RADIO-OPACITY OF MALAYSIAN FISH BONES- AN *IN VITRO* STUDY

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ABSTRACT

Foreign body ingestion is a common problem presenting to the Accident Emergency department. The foreign body most commonly ingested being fish bone. A lateral neck radiograph is often requested for making the diagnosis. However, a large proportion of fish bones are not radio-opaque which makes this a difficult diagnostic problem.

OBJECTIVE

The objective of this study was to determine the incidence and types of impacted foreign bodies in the upper gastrointestinal tract in the Malaysian population as well as to assess the radio-opacity of the bones of common Malaysian fish.

METHODS AND MATERIALS

A retrospective study was carried out over a one year period i.e. 1st. Jan - 31st. Dec 1995 at University of Malaya, Medical Center, Kuala Lumpur to note the incidence and type of swallowed foreign body in the Malaysian population. An in-vivo study was done where the dried bones of 18 species of Malaysian fish were radiographed separately as well as in an animal carcass using X-omatic Kodak film with a X-omatic Kodak regular intensifying screen. A Kodak RPX - OMAT processor, model M6B was used.

RESULTS

Foreign body impaction is more common in adults with fish bones being the most common cause (88%). The lateral soft tissue neck was only able to demonstrate 4 out of the 19 patients but those missed were located in the tonsils, valleculae and posterior pharyngeal wall and would be visible on oral examination. In the in vitro study, 89% of the bones were well to moderately visualized in the larynx, 50% moderately to well visualized in the oesophagus but none could be seen in the tonsil or valleculae.

CONCLUSION

The results concur with those of other studies with regards to the age and type of foreign body impaction except that there were no cases of food bolus impaction. Most of the Malaysian species of fish bones were visible in the oesophagus but none placed in the valleculae or tonsil. It would seem that the results are in agreement with those of the retrospective study in that all the impacted foreign bodies located in the oesophagus were visible on the plain radiograph.

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INTRODUCTION

Foreign body ingestion is a common problem presenting to the Accident Emergency department. Fortunately of the foreign bodies that reach the gastrointestinal tract, 80-90% will pass spontaneously.[1] However 10-20% will require non-operative intervention and 1% or less will require surgery.[1] Most true foreign bodies especially metallic are radio-opaque and can be identified on plain films of the neck, chest or abdomen. However objects such as fish or chicken bones, wood, plastic, most glass and metal objects are not readily seen.[1] The type of materials that can lodge in the gastrointestinal tract can be classified into 2 groups, one that consists of food bolus impaction while the second consists of true foreign bodies. The latter group consists of blunt (buttons, coins, etc.) and sharp pointed objects (ones, nails, etc.) and the miscellaneous group (disc batteries). The complications that have been noted to arise from swallowed foreign bodies especially sharp foreign bodies are perforation, parapharyngeal abscess, mediastinitis pericarditis, pneumothorax, pneumomediastinum, tracheo-oesophageal fistula and vascular injury.

The majority of swallowed foreign bodies have been noted to be bones. A study done by Sprigg et al[2] looked at the species variation of the radio-opacity of fish-bones in the western context. Of the 14 species of fish radiographed, 64% were moderately to clearly visible in the larynx and oesophagus and 57% being visualised in the valleculae and tonsil. Hence in their study a lateral neck radiograph proved useful in the detection of swallowed fish bones especially when the type of fish ingested is known.

There is no data available on the incidence, types and complications of swallowed foreign bodies at University Hospital, Kuala Lumpur. In addition the radio-opacity of common Malaysian fish bones is also not known.

The objective of this study was to determine the incidence and types of swallowed foreign bodies in the Malaysian population. We also assessed the radio-opacity of the bones of common Malaysian fish on a lateral neck radiograph in an animal carcass and hence the usefulness of a lateral neck radiograph in detection of fish bone impaction.

MATERIALS AND METHODS

A retrospective study covering a one year period from 1st Jan-31st Dec 1995 was carried out to determine the incidence and types of swallowed foreign bodies in the Malaysian population presenting to the University of Malaya Medical Center, Kuala Lumpur. The radiographs and case notes of all the patients who had presented at the Accident and Emergency department for complaints related to foreign body ingestion were reviewed. The case notes were then reviewed to note the age, sex, complaint at presentation, clinical examination findings, findings on endoscopy and any related complications. The radiographs were then reviewed by 2 radiologists and the presence and type of foreign body noted. Results were then tabulated.

