present unexplained. Hypertrophic spondylitis deformans with the formation of osteophytes around the bodies of the vertebrae, yet another form of osteo-arthritis, will not be dealt with here.

The different types which, for the present, may be included in the osteo-arthritic group are as follows: (1) single major joint (possibly infective); (2) several major joints (rare); (3) major and several minor joints (hands); (4) minor joints (hands) alone involved; (5) spondylitis deformans; (6) osteochondritis dissecans.

The most tragic of cases treated at the clinic are the young patients crippled by spondylitis deformans, or the so-called general infective arthritic cases. To my mind this type of arthritis requires separate study and interpretation. It is interesting, however, to note that most of these unfortunate patients have, at the age of 20, the bones of a man of 50; their costal cartilages show extensive calcification, while other senile degenerative changes are present, suggesting that the disease has some metabolic basis. Another interesting observation I have made is that many of these spondylitis deformans cases (90 per cent.) show evidence of a chronic infective condition, or even abscess formation in the sacro-iliac joints.

GOUT

The feature in "uratosi," or "osteo-arthritis urica" of the Germans, is the deposit of sodium urate crystals in the articular ends of the minor joints of the hand and wrist; occasionally in the joint of the big toe.

Radiographically, these deposits are indicated by well-defined punched-out areas in the bone. Although these are usually to be found in the superficial surface of articular bone—that is, immediately under the cartilage—localized defects are occasionally situated in the actual bone substance. These small cavities may contain crystals during the active stage of the disease, later to be replaced by granulation tissue, while in some cases they are just empty spaces in the bone. There is reason to believe that the cavities noted in the head and neck of the femur, in many of the so-called osteo-arthritic hips, may be of gouty origin. I have seen one case where these gouty cavities in the bone have been replaced by normal bone, either as the result of the attack quieting down, or as a response to treatment. Further investigation on these lines might form a valuable indication as to the effect of treatment.

The various stages of the disease, as indicated in the hand, are as follows. The very early cases show no articular changes. Other changes are a single punched-out area at the base or head of the bones making up a minor joint; or, occasionally, a small group of transparent spots, frequently in the base of the first metacarpal; or involvement of the bones and joints of the wrists, producing characteristic "mottling" of the carpals. As the later stages of the disease are approached, the disorganization of joints and the difficulty in differential diagnosis become greater. A loss of cartilage occurs in joints showing gouty deposits. Irregularity and erosion of the articular bone follows, and, finally, subluxation, with almost complete destruction of the articular bone.

The presence of general osteoporosis or a disturbance of B.D.B. in rheumatoid arthritis serves to distinguish this condition from gout, in which both are absent.

A number of cases, usually under the age of 30, come to the clinic labelled rheumatoid arthritis, but prove radiographically to have characteristic gouty deposits, giving, in fact, the identical radiographic picture of those cases of gout where the clinical and radiographic diagnoses are in agreement. This indicates that gout in the early decades of life is not such a rare occurrence as is commonly thought. Recent investigations lead me to think that Still's disease in children belongs to this group.

When gout attacks a major joint there are no radiographic changes of diagnostic value.

It is in these cases, where a major joint is attacked, that the radiographic examination of a hand is so valuable, for small urate deposits are detected in the hands in nearly all cases of true gout, even though the disease has primarily attacked a major joint. Clinically, there appears to be some difficulty in differentiating between osteo-arthritis, gout, and the late stages of some types of rheumatoid arthritis, when these diseases attack the hand. Radiographically, it is comparatively simple to determine to which group the particular arthritis belongs. It is possible to get two types of arthritis in one and the same patient. Infective arthritis is not included in this paper.

I consider that eventually all chronic arthritic cases will be classified according to the changes seen radiographically. A radiograph depicts pathology in terms of shadows, and a correct interpretation of this pathological process must give us a much more reliable foundation for our diagnosis than is at present afforded by clinical methods.

FOREIGN BODIES IN THE OESOPHAGUS*

BY

F. HOLT DIGGLE, O.B.E., F.R.C.S.

HONORARY SURGEON, EAR, NOSE, AND THROAT DEPARTMENT,
ANCOATS HOSPITAL, MANCHESTER, AND MANCHESTER
EAR HOSPITAL

It has been my privilege between the years 1920 and 1930 to deal with sixty-seven cases of foreign bodies impacted in the oesophagus. During this period, however, only two verified cases of foreign bodies in the lower air passages have been admitted. According to American journals cases are frequent in that country; the habit of eating pea-nuts is said to be largely responsible. It would therefore be interesting to have the experience of British endoscopists as to the relative frequency of foreign bodies in the food and lower air passages.

As there still seems to be some doubt with regard to the urgency or appropriate treatment to be adopted when a foreign body is lodged in the oesophagus, a review of the sixty-seven cases which I have seen may be of value. The ages of the patients varied from 11 months to 62 years, while the foreign bodies consisted of thirty-nine coins, fourteen meat bones, one denture, three pins, and various charms, whistles, buttons, and badges. In fifty-eight cases the foreign body was successfully removed by endoscopic means; in seven it was ultimately passed by the rectum; in one endoscopic removal was only partially successful, the patient vomiting the rest of the fragment; the remaining case ended fatally, giving a mortality rate of 1.4 per cent.

LEVEL OF IMPACTION

Anatomically the oesophagus is constricted at four points: at its upper end on a level with the sixth cervical vertebra, where its orifice is strongly guarded by the powerful contraction of the crico-pharyngeus or inferior pharyngeal constrictor muscle, and supported anteriorly by the resistant posterior surface of the cricoid cartilage; in the thoracic portion by the arch of the aorta and the left bronchus at the level of the fourth and fifth dorsal vertebrae respectively; and, finally, on a level with the ninth or tenth dorsal vertebra the lumen narrows as it passes through the crus of the diaphragm to continue in its intra-abdominal course.

Although anatomically the oesophageal lumen is slightly constricted by the aorta and left bronchus, it is rarely, in my experience, that impaction occurs at these levels. This, no doubt, is due to the transmitted respiratory expansion and contraction of the thoracic

* A university post-graduate lecture delivered at Ancoats Hospital.

oesophagus, as also to its natural unhampered distensibility in this region. To these four anatomical oesophageal constrictions must, from the endoscopist's point of view, be added a fifth—namely, at the level of the suprasternal notch, coinciding approximately with the second dorsal vertebra. At this level several structures—trachea, oesophagus, common carotids, and subclavian arteries, together with the large veins from the neck—are all packed into a small, indistensible compartment, bounded anteriorly and posteriorly by firm, resistant bone. Most foreign bodies, especially flat disk-shaped objects, such as coins, buttons, etc., are impacted at this suprasternal or sterno-clavicular level. In the present series of cases the foreign body was recorded as impacted at the sterno-clavicular level in thirty-four instances (twenty-six coins, one button, one charm, etc.), at the upper orifice in ten cases (five meat, three coins, one charm, one safety-pin), at the lower end three times (all meat bones or meat), and at the aortic level in four patients (two meat, one coin, one pin).

UNSUCCESSFUL CASES

There were nine failures at endoscopic removal, the foreign bodies being coins (five cases), a pin, a tin whistle, and meat (two cases). All the coins, the pin, and the whistle had been radiographically located in the oesophagus. In two of the coin cases a halfpenny was gently pushed onwards with the forceps into the stomach while the patient was under the relaxation of general anaesthesia; in the one case, owing to the slipping grasp of the forceps, the coin could not be delivered perorally, and in the other, oedema from a week's sojourn of the coin prevented a complete view and hindered delivery. Retching under anaesthesia presumably accounted for the disimpaction of two other coins, the pin, and the whistle, as they were never seen in the oesophagus, though previously located by *x* rays, and all were passed naturally. The fifth and fatal case of a coin in the oesophagus occurred in a male child, aged 4, who had a halfpenny impacted for three days at the sterno-clavicular level. On admission to the hospital the child looked ill and was vomiting; the senior resident surgeon, who saw the coin, attempted removal, but failed, owing to a breakdown in the endoscopic apparatus. A further attempt was made some few hours later, but, owing to anaesthetic respiratory distress, this had to be abandoned. The child developed broncho-pneumonia, and died suddenly three days later, shortly after an injudicious hypodermic administration of 1/8 grain of morphine. A necropsy was unfortunately refused.

In one of the "meat cases" there was complete dysphagia with vomiting. A rounded, bone-like object was identified endoscopically, surrounded by considerable ulceration, but while attempting to get a grip of it the object was seen to slip away, and a further search failed to reveal it. A good recovery ensued. The other "meat case" was interesting. The foreign body was impacted at the diaphragmatic level; portions were removed piecemeal, but a quantity of barium in the oesophagus, in spite of suction and lavage, made it dangerous to continue the removal. The patient was then given liquor pepticus with dilute hydrochloric acid, and four-hourly injections of 1/150 grain of atropine; by dint of retching, the patient vomited the fragment two days later.

