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A CASE

OF

LIGATURE OF THE LEFT COMMON CAROTID ARTERY

WOUNDED BY A FISH-BONE WHICH HAD PENETRATED THE PHARYNX.

WITH

REMARKS AND AN APPENDIX CONTAINING FORTY-FIVE CASES OF WOUNDS OF BLOOD-VESSELS BY FOREIGN BODIES.

BY

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Penetration of some part of the alimentary canal by sharp-pointed foreign bodies which have been swallowed, and arrested in their passage, is not a very uncommon occurrence. Apart from obstruction to the passage of air to the lungs, or food along the alimentary tract, it is familiar to the surgeon as the cause of two main and distinct kinds of mischief; on the one hand of inflammatory mischief, more or less severe, prolonged, and critical according to the nature of the organ or tissue involved in the imprisonment or migration of the foreign substance, and on the other hand of mischief to adjacent blood-vessels, too often terminating in rapid death from sudden and uncontrollable hæmorrhage. The relative frequency

of the different kinds of fatal lesions due to the arrest of foreign bodies in the pharynx and œsophagus may be gathered from Adelman's table.[1] Out of 314 cases 109 proved fatal, 43 from lesions of the respiratory organs, 25 from ulceration of the œsophagus and inflammatory processes in the neighbouring parts, and 31, or less than one third, from implication of blood-vessels. To the last source of danger attention will mainly be confined in this paper. In the Appendix will be found abstracts of 44 cases in which lesions of blood-vessels occurred through the agency of foreign bodies penetrating the alimentary canal, 43 of these proving fatal. Arranged according to the vessels injured the cases comprise :

23 instances of lesion of the thoracic aorta.
11 instances of lesion of one or more of the carotid arteries.
1 instance of lesion of the left ascending pharyngeal artery.
1 instance of wound of an abnormal right subclavian.
1 instance of wound of the pulmonary artery.
1 instance of lesion of an azygos vein.
1 instance of wound of the heart and right coronary vein.
3 instances of lesion of one or more of the venæ cavæ.
1 certain instance of lesion of the inferior thyroid artery, or one of its branches.
2 doubtful instances of ditto.

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45

The different divisions of the alimentary canal enjoy different and unequal liabilities to injury from sharp-pointed foreign bodies.

In the pharynx needles, pins, bristles, and fish-bones readily find a temporary resting-place. Generally they are speedily dislodged and pass along the alimentary

1 'Vierteljahrschrift für die praktische Heilkunde,' vol. xcvi, p. 66.

canal; sometimes they continue impacted, and, working their way through the walls of the cavity, either by penetration or ulceration, produce results of a serious or fatal character through inflammatory affections of neighbouring structures, or implication of neighbouring blood-vessels; and these very results may be ensured or aggravated by injudicious procedures adopted for the displacement of the impacted or adherent substances. The part of the pharynx where foreign bodies are most likely to lodge is at its junction with the œsophagus. The pharynx also is liable to be directly perforated, with accompanying wound of one of the carotid arteries by sharp-pointed instruments, or other bodies, such as tobacco pipes thrust through it from the mouth. For some instructive cases of this kind reference may be made to Mr. Durham's able article on "Injuries to the Neck" in Holmes and Hulke's 'System of Surgery,' vol. i, and to the Appendix to this paper.

The narrowness of the œsophagus renders it more especially liable to injury from the lodgment of foreign bodies. The arrest may occur in any part of the tube, the most frequent site being about opposite the point where the left bronchus crosses the aorta. If they are arrested in the neck, the common carotid, and especially the left common carotid, is exposed to danger, and after the carotids one of the œsophageal branches of the inferior thyroid artery. In the thorax the aorta is by far the most frequently injured, but occasionally one of the venæ cavæ, the pulmonary artery, one of the large vessels springing from the arch of the aorta, an azygos vein, or even the heart itself, and one of the coronary arteries or veins may be implicated. Within the abdomen the impaction of foreign bodies is not specially related to lesions of blood-vessels, and I am not acquainted with any cases of wounds of arteries giving rise to fatal hæmorrhage in that cavity. In one case the vena cava was involved. A young woman died in the Middlesex Hospital, after having been ill for fifty-three days, with all

the symptoms of hectic fever, and after having presented the signs of coagulation in the veins of both lower limbs (phlegmasia alba dolens). Throughout the case she complained of aching pains in various regions of the spine. At the autopsy a needle was found in the lower part of the vena cava, and around it a thrombus had formed. There was an opening in the back of the vein about an eighth of an inch in diameter. The iliac and femoral veins on both sides were obstructed. A second needle was found in an abscess to the left of the third lumbar vertebra.[1]

If they reach the rectum, pointed bodies like fish-bones are recognised as occasional causes of ischio-rectal abscess and fistula.

It is a well-known fact that swallowed needles may penetrate the alimentary canal, migrate through the muscles without transfixing any blood-vessel, reach a remote part of the body, and be extracted through the skin. Some remarkable cases of this kind are on record.[2]

[1] Dr. Henry Thompson, 'Brit. Med. Journ.,' 1874, vol. ii, p. 571.

[2] Poulet gives the following:—1. A stepmother, desiring to rid herself of her little daughter, made her swallow at different times a certain number of needles. After a long suffering the needles made their exit from different parts of the body, and especially from the arms. 2. A needle which had been swallowed and lodged in the œsophagus penetrated the muscles, and a month later was found behind the right ear, where it was extracted by an incision. 3. A child had swallowed a needle, which lodged in the œsophagus and pierced its walls; it became embedded in the muscles of the neck. It was extracted by an incision and the aid of a magnet (Kerckringius, 'Spicilegium Anatomicum,' Obs. 44). Lavacherie ('Bull. de l'Acad. Méd. de Belge,' 1848) also mentions the case of a young woman who had a foreign body in the fauces, which, after the lapse of a year, appeared under the skin near the sterno-clavicular articulation, whence it was extracted by an incision three months later.

Poulet adds in a note:—"Vigla has collected the most interesting of these cases of migratory foreign bodies. Hévin quotes several cases in which cornstalks were extracted from abscesses of the thoracic walls thirteen to fifteen days after their ingestion. Bonnet, Helmontius, and Volgnarius have reported similar facts; the latter saw a cornstalk emerge through the axilla. In Polisius' case the stalk made its exit three months afterwards from an abscess in the back. Bally ('Rev. de Méd.,' ii, 1825) reports the ingestion of a stalk; three months later peripneumonia, abscess upon right side of the thorax,

Of the 45 cases of lesions of blood-vessels placed in the appendix 19 resulted from swallowing pieces of bone, 4 were due to sewing needles, 3 to coins, 2 to tobacco pipes, 1 to a puncture by a parasol, 2 to tooth plates, Guthrie's case of wound of both carotids to an ingenious suicidal machine made of corks and pins, whilst 12, including my own case, were caused by fish-bones. In 6 of the 12 the vessel implicated was the thoracic aorta, viz. the cases of Théron, Auvert de Moscou, Bousquet, Dr. Waters, of Liverpool, Dr. Ramskill, and one related in the Catalogue of the Museum of St. Bartholomew's Hospital. I may mention that I witnessed the post-mortem examination on Dr. Ramskill's case, and it was recalled to my mind when I was asked to see the patient whose case forms the basis of this paper. Five of the remaining 6 cases are instances of wound of a carotid, viz. a second case given by Auvert de Moscou, a case briefly referred to by Mr. Cripps in the discussion at the Clinical Society on 24th May, 1878, on Dr. McKeown's paper on a successful case of œsophagotomy for the removal of a set of artificial teeth impacted in the œsophagus, Dr. Reid's case occurring in 1837, my own case, and one under Dr. Cresswell Rich at the Liverpool Royal Infirmary. Some months after the occurrence of my own case, while I was attending the meeting of the British Medical Association at Liverpool in 1883, I saw in the Annual Museum of the Association a specimen showing "perforation of the œsophagus by a fish-bone with rupture into the left common carotid artery." Through the kindness of Mr. Reginald Harrison, to whom I applied for the particulars, Mr. Paul, and Dr. Cresswell Rich I have been able to append the details of this interesting case, and through the same channel I received the particulars of the case of perforation of the aorta under Dr. Waters above referred to. The sixth case is the well-known case related by Dr. Andrew where a fish-bone penetrated the stomach close to the œsophagus, then the

between the second and third ribs, through which the foreign body emerged." ('Treatise on Foreign Bodies,' vol. i, p. 84.)

diaphragm and pericardium and posterior surface of the heart, and finally inflicted a jagged wound in the middle of the septum immediately over the right coronary artery and vein, penetrating the latter vessel. The pericardium was filled with a pint and a half of fluid blood.

