Chapter 22: The oesophagus in otolaryngology

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To be able to eat a meal that has been specifically and lovingly prepared is one of life's most satisfying pleasures; certainly the intake of food is an essential necessity of life. Any interference with the ability to swallow quickly leads to the patient consulting the general practitioner. The patient may then be referred to a gastroenterologist, a cardiothoracic surgeon or to an otolaryngologist. It is essential, therefore, that specialists in all disciplines are familiar with the conditions affecting the oesophagus.

Anatomy and physiology

The oesophagus is that part of the alimentary tract which connects the pharynx to the stomach and therefore has a cervical portion, an intrathoracic portion and a short intra-abdominal portion. The function of the oesophagus is the rapid and satisfying transfer of food in one direction and, less pleasant, gastric gases and contents in the other.

A detailed account of the anatomy and physiology of the oesophagus is given in Volume 1, Chapters 10 and 11. It is sufficient here to say that a knowledge of the act of swallowing goes a long way towards the understanding of the symptoms of disorders of the oesophagus.

The act of swallowing is initiated voluntarily and is completed, thereafter, by a sequence of orderly reflexes. Swallowing may be considered in three phases: oral, pharyngeal and oesophageal. In the oral phase food is chewed, mixed with saliva and then propelled backwards by the tongue into the pharynx. This initiates a reflex inhibition of breathing and the closure of the openings into the nasopharynx, oral cavity and larynx, preventing regurgitation into the nose and aspiration into the larynx and bronchial tree. The pharyngeal phase is quite short. Relaxation of the cricopharyngeal muscle or upper oesophageal sphincter is critically timed to allow the food bolus to pass from the pharynx into the oesophagus. Almost immediately the cricopharyngeus contracts and an orderly primary peristaltic contraction of the oesophagus propels the bolus down towards the stomach. Each peristaltic contraction is preceded by a zone of relaxation. The lower gastro-oesophageal sphincter mechanism - there is no anatomical muscle present - relaxes and allows the food to enter the stomach. Should the oesophagus not be cleared, then a secondary peristaltic wave will complete the process.

Reflux of gastric contents back into the oesophagus is prevented by a combination of the physiological tone of the lower oesophagus, the oesophagogastric angle, the pinch-cock effect of the diaphragm, the negative intrathoracic pressure in association with the slight positive intra-abdominal pressure and perhaps the mucosal folds at the oesophagogastric junction.

With this brief insight into the physiology of the act of swallowing, some of the symptoms of oesophageal disease can now be considered.
Symptoms of disease of the oesophagus

Although conditions of the oesophagus are being considered, it should not be forgotten that almost any disease or abnormality of the tongue, pharynx or oesophagus can cause problems with swallowing. Swallowing can be inhibited by pain, neuromuscular dysfunction or mechanical obstruction, thus oesophageal disease may be indicated by one or more of the following symptoms.

**Dysphagia**

It is essential, when a patient complains of difficulty in swallowing, that a distinction is made between those who can initiate the act of swallowing, those who are reluctant to swallow because of inflammation of the throat or because of the embarrassing effects of laryngeal incompetence, and thirdly, those who can swallow properly but the food is either slow to go down, sticks completely or only passes into the stomach after the patient drinks a glass of water.

The question of how long the patient has had the problem should always be asked, for if it has been present for a number of years the cause is likely to be of a benign rather than a malignant nature. Malignant conditions tend to produce symptoms within weeks, although the occasional patient, reluctant to consult his doctor, may put up with his symptoms for a year or more before seeking help.

The changing nature of the diet which the patient can take will also give some indication of the nature and progression of the problem. When sphincters are weak, fluids are more difficult to direct along the proper channels than solids. True dysphagia with its implication of neuromuscular or mechanical obstruction is worse with solids. Precise localization of the site of obstruction is often unreliable, the patient invariably suggesting a level higher than it actually is.

**Regurgitation**

A distinction should be made between the forceful vomiting of gastric contents and the gentle regurgitation of undigested food. The painless regurgitation of undigested food indicates a dilated viscus above an obstruction - seen in its most marked form in achalasia or cardiospasm. Regurgitation due to lesions in the upper oesophagus happens during a meal; indeed the emptying of a pharyngeal diverticulum temporarily relieves the dysphagia caused by the distension of the pouch with food.

Acid regurgitation from the stomach into the throat is associated with a bitter taste - waterbrash. Patients may also feel a burning sensation in the precordium or back. Heartburn is due to a failure of the lower oesophageal sphincteric mechanism to prevent the acid gastric contents from entering the oesophagus when the patient bends down or tries to lie flat in bed. It is frequently associated with the sliding type of hiatus hernia. The volume of regurgitated contents can help in the diagnosis. The dilated oesophagus in achalasia may contain as much as 2 or 3 litres of material, whereas in cases of pharyngo-oesophageal diverticula or carcinoma the volume will be very much less.
**Pain**

When caused by oesophageal disease, pain may be felt in the epigastrium, in the substernal region, in the left subscapular region of the back, or in the root of the neck. If the pain is associated with, or aggravated by swallowing, its significance is readily appreciated. If dysphagia is minimal or absent, then oesophageal pain may wrongly be attributed to disease of the heart, lungs or stomach. Acid fluids cause ulcerated lesions to burn, so a patient with a hidden pharyngo-oesophageal neoplasm will avoid fruit juices because it aggravates his pain. The spasmodic pain associated with neuromuscular and obstructive lesions is more likely to be elicited by the ingestion of solid food.

**Bleeding**

Gross haemorrhage from the oesophagus is not often seen. It is usually due to varices. Some patients with neoplasms or inflammatory conditions may vomit or regurgitate a little blood-stained fluid. Fresh blood appearing in the throat may arise from lesions near the upper end of the oesophagus, but is more likely to come from the nose or pharynx.

**Respiratory symptoms**

Recurrent attacks of bronchitis or bronchopneumonia as a result of laryngeal spill-over or tracheo-oesophageal fistula frequently complicate disease of the oesophagus. Progressive deterioration of pulmonary function may be such that the underlying cause may be missed altogether. Occasionally, cancers of the bronchus may invade the oesophagus, giving rise to dysphagia or even, in advanced cases, broncho-oesophageal fistulae.

Hoarseness, whether due to vocal cord paralysis, simple laryngitis or to the simple weakness of cachexia should, in the absence of a bronchial tumour, arouse suspicion of an oesophageal lesion.

**General symptoms**

Loss of weight is the most important of the generalized symptoms. It occurs rapidly in the presence of oesophageal obstruction. General malaise and tiredness due to anaemia are frequently observed in oesophageal disease.

**Physical examination**

As with all patients, the examination of a patient with suspected oesophageal disease should include a physical examination of the chest, abdomen, cardiovascular and nervous systems. Evidence of wasting, weight loss and dehydration should be noted. Inspection and palpation of the neck may reveal enlargement of the thyroid gland. Palpable lymph nodes suggest inflammatory or neoplastic conditions arising in the pharynx or oesophagus. The absence of laryngeal crepitus against the vertebral column may be seen in some cases of carcinoma of the postcricoid region or the upper oesophagus.

Inspection of the mouth and tongue may reveal evidence of anaemic such as glossitis, atrophy of the lingual papillae and cracks or fissures at the corners of the mouth. These
features are frequently seen in the Paterson-Kelly (Plummer-Vinson) syndrome, as are brittle spoon-shaped finger nails. An enlarged spleen may be palpable in patients with this syndrome. Enlargement of the liver may also be noted on abdominal examination, which may be due to metastatic involvement from carcinoma of the oesophagus or stomach. In the early stages of portal cirrhosis, the liver, before it begins to contract, may be palpable. Other manifestations which should be looked for are spider naevi around the neck and upper chest, palmar erythema and, in the advanced stages when bleeding from oesophageal varices occurs, the superficial veins radiation from the umbilicus enlarge to form the caput medusae. Progressive ascites also occurs, as it may with malignant disease of the oesophagus involving the liver.

Mirror examination of the pharynx may reveal palatal or vocal cord paralysis, ulceration or tumour. Even when these areas appear normal, the pooling of saliva in the pyriform fossae arouses suspicion of a lesion at a lower level.

**Diagnostic aids**

Accurate diagnosis of oesophageal disease requires a variety of diagnostic techniques which include various radiographic techniques, endoscopy and measurement of intraluminal pressures of the oesophagus and pH changes at different intraluminal levels.

**Radiological techniques**

Radiological techniques include routine plain films of the chest and neck and fluoroscopic screening with contrast media (see Chapter 2).

*Posteroanterior views* of the chest and mediastinum may show pulmonary fibrosis and tumour enlargement or displacement of the mediastinum, aortic aneurysm, and the shape and the size of the heart. Enlargement of the left atrium in mitral valve disease can result in dysphagia, due to compression of the oesophagus.

*Lateral soft tissue views* of the neck to show outlines of the larynx, trachea, vertebral column, the vertical band of soft tissue representing the postcricoid region and the cervical portion of the oesophagus are especially useful. Widening of the retro-oesophageal soft tissue may indicate the presence of a tumour or perhaps cellulitis. Surgical emphysema suggests a perforation of the oesophagus which may be spontaneous or more commonly, iatrogenic, following endoscopy or reconstructive surgery. A fluid level within an abscess cavity or a persistent gas bubble in the upper oesophageal lumen are also significant abnormalities seen in this projection.

*Fluoroscopic screening* permits the radiologist to observe the passage of a bolus of contrast medium from the pharynx to the stomach. Cine photography or video recordings are especially useful in studies of upper oesophageal and pharyngeal abnormalities where movement is extremely rapid. The best contrast medium is a water suspension of barium sulphate, although a water-soluble contrast medium is advisable when perforation is suspected. Radiography is not the best way to demonstrate the presence or absence of significant or pathological oesophageal reflux, especially if manoeuvres such as abdominal compression or the Valsalva test are required to provoke it. Thus other more sensitive tests should be used to confirm the diagnosis of suspected gastro-oesophageal reflux.
Endoscopy

Endoscopy - the techniques of which are given in Chapter 3 - permits direct inspection of the lumen of the oesophagus and of the oesophagogastric junction. It confirms the information obtained from radiographic and physiological studies. It enables verification of the nature of oesophageal pathology to be made, either by biopsy or from cytological studies of smears or washings. It is also useful in localizing the site of bleeding.

Although it is true to say that endoscopic studies are an essential part of the investigation of oesophageal disorders, they should not be performed by the occasional endoscopist. The original oesophagoscopes were rigid instruments which were difficult and dangerous to use. Oesophageal perforation, particularly in the cervical region, occurred in as many as one in 100 examinations. The introduction of the flexible fibrescope has considerably simplified the endoscopic examination of the oesophagus and has reduced the incidence of perforation. Many believe that rigid endoscopes should be reserved for the removal of foreign bodies.

Some endoscopists will not perform an oesophagoscopy without there being a previous barium swallow to indicate the site of any possible obstruction. This in turn helps to reduce the incidence of oesophageal perforation.

Manometry

The measurement of pressures within the lumen of the oesophagus is an important and reliable technique in the evaluation of the oesophageal disorders, particularly those characterized by abnormalities of oesophageal motility. Manometric studies are performed using saline-filled tubes, usually a constantly infused system. The pressure changes recorded graphically are usually made with the tube assembly in the stomach, in the high pressure zone and in the body of the oesophagus.

Manometric measurements are of use in determining the location of the lower oesophageal sphincter mechanism and also the abnormal segments encountered in achalasia and diffuse spasm of the oesophagus.

pH measurement

The pH reflux test is especially sensitive in confirming the presence or absence of gastro-oesophageal reflux. In this test a small volume of 0.1M hydrochloric acid is instilled into the stomach. A special pH electrode is placed in the oesophagus and the pH recorded while the patient performs various manoeuvres such as coughing, deep breathing and the Valsalva test in various positions. A fall in pH to below 4.0 is taken as indicative of the presence of gastro-oesophageal reflux.

The introduction of the technique of 24-hour pH monitoring has proved especially helpful in patients with complicated diagnostic problems. The refinement of technique which permits pH measurement in the patient’s home or working environment rather than in the laboratory, has proved even more useful.
**Miscellaneous studies**

These include the acid clearing test, the acid perfusion test, the measurement of the potential difference between the inside and outside of the stomach and oesophagus, and technetium scanning.

The acid clearing test measures the ability of the oesophagus to clear regurgitated gastric contents. A prolonged acid clearing test indicates a poor prognosis in terms of the development of oesophagitis and its sequelae. The acid perfusion test is of limited value and was used as a means of differentiating pain of oesophageal origin from that of angina. Measurement of the potential difference between the inside and outside of the stomach and oesophagus has been found useful in identifying the junction between the squamous and columnar epithelium of the oesophageal mucosa. The change in potential difference does not accurately define the gastro-oesophageal junction.

Technetium-99m is used in the diagnosis of oesophageal disease, particularly in attempts to identify mucosal changes in patients with a Barrett or gastric-lined oesophagus and to diagnose oesophageal tumours. Some workers consider technetium scanning a safe non-invasive method not only to detect but also to quantify gastro-oesophageal reflux.

**Oesophageal motility disturbances**

For convenience disturbances of motility can be considered as affecting:

1. the upper oesophageal sphincter;
2. the body of the oesophagus and the lower oesophageal sphincter.

**Upper oesophageal sphincter**

Oropharyngeal dysphagia, that is cervical oesophageal dysphagia, is caused by a variety of conditions - cerebrovascular accident, Parkinson's disease, bulbar poliomyelitis and multiple sclerosis. Muscular diseases, conditions such as muscular dystrophy, myasthenia gravis and the inflammatory dermatomyositis also affect the upper sphincter. These disturbances of motility are discussed in Chapter 10 and pharyngeal diverticula, another important cause of cervical dysphagia, in Chapter 14.

**Body of the oesophagus and lower sphincter**

Motility disturbances of the body of the oesophagus and the lower sphincter may be due to achalasia or cardiospasm, diffuse spasm, or to a hypotensive lower oesophageal sphincter as seen in hiatus hernia and scleroderma, and also to miscellaneous conditions such as myasthenia gravis, cerebrovascular accidents, Parkinson's disease, muscular dystrophy, and diabetic and alcohol neuropathies.
Achalasia of the cardia

The aetiology of this condition is unknown. It is characterized by the absence of peristalsis in the body of the oesophagus, a high resting pressure at the lower oesophageal sphincter, and the failure of the sphincter to relax in response to swallowing. It is thought to have a neurogenic cause supported by the absence or reduction in the number of ganglion cells in Auerbach's plexus. Obstruction to swallowing is the commonest and perhaps the earliest symptom. Frequently the patient has most difficulty with cold food, and solids pass more readily than liquids. This latter feature contrasts with the symptoms of a malignant or benign stricture. Regurgitation occurs in nearly 70% of patients particularly at night, can give rise to aspiration and respiratory symptoms. Pain is infrequent.

Few patients lose weight with this condition. It is more frequently seen in women than men and in patients aged between 30 and 60 years, and often these patients are psychologically disturbed. It may occur in children.

