Eye (1990) **4**, 510–513

Per-nasal Swabbing as an Aid to the Diagnosis of Chlamydial and Adenovirus Conjunctivitis

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Summary

Two hundred and thirty four patients (adults and babies) with conjunctivitis were investigated by taking eye swabs and in addition by taking per-nasal swabs. Chlamydia trachomatis was isolated from 20 patients and adenovirus from 14 patients. Per-nasal swabbing led to a 53% increase in chlamydia diagnosis and a 27% increase in the diagnosis of adenovirus infection. It is suggested that per-nasal swabbing has an important role to play in detecting chlamydial conjunctivitis which itself may be an indicator for high morbidity in patients and their contacts.

Acute conjunctivitis presents commonly to the Accident and Emergency Department (AED). Few cases are investigated fully because in most patients the condition is self-limiting and benign. In a recent study[1] when full microbiological investigation was done it was found that the incidence of acute conjunctivitis caused by Chlamydia trachomatis and adenoviruses was 9% and 8% respectively. This particular study excluded ophthalmia neonatorum. The incidence of ophthalmia neonatorum has been recorded as 8.2% and 12% in British maternity units.[2,3] In this latter condition, adenovirus is rarely isolated but C. trachomatis is responsible for as many as 29% or 38% of cases seen in Eye Departments[4,5] where a selected group with symptoms that are severe or refractory to initial treatment may gather. It has been argued[1] that full laboratory investigation is cost-effective because a definite diagnosis leads to a reduction in the number of out-patient attendances. Furthermore the recognition of chlamydial eye disease is especially important because although ocular complications of chlamydial conjunctivitis are rare in this country, this condition points to possible genital tract or systemic diseases which themselves need attention. In a recent UK study[6] Chlamydia trachomatis was thought to have played a role in the pathogenesis of 60% of cases of acute salpingitis, a major cause of female infertility. In men under 35 years C. trachomatis is an important cause of acute urethritis and epididymitis.[7] Chlamydial ophthalmia neonatorum may be complicated by pharyngitis, otitis media and pneumonia.[8] C. trachomatis may occasionally be the causative agent in prostatitis, endocarditis and perihepatitis and has been implicated in the pathogenesis of Reiters syndrome.

When cases of chlamydial conjunctivitis go

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undetected, an opportunity is missed to prevent the potentially serious complications of chlamydial disease. Recognising that C. trachomatis can readily colonise the respiratory tract we decided to assess the possible contribution of per-nasal swabbing to the diagnosis of chlamydial conjunctivitis. The study design also allowed investigation for adenovirus infection which can show a similar clinical presentation to that of chlamydial conjunctivitis.

Materials and Methods

During a two year period (1986–87) clinicians in a number of hospital outpatient departments and special care baby units were asked to submit a per-nasal swab as well as the usual eye swabs when investigating patients with suspected chlamydial conjunctivitis. Within this study population a more detailed history was obtained from patients attending St Paul's Eye Hospital, Liverpool. Thus between February 1986 and January 1987 the doctor on duty in the AED of St Pauls was asked to refer to the authors any patient younger than 40 years in whom a diagnosis of chlamydial conjunctivitis was considered. Those selected were suffering from a follicular conjunctivitis or were babies with sticky eye developing within the first few weeks after delivery; for these patients the duration of symptoms and the presence or absence of upper respiratory tract infection were noted. For some patients, details of previous treatment were obtained.

Swabs taken from the inferior conjunctival fornix of both eyes were combined and examined for chlamydia and adenovirus. A per-nasal swab was also taken, using a cotton wool tipped wire swab passed through the nostril to touch the posterior wall of the nasopharynx, and similarly investigated.

Swabs were transported to the Public Health Laboratory, Liverpool in 2.5 ml of medium consisting of Medium 199 (Wellcome TC22) with 0.11% sodium bicarbonate, 10% fetal bovine serum, 5% sorbitol, 0.5% glucose and 100 units per ml each of vancomycin, streptomycin and nystatin. Adenovirus isolation was by inoculation of HEp2, human amnion and baboon kidney cell monolayers and examination for viral cytopathic effects over a three week incubation period. Any adenoviruses recovered were further identified by neutralisation tests.

C. trachomatis was isolated in McCoy cell monolayers grown in the wells of plastic plates by a method modified from that previously described[9] using an inoculum of 0.4 ml into 24-well plates (Cel-Cult 33F24L, Sterilin Limited). Inoculated cultures were incubated in the presence of cycloheximide (1 ug/ml). After 72 hours incubation McCoy cell monolayers were stained by the periodic acid-Schiff (PAS) method and C. trachomatis was observed as magenta coloured intra-cytoplasmic inclusion bodies at ×100 magnification.

Results

Altogether 234 patients were studied. C. trachomatis was recovered from 16 (14.8%) of 108 babies and four (3.2%) of 126 older patients. Adenoviruses of various serotypes were isolated from one (0.9%) baby and 13 (10.3%) older patients. Table I shows details of recovery of these agents on eye swabs and on per-nasal swabs. The use of eye swabs alone identified 13 chlamydia positive and 11 adenovirus positive patients. Per-nasal swabbing detected seven extra chlamydial cases and three extra adenovirus cases. The additional patients found by per-nasal swabbing comprised five of 16 chlamydia positive babies; two of four chlamydia positive older patients; two of 13 adenovirus positive older patients (both serotype 4) and the only adenovirus positive baby (serotype 3). Quantitative information available for 15 chlamydia positive patients, Table II, showed substantial differences in the titre of chlamydia recovered on the eye swab and on the corresponding per-nasal swab for nine (60%) patients.

