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Diagnostics

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ABSTRACT

Peritonsillar abscess (PTA) is one of the most common deep neck space infections that can potentially have life-threatening complications if inadequately diagnosed and not treated promptly. The ability of clinicians to reliably differentiate PTA from peritonsillar cellulitis by physical examination alone is limited and blind needle aspiration, the typical method of diagnosis of PTA, is also unreliable. We review the available evidence supporting the use of ultrasound, either intraoral ultrasound or transcutaneous ultrasound to be the initial imaging modality of choice for evaluation of PTA and be used for real-time needle guidance.

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1. Overview and clinical problem

Peritonsillar abscess (PTA) is one of the most common deep neck space infections with the incidence rate approximated at 1 in 10 000 in the United States [1]. Peritonsillar abscess is generally a disease of young adults with 80% of the cases reported between the ages of 10 and 40 years [2]. Inadequately treated PTA can potentially have life-threatening complications including airway obstruction; aspiration of pus from abscess rupture; and can potentially erode or extend into the deep tissues of the neck, carotid sheath, or posterior mediastinum [3].

The ability of clinicians to reliably differentiate PTA from peritonsillar cellulitis (PTC) by physical examination alone is limited [4,5]. Physician's ability to accurately diagnosis a PTA has been found undependable with a sensitivity and specificity of 78% and 50%, respectively [6]. Both conditions can have overlapping clinical presentations and findings; however, these 2 conditions have very different treatment regimens [6,7]. Blind needle aspiration, the typical method of choice to diagnosis a PTA, has also been found unreliable with a reported false-negative rate of 10% to 24% [6,8–10]. The reported false-negative rates of needle aspirations in patients with proven PTA are mostly quoted in the otolaryngologist literature, and these may be even higher for physicians who are inexperienced or do not regularly perform blind needle aspirations [10]. Furthermore, a blind needle aspiration is more difficult to perform in children and may even require the use of moderate sedation or general anesthesia.

Most PTAs will resolve with simple surgical management from incision and drainage or needle aspiration. Needle aspiration has become a method for both diagnosis and treatment of this disease, despite knowing that the procedure may provide false-negative results even in experienced hands [11]. Many needle aspirations are performed blindly aiming for superior pole because approximately 70% of PTAs occur in

this region [5,8]. The remaining 30% of abscesses occur in the midpole to inferior pole of the tonsil, a region where many practitioners hesitate and may be reluctant to aggressively search for purulent collections [5,6,8]. In addition, due to the possibility of the abscess being multiloculated and variable in location, multiple blind aspirations may be attempted. This can be very uncomfortable, painful, and potentially dangerous to the patient. [9,10] The close proximity of the internal carotid artery to the tonsils makes clinicians weary of attempting blind needle aspirations especially if the abscess is in the distal part of the tonsil because puncture could have devastating and disabling consequences for the patient.

Radiologic imaging is being used more and more by clinicians to help differentiate between a PTA from PTC. Computer tomographic (CT) scanning can accurately diagnose PTA (sensitivity, 100%; specificity, 75%) while identifying infective spread beyond the peritonsillar space [6]. However, CT imaging of the neck is not without risk. The radiation dose of CT neck is 3 mSv [12], but the effective radiation dose delivered to the thyroid from a spiral neck CT ranges from 15 to 52 mSv [13].

The acceptable annual radiation dose from the environment is 3 mSv [14]. This can lead to an increase rate of cancer to 390 per million especially because PTAs are more common in the younger age population. Magnetic resonance imaging is also being used to diagnose PTA and has the advantages of improved soft tissue detail and allowing assessment of the carotid sheath without the associated radiation of a CT. However, magnetic resonance imaging takes longer and has greater problems of availability compared with CT scanning. Both imaging modalities are expensive, they can lead to inefficient practices and longer waiting times, and hardly lend themselves to either guided needle drainage or marking the best approach for a blind attempt at drainage [6,10].

2. Discussion

Ultrasound, either intraoral ultrasound (IOU) or transcutaneous ultrasound (TCU), provides a feasible alternative and should become the

