Singapore Med J 2004 Vol 45(8) : 397

CME Article

Clinics in diagnostic imaging (100)

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Fig. 1 Lateral radiograph of the lower neck.

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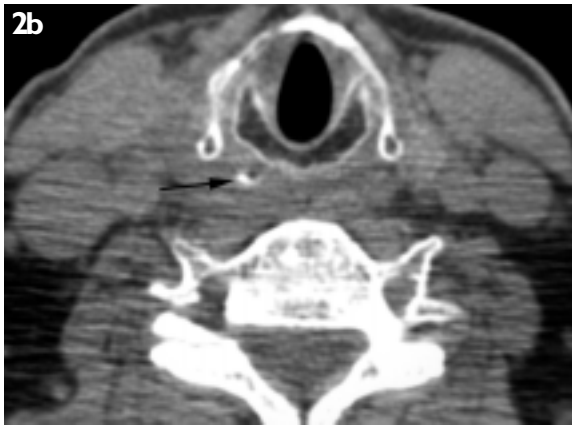
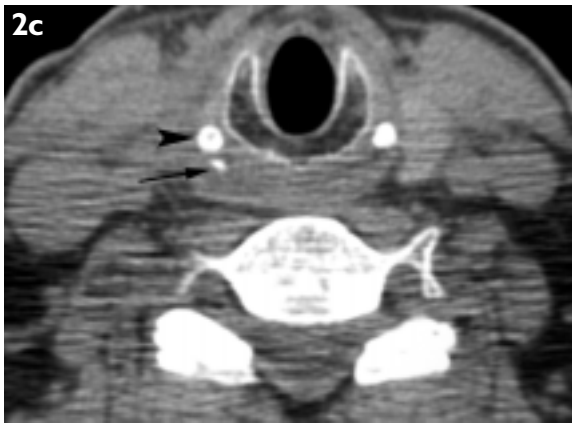
CASE PRESENTATION

A 71-year-old man presented at midnight to the accident and emergency department, complaining of pain in the right side of neck. The pain was particularly painful on swallowing solids, and there was a sensation of something stuck in throat. His symptoms started after his usual dinner of fish curry that he had taken the same evening. His medical history was significant only for hypertension for which his treatment was intermittent. His vital signs were normal and there was no fever. Physical examination revealed tenderness in the right upper neck. Patient was unable to tolerate the indirect laryngoscopy. What does the lateral neck radiograph show (Fig. 1)? What is the diagnosis?





Figs. 2a-c Series of axial CT images taken through C5-6 vertebral levels. A dense curvilinear radio-opaque foreign body (arrows) is seen in a largely vertical orientation. It is located posterior to the right side of the calcified cricoid cartilage and the right inferior horn of the thyroid cartilage (arrowhead).

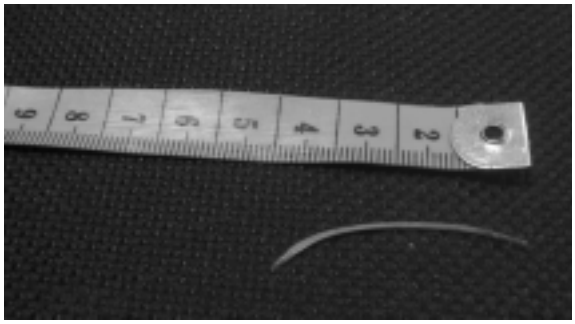


Fig. 3 Photograph shows the 4cm long curvilinear fish bone after surgical removal.

Fig. 4 Post-operative lateral radiograph of the neck confirms successful removal of the fish bone. A curved surgical drain is present.

IMAGE INTERPRETATION

The lateral neck radiograph (Fig. 1) shows a thin curvilinear radio-opaque foreign body, located anterior to the C5/6 disc space and posterior to the calcified laryngeal cartilages. There is marked pre-vertebral soft tissue swelling (Fig. 1). Computed tomography (CT) confirmed the presence of the foreign body which was embedded in the right parapharygeal soft tissues posterior to the right side of the calcified cricoid and thyroid cartilages (Figs. 2a-c).

