

Persistent streptococcal throat infection in a preparatory school for boys

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SUMMARY

An outbreak of streptococcal throat infection which took place in a preparatory school for boys (some of whom were choristers) over three terms from November 1983 to June 1984 is described. Typing of the organism revealed that four successive outbreaks, each due to a different type, had occurred. Thirty-nine per cent of the boys were affected, the incidence of infection being higher among boarders than day boys. Infection seemed to spread via the forms, dormitories and choir. Recurrent attacks occurred in 32% of infected boys. The complication rate was 8%. Treatment with penicillin was always effective but did not prevent reinfection. Suggestions for the management of an outbreak of sore throat in a school are given.

INTRODUCTION

Outbreaks of streptococcal throat infection are common in boarding schools and have been increasingly reported in the study of clinical illness in boarding school children carried out jointly since 1980 by the Medical Officers of Schools Association and the Communicable Disease Surveillance Centre. These outbreaks are often difficult to control despite vigorous attempts to do so. The experience of an outbreak in 1981 (Briscoe, 1982) which lasted two terms and of another described in this report at the same school which lasted three terms confirms this view.

METHOD

From November 1983 to June 1984 almost all the boys with sore throats in a preparatory school for boys aged 7-13 years were investigated with the co-operation of the local microbiological laboratory. Throat swabs were placed in transport medium and plated out the same day except when the whole school was sampled when the swabs were plated out immediately. Typing of the organisms was requested on every streptococcus strain isolated. Treatment was carried out with oral phenoxymethyl penicillin and a number of clearance swabs were taken to monitor the efficacy of this treatment.

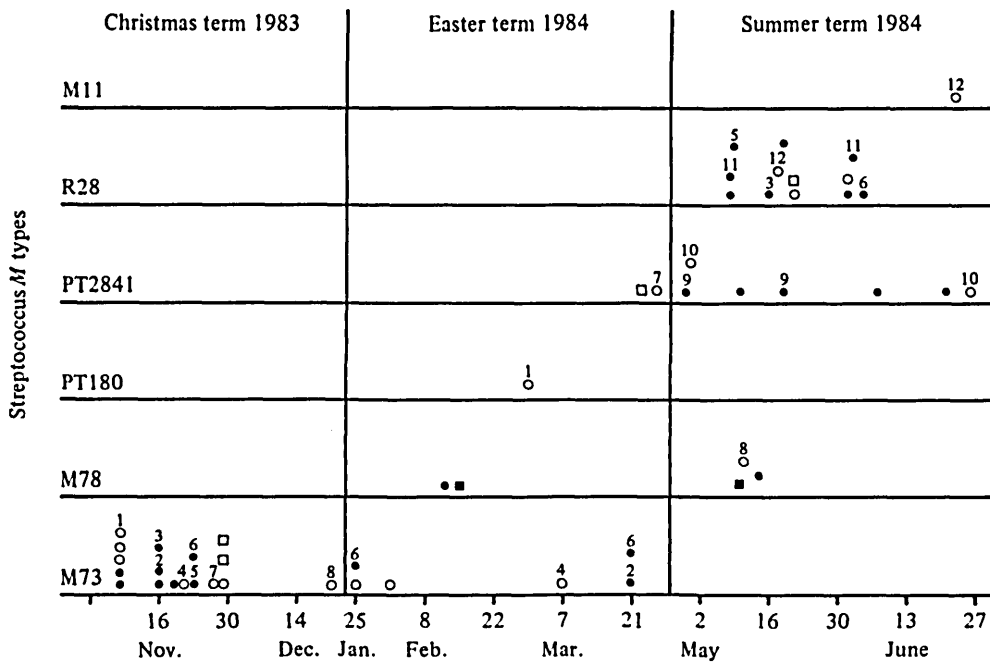


Fig. 1. Cases of infection: ●, boarder; ○, chorister boarder; ■, weekly boarder; □, day boy. The superscript numbers link recurrent attacks in single individuals. Thus one boy had an infection caused by M type 73 on 8 November and a second caused by PT180 on 29 February.

RESULTS

Christmas term

On 8 November 1983 an acute illness causing fever, sore throat and vomiting affected 8 boys for 48 h in a preparatory school for 56 boarders (of whom 23 were choristers) and 26 day boys aged 7–13 years. Group A haemolytic streptococci were isolated from 5 of the 8 boys (Fig. 1). Over the subsequent three weeks to 28 November, 9 out of 23 boys with sore throats were found to have streptococcal infection. It was decided to screen the whole school on 29 November and throat swabs were taken from 79 of the 82 boys. Only 2 boys, both symptomless, were found to be carriers of group A haemolytic streptococci. On 7 December throat swabs were taken from the 3 boys who had been absent at home on 29 November suffering from sore throats. None had been treated with antibiotics. One was found to be harbouring group A haemolytic streptococci in his throat and in his facial impetigo. Between 21 and 30 November 27 throat swabs were taken from teaching, administrative, kitchen and medical staff; all were negative. There were only two further cases of sore throat during the Christmas term; one boy, ill on 18 December had a negative throat swab, the other, a chorister staying on at school for the Christmas services, was found to have a group A streptococcal infection on 21 December, the last day of term.