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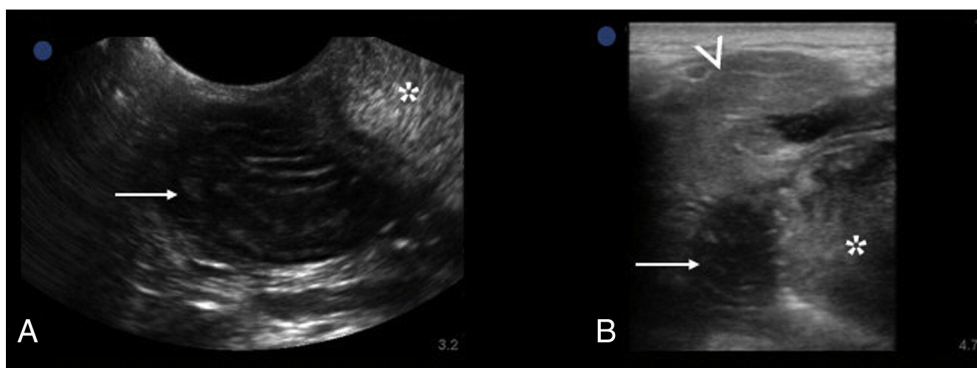


Fig. 1. A, Appearance of normal tonsil (white arrow) on IOU. B, Appearance of normal tonsil (white arrow) on TCU.

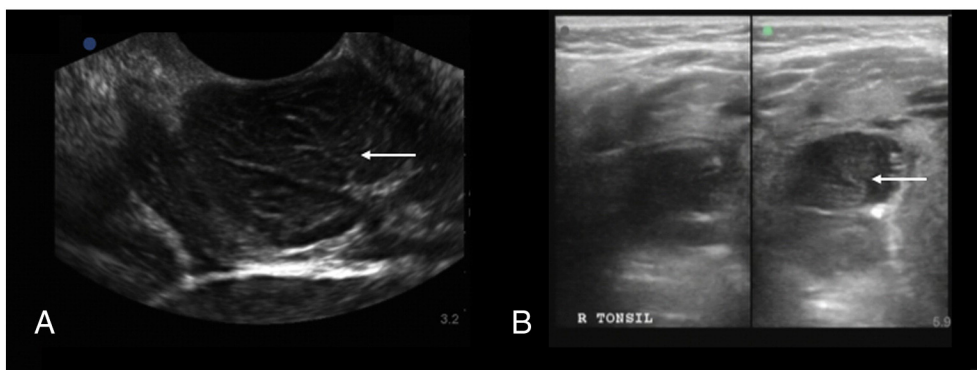


Fig. 2. A, Appearance of PTC on IOU. B, Dual-screen image of normal tonsil (left image) compared with PTC (right image).

initial imaging modality of choice for evaluation of PTA. Ultrasound is a quick, inexpensive diagnostic and therapeutic tool and can be used for real-time needle guidance. Current medical literature suggests and supports the use of ultrasound along with its safety in diagnosis and drainage of PTA [4-10,15-18].

The sonographic appearance of a normal tonsil is defined as a small (10-20 mm), (Fig. 1A and B) triangular or oval structure with a homogeneous low-level echogenic texture [8,17]. Although enlarged tonsils (>20 mm) with a homogeneous or striated appearance are usually considered PTC [8] (Fig. 2A and B), enlarged tonsils with a heterogeneous or cystic appearance, in contrast, are typically considered to be a PTA (Fig. 3A and B) [8]. The clinician should be aware that a PTA may displace or distort the tonsil medially and caudally and that any collection regardless of echogenic pattern adjacent to and potentially inseparable from the tonsil with mass effect is more likely to represent an abscess [15]. The location of the abscess can be variable, and the distance from

the surface of the oropharynx can range from 5 to more than 30 mm on intraoral sonography with a mean distance of 9 mm [5,9]. The distance between the posterior wall of the abscess and the carotid artery on IOU ranges from 5 to 25 mm [5].

2.1. Intraoral

Intraoral ultrasound examination can be performed with an intracavitary (8-5 MHz) transducer covered with a sterile sheath (Fig. 4). The transducer should be dressed with either a condom or a finger from a sterile glove filled with ultrasound gel. The transducer cover should then be covered with a sterile lubricant. A topical anesthetic should be sprayed in the posterior pharynx for patient comfort. The transducer should come in contact with the tonsillar tissue because PTA usually forms within a potential space between the palatine tonsil and its capsule, and the area of interest should be scanned in 2