Of the 129 patients selected for more details clinical examination by the authors (CEM, LGC, AAA, LCK) eight (6.2%) had chlamydial infection and eight (6.2%) had adenovirus infection. None of the eight chlamydia positive cases had signs or symptoms of respiratory tract infection but in patients with adenovirus conjunctivitis concurrent respiratory symptoms were common; occurring in four of six patients with serotype 4 and in each of the patients with serotypes 3 and 10. Per-nasal swabbing recovered an adenovirus from four

Table I *Recovery of C.trachomatis and adenoviruses on Eye and Per-nasal swabs*

	Selected patients		*All patients*	
	PN-swab +	*PN-swab* −	*PN-swab* +	*PN-swab* −
C.trachomatis:				
Eye-swab +	1	3	4	9
Eye-swab −	4	121	7	214
Adenovirus:				
Eye-swab +	3 (3,4,4)	4 (4,4,4,10)	5 (3,4,4,4,7)	6 (4,4,4,4,4,10)
Eye-swab −	1 (4)	121	3 (3,4,4)	220

Braces show adenovirus serotypes.

of the six patients with associated respiratory symptoms. Five chlamydia positive patients had received prior topical treatment for their conjunctivitis. Of these, three had positive eye swabs only and two had positive per-nasal swabs only. The duration of conjunctivitis at examination was 2.8 days (range one to five days) for adenovirus infection and 16.3 days (range 10 to 25 days) for chlamydial infections. Average duration of symptoms was similar in patients with chlamydia positive eye swabs (14.3 days) and in those with chlamydia positive per-nasal swabs (16.6 days).

Discussion

Although the number of patients studied here was too small for statistically significant results, per-nasal swabbing led to a dramatic (53%) increase in chlamydial diagnoses and a lesser (27%) increase in adenovirus recovery. Isolation of chlamydia or an adenovirus from the respiratory tract may of course not always be proof of the cause of the patient's conjunctivitis. However the adenovirus serotypes recovered from the nose were those commonly associated with ocular infection and certainly all patients with chlamydial infection would benefit from treatment.

As in a previous larger study[4] adenovirus conjunctivitis in babies appeared to be a rare event. Older patients with adenovirus conjunctivitis often had concurrent respiratory symptoms and presented for examination within a few days of onset. None of the chlamydia positive patients seen by the authors had respiratory symptoms. Thus if chlamydial diagnosis is the prime concern, per-nasal swabbing would be most productively applied to babies together with older patients presenting with conjunctivitis of duration at least one week and without respiratory symptoms.

Whilst evidence suggests that per-nasal swabbing is of benefit in detecting chlamydial conjunctivitis the reasons for this are not clear. When eye and per-nasal swabs were examined quantitatively, quite different yields of chlamydia were recovered from the two sites. This may reflect the number of available organisms at the two sites or the relative efficiency of transfer of infected cells to the swab tip—possibly a more robust approach is used to obtain a per-nasal swab than when sampling the delicate conjunctival surfaces. We have tested the common practice of sampling only the inferior fornix instead of the whole conjunctiva. This could under-estimate ocular infection if as in the case of trachoma, taking scrapings from multiple conjunctival surfaces i.e. upper tarsus, upper fornix and lower lid were more sensitive than examination of scrapings from the best single

Table II *Numbers of patients with stated levels of chlamydia on eye and per-nasal swabs*

		Per-nasal swab result			
		Negative	Low	Medium	High
Eye Swab result	Negative		3	1	2
	Low	1			2
	Medium	4			
	High			1	1

Chlamydial inclusion counts:
Low=<120/well, Medium=120–4500/well, High=>4500/well.

area, the lower lid.[10] It might be argued that per-nasal swabbing is only helpful where staff are not experienced in obtaining good conjunctival samples containing infected epithelial cells. However results obtained from the selected patients (swabs collected by an ophthalmologist) also showed a greatly improved diagnostic yield from per-nasal swabs. There was no evidence here that prior topical treatment of the eye led to a pattern of chlamydia negative eye swabs and chlamydia positive per-nasal swabs although at the outset this was considered an argument in favour of per-nasal swabbing. There was no suggestion (in the clinical records) that the conjunctivitis was especially mild in those patients with chlamydia positive per-nasal swabs but chlamydia negative eye swabs.

This study showed that per-nasal swabbing can increase the detection of chlamydia and adenoviruses. Diagnosis of chlamydial disease is a main concern because of the benefits in eradicating this systemic infection. Detection of an adenovirus (of a type often associated with eye infections) from the respiratory tract is only circumstantial evidence but may help explain an otherwise undiagnosed case of follicular conjunctivitis. If it is accepted that chlamydia found at any site should be treated then the additional cost of collecting per-nasal swabs could be minimised by placing both the eye swab and the per-nasal swab in the same bottle of transport medium. That chlamydial infection of the respiratory tract occurs is well documented. We suggest that per-nasal swabbing has an important role to play in detecting chlamydial conjunctivitis which is itself and indicator for high morbidity in patients and their contacts.

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