DIAGNOSIS

Migrated pharyngeal fish bone.

CLINICAL COURSE

The patient underwent a rigid oesophagoscopy which did not show a foreign body. This was followed by exploration of the neck. Dissection between the trachea and right sternomastoid muscle was performed, with division of the strap muscles. A 4cm long curvilinear fish bone was found in a migrated position, impinging on the superior pole of the thyroid gland. It was located at the level of the cricothyroid junction. The fish bone was removed (Fig. 3), haemostasis ensured and a drain inserted before skin closure.

He was infused with intravenous antibiotics during and immediately after surgery. The patient recovered very well from surgery. A follow-up radiograph (Fig. 4) was obtained to confirm that no

pieces of fish bone were left. The drain was removed after two days and patient was discharged on oral Augmentin 625mg twice-daily, with an advice to follow-up in the outpatient specialist clinic.

DISCUSSION

The majority of symptomatic ingested foreign bodies in Singapore are food components, with fish bone being by far the most common object[1]. The majority of the fish bones have been reported to be radio-opaque[2]. Patients with a suspected swallowed foreign body usually presents with throat pain, dysphagia, and sensation of something stuck in throat. Often, there is no definite correlation between the onset of the symptoms and the ingestion of a foreign body. Approximately 90% of the fish bones are impacted in the suprahyoid location[3]. This is the area of maximum soft tissue and bony density on the lateral cervical radiograph and incidentally, a region which is ideally suited to examination by indirect laryngoscopy. Below the level of the oropharynx, common site for lodgement of foreign bodies are the valleculae, the pyriform sinuses, the cricopharyngeal region and the cervical oesophagus.

Fish bones typically appear as an area of slender linear radio-opaque density that is much less opaque than human vertebra. In some cases, secondary signs may help in confirming or arousing a suspicion of a foreign body in the neck. These secondary signs are widening of the prevertebral soft tissue space, streaky air shadows within this soft tissue which may indicate a perforation, and presence of soft tissue swelling in the region of the base of the tongue and the supraglottic larynx.

On radiographs, densities that are paired usually represent normal calcified structures. The casualty medical officer or a general physician is usually the first healthcare worker to examine these patients. As part of the protocol, a soft tissue lateral radiograph of the neck is often the first investigation for evaluation of such patients. It is important for physicians and casualty medical officers as well as the radiologist to have a comprehensive knowledge about the normal structures that can mimic foreign body on the lateral neck radiograph. A good understanding of normal calcifications seen on the neck radiograph will not only help the physician in identifying the abnormal radio-opaque foreign body but also save the patient from unnecessary investigations. Further investigations should be reserved for patients with a negative radiograph but with a strong clinical suspicion of impacted foreign body. For the purpose of easy understanding of normal calcification in neck, we have divided the normal calcified structures into following three categories, namely: laryngeal cartilage calcifications, styloid process and stylohyoid ligament, and prevertebral space calcification.

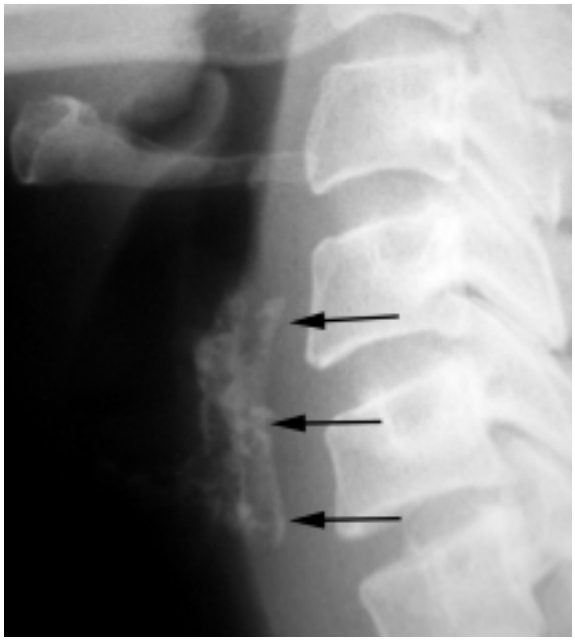


Fig. 5 Dense amorphous calcification of most of the posterior alae and both superior and inferior cornua of the thyroid cartilage (arrows).