It is worth while remarking that out of the 12 cases of lesions of vessels due or ascribed to fish-bones, the offending bone itself was not certainly discovered in more than 4, viz. Bousquet's, Dr. Andrew's, the case at St. Bartholomew's Hospital, and my own. It was not found in either of the Liverpool cases, the reason doubtless being that it had been washed away by the copious hæmorrhage from the considerable opening at the seat of injury to the artery into a lower part of the alimentary canal. In Dr. Waters's case the opening in the œsophagus was large enough to admit the little finger, and that in the aorta at the junction of the transverse and descending aorta would have admitted a No. 10 catheter, whilst the stomach and duodenum were distended with blood-clot weighing 2¼ lbs., and forming an accurate cast of their cavities. In the case of wound of the carotid, the perforation in the anterior wall of the gullet was circular with perpendicular edge, and of a size to admit a No. 8 catheter, and the opening in the artery was of the same size as that in the gullet. The large bowel was full of altered blood. Most probably the fish-bones were concealed in the blood in the intestinal canal.

Among the other freaks of fish-bones one or two are worthy of mention. Morell Mackenzie[1] records a remarkable case which he saw some years ago with Dr. Turtle at Woodford. A fish-bone had accidentally found its way into an infant's throat, and a very careful examination failed to discover it. The infant wasted and died at the end of a few months. It was then found that the fish-bone had passed through an intervertebral substance and wounded the cord.

In the following case a fish-bone was instrumental in

1 'Diseases of the Throat and Nose,' vol. ii, p. 192.

causing intestinal obstruction. In the museum of the Royal College of Surgeons of England is a very interesting specimen (No. 2569), taken from a case under the care of Mr. Coulson. It shows an annular stricture of the rectum six inches above the anus and a small piece of fish-bone sticking in its inner ulcerated surface. The gravid uterus pressed on the foreign body, causing great irritation and effusion of lymph, and complete occlusion of the bowel resulted. The patient was a woman, thirty-four years of age, in good health and more than four months pregnant, who was seized with sickness, constipation, pain, and distension of the abdomen. Fæcal vomiting supervened with more distension and continued constipation. Injections were immediately expelled, and death resulted on the third day from the commencement of the attack.

The preceding remarks will suffice to introduce the subject, and I now append the particulars of my own case.

R. B—, a badly-nourished boy, æt. 9, with glandular enlargements, was admitted into the London Hospital on November 14th, 1882, under the care of Dr. Sutton.

On November 8th, that is to say six days previously, he was eating plaice, and swallowed a small bone. He ran into the yard, followed by his mother, who put her finger down his throat and made him vomit. It was thought that the fish-bone had been ejected, but as pain continued he was taken to a neighbouring doctor, who advised him to go to the hospital. This advice he carried out the next day. In the receiving room of the London Hospital he was seen by the house surgeon and a member of the staff. Saliva was freely dribbling from the mouth. After a careful examination of the mouth and throat a probang was passed, and as the passage was clear he was sent home. Not being relieved he came back to the hospital as a medical out-patient, and was then admitted as an in-patient. His symptoms were pyrexia, stiffness of the neck, œdema of the upper eyelids, profuse salivation,

and a small tender lump on the left side of the neck opposite the cricoid cartilage. When examined the following day he was in the same condition. His pulse was 120, his temperature 101·3,° and his respirations 22. The tenderness and rigidity of the neck continued, but he could not swallow solid food. On the 17th it was noted that the patient was very drowsy, that blood flowed from the mouth, and that the sound of the voice was thicker than usual. He complained of earache. He had two attacks of hæmorrhage on the 17th. On the 18th he was easy. Saliva still flowed from his mouth. The pulse was 128, and the temperature 98°. There was no hæmorrhage. On Sunday, the 19th, hæmorrhage suddenly supervened. Blood flowed in a stream from the patient's mouth, and was received into a spittoon holding a pint. The blood half filled the vessel. Mr. E. H. Fenwick, then house surgeon, now assistant surgeon at the hospital, sent me a note detailing the history and requesting me to see the case. I found the patient in bed lying on his right side, with difficulty in turning round, and the other symptoms previously mentioned. He would not answer questions. Dr. Charlewood Turner saw the patient with me. I came to the conclusion, which I believe Mr. Fenwick had already drawn, that the fish-bone swallowed on the 8th had been arrested in the pharynx, had passed through its walls, and wounded one of the left carotid arteries, that the hæmorrhage proceeded from the wounded vessel, and that it would recur and prove fatal if an operation were not performed. I therefore advised an exploratory operation, and in this advice Dr. Turner concurred. I expected to find the fish-bone, and the wound in the artery, in the situation of the lump in the neck. The patient was taken to the theatre, and chloroform was given by my house surgeon, Mr. Hingston. As I was on the point of commencing the primary incision, my colleague, Mr. James Adams, happened to come into the theatre. He kindly stayed and gave me valuable assistance during the operation.

An incision was made along the edge of the sterno-mastoid for several inches. The muscle was found to be glued to the subjacent parts by recent adhesions. After separating and retracting the muscle, the omohyoid was recognised enclosed in a sheath. Above its anterior belly there was a dark patch about the size of a four-penny piece caused by extravasated blood looming through the fascia. Although it was not absolutely necessary, at Mr. Adams' suggestion, I divided the omohyoid to ensure sufficient room. Having divided the fascia over the large vessels I passed a probe deeply into the cavity which contained the clot, and the left index finger through the mouth into the pharynx, but I could not feel the probe through the wall of the pharynx. I then turned out some clot, and, introducing my finger, ascertained that the probe was in a cavity hollowed out behind the vessels and in the inner side. Having examined the common carotid artery lower down for pulsation I could not very clearly detect any, but once or twice there seemed to be a feeble stream. This indicated that the carotid below the site of the probable wound was blocked with clot, but I deemed it advisable for greater security against hæmorrhage to place a temporary ligature on the artery opposite the divided omohyoid. This was effected with some difficulty owing to the uniform discoloration of artery, vein, nerves, fascia and areolar tissue by the extravasated blood. I could scarcely recognise the structures met with, all being dark and equally stained. I did not see the descendens noni, and though I looked carefully for it I could not distinguish the pneumogastric nerve. Hence it was with some anxiety that I proceeded to turn out more clot from the cavity above for the purpose of finding the wound in the vessel, and applying ligatures above and below the aperture. As this was effected each clot was carefully examined, and in the centre of one the fish-bone was found. Owing to the difficulty in recognising and discriminating one structure from another my colleague suggested that I might include

