

Chapter 36

The Neck

The Branchial Apparatus and Its Abnormalities

In a foetus approximately thirty-five days old, four grooves can be seen on each side of the neck. These are the branchial clefts, which resemble the gills of a fish; the intervening bars are the branchial arches. Each arch contains a central cartilage. The clefts in human embryos are composed of grooves on the outside and pouches on the inside (pharynx). The first cleft persists as the external auditory meatus; the second, third, and fourth clefts normally disappear. The whole, or a portion, of one of the clefts that normally disappear may persist. Alternatively, a portion can become sequestered.

Branchial Cyst.- From the vestigial remnants of the second branchial cleft the cyst is usually lined by squamous epithelium, and its contents are either clear fluid or like toothpaste. It appears in young adults, sometimes in later life. It protrudes from beneath the anterior border of the upper third of the sternomastoid as a fluctuant swelling which may transilluminate. If infection has occurred, it may be difficult to differentiate from a tuberculous abscess. If the aspirated fluid contains cholesterol crystals, the diagnosis is made.

A rare variety of branchial cyst is found lying closely related to the pharynx. It is lined by columnar epithelium, and filled with mucus. Occasionally small symptomless cysts of this type are discovered at necropsy.

Treatment.- A branchial cyst should be excised. Through an incision parallel to the skin creases the anterior wall of the cyst is exposed and some of the content is aspirated. This procedure permits the wall of the cyst to be grasped in suitable forceps, and assists materially in a dissection which, in some instances, entails following a track that passes through the fork of the common carotid artery as far as the pharyngeal wall. It passes superficial to the hypoglossal and glossopharyngeal nerves but deep to the posterior belly of the digastric. The hypoglossal and the spinal accessory nerve may be in danger and should be recognised and protected. If the specimen is examined microscopically, the wall of the cyst is often found to be surrounded by a layer of lymphadenoid tissue. This suggests that the cyst arose as a result of branchial epithelium becoming entrapped within a lymph node during development. It also explains why branchial cysts become inflamed: the lymphadenoid shell participates in regional lymphadenitis.

Branchial fistula may be unilateral or bilateral and it is highly probable that the fistula represents a persistent second branchial cleft, the occluding membrane of which has broken down. Nearly always the external orifice of the fistula is situated in the lower third of the neck near the anterior border of the sternomastoid muscle.

The internal orifice is located on the anterior aspect of the posterior pillar of the fauces, just behind the tonsil (Wilson) (Charles Paul Wilson, 1900-1970. Surgeon, Ear, Nose and Throat Department, Middlesex Hospital, London.), but more often than not the track ends blindly on the lateral pharyngeal wall, the condition then being a sinus rather than a fistula. The track is clothed with muscle and lined by ciliated columnar epithelium until destroyed

by recurrent attacks of inflammation. The discharge is mucus or muco-pus. The condition may also be secondary to an incision in an infected branchial cyst.

Treatment.- When causing troublesome symptoms, *eg*, by a discharge of mucus, branchial fistulae should be excised.

Operation.- A ureteric catheter or a probe is passed up the track via the orifice, so that by means of an incision higher in the neck the track may easily be identified and dissected as it passes through the fork of the common carotid artery towards the pharyngeal wall. When the upper dissection is completed the orifice below is freed by a small elliptical incision and the whole of the lower part of the track can be eased out of the upper wound (Small). (Hugh Alan Dugleby Small, 1910-1981. Formerly Surgeon, The Royal Northern Hospital, London.)

Branchial Cartilage.- A small piece of cartilage, connected to the deep surface of a cutaneous dimple in the position of an external orifice of a branchial fistula, is occasionally encountered.

Cervical Auricle.- So named because of its morphological significance, this cutaneous projection is found almost invariably in the position of the external orifice of a branchial fistula. Cervical auricles were recognised in the days of the Roman Empire, and are represented in some of the statuary of that period.

Pharyngeal Pouch (Chapter 34).