The dried clean bones of 18 species of Malaysian fish (Table 1) were radiographed separately to determine the radio-opacity of the bones of common Malaysian fish. This was done by placing different sized bones of all the different species on the same double film-screen combination (as used in the rest of the study) and radiographed. The radio-opacity of the bones was graded as Grade 1- poorly visible, Grade 2- moderately visible and Grade 3- clearly visible.

The fish bones of each species in turn were then placed in the four locations (Figure 1) in the animal carcass and radiographs taken. The locations chosen were the tonsil, valleculae, larynx and oesophagus. The exposure factors used were 48 kVp, 5 mAs , a FFD of 100cm. No grid was

used as the lateral neck radiograph is generally taken without using a grid. The film used was a Kodak X- Omatic while the intensifying screen was a Kodak X- Omatic Regular. The film were processed using a normal processor (KODAK RPX-OMAT processor, model M6B). The radio-opacity of the fish bones was graded by two radiologists by consensus. The radio-opacity of the fish-bones once implanted within the goats neck preparation was as Grade 1- fishbone not seen, Grade 2- fishbone moderately visible and Grade 3- fishbone clearly visible.

The phantom used was an animal carcass consisting of a goat's head and neck. This was chosen as the exposure factors used were comparable to a soft tissue lateral radiograph of the human neck.. There were in addition social and cultural constraints for choosing the goat's preparation. The carcass had been sectioned in the mid-sagittal plane through the oesophagus and trachea allowing easy placement of the fish bones. The carcass was stored in formalin to preserve the soft tissues.

Table I. The Scientific, English and Local names of the 18 species of fish.

Scientific	English	Local
1. Clarius Batrachus	Walking Cat-Fish	Keli Kayu
2. Formio Niger	Black Pomfret	Bawal Hitam
3. Rastrelliger Brachysoma	Short Bodied Mackerel	Pelaling Kembong
4. Megalaspis Cordyla	Hardtail Scad	Cencaru
5. Selaroides Leptolepis	Yellow Banded Scad	Selar Kuning
6. Eleutheronema Tetradactylum	Fourfinger Threadfin	Senangin
7. Hilsa Toli	Tolishad	Terubuk
8. Thunnus Tonggol	Longtail Tuna	Tongkol
9. Chirocentrus Dorab	Dorab Wolf-Herring	Parang
10. Pampus Argenteus	Silver Pomfret	Bawal Puteh
11. Scomberomorus Commerson	Narrow-Barred Spanish Mackerel	Tenggiri Batang
12. Lutjanus Johni	Golden Snapper	Jenahak
13. Lates Calcarifer	Giant Perch	Siakap
14. Leptobarbus Hoevenii	Sultan Fish	Jelawat
15. Epinephelus Sexfasciatus	Six-Banded Grouper	Kerapu
16. Nemipterus Delagoae Smith	Delagoa Threadfish Bream	Kerisi
17. Oreochromis Niloticus	Nile Tilapia	Tilapia
18. Channa Striatus Bloch	Striped Snakehead	Aruan

