

Throat swabs have no influence on the management of patients with sore throats

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Abstract

Background: Throat swabs are neither specific nor sensitive for micro-bacteria causing sore throat symptoms; however, current guidelines suggest they are still useful in some cases.

Method: Retrospective and prospective analyses were conducted of throat swabs requested within the months of January 2016 and August 2016, respectively.

Results: The study comprised 247 patients. Fifty-nine (24 per cent) had a positive culture. Forty-six grew group A beta-haemolytic streptococci, with the remainder growing candida ($n = 10$), coliform ($n = 1$) and klebsiella ($n = 2$). There was no significant difference in culture rates between primary or secondary care sources ($\chi^2 = 0.56, p = 0.45$). None of the swabs influenced a variation in patient management from local antimicrobial policies. Current practice has an estimated annual financial impact of £3 434 340 on the National Health Service.

Conclusion: Throat swabs do not influence the antimicrobial treatment for patients with sore throats, even under current guidelines, and incur unnecessary cost. Current clinical guidelines could be reviewed to reduce the number of throat swabs being conducted unnecessarily.

Key words: Pharyngitis; Respiratory Tract Diseases; Tonsillitis; Streptococcal Infections; Bacterial Infections; Culture Techniques; Microbiology; Immunocompromised Host

Introduction

One-quarter of the UK population present to their general practitioner each year with an acute respiratory infection, accounting for 60 per cent of antibiotics prescribed in primary care.¹ Sore throat is a common symptom, often associated with an acute respiratory infection. Although current guidelines stipulate that throat swabs should not be undertaken routinely in the investigation of a sore throat,² they advise that throat swabs may be useful, to establish the aetiology of recurrent severe episodes in adults when considering referral for tonsillectomy,² and in high-risk groups to guide the choice of treatment if treatment failure occurs.³

A throat swab culture positive for group A beta-haemolytic streptococcus makes the diagnosis of a streptococcal sore throat likely; however, a negative culture does not necessarily rule this diagnosis out.^{2–4} This is because of the underlying poor sensitivity of the investigation, which cannot accurately differentiate between infection and normal flora carriage. In addition, throat swab technique, for instance, blind swabbing of the mucosa rather than targeted swabbing

of pustular material, could influence culture results.⁵ Many sore throats, including those caused by tonsillitis, are treated on clinical grounds, and are managed both in primary and secondary care with simple analgesics, with or without the addition of antimicrobials covering the usual suspected causative organisms.^{5–7}

Throat swabs, therefore, are unlikely to influence prescribing decisions. With recent financial problems affecting the National Health Service (NHS) and with the analysis costs of throat swabs being relatively expensive,³ we consider that the number of throat swab requests should be rationalised. Hence, we sought to review the current throat swabs that are being requested and the cost implications this has on the service provided within our institution.

Materials and methods

A comparative, retrospective analysis of microbiology data was performed from throat swabs cultured at the Great Western Hospitals NHS Foundation Trust, from primary and secondary care sources, within the month of January 2016. A further prospective analysis of data was undertaken in the month of August 2016.

Data parameters assessed included the source of the request, the clinical indication as outlined on the request form, the microbiological culture and the antimicrobial sensitivities (where available).

Swabs were considered, by multiple authors (LC, VP and DG), to be 'appropriately requested' if a patient was categorised under a high-risk clinical group, which included conditions such as neutropenic or post-partum sepsis, or if the request specifically indicated a history of recurrent sore throat or suspected scarlet fever.

A change to clinical management was considered, by the authors LC, VP and DG, following the result for each throat culture, taking into account the clinical information provided on the swab request form. This was based on whether each result would have changed the treatment for a sore throat or tonsillitis, or neutropenic sepsis, from standard trust antimicrobial policies.

Ethics

Local health research authority approval was sought to access individual throat cultures from both primary and secondary care.

Statistical analysis

A chi-square test was used to compare growth rates between primary and secondary care, with a pre-defined significance threshold of 0.05. Statistical analyses were performed using Clinstat and Biconf.⁸

Results

Retrospective analysis

A total of 161 throat swabs were collected during the study period from 1 January to 31 January 2016. Of these, 59 were deemed appropriately indicated according to the information provided on the clinical request form. The majority of throat swabs were requested from primary care ($n = 122$, 76 per cent).

From all the swabs requested, 49 (30.4 per cent) had growth cultured (95 per cent confidence interval (CI) = 23.4–38.2). Of the positive growth cultures, 81.6 per cent ($n = 40$) grew group A beta-haemolytic streptococcus, with the remainder growing candida ($n = 7$), coliform ($n = 1$) or klebsiella ($n = 1$).

Of those requested from primary care, 39 had growth cultured (32.0 per cent; 95 per cent CI = 23.8–41.0).

Positive specimens predominantly grew group A beta-haemolytic streptococcus ($n = 37$), although two grew candida.

In secondary care, 39 throat swabs were requested, of which 10 swabs had growth cultured (25.6 per cent; 95 per cent CI 13.0–42.1). Of the five positive throat swabs, three grew group A beta-haemolytic streptococcus and two grew candida.

None of these swabs influenced a change in patient management, as the culture species were found to be sensitive to antimicrobials and antifungal agents included in our local policy for treating symptoms of a sore throat, or for treating pyrexia of unknown origin with or without the presence of neutropenia.

There was no significant difference in rates of positive cultures between those sent from primary and secondary care ($\chi^2 = 0.56$, $p = 0.45$).

From those swabs deemed as appropriately clinically indicated ($n = 59$), 18 had a positive culture (30.5 per cent; 95 per cent CI = 19.2–43.9) (Table I). Forty-one swabs were from primary care; 13 of these swabs were positive for growth (31.7 per cent; 95 per cent CI = 18.1–48.1). Twelve of these 13 swabs grew group A beta-haemolytic streptococcus, with the remaining swab being positive for candida. Eighteen swabs were from secondary care, of which five were positive for growth (27.8 per cent; 95 per cent CI = 9.7–53.5). Three of these swabs grew candida, with the remainder growing klebsiella ($n = 1$) and coliform ($n = 1$).

Prospective analysis

Eighty-six throat swabs were collected prospectively between the period 31 July and 9 September 2016. The majority of swabs were requested from primary care ($n = 58$, 67.4 per cent), compared with secondary care ($n = 28$, 32.6 per cent). Of these, 40 were deemed to be indicated based upon clinical details shown on the request form. Unfortunately, three swab results could not be accessed because of the illegibility of the patient identification details on the request form, but these were not excluded from summary analysis.

Of the 83 throat swabs, 10 (12.0 per cent; 95 per cent CI = 5.9–21.0) yielded positive culture results and 73 (88.0 per cent; 95 per cent CI = 79.0–94.1) had no growth (Table II). Seven of the positive swabs originated from primary care and three were from secondary

TABLE I
RETROSPECTIVE ANALYSIS OF MICROBIOLOGY DATA

Care setting (n)	Indicated swabs*			Non-clinically indicated swabs†		
	Growth	No growth	Change to patient management	Growth	No growth	Change to patient management
Primary care (122)	13 (31.7)	28 (68.3)	None	26 (32.1)	55 (67.9)	None
Secondary care (39)	5 (27.8)	13 (72.2)	None	5 (23.8)	16 (76.2)	None

Data represent numbers (and percentages) of swabs, unless indicated otherwise. * $n = 59$; † $n = 102$

TABLE II
PROSPECTIVE ANALYSIS OF MICROBIOLOGY DATA

Care setting (n)	Indicated swabs*			Non-clinically indicated swabs†		
	Growth	No growth	Change to patient management	Growth	No growth	Change to patient management
Primary care (58)	4 (25.0)	12 (75.0)	None	3 (7.7)	36 (92.3)	None
Secondary care (28)	3 (12.5)	21 (87.5)	None	0 (0)	4 (100)	None

Data represent numbers (and percentages) of swabs, unless indicated otherwise. *n = 40; †n = 43

care. Of the positive cultures, the majority (n = 6) grew group A beta-haemolytic streptococcus, three grew candida and one grew klebsiella. The candida- and klebsiella-positive swabs were all cultured from patients who were immunocompromised. Those that grew group A beta-haemolytic streptococcus were cultured from patients with a history of recurrent or persistent sore throat, or scarlet fever, or from patients with no indication outlined on the request form.

Of all the cultured growths, first- and second-line antibiotics and antifungal agents would have been successful treatments based on the sensitivities given by the laboratory for bacterial tonsillitis and pyrexia of unknown origin.^{9–11} Therefore, none of the swab results would have influenced the choice of antimicrobial agent from standard protocol (Table II).

Financial implications

The total cost of processing a throat swab, inclusive of overhead costs, in our institution is £13.86. Given that none of the swabs would have influenced the choice of antimicrobial treatment from usual protocols, we extrapolated our findings to estimate the financial impact.