A serious complication of achalasia, even in treated patients, is the development of carcinoma of the oesophagus. Therefore all patients should be kept under review for life. The diagnosis of achalasia is confirmed radiologically and by motility and manometric studies. Endoscopy should also be performed to distinguish early achalasia from carcinoma and benign strictures, which can complicate the condition.

Barium swallow X-rays show a dilated oesophagus with a narrowed rat-tail lower end. In advanced cases the oesophagus may contain 2-3 litres of fluid and food debris. Manometry shows absent peristalsis in the whole length of the oesophagus, feeble or absent contractions, a normal or elevated resting pressure of the lower oesophageal sphincter and failure of the sphincter to relax during swallowing when a higher pressure will be recorded.

Treatment

Attempts to relieve the symptoms of patients with achalasia by eliminating the distal oesophageal obstruction by drugs or by forced dilatation, have largely been unsuccessful in the long term. Nitrates or nitroglycerines have been used and some patients have been taught to pass their own bougies. Surgical treatment with the modified Heller myotomy has proved to give much better relief of symptoms than forced dilatation and should therefore be the treatment of choice in all but those who are unfit for operation. It carries a lower mortality, the incidence of perforation is considerably less, and most patients are improved. The approach is via a left posterolateral thoracotomy. Controversy rages between surgeons as to whether or not an antireflux procedure should be undertaken after the myotomy has been carried out, as reflux oesophagitis has been reported postoperatively.

Diffuse spasm

Diffuse spasm differs in that there is normal sphincteric relaxation whether the pressure is normal or elevated. In cases of diffuse spasm of the oesophagus, an extended myotomy is frequently carried out, the myotomy including the lower sphincter if it is shown by manometry to be hypertensive. The length of the myotomy is governed by the extent of
the disease as defined by the manometric studies. The incision may extend up to the aortic arch or even higher in some cases. Oesophageal diverticula if present can be excised.

**Perforation of the oesophagus**

Perforation or rupture of the oesophagus, in spite of modern therapy, still carries a high mortality and morbidity. Early recognition and treatment should ensure a favourable outcome in most cases.

Although perforation or rupture may occur spontaneously, the commonest cause is instrumental, either by the rigid oesophagoscope or by bouginage. The advent of the flexible fibreoptic oesophagoscope has considerably reduced the number of oesophageal perforations. Instrumental perforations may occur at any level, but most are seen in the upper oesophagus especially just above the upper sphincter and also as a result of impingement of the oesophagoscope on the bodies or on osteophytes of the cervical vertebrae. The next most common site both for instrumental and foreign body perforations is the lower oesophagus as it narrows to pass through the hiatus. Perforations of the middle third and abdominal section of the oesophagus are infrequently seen unless benign or malignant strictures have necessitated dilatation. The use of the YAG laser in the cutting out of a passage through inoperable tumors may also result in perforation of the oesophagus.

Postemetic rupture usually occurs at the lower end of the oesophagus but can, on rare occasions, occur at the upper end or even in the middle. Perforation occurs as a longitudinal tear of all layers of the wall of the oesophagus just above the diaphragm. It is thought that the sudden onset of pressure in the oesophagus rather than the actual pressure is the chief contributory factor. The fact that it occurs in adults rather than in children suggests that the strength of the oesophagus is greater in children. Typically postemetic ruptures are seen after ingestion of a heavy meal, or following a beer drinking session followed by retching and vomiting. Other conditions implicated in non-instrumental perforation of the oesophagus include stress associated with neurological disease, or after burns or operations away from the oesophagus. Postoperative leaks may be seen after reconstructive operations on the oesophagus. Injuries to the cervical oesophagus may be seen in suicidal or malicious throat cuts, or gunshot wounds.

The consequences of perforation are due to the contamination of the mediastinal tissues and pleural cavities with digestive juices, food and bacteria which gives rise to cellulitis and suppuration.

The symptoms of perforation depend largely on the site of perforation and the extent of inflammatory reaction. Pain, fever and difficulty in swallowing and flexing of the neck are frequent early features of cervical oesophageal rupture. Surgical emphysema or crepitation may vary in extent but is a common feature. In cases of thoracic oesophageal perforation, cervical surgical emphysema may be present but without tenderness. Cardiorespiratory embarrassment may be a feature and a pneumothorax may also result from perforation of the oesophagus. X-rays of the chest and neck are most useful in making the diagnosis. Indeed, all patients who complain of pain or tenderness after endoscopy should undergo further X-rays. Air in the mediastinal tissue spaces and widening of the mediastinum and retrovisceral space are frequently seen. Pleural effusion with or without pneumothorax may present and
occasionally air may be seen under the diaphragm should the abdominal portion of the oesophagus be ruptured. Abscess formation may also be revealed in long-standing cases and the author has even seen an infected pericardial effusion some 3 weeks after endoscopic perforation. Barium studies are useful in determining the site of perforation and detecting underlying pathology.

**Treatment**

Early diagnosis of perforation of the oesophagus is essential, mortality being as high as 50% or more if treatment is delayed for over 24 hours after injury. As soon as the diagnosis of perforation is made the patient should not be allowed to take food or fluid by mouth, a central venous catheter should be inserted for parenteral feeding and also for measurement of the central venous pressure. Suitable broad spectrum antibiotics are also given intravenously to minimize mediastinal infection. The site of perforation, the clinical state of the patient at the time of diagnosis and underlying oesophageal pathology influence the management of perforations of the oesophagus. Instrumental perforations of the cervical oesophagus, if recognized early, can be managed by simple conservative measures but, if suppuration has developed, surgical drainage of the retro-oesophageal space and/or the mediastinum may be necessary. Suppuration extending down to the level of the fourth thoracic vertebra can be reached through a cervical incision made along the anterior border of the sternomastoid muscle. This together with parenteral feeding and antibiotics may be all that is required. Sometimes mediastinal abscesses need to be drained via the chest. Complete healing of the oesophagus may take as long as 2 months and mobilization of the patient may be speeded up by the establishment of a feeding gastrostomy or jejunostomy. Some operators have encouraged the healing process by the local endoscopic application of a solution of 20% sodium hydroxide repeated at weekly intervals.

Oral feeding can be resumed when there is no radiological evidence of a leak and there is no discharge from the chest.

Management of perforation of the thoracic oesophagus depends upon the original pathology and the time after injury. Perforation of the thoracic oesophagus is usually more serious than that of the cervical oesophagus. Conservative management in these circumstances is rarely successful and active treatment is necessary. Simple repair of the perforation with drainage of the pleural cavity is suitable when the diagnosis is made early - within 6 hours - and there is minimal soiling of the mediastinum and pleural cavity and no underlying pathology in the oesophagus.

Excision of the oesophagus containing the perforation, stricture or tumor, followed by reconstruction of the alimentary tract is also suitable in cases diagnosed early. Some surgeons prefer to perform the proximal anastomosis in the neck rather than in the thorax, as the consequences of anastomotic leak are less. In the case of delayed presentation or diagnosis, it may not be possible to undertake the major reconstructive surgery until a much later date. In these cases the damaged oesophagus can be excised, pleural drainage, cervical oesophagogostomy, closure of the cardiac end of the stomach and a feeding gastrostomy or jejunostomy are all carried out as the first stage with reconstruction, utilizing colon or stomach, being carried out at a later date.
Spontaneous postemetic perforations of the lower oesophagus are best debrided and closed surgically as soon as possible. The suture line may be reinforced by pleura or by using the fundus of the stomach as a patch (Thal). In cases of delayed diagnosis, management comprises simple drainage together with parenteral feeding and antibiotics, but mortality is high, death resulting from sepsicaemia and its sequelae of hepatorenal failure and disseminated intravascular coagulation. Similarly anastomotic leaks developing after initial repair are difficult to deal with, hence the two stage forms of treatment.