Laryngocele (Chapter 35) are possibly derived from the branchial apparatus.

Branchiogenic carcinoma is very rare; such a diagnosis is unjustifiable until every possible source of a primary growth in the mouth, pharynx and external auditory meatus has been excluded.

Cystic Hygroma (Cavernous Lymphangioma)

About the sixth week of embryonic life the primitive lymph sacs develop in mesoblast, the principal pair being situated in the neck between the jugular and subclavian veins; these, which correspond to the lymph hearts of lower animals, are known as the jugular lymph sacs. Sequestration of a portion of a jugular lymph sac from the lymphatic system accounts for the appearance of these swellings.

Of all the swellings of the neck, cystic hygroma rivals, and at times surpasses, sternomastoid 'tumour' as the earliest to appear: usually it manifests itself during early infancy, occasionally it is present at birth, and exceptionally it is so large as to obstruct labour. Typically, the swelling occupies the lower third of the neck, and as it enlarges it passes upwards towards the ear; often it is the posterior triangle of the neck that is mainly involved. Due to intercommunication of its many compartments, the swelling is softly cystic and is partially compressible; it visibly increases in size when the child coughs or cries, but *the* characteristic that distinguishes it from all other cervical swellings is that it is brilliantly translucent.

The cheek and the axilla are other, though less frequent, sites for a cystic hygroma. Another infrequent, though striking dual lesion is that of a cystic hygroma and a lymphangiogenetic macroglossia. Exceptionally a cystic hygroma occurs in the groin or in the mediastinum. When situated wholly within the thorax (Chapter 40), it cannot be differentiated, prior to operation, from other benign neoplasms.

Clinical Course.- The behaviour of cystic hygromas during infancy is so uncertain that it is impossible at that age to prognosticate as to what will happen. Sometimes growth is extremely rapid and occasionally respiratory difficulty ensues, a contingency that demands immediate aspiration of much of the contents of the cysts and possible tracheostomy. At other times, as a result of nasopharyngeal infection, the swelling becomes inflamed and spontaneous regression of the cysts may then occur.

Pathology.- The swelling consists of an aggregation of cysts like a mass of soap bubbles. The larger cysts are near the surface, while the smaller ones lie deeply and tend to infiltrate muscle planes. Each cyst is filled with clear lymph and is lined by a single layer of endothelium having the appearance of mosaic.

Treatment.- Excision of all the cysts at an early age is the treatment of election. It is often helpful to give preliminary injections, at weekly intervals, of sclerosing solutions or even boiling water into the cysts. The swelling will then slowly reduce in size and the cyst walls become more fibrous. Dissection is thus facilitated.

Cervical Rib and the Scalene Syndrome

By mass radiography it has been ascertained that a rib arising from the seventh cervical vertebra occurs in 0.46% of persons. In a little more than half of these the cervical rib is unilateral, and somewhat more frequent on the right side. It is paradoxical that a cervical rib or ribs found in the course of routine x-ray examination hardly ever gives rise to symptoms, whereas more often than not, when a radiograph of the cervical region is requested on account of nerve-pressure symptoms, no such rib is demonstrable.

Usually extra ribs spring from the seventh cervical vertebra and may be associated with spinal anomalies elsewhere.

Four main varieties of cervical rib are recognised.

(a) A complete rib, often containing a false joint in its length, articulates anteriorly with the manubrium or the first rib.

(b) The free end of rib expands into a large bony mass.

(c) A rib ending in a tapering point, which is connected by a fibrous band to the scalene tubercle of the first rib.

(d) A fibrous band closely applied to, or incorporated in, the scalenus medius alone is present. This not infrequent variety, of course, cannot be demonstrated radiologically.

At their exit from the neck, the brachial plexus and the subclavian artery pass through a narrow triangle. It is to the *base* of the triangle that attention must be focused.