Laryngeal cartilage calcifications

The three major cartilages of the larynx, namely, the thyroid, cricoid, and the arytenoids, are all composed of hyaline cartilage. They may undergo calcification or endochondral ossification (or both), and become visible radiographically[4]. Some cartilage parts consist of elastic cartilage (e.g. the apices and vocal processes of the arytenoid cartilage). In general, the ossification is earlier in males than in females. The pattern and rate of calcification and ossification of the laryngeal cartilages is unpredictable. The lateral neck radiograph may hence be difficult to interpret.

Thyroid cartilage

The thyroid cartilage is the largest one, and encloses the larynx anteriorly and laterally. This cartilage is composed of two alae which meet anteriorly, dipping down from above. Posteriorly, each wing has a superior cornua that extends upward, and a much shorter inferior cornua which articulates with the cricoid cartilage below. Ossification normally starts at the posterior border, lower margin and inferior horn of the thyroid cartilage in both sexes. It is unusual to find the ossification of the superior margin of the lamina or the superior cornua in isolation at an early age[5]. The male thyroid cartilage is ossified in most of its parts from the age of 70 years, in contrast to the female thyroid cartilage which never ossifies completely. In females, the ventral half of the

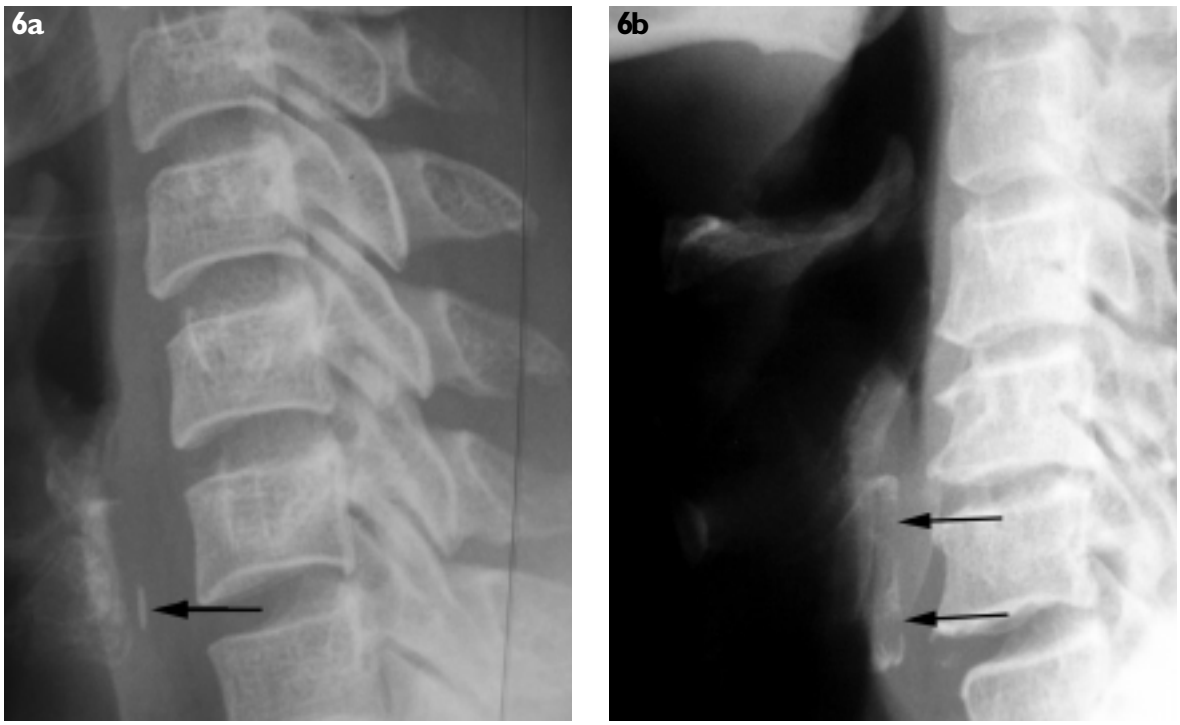


Fig. 6 Varying calcification of the cricoid cartilage in two different patients. This is the most common calcification mimicking fish bone. Its location opposite C6-C7 vertebra posterior and inferior to the calcified thyroid cartilage is helpful in differentiating it from abnormal calcification. (a) There is a linear dense calcification of part of the posterior lamina of the cricoid cartilage (arrow). (b) More extensive calcification of most of the cricoid cartilage is present (arrows). Note its relationship posterior and inferior to the calcified thyroid cartilage.

cartilage is left unossified. Calcifications of thyroid cartilage can be focal, or diffuse and amorphous (Fig. 5).

Cricoid cartilage