all in a common ligature, but being anxious to proceed *secundum artem*, and keep the operation free from any avoidable complications, I preferred endeavouring to isolate the artery. More clot was removed and then a free gush of arterial blood took place evidently proceeding from the distal end. Pressure arrested the flow, and the further emission of blood was prevented for the moment by my colleague pulling forward the vessels with a blunt hook. I was then able to find the wounded vessel, and with an aneurism needle to pass a ligature, as I thought, closely round it above and below the seat of injury. Owing to some firm adhesions the upper ligature was passed at a little distance from the wound. In consequence of this necessity—for I had no time to make a prolonged dissection owing to the danger of subjecting the patient to further loss of blood, of the liability to which we were reminded by an occasional jet from the distal end as the hook was shifted or pressure relaxed—I deemed it prudent to divide the artery at the seat of wound to make sure that no branch was given off between the ligatures. When this was done I recognised on the cut section some nerve-fibres, and the question arose whether they belonged to the descendens noni or to the pneumogastric. As they were in front of the vessel, closely adherent, and appeared scarcely numerous enough for the vagus, I came to the conclusion that they belonged to the descendens noni. It will be seen that they belonged to the vagus, which, instead of lying between and behind the artery and vein, took, or had been pressed into, an unusual position in front of the artery, and owing to the inflammation induced by the injury had become firmly adherent to the vessel for some little distance above and below the aperture in the artery. Externally the nerve was stained of the same dark colour as the artery, and only in the centre after section were the white nerve-fibres to be recognised. Believing it to be the descendens noni I made no attempt to disengage it or unite its extremities as I should have done if I had known that it was really the vagus. The

temporary ligature on the trunk of the carotid below was removed, the edges of the wound were dusted with iodoform and approximated, and the patient sent to bed. After the operation he was very restless and thirsty, with difficulty in swallowing. His pupils were equal. He coughed a good deal and vomited two ounces of milky fluid containing coffee grounds. On the 20th his pulse was 140 and respirations 22. He had passed a good night. He took milk, beef tea, and brandy mixture, and was constantly asking for drink. On the 21st he was less restless and more drowsy, with decided weakness in the right arm. Up to the 25th he took his nourishment exceedingly well, but then he began to fail. He lay curled up on his left side with his legs out of bed and his left hand on his left ear and he became very drowsy. He could be roused by opening his eye, and pressing on the conjunctiva, and every now and then he tried to get out of bed. A systolic murmur was heard at the apex. He coughed occasionally but had no return of the vomiting. He was partially paralysed on the right side. He sat up in bed and looked over a picture book on Tuesday, the 28th, but this appearance of improvement was deceptive, for he died exhausted at 1 a.m. on the 29th of November, ten days after the operation. The wound remained healthy throughout. The *post-mortem* was made by Dr. Sutton. The heart and lungs and other internal organs were healthy. On opening the membranes the brain surface in the middle and upper regions of the left hemisphere was seen in two places to be of a green colour and much softened, with pus oozing out. There were two abscesses, each containing green pus, three quarters of an inch and one inch in diameter respectively. The pus was enclosed by a defined boundary, but not by a distinct lining membrane. The surrounding brain was rather softened but not much congested. There was no sign of clotting in the surface vessels of the brain. There was no pus in the left ear. Mr. Hingston removed the pharynx and blood-vessels of the neck, and made a careful examination

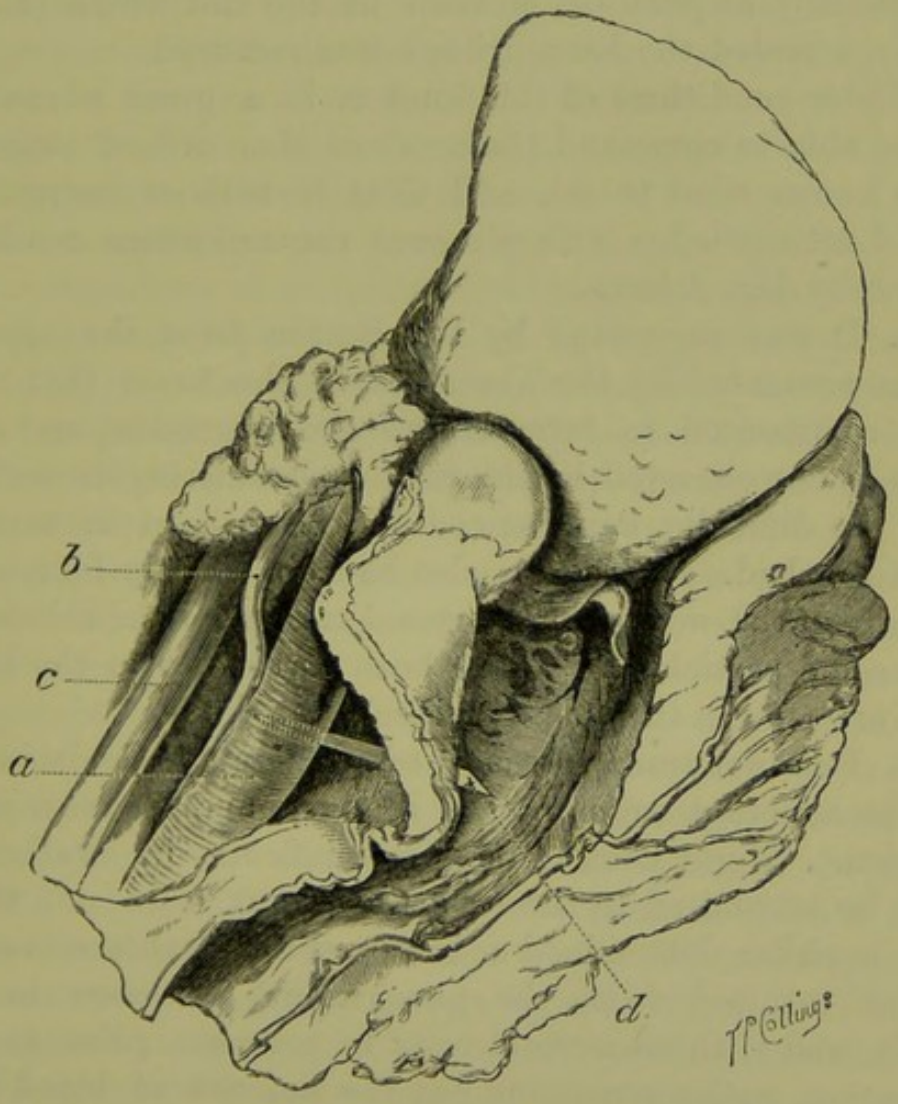
of the parts. The ligature had come away from the upper end of the artery and included nerve, leaving a small round aperture filled with clot. On laying open the vessel the clot was found to be small in quantity, about a quarter of an inch in length, and just sufficient to prevent hæmorrhage. The pneumogastric was adherent for a considerable distance. Some portion of the upper part of it was dissected off the carotid by Mr. Hingston, but more than a quarter of an inch still remains attached thereto. The lower ligature remained round the artery only, and only separated after being cut with the scissors when the artery was laid open. The clot here was abundant, more than an inch long, dark red but decolorized at the tapering end. The small wound in the pharynx made by the fish-bone had contracted and almost closed, but the spot could be recognised by a depression and congestion round it. In the preparation the place of perforation is visible as a small thinned area of mucous membrane with a pin-hole aperture in it situated at the back of the cricoid cartilage and to the left. The seat of the wound in the carotid was three quarters of an inch below the bifurcation. The artery has been laid open. The clot in the lower part of the divided vessels decolorised by the action of the spirit is still present, whilst the scanty clot in the upper part has nearly disappeared. The pneumogastric nerve is seen closely adherent to the upper segment, and looking externally like a branch of the artery. (See woodcut, p. 75.)

Remarks.—Several reflections are suggested by the case itself.

1. The diagnosis was tolerably clear. We had the history of a swallowed fish-bone, the continuance of pain, the visit to the hospital receiving-room with the passage of a probang by which it was rendered probable that the bone had been pushed through the mucous membrane, the local pain and inflammatory symptoms, the pyrexia, and the indications of interference with the carotid artery

and adjacent nerves, viz. the lump in the neck opposite the cricoid cartilage, the œdema of the eyelids, tenderness and rigidity of the neck, inability to swallow solid food, the profuse salivation, the earache on the left side, and, lastly, the attacks of hæmorrhage by which the patient's life was endangered.

2. The diagnosis being established, surgical interference was necessary to prevent death by recurrent hæmorrhage.



a. Left common carotid artery.
b. Pneumogastric nerve, adherent to artery below.
c. Internal jugular vein.
d. Fish bone. This should have been represented as hanging down obliquely and entering the artery at a rather lower point.

3. The operation was undoubtedly a difficult one, partly by reason of the relatively small size of the parts in a patient only nine years of age, but mainly because of the preceding inflammation, formation of adhesions, and that staining of all the tissues of a uniformly dark colour by imbibition of blood which rendered it almost impracticable to distinguish one vessel from another, and, in the absence of pulsation, nerve from blood-vessel. Add to this the necessity imposed upon the operator to ligature the artery as speedily as possible, so soon as the clot which temporarily arrested the hæmorrhage was removed.

Under conditions of this kind it is a great advantage to be able to command the services of a skilled assistant who knows what to do, and does it without instruction, and I acknowledge with pleasure the assistance rendered to me by Mr. Adams.

4. It was suggested by Dr. Sutton from the appearances presented by the abscesses in the brain that they had commenced to form before the operation, and this view is corroborated by the previously existing drowsiness and the difficulty experienced by the patient in turning round in bed. Moreover, clot had abundantly formed at the site of the wound in the vessel and round the fish-bone, and some particles may have been carried up to the brain and arrested in the smaller vessels.

5. I cannot trace any marked ill-effects to the inclusion of the adherent vagus in the ligature, and its subsequent section. Slight cough and some difficulty in swallowing may be attributed to the occurrence, but I do not think that it either determined or hastened the fatal termination. Death resulted from the gangrenous abscesses in the brain, and if these were already in progress prior to the operation, nothing remains but the amount of blood lost at the operation to be placed on the debit side of the account. There were one or two free gushes of blood from the distal side of the wounded artery before it was secured, but whilst admitting the difficulty of an accurate estimate I do not think that more than four or five ounces

were lost during the operation. The loss prior to the operation was far more serious, the patient being as thin and ill-nourished a subject, and as ill adapted for a loss of the kind, as one generally meets with in hospital practice.

6. The slight effects beyond the local paralysis resulting from section of a single vagus, the absence of lung mischief, œdema, and dyspnœa, accord with the results of experiment, and with the negative effects in Mr. Savory's case of "Abscess in the Neck"[1] which, in its course, destroyed a large portion of the carotid artery, jugular vein, and pneumogastric nerve on the left side. Nevertheless, it seems desirable to call special attention to the inclusion of the pneumogastric in the ligature, because the occurrence may furnish a useful hint for future operations. The liability to the formation of adhesions between the vagus and the carotid by inflammatory action set up by a foreign body, and to displacement of the nerve forwards by the pressure of accumulating clot may be usefully remembered by those who are called upon to undertake ligature of the carotid under similar or analogous circumstances.

7. Another point suggested is the danger involved in incautiously passing bougies or probangs for the purpose of clearing the pharynx or œsophagus of a fish-bone or other sharp-pointed body. The history of the case seems to justify an inference that the probang produced the injury to the carotid by pushing the fish-bone through the wall of the pharynx. A similar indictment must be brought against this routine method in Dr. Cresswell Rich's case of perforation of the carotid and in Dr. Waters's case of perforation of the thoracic aorta by a fish-bone. In both, œsophageal bougies or probangs had been employed in the usual manner with aggravation of the symptoms. In Dr. Waters's case a dessert-spoonful of blood was brought up by the patient on the evening of the day on which the probang was passed. The same point might be illustrated

[1] 'Medico-Chirurgical Transactions,' vol. lxiv, 1861, p. 21.

from other cases in which propulsion was attempted. Wagret's case is the most striking. "After a physician had made attempts at the propulsion of the bone, the patient experienced entire relief, and said to his benefactor that he thanked him very much, and that he had saved his life. A few days later the patient died from perforation of the descending aorta."[1]

Improved methods of illumination of the pharynx and œsophagus, the more general use of the laryngoscope and œsophagoscope, exploration with the finger, and the employment of appropriate forceps, may be expected to limit the area within which probangs have wrought mischief. The value of the œsophagoscope invented by Mackenzie is shown by the case which he relates, where at a second sitting he was able to detect and remove from the anterior wall of the œsophagus, about two inches below the cricoid cartilage, a flat lamella of bone about four millimetres square with a small piece of decayed meat adherent to it.[2] At present the chief drawback to the use of the œsophagoscope is the irritation occasioned by its introduction, and this is so pronounced that patients who have once experienced it have declined to submit to it again. For surmounting this obstacle a general anæsthetic is not applicable as it then becomes difficult to place the patient in a favorable position for the illumination of the œsophagus. Better hopes, perhaps, may be entertained of the new local anæsthetic, cocaine, which has already been employed with success in minor operations in the nasal passages, mouth, pharynx, larynx, and rectum, as well as on the conjunctiva. Pending the extraction of the offending body or its passage into the stomach the diet of the patient should be carefully regulated. Hard solid substances should be prohibited and the patient should be restricted to slops, bread and milk, arrowroot, gruel, &c. The exhibition of demulcents like barley water, glycerine, cod-liver and other oils might assist materially in disengaging

[1] Poulet, 'Foreign Bodies in Surgery,' vol. i, p. 93.

[2] Op. cit., vol. ii, p 193.

a small foreign body like a pin or fish-bone clinging to the mucous membrane. If it is necessary to use a probang, the least objectionable and most efficient is the expanding probang or *ramoneur* for withdrawing the body through the mouth. On looking over the cases in the Appendix, and comparing them with each other and with my own case, the following considerations are suggested:

1. The cases which bear the closest resemblance to the one I have related are the cases of Dr. Reid, Mr. Cripps, and Dr. Cresswell Rich, in which the carotid was perforated by fish-bones, and that related by Mr. Bell, of Barrhead, in which a fine sewing needle transfixed the œsophagus and right carotid. In none of these cases, however, was an operation performed.

2. The nature of the foreign body and the size of the vessel injured mainly determine the period at which hæmorrhage appears and death takes place.

(*a*) When the foreign body is very sharp and pointed, or has a sharp pointed projection or a cutting edge, and the artery implicated is the aorta or one of its large branches, death may occur suddenly or in the course of twenty-four or forty-eight hours.

Mr. Colles's patient, a man fifty-six years of age, entered St. Stephen's Hospital on March 30th, 1855. Whilst eating, the patient had experienced a sensation of rupture in the chest, and this pain increased very much during deglutition. Almost immediately afterwards he began to spit blood in large quantity, at first black and then ruddy; the day following the accident he vomited a bone, about an inch long, irregular and with cutting edges, and died the same day at 9 o'clock. A vertical rupture of the posterior wall of the œsophagus was found, corresponding to a rent in the wall of the aorta.

Dr. Hume Spry's patient swallowed a piece of bone. Two days afterwards he was very ill, pale, anxious, and with severe radiating pain, and in the evening he vomited an enormous quantity of blood and fell back on his pillow

dead. The spicule of bone had perforated the œsophagus and wounded the arch of the aorta, and it was found *in situ*.

In other cases an interval of a few days elapses before spitting or vomiting of blood occurs, the fatal issue ranging in its date from six or eight days to two or three weeks from the accident. In one or two cases where the vessel was opened by a gradual process of ulceration the duration of the case has been proportionately lengthened.

(*b*) If the body is rounded and blunt the implication of an important vessel is usually the effect of ulceration, and does not occur, perhaps, for some months after impaction. In the case of Mr. C. L. Bradley's "smasher" the impaction of a counterfeit half-crown in the œsophagus occasioned death from sudden and profuse hæmorrhage from the aorta eight months after the coin had been swallowed, and Mr. Erichsen has recorded an interesting case in which a piece of gutta percha, belonging to a masticatory apparatus was arrested in the œsophagus, and opened a large œsophageal vessel, six months after the patient had swallowed it.