**Foreign bodies in the oesophagus**

The variety of foreign bodies lodging in the oesophagus is legion, but coins, bones, open safety pins and lumps of meat are by far the most common to be encountered. The site of impaction may be at the upper oesophageal sphincter (cricopharyngeus muscle), at the level of the arch of the aorta or at the level of the hiatus. Pathological causes include benign and malignant strictures.

The incidence of foreign bodies rises in old people who frequently get lumps of meat stuck in the oesophagus by a combination of failing to chew properly - particularly if they are edentulous or wear ill-fitting dentures - or if there is lack of effective propulsion by the oesophageal musculature. Dentures themselves may be swallowed, particularly those that are partial or ill fitting especially when the patient is asleep or under the influence of alcohol.

Impaction of blunt objects usually causes total dysphagia, discomfort and excessive salivation whereas sharp objects may puncture the oesophagus thus giving rise to mediastinitis. The patient is often able to point to the exact site particularly if the foreign body is lodged in the upper part of the oesophagus. When the foreign body is in the middle or lower third, localization is not so accurate and pain is referred to the back or behind the sternum. The pain is of a sharp, cutting nature and is worse when the patient attempts to swallow and occurs at the same site every time the patient swallows. Dysphagia is nearly always present and is due to the size of the foreign body or to inflammatory reaction and spasm caused by its presence. At first there may only be slight difficulty in swallowing, but later the difficulty becomes more pronounced. There is also regurgitation of food, saliva and mucus in the later stages. When the obstruction is complete there may be overflow of oesophageal contents, giving rise to respiratory symptoms suggesting the possibility that the foreign body is in the bronchial tree.

**Examination**

The patient must be observed during the act of swallowing. Palpation of the neck may reveal a tender swelling in the lower part, medial to the sternomastoid, due to the inflammatory reaction around the foreign body by an abscess, and if the oesophagus or pharynx has been perforated surgical emphysema may be felt.

The mouth, pharynx, tonsillar region and the base of the tongue must be examined carefully and with a good light. A small sharp fish bone may lodge in the base of the tongue or the crypt of the tonsil, even if the patient is convinced that the bone has been swallowed.
Each part of the pharyngeal wall must also be examined carefully to find the tip of a fish bone that has become embedded in the tissues. The tissues may well appear bruised and inflamed. If the patient is able to localize the pain to one side, then the foreign body or the laceration caused by its passage must be above the cricoid level and should be visible in a mirror. Most foreign bodies which can be seen in the mirror can be removed without the need for a general anaesthetic. If the patient holds his own tongue the surgeon can, with the aid of his mirror, guide the forceps down the throat, grasp and withdraw the foreign body. He must not carry out a 'blind grab'. If a foreign body cannot be seen in the laryngeal mirror, other investigations are necessary.

All patients with a history of swallowing a foreign body should have posteroanterior chest and lateral neck X-rays taken and if the foreign body is not revealed, the neck, thorax and abdomen should be screened, using a little barium. The opaque medium may be held up and actually outline the foreign body or the column of barium may be split. If the barium does not pass or cannot be washed down with water, then the presence of a foreign body is to be strongly suspected.

The patient should be kept under observation until he is completely symptom free. Abrasion of the oesophageal mucosa will give some pain and cause dysphagia but usually these symptoms disappear rapidly. Increasing pain and dysphagia indicate the presence of a foreign body or some more serious damage to the oesophageal wall. In these circumstances or if there is any doubt about the presence of a foreign body, an oesophagoscopy is imperative.

Ideally endoscopy should be carried out as soon as possible after the radiological examination because the foreign body may have moved. Obviously, in children, small oesophagoscopes or even an anterior commissure laryngoscope may be sufficient if the foreign body is impacted in the upper oesophagus. Oesophagoscopys should be performed under general anaesthesia, the anaesthetist taking care not to pass the endotracheal tube blindly, thus damaging the oesophagus or causing the foreign body to perforate the oesophageal wall. The oesophagoscope should be passed slowly because it is easy to override the foreign body such as a coin, tablets or pieces of meat, especially if it has become coated with mucus. The oesophagoscope is passed as near as possible to the foreign body making sure that it is not pushed further downwards. Grasping alligator-type forceps are passed and the foreign body is pulled up through the oesophagoscope or until it impinges on the end of the oesophagoscope which is then removed. Care must be taken passing the cricopharyngeus as the foreign body could be dislodged sometimes to be found in the pharynx from which it can be removed using McGill's forceps.

Meat and soft foreign bodies are extracted piecemeal with forceps. Sharp objects such as bones, safety pins, razor blades and dentures present special problems for the operator. The oesophagoscope is passed until the foreign body is seen and the position of the sharp edge noted. The object of the exercise is to remove the foreign body without damaging the oesophagus.

Mucus, food debris and any barium left after the X-ray examination are removed carefully by suction. If the end of the foreign body is buried in the oesophageal wall, manipulation is necessary to release it so that it can be withdrawn. Any bleeding may be
controlled with adrenaline-soaked gauze pledgets. Small bones may be extracted through the oesophagoscope but large ones should be withdrawn abutted to the end of the scope. Razor blades may have to be broken or bent in half to facilitate their removal. An open safety pin presents little problem if the point is downwards. However, if the point is facing upwards great difficulty is often experienced in removing it. If it is not possible to turn the pin in the oesophagus, it may be possible to manipulate the point of the pin into the lumen of the oesophagoscope and remove it that way. Endoscopic shears have been used and some operators attempt to close the pin with Clerf's or similar forceps. Should all else fail then the pin could be pushed into the stomach and either be rotated and extracted or even be allowed to pass onwards and in the fullness of time be passed per rectum.

Dentures in the oesophagus present many hazards, especially partially dentures with sharp points and hooks. During endoscopy the hook should be manipulated into the lumen of the oesophagoscope before extraction. If the denture is impacted it may have to be divided within the oesophagus.

After removal of the foreign body, it is essential that the oesophagoscopy is repeated to verify the presence or absence of any pathology such as benign or malignant strictures at or beyond the level of the foreign body, or injury to the oesophagus. The examination may have to be repeated some days later when the inflammatory reaction has subsided. In this instance, the patient should be treated for perioesophagitis or perforation with intravenous feeding and antibiotics.

Most foreign bodies which lodge in the oesophagus can be removed endoscopically but some have to be extracted at operation - these include dentures and razor blades. If the foreign body has been impacted for some time, it may erode through the oesophageal wall and form a perioesophageal abscess which will have to be drained and the foreign body removed.

**Hiatus hernia**

Hiatus hernia may be defined as a displacement of the stomach up through the oesophageal opening (hiatus) of the diaphragm into the lower mediastinum.

Two main types of hernia are recognized - sliding and paraoesophageal. In the sliding hiatus hernia the gastro-oesophageal junction, normally below the diaphragm, ascends into the chest. The consequence of this is gastro-oesophageal reflux because the oesophagus is not kept closed by the lower sphincteric mechanism. It should be remembered that not all patients with reflux necessarily have a hernia.

In the paraoesophageal hernia the lower end of the oesophagus and the gastro-oesophageal junction retain their normal anatomical positions below the diaphragm. However, a portion of the stomach protrudes up alongside the oesophagus through an enlarged hiatus. These patients do not suffer from reflux.

A mixed type of hernia may be encountered in which components of both sliding and paraoesophageal herniae are to be found, that is the lower oesophagus and gastro-oesophageal
junction slide up into the chest and, at the same time, part of the stomach passes up alongside the oesophagus through the enlarged hiatus.

**Clinical presentation**

The main symptoms of patients with sliding hiatus hernia are due to reflux and oesophagitis - heartburn on bending or on lying flat in bed, retrosternal discomfort, nausea and occasionally vomiting. Dysphagia may be due to muscular spasm or motility disorders, but is usually associated with the presence of a stricture.

