Ultrasonography versus radiography in the diagnosis of maxillary sinusitis

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المقارنة بين تخطيط الصدى وبين التصوير الشعاعي في تشخيص التهاب الجيب الفلكي

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خلاصة: تمت المقارنة بين صورة الأشعة البسيطة (غير الملونة) بمنظر واترز وبين تخطيط الصدى لتشخيص التهاب الجيب الفكي الحاد في خمسين مريضاً بقسم الأشعة بمدينة الملك حسين الطبية في الأردن. ولقد وُجد أن تخطيط الصدى يتطابق بنسبة 100% مع الصور الشعاعية البسيطة التي وصفت بأنها تُظهر عتامات تامة أو مستوى فاصلاً بين السائل والهواء، وذلك هو المؤشّر الوحيد الموثوق في الفلم البسيط للجيب الملتهب. وخلاصة القول إن تخطيط الصدى، وهو إجراء غير مؤيِّن، يمكن أن يكون بديلاً للتصوير الشعاعي البسيط عند الاستقصاء الأوّلي لحالات التهاب الجيب الفكي.

ABSTRACT Water's view plain film radiography was compared with ultrasonography in the diagnosis of acute maxillary sinusitis in 50 patients at the Radiology Department of King Hussein Medical Centre in Jordan with clinical diagnosis of acute sinusitis. Ultrasound showed 100% concordance with plain radiographs reported as showing complete opacifications or an air fluid level, the only reliable plain film indicator of an inflamed antrum. We conclude that ultrasonography, which is non-ionizing, can provide an alternative to plain radiography in the initial investigation of maxillary sinusitis.

L'ultrasonographie versus la radiographie dans le diagnostic de la sinusite maxillaire
RESUME La radiographie simple en incidence de Blondeau a été comparée avec l'ultrasonographie dans le diagnostic de la sinusite maxillaire aiguë chez 50 patients ayant un diagnostic clinique de sinusite aiguë au Département de Radiologie du Centre médical King Hussein en Jordanie. L'échographie a montré une concordance à 100% avec les radiographies simples dont on signalait qu'elles indiquaient des opacifications complètes ou une image hydro-aérique, le seul indicateur de radiographie simple fiable d'une inflammation des sinus. Nous concluons que l'ultrasonographie, qui est non ionisante, peut fournir une alternative à la radiographie simple dans l'investigation initiale de la sinusite maxillaire.

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Introduction

Acute sinusitis is diagnosed clinically on the basis of fever, a preceding upper respiratory tract infection, unilateral purulent rhinorrhoea and unilateral maxillary pain and tenderness [*1*]. This clinical picture is difficult to establish in paediatric patients [*2*].

Four methods are available to diagnose maxillary sinusitis objectively: radiography, computed tomography (CT), ultrasonography (US) and invasive procedures. For many years, the mainstay has been radiography. It has been shown that accurate interpretation of the radiograph is difficult, with a repeated false-positive rate of 35% and a false-negative rate of 10% [*3*].

Radiographically, normal sinuses should be free of fluid. The clinical importance of radiographic mucosal thickening has been a source of confusion. In general, the greater the thickening of the mucous membrane, the more likely the presence of fluid. Mucosal thickening seems to disappear slowly after the disappearance of the sinus disorder [*2*].

In this study, we aimed to assess the concordance of ultrasonography with single Water's view plain film radiography.

Patients and methods

A total of 50 patients aged 6–50 years (mean age 23.4 years) were referred from the ear nose and throat clinic, emergency room, and paediatric and medical clinics with suspected maxillary sinusitis. Each patient underwent plain film radiography consisting of occipito-mental view (Figure 1). All patients then underwent US of both maxillary sinuses (100 antra total). This was performed using a 5 MHz curvilinear array probe (Siemens SI400). Patients were scanned sitting upright and the maxillary sinuses imaged in transverse and longitudinal planes using the anterior antral wall as a window.

Normality was indicated by the presence of only air in the antrum and the absence of echoes from the posterior wall (Figure 2). Abnormality was defined by the presence of echo from the bony posterior wall of the antrum (Figure 3). This indicates the presence of secretions that, unlike air, allow the transmission of echoes to and from the posterior bony wall.

Both the radiographs and US images were reported independently and the two groups were compared. The US images were reported as normal or abnormal. The radiographs were reported as normal, as demonstrating mild mucosal thickening (up to 6 mm), moderate (6–12 mm) or severe (12 mm), or as complete opacification or an air fluid level.

Results

In all, 46 of the 100 antra were reported as radiographically normal, with which US showed 100% agreement. The remaining 54 antra were reported as radiographically abnormal and US showed agreement in 42 cases (78%). The 12 antra (22%) which were reported as ultrasonographically normal showed mild to moderate mucosal thickening only on plain radiography, which has poor diagnostic significance in acute maxillary sinusitis. US demonstrated 100% concordance with radiographs showing opaque sinus, an air fluid level or severe mucosal thickening, which are more reliable signs of acute antral disease (Table 1, Figures 1–3).