Pathology.- Should the base of the triangle be raised the height of one vertebra by the interposition of a cervical rib, the subclavian artery and the first dorsal nerve are bound to be angulated, if not compressed, as they pass over the new floor, *ie*, that formed by the cervical rib, instead of the first thoracic rib.

Pathology of the Vascular Symptoms.- Owing to the angulation over the cervical rib, the lumen of the artery at this site becomes constricted. *Pari passu* with the formation of the constriction, fusiform dilatation of the first 2 to 4 cm of the artery occurs distal to the constriction. Within the post-stenotic dilatation (or possibly at the site of the constriction) clotting occurs on the intima. Portions of this mural thrombus may become detached, and give rise to an embolus or emboli. Also proximal extension of the thrombus can occur so that the vertebral artery may be involved and cerebrovascular embolic episodes occur as described by Sir Charles Symonds in 1927 (Shucksmith) (Henry Samuel Shucksmith, Contemporary. Formerly Surgeon, General Infirmary, Leeds, England).

Three clinical types are encountered:

1. **Cervical Rib with Local Symptoms.-** From time to time a patient presents on account of a lump in the lower part of the neck which may be visible, or, more commonly, because of the tenderness in the supraclavicular fossa. On palpation the lump is found to be bony hard and totally fixed. Type (b) is most likely to give rise to these signs.

2. **Cervical Rib with Vascular Symptoms.-** *Vascular symptoms* occur only when a cervical rib is complete.

Pain is the prevailing symptom. It is located in the forearm, but in some instances it radiates to the upper arm. What is so characteristic is that the pain is brought on by use of the arm: should the arm be in a raised position at the time of exercising it, the onset of the pain is accelerated. The pain is relieved by rest. Without doubt, this pain is ischaemic muscle pain, comparable to intermittent claudication in the leg.

Temperature and Colour Changes.- The hand on the affected side tends to (a) be colder than its fellow, (b) become unduly pale when held aloft and (c) become unduly blue when it is dependent for any length of time.

The Radial Pulse.- Sometimes it is as full as that of the other side; sometimes it is absent, and at others it is feeble, depending upon whether the collateral circulation is good, bad or indifferent. The distal part of the subclavian artery should be auscultated; a systolic bruit is significant.

Numbness of the fingers may be complained of, and ulceration or, more rarely, gangrene may occur.

Treatment is timely extraperiosteal excision of the cervical rib, together with any bony prominence of the first rib. At the same time it is advisable to perform sympathetic denervation of the upper limb.

3. Cervical Rib with Nerve-Pressure Symptoms.- Nerve-pressure symptoms, due to angulation of the first dorsal nerve is of doubtful occurrence and most, if not all, cases previously described were due to cervical spondylosis or the carpal tunnel syndrome. Only if these and other localised nerve lesions are excluded, should the scalene syndrome be considered as the cause of pain and tingling in the hand and forearm, whether wasting or the thenar and hypothenar muscles is present or not.

Differential Diagnosis.- Many of the nerve-pressure symptoms formerly attributed to a cervical rib can be, and are, produced by pressure on the cervical roots in the region of the intervertebral foramina by lateral protrusion of intervertebral discs. Secondly, paraesthesia and wasting of the thenar eminence are often due to carpal tunnel syndrome. Thirdly, hypothenar wasting can also arise from angulation of the ulnar nerve behind the elbow (Griffiths) (David Lloyd Griffiths, Contemporary. Director, University Department of Orthopaedic Surgery, Royal Infirmary, Manchester, England.). Other conditions to be considered include motor neurone disease and syringomyelia.

Treatment.- In mild cases the use of a sling and exercises aimed at strengthening the muscles of the should girdle may alleviate the symptoms, at least temporarily. In about 70% of cases even if a cervical rib cannot be recognised, the symptoms are relieved by dividing the scalenus anterior (scalenotomy). Other surgeons remove the cervical rib or the corresponding band in addition, and in this way reduce the number of unsatisfactory results. When a cervical rib is excised, it is essential to remove it with its periosteum or it will regenerate. Care must be exercised to avoid damage to the brachial plexus and phrenic nerves.

