

Handbook of ENT

Diseases and Disorders of the Ear, Nose, and Throat

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Part III

The throat, head, and neck

10. Structure and function of the throat, head, and neck

The head and neck region is one of the most complicated anatomical regions. A sound knowledge of the anatomy is an essential prerequisite before embarking on any surgery of this area, but it is beyond the scope of this textbook. This chapter will focus on those clinically significant structures within the upper aerodigestive tract required for primary ENT care.

The oral cavity

The mucosal lining of the anatomically complex oral cavity is the site of most oral cavity diseases but within the cavity are three clinically significant structures: the dentition, the salivary gland openings, and the tongue.

The dentition

There are four jaw quadrants, sensibly labelled 1, 2, 3, and 4. As you face the patient and move clockwise: 1 is the patient's upper right (if you are on top and right you are no 1), 2 is upper left, 3 is lower left, and 4 is lower right. There are 32 teeth in the adult jaw, 8 in each quadrant labelled (from the midline), 1, 2, 3, 4, 5, 6, 7, and 8 (central incisor, lateral incisor, canine, 1st premolar, 2nd premolar, 1st molar, 2nd molar, 3rd molar or wisdom). A binary code immediately identifies the tooth you are concerned with, 11 (not eleven but one-one) is the upper right central incisor, and 38 (three-eight) the lower left wisdom. Deciduous teeth are 20 in number, 5 per quadrant, and labelled from the midline a, b, c, d, e.

The salivary gland openings

Stensen's ducts from the parotid glands open on the inner surface of the cheek adjacent to the 2nd upper molar teeth. Wharton's duct from the submandibular glands open in the floor of the mouth on either side of the frenulum of the tongue. The sublingual glands have multiple ducts that either open into Wharton's duct or independently into the floor of the mouth where they are not obvious. The autonomic innervation to the parotid gland - predominantly serous secretion - is via the otic ganglion which receives its fibres by way of the tympanic plexus located on the medial wall of the middle ear. That of the submandibular gland - a mixture of serous and mucoid saliva - is the submandibular ganglion which receives

its fibres by way of the chorda tympani nerve which runs across the middle ear. This arrangement means that these nerves are accessible should denervation of these glands be contemplated, for example, to control drooling. Saliva predominantly lubricates food to facilitate mastication and deglutition, but is also essential for oral hygiene (it contains IgA which has a protective role), for taste, and it contains digestive enzymes. A moist environment is also needed for articulation.

The tongue

This muscular (motor innervation is the hypoglossal nerve) and mobile structure is obvious and familiar but remember that the anterior two-thirds, covered by cornified squamous epithelium and the filiform papillae, is touchable, trigeminal tongue, but the posterior one-third, behind the circumvallate papillae, is untouchable, glossopharyngeal tongue (gag reflex - be careful how far you put in a tongue depressor). There are numerous taste buds, posteriorly innervated by the glossopharyngeal nerve but anteriorly having afferent fibres that travel via the lingual and chorda tympani nerves (the latter traverses the middle ear where it can be damaged during middle ear surgery). Tasting of food is highly complex. Only the primary tastes of salt, sweet, sour, and bitter are perceived by the tongue, nuances of flavour are olfactory (you can't taste your food with a heavy cold). The piquancy of chilli is 5th nerve with a perverted excitation of sensory fibres.

The mouth and oral cavity are predominantly concerned with grinding up food by the teeth, mixture with liquid saliva, exposure to the digestive enzymes, and backward displacement of the bolus into the oropharynx - the voluntary, first phase of swallowing. Other functions include tasting of food, surveillance of the immunological scene, and forming words.

The pharynx

The entrance to the pharynx (see Figure 10.1) is framed by the tongue inferiorly, the uvula and soft palate superiorly and, on either side, by the tonsils enclosed fore and aft in a muscular sling, the anterior and posterior faucial pillars. Because the pillars comprise muscle covered by mucosa they are generally red (aemic) - this is often misinterpreted as hyperaemia.