Discussion

Acute maxillary sinusitis is a common problem. Bacterial sinusitis requires antibi-

otic therapy. Inappropriate use of antibiotics should however be minimized, given the increasing incidence of resistant organisms [*1,3*]. Clinical symptoms and signs can be misleading and therefore imaging must be carried out where sinusitis is suspected in order to reach an accurate diagnosis and avoid unnecessary antibiotic prescription. Van Duijn et al. showed that correct clinical diagnosis was reached in only 40%–55% of cases [*1*]. Their study assessed the diagnostic accuracy of a five-point clinical al-

Table 1 **X-ray and ultrasonograph findings in 100 antra**

X-ray findings	Ultrasonograph findings	No. of antra
Normal	Normal	46
Abnormal		
Mild mucosal thickening	Normal	6
Moderate mucosal thickening	Normal	6
Severe mucosal thickening	Abnormal	2
Opaque	Abnormal	22
Air fluid level	Abnormal	18

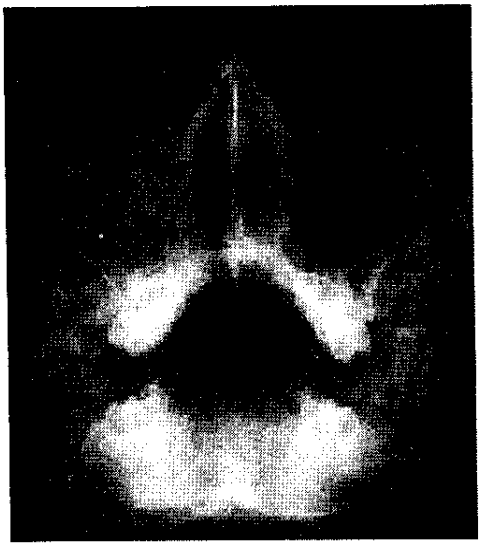

Figure 1 **Occipito-mental view for the sinuses showing opaque left antrum and normal right antrum**

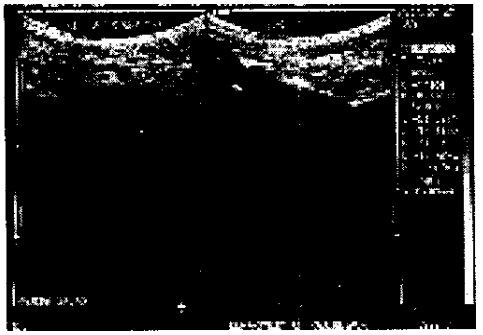

Figure 2 **Normal transverse and longitudinal scan showing the absence of echoes from the posterior wall**

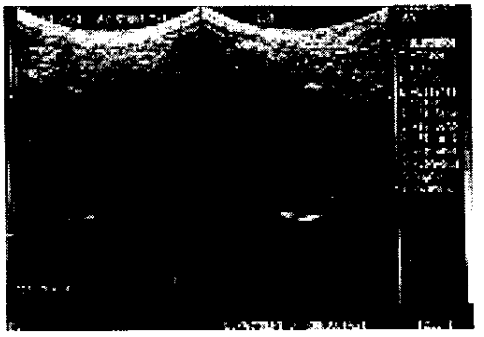

Figure 3 **Abnormal transverse and longitudinal scan showing echoes from the bony posterior wall**

gorithm using US as the standard against which clinical diagnoses were judged, quoting a sensitivity and specificity of 89% and 95% for US [*1*]. Plain films are also unreliable, with repeated 35% false-positive and 10% false-negative results [*3*], although these figures refer to plain film diagnosis made on varying degrees of mucosal thickening and opacifications.

Our study showed that those patients whose plain films demonstrated either complete opacification or an air fluid level or severe mucosal thickening all had abnormal antra on US examination. US was less accurate at detecting a moderate mucosal thickening as seen on plain film radiography, but this is not in any case an accurate plain film parameter for acute maxillary sinusitis. US has shown 90% conformity with the finding of antral fluid at antroscopy or irrigation [*3*]. Berg and Carenfelt showed that US failed to give positive results with small amounts of antral fluid (up to 3 mL) [*4*].

Revonta and Kuuliala claimed that US and plain films were equally useful in the initial diagnosis of acute maxillary sinusitis, and also demonstrated a good correlation between loss of back wall echo and symptomatic improvement in the follow-up of children with sinusitis [*2*]. Other studies have shown US to be effective in the diagnosis of frontal sinusitis [*3*].

There are limitations to the use of US in imaging the maxillary sinus. First, US gives a positive diagnosis of antral fluid in disease but does not give the exact cause for that, whether bacterial, viral or allergic, as is true of other imaging methods. Second, US cannot show the bony detail of the sinuses which can be clearly seen by radiography and CT. Third, US images only the maxillary sinus, and to some extent the frontal sinuses, but fails to image the ethmoid or sphenoid sinuses, which can be the source of the clinical condition. Fourth, the cost of US examination of sinuses is approximately two to three times that of plain films.

On other hand, US does not involve the use of ionizing radiation. The simple process can be performed easily within a radiology department, clinic or intensive care unit. US can also be easier to image for some children where movement can limit taking good radiographs.

References

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