Injuries

Cut Throat.- In more than half the cases of cut throat that reach surgical aid the wound does not involve any vital structure - only the skin, platysma, and perhaps the sternomastoid or other muscles are severed.

Wounds above the Hyoid Bone.- The cavity of the mouth may have been entered. The epiglottis is often partially divided near its base. This should be repaired with catgut sutures. The mucosa of the pharynx is trimmed and united and the skin wound is closed.

Wounds of the Thyrohyoid Membrane.- Again the epiglottis is often damaged. The severed thyrohyoid membrane can usually be sutured. If there is respiratory distress, it is advisable to perform tracheostomy.

Wounds of the Thyroid or Cricoid Cartilage.- A tracheostomy well below the larynx is indicated. The laryngeal skeleton is then fully exposed and the damaged cartilages repositioned and sutured. An indwelling stent or 'keel' is moulded to fit within the lumen and also shaped with a narrow waist to lie between the vocal cords. This stent is held by a wire or nylon retaining suture through the neck. In 2-3 weeks the stent is removed endoscopically after cutting the retaining suture. The tracheostomy is then closed.

Division of the Trachea.- Wounds of the trachea are comparatively rare. In order to obtain adequate exposure it is usually necessary to divide the thyroid isthmus between haemostats. In most instances it is advisable to perform tracheostomy below the wound, and then to proceed to repair the latter with sutures.

Injury to Nerves.- It is remarkable how rarely important nerves are injured in self-inflicted wounds. In stab wounds any nerve may be involved. In one of our patients, a sailor, the most inaccessible nerve in the neck, the cervical sympathetic, was divided in this way, the assailant's weapon being a small penknife.

Complications of Cut Throat.- Haemorrhagic shock can be severe and blood transfusion is necessary. Venous air embolism is a likely cause of death. Infection of the wound is common and, if cellulitis supervenes, it may spread downwards to cause mediastinitis. Pneumonia also is common. Rare complications include surgical emphysema due to the omission of a tracheostomy, and aerial fistula between the air passages and the exterior, which can be prevented or treated by the stent or 'keel' operation described above. Oesophageal or pharyngeal fistula usually heals by itself. Aphonia or dysphonia may follow injury to the vocal cords or division of a recurrent laryngeal nerve, while stenosis of the trachea or larynx due to scarring may necessitate permanent tracheostomy.

Wounds of the Cervical Portion of the Thoracic Duct

Wounds of the thoracic duct are rare, and usually occur during dissection of lymph nodes in the left supraclavicular fossa. When the accident is not recognised at the time, chyle pours from the wound - as much as 1 to 1.5 litre in twenty-four hours - and, as a result, the patient wastes rapidly.

Treatment.- Should the accident be recognised during an operation, the proximal end of the duct must be ligated with fine silk. Ligation of the duct is not harmful, for there are a number of anastomotic channels between the lymphatic and the venous systems in the neighbourhood. Usually the first intimation of a severed thoracic duct is a copious chylous discharge from the wound on the day following the operation. That the fluid *is* chyle is substantiated if it has a specific gravity of over 1.012 and if fat can be extracted from it with ether. Firm pressure by a pad and bandage should be applied, but this simple expedient may not be successful. More often the wound must be reopened. If the patient is given cream to drink an hour before the operation, more especially if the cream is coloured with confectioner's green dye (D-C 6), there is seldom any difficulty in locating a cut thoracic duct, which is about the size of a straw and an immediate external relation of the last 3.75 cm of the left internal jugular vein. If the duct is found, it should be ligated, but in any case the wound should be packed firmly and allowed to heal by granulation. Thanks to subsidiary anastomotic channels, these measures are regularly satisfactory.

Inflammatory Conditions

Acute cellulitis is either superficial or deep to the deep cervical fascia.