(*c*) Even with a blunt body, however, retained in the œsophagus, fatal hæmorrhage may occur in fourteen or fifteen days. This happened to the unfortunate Corporal M—, who had been in the habit of swallowing six-franc pieces for the amusement of his comrades, usually evacuating them in a few days after a dose of salts. He repeated the experiment once too often, and perished from abundant vomiting of blood on the fifteenth day. The coin was found in the œsophagus, opposite the bifurcation of the trachea, lying on edge between two erosions, one of which communicated with the aorta.

3. Forcible efforts at extraction of the foreign body, or at propulsion into the stomach, may act injuriously in several ways. They may cause the foreign body to scrape or lacerate the mucous membrane, and lay the foundation for subsequent inflammation and ulceration into a neighbouring and perhaps adherent blood-vessel; they may

push the body through the coats of the pharynx or œsophagus and make it penetrate a vessel which otherwise might have escaped injury; they may enlarge a pre-existing laceration of the alimentary canal, and a puncture of a wounded vessel, and lastly they may displace the foreign body from the opening which it is partly plugging and thus hasten the fatal issue.

4. The chief points and symptoms which will assist the surgeon in coming to a right conclusion as to the presence of a foreign body in the pharynx or œsophagus, in determining the situation of the body, and in deciding upon the measures to be taken for its removal, are the following: A definite history of a foreign body having been swallowed; persistence of pain and more or less fixed pain referred to one spot, although radiating twinges may be felt in other directions; dysphagia, and especially continued inability to swallow solids; salivation and dribbling of saliva from the mouth; failure of the foreign body to pass per anum or to be returned through the mouth; expectoration or vomiting of blood, passage of blood by stool, and fainting fits due to hæmorrhage into the alimentary canal. When the foreign body is situated in the neck there will probably be added some local swelling and tenderness or more marked inflammatory signs along the course of the affected vessel.

5. I think it may be concluded that foreign bodies like needles, pins, bristles, and fish-bones which are arrested at the commencement of the œsophagus ought to be capable of extraction by the aid of artificial illumination and forceps, and, failing these, by the *ramoneur*.

Lower down, as at the root of the neck or opposite the arch of the aorta, the continued presence of a foreign body which cannot descend into the stomach under the general means of management indicated above, and which cannot safely be pushed onwards or withdrawn through the mouth, ought to lead the surgeon to the early consideration of the question of an exploratory œsophagotomy. On this subject M. Nevot wrote in 1879 that he believed that

œsophagotomy could render great service in a large number of cases, and he adduced the following instructive instance of its utility :—"On the 14th of February, 1848, M. Lavacherie was called to attend a man named Pascal Dombat, who had swallowed a bone. He practised œsophagotomy with success, found the œsophagus perforated, and the point of the bone in relation with the left common carotid, which was still undamaged. There can be no doubt that in this case the operation rescued the unfortunate Dombat from certain death."[1]

6. The brief duration of many of these cases, their rapid course after hæmorrhage has appeared, and their almost invariably fatal issue, prove the necessity for the utmost promptitude and sagacity on the part of the medical attendant. When hæmorrhage has commenced the life of the patient will hang upon a thread, and the best and only hope of recovery will lie in immediate surgical interference if the wounded vessel can be reached. The services of the surgeon should be sought without further delay, before any considerable quantity of blood has been lost, and before the foundation has been laid for embolism of the cerebral arteries, blood-poisoning, or abscess of the brain, which would nullify all his efforts to rescue the sufferer from impending death.

[1] "De la Perforation de Vaisseaux par les corps étrangers de l'Œsophage," 'Thèse de Paris,' 1879, p. 50.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 8.)

APPENDIX.

Cases Nos. 1—10, 14, 21, 25, 26, 28, 29, and 42—44 were taken from Nevot's treatise, and the details are quoted from him. The references, however, have been verified and corrected.

I. Perforations of the Aorta.

1. *Wagret*, Obs. de Med. et de Chir., 1718.

Male, æt. 38, swallowed a large bone with a pointed extremity. Rent in mid part of œsophagus and aorta. Bone found in jejunum.

2. *Laurencin* ('Arch. gén. de Méd.,' 1824, t. vi, p. 302).

Male, who had swallowed bone eight or ten days before, entered the hospital with symptoms of left pneumonia. On tenth day vomiting of blood and death in five minutes. Œsophagus perforated, and ulceration of aorta, two inches from the great curvature.

3. *Dubreuil de Brest* ('Journ. Universel,' t. ix, 1818, p. 357).

Soldier swallowed bone. On night of fifteenth or sixteenth day vomiting of bright red blood. Sudden death. Œsophagus and aorta perforated half an inch below the arch. Bone found between œsophagus and aorta.

4. *Revolat* ('Ann. de Soc. de Méd. Prat. de Montpellier,' t. iv, p. 114).

Grenadier swallowed bone; after twenty-one days copious vomiting of blood, and death. Stomach full of blood; two perforations, one at the superior fourth of the œsophagus, and the other towards the cardiac orifice of the stomach. The vessel which had furnished the blood was not looked for.

5. *Lavacherie* ('Mém. de l'Acad. de Méd. Belge,' t. ii, 1848, p. 91).

Male, æt. 18, swallowed a fragment of bone 29th May, 1839. Immediate catheterism discovered nothing. Six days later nausea and vomiting of blood. A small fragment of bone found in a vomited clot. June 10th, two fainting fits. June 16th, abundant vomiting of blood, lasting for two hours and followed by death.

6. *Hugues* ('Lyon Médicale,' t. v., 1870, p. 552).

Male, æt. 32, swallowed a flat triangular bone, apparently without knowing it. Some days after he came into hospital complaining of some ill-defined malady. Fourteen days later vomiting of blood and

hæmorrhagic stools. Death next day. Perforation of œsophagus and aorta. Bone found *in situ*.

7. *Théron* ('Gaz. des Hôpitaux,' 1862, p. 182).

Male, æt. 22, swallowed something, probably a fish-bone. Ulceration of œsophagus followed at length by that of the aorta. Duration of case some months.

8. *Stetter* ('Langenbeck's Archiv,' Bd. xxii, 1878, p. 959).

Male, æt. 26, swallowed bone in soup. Sharp pain, which swallowing increased. Œsophageal sound introduced. At fifth attempt it was pushed strongly and penetrated into the stomach. The patient said he no longer felt anything. Three days later he returned complaining of pain between the shoulders. The sound passed easily, only causing pain in the middle of the œsophagus. Patient went into hospital and left nine days later, saying he was quite cured. He returned to work. Three days later copious hæmatemesis and death in five and a half hours. Double perforation of the œsophagus at level of bifurcation of the bronchi extending from right to left, and very small perforation of the descending aorta $2\frac{1}{2}$ centimetres from the left subclavian. An angular thin piece of bone was found there. Stomach and intestines filled with blood.

9. *Miennée* ('Gaz. des Hôpitaux,' 1851, p. 89).

Soldier, æt. 25, swallowed bone whilst eating soup. Pain in deglutition. Seven days after, vomiting of red frothy blood and bloody stools. Death in the evening. Perforation of the œsophagus and aorta below the arch by a flat triangular piece of bone 3 centimetres in diameter.

10. *Haurmin* ('Rec. de Méd. Mil.,' 1825, t. xvi, p. 245).

Male swallowed piece of bone an inch long, eight or ten days before going into the hospital. There were symptoms of left pneumonia, and a painful spot behind near the vertebral column. On the tenth day he was seized with cough, vomited blood, and died in five minutes. In the middle of the chest there was an opening in the œsophagus as large as a twenty-sous piece, and an ulceration of the aorta two inches below the arch. A small bone an inch in length, with a pointed extremity, was found to the right of the aortic opening.

(N.B. This case is certainly identical with Laurencin's above given.)

11. *C. Laurence Bradley* ('Med. Times and Gazette,' vol. ii, 1868, p. 447).