Lymphoid tissue

There is a whole ring of lymphoid tissue (Waldeyer's ring) surrounding and immunologically surveying the upper aerodigestive tract. The largest aggregations are found in the tonsils and the adenoid (situated in the nasopharynx). There is a further aggregation in the base of the tongue (lingual tonsil) and a scattering of small nodules on the posterior pharyngeal wall and behind the posterior faucial pillar. Unlike other lymph glands, these have no afferents, only efferents. Afferent supply is from the surface, with air and food particles passing over the irregular surface and becoming trapped. Exposure of B and T lymphocytes to antigenic particles is the first step to full immunologic competence. Not surprisingly, Waldeyer's ring is at its most active in the first few years of life when 'tonsillitis' may be almost thought of as physiological rather than pathological.

The oropharynx

The oropharynx is an ill-defined area between the nasopharynx and the hypopharynx below.

The hypopharynx

The hypopharynx is the area of the parting of the air and food passages with the larynx projecting into it anteriorly. Here the problem is that food and drink must go into the stomach and air must go into the lungs (vice versa is incompatible with life). The suspect design of having food, drink, and air in the same tube is salvaged by the subtlety of laryngeal function which has evolved to take care of this dilemma (we have a bonus - it makes voice). The involuntary second phase of swallowing is initiated when the tongue propels the food bolus backwards through the oropharynx into the hypopharynx. Food is prevented from gaining access to the airway by:

- the forcible midline approximation of the true vocal cords.
- the forcible midline approximation of the false vocal cords.
- the closing like a lid over everything by the epiglottis.

With the airway sealed, muscular propulsion will get the food or drink to its correct destination.

Of necessity, with air being sucked in by the negative pressure generated during the inspiratory phase of respiration, the airways are rigid and uncollapsible. If the upper airway did not have a certain rigidity, it would collapse like an uninflated balloon (incompatible with life). The laryngeal skeleton may be felt in the neck - the hyoid above, the thyroid and cricoid cartilages suspended beneath this, and then the tracheal rings. In contrast, the food passage is a floppy distensible muscular tube, relying on gravity and muscular contractions of great co-ordination (swallowing) to convey the food to the GIT - the third phase of swallowing.

The larynx

The larynx as a sphincter

The first line of defence of the airway lies at the true cords. The cricoid cartilage, with its two high posterior shoulders, lies below and partially within the arch of the thyroid cartilage - the inferior cornua articulate with the cricoid and clasp it. On top of the shoulders are situated the arytenoid cartilages, highly mobile from side to side. Attached to each is a membrane running forward to the inner surface of the midpoint of the thyroid cartilage (see Figure 10.2). Thus, if the arytenoid cartilages are together (adducted), the edges of this membrane lie side by side, that is they close. If the arytenoids are distracted (abducted), the posterior end opens out creating a V-shaped aperture (the glottis). These movements result from contractions of the laryngeal muscles innervated by the recurrent laryngeal nerves. The membrane is most confusingly called a vocal cord - it is not a cord at all, it has a free edge medially and extends the whole way laterally to be attached onto the side wall of the laryngeal skeleton.

The epiglottis is a leaf-shaped cartilage, rising out of the larynx from its stalk-like attachment just above where the cords meet on the inner surface of the thyroid cartilage. It is ordinarily held vertically, but if allowed to fall backwards, it closes like a lid over the laryngeal inlet. From both lateral edges of the leaf, swooping down to the arytenoids, are the aryepiglottic folds, which have medial free edges lying above the vocal cords and which are also capable of meeting in the midline. These medial free edges are known as the false cords - the vocal cords are often referred to as true cords.

Thus, the laryngeal phase of swallowing is in three parts, true cord closure, false cord closure, and epiglottic closure, the three together sealing off the airway. With the airway sealed, food and drink are diverted into lateral channels on either side of the epiglottis - the piriform fossae. The opening to the upper oesophagus (the cricopharyngeus muscle sphincