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Diagnosis of peritonsillar infections: a prospective study of ultrasound, computerized tomography and clinical diagnosis

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Abstract

Peritonsillar infections include cellulitis and abscess (quinsy). Clinical diagnosis is often supplemented by diagnostic drainage (aspiration or incision) in an effort to distinguish abscess from cellulitis. In a prospective study of 14 patients we have shown that clinical impression alone is unreliable (sensitivity 78 per cent, specificity 50 per cent). Computerized tomography (CT) (sensitivity 100 per cent, specificity 75 per cent) and intraoral ultrasound (sensitivity 89 per cent, specificity 100 per cent) are much more reliable. We propose that intraoral ultrasound could play a useful role in the clinical assessment of peritonsillar infections helping to improve accuracy in distinguishing abscesses from cellulitis.

Key words: Ultrasonography; Tonsillitis; Cellulitis; Abscess; Tomography, X-ray computed

Introduction

Peritonsillar disease spreads from infection in the crypta magna in the tonsil into the peritonsillar tissues. This peritonsillar cellulitis may form pus leading to a quinsy (Fried and Forest, 1981). Antibiotics alone can halt the progression from cellulitis to abscess. Once pus forms however, the principles advocated by Guy de Chauliac in the 14th century (Brandow, 1973) apply and pus must be drained by needle aspiration, incision, or quinsy tonsillectomy.

There are frequent clinical occasions where a definite diagnosis of either peritonsillar cellulitis or quinsy cannot be made and these patients are subjected to diagnostic incision or aspiration. Both of these are uncomfortable and may be unreliable. The pus usually collects at the upper pole but, in up to 40 per cent of abscesses, pus collects at the lower or mid-pole of the tonsil that can result in difficulty locating the pus (Brandow, 1973; Yung and Cantrell, 1976). For these reasons needle aspiration of peritonsillar abscess has a false negative rate of 12 per cent (Snow *et al.*, 1991). Furthermore the abscess may be loculated making incision unreliable (Fried and Forest, 1981). It has also been shown that a peritonsillar abscess may be only a few millimetres from the internal carotid artery (Haeggstrom *et al.*, 1993) placing the artery at risk of trauma and false aneurysm formation during needle aspiration or incision. Treatment of peritonsillitis only requires antibiotics without painful drainage procedures. CT is able to confirm the presence of pus without the discomfort of diagnostic drainage (Patel *et al.*, 1992; Sakaguchi *et al.*, 1995) but expense and limited access restrict its general use.

Intraoral ultrasound has been investigated as a method of diagnosing quinsy (Haeggstrom *et al.*, 1993; Blokmanis, 1994; Buckley *et al.*, 1994; Strong *et al.*, 1995) and has been advocated as a quick, reliable method for determining the presence of pus. We wished to determine, in a prospective clinical setting, the accuracy of both clinical assessment and intraoral ultrasound when compared to CT in diagnosing quinsy.

Materials and methods

All patients admitted with a presumed diagnosis of either quinsy or peritonsillar cellulitis were considered for study. Patients who would have their definitive management delayed by waiting for radiological assessment were excluded from the study. All patients were first assessed by an ENT specialist and a clinical diagnosis of either quinsy or peritonsillitis was recorded prior to radiological imaging. An intraoral ultrasound was performed using a standard 10 Mhz intracavity transducer (ATL, HDI). The radiologist performing the ultrasound was unaware of the presumptive clinical diagnosis. The patient also had a contrast-enhanced CT study (GE Hispeed Advantage) performed by taking 5 mm axial cuts from the skull base to the hyoid bone following 90 ml intravenous injection of Omnipaque® (240 mg iodine/ml). Again, the radiologist reporting the

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TABLE I
CLINICAL, RADIOLOGICAL AND FINAL DIAGNOSIS FOR EACH PATIENT

Patient number	Clinical diagnosis	IOU diagnosis	CT diagnosis	Treatment	Final diagnosis
1	Quinsy	Failed. Trismus	Pharyngeal abscess	External drainage	Pharyngeal abscess
2	Peritonsillitis	Peritonsillitis	Quinsy	I&D No pus	Peritonsillitis
3	Peritonsillitis	Peritonsillitis	Peritonsillitis	Antibiotics	Peritonsillitis
4	Quinsy	Peritonsillitis	Peritonsillitis	Antibiotics	Peritonsillitis
5	Quinsy	Peritonsillitis	Peritonsillitis	Antibiotics	Peritonsillitis
6	Quinsy	Peritonsillitis	Quinsy	I&D	Quinsy
7	Peritonsillitis	Quinsy	Quinsy	Quinsy tonsillectomy	Quinsy
8	Peritonsillitis	Quinsy	Quinsy	Antibiotics	Quinsy
9	Quinsy	Quinsy	Quinsy	I&D	Quinsy
10	Quinsy	Quinsy	Quinsy	I&D	Quinsy
11	Quinsy	Quinsy	Quinsy	I&D	Quinsy
12	Quinsy	Quinsy	Quinsy	I&D	Quinsy
13	Quinsy	Quinsy	Quinsy	I&D	Quinsy
14	Quinsy	Quinsy	Quinsy	I&D	Quinsy

IOU = Intraoral ultrasound; I&D = incision and drainage

scan was unaware of the clinical or ultrasound diagnosis. On returning to the ward all results were collated and the clinician managed the patient with the results of both ultrasound and CT available. Needle aspiration, incision and quinsy tonsillectomy were all employed as necessary. A final diagnosis of quinsy or peritonsillar cellulitis was made by considering the clinical and radiological findings. No one method was deemed to be perfect.

Results

Initially three normal volunteers had their tonsils scanned with intraoral ultrasound. This confirmed that topical anaesthesia was unnecessary and that the tonsils could easily be viewed with intraoral ultrasound. Fourteen patients entered the study, 11 males and three females. Ages ranged from 17 to 62 years. The patients had had symptoms for between two and 21 days prior to admission. The clinical, radiological and final diagnosis together with management of each patient is tabulated (Table I).

CT identified 10 quinsys and eight were confirmed by surgical drainage. In one patient (number 8), although both CT and intraoral ultrasound identified

FIG. 1
Transverse intra-oral ultrasound scan showing the hypoechoic peritonsillar abscess (between arrows) with the distance to the carotid artery (curved arrow) between the crosshairs.

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TABLE II
SENSITIVITY AND SPECIFICITY OF CLINICIAN, IOU AND CT FOR DIAGNOSING QUINSY

	Clinical	IOU	CT
Sensitivity	78%	89%	100%
Specificity	50%	100%	75%

pus, the patient showed a rapid response to intravenous antibiotics and neither incision nor aspiration were required. As both intraoral ultrasound and CT agreed unequivocally, this patient was deemed to have had a small collection of pus and this was recorded as a quinsy. In another patient (number 2) although CT identified pus, intraoral ultrasound and incision failed to find pus. The patient settled on antibiotics and the diagnosis was assumed to be peritonsillitis. There was one case of parapharyngeal abscess noted (patient 1) which was not suspected clinically and required external drainage. It was associated with a peritonsillar abscess and for this reason the clinical diagnosis of a quinsy was assumed to be correct in the calculation for sensitivity and specificity. The remaining three cases were treated as peritonsillar cellulitis as suggested by the CT scan and settled rapidly with intravenous antibiotics.

Intraoral ultrasound failed on one occasion due to trismus (parapharyngeal abscess case 1). Intraoral ultrasound did successfully identify eight of nine quinsys as illustrated in Figure 1, it also successfully identified all three cases of peritonsillitis. However, intraoral ultrasound disagreed with CT on two occasions; in one case CT and incision confirmed quinsy (patient 6) and in the previously mentioned case (patient 2) in which CT diagnosed quinsy but drainage failed to locate pus.

Only seven of nine quinsys were correctly identified by clinical diagnosis. One of the two that was only diagnosed by intraoral ultrasound and CT was managed conservatively (patient 8). Two of the four cases of peritonsillitis were correctly identified. Two were falsely interpreted as quinsy. Overall clinical diagnosis agreed with the final diagnosis on eight of 14 cases.

The sensitivity and specificity of all three methods is summarized in Table II. It is disappointing that clinical sensitivity (78 per cent) and specificity (50 per cent) are so poor.

Three patients deserve specific mention. One patient was unwell for 21 days prior to admission (patient 1) and was known to suffer from systemic lupus erythematosis (SLE). She was Cushingoid from taking long-term oral steroids. She was identified as having a parapharyngeal abscess on CT when the clinical diagnosis was a quinsy. She failed ultrasound due to trismus. In another case (patient 7) the clinical diagnosis was peritonsillar cellulitis. CT and intraoral ultrasound clearly demonstrated the presence of a large postero-inferiorly placed abscess. Even with this information it was impossible to drain the abscess with topical anaesthesia and the patient had a quinsy tonsillectomy performed from which he made a rapid and uneventful recovery. There was a 12-hour delay between radiology and surgery. No pus was found at surgery but the remains of an empty abscess cavity was identified. It is assumed that the gossamer thin abscess wall (Figure 2) ruptured between radiological assessment and surgery. Finally the patient with a clinical and intraoral ultrasound picture of peritonsillitis (patient 2) deserves mention. As the patient responded to antibiotics without pus being apparent after what was an adequate incision and drainage, this patient was considered to have peritonsillar cellulitis despite the CT appearance suggesting pus.

FIG. 2
CT scan with contrast showing a large abscess at the lower pole and a very thin mucosa (arrow).

Discussion

Clinically the diagnosis of peritonsillar infection is, as we have shown, inaccurate. The consequence of this is that some patients are being subjected to unnecessary drainage procedures and others may have prolonged hospitalization where an abscess is not recognized and is inappropriately managed with antibiotics alone. Both needle aspiration and incision under local anaesthetic improve clinical diagnostic accuracy but are painful. If diagnostic accuracy can be significantly improved with the use of radiology, it will save the patient unnecessary drainage procedures and ensure fewer abscesses are mistaken as peritonsillitis.

The difficulty with all studies of quinsy and peritonsillar cellulitis is deciding an end-point for diagnosis. Surgical drainage of pus will confirm a clinical diagnosis of quinsy. This can be done by aspiration or incision. If either of these is negative, it

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may mean there is no abscess or that the drainage procedure missed the collection of pus, usually because the abscess is located in a site other than at the upper pole of the tonsil. Snow *et al.* (1991) found that needle aspiration has a false negative rate of 12 per cent and Yung and Cantrell (1976) showed that incision and drainage could have a false negative rate of up to 20 per cent. A negative aspiration or incision for pus cannot therefore be taken as confirmation of peritonsillar cellulitis. Furthermore, if a diagnosis of peritonsillar cellulitis is suspected clinically, the patient is subjected to routine incision to exclude the diagnosis of quinsy. Some previous investigations of diagnostic and therapeutic drainage have avoided this problem by only including known cases of quinsy. We have assessed each patient with all the available information, both clinical and radiological, to decide retrospectively what the most likely diagnosis for each case was in order to calculate sensitivity and specificity. Even so there were two difficult cases (number 2 and number 8) where effectively a majority decision was taken on the final diagnosis.

Four groups have already tried to assess the role of ultrasound in diagnosing quinsy. Haeggstrom *et al.*, (1993) reported 12 cases where a clinically suspected abscess was confirmed by ultrasound and drainage. Strong *et al.* (1995) assessed 16 patients. They used five different end-points inconsistently (aspiration, incision, tonsillectomy, magnetic resonance imaging (MRI) and CT). Analysing their heterogeneous results gives intraoral ultrasound a sensitivity of 82 per cent and a specificity of 83 per cent for diagnosing quinsy. Buckley *et al.* (1994) report 18 cases, however in four cases there was no attempt to confirm the ultrasound diagnosis of cellulitis. Blokmanis (1994) reported 12 cases. One failed due to trismus. Of the remaining 11 it would appear that he showed a sensitivity of 86 per cent and a specificity of 83 per cent for intraoral ultrasound in diagnosing quinsy. In our series of 14 patients, intraoral ultrasound has a sensitivity of 89 per cent and a specificity of 100 per cent for diagnosing an unselected group of patients with both peritonsillar cellulitis and abscess. These figures compare favourably with those previously recorded and show intraoral ultrasound to offer considerably more information than that gained on clinical diagnosis alone. Intraoral ultrasound not only improves diagnosis but also allows localization of the abscess which is an aid in directing drainage by either aspiration or incision.

CT is a well recognized method of demonstrating abscesses. When combined with intravenous contrast it is shown to be accurate both in the head and neck and in the peritonsillar region (Patel *et al.*, 1992; Sakaguchi *et al.*, 1995). We have confirmed this and shown that CT has the best sensitivity (100 per cent) of all three methods used. As mentioned before, a case (number 2) occurred where the CT diagnosis appeared to be incorrect and so the specificity of CT was 75 per cent. Again CT is far superior to clinical diagnosis. It is more sensitive than intraoral ultrasound and is therefore a better screening method. Its expense, however, and the frequency of quinsy make CT screening of all peritonsillar infections impractical. Intraoral ultrasound however, is accurate, much cheaper and quicker to perform than CT, has no irradiation and is practical as a method of screening all peritonsillar infections to differentiate cellulitis from abscess. Both radiologists had little experience with intraoral ultrasound, but found no difficulty in diagnosing the abscesses. Intraoral ultrasound is easy to learn and radiologists or otolaryngologists should have little difficulty using this method for screening patients.

Conclusion

We have shown how unreliable a clinical diagnosis of quinsy can be. It is clearly to the patients' benefit to improve this accuracy. Although CT scanning with contrast is the most accurate method, its expense makes it unsuitable for screening such a common clinical problem. Intraoral ultrasound on the other hand although not as accurate as CT, is fast, readily available and much less expensive and in addition, it does not require the use of ionizing radiation. Although our series is small, the results suggest that intraoral ultrasound could be used as an ancillary screening tool, to improve on the clinical diagnostic accuracy and expedite the appropriate management.

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