Superficial cellulitis is common, and methods of treating it follow that of cellulitis elsewhere. When, however, it occurs above the level of the hyoid bone it is especially dangerous, because sudden asphyxia from oedema of the glottis is an ever-present possibility.

Deep cellulitis in the lower third of the neck, on the other hand, is free from this danger. Consequently, it can be treated by antibiotic therapy with every confidence, and should an abscess develop, it is opened.

Ludwig's Angina.- Ludwig (Wilhelm von Ludwig, 1790-1865. Professor of Surgery and Midwifery, Tübingen, Germany.) described a clinical entity characterised by a brawny swelling of the submandibular region combined with inflammatory oedema of the mouth. It is these *combined* cervical and intrabuccal signs that constitute the characteristic feature of the lesion. The cause is a virulent (usually streptococcal) infection of the cellular tissues surrounding the submandibular salivary gland. It may be a complication of advanced carcinoma of the floor of the mouth.

Clinical Course.- Unless the infection is controlled, these cases may rapidly assume a grave aspect. The swollen tongue is pushed towards the palate and forwards through the open mouth, while the cellulitis extends down the neck in that most dangerous plane - deep to the deep fascia.

Ludwig's angina is an infection of a closed fascial space, and, untreated, the inflammatory exudate often passes via the tunnel occupied by the stylohyoid to the submucosa of the glottis, in which event the patient is in imminent danger of death from oedema of the glottis (Chapter 35).

Treatment.- When the condition is diagnosed early, the results of antibiotic therapy are sometimes dramatic. In cases where the swelling, both cervical and intrabuccal, does not subside with such treatment, a curved incision beneath the jaw is made. The incision is deepened, and after displacing the superficial lobe of the submandibular salivary gland, the mylohyoid muscles are divided. This decompresses the closed fascial space referred to. The wound is lightly sutured and drained. The operation can be conducted with the greatest safety under local anaesthesia. Thiopentone anaesthesia usually precipitates laryngeal spasm and asphyxia.

Infection of the Pharyngo-maxillary Space (*Parapharyngeal Abscess*).- The pharyngomaxillary space is a potential cone-shaped space, base uppermost. The base is formed by the base of the skull; the apex abuts the great cornu of the hyoid bone; the medial wall consists of the superior constrictor muscle; the lateral wall, from above downwards, is composed of the fascia covering the internal pterygoid muscle, the mandible about its angle, and the submandibular salivary gland, below which the apex of the space becomes relatively superficial. Usually infection of this space originates in the tonsil, and may occur after tonsillectomy, especially when the operation has been performed under local anaesthesia.

Clinical Features.- Every posterior peritonsillar abscess is a potential pharyngomaxillary space infection, the general reaction of which is greater than that accompanying peritonsillar abscess. There is often *slight* trismus, and swelling over the lower part of the parotid gland; this is never present in quinsy. Tenderness, and later swelling below

the angle of the mandible, appears when the apex of the space is involved. As the carotid sheath runs through the space, the dreaded complications of thrombophlebitis of the internal jugular vein and/or erosion of an artery, usually the internal carotid, may occur if the space is not adequately drained. Sometimes the abscess bursts spontaneously between the cartilaginous plates of the external auditory canal, but obviously such an eventuality is a fortunate escape from death, for which the patient's medical advisers can take no credit.

Treatment.- As soon as the diagnosis is strongly suspected an incision should be made below and behind the angle of the mandible, on a line towards the hyoid bone. A finger is passed upwards, medial to the mandible and the distended space is entered by rupturing its wall. The space is drained with a large soft wick drain.

Cervical Lymphadenitis

There are approximately 800 lymph nodes in the body; no fewer than 300 of them lie in the neck. Inflammation of the lymph nodes of the neck is exceedingly common. Infection occurs from the oral and nasal cavities, the ear, the scalp, and face. The source of infection must be sought for systematically.