Cricoid ossification typically follows that of the thyroid cartilage. The first part to be calcified is the superior portion and lamina, and hence could easily be mistaken for the foreign body[6]. The calcification then progresses caudally. In the adult, the cricoid cartilage is located at the level of C6 and C7 vertebrae, and in the child, it is located at C3 and C4 vertebral levels. In our experience, vertical calcification of the posterior lamina of the cricoid cartilage is most common calcification to be mistaken for a foreign body (Fig. 6). Typically, location of this vertically-orientated linear opacity at the level of C6 and C7 vertebra i.e. inferior to the thyroid cartilage, with subtle anterior concavity, may help in correctly identifying it. Again, the calcification in cricoid cartilage may be patchy or diffuse.

Arytenoid cartilage

These paired cartilages calcify in the 3rd decade of life. The base of this cartilage that rests on the upper edge of cricoid lamina is usually the first part to calcify[6]. If the base alone is calcified, it appears as a horizontally-oriented slightly-curved linear opacity, with a convex surface above the cricoid lamina (Fig. 7a). Completely calcified arytenoid cartilages appear as L-shaped paired radio-opaque structures on the lateral neck radiograph (Fig. 7b).

Triticeous cartilage

The triticeous cartilage (or cartilago triticea) is a variable small elastic cartilage that is located within the lateral thyrohyoid ligament. When present and calcified, it could be mistaken for a foreign body on radiographs[6]. They are usually seen as paired well-defined rounded opacities, lying in a line drawn from tip of the superior horns of thyroid cartilage to the posterior end of the greater horns of hyoid bone (Fig. 8).

Styloid process and stylohyoid ligament

The styloid process is a slender elongated bony projection that is located anteromedial to the mastoid process and extends caudally toward the hyoid bone. On the lateral neck radiograph, a long styloid process may project over upper aerodigestive tract (Fig. 9). Similarly, the calcified stylohyoid ligament can be confused with a fish bone in valleculae. It is a fibrous cord, which is attached to the tip of the styloid process and extends to the lesser cornua of the hyoid bone. The identification of paired linear densities along the anatomical path of this ligament is helpful in identifying this structure and in excluding a fish bone (Fig. 10).