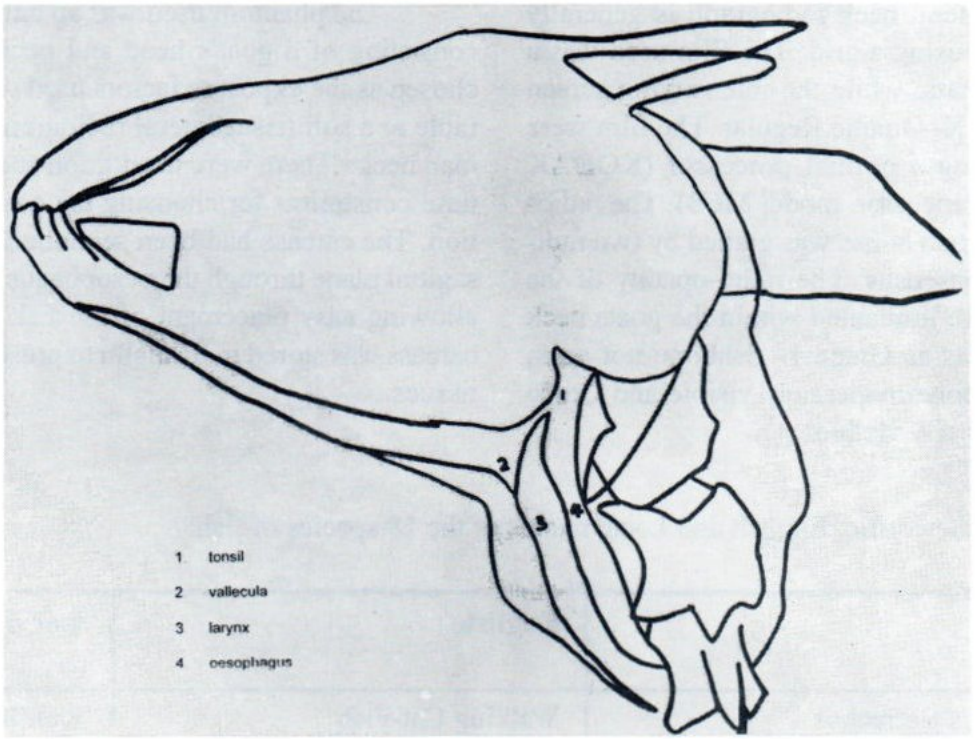

Fig. 1. The line drawing of the goat carcass with the locations of the implanted bones.

RESULTS

The data collected showed that a total of 118 patients (76 adults, 42 children) presented with history of swallowed foreign bodies over the time period evaluated. Swallowed foreign bodies were more common in adults (64.4%), compared to children (35.6%). In adults, swallowed foreign bodies were more common in females (55.3%), compared to males (44.7%), whereas in children the reverse was true i.e. 48% in females and 52% in males (In adults the male: female ratio was 1:1.4 and in children the ratio was 1.1:1). Age ranged from 7mths-73yrs. The mean age was 24yrs while the mode was 32yrs. The most frequently swallowed foreign body noted was due to fishbone, and this being more common in adults. (37 males, 30 females). Coins were noted to be the most commonly swallowed foreign body in children. The other swallowed foreign bodies included pins, bottle stopper, dentures, play-toy, preserved plum seed, metal lid, needle, metal bolt, screw, local kebab stick, wire, chain, nail, ring, gold plated necklace and buttons.

Of the suspected swallowed foreign bodies, bones constituted the largest number i.e. 64.4%, compared to other foreign bodies 35.6%. The commonly swallowed bones were fish bones (88%) followed by chicken bones (10.5%) and duck bones (1.5%). Of the 67 suspected cases of impacted fish bones, 15 patients were not radiographed i.e. just a peroral examination was done and most of the bones were noted to be impacted in the tonsil, followed by posterior pharyngeal wall and valleculae. 52 patients were radiographed and out of these there were 4 which were true positive (confirmed by endoscopy). Of the 48 patients that were radiographed negative, 15 patients were false negative (on examination 8 had bones lodged in their tonsil, 5 in valleculae and 2 in posterior pharyngeal wall). The remaining 33 patients were true negatives. Peroral examination picked-up the 30 patients with impacted fish bones in the oropharynx.