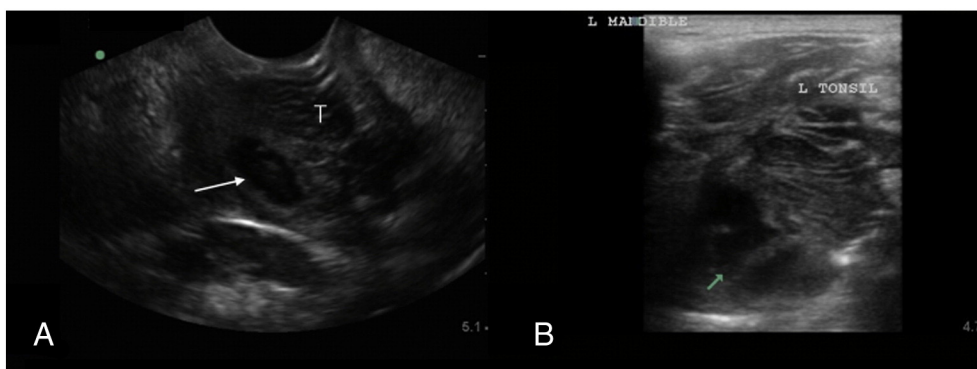


Fig. 3. A, Anechoic fluid collection (white arrow) adjacent to tonsil consistent with PTA on IOU. B, Irregular bordered anechoic fluid collection (white arrow) adjacent to tonsil on transcutaneous ultrasound consistent with PTA.



Fig. 4. Proper probe positioning for IOU.

orthogonal planes. The probe may be orientated first in the transverse plane in the oral cavity, as this may be more feasible if patient has some trismus.

The learning curve for diagnosing PTA on IOU is relatively short with approximately 3 to 4 patients [15]. Although most studies involve small numbers of subjects, IOU has been reported to have a sensitivity of 89% to 95% and a specificity of 78% to 100% depending on the training of the sonographer as well as the field of training [7–10,16,18]. It can aid the efficacy and safety of aspiration by localizing the area of pus and visualizing the relationship of the abscess to the carotid artery (Fig. 5). In 1 prospective randomized study, looking at clinician's diagnostic accuracy at diagnosing PTA using IOU vs needle aspiration on initial visual inspection using landmark (LM) technique found that IOU diagnostic accuracy was 100% when compared with 64% accuracy from LMs [16]. Ultrasound led to 7-fold decrease in subspecialty consultation and required no CT imaging for diagnosis vs 50% of patients in the LM group [16].

2.2. Transcutaneous

The transcutaneous approach to view the peritonsillar region should be considered in patients who do not have access to IOU or who have too much trismus. A high-frequency linear transducer or curvilinear transducer (6–12 MHz) can be used to perform the transcutaneous

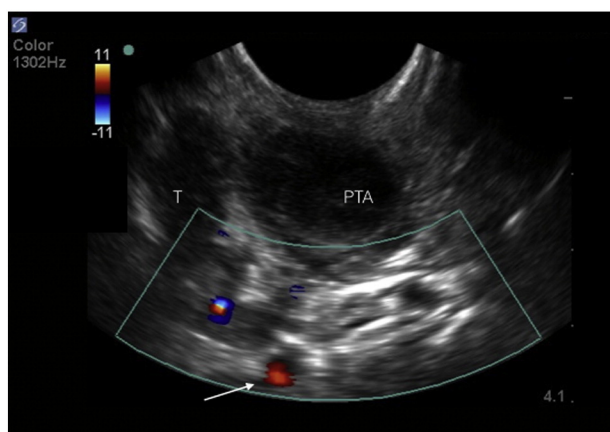


Fig. 5. Relationship of carotid artery to PTA on IOU.



Fig. 6. Proper probe positioning for TCU.

cervical technique. To start, place the transducer under the angle of the mandible with the probe marker facing toward the patient's ear [4] (Fig. 6). The transducer should be placed medial to the angle of the mandible and then directed posterosuperiorly toward the tonsillar fossa [17]. Although some abscesses may appear obvious, when there is doubt, the sonographer should evaluate the contralateral side. Visualizing a normal noninflamed tonsil may be difficult for the novice sonographer. First, locate the internal jugular vein and carotid artery and fan the transducer cephalad, noting the course of the common, then internal carotid artery, with the tonsil appearing laterally and adjacent to the hyperechoic oropharyngeal space. Asking the patient to swallow may help identify the mass of the tonsil relative to other oropharyngeal structures. Using color Doppler can help identify vascular flow from the internal carotid as well as inflamed tonsillar tissue. An abscess should have no internal flow. As most PTAs are superior and posteriorly located, these will appear deep on transcutaneous views.

The number of studies evaluating the accuracy of transcutaneous approach to diagnosis PTA is limited. The sensitivity of TCU has been reported between 80% and 91% and specificity of 80% and 93% [7,17]. When IOU could not be used due to trismus, TCU diagnosed abscesses in 100% of cases, and the aspirated volume was increased in these patients [7].

3. Conclusion

Intraoral ultrasound should be considered first-line imaging modality to confirm and differentiate peritonsillar swelling for PTA or cellulitis. If the clinician does not have access to an IOU or the patient condition, that is, trismus does not allow adequate acquisition of images of the peritonsillar region, then a transcutaneous approach should be considered before needle aspiration or incision and drainage is to be performed.

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