

Occipitomenal (Waters' view) radiographs from general practice: Are they adequate?

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Summary

Critics maintain that family physicians produce radiographic images of poorer technical quality than radiologists but the impact of lower quality images on patient care is unknown. Two radiologists assessed occipitomenal radiographs made in either a general practice or a certified laboratory for 247 patients with clinically diagnosed acute bacterial rhinosinusitis. With an occipitomenal radiograph correct positioning is more difficult than with the usual radiographs of chest or extremities commonly made in general practice. Good positioning was less common in radiographs from general practices, with the pyramid projected below the maxillary sinuses in 63% of radiographs from general practice and 79% of radiographs

from a certified laboratory. However, a radiographic diagnosis of possible acute maxillary sinusitis was as common in radiographs from general practice (38%) as in radiographs from a certified laboratory (41%). Although routine use is not recommended, family physicians with suitable technical and interpretative skills can use an occipitomenal radiograph to rule out acute maxillary sinusitis in difficult cases. With a radiograph that is hard to read the physician should act as if the disease is present or refer the radiograph to a consulting radiologist.

Key words: family practice; quality; sinusitis; radiography

Introduction

Radiography in a general or family practice setting is still controversial [1, 2]. The limited data available suggest that most family physicians in the US have radiographic facilities in their practices [1]. A similar situation exists in Switzerland [3], with an estimated 4470 radiographic licenses issued to general practices (Bundesamt für Gesundheit, pers. comm.) in a country with a population of 7.3 million (61 licensed practices per 100 000 inhabitants).

Critics maintain that radiographic facilities in general practice lead to increased health care costs through more frequent use of radiography [2]. Quality is also a concern: critics maintain that physicians are more prone to errors of interpretation and produce images of poorer technical quality than radiologists [4]. Others argue that physi-

cians are nevertheless very accurate and that the differences have a limited impact, if any, on patient care [5, 6].

Little is known about the technical quality of radiographs from general practice. Data from health care insurers suggest that radiographs of an unacceptable quality are common when made in a general or family practice (45% and 55% respectively) but relatively rare when made by radiologists (12%) [4]. In theory if image quality is not adequate errors of interpretation will be more frequent. In practice the impact of lower quality images on patient care is unknown. Using data from a randomised clinical trial, we investigated whether radiographic quality and findings differ when occipitomenal radiographs are made in general practice rather than in a certified laboratory.

Methods

In a trial to assess the efficacy of amoxicillin/clavulanate in patients with clinically diagnosed acute bacterial rhinosinusitis, 252 patients were recruited at 24 general practices and two university hospital outpatient clinics in Basel, Switzerland [7]. Those recruited had to have a history of purulent nasal discharge and maxillary or frontal pain for at least 48 hours but less than one month. At baseline, a single occipitontal view radiograph was made for each patient. Radiographs were made either in a general practice or by referral to a certified laboratory. General practitioners and hospital radiology staff met at our hospital and were given instructions by a radiology technician in order to standardise radiographic technique.

Two board-certified senior radiologists (MM, UO) each independently assessed 247 radiographs blind to other patient information. Radiologists were not blind to the source of the radiograph; this was obvious because radiographs from general practices were analogue while

those from certified laboratories were digital. Each radiologist assessed four aspects of radiographic quality and five findings. Radiographic quality was assessed as: (1) a correctly exposed negative, (2) orbitals symmetric, (3) the pyramid (pars petrosa ossis temporalis) projected below the maxillary sinuses, (4) sphenoidal sinus seen through the mouth. Findings with respect to frontal or maxillary sinuses were assessed as: (1) all normal, at least one with (2) mucosal swelling >5 mm, (3) mucosal swelling ≤5 mm, (4) fluid, (5) opacity.

Statistical analysis was carried out using the GENMOD procedure in SAS version 8.2. Multivariate logistic regression models were fit using generalised estimating equations, assuming a constant correlation between the two responses for the same radiograph. Model parameters are shown as odds ratios (OR), each with a 95% confidence interval.

Results

Averaged over both radiologists, positive ratings for projecting the pyramid below the maxillary sinuses and the sphenoidal sinus through the mouth were lower in radiographs from general practices (Table 1). Few radiographs showed sinuses that were considered normal (<30%), and swelling was common (≥60%). Few radiographs

showed fluid in sinuses or opaque sinuses (<30%). However these two findings were almost mutually exclusive so that the composite finding of either fluid or opacity, recommended for radiographic diagnosis of maxillary sinusitis [8], identified many more individuals (38% and 41% for general practice and certified laboratory respectively) than ei-

Table 1

Percentage of positive and missing ratings averaged over both radiologists for radiographs from general practice (GP) and from a certified laboratory (CL).