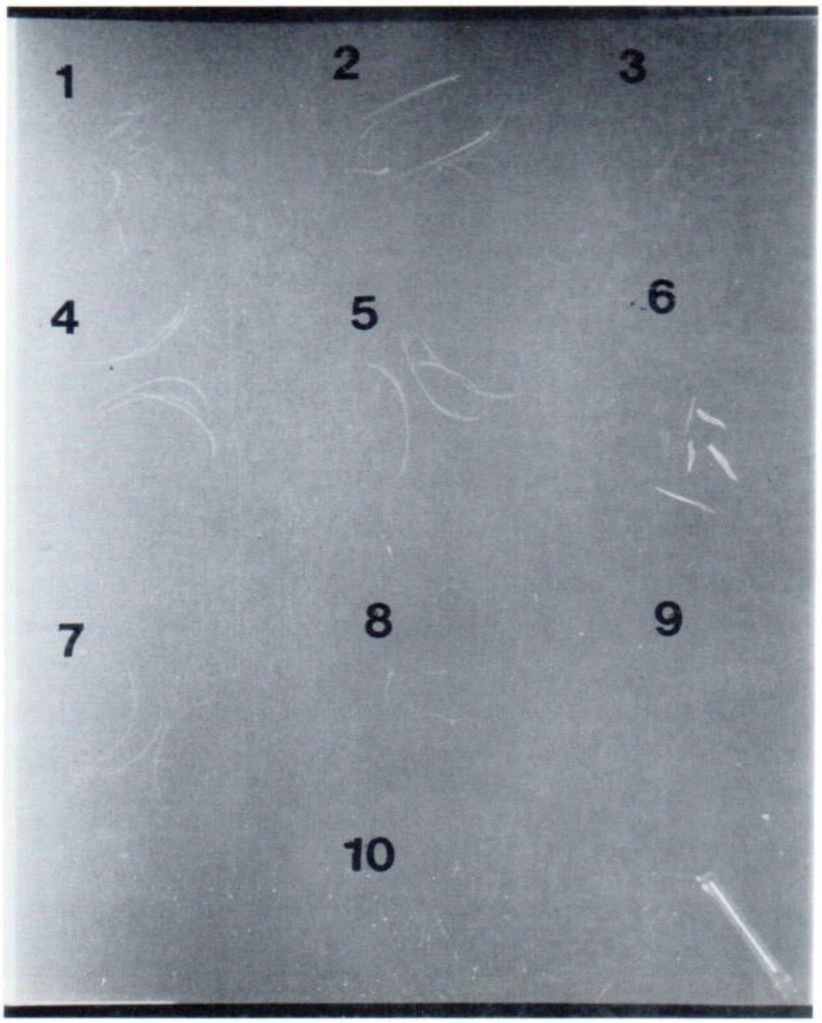

Fig. 2a Radiograph of the dried fish bones prior to implantation labelled as follows

	Scientific	English	Local
1.	Clarius Batrachus	Walking Cat-Fish	Keli Kayu
2.	Formio Niger	Black Pomfret	Bawal Hitam
3.	Rastrelliger Brachysoma	Short Bodied Mackerel	Pelaling Kembong
4.	Megalaspis Cordyla	Hardtail Scad	Cencaru
5.	Selaroides Leptolepis	Yellow Banded Scad	Selar Kuning
6.	Eleutheronema Tetradactylum	Fourfinger Threadfin	Senangin
7.	Hilsa Toli	Tolishad	Terubuk
8.	Thunnus Tonggol	Longtail Tuna	Tongkol
9.	Chirocentrus Dorab	Dorab Wolf-Herring	Parang
10.	Pampus Argenteus	Silver Pomfret	Bawal Puteh