Patients with paraoesophageal hernia do not experience heartburn and oesophagitis unless a mixed form of hernia is present. These patients' symptoms are due to anaemia, abdominal discomfort, dyspnoea and pseudoangina, the 'angina' indicating possible acute obstruction or impaction. In patients with reflux the possibility of regurgitation into the pharynx and aspiration into the larynx and bronchial tree should be remembered.

**Diagnosis**

The diagnosis of hiatus hernia is confirmed radiologically and by manometric and pH studies, as well as by endoscopic examination. Paraoesophageal herniae may be diagnosed on a lateral chest X-ray, the gastric air shadow being seen behind the heart. Fluoroscopic studies using contrast media such as barium also help to confirm the diagnosis.

Oesophagoscopy is desirable not only to determine the level of the gastro-oesophageal junction (the smooth pink oesophageal mucosa changes to the rugal gastric pattern), but also to observe the degree of oesophagitis. The terms mild, moderate and severe should be avoided in favour of a more specific grading such as:

- grade 1 - mucosal erythema;
- grade 2 - erythema plus superficial ulceration;
- grade 3 - ulceration and a dilatable stricture;
- grade 4 - ulceration and an irreversible stricture.

A biopsy of the oesophageal mucosa should be taken to confirm the presence of oesophagitis, to diagnose the so-called gastric lined or Barrett’s oesophagus with its columnar epithelium, and to exclude malignancy.

**Treatment**

Many patients have a sliding hiatus hernia without experiencing any symptoms of gastro-oesophageal reflux; they need no treatment.

Symptomatic patients require treatment designed to reduce reflux and to lower the acidity of the gastric contents to minimize its effect on the oesophageal mucosa.
Medical treatment

Medical treatment consists of a weight reducing diet, avoidance of alcohol and tobacco together with drugs such as antacids, antispasmodics and H₂-receptor antagonists, used either on their own or in combination. Patients should not wear tight belts or corsets and they should, if possible, avoid bending. At night they should sleep with the head of the bed raised on blocks. The tendency is to slip off at any extra pillows that may be used, unless, of course, they are placed under the mattress.

Surgery is indicated in the treatment of sliding hiatus hernia only when medical treatment has failed to control the patient's symptoms within 6 months to a year. On the other hand, surgery is the treatment for paraoesophageal herniae if complications are to be prevented.

Age should not be considered a contraindication to surgical repair if the symptoms interfere with the patient's quality of life.

Surgical repair

The aim of any operation to repair a hiatus hernia should be to restore the gastro-oesophageal junction to its rightful anatomical place below the diaphragm while, at the same time, preventing gastro-oesophageal reflux.

The operation should be designed in such a manner that the pupils can readily reproduce the results of their masters. It is true to say that many operations have been described and none has proved to be ideal and we are still awaiting the perfect solution to the control of gastro-oesophageal reflux.

Operations which have stood the test of time include the Belsey mark IV, the Nissen fundoplication and the Hill antireflux procedure.

More recently, a Collis gastroplasty, in which the oesophagus is lengthened by the construction, in continuity, of a tube from the fundus of the stomach, coupled with an antireflux procedure, has found favour with many surgeons including Pearson whose name is now associated with the procedure.

The mark IV operation is performed only through a left thoracotomy incision and the Hill repair via the abdomen. The Nissen fundoplication and the Pearson procedure can be performed through either an abdominal or thoracotomy incision, as also can the Thal gastric patch plus an antireflux procedure.

A likely cause of failure of operations to cure symptoms of reflux is insufficient mobilization of the oesophagus, a reason why many surgeons prefer the thoracic approach. Oesophagectomy and reconstruction with stomach or preferably an isoperistaltic segment of the left colon or jejunum is reserved for patients who have had multiple previous procedures, especially if the oesophagus has become an unmanageable fibrous tube, or has been damaged during re-operation and resection.
The principles of the Belsey mark IV are adequate mobilization of the oesophagus, even as far as the arch of the aorta, and adequate cleaning of the gastro-oesophageal junction. Sutures are placed to close the hiatus before the antireflux procedure is constructed. The antireflux procedure is a 270° wrap of the gastro-oesophageal junction. This is achieved in two layers of mattress sutures, the first being placed in the stomach and oesophageal wall 2 cm above the oesophagogastric junction and back again. The second row of mattress sutures incorporates the central tendon of the diaphragm, that is diaphragm, stomach, oesophagus and back again. When this final layer is tied down the gastro-oesophageal junction is pulled below the diaphragm. Usually three mattress sutures are employed in each layer. Finally the hiatus is closed by closing the sutures already in position in such a way as to avoid obstructing the cardia.

The Nissen fundoplication is usually performed via the abdomen and also requires careful mobilization of the oesophagus. Its chief aim is the restoration of the normal function of the lower oesophageal sphincter mechanism rather than an anatomical correction. The plication is achieved by a 360° wrap of the lower oesophagus by approximating the anterior and posterior fundal folds in front of the oesophagus. The hiatus should also be narrowed to prevent the stomach passing through into the chest.

The original operation has undergone many modifications since its inception and has even been performed in the chest when the oesophagus was short.

Unfortunately there is a recurrence rate after all the operations for repair of hiatus hernia of 10-15% but in some series it may be as high as 75%. However, symptoms may be less severe and therefore more easily controlled with antacids, etc. Only in the last resort should oesophagectomy and reconstruction be necessary.

Strictures

In this section strictures associated with reflux oesophagitis are considered along with those due to the ingestion of caustic substances. Malignant strictures will be discussed in the section on malignant tumours.

Reflux strictures

The commonest type of oesophageal stricture is that secondary to the reflux of acid or alkali, of which acid oesophagitis is probably the most important. Reflux oesophagitis, if not overcome, can develop into chronic inflammation with ulceration or fibrous scarring which gives rise to stricture formation and shortening of the oesophagus or both. Strictures secondary to reflux can lie at the oesophagogastric junction or higher at the junction between squamous and columnar epithelium - this level may be as high as the arch of the aorta, as seen in the gastric lined or Barrett's oesophagus. Third, a long stricture involving the lower one-third or half of the oesophagus may develop. Possible causes of this long stricture are postpartum vomiting and postoperative nasogastric intubation and suction.
Symptoms

*Dysphagia* is the main symptom, typically in patients who have previously suffered symptoms of reflux, such as heartburn and discomfort associated with hiatus hernia, which tend to subside or disappear with the formation of the stricture.

*Loss of weight* is common with reflux strictures.

*Anaemia* and pain may be present, especially if a chronic ulcer is present.

Investigations

*Chest X-ray and barium swallow* are important investigations, as in all cases of dysphagia, to outline the stricture and any mediastinal lesion. It could be argued that manometric and pH studies are irrelevant in the presence of fibrous oesophageal strictures but, occasionally, strictures can occur in conditions with motor dysfunction such as achalasia.

*Endoscopy* should be performed in all cases of stricture to exclude neoplasm and to determine the level and severity of the stricture, and the presence of inflammation of ulceration of the oesophageal mucosa. In all examinations a mucosal biopsy of the stricture and, if possible, mucosa above and below it should be taken.

Treatment

The initial treatment of peptic reflux strictures is bouginage via the mouth followed by intensive medical therapy to neutralize the acid contents of the stomach which are more easily able to pass into the oesophagus. Bougies such as Hurst or Maloney mercury bougies or the Chevalier Jackson bougie may be passed using the rigid Negus oesophagoscope. The Eder Peustow type of dilators are passed over a fine guide wire placed in position with a fibrooptic oesophagoscope.

In both methods the risk of perforation, and the importance of its early recognition cannot be overemphasized.