The estimated annual financial impact at our institution is: 102 + 86 swabs/72 days × 365 days × £13.86 = £13 209. Given that our institution serves a population of approximately 250 000 people, and the national population is estimated at 65 million, the estimated annual financial impact on the NHS budget is: 65 000 000/250 000 = 260 × £13 209 = £3 434 340.

Discussion

The majority of throat swabs requested in primary and secondary care in the management of sore throat are not clinically indicated and have minimal impact on prescribing decisions. Indeed, the majority of the positive growth cultures grow beta-haemolytic streptococcus, in line with previously reported literature.^{2–5} Given the poor specificity and sensitivity of throat swab cultures, it is difficult to determine whether this growth represents a normal flora colonisation within the oral cavity or oropharynx, or whether this truly represents bacterial infection.^{2,4,12} A clinician should be cautious, therefore, on acting upon the results of a throat swab in the absence of clinical examination findings indicative of bacterial infection, such as pustular or inflamed tissue.

Moreover, awaiting a culture result should not delay the treatment of a patient if they are symptomatic, and fulfil such criteria or scoring diagnostic aides such as Centor's criteria¹³ (Table III) or 'FeverPAIN' (Fever, Purulence, Attend rapidly, Inflamed tonsils, and No cough or coryza) scoring¹⁴ (Table IV). Our results reiterate the information upon which these scoring criteria are based, that group A beta-haemolytic streptococcus is most commonly cultured bacteria in these clinical scenarios.^{13,14} Therefore a throat swab would not change the clinician's choice of antimicrobials on such occasions.

Given the way in which the swab requests were scrutinised, there is the potential limitation of swabs being deemed 'indicated' because of a lack of clinical information on the request form. Whilst this would not affect the overall conclusion, a sub-analysis was also performed to examine whether 'clinically indicated' throat swabs skewed the data favourably. Despite the clinical differences, we found that the majority of throat swabs requested in both groups were predominantly negative. The most common organism cultured was beta-haemolytic streptococcus, for which a throat swab would not influence a change from standard antimicrobial management.

Our data were collected at the peaks of the winter and summer seasons, giving us a good estimate of the frequency of throat swabs taken throughout the year. Although this may affect the total extrapolated financial implication of the throat swab service, the notion that mitigating inappropriate swab requests throughout the year may still result in some financial savings cannot be denied. We have no reason to suspect that there are different swabbing or treatment practices in other

TABLE III
CENTOR'S CRITERIA¹²

Criteria
– Tonsillar exudate
– Tender or swollen anterior cervical lymph nodes
– Fever (temperature >38°C, 100.4°F)
– Absence of cough
Interpretation
– Likelihood of group A beta-haemolytic streptococcus infection increases with increasing score, & is 25–86%, with a score of 4
– Absence of 3 or 4 of Centor's criteria has high negative predictive value of 80%
– Score is not validated for use in children aged <3 years
– Streptococcal infections are most likely in 5–15 year olds

TABLE IV
'FEVERPAIN' SCORING¹³

<p>Criteria</p> <ul style="list-style-type: none"> – Fever in past 24 hours – Purulent tonsils – Attend rapidly (symptom onset ≤ 3 days) – Inflamed tonsils (severe) – No cough or coryza <p>Interpretation</p> <ul style="list-style-type: none"> – Score 0–1: 13–18% have streptococcus, close to background carriage – antibiotics not required, with discussion – Score 2–3: 34–40% have streptococcus, back-up or delayed antibiotic prescription is appropriate, with discussion – Score >4: 62–65% have streptococcus, consider immediate antibiotics if symptoms are severe, or a short 24–48 hour antibiotic prescribing strategy may be appropriate, with discussion

UK institutions. In addition, there was no variation in the types of bacteria responsible for these symptoms throughout the year, even between retrospective and prospective data collections, which validates existing antimicrobial prescribing protocols that are used to guide treatment for these patients.

Many throat swabs were requested in the clinical context of neutropenic or post-partum sepsis, and several positive cultures grew candida species. It is recognised that fungal infections affect immunocompromised patients more frequently,⁷ and the growth cultured in our throat swabs reflects this. However, candida is also a normal flora, commensal of the mucocutaneous membranes of the oral cavity and oropharynx.⁶ True candidal infection here clinically presents with soreness, and typically plaques are visible on the palate and/or oropharynx; therefore, the condition can be reliably clinically diagnosed. The treatment of choice is a topical or oral antifungal medication.¹⁵ It is therefore, once again, unlikely that a throat swab would have influenced the choice of antimicrobial used in these patients.

