Is CT effective in cases of upper oesophageal fish bone ingestion?

Reported by Debasis Das, Spr Radiology

Checked by Gabby May, Clinical Fellow, Manchester Royal Infirmary

Guy’s & St Thomas’ Hospitals, London
doi: 10.1136/emj.2006.044388

Three part question

In [patients who are suspected to have fish or chicken bones impacted in the oesophagus] is [computerised tomography better than plain radiography] at [identifying and localising a foreign body]?

Clinical scenario

A 60-year-old man attends the emergency department complaining that a fish bone has got stuck in his throat. Clinical examination rules out impaction within the pharynx so you are concerned that the bone has become impacted within the oesophagus. Prior experience tells you that oesophageal abrasions secondary to ingested bones can often mimic impaction, that rigid oesophoscopy (the definitive investigation) carries a significant mortality and morbidity rate, and that the most readily available non-invasive investigations, lateral neck and chest x rays, are often unreliable. You wonder whether a computed tomography (CT) scan of the neck would be a more accurate non-invasive tool?

Search strategy

Medline 1966—week 3, February 2006. Limit to human and English. {exp. Tomography, Spiral Computed/or exp. Tomography, X-ray computed/or CT, mp.} AND {[fish bone. mp.] OR {foreign body. mp. OR exp. Foreign bodies}} AND {exp. Esophagus/or oesophageal. mp.}

Search outcome

Altogether 66 papers found, of which 62 were irrelevant or of insufficient quality. The remaining four papers have been systematically reviewed.

Comment(s)

The studies reviewed above clearly show that CT of the neck is an extremely accurate, non-invasive diagnostic tool with a high PPV. However, of the 58 patients in the four series with positive x ray findings, there were only 3 false-positives. Thus, disregarding study 4 (which is appears to be a small-scale pilot study for study 2 with skewed results), it is unsurprising that studies 1–3 all still recommend plain x ray as the initial radiographic screening tool. Positive results, which include soft tissue changes, warrant oesophagoscopy, while negative results should lead to a CT scan of the neck. Bearing in mind that there was 100% sensitivity amongst the 144 patients undergoing CT, and that there was just one false positive amongst the 80 patients with positive results, only visualisation of an actual fish or chicken bone should result in an oesophagoscopy at this point. Similarly, a negative CT scan should confidently exclude fish and chicken bones.

**CLINICAL BOTTOM LINE**

CT is more effective than plain radiography at identifying and excluding impacted oesophageal fish and chicken bones. However, plain radiography is also specific enough for positive results to warrant oesophagoscopy without any further

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Table 2

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braverman I et al, 1993, Israel</td>
<td>13 patients with suspected fish and chicken bone ingestion. All patients underwent lateral neck x ray and CXR, followed by CT</td>
<td>Prospective, non-randomised study</td>
<td>Sensitivity, Specificity</td>
<td>CT: 100%, XR: 80%&lt;br&gt;CX: 100%, XR: 50%&lt;br&gt;PPV: 100%, XR: 88.9%</td>
<td>Low study numbers&lt;br&gt;One patient underwent CT after oesophagoscopy; &amp; one did not have an x ray—both have been excluded from the results&lt;br&gt;Statistics were not reported (calculated by ourselves again)</td>
</tr>
<tr>
<td>Watanabe K et al, 1998, Japan</td>
<td>32 patients with suspected fish bone ingestion. All patients underwent lateral neck x ray and CXR, but only 11 underwent CT</td>
<td>Prospective, non-randomised study</td>
<td>Sensitivity, Specificity</td>
<td>CT: 100%, XR: 44%&lt;br&gt;PPV: CT: N/A, XR: 100%&lt;br&gt;CT: 100%, XR: 100%&lt;br&gt;PPV: CT: N/A, XR: 100%&lt;br&gt;CT: 100%, XR: 100%</td>
<td>Selection bias—why only 11 patients for CT&lt;br&gt;Low study numbers for CT&lt;br&gt;Statistics were not reported by authors (they have been calculated by ourselves)</td>
</tr>
<tr>
<td>Elishar R et al, 1999, Israel</td>
<td>45 patients with suspected fish and chicken bone ingestion. All patients underwent lateral neck x ray and CXR, followed by CT</td>
<td>Prospective, non-randomised study</td>
<td>Sensitivity, Specificity</td>
<td>CT: 100%, XR: 55.2%&lt;br&gt;PPV: CT: 93.7%, XR: 100%&lt;br&gt;CT: 96.7%, XR: 100%&lt;br&gt;PPV: CT: 93.7%, XR: 100%&lt;br&gt;CT: 96.7%, XR: 100%</td>
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<tr>
<td>Akazawa Y et al, 2004, Japan</td>
<td>76 patients with suspected fish bone ingestion. All patients underwent lateral neck x ray and CXR, followed by CT</td>
<td>Prospective, non-randomised study</td>
<td>Sensitivity, Specificity</td>
<td>CT: 100%, XR: 64.5%&lt;br&gt;PPV: CT: 100%, XR: 95.6%&lt;br&gt;CT: 100%, XR: 90.9%&lt;br&gt;PPV: CT: 54.8%&lt;br&gt;XR sensitivity miscalculated by authors as 54.8%</td>
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CT, computed tomography; CXR, chest x ray; PPV, positive predictive value.
imaging, and should thus continue being utilised as the first line radiological investigation.


