood loss, and no cause was found other than the ulcers described. Idiopathic ulceration associated with malabsorption is invariably visible radiologically and on inspection at laparotomy.² The ulcers that we found were seen