Should bouginage and medical therapy fail then surgical treatment may be necessary to relieve symptoms of reflux strictures. These operations are those already described for the repair of hiatus hernia. The stricture must be dilated before the operation and perhaps once or twice afterwards before the dysphagia is completely relieved.

*Corrosive strictures*

The swallowing of corrosives is usually accidental in children and suicidal in adults. Strong solutions of caustic alkali are now rare household commodities. Because of this and precautionary warnings, labelling and safety devices used by manufacturers, these strictures are less frequently seen, while strong acids such as sulphuric, nitric and hydrochloric are only used in industry.
The greatest damage when these poisons are swallowed is seen in the mouth and in the lower third of the oesophagus. It is the injury to the oesophagus which determines the long-term future of the patient. The immediate survival hinges on acid-base equilibrium and renal function, upon the incidence of laryngeal oedema and the development of bronchopneumonia, especially in corrosives which emit fumes such as strong ammonia, hydrochloric acid and foaming nitric acid.

Immediate treatment is directed towards the treatment of shock and pain, and to the neutralization of the corrosive by the appropriate weak solution of acid or alkali. Parenteral feeding and intravenous antibiotics are begun as soon as possible. Careful regulation of the intravenous fluid and electrolytes is essential to preserve renal function.

A full evaluation of the injury by radiology and endoscopy should be carried out, although there is some controversy as to the value of early endoscopy.

A late result of ingestion of a corrosive burn is stricture formation of the oesophagus, the incidence of which may be reduced by the administration of corticosteroids. If the stricture is short and not severe and there is no ulceration or perforation, it can often be dilated. However, in a severely damaged oesophagus, the stricture is tight, fibrotic and elongated. In such cases resection of the affected segment and reconstruction using colon, jejunum or stomach are necessary.

**Postoperative strictures**

These can occur following operations on the oesophagus and other parts of the alimentary tract in which a nasogastric tube has been used. Strictures following oesophageal operations usually appear at the site of the anastomosis.

Those strictures occurring within a few weeks or months after operation are usually due to infection at the suture line and excessive granulation tissue. Stricture may be caused by reflux, local inflammation by tablets, particularly potassium salts and especially in patients with a recurrence of a previously resected neoplasm. Dysphagia following vagotomy and pyloroplasty is not infrequent. If this persists a stricture may develop possibly due to reflux and trauma at the lower end of the oesophagus.

Oesophageal webs or rings are fibrous membrane projections into the lumen producing an obstructive lesion. These are of two types:

1. the cervical web at the pharyngo-oesophageal junction which is more commonly seen in women. The patient complains of dysphagia, which if associated with glossitis and anaemia, is called the Paterson-Kelly or Plummer-Vinson syndrome.

2. lower oesophageal web or Shatskis ring can also cause dysphagia.
'Drug strictures'

Several tables can cause oesophagitis and subsequent ulceration and fibrosis if they are lodged in the oesophagus for any length of time. These are the various preparations of potassium, given in conjunction with diuretics, and antiarthritic drugs.

Increasing cases of oesophageal monilia are being reported with the increasing use of immunosuppressive therapy, steroids and antibiotics. The symptoms are those of painful dysphagia which may be relieved by the oral administration of nystatin.

**Diverticula of the oesophagus**

Upper oesophageal diverticula protrude between the oblique and horizontal fibres of the inferior constrictor muscle of the pharynx - the dehiscence of Killian. Strictly speaking this is a pharyngeal diverticulum or pouch and as such is discussed in Chapter 14.

Mid-oesophageal diverticula are of the traction type; most cause no symptoms and are only discovered on barium studies for unrelated conditions. Low oesophageal diverticula are frequently referred to as paradiaphragmatic diverticula and are usually associated with other oesophageal conditions such as hiatus hernia and diffuse oesophageal spasm. Inflammation can cause dysphagia and pain which are symptoms of the associated conditions and are indications for surgical treatment. Treatment consists of a long segment myotomy to overcome the motility disorder together with repair of the associated hiatus hernia. Diverticulotomy is not recommended unless the diverticulum has a very narrow neck. Occasionally, it may be necessary to excise that part of the oesophagus containing the diverticulum followed by reconstruction.

**Neoplasms of the oesophagus**

**Benign neoplasms**

Benign tumours of the oesophagus are rare accounting for less than 10% of oesophageal neoplasms. They tend to occur in younger age groups and symptoms are usually of longer duration than with malignant tumours.

**Leiomyoma**

Smooth muscle tumours account for two-thirds of the benign tumours and are seen more frequently in men than in women. Although they may occur anywhere in the oesophagus, they are more commonly seen in the lower third, usually they are solitary lesions, although multiple tumours have been reported. Symptoms depend upon the size of the tumour. dysphagia and a feeling of pressure or fullness substernally are the usual complaints. Radiographically an ovoid sharply demarcated filling defect may be seen.

Endoscopically tumours may be missed because they lie beneath the mucosa but, with care, the bulge into the oesophageal lumen will be observed. Biopsy of the suspected area should be avoided as it may complicate surgical enucleation of the tumour. Enucleation is performed through a left or right thoracotomy depending on the level of the tumour. A
A longitudinal incision is made in the muscular wall of the oesophagus without injuring the intact mucosa. Should the leiomyoma encircle the oesophagus or the gastro-oesophageal junction, oesophagogastrectomy may be necessary for its removal.

**Pedunculated tumours or polyps**

A number of polypoid oesophageal tumours have been described including mucosal polyps, fibromata, lipomata and haemangiomata. Dysphagia is a common feature together with regurgitation and weight loss. Very rarely a pedunculated tumour may be regurgitated into the mouth.

Surgical removal is the treatment of choice, although some pedunculated tumours have been removed via the oesophagoscope. The tumour is approached from the opposite side of the pedicle so that it can be readily seen through a longitudinal incision through the oesophageal wall and removed. The defect in the oesophageal wall is then closed in two layers.

**Oesophageal cysts**

These cysts form the second commonest group of benign neoplasms and represent intramural embryonic rests. They may be lined with either columnar or stratified squamous epithelium. These, too, like leiomyomata can be enucleated from the muscle wall.

Duplication of the oesophagus is a less common abnormality consisting of a tube composed of muscular and submucosal layers with a squamous epithelial lining running parallel to the oesophagus. Although the muscle layers of the duplication and real oesophagus may intermingle, the mucosae remain separate and so can usually be removed without the need for oesophageal resection.

**Malignant tumours**

The aetiology of oesophageal cancer is unknown. It is predominantly a disease of men between the ages of 50 and 70 years. There is a particularly high incidence in certain areas of China, Japan, USSR and South Africa. Epidemiological studies have identified risk factors such as cigarette smoking and a high consumption of alcohol. The ingestion of nitrosamines is carcinogenic for the oesophagus and may explain the higher incidence in the Bantus of South Africa.

Malignant tumours often develop in an abnormal oesophagus, as seen in achalasia, or the columnar or gastric-lined oesophagus, when it has been damaged by corrosive agents. The male members of certain families with tylosis - a thickening of the skin on the palms of the hands and soles of the feet - develop carcinoma of the oesophagus. The female members of the family are the genetic carriers. Squamous cell carcinoma is by far the commonest malignant tumour of the body of the oesophagus. Primary adenocarcinoma of the oesophagus is relatively rare if one excludes the adenocarcinoma at the oesophagogastric junction which is almost invariably a tumour of the stomach extending upwards to involve the oesophagus. Other rare tumours include fibrosarcoma, leiomyosarcoma and primary malignant melanoma.
Oesophageal tumours spread by local extension within the wall and lumen and invade neighbouring structures such as the trachea, the left main bronchus, aorta and the pericardium. Lymphatic spread via a submucosal network ensures spread well beyond the limits of the perioesophageal nodes. Thus cervical tumours pass to the cervical nodes along the jugular veins and also to the supraclavicular group of nodes. Thoracic lesions spread to the local nodes and also to the supraclavicular nodes and to the subdiaphragmatic nodes around the coeliac axis of the aorta. Tumours at the cardia may spread upwards to the mediastinal nodes and also to nodes around the coeliac axis and mesentery. Spread through the blood vessels may result in metastatic deposits in the liver, lungs and bone.

