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

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 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 oesophagoscopy (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 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

Table 2

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Braverman I <i>et al</i> , 1993, Israel	13 patients with suspected fish and chicken bone ingestion. All patients underwent lateral neck x ray and CXR, followed by CT	Prospective, non-randomised study	Sensitivity Specificity PPV	CT: 100%, XR: 80% CT: 100%, XR: 50% CT: 100%, XR: 88.9%	Low study numbers One patient underwent CT after oesophagoscopy, & one did not have an x ray—both have been excluded from the results Statistics were not reported (calculated by ourselves again)
Watanabe K <i>et al</i> , 1998, Japan	32 patients with suspected fish bone ingestion. All patients underwent lateral neck x ray and CXR, but only 11 underwent CT	Prospective, non-randomised study	Sensitivity Specificity PPV	CT: 100%, XR: 44% CT: N/A, XR: 100% CT: 100%, XR: 100%	Selection bias—why only 11 patients for CT? Low study numbers for CT Statistics were not reported by authors (they have been calculated by ourselves)
Eliashar R <i>et al</i> , 1999, Israel	45 patients with suspected fish and chicken bone ingestion. All patients underwent lateral neck x ray and CXR, followed by CT	Prospective, non-randomised study	Sensitivity Specificity PPV	CT: 100%, XR: 55.2% CT: 93.7%, XR: 100% CT: 96.7%, XR: 100%	
Akazawa Y <i>et al</i> , 2004, Japan	76 patients with suspected fish bone ingestion. All patients underwent lateral neck x ray and CXR, followed by CT	Prospective, non-randomised study	Sensitivity Specificity PPV	CT: 100%, XR: 64.5% CT: 100%, XR: 95.6% CT: 100%, XR: 90.9%	XR sensitivity miscalculated by authors as 54.8%

CT, computed tomography; CXR, chest x ray; PPV, positive predictive value.

imaging, and should thus continue being utilised as the first line radiological investigation.

Braverman I, Gomori JM, Polv O, *et al.* The role of CT imaging in the evaluation of cervical esophageal foreign bodies. *The Journal of Otolaryngology* 1993;**22**(4):311–14.

Watanabe K, Kikuchi T, Katori Y, *et al.* The usefulness of computed tomography in the diagnosis of impacted fish bones in the oesophagus. *The Journal of Laryngology and Otolaryngology* 1998;**112**:360–64.

Eliashar R, Dano I, Dangoor E, *et al.* Computed tomography diagnosis of esophageal bone impaction: a prospective study. *The Annals of Otolaryngology, Rhinology, & Laryngology* 1999;**108**:708–10.

Akazawa Y, Watanabe S, Nobukiyo S, *et al.* The management of possible fishbone ingestion. *Auris, Nasus, Larynx* 2004;**31**:413–16.

Does plain radiography predict pneumothorax size?

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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 sided 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

Medline 1966 to 11/2006 using the OVID interface ["pneumothorax"[MeSH Terms] OR pneumothorax[Text

Word]] AND size[All Fields] Cochrane 11/07: "pneumothorax size"

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.

Engdahl O, Toft T, Boe J. Chest radiograph—a poor method for determining the size of a pneumothorax. *Chest* 1993 Jan;**103**(1):26–9.

Collins CD, Lopez A, Mathie A, *et al.* Quantification of pneumothorax size on chest radiographs using interpleural distances: regression analysis based on volume measurements from helical CT. *Am J Roentgenol* 1995 Nov;**165**(5):1127–30.

Blaivas M, Lyon M, Duggal S. The management of chest tubes in patients with a pneumothorax and an air leak after pulmonary resection. *Acad Emerg Med* 2005 Sep;**12**(9):844–9.

Kelly AM, Weldon D, Tsang AY, *et al.* Comparison between two methods for estimating pneumothorax size from chest X-rays. *Respir Med* 2006 Jan 4;[Epub ahead of print].

Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Engdahl O <i>et al</i> , 1993, Sweden	16 consecutive adults with spontaneous pneumothorax	Prospective case controlled cohort	correlation between plain chest radiography and CT scans in determining size of pneumothorax	$r = 0.71$ ($0.001 < p < 0.01$)	Small cohort. Only included spontaneous pneumothoraces—no other aetiology.
Collins CD <i>et al</i> , 1995, UK	19 adults. 20 pneumothoraces. Spontaneous (7), iatrogenic (13)	Prospective controlled cohort study	formula to accurately calculate percentage pneumothorax from a plain chest radiograph	$r = 0.98$ ($p < 0.0001$)	No trauma patients included. Small cohort. Formula not validated in a prospective clinical trial.
Blaivas M <i>et al</i> , 2005, USA	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 thoracostomy (if the clinician reported hearing a rush of air after placing a chest tube).	Prospective single blinded study with convenience sampling	to compare the sensitivity and specificity of supine chest x rays in the detection of pneumothorax using CT as the gold standard	Chest radiography sensitivity 75.5% (95% CI 61.7% to 86.2%) specificity 100% (95% CI 97.1% to 100%). Ultrasound sensitivity 98.1% (95% CI 89.9% to 99.9%) specificity 99.2% (95% CI 95.6% to 99.9%)	only severely injured trauma patients, pneumothorax could have increased in size between investigations
Kelly AM <i>et al</i> , 2006, Australia	57 adult patients with spontaneous pneumothorax	Retrospective cohort review	Comparing two common methods to estimate the size of pneumothoraces on plain chest radiographs	They agree on smaller pneumothoraces but the Rhea method may significantly under-estimate the size of larger pneumothoraces	Small retrospective study. Did not compare either method to the accepted standard of a CT scan

CT, computed tomography