Variable	Average over both radiologists			
	% positive		% missing	
	GP (n = 207)	CL (n = 40)	GP (n = 207)	CL (n = 40)
Quality				
Correctly exposed negative	62	58	0	0
Orbitals symmetric	73	63	0	0
Pyramid below maxillary sinus	63	79	0	0
Sphenoidal sinus seen through mouth	53	70	0	0
Finding				
Normal	29	26	3	0
Swelling >5 mm	64	79	4	1
Swelling ≤5 mm	62	60	4	0
Fluid	28	26	3	0
Opaque	13	18	2	0

Table 2

Multivariate logistic regression models for poor exposure, poor position, indecision and diagnosis: model parameters are shown as odds ratios, each with a 95% confidence interval, and the certified laboratory is the reference category for the source of the radiograph.

Response variable		Predictor variables			
		Radiologist		Source	
Quality	Poor exposure	2.03	[1.50-2.76]	0.81	[0.46-1.43]
	Poor position	1.45	[1.13-1.87]	1.51	[0.83-2.76]
Finding	Undecided	9.69	[2.19-42.8]	3.92	[0.52-29.7]
	Diagnosed	1.17	[0.93-1.46]	0.86	[0.46-1.61]

ther finding alone. Missing ratings occurred when a radiologist was unable to decide on a finding. Indecision was more common with radiographs from general practice.

Using multivariate logistic regression, we fitted models (Table 2) for: poor exposure, poor position (a negative rating for any of the three positioning variables), indecision (a missing rating on any finding) and diagnosis (a finding of either sinus fluid or opacity). Predictor variables were the radiologist and the source of the radiograph. One radiologist was more critical than the other and more likely to consider radiographs as poorly exposed (OR 2.03 [1.50–2.76]) or poorly positioned

(OR 1.45 [1.13–1.87]). Accordingly, this radiologist was also more indecisive than the other (OR 9.69 [2.19–42.8]). There is weak evidence that radiologists were more indecisive with radiographs from a general practice (OR 3.92 [0.52–29.7]) and that they were more likely to consider these radiographs as poorly positioned (OR 1.51 [0.83–2.76]). However a diagnosis of possible acute maxillary sinusitis based on findings of fluid or opacity was no less likely with one radiologist than with the other (OR 1.17 [0.93–1.46]), nor with radiographs from general practices rather than from a certified laboratory (OR 0.86 [0.46–1.61]).

Discussion

Both general practice and certified laboratory appear to produce radiographs of a similar technical quality. If a negative rating on any aspect of radiographic quality is taken as a sign that the radiograph is "unacceptable", then 73% of radiographs from general practice were unacceptable and 65% of radiographs from a certified laboratory were unacceptable. In contrast, a previous US study suggested a considerable difference in quality: unacceptable radiographs were common when made in a general or family practice (45% and 55% respectively) but relatively rare when made by radiologists (12%) [4]. Bias is possible in our study because each radiologist would have known which radiographs were from a general practice. However it is hard to see why radiologists would be biased in favour of radiographs from general practices. Of course whether a lower quality radiograph is "unacceptable" really depends on whether its lower quality leads to misinterpretation, which is why it is important to assess technical quality in terms of its impact on diagnosis and hence on patient care.

In our study there was slight evidence that poor positioning was more common in radiographs from general practice. Correct positioning is more difficult with an occipitomenal radiograph than with the usual radiographs of chest or extremities commonly made in general practice [3]. Projecting the pyramid below the maxillary sinuses is particularly important for a clear image of the maxillary sinuses, and this was achieved in 63% of radiographs from general practice and in 79% of radiographs from a certified laboratory. In an audit of occipitomenal radiographs from a laboratory at a dental hospital, 64% of radiographs had a correctly positioned pyramid; this figure was considered too low given its importance [9].

However, a diagnosis of possible acute maxillary sinusitis was no less likely given radiographs

from general practice rather than from a certified laboratory. Our results showed what trained and motivated family physicians can achieve when taking part in a clinical trial. This suggests that occipitomenal radiographs made by trained and motivated family physicians in general practice will not be significantly lower in technical quality than those made in a certified laboratory, and that any differences should have little impact on patient care. Evidence suggests that family physicians are more likely to misinterpret radiographs than radiologists, but family physicians appear to be good at recognising and referring difficult radiographs to a consulting radiologist [5, 6].

Routine use of radiography is not recommended for the diagnosis of sinusitis because of its low positive predictive value [10]. The radiographs in our study were taken because baseline imaging is recommended in clinical trials of antibiotics [11]. However, in a general practice, an occipitomenal radiograph can be used to rule out maxillary sinusitis in difficult cases because of its high negative predictive value in a low prevalence setting [12, 13]. The occipitomenal radiograph only gives an adequate image of the maxillary sinuses [14, 15]. When sinuses other than the maxillary may be infected, with potentially serious consequences [16], then more sophisticated imaging is definitely needed [17].

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