**Clinical features**

The most common symptom of carcinoma of the oesophagus is dysphagia. Difficulty is first encountered with solids and progresses quite quickly to difficulty swallowing liquids and saliva. Weight loss and weakness follow. In high lesions aspiration pneumonia may occur.

Early diagnosis is essential if invasion of adjacent structures is to be prevented. Any patient over the age of 35 years complaining of pain or difficulty in swallowing should have barium studies and oesophagoscopy to exclude a malignant lesion.

Barium studies show an irregular mucosal pattern with narrowing of the lumen without the proximal dilatation seen in benign strictures. The diagnosis is confirmed by oesophagoscopy not only to determine the histological type but to establish the exact level and extent of the tumour. Lesions arising in the cervical and upper portion of the oesophagus should also be investigated by bronchoscopy to exclude involvement of the trachea and main bronchi. Indeed, some lesions prove to be primary bronchial neoplasms which have spread to the oesophagus.

**Treatment**

The aim of any treatment of patients with carcinoma of the oesophagus should be the relief of dysphagia, permitting the intake of a normal diet, improving the quality of life and, at the same time, effecting a cure of the disease.

Long-term survival after all forms of treatment of carcinoma of the oesophagus is disappointingly low and controversy reigns over the merits of otherwise of the various forms of treatment available. Some employ surgery alone, where others consider a cure so unlikely that they irradiate all patients in spite of complications such as radiation pneumonitis and postradiation stricture - a condition that is very difficult to treat. As a compromise some people prefer a combination of radiotherapy and surgery. As yet chemotherapy, whether used alone or in combination with surgery or radiotherapy, has little value in the treatment of oesophageal cancer. Intracavity radiotherapy, with caesium-137 instead of radium or gold, has been revived with some effect albeit over an all too brief a period. Palliation by intubation may allow the patient to take a soft or liquid diet, but does not cure the disease, nor does the use of the neodymium YAG laser which is used to 'burn' a passage through the tumour.
**Surgery**

Several operations in one or more stages have been used over the years in the management of carcinoma of the oesophagus. For example, the Wookey operation for cancer of the cervical oesophagus which combines resection with the formation of skin tubes to reconstruct the alimentary tract.

Resection of the oesophagus with the use of stomach, jejunum or colon to restore the continuity of the alimentary tract, is most frequently used today, although use of microsurgical techniques has revived interest in free jejunal grafts for pharyngo-oesophageal and cervical oesophageal tumours.

**Oesophagogastrectomy**

Oesophagogastrectomy with oesophagogastrostomy is widely used for tumours of the oesophagus at all levels and carries a relatively low hospital mortality rate. For tumours of the lower oesophagus and cardia, a left thoracoabdominal incision provides a good exposure to permit mobilization of the stomach, resection and an intrathoracic anastomosis. Some surgeons, however, prefer a left thoracotomy with a radial incision of the diaphragm rather than the more extensive thoracoabdominal incision. For lesions requiring an anastomosis at or above the arch of the aorta, some surgeons, rather than perform the anastomosis anterior to the aorta, employ a combined abdominal and right thoracic approach. When resection is undertaken for cervical lesions, either of these two approaches may be employed for the mobilization of the stomach, the oesophagogastrostomy being performed through a separate cervical incision. A thoracotomy may be avoided by freeing the oesophagus by blunt dissection from the neck and abdomen, resecting it and pulling the freed stomach through the posterior mediastinum into the neck in order to anastomose it to the proximal oesophagus. First described by Grey Turner this operation, revived by Orringer, should only be performed by experienced operators. It is not a minor procedure. In all cases careful mobilization of the stomach is essential in order that the blood supply may be preserved. The stomach is freed from the omentum and mesocolon preserving the right gastroepiploic artery. The short gastric vessels are divided, as is the left gastric artery at its origin from the coeliac axis. Mobilization is considerably enhanced by the use of ‘stapling guns’ which clip and cut the vessels in one movement. If necessary the spleen and the tail of the pancreas may be included in the resected specimen. To minimize the postvagotomy effect, some surgeons perform a pyloromyotomy or pyloroplasty.

Stapling devices may again be used to divide the stomach at a suitable level before carrying out an end-to-side anastomosis between the stomach and the proximal oesophagus. A variety of anastomotic techniques has been employed together with a variety of suture materials, ranging from a two layer anastomosis with an inner layer of continuous chromic catgut and an outer layer of interrupted silk sutures, to the use of special anastomotic stapling guns, employing two circles of stainless steel wire staples. This latter technique requires a small gastrostomy incision, although the author overcomes this by inserting the instrument through the incision across the pylorus, before closing it as for a pyloroplasty.

A nasogastric tube may be inserted for gastric decompression and intravenous feeding for 4-5 days if necessary, to allow the anastomosis to heal before oral feeding is resumed.
Colon interposition

Initially the right colon supported by the middle colic artery was preferred as it permitted the creation of an isoperistaltic anastomosis, its chief disadvantages being its bulk and discrepancy in size compared with the oesophagus. Furthermore, its blood supply at the ileocaecal region may be defective, and it normally propels fluid rather than solid materials. The use of the transverse colon supplied by the middle colic artery is technically easier but usually it was used in an antiperistaltic manner with far from satisfactory results.

Reconstruction with isoperistaltic segments of the left colon and splenic flexure supplied by the left colic artery has proved to be a most suitable alternative to the right colon. The left colon is more used to the propulsion of solid material and its calibre more closely resembles the oesophagus. It is less bulky than the right colon and its marginal artery permits a linear interposition without kinking. In all cases, care must be taken not to twist the vascular pedicle. The route taken between the stomach and neck may be subcutaneous, substernal or through the posterior mediastinum. In all instances it is essential to avoid any redundancy of the colon within the chest. The colon therefore should be anchored to the margins of the hiatus.

Jejunal interposition and free jejunal grafts

Two techniques for reconstruction have been devised. One is a long vascular pedicle to support a segment of proximal jejunum for isoperistaltic interposition, the limiting factor being the jejunal blood supply. The second is microvascular surgery to permit the use of free jejunal grafts for pharyngo-oesophageal lesions.

Results of surgery

The operative (hospital) mortality in resection of oesophageal cancers depends upon selection, and the experience of the surgeon. In experienced hands operative mortality should be less than 10%. Long-term survival will depend to a degree on the extent of the disease, up to 40% of those without lymph node involvement enjoying 5-year survival.

Treatment of unresectable carcinomata

There is no doubt that irrespective of long-term survival, surgical resection offers the patient the best palliation of symptoms due to carcinoma of the oesophagus. However, approximately 40% of patients referred for surgery are unsuitable for resection because of their poor general condition, the presence of multiple metastatic deposits or involvement of other intrathoracic structures. If, at operation, the tumor is found not to be resectable it can be bypassed by anastomosing the unaffected proximal oesophagus to the stomach or to a loop of jejunum. Failing this, oesophageal intubation may be performed.