Acute Lymphadenitis.- The affected lymph nodes are enlarged and tender, and there is a varying degree of pyrexia. The treatment, in the first instance, is directed to the general condition and to the focus of infection, the neck itself being simply protected by a bandage over wool. If, in spite of antibiotic therapy, pain continues or certain lymph nodes appear to be getting larger, fomentations are applied locally. Abscess formation calls for adequate drainage.

Chronic Lymphadenitis.- In the early stages it is extremely difficult to distinguish tuberculous adenitis from chronic non-tuberculous adenitis, but clinical experience shows that chronically inflamed lymph nodes which do not resolve in the space of three or four weeks are nearly always tuberculous.

Tuberculous adenitis (Chapter 9)

The majority of patients affected are children or young adults, but the condition can occur for the first time at any age. Usually one group of cervical nodes is first infected, most frequently those of the upper jugular chain. More rarely there is widespread cervical lymphadenitis, and in these cases especially, periaadenitis or matting of the lymph nodes is evident.

Source of Infection.- In the majority of instances tubercle bacilli gain entrance through the tonsil of the corresponding side. The nodes of the posterior triangle are infected in 22% of cases, probably stemming from adenoidal infection.

Contrary to what is believed, it is the human (The human bacillus is responsible for 100% of cases among Bantu-speaking urban population of South Africa (Keen) (Paul Keen. Formerly Senior Surgeon, Non-European Hospital, Johannesburg, South Africa.), and not the bovine, bacillus that is responsible for tuberculous cervical adenitis in about 70% of cases. In fully 80% of cases the tuberculous process is virtually limited to the clinically affected

group of lymph nodes; nevertheless, a primary focus in the lungs must be suspected. Renal tuberculosis may coexist and the urine should be examined for this organism.

In the event of the patient developing a natural resistance to the infection or (more often) as a result of appropriate general treatment, fibrosis or calcification may occur. In other circumstances the caseating material liquefies, breaks through the capsules of the lymph nodes, and a 'cold abscess' forms. The pus is at first confined by the *deep* cervical fascia. In a few weeks this dense sheet becomes eroded at one point, and the pus flows through the small opening into that more commodious space beneath the *superficial* fascia. The process has now reached the well-known stage of collar-stud abscess (Chapter 9). The superficial abscess enlarges steadily, and unless suitable treatment is adopted, the skin will soon become reddened over the centre of the fluctuating swelling, and before long a discharging sinus, with its attendant evils, is at hand. (For 600 years the King's touch was believed to cure this prevalent disease. Charles II touched on an average 10,000 sufferers a year. In addition, he presented each with half a sovereign. The condition was known as the King's Evil.)

Differential Diagnosis

<i>When the swelling is solid, from:</i>	Chronic non-tuberculous lymphadenitis. Hodgkin's lymphoma (Chapter 9). Non Hodgkin's lymphoma. Secondary malignant disease.
<i>When the swelling is cystic, from:</i>	Branchial cyst. Extension of an abscess connected with a tuberculous cervical vertebra.
<i>When a sinus or sinuses have formed, from:</i>	Actinomycosis. An acquired branchial fistula.

Treatment of Tuberculous Lymphadenitis

The patient should be treated by general measures and appropriate chemotherapy (Chapter 4). If abscess is present it should be aspirated and an attempt should be made to grow the tubercle bacillus and find out its sensitivity to the anti-tuberculous drugs. Repeated aspiration of a collar-stud abscess cannot be recommended because this predisposes to sinus formation and secondary infection.

Operation for Collar-stud Abscess.- After an incision in line with the skin creases, the pus in the superficial compartment is mopped away, and the hole in the deep fascia is enlarged to admit a small curette, so that the caseating lymph node can be scraped out and the cavity packed with iodoform gauze. This is brought out through the edge of the wound which is closed by careful primary suture. It is removed after 24 hours, but the sutures are left for 10 days.

Excision of Lymph Nodes.- This becomes necessary when there is no local response to chemotherapy and if a sinus persists. When there is active tuberculosis of another system,

eg, pulmonary tuberculosis, removal of tuberculous lymph nodes in the neck is, of course, illogical.