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**Does plain radiography predict pneumothorax size?**

**Report by Gary Sudwarts, SHO**

**Checked by David Foler, Senior Registrar in Accident and Emergency**

**Great Ormond Street Hospital**

doi: 10.1136/emj.2006.044396

**Three part question**

In a patient with a pneumothorax are plain chest x rays reliable [in predicting volume of air in the chest]?

**Clinical scenario**

A 22-year-old male presents to you in Accident and Emergency complaining of sudden onset of shortness of breath and right sided pleuritic chest pain. He has clinical signs in keeping with a pneumothorax and is not currently tensioning. You request a plain posterior/anterior erect chest radiograph which shows a small right tided pneumothorax. After aspirating 200 ml of air, you repeat the chest radiograph which shows no improvement in the pneumothorax. Can you rely on the x ray?

**Search strategy**


**Search outcome**

Altogether 400 papers were found using Medline, of which 4 were deemed to be relevant or of sufficient quality for inclusion. Guidelines published by the British Thoracic Society on the management of spontaneous pneumothorax in 2003 has a section relevant to this question.

**Comment(s)**

Although there are no large high quality trials considering this question, there seems to be no debate that a plain film erect or supine chest radiograph usually underestimates the size of a pneumothorax and is certainly unreliable. There are formulas using interpleural distances that do enhance reliability. Computed tomography (CT) scanning is considered the best investigation although very specialised investigations, such as plethysmography, are available. The lateral decubitus radiograph is probably as sensitive as CT scanning. It recognised that widespread use of CT scans for suspected pneumothorax is impractical however it is indicated if clinical suspicion is high or in the case of difficult to read x-rays such as in patients with emphysematous bullous disease. The British Thoracic Society has published guidelines on the management of spontaneous pneumothorax in 2003.

> **CLINICAL BOTTOM LINE**

Erect or supine chest x rays are not reliable in estimating the size of a pneumothorax.


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**Table 3**

<table>
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<tr>
<th>Author, date and country</th>
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<tbody>
<tr>
<td>Engdahl O et al, 1993, Sweden</td>
<td>16 consecutive adults with spontaneous pneumothorax</td>
<td>Prospective case controlled cohort</td>
<td>correlation between plain chest radiography and CT scans in determining size of pneumothorax</td>
<td>( r = 0.71 (0.001 &lt; p &lt; 0.01) )</td>
<td>Small cohort: Only included spontaneous pneumothorax—no other etiology.</td>
</tr>
<tr>
<td>Collins CD et al, 1995, UK</td>
<td>19 adults. 20 pneumothoraces. Spontaneous (7), iatrogenic (13)</td>
<td>Prospective controlled cohort study</td>
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<td>Blaivas M et al, 2005, USA</td>
<td>176 adults who presented with blunt trauma. They all had a focussed assessment with sonography (FAST) ultrasound scan and were sufficiently ill to justify a CT scan of their chest. 53 had pneumothoraces either on CT scan, or post thoracotomy if the clinician reported hearing a rush of air after placing a chest tube.</td>
<td>Prospective single blinded study with convenience sampling</td>
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<tr>
<td>Kelly AM et al, 2006, Australia</td>
<td>57 adults with spontaneous pneumothorax</td>
<td>Retrospective cohort review</td>
<td>Comparing two common methods to estimate the size of pneumothoraces on plain chest radiographs</td>
<td>They agree on smaller pneumothoraces but the Rhea method may significantly underestimate the size of larger pneumothoraces</td>
<td>Small retrospective study. Did not compare either method to the accepted standard of a CT scan.</td>
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</table>

CT, computed tomography.