Male, æt. 21, swallowed a counterfeit coin. This was followed by vague pains in the chest and other symptoms, which were regarded as dyspeptic. He also had a slight cough without expectoration. Eight months after the coin had been swallowed death occurred from sudden and profuse hæmorrhage from the aorta.

12. *Martin* ('Recueil de Médecine Militaire,' t. xx). Poulet, (translation) vol. i, pp. 75 and 94.

Corporal M— had several times swallowed six-franc pieces for the amusement of his comrades, evacuating them in a few days after a dose of salts. He repeated the experiment, and perished from abundant vomiting of blood on the fifteenth day. The coin was found in the œsophagus opposite the bifurcation of the bronchi, lying on edge between two erosions which communicated with the aorta.

13. *Lancet*, Nov. 24th, 1877, p. 789.

In November, 1877, Dr. White, City Coroner for Dublin, held an inquest at the Richmond Lunatic Asylum on the body of an inmate named Nolan, aged forty-seven, who had died suddenly in that institution. After the evidence obtained, the jury found that the deceased came by her death in consequence of hæmorrhage from a punctured wound in the aorta caused by a sewing needle which she had swallowed. Part of the sewing needle was found embedded in the œsophagus, covered with rust.

(In Poulet's work, vol. i, p. 91, Nolan is called Volon and the sex is changed.)

14. *M. Denonvilliers* ('Bull. Soc. de Chir.,' t. vi, 1856, p. 349).

Male swallowed in jest a five-franc piece. The foreign body caused ulceration of the œsophagus and perforation of the aorta. Copious vomiting of blood carried off the patient. The coin was found resting partly in the œsophagus and partly in the aorta.

15. *Duncan* ('Northern Journal of Medicine,' 1844, vol. i, p. 15).

Male, æt. 22, swallowed in his sleep a gold plate carrying some artificial teeth. He suffered from dysphagia, fixed pain, and expectoration of small quantities of blood. Soon after the accident he consulted Mr. Syme, who detected the foreign body in the œsophagus with a probang, and subsequently, when the patient had been removed to the hospital, made an attempt to draw it up with threads passing through the bulb of the probang. Nothing was detected or removed by this manœuvre, and the patient experiencing considerable relief it was believed that the plate had found its way into the stomach, and it was considered inexpedient to make any further

examination. Ten days after the accident the patient vomited the tooth-plate, but a few minutes afterwards expired from hæmorrhage. An ulcerated perforation, communicating with the arch of the aorta, half an inch below the origin of the left subclavian artery, was found in the anterior wall of the œsophagus.

16. *Hume Spry* ('Path. Trans.,' vol. xix, p. 219).

Male swallowed a sharp spicula of bone. Two days afterwards he was very ill, pale, anxious, and with severe radiating pain, and in the evening he vomited an enormous quantity of blood and fell back on his pillow dead. The spicula of bone had perforated the œsophagus and wounded the arch of the aorta and it was found *in sitû*.

17. *William Colles* ('Dub. Quart. Jour. of Med. Science,' 1855, vol. xix, p. 325).

Male, æt. 56, entered Steeven's Hospital on March 30th, 1855. Whilst eating, the patient had experienced sensation of rupture in the chest and this pain increased very much during deglutition. Almost immediately afterwards he began to spit blood in large quantities, at first black and then ruddy. The day following the accident he vomited a bone about an inch long, irregular, and with cutting edges. He died the same day at 9 o'clock. Blood was found in the pleura, pericardium, and posterior mediastinum, blood in the stomach and small intestines, and a vertical rupture of the posterior wall of the œsophagus half an inch long corresponding to a rent in the wall of the aorta.

18. *Ramskill* ('Lancet,' 1871, i, p. 646).

Male swallowed a fish-bone which lodged in his throat. He went at once to the London Hospital, but returned without having had it removed. On reaching home he took to his bed, and complained of pain in his chest. He soon afterwards felt sick and began to retch without actually vomiting. The day before admission, feeling somewhat better, he sat up for a couple of hours, but on returning to bed felt much worse and complained of great pain across the region of the stomach. He passed a very restless night, and in the morning whilst coughing vomited a quantity of dark-coloured coagulated blood, amounting to three quarts, according to the estimate of his friends. He was taken to the hospital and admitted under Dr. Ramskill, but died the same evening, after bringing up a great quantity of arterial blood together with blood-clot. At the post-mortem examination Dr. Sutton found at the level of the fourth dorsal vertebra two perforating ulcers in the œsophagus; one on the left side communicated with the aorta by an opening which admitted a

probe, whilst the other had extended through the œsophagus and caused thickening round the vena azygos, which was plugged with blood-clot.

19. *Museum of St. Bartholomew's Hospital* (Catalogue).

No. 1376 is a preparation showing a ragged laceration of the aorta beyond the origin of the left subclavian involving more than half its circumference. It was taken from the body of a middle-aged man, who after eating some fish complained of constant pain behind the first bone of the sternum. Every day he spat up blood, for the most part bright red, sometimes dark, and a large quantity passed per anum. He died from exhaustion. At the post-mortem a lance-shaped fish-bone was found transfixing the œsophagus and the arch of the aorta. It was evident that the lacerated wound of the vessel had been produced by the movement of the artery as it pulsated on the point of the fish-bone.

20. *Auvert* ('Selecta Praxis Med. Chi.,' Paris, 1851).

Male swallowed a fish-bone. All the symptoms of a foreign body, and some expectorations of blood. On the third day copious hæmorrhage carried off the patient. Anterior wall of œsophagus perforated and the aorta near the arch.

21. *Bousquet* ('Bull. de la Soc. Anat.,' 1877, p. 317).

Soldier entered the hospital for pleuro-bronchitis of six days' standing, on 20th March, 1877. On the 11th April, he asked to be allowed to go out, but his medical attendant declined. Next day he had vomiting of blood, and bloody stools. He died on the 13th. The œsophagus and aorta were both perforated, and the former contained a sharp-edged fish-bone 2 centimetres long.

22. *Dr. Waters,* Liverpool Royal Infirmary, 1879. Communicated by Mr. Paul.

Mary Hazelton, æt. 55, swallowed a fish-bone, which became impacted in the œsophagus, four days before her admission into the Royal Infirmary. On admission, 26th November, 1879, she complained of great pain in the chest, opposite the lower end of the sternum. Deglutition was very painful and difficult. An œsophageal bougie was passed without a hitch, but she brought up a dessert-spoonful of blood the same evening. Nov. 29th, temp. 103·4°, dulness and tubular breathing in the interscapular region. Nov. 30, 8 p.m., temp. 104·8°. At 11 p.m., a sudden, small hæmorrhage from the mouth followed by death, almost immediately, from syncope. *Post-mortem examination.*—Stomach and duodenum distended with blood-

clot, weighing 2¼ lbs., and forming an accurate cast of their cavities. Just at the junction of the transverse with the descending part of the arch of the aorta was a perforation that would have admitted a No. 10 catheter; the opening passed into a fœtid, inflammatory swelling between it and the œsophagus and surrounding the parts about the roots of the lungs, accounting no doubt for the dulness noticed in the interscapular region. The opening passed directly through this fœtid cellulitis into the œsophagus, where it was large enough to admit the little finger. No fish-bone could be found. Probably it had been washed away in the gush of blood.

23. *Aschenborn* ('Berliner klin. Wochens.,' 1877, t. xiv, p. 725), 'Lond. Med. Record,' vol. vi, 1878, p. 21, quoted by Durham, in Holmes and Hulke's 'System of Surgery,' vol. i, p. 787.

A young man swallowed a hard morsel of bread containing, apparently, a needle two inches long. The œsophagus was penetrated and the aorta transfixed. Blood was passed by stool on the ninth and tenth days, and the patient succumbed in a few minutes on the eleventh day from a copious hæmorrhage from the mouth.

II. Perforation of an Undetermined Artery.

24. *Erichsen* ('Science and Art of Surgery,' 8th ed., vol. ii, p. 661).