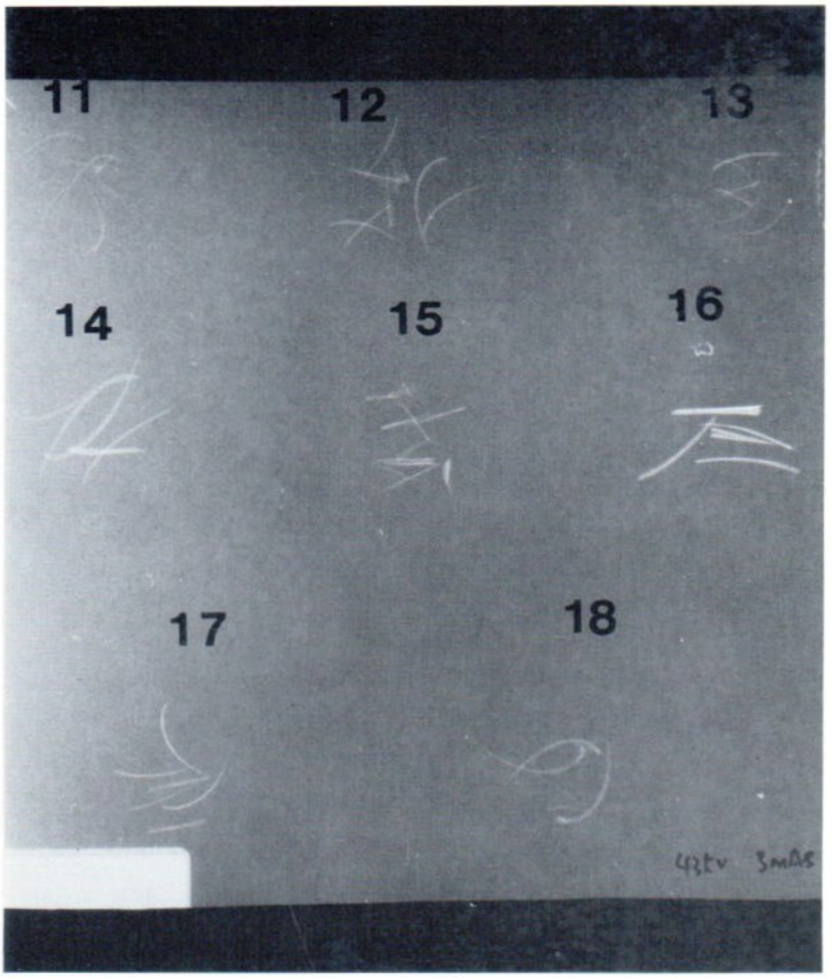

Fig. 2b. Radiograph of the dried fish bones prior to implantation labelled as follows

11.	Scomberomorus Commerson	Narrow-Barred Spanish Mackerel	Tenggiri Batang
12.	Lutjanus Johni	Golden Snapper	Jenahak
13.	Lates Calcarifer	Giant Perch	Siakap
14.	Leptobarbus Hoevenii	Sultan Fish	Jelawat
15.	Epinephelus Sexfasciatus	Six-Banded Grouper	Kerapu
16.	Nemipterus Delagoae Smith	Delagoa Threadfish Bream	Kerisi
17.	Oreochromis Niloticus	Nile Tilapia	Tilapia
18.	Channa Striatus Bloch	Striped Snakehead	Aruan

Of the 42 other swallowed foreign bodies, 36 had x-rays taken. Chest x-ray was diagnostic in 5 patients for coins[4] and dentures.[1] Abdominal x-ray was positive in 16 patients for coins,[9] chain,[2] metallic toy,[1] stopper,[1] pin,[1] screw,[1] button.[1] None suffered complications. Cervical spine x-ray was positive far one patient (coin).No foreign body was detected in the remaining 21 patients.

Most of the swallowed foreign bodies (76/118) are noted to pass through the GIT without complications. Of foreign bodies which commonly impact (mainly fish-bones) 28 were removed by peroral examination and 4 by endoscopy. None of these patients had associated complications. Studies performed revealed a low rate of complications. The common complaints were foreign body sensation in the throat, dysphagia, odynophagia, blood stained sputum and vomiting.

The visibility of the dry bones is as shown in (Table II.) It is noticed that most of the dry bones when radiographed separately are well visualised, except for bones of parang. The bones of bawal puteh were only moderately visible.

Results of the Radiographic Visibility of the 18 species of fish using X-omatic film-screen combination when implanted in the goat carcass are shown in (Table III.) Most of the bones were moderately to well visualised in the larynx (i.e. 89%) except for bones of Walking Cat-fish and Sultan fish. 50% of the bones were moderately to well visualised in the oesophagus i.e. those of Hardtail Scad, Fourfinger Threadfin, Narrow-Barred Spanish Mackerel, Golden Snapper, Giant Perch, Six-Banded Grouper, Delagoa Threadfish Bream, Nile Tilapia and Striped Snakehead. None of the bones were seen in the valleculae or tonsil.

Table II. The radiographic visibility of dry bones of 18 species of fish. The radio-opacity of the dried bones was graded as Grade 1-poorly visible, Grade 2- moderately visible and Grade 3- clearly visible.

NAMES OF FISHES	GRADING
Walking Cat-Fish	3
Black Pomfret	3
Short Bodied Mackerel	3
Hardtail Scad	3
Yellow Banded Scad	3
Fourfinger Threadfin	3
Tolishad	3
Longtail Tuna	3
Dorab Wolf-Herring	1
Silver Pomfret	2
Narrow-Barred Spanish Mackerel	3
Golden Snapper	3
Giant Perch	3
Sultan Fish	3
Six-Banded Grouper	3
Delagoa Threadfish Bream	3
Nile Tilapia	3
Striped Snakehead	3

Table III. Radiographic visibility of bones of 18 species at four different sites in the goat neck preparation. The visibility was graded as 1- not visible, 2- moderately visible and 3- well visualised.

NO	NAMES OF FISHES	LARYNX	VALLECULAE	TONSIL	OESOPHAGUS
1.	Walking Cat-Fish	1	1	1	1
2.	Black Pomfret	2	1	1	1
3.	Short Bodied Mackerel	2	1	1	1
4.	Hardtail Scad	3	1	1	3
5.	Yellow Banded Scad	2	1	1	1
6.	Fourfinger Threadfin	3	1	1	3
7.	Tolishad	2	1	1	1
8.	Longtail Tuna	3	1	1	1
9.	Dorab Wolf-Herring	2	1	1	1
10.	Silver Pomfret	2	1	1	1
11.	Narrow-Barred Spanish Mackerel	2	1	1	2
12.	Golden Snapper	3	1	1	3
13.	Giant Perch	3	1	1	3
14.	Sultan Fish	1	1	1	1
15.	Six-Banded Grouper	3	1	1	3
16.	Delagoa Threadfish Bream	3	1	1	2
17.	Nile Tilapia	3	1	1	2
18.	Striped Snakehead	3	1	1	2

DISCUSSION

Of all patients ingesting foreign bodies, studies performed showed adults to represent 17-85% of cases which is similar to our study where adults constitute 64.4 % of the population. Patients younger than 40 years have the highest incidence of (nonfood) foreign bodies (94%), whereas in patients greater than 60 years, food bolus predominates (72%).[1] It was also found that in the 60 years old group, 72% were found to have associated diseases and as many as 75% had dental appliances. In our study there were no patients older than 40 years. The associated disorders reported for adult patients ingesting foreign bodies have included prisoners, presence of dentures, past history of suicidal attempts, psychiatric histories[1] and alteration in the normal protection mechanism secondary to alcohol or cerebrovascular accidents. Except for the 3 patients who allegedly swallowed dentures none of our patients had any of these associated diseases. This is similar to study by Phillipps and Patel[3] who also found no predisposing factors towards swallowed foreign bodies. The main reasons for people ingesting a foreign body is either sheer misfortune or sheer carelessness

through people "gulping" their food down. Pediatric patients have been cited to comprise 14-83% of patients ingesting foreign bodies. Most occurred in the 3 mth-12 year age group with the incidence being equal in males and females.[1]

Fish bones are the most commonly encountered (50-71.6%) ingested foreign body , followed by meat bones (15%), unknown and coins (26%) and food bolus (10%).[1,3,4] Impaction of food bolus is due to the presence of underlying esophageal disease and poor sensitivity from dental prostheses.[1] Surprisingly in our study there were no cases of food bolus impaction and this is probably related to the younger population as well as the difference of diet which is a more Asian diet with less ingestion of steak.

Most foreign bodies pass through the gastrointestinal tract without major complications. Only 10-20% will lodge and require surgical removal with less than 1% presenting with perforation. The most common site of impaction are in the oral cavity and oropharynx[1,4] which is also the finding in our study (30 out of 34 cases). This is usually due to the smaller sized fish bones whereas the larger fish bones impact in the upper thoracic esophagus (17%) and lower esophagus (6%).[1] Complications of penetration or perforation of the esophagus reported have included include paraesophageal abscess, mediastinitis, pericarditis, pneumothorax, pneumomediastinum, tracheo-oesophageal fistula vascular injury and esophageal diverticulum.[6] However suprisingly in our study none of these complications were reported. This may be related to the early presentation to the Accident & Emergency department and the liberal use of flexible endoscopy. Interestingly, mortality due to perforation was found to be higher with those foreign bodies situated intraluminally and lower with those where the object had migrated out of the lumen.[7] This mortality was highest for dental appliances which had eroded the mucosa particularly when the appliance had lodged in the lower thoracic oesophagus.[7] Infection and vascular complications are the usual cause of death.[7]

Plain radiography is highly specific for fishbone lodgment when the radiograph is positive though however its sensitivity is low.[4,5] This is in contrast to our study where the lateral soft tissue was able to demonstrate all 4 fish bones impacted in the oesophagus but none in the oropharynx. This concurs with the in-vitro study where none of the bones placed in the tonsil or valleculae were seen. The failure to visualize bones impacted in the tonsil or vallecula is not really a problem since an oral examination or indirect laryngoscopy would be able to visualize these impacted fish bones.[4] It has been suggested that patients complaining of ingestion of fish bones, should have an oral examination performed first to detect the fish bone, regardless of symptoms and radiographic findings.[4]

There is uncertainty about the role of the lateral soft tissue neck radiographs in the management of impacted fish bones. Like several authors,[3,12] we feel that plain films (a good quality lateral of the neck and sometimes with a chest radiograph) have been found to be an excellent method of detecting or excluding the presence of most foreign bodies and is basic to the investigation of foreign body ingestion. The presence of an impacted foreign body would allow a definitive diagnosis though the radiographic absence should not obviate the need of endoscopy in the appropriate clinical setting. In dealing with radio-opaque foreign bodies, it will show whether the foreign body is present or not or has passed into the stomach. In addition it is able to demonstrate the presence of complications e.g. subcutaneous emphysema, abscesses etc.. It will also give information on the state of the spine if subsequent general anaesthesia becomes necessary. However several authors[5,3-15] have called into question the value of these radiographs. These radiographs resulted in a change of management in only 1.4% but resulted in a 2% risk of unnecessary endoscopy.[13] Further, there may be an unnecessary delay in definitive management[5] and therefore they suggested that patients with a strong history of complaints of fish bone ingestion i.e. 48 hours or less should first be

evaluated with oral and endoscopic examination.

Calcification of normal laryngeal cartilage especially the vertical plate of the cricoid can make the recognition of a foreign body e.g. fish bone lodged in the pharynx difficult. Misinterpretation of soft tissues and calcified laryngeal appearance as foreign bodies occurred in 18/54 positive radiographs.[4] As fish bones have been found to be commonly swallowed foreign bodies it is helpful to know the exact type of fish that was eaten. Radiodensity is dependent on the type of fish. Shallow water fish have denser bones. Deep water sea fish have reduced ossification. Size wise, bones of larger fish have denser bones.

In practice, when plain films have been obtained and no direct signs (bone) or indirect signs (swelling or gas in soft tissue) are detected then it is important to maintain a low threshold for proceeding to endoscopy, which is both diagnostic and therapeutic. Patients on clinical grounds who are well enough to be sent home after normal plain films should be told to re-attend the next day if symptoms persist so that an ENT specialist can reassess the patient. In addition to localization of radio-opaque objects, presence of free mediastinal or peritoneal air should be assessed.

A study on the radio-opacity of fish bones species variation was done by Ell and Sprigg.[2] They used the clean dry bones implanted in the reconstituted pig offal. Their results showed that most (64%), of the bones were moderately to clearly visible in the larynx and oesophagus (being better visualized in the larynx), and 57% being visualised in the valleculae and tonsil. In our study only 50% were visible in the oesophagus (9 species of fish). Thus in patients ingesting the other 9 species (Walking Cat-fish, Black Pomfret, Short Bodied Mackerel, Yellow Banded Scad, Tolishad, Longtail Tuna, Silver Pomfret, and Sultan Fish) a negative radiograph is going to be the norm and therefore in these species the radiographs may not be used to determine the presence. However for the 9 species that are visible the absence may be good evidence of true negative especially if not symptomatic. 89% were clearly seen in the larynx (16 species of fish, except Walking Cat-Fish and Sultan Fish) but none seen in the tonsil or vallecula.

The differences in the radio-opacity of fish from Malaysia and British Isles may be related to the greater inherent density of the fish of the British Isles though these differences may be due to the different phantom used which may not be truly representative of the actual situation. This may also account for the higher visibility of the bones in the tonsil and vallecula since the identification of the position of the bones. We reckon that our phantom simulates closely the true situation since the goat's head and neck was sectioned through the midsagittal plane without disrupting the anatomy. Ell and Sprigg[2] inferred that a lateral neck radiograph was useful in the further detection of swallowed fish bones especially when the type of fish ingested is known. An earlier study was done by them using chicken legs as the site of implantation[15] but this was certainly not representative of the true situation.

Dense bones (e.g. Hardtail Scad, Fourfinger Threadfin, Narrow-Barred Spanish Mackerel, Golden Snapper, Giant Perch, Six-Banded Grouper, Delogoa Threadfish Bream, Nile Tilapia and Striped Snakehead) will be clearly seen anywhere compared to the poorly opaque bones (e.g. Walking Cat-fish, Black Pomfret, Short Bodied Mackerel, Yellow Banded Scad, Tolishad, Longtail Tuna, Silver Pomfret, and Sultan Fish) which will only be visible when viewed against bone. Long bones will also be better seen than the shorter bones. The density of fish bones can be inferred from its functional design and habitat.[2] In our study the fresh water fish appear to have denser bones compared to the sea dwellers. This has been attributed to dwelling in shallower waters. Other factors which have been suggested as affecting the density of bones include the size (the weight/length to surface area), the speed of swimming and the presence of oils within the fish.[16-18]

There is little role for any contrast studies in the diagnosis of impacted fish bone except the use of cotton wool soaked in barium, but this is no longer a common practice. However contrast studies may have a role in the diagnosis of perforations. Water soluble contrast media (Gastrografin) or even better non-ionic water soluble contrast medium would be used in cases of[1] suspected esophageal perforation to minimize complications (chemical pneumonitis) from leakage of the agent into the mediastinum or pleural space. If no perforation is noted, the examination is completed with inert barium sulfate since it has minimum reactivity in the lungs and is used if aspiration is a concern. Contrast examination should not be performed if high grade acute esophageal obstruction is suspected. For localizing small/low contrast objects, thick barium paste may be used.

Computed tomography (CT scan) reviewed at soft tissue and bone windows has been at times used to detect foreign bodies in the cervical esophagus[9] where there are associated complications, to look for foreign bodies that are seen on radiographs but not on endoscopy, and when there is no plain film evidence of foreign body but on endoscopy mucosal tears are noted suggestive of foreign body impaction.[9] However it is not a good mode of screening. It demonstrates and localizes small calcified esophageal foreign bodies as well as any associated complications. There is better detection of thin, small, minimally calcified foreign bodies which are often obscured by overlying tissues in the usual x-ray studies. Spiral or helical computed tomography, which permits images to be reconstructed at variable positions without additional scanner time or radiation exposure may have a role in the management of impacted fish-bones but this has not been determined.

Impacted foreign bodies require surgical referral. More than 80% of ingested foreign bodies passing the oesophagus will be spontaneously eliminated without complication and therefore expectant observation is indicated in this group of patients. For those that impact in the oesophagus numerous methods of treating these have been described. These involve both pharmacologic and mechanical methods. Rational treatment must be based on symptoms, type and size of foreign body, location of impaction, duration of symptoms and the possibility of underlying pathology. Endoscopy remains the treatment of choice for foreign body extraction by those trained in their use. It is the only non-surgical method of removing impacted sharp foreign bodies. Benefits include direct visualisation of the foreign body, ability to evaluate associated oesophageal pathology and maintain airway control. There are however complications to this procedure and mortality is a recognised complication. Further it requires a general anaesthetic.

CONCLUSION

As compared to studies done elsewhere, the commonest swallowed foreign body in the Malaysian population was noted to be fish-bones in adults and coins in children. The incidence was also higher in adults. The visibility of a fishbone depends on its inherent radio-density and the relative density between it and the tissue in which it is embedded. Based on the results of the radioopacity of the bones of the 18 species of fish on the lateral neck radiograph, it is concluded that most bones were generally moderately to well visualised in the larynx, most of the bones were not visualised in the oesophagus and were never detected in the valleculae or tonsil. Hence as swallowed fish bones generally impact in the valleculae and tonsil for which a peroral examination suffices, a lateral neck radiograph though can be used as a mode of investigation for fish bone impaction in the oesophagus, however it cannot be used to exclude the presence of a foreign body. If clinically suspicious an endoscopy is warranted to minimise the risk of complications.

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