Easter term

The Easter term began on 18 January 1984 with 59 boarders (of whom 22 were choristers), 3 weekly boarders and 22 day boys in the school. On 19 January a negative swab was obtained from the chorister who had been ill on 21 December. On 25 January throat swabs from a boy with tonsillitis and a chorister with pharyngitis and otitis media grew group A haemolytic streptococci (Fig. 1). A throat swab from a third boy with a sore throat was negative. The outbreak of sore throat continued sporadically for the rest of the term affecting 19 more boys. Nine were suffering from streptococcal infection, 7 had negative swabs and 3 were not investigated.

Easter holiday

As it was felt that the chorister who developed streptococcal infection at the end of the Christmas term might have passed the organism to the chorister who was found to be infected at the beginning of the Easter term, it was decided that when the senior choristers returned during the Easter holidays for the Easter services they should all have throat swabs to determine whether any were harbouring the streptococcus. On 19 April 15 choristers returned; nose and throat swabs were taken from 10 and throat swabs from the remaining 5 choristers; all were negative.

Summer term

Term began on 24 April with 61 boarders (of whom 23 were choristers), 4 weekly boarders and 21 day boys in the school. Two boys developed tonsillitis on 29 and 30 April respectively and throat swabs from both grew group A haemolytic streptococci (Fig. 1). Between 30 April and the start of half term on 24 May, 24 more boys had sore throats. Thirteen were suffering from streptococcal infection, 6 had negative swabs and 5 were not investigated. The outbreak continued after the half-term holiday finished on 30 May until 26 June, 3 weeks before the end of term on 18 July. During the second part of the term 11 more boys had sore throats. Eight were suffering from streptococcal infection and 3 had negative swabs. During the term negative swabs were obtained from 1 member of the teaching staff, 2 of the kitchen staff and the assistant matron, all of whom had sore throats.

Results of laboratory typing

All the cultures during the Christmas term were representative of M-type 73 (T3/13/B3264/M73/OF⁺). This same type was picked up again from the initial cases in the Easter term and from others later in that term. During the Easter term representatives of three other M-types were found: two cultures of type 78 (T11/M78/OF⁺) one of the provisional type 180 (T5/27/44/MPY 180/OF⁺) and two of the provisional type 2841 (T28/MPT2841/OF⁺). The last type was picked up again from the first two cases in the Summer term. Shortly afterwards type 28 (T28/R28) was isolated and infections from this type and from type PT2841 occurred together during this term. There was also a further type, M11/T11/M11/OF⁺, found during the Summer term.

Table 1. *Incidence of infection over three terms*

	No. of cases	Total boys in year	%
Boarders	18	38	47
Choristers	13	28	46
Weekly boarders	2	4	50
Day boys	4	25	16
Total	37	95	39

Figure 1 shows that, if the two types PT180 and M11, with only one case of infection each are excluded, there were four outbreaks of streptococcal infection each due to a different type which occurred during the course of the three terms. The index cases in the first, second and fourth outbreaks were probably boarders, and in the third, a day boy. The progressive introduction of new streptococci into the school made eradication of infection difficult.

Incidence and spread of infection

Thirty-seven (39%) of the 95 boys at risk over the three terms suffered from streptococcal infection, 35 being ill and 2 being carriers. The incidence was uniform in all types of boarder but much lower in day boys (Table 1) as one would expect from their reduced contact with boarders and each other. It is also possible that the figure for day boys was low because illness was less likely to be reported to the school doctor.

There was an uneven incidence in forms (Table 2) and dormitories, both of which are organized mainly by age, suggesting that spread of infection occurred in those places where boys were spending a good deal of time together. When the progression of the four separate outbreaks of infection was examined it was clear that on many occasions spread of infection could have occurred from boy to boy in the same form or dormitory within the accepted incubation period limit of 7 days. Streptococcal infection affected increasingly older boys as the terms progressed as shown in Table 2. It might have been expected that the 23 choristers who spent many hours a day together either singing in chapel or practising would be particularly at risk of infection but there was no evidence that this was so.

Treatment of cases

All the cases of streptococcal throat infection, both symptomatic and asymptomatic were treated with oral phenoxymethylpenicillin potassium 250 mg t.d.s. for a minimum of a week. Every dose taken was supervised by the school matron. Throat swabs taken after treatment showed that the organisms had been eradicated after 7 days' penicillin in 8 boys and after 5 days' penicillin in 8 boys.