Male swallowed a piece of gutta percha, part of an artificial masticatory apparatus. A few days after examined by a surgeon, who could not detect any foreign body. Inability to swallow solids. Six months later examined by Mr. Erichsen, who failed also to discover the body. One day while at dinner the patient suddenly vomited a large quantity of blood, and fell down dead. The gutta percha had formed for itself a bed in the wall of the œsophagus, and lay parallel with the inside of the tube. The œsophageal vessel opened was not ascertained. The carotid arteries and jugular veins were not implicated. The surface of the gutta percha, which looked towards the œsophagus, being constantly covered and smoothed over by mucus, and protected by a rim of swollen mucous membrane, had allowed the probang to glide smoothly over it.

III. Perforation of Œsophageal Artery.

25. *Monestier* ('Bull. de la Soc. Anat.,' vol. viii, 1833, p. 226).

Young female eating cabbage, swallowed a piece of the vertebra of a pig. This caused a slough involving an œsophageal artery.

On the separation of the slough slow effusion of blood took place into the stomach, which relieved itself from time to time by vomiting and stool. The patient died suddenly at the end of three weeks.

IV. Perforation of Inferior Thyroid.

26. *Pilate* ('Bull. de la Soc. Anat. de Paris,' 1867, p. 648).

Female, æt. 55, swallowed a piece of bone; slight pain in swallowing. Eight days later she entered the hospital. Soon after hæmatemesis and frequent and copious bloody stools. Death in a short time. A piece of bone 3 centimetres long and 3 millimetres broad, with one end pointed, lay horizontally across the œsophagus at the inferior border of the cricoid cartilage. The lateral walls of the œsophagus were perforated and the adherent thyroid gland formed the base of the œsophageal ulcerations. One of the branches of the right inferior thyroid was involved.

V. Perforation of Carotid.

(*a*) *Left Carotid.*

27. *Bégin*, quoted by Dr. James Duncan, 'Northern Journal of Medicine,' vol. i, p. 20.

Male, while eating soup, swallowed a piece of bone, which stuck in the œsophagus; attempts to push it on towards the stomach were made and appeared to be successful. No further inconvenience was experienced till a month later, when he had sharp pains on the left side of his neck which continued with slight intermissions for some time. Everything seemed to be going on well, when he suddenly threw up large quantities of blood, perhaps to the amount of several pounds. The hæmorrhage presently ceased, but the next day it returned and proved fatal. On examining the body there was found in the œsophagus, about its upper third part, two parallel ulcerations, that on the right side nine lines in breadth, that on the left twelve; opposite the latter there was an adhesion between the œsophagus and the corresponding part of the carotid. In this vessel erosion had produced a small opening, about a line in diameter, which proved to be the source of the hæmorrhage. In all probability the ulcerations were due to scraping or tearing the mucous membrane during the operation of pushing the bone into the stomach with a probang.

28. *Auvert*, op. cit.

Perforation of œsophagus and left common carotid. Death.

29. *Dumoustier* ('Recueil de Méd. Militaire,' 1828, t. viii, p. 231). Male swallowed a beef-bone while eating soup. He entered the hospital on 18th April, 1820, complaining of sharp pain in the upper third of the œsophagus. Attempts at propulsion were made, great improvement followed, and patient left on the 18th of May. He came again on June 14th and stayed a few days. On 18th July he again returned; since accident he had experienced pain at anterior part and left of neck. No fresh symptom till 27th, when copious hæmatemesis occurred, recurring on 28th; he died on the 29th. At the upper third of the œsophagus were two parallel ulcerations, and there was a small hole in the left carotid united to the œsophagus by adhesions.

30. *Reid* ('Ed. Med. and Surg. Journal,' vol. xlviii, 1837, p. 95). George B—, æt. 27, tailor, was eating fish when a bone was arrested in his throat. The following day, he saw a surgeon who did not think there was any bone in the case, but attributed the pain and irritation to inflammation of the parts brought on by a fit of intemperance. At this time there was much pain and some tumefaction in the throat, and the patient could not swallow his spittle, which flowed from the angle of his mouth into a cup as he lay on his side. The next day he was twice bled to a soup-plate full, and on the fourth day was blistered over the sternum. On the fifth day there was tumefaction over the whole of the cervical region and he was bled again to a soup-plate full. On the eleventh day he was sick and vomited about a pint of fluid blood, not in the least coagulated. The sickness and vomiting of blood recurred the following morning. At 5 a.m. on the thirteenth day he awoke from sleep very sick, and just as he was about to get a cupful of tea he gave a groan and immediately expired, without external symptoms of hæmorrhage. At the post-mortem the stomach was found filled with blood. An inch above the left sterno-clavicular articulation two slightly ulcerated openings were found on each side of the tube. The left carotid adhered to the œsophagus and had in it a longitudinal opening to the extent of a quarter of an inch. The right carotid was sound. The fish-bone was not found.

31. *H. C. Johnson,* Durham, op. cit., p. 745. Boy, æt. 7, sustained a penetrating wound on the left side of the pharynx, through falling whilst he held the sharp end of a parasol in his mouth. The point was thrust so forcibly backwards that it nearly made its appearance through the skin at the side of the neck. Considerable hæmorrhage took place at once, and recurred at night. About the 7th or 8th a slough came from the interior of the mouth,

and arterial hæmorrhage to the extent of five ounces, and was arrested by external pressure. Soon afterwards the boy was admitted into St. George's Hospital, and a fluctuating swelling as large as half a hen's egg below and behind the left ear was opened, giving exit to pus and blood-clot. Two days later a gush of arterial blood followed a fit of coughing. Mr. H. C. Johnson tied the common carotid. No further hæmorrhage occurred, and the patient was discharged cured twenty-seven days after the operation.

32. *Dr. Cresswell Rich* and *Mr. Paul*, Liverpool. Preparation in museum of Liverpool School of Medicine.

Boy, æt. 6, had fluke for dinner on February 23rd, 1883. An hour afterwards he complained of something sticking in his throat. He was taken to a dispensary and told that the bone had been pushed down by an instrument. He continued unable to eat solids. Five days after the accident castor-oil was given to him, and an hour after taking it he vomited clotted blood. He was taken to the Infirmary, vomiting blood all the way. On reaching the hospital he was in a faint, the surface of the body and the face being livid and blue. Ergotine was subcutaneously injected. He became alternately conscious and unconscious and continued to vomit blood at intervals till death took place on the following day.

Post-mortem examination.—Well-nourished boy. On anterior wall of gullet, opposite the commencement of the trachea, there was a perforation of the size to admit a No. 8 catheter. It was circular, had a punched-out appearance, with perpendicular edge raised inside, and of a purplish red colour. There was neither discoloration of the surrounding mucous membrane nor undermining or separation of the coats of the œsophagus. There was no adhesion between the gullet and the left common carotid artery, but there was an opening in the vessel of the same size as that in the gullet. The vein was not injured. All the organs were very anæmic. No fish-bone or other foreign body was found; it had probably been washed away in a gush of blood. The mucous membrane of the alimentary canal was healthy, and there was no sign of any hæmorrhage from it. The large bowel was full of altered blood.

33. *Rivington*, 'Med.-Chir. Trans.' (Case described in present paper.)

(*b*) *Not stated, but probably Left Carotid.*

34. *Cripps* ('Lancet,' 1878, vol. i, p. 834).

In the discussion at the Clinical Society on the 24th May, 1878,

on Dr. McKeown's paper on a successful case of œsophagotomy for the removal of a set of artificial teeth from the œsophagus, impacted at the lower part of the neck, Mr. Cripps related a case in which a small fish-bone had been swallowed. Some pain was felt for a week, but no other inconvenience, when suddenly a short time after severe pain occurred, followed by a gush of blood from the mouth and rapid death, which was found to have been due to the bone having perforated the œsophagus and caused ulceration of the carotid at its bifurcation.

35. *Fingerhuth*, quoted by *Mackenzie*, 'Diseases of Throat and Nose,' vol. i, p. 109. Quoted also by Durham, op. cit., p. 784.

A piece of tobacco pipe was lodged in the side of the pharynx, and after an interval of eight months occasioned fatal hæmorrhage by wounding the carotid in a sudden movement of the head.

(c) *Left Ascending Pharyngeal.*

36. *Mr. Morrant Baker* ('St. Bartholomew's Hosp. Reports,' vol. xii, 1876, p. 163).

Man, æt. 23, fell with a clay pipe in his mouth. Two days afterwards he applied at St. Bartholomew's Hospital for sore-throat. The case was at first thought to be medical, but was subsequently transferred to the house surgeon as a case of abscess of the tonsil. The supposed abscess was punctured and only blood escaped. In the evening several more ounces of blood escaped from his mouth. Two days afterwards nearly a pint of blood was lost and a cavity found in the left side of the pharynx was plugged. The next day hæmorrhage recurred, and on examination under anæsthesia a piece of tobacco pipe three quarters of an inch long was found in the tonsil. This was removed and the cavity plugged. The common carotid was then tied, but the patient died in three hours. At the post-mortem an irregular cavity was found above and behind the left tonsil. The internal carotid lay about one eighth of an inch away from the cavity and had not been wounded. Into the cavity no artery could be traced, but the ascending pharyngeal appeared to terminate abruptly just at its edge and was stained by perchloride of iron.

(d) *Right Carotid.*

37. *Bell, of Barrhead* ('Lond. Med. Gaz.,' n. s., vol. i, 1843, p. 694).

Lad, æt. 18, swallowed a sharp body (as he thought, a pin) whilst he was eating some oatmeal porridge, and felt it sticking in his throat. He began to spit blood on the ninth day at 6 p.m., and at

11 p.m. brought up a soup-plate full. He kept spitting up mouthfuls till the next morning, when he vomited a large quantity, and died. The œsophagus was transfixed opposite the middle of the thyroid cartilage by a fine sewing needle three inches long, its point resting against the right common carotid artery. The walls of the vessel were destroyed, and a considerable opening, communicating with the œsophagus, had been made in the vessel, the internal coat of which had disappeared for one and a half inches, and was quite rotten. An ounce of pus and blood was found between the œsophagus and the artery.

(*e*) *Both Carotids.*

38. *Guthrie* ('Wounds and Injuries of Arteries,' p. 77).

A soldier swallowed an instrument composed of two half phial corks, fastened together with strong thread and with three pins thrust through each, so that the pins projected on each side. This machine became entangled at the commencement of the œsophagus, and caused death from hæmorrhage after the lapse of some days. The patient at first complained of some difficulty of breathing and uneasiness in the chest. The fauces became slightly reddened and inflamed and he was utterly incapable of swallowing anything but liquids. This was followed by ptyalism and soon by spitting of blood of a light scarlet colour, without any cough; increasing in quantity daily, until he brought up six or eight ounces. A day or two afterwards the blood poured out of his mouth so rapidly that Guthrie was sent for. He arrived in time to see the blood fill a chamber-pot, when the patient fell back, dead. The instrument rested across the œsophagus so that the points of the pins were close to the carotid arteries, and having by degrees given rise to ulceration of the œsophagus, wounded them on both sides. Every elongation or pulsation of the arteries had brought them against the point of one or more of the pins, the marks of which were observable in several small holes of different sizes on the sides of the vessels. As one or two of these became larger from the constant attrition, blood came through into the œsophagus, and as they again increased by ulceration, larger holes were formed from which the sudden and fatal hæmorrhage took place. Guthrie adds, "The instrument and the arteries I sent from North America to the late Dr. Hooper, and they ought to be in the museum of King's College."

VI. Perforation of Right Subclavian (abnormal).

39. *Kirby* ('Dublin Hospital Reports,' t. ii, p. 224).

A poor woman, one of those miserable creatures who feed in the streets of Dublin upon the mixed offal which they receive from servants, was greedily enjoying such wretched fare, when a morsel stuck in the œsophagus. She was taken to St. Peter's and St. Bridget's Hospitals, but died before Mr. Kirby arrived. Tracheotomy and artificial respiration were of no service. At the post-mortem two large morsels of food were found in the œsophagus, one below the cricoid cartilage and the other as low down as the upper extremity of the sternum. The latter morsel contained a piece of bone, an inch and a half long, one of its ends being sharp and pointed. The bone lay obliquely across the œsophagus, transfixing it at its left and posterior part, and wounding the right subclavian artery, which, contrary to its usual course and origin, lay in this situation as it passed from the left of the arch of the aorta, where it arose towards the right shoulder. The surrounding cellular tissue was filled with blood, which, accumulating principally at the sides of the neck, had produced a remarkable fulness there noticed during the previous examination of the patient.

VII. Perforation of Pulmonary Artery.

40. *Bernast* ('Jour. hebd. des Sci. Méd.,' 1833, also 'Lond. Med. Gazette,' May 11th, 1833, p. 175, and Duncan, op. cit.).

A young soldier swallowed a sharp bone while taking soup. He entered the Toulon Hospital, continued in great pain for some days, and threw up some ounces of blood. He died on the eighth day. A flattened sharp-pointed bone was found in front of the œsophagus, which it had perforated, and there was a minute opening in the pulmonary artery at its bifurcation. A large quantity of extravasated blood was found in the chest.

VIII. Perforation of Heart and Right Coronary Vein.

41. *Andrew* ('Lancet,' vol. ii, 1860, p. 186).

A woman was found on a doorstep in a dying state, and taken to University College Hospital. The previous history could not be gathered. At the post-mortem it was found that a fish-bone had penetrated the stomach close to the œsophagus, then the diaphragm and pericardium, and the posterior surface of the heart, and finally inflicted a jagged wound in the middle of the septum immediately over the right coronary artery and vein, penetrating the latter vessel. The pericardium was filled with a pint and a half of fluid blood.

IX. Perforation of Demi-Azygos Vein.

42. *Saucerotte* ('Ann. de la Soc. de Méd. pratique de Montpellier,' t. ii, p. 247).

Carbineer swallowed a piece of bone. Sharp pain towards cardiac orifice. Eight days afterwards Saucerotte introduced a wax bougie. The bone was dislodged and returned by vomiting with much blood. Death next day. The œsophagus was divided vertically for 3 centimetres at the level of the sixth rib, and a large vein, believed by Saucerotte to be the demi-azygos, was implicated.

X. Perforations of Vena Cava, Superior and Inferior.

43. *Laurent Lovadina* ('Jour. Complém. du Dict. des Sciences Médicales,' t. i, 1818, p. 93).

Male, æt. 42, swallowed a bone, which was arrested at the back of the throat and required much time and effort to make it descend into the œsophagus. Angina, sharp pains at each respiration, and efforts at vomiting persisted for ten days, when the patient, whilst raising himself to make water, was seized suddenly with vomiting of blood and expired.

Autopsy.—Great gangrenous patches upon the soft palate, pharynx, and œsophagus. A little below the orifice of the gullet there was a great rent, which was thought to have been produced by the sharp angles of the bone. On the outer and towards the anterior part of the vena cava superior was a rent an inch long and about an inch from the right auricle. Another less extensive rupture was found on the anterior face of the vena cava inferior before its entry into the pericardium.

44. *Coester* ('Berliner klin. Woch.,' 1870).

Male, æt. 56, complained on Nov. 11th of great pain radiating from the epigastrium, loss of appetite, and oppression. Castor-oil gave some relief. On the 17th the painful crisis returned, followed by vomiting of blood and sudden death. The pleura and stomach were found filled with blood. The œsophagus was perforated half an inch above the diaphragm. In the perforation a rather large pointed and cylindrical piece of bone was engaged. The descending cava had contracted adhesions to the œsophagus and was perforated like it.

45. Dr. H. Thompson ('Brit. Med. Journal,' 1874, vol. ii, p. 571), quoted in text, p. 65.