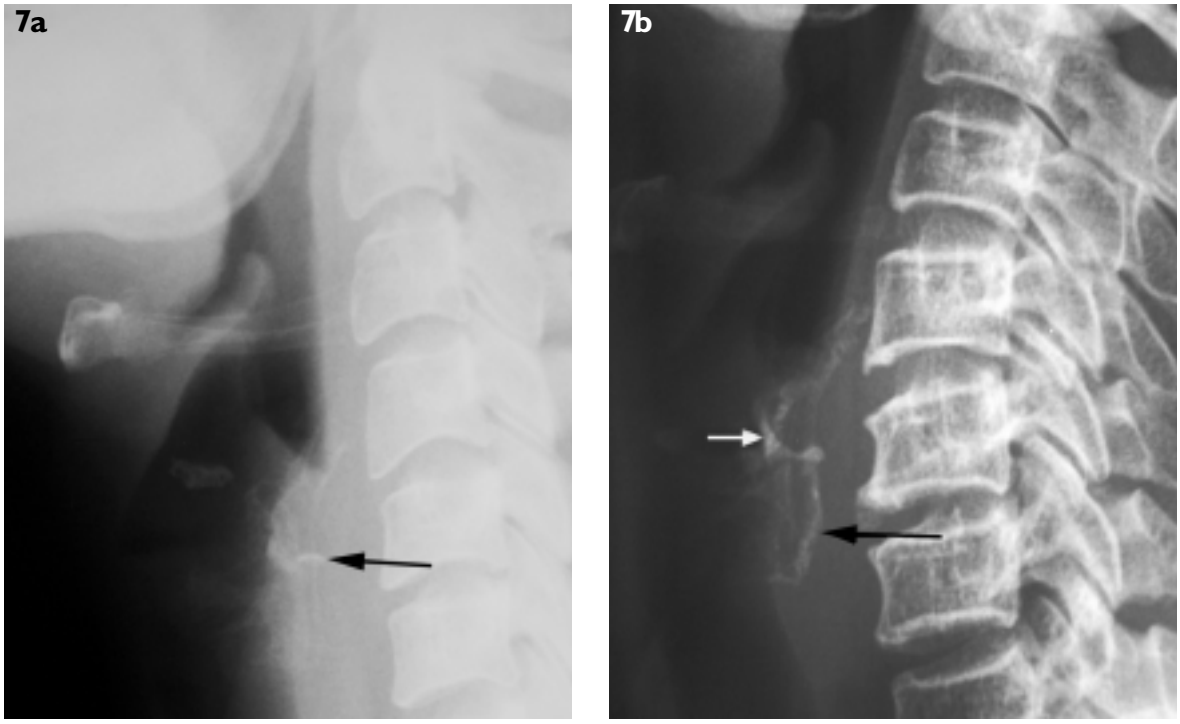


Fig. 7 Varying calcification of the arytenoid cartilages in two different patients. (a) Horizontally-orientated linear calcification of arytenoid cartilage (arrow) located adjacent to the superior edge of the cricoid cartilage is present. (b) L- shaped calcification of arytenoid cartilage (white arrow). Overlapping calcifications of posterior cricoid lamina and inferior thyroid cornua are present (black arrow).

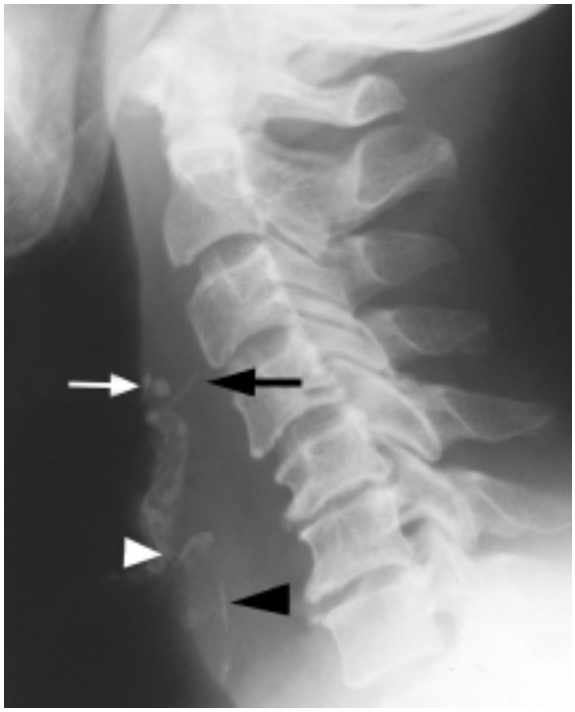


Fig. 8 Normal and abnormal calcifications in a neck radiograph. There is a embedded curvilinear fish bone (black arrow). Note calcifications of posterior lamina of cricoid (black arrowhead), arytenoid (white arrowhead), and triticeous cartilages (white arrow). There is widening of the prevertebral soft tissue, an important secondary sign of an impacted foreign body.

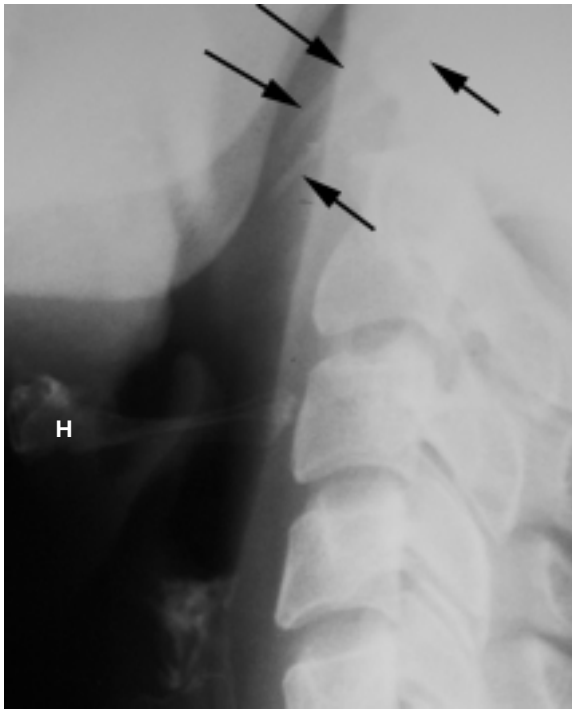


Fig. 9 Normal calcification of the paired styloid processes (arrows). Note the patchy calcifications of the thyroid cartilage (H: hyoid bone).

Calcification in the prevertebral space

Marginal vertebral osteophytes and ossification of anterior longitudinal ligament may be mistaken for a foreign body by an inexperienced observer. Typically, osteophytes are located at the inferior or superior corner of vertebral bodies and may extend

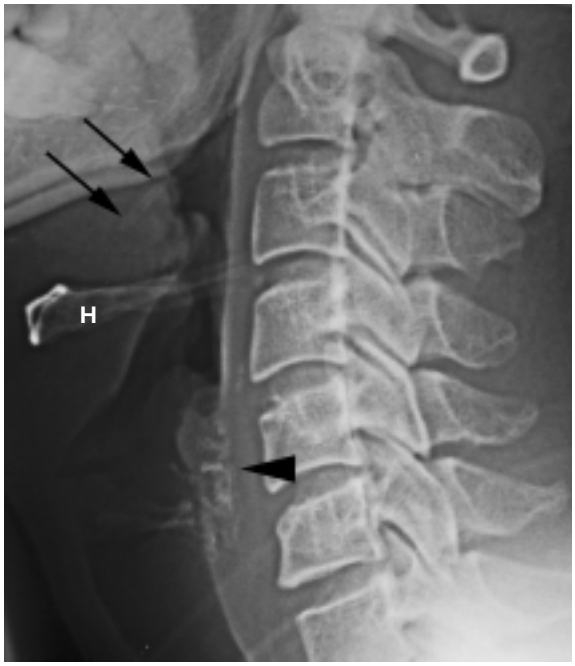


Fig. 10 Calcified stylohyoid ligament (arrows). Note calcifications of various laryngeal cartilages, including the arytenoid cartilage (arrowhead) (H: hyoid bone).

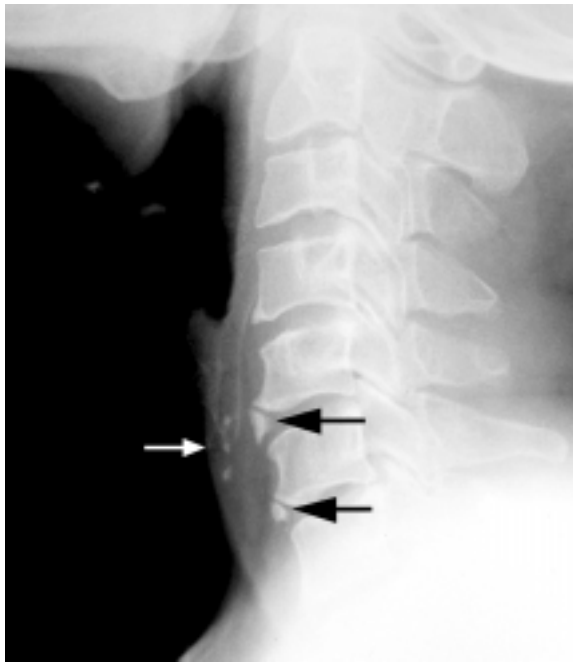


Fig. 11 Osteophytes at the anterior-inferior aspect of C5 and C6 vertebral bodies (black arrows). There is patchy calcification of the cricoid cartilage (white arrow).

vertically or obliquely anterior to the disc space (Fig. 11). Other changes of degenerative spondylosis are usually present. Other calcified structures which may simulate foreign bodies are tracheal calcification, salivary gland/calculus, and lymphoid tissue calcification.

In conclusion, interpretation of the lateral neck radiograph may not be easy and is often problematic for inexperienced doctors. A normal calcified structure may be mistaken for an ingested foreign body, while an impacted foreign body and its sequelae may not be recognised. Occurrence of the former may result in the excessive investigation of the patient and the wastage of manpower and resources, while the latter may contribute to increased patient morbidity and mortality. Although the lateral neck radiograph has its own limitations due to the presence of typical and atypical physiological calcifications in the neck, it still remains the first imaging investigation in the evaluation of patient with a suspected swallowed fish bone. If the radiograph is positive, unnecessary delay in further management of the patient can be avoided. If the radiograph is negative, in the presence of strong clinical evidence of a foreign body, it would be prudent to proceed to a barium swallow and/or CT examination[8].

ABSTRACT

A 71-year-old man presented with a suspected swallowed fish bone. The lateral radiograph of the neck showed a curvilinear radio-opaque density in the swollen pre-vertebral soft tissues. The diagnosis of a migrated fish bone was confirmed on computed tomography and during subsequent surgery. The patient made a good recovery. As calcified normal structures, particularly the laryngeal cartilages, can mimic abnormal radio-opaque foreign bodies, it is important to be able to recognise the normal calcified structures seen on the neck radiograph. A sound knowledge of radiological anatomy is required in order to avoid unnecessary investigation and to provide prompt and appropriate management.

Keywords: fish bone, foreign body, imaging, laryngeal cartilages, lateral neck radiograph

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SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME

Multiple Choice Questions (Code SMJ 200408B)

	True	False
Question 1. Regarding symptomatic ingested foreign bodies in Singapore:		
(a) The most common object ingested is the fish bone.	❑	❑
(b) Dysphagia is one of the usual presentations.	❑	❑
(c) There is usually a good correlation between ingestion of a foreign body and onset of symptoms.	❑	❑
(d) 90% of fish bones are impacted in the infrahyoid area.	❑	❑
Question 2. Common sites for lodgement of ingested foreign bodies in the neck are:		
(a) Valleculae.	❑	❑
(b) Pyriform sinuses.	❑	❑
(c) Cricopharyngeal region.	❑	❑
(d) Thyroid gland.	❑	❑
Question 3. The following are recognised radiographical signs of an impacted fish bone in the neck:		
(a) Linear radio-opaque density.	❑	❑
(b) Widening of the prevertebral soft tissue space.	❑	❑
(c) Streaky air shadows within the soft tissue.	❑	❑
(d) Fracture of the stylohyoid ligament.	❑	❑
Question 4. The following statements regarding laryngeal cartilages are true:		
(a) If calcified, they may mimic ingested foreign bodies.	❑	❑
(b) It is rare for the thyroid cartilage to calcify, particularly in the elderly.	❑	❑
(c) The calcified posterior lamina of the cricoid cartilage is typically horizontally-orientated.	❑	❑
(d) Completely calcified triticeous cartilages are typically L-shaped.	❑	❑
Question 5. The following structures appear as paired calcifications on the lateral neck radiograph:		
(a) Stylohyoid ligament.	❑	❑
(b) Arytenoid cartilage.	❑	❑
(c) Superior cornua of the thyroid cartilage.	❑	❑
(d) Anterior longitudinal ligament.	❑	❑

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2. Successful candidates will be notified by email in October 2004.
3. Passing mark is 60%. No mark will be deducted for incorrect answers.
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