Oesophageal intubation

There are two main types of oesophageal tubes, those which can be introduced through the mouth and pushed down through the tumour and those which have to be pulled down through the tumour into the stomach. The Celestin and Mousseau Barbin tubes are pulled
through the tumour via a small gastrostomy incision, cut to a suitable length and then firmly
fixed in position. The author prefers to cut side holes in the tube to facilitate drainage through
the tube and to prevent blockage of the tube should gastric mucosa abut over the end of the
tube. Soutar's and Livingstone tubes are push-through types which can ride up as they have
no flange, unlike the Atkinson tube, and the new type of Celestin tube. Tubes are not really
suitable for lesions above the level of the arch of the aorta because of regurgitation and
aspiration.

Most patients take a soft or liquid diet followed by a fizzy drink to keep the tube
clean. Frequently the patient takes too large a piece of food and the tube becomes blocked
requiring it to be unblocked or replaced. The insertion of the push-through tubes necessitates
dilatation of the oesophagus which can cause splitting or perforation of the mucosa. This, in
a patient already considered unsuitable for resection, usually signifies the death of the patient
within a few days from mediastinitis and pneumonia.

**Laser**

The neodymium YAG laser is now being used to vaporise tumour tissue either to
ablate the neoplasm or to produce palliation. Care should be taken in the selection of patients
for such treatment so that they are not denied a potentially curative resection. High
oesophageal lesions are particularly suitable for treatment by laser as are recurrences at
anastomotic sites of previously resected tumour.

**Postoperative care**

Special attention in the postoperative period following oesophageal surgery should be
given to fluid and nutritional requirements. As many patients are elderly with cardiac and
renal dysfunction, they should not be overloaded with fluid. Many patients with severe
obstruction suffer from hypoproteinaemia and are particularly deficient in albumin, a feature
which may be masked by dehydration. Strict fluid balance charts should be kept to record
input and fluid loss via the chest drain, nasogastric tube and urinary catheter. A total of
approximately 40 mL fluid/kg body weight per 24 hours should cover most circumstances.

Intravenous feeding or parenteral feeding is necessary for patients who are unable to
eat and should take care of the patients calorific and protein requirements. Also electrolytes
such as potassium chloride can be added to one of the many proprietary preparations now
available. One should aim for 168-189 kL (40-45 kcal)/kg of bodyweight and a protein
equivalent of 0.2-0.25 g nitrogen/kg of body weight in 24 hours. Daily urea and electrolytes,
blood sugar and protein estimations are therefore necessary for any patient on parenteral
feeding. The time of resumption of feeding after reconstructive oesophageal surgery varies
from 48 hours to 10 days. Thereafter there should be a gradual change from intravenous to
oral fluids, at the same time retaining the calorific intake to maintain the postoperative
recovery of the patient.

**Physiotherapy**

Special attention to avoid retention of secretions and aspiration pneumonia should be
given to all patients who have had oesophageal surgery. Early mobilization will prevent
cardiopulmonary complications, deep venous thrombosis and emboli, and also frozen shoulders.

**Nasogastric tubes**

A nasogastric tube, if used, should not be spiggotted or connected to a closed system. Its function is twofold:

1. to prevent distension of the stomach with air and putting strain on the new anastomosis;
2. to permit aspiration of excess gastric secretion until the ileus has cleared.

Initially the tube should be aspirated hourly and then every 4-6 hours. The tube should be securely fixed with three pieces of tape to the nose to prevent its being pulled out. Should the tube be pulled out it should not be replaced for fear of perforating the anastomosis. If there is excessive regurgitation of gastric contents the tube could be replaced with the judicial use of the rigid oesophagoscope.

**Drugs**

Generally speaking the only drugs required in the postoperative period are analgesics and antibiotics. If complications occur the appropriate drugs may be necessary.

**Complications of oesophageal surgery**

Early complications such as postoperative shock and haemorrhage can follow any major operation. As reconstructive operations on the oesophagus are often lengthy, hypovolaemia is probably the commonest cause of postoperative shock.

Bleeding may be evident in the drainage bottles, but sometimes these can become blocked concealing the haemorrhage. Bleeding can also occur in the abdomen and also into the alimentary tract itself.

Serious cardiac complications such as myocardial infarction occasionally complicate major surgery. Abnormalities or rhythm such as atrial fibrillation may be seen. Correction of any deficiency of potassium should be carried out before digitalization is commenced. Late onset of atrial fibrillation may indicate a breakdown of the new anastomosis. Some surgeons advocate routine postoperative artificial ventilation for 24 hours but many do not find it necessary. Retention of secretions or inhalation of gastric contents may also give rise to respiratory difficulties requiring bronchial toilet via a bronchoscope. Pre-existing respiratory disease such as emphysema and chronic bronchitis may also give postoperative problems, particularly if the patient is also a heavy smoker. Good physiotherapy with or without a minitracheostomy should help the patient over his or her difficulties together with the appropriate antibiotics prescribed according to bacteriological culture and sensitivity reports. Pulmonary emboli occurring around the tenth postoperative day can be avoided if deep venous thrombosis is detected and treated early.
Complications arising from the alimentary tract include distension of the stomach, intestines and ileus. Decompression is frequently necessary either via the nasogastric tube already in situ or by the passage of a flatus tube. Patients may suffer from malnutrition following reconstructive surgery, some are reluctant to eat solid food again and have to be helped over the psychological barriers. Often patients are not able to take a normal meal and have to be given small amounts more frequently. Lack of appetite may be due to nausea, reflux or even to the absence of the stomach which normally produces a feeling of hunger. Drugs to stimulate the appetite may help, otherwise some form of enteral feeding may be necessary. A feeding gastrostomy or jejunostomy should be avoided, a fine nasogastric tube being the best way to feed the patient in such circumstances.

**Infection**

Infection, in spite of antibiotic cover, can be a problem after oesophageal surgery. Chest infection, urinary tract infection and even wound sepsis are frequent. Empyema is rare unless there has been an anastomotic leak as in a subphrenic abscess. General septicaemia can occur in these patients from any site, but infected intravenous cannulae must always be considered.

**Anastomotic breakdown**

Anastomotic breakdown is the most serious of all postoperative complications following reconstructive oesophageal surgery. Prevention is better than cure. Therefore the surgeon should do his utmost to prevent devascularization of the stomach, crushing of the oesophagus and placing the anastomosis where tumour is still present. Often malnutrition, infection and abscess formation contribute to the breakdown. Sometimes if the blood supply has been compromised, the gastric suture line, rather than the anastomosis, may break down or the stomach wall may necrose and rupture. Fortunately in experienced hands this complication is uncommon, but awareness of its possibility and prompt diagnosis and treatment will save some patients.

Complications due to fistulae frequently occur 7-10 days after operation. A slight fever or the onset of atrial fibrillation may be early indications of trouble. A chest X-ray when compared with earlier films may show pleural changes or even a hydropneumothorax. The diagnosis may be confirmed, if a pleural drain is in situ, by giving the patient a weak solution of methylene blue dye to drink, the dye soon appearing in the drainage bottle. If the tube has been removed further X-ray screening with contrast media, such as gastrograffin, may demonstrate, not only the site of the leak, but also its size.

Small leaks may be treated conservatively by giving nil by mouth, intravenous antibiotics, parenteral or enteral administration of a high energy and high protein nutrition, and drainage of the pleural cavity. Large leaks or total anastomotic breakdown should be treated by surgery to refashion the anastomosis or to close the fistula. This is often very difficult because of oedema and infection and it may be necessary to excise the stomach and oesophagus performing a cervical oesophagostomy and a feeding jejunostomy. Should the patient survive the reconstruction, utilization of an isoperistaltic segment of the left colon can be undertaken 3-6 months later.
Conclusions

The oesophagus should be treated with great respect and only surgeons who have received full training in oesophageal surgery in all its aspects should undertake operations on the oesophagus. Usually one has a single chance to get things right, seldom two and rarely three.