Current guidelines consist of the Scottish Intercollegiate Guideline Network, and the Clinical Knowledge Summaries provided by the National Institute for Health and Care Excellence. These suggest that swabs may be useful in high-risk patients in whom primary treatment has failed, or to establish the aetiology of a sore throat when referring for a tonsillectomy procedure.^{3,4} However, our results show that, even in patients with a history of recurrent sore throat or in patients who are deemed high-risk, the culture results would not affect the choice of antimicrobials. Furthermore, even when considering the use of throat swabs to establish the aetiology of a recurrent sore throat, there is existing literature to suggest that the flora of bacteria cultured from the surface of a tonsil does not necessarily correlate with those deep in the tonsillar crypts which are most likely to cause a patient's infection.^{2,16,17} Both guidelines clearly outline useful criteria to aid clinicians on deciding who to treat with antimicrobials, such as Centor's

criteria,¹³ and to ensure a low threshold for treating patients at high-risk. Recent clinical commissioning guidance on tonsillectomy gives no recommendation on the need for throat swabs for deciding the suitability of patients for surgery; such decisions are made upon clinical grounds only.¹⁸

Some swabs collected were investigating suspected scarlet fever. Throat swabs do not feature among the recommendations for managing patients with suspected scarlet fever.¹⁹ The Royal College of Paediatrics and Child Health suggest that throat swabs may be useful if only to confirm the diagnosis in suspected cases in view of a recent outbreak.²⁰ However, it is again acknowledged that a negative swab culture would not necessarily exclude the diagnosis, in view of the reasons outlined above.²⁰ Although we have included such swabs as 'appropriately indicated' in our study, the use of phenoxymethylpenicillin is advised treatment for patients in this category, which is also the first-line treatment for tonsillitis or sore throat. Thus, the culture result did not change the antimicrobial choice for these patients.

All health professionals and many patients are becoming increasingly aware of the risk of overusing antibiotics, as this may encourage microbial resistance to commonly used first-line antimicrobials.²¹ In efforts to reduce this and to ensure antimicrobials are prescribed to the appropriate patients, scoring criteria such as Centor's criteria¹³ and FeverPAIN scoring¹⁴ continue to be helpful. Clinicians are encouraged to utilise these, and their own clinical judgement, in selecting the appropriate antimicrobial and determining the correct duration of treatment to prevent apparent treatment 'failure', which may reduce unnecessary throat swab requests further.

- **Throat swabs are poorly specific and poorly sensitive for micro-bacteria that cause throat symptoms**
- **Current guidelines discourage routine throat swab use, but deem them useful in 'high-risk' cases or when referring for tonsillectomy surgery**
- **Throat swabs do not influence choice of treatment for sore throat, even in patients deemed 'high-risk'**
- **The estimated annual financial impact of throat swab practice on the National Health Service budget exceeds £3 million**
- **Current clinical guidelines could be reviewed to reduce the number of throat swabs being conducted unnecessarily**
- **Individual centres could establish a protocol to rationalise throat swab processing for local antimicrobial sensitivity data**

Both retrospective and prospective data were collected partly upon the advice of our microbiology colleagues. Swabs sent into the department are used for establishing the incidence of microbial infections, and to keep track of local antimicrobial sensitivity and resistance profiles. Our data, together with previously reported literature and established antimicrobial policies, suggest the profiles of microbes causing sore throats have not changed for some time. In addition, given the investigations' inaccuracy and poor sensitivity, it might be misleading to regard any cultured results as meaningful enough to influence changes in antimicrobial policy. It might therefore be more productive and cost-effective, if individual departments still wish to collect these data, to do so on a periodic basis rather than continuously throughout the year.

Conclusion

Our results show that throat swabs do not influence the management of patients with sore throat, and thus are an unnecessary, costly investigation that could be reduced in light of an already financially overstretched healthcare system. We would encourage greater empowerment of the skills of clinicians in selecting appropriate patients to treat with antimicrobials, and in deciding the type and duration of antimicrobial treatment, to further discourage reliance on this poorly accurate and non-specific investigation. We advise that if a throat swab is taken, the indication is clearly and explicitly outlined on the request form by the requesting clinician. Our results suggest that current clinical guidelines should perhaps be reviewed to restrict the processing of non-clinically indicated throat swabs. Individual centres might consider establishing a protocol that would enable them to rationalise the frequency of processing throat swabs for the purposes of collecting data on local antimicrobial sensitivities.

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