An oblique incision conforming with the skin creases, gives satisfactory access. If the nodes are related to the internal jugular vein this structure should be identified first and then the nodes can be dissected away from it.

To minimise unnecessary injury to large veins, no tissue should be divided when stretched taut. Should the internal jugular vein prove to be involved to such an extent that freeing it is difficult or impossible, this great vessel can be ligated, or a portion of it can be resected, without any untoward effect at any age (cf block dissection of the neck).

There is no contraindication to dividing the sternomastoid muscle if, as is frequently the case, such a step facilitates access to the diseased nodes and enables the operator to visualise the spinal accessory nerve more easily. The divided muscle is subsequently reunited.

During the dissection of cervical lymph nodes every effort must be made to preserve: the spinal accessory nerve; the mandibular branch of the facial nerve; the hypoglossal nerve; which are the nerves most likely to be injured.

Actinomycosis of the Neck (See Chapter 4).

Primary Malignant Tumours of the Neck

Carotid Body Tumour ('Potato' Tumour).- The carotid body, which is situated at the bifurcation of the carotid artery, is the most important moiety of the chemoreceptor system. The cells of this system are sensitive to changes in the pH and temperature of the blood. Hence a tumour is called a chemodectoma, though it is classified histologically as a non-chromaffin para-ganglioma. It will remain localised for years but regional metastases will occur in about 20% of cases and distant metastases less frequently.

Clinical Features.- Usually unilateral, it becomes apparent in middle life, but occasionally earlier. The diagnosis is suggested by a long history and a lump at the carotid bifurcation which moves from side to side but not vertically, and usually a pulsating vessel overlies its outer surface (Westbury) (Gerald Westbury, Contemporary. Professor of Surgery, Royal Marsden Hospital, London.).

Arteriography is valuable and shows the carotid fork to be splayed and a 'blush' outlining the abnormal tumour vessels.

The Special Danger of Excision of a Carotid Body Tumour is due to its vascularity and the way it is blended with the carotid bifurcation. Therefore:

1. There is considerable danger of torrential haemorrhage occurring if a biopsy is attempted in the erroneous belief that the lump is an infected or neoplastic lymph node. Control of this bleeding by artery forceps inevitably results in occlusion of the carotid artery with hemiplegia or death occurring in at least 33% of cases.

2. If extirpation is to be attempted it is essential to have ready a length of silicone bypass tubing in case carotid occlusion becomes necessary, otherwise a similar tragedy is likely.

In some cases it is possible to dissect the tumour away from the fork of the carotid. But when the tumour is large and inseparable from the vessels resection will be necessary and a bypass is essential while a vein autograft is being inserted to restore arterial continuity.

Recurrence after complete removal is unusual.

In the old and enfeebled it may be decided that it is best to let Nature take its course. Hardly any of the tumours are radiosensitive.

Lymphomas (Chapter 9).

Secondary Carcinoma of the Neck

Secondary carcinomatous infiltration of the cervical lymph nodes is only too common. When a patient presents with enlargement of cervical lymph nodes that are suspiciously indurated, search for a primary growth is imperative and must be made *before* a node is removed for biopsy. Often the primary growth lies within the nasopharynx; when this is not the case, the search must continue. Among the sites that are prone to be overlooked are the base of tongue (vallecula), laryngo-pharynx, paranasal sinuses, and less commonly, distant sites (bronchus, breast, stomach, testis).

Management.- The management of involved cervical nodes depends on the overall treatment regime: 1. If primary surgery is used and the cervical nodes are palpable, they must be excised *en-bloc* with the primary; 2. If radiotherapy is used initially and there is resolution of the primary but persistence of the metastatic nodes, they can be resected subsequently by a cervical block dissection; 3. Should lymph node metastasis develop subsequent to the successful treatment of the primary, a block dissection can often be curative.

Types of Neck Dissection.- 1. Classic Radical Neck Dissection (Crile). The classic operation involves resection of the cervical lymphatics and those structures closely associated such as the internal jugular vein, the accessory nerve, the submandibular gland and the sternomastoid muscle. A variety of incisions have been described but it is important in the irradiated case that the incision line does not pass over the carotid bulb, because if wound breakdown occurs a fatal carotid blowout may ensue. The main disability that follows the operation is the drooping of the shoulder due to paralysis of the accessory muscle.

2. Conservative (Functional) Neck Dissection. In selected cases the classic operation is modified to preserve one or other of the associated structures. It may be used in those cases needing bilateral neck dissection (to prevent excessive venous congestion of the head if both internal jugulars are divided or resected). It may be used when the metastasis has not spread beyond the capsule of the lymph node, especially in early cases of carcinoma of the tongue, floor of the mouth or the lower lip. This modified procedure preserves the accessory nerve, the jugular vein and the sternomastoid muscle. However, it must be emphasised that this

conservative dissection should only be used if it does *not* compromise the complete exenteration of the carcinoma.

Procedure for Crile dissection.- The skin flaps having been dissected up, the sternomastoid is divided about 2.5 cm above the clavicle. The muscle is freed and retracted upwards. Next, the internal jugular vein is divided between ligatures low down in the neck. The dissection proceeds upwards methodically and the muscle, fascia, fat, lymph nodes, the internal jugular vein, together with the salivary gland, are dissected and removed *en bloc*. Attention must be directed to clearing the space between the parotid and the great vessels, and also the submental triangle between the hyoglossi, for it is in these areas that a lymph node can easily be overlooked. Bleeding vessels are ligated as they occur; finally the upper end of the internal jugular vein is ligated by transfusion, and divided. When the dissection has been completed, the carotid artery is laid bare, and lying with it is the vagus nerve, which has been carefully preserved. The operation aims at removing the whole of the lymphatic-bearing tissues on the affected side of the neck. The skin flaps are approximated and the wound is drained. Surprisingly little deformity follows this extensive dissection, but the neck is stiff and there is drooping of the corner of the mouth. (The cervical branch of the facial nerve is severed.) When *bilateral* block dissection is required it must be undertaken, not simultaneously, but consecutively with an interval of about three weeks. Removal of both internal jugular veins can be attended by obstructed cerebral circulation and brain swelling (see above and Chapter 26). (George Washington Crile, 1864-1943. Professor of Surgery, Western Reserve University, and one of the Founders of the Cleveland Clinic, Cleveland, Ohio, USA.)

Postoperative Care.- Suction drainage is essential where there are such large skin flaps in order to prevent subcutaneous collections of blood or serum. If the pharynx or oral cavity has been opened by the dissection the patient should be given antibiotics (including metronidazole) prophylactically. Blood and fluid replacement and nutrition should be as required (Chapters 5, 6, 7).

Head and Neck Reconstruction

Over the last decade, the major advance in head and neck surgery has been the advent of immediate reconstruction, minimising surgical mutilation, both cosmetic and functional. The use of local flaps has been superceded by regional or myocutaneous flaps. In certain cases free microvascular flaps are valuable.

Regional flaps usually derive their blood supply from an axial artery running along the length of the flap.

Forehead Flap.- This is supplied by the superficial temporal artery and is used to provide a lining for the oral cavity and pharynx. A second stage may be necessary to divide the pedicle.

Deltpectoral Flap.- This versatile flap from the upper chest was popularised by Bakamjian and is supplied by the perforating branches of the internal mammary artery. It is

used to provide both lining and cover in many sites of the head and neck. A two-stage operation is usually needed.

Myocutaneous flaps derive their blood supply from the underlying muscle included in the flap, consequently they can be used with an island of skin enabling a one stage reconstruction to be performed. The usual donor sites are the pectoralis major muscle and the latissimus dorsi muscle and a 'paddle' of overlying skin.

A variety of *free microvascular flaps* often with bone are also used.