SYMPTOMS

A foreign body lodged in the oesophagus may on occasion give rise to vomiting, salivation, pain on swallowing, a feeling of a lump in the throat or neck, cough, or dyspnoea; while many or very rarely all of these symptoms may be present, frequently all are absent. The oesophagus is a very tolerant organ, and the foreign body, although much depends upon its nature, not infrequently, after the initial spasm or choking, lies

quiescent in the oesophagus for days. Especially is this the case with coins or smooth flat objects. In the vast majority of instances, however, sooner or later ulcerative oesophagitis sets in, which almost invariably ends fatally, unless the object be successfully and skilfully removed. Exceptional cases of foreign bodies retained in the oesophagus for years have been recorded, but these are to be regarded as pathological curiosities. This "silent period" in the symptoms often leads to a false sense of security, which may be disastrous. A pointed object, such as a pin, a denture, or a spicule of bone, is more likely to produce local pain, and, from its irritation, local spasm, causing vomiting, although its actual size may not be sufficient to obstruct the oesophageal lumen.

A large foreign body impacted in the cervical oesophagus may, through pressure on the thin posterior tracheal wall, produce urgent dyspnoea. Similarly, an object so placed can induce coughing, either reflexly from irritation or, if the obstruction is complete, from overflow of saliva or food into the larynx. The occasional occurrence of these symptoms of dyspnoea and cough is worth remembering, as otherwise one might suspect that the foreign body was respiratory rather than oesophageal. Ulcerative tracheo-oesophageal fistulae from long-retained foreign bodies, producing coughing and choking with each act of deglutition are, in these days of endoscopy and radiology, fortunately so uncommon as to be almost unknown.

The following cases illustrate some of these points:

CASE I

A female child, aged 2, was admitted with the history of having swallowed a halfpenny twenty-four hours before. The child was somewhat dyspnoeic, with profuse salivation, coughing, and vomiting. An *x* ray revealed a coin just below the cricoid cartilage, which was successfully removed.

CASE II

A woman, aged 50, was admitted two and a half hours after swallowing a large piece of meat. She was constantly coughing, salivation was profuse, and vomiting with violent fits of coughing and choking occurred with each act of deglutition. A large piece of meat was found firmly wedged in a fibrous stricture just above the clavicles.

Of the thirty-nine coin cases, definite pain was only recorded in six, in two others the child complained of "something in the throat," while vomiting after food was mentioned in fourteen (in two, vomiting occurred only for an hour or so, after which the child took liquids freely). Pain was recorded in eight of the fourteen cases of impacted meat bones, while nine of these patients complained of vomiting or, more or less, aphagia. One of the three "pin" cases was that of a child of 11 months, who was constantly crying; in the other two cases the patient complained of severe pain on swallowing, and was afraid to drink. Sharp-pointed objects are therefore more likely to produce pain, while vomiting, with or without pain, is the more frequent when large, bulky objects, such as meat, meat bones, or coins, etc., are impacted. The "silent period" in the symptoms associated with smooth disk-shaped objects must not be overlooked. A sudden and complete inability to swallow saliva, with persistent regurgitation of fluids following the eating and impaction of a meat bolus, not infrequently reveals the presence, as in Case II, of an unsuspected pathological oesophageal stricture; especially is this so if the impaction is in the upper half of the oesophagus. Instances have been recorded in which the first evidence of a malignant oesophageal stricture has been the impaction of food.

RELATIVE URGENCY OF OESOPHAGEAL FOREIGN BODIES

Once a foreign body is suspected no time should be lost in definitely establishing its existence or otherwise. In these days of modern transport, cases are rarely so urgent as to necessitate action before the services of a radiologist

and endoscopist can be obtained. The blind use of the coin catcher, bristle probang, or bougie as an aid to diagnosis or as a means of treatment is to be deprecated, as I am convinced that their use has resulted in more deaths from trauma and oesophageal perforation than lives saved. Further, the traumatism produced not only endangers the life of the patient, but greatly increases the difficulties of the endoscopist whose services are almost invariably required.

The relative urgency depends largely upon the type of the foreign body. Sharp-pointed objects, such as pins, bones, dentures, etc., are, by virtue of the early onset of ulcerative oesophagitis, relatively more urgent than are flat, smooth objects, such as coins, buttons, etc. I have already shown that the latter may be tolerated by the oesophagus for many hours or days without producing ulceration, although in one case the extent of the surrounding oedema prevented what would otherwise have been a simple endoscopic removal. Meat bones are particularly prone to produce early local sepsis with ulcerative oesophagitis, pyrexia, and a foul odour if removal be delayed; the thin, friable condition of the oesophageal wall thus produced greatly increases the difficulty of endoscopic disimpaction and removal. In only two cases was there any post-operative pyrexia, the foreign bodies which were successfully removed being meat bones impacted for twenty-four hours and two days respectively. Apart from the local ulcerative oesophagitis produced round a sharp-pointed object, there is always the risk of the point penetrating the oesophageal wall, and especially is this so when the object lies in the thoracic portion of the oesophagus. Should the foreign body be tightly wedged across the lumen, the transmitted respiratory contraction and dilatation of the oesophagus, together with the local reflex spasm, greatly add to this risk. Delay, therefore, may produce local oedema, ulceration, or penetration of the oesophageal wall with disastrous cervical cellulitis or mediastinitis. Further, the foreign body may shift its position; it may either pass downwards (in the case of disk-shaped objects, this is, perhaps, not harmful, but with sharp-pointed objects anxiety is still present until the object is finally evacuated), or, after a violent fit of retching and coughing, it may even be vomited and then aspirated into the trachea or bronchus.