Recurrent attacks

Twelve boys (32%) out of 37 suffered more than one attack of streptococcal infection (Fig. 1). Second attacks occurred in 6 boarders and 6 choristers after an interval varying between 12 days and 16 weeks. All had recovered clinically from the first attack and 3 boarders and 3 choristers yielded negative swabs between the attacks. Throat swabs taken at the start of the second attack grew the same

Table 2. Form incidence of streptococcal infection

Age	Form	Christmas term			Easter term			Summer term		
		Ill boys	Total in form	%	Ill boys	Total in form	%	Ill boys	Total in form	%
Oldest ↓	6s	2	16	13	0	4	0	2	6	33*
	6c	2	10	20	1	14	7	9	12	75*
	5	0	11	0	4	13	31*	4	14	29*
	4	4	13	31*	1	14	7	4	13	31*
	3	4	10	40*	3	15	20*	1	15	7
↓	2	3	11	27*	1	11	9	2	13	15
Youngest	1	2	11	18	1	13	8	1	13	8
Total		17	82	21	11	84	13	23	86	27

* Above average incidence.

type of streptococcus as in their first attack in 6 boys (nos. 2, 4, 6, 9, 10 and 11 in Fig. 1) but a different type in the other 6 boys. One boarder (No. 6) suffered two further attacks of streptococcal infection. His first three attacks at 8-weekly intervals were due to the same type of streptococcus but the fourth attack which came 10 weeks after the third attack was due to a different type. It is possible that, where recurrent infection occurred with the same type of streptococcus, the organism was not eradicated by treatment. However, in 4 of the 6 boys (nos. 2, 6, 9 and 10 in Fig. 1) negative swabs were obtained between attacks (in the case of No. 6 between his second and third attacks). Further, 14 of the boys affected in this series of outbreaks suffered streptococcal infection in the last outbreak in the school in 1981.

Complications

Complications occurred in 4 (8%) of 51 infections. All the complications occurred in boys infected with type 73 – in three boys in the initial attack and in one in a subsequent attack.

(1) On 18 November a boy developed Henoch–Schonlein purpura with persistent vomiting. Streptococci were grown from a throat swab taken on 21 November and a rapid recovery followed treatment with penicillin.

(2) On 7 December the same type of streptococcus was grown from the facial impetigo of a boy with streptococcal throat infection.

(3) On 25 January a boy with streptococcal throat infection developed otitis media.

(4) On 16 November a boy developed streptococcal throat infection which seemed to have been eradicated by penicillin. He remained well until 21 March when he developed streptococcal throat infection again. Despite treatment with penicillin he remained febrile and unwell and developed a cough. On 26 March he was found to have consolidation of the right middle and lower lobes with a pleural effusion confirmed on chest X-ray. He was transferred to hospital where 210 ml of straw-coloured fluid was tapped from the right side of his chest and sent for culture. No organisms were grown from this fluid or from his sputum. Treatment with intravenous penicillin and cefuroxime, together with intensive physiotherapy, eventually resulted in complete recovery.

DISCUSSION

The occurrence of throat infection in a choir school is soon brought to the attention of the school doctor as it affects the choristers' ability to sing. From the experience gained from the previous outbreak of streptococcal infection in the school it was decided to swab the throats of all boys with sore throats as soon as it was clear a number of cases had occurred. If clinically there was a likelihood of streptococcal infection a course of penicillin was started at once; otherwise the result of the swab was awaited. This policy meant that treatment was delayed for 2 days in some cases and those individuals were able to spread infection during this time. However if all boys with sore throats had been treated indiscriminately with penicillin 35 (42%) out of 84 would have been treated unnecessarily.

Throat swabs were taken from the whole school early in the outbreak to establish the extent of infection and pick up any symptomless carriers, but only two positive results were obtained. Typing of the streptococci, however, was extremely useful in showing in retrospect that outbreaks of different types were occurring and this explained to some extent why the infection was so difficult to eradicate.

Treatment with penicillin appeared to be clinically effective in two asymptomatic carriers and in all cases of infection and was proved to be so by clearance swabs taken from 18 (35%) of the 51 cases. Nevertheless there was a high percentage of second attacks which, in six instances, were caused by the same type. It would seem that successful penicillin treatment does not prevent reinfection of the boy on occasions as early as 17 days after the first attack. This suggests that prompt treatment with penicillin may prevent the development of type-specific natural immunity to the streptococcus (Bisno, 1979). It could be argued that antibiotics should not be exhibited. It is surely, however, unacceptable, to leave cases untreated owing to the risk of the rare serious complications of rheumatic fever, nephritis and meningitis, the less rare complications of pneumonia and Henoch-Schonlein purpura and the common complications of impetigo and otitis media. Treatment of the whole school at once would only be effective for the duration of that treatment as soon after stopping treatment a new streptococcus could be introduced and cause a further outbreak of infection. It would only be justified if the outbreak was very large. It is extremely difficult to eradicate the streptococcus from a boarding school population. The recently introduced antigen detection systems for diagnosis of streptococcal sore throat could provide a method of rapid diagnosis in place of conventional bacteriological procedures and this coupled with immediate penicillin treatment of cases offers promise of control of outbreaks such as those described here.

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