DIAGNOSIS

The presence of a foreign body should be established by a careful consideration of the history and symptoms. At the same time it should be remembered that patients have occasionally been in error. An adult patient may be convinced that he has swallowed his denture, and this be later discovered at home, and children, through fear of scolding or fright, may not admit, and yet the parent be tolerably certain. The "silent period" may again be misleading. A thorough examination of the oral and laryngeal pharynx and larynx should be made with the mirror, and the neck gently palpated for tender areas. A radiological examination alone, and with an opaque meal, should then be made, and if from the history and symptoms doubt still arises, I am convinced that oesophagoscopy should be advised. Otherwise objects, especially non-opaque ones, such as fish and meat bones, whose presence was not confirmed by the x rays, may be overlooked with disastrous consequences. The risks of oesophagoscopy in the hands of those accustomed to endoscopic surgery are so very slight as to be practically negligible.

VALUE OF RADIOLOGY

In cases of opaque foreign bodies in the oesophagus the value of radiology is undoubted; by its means not only is the level of the object located, but also the lie

and presentation to the endoscopist, a fact of considerable importance when dealing with jagged or pointed objects. It is important to have such a view in two planes—postero-anterior and lateral. There were, however, many substances, as, for example, fish and meat bones, bone buttons, glass beads, vegetable substances, macerated meat, etc., which are non-opaque; skilled radiology can, even in these cases, give considerable assistance. An opaque meal may momentarily be "held up" at the site of the impaction, owing to the local spasm induced by the foreign body. The radiologist must be conversant with the sites of natural delay which occur during normal deglutition, otherwise great confusion may arise and even dogmatism. Again, a foreign body, such as a meat or fish bone, which previously was non-opaque to the x ray may, after an opaque meal, be revealed owing to the incrustation of the opaque substance on its roughened surface. Bifurcation of the stream of opaque meal at the level of the foreign body may not infrequently be observed if a "screen" examination be made in more than one plane.

If the swallowed object be small, more or less linear in shape, and pointed—for example, a spicule of bone—there may still be doubt, and other methods might be adopted. A small capsule of barium, previously moistened to prevent adherence to normal mucous membrane, may be arrested by the pointed object either temporarily or even indefinitely, in spite of drinks of water. Another useful procedure is to get the patient to swallow a small piece of cotton-wool impregnated with barium; the cotton is arrested by the sharp-pointed object. I am convinced, however, that these two methods are often fallacious, and should only be attempted if the patient is in the hands of the endoscopist, when immediate removal of the foreign body can be effected. A capsule of barium or a pledget of cotton-wool impacted on or at the site of the foreign body increases the size of the latter, and penetration of the oesophageal wall from local oesophageal spasm or thoracic respiratory movements may, in consequence, be greatly encouraged. Although radiology in these days often reveals definite evidence of the existence of a foreign body, too much reliance must not be placed on negative findings in the presence of other very suspicious evidence in the history and symptoms. An endoscopic examination should in all doubtful cases be recommended.

What should be our procedure when the foreign body is definitely known to have passed onwards from the oesophagus? In the vast majority of instances foreign bodies, whether they be flat, disk-like, or sharp-pointed, are, once they enter the stomach, passed naturally per rectum usually within five days. Particularly is this the case with coins. Occasionally a coin may remain for days in the stomach—in my knowledge, for ten days—and yet cause no harm; a normal diet with an unrestricted life will encourage its exit from the stomach. The progress of the foreign body should be watched daily with the x rays, especially if the object be pointed, and even more so if it is known that the point, say of a pin, is in advance. Almost invariably the pointed object is naturally rotated in the stomach until the blunt end is engaged in the pylorus and then it passes naturally onwards; there is, however, the possibility of intestinal perforation or ulceration until the pointed object is evacuated. Chevalier Jackson maintains that laparotomy with removal of the object should be performed if it remains stationary for four or five days. Even with a laparotomy, difficulty is often experienced in finding the pointed object, and there is always the risk of unknowingly perforating the intestinal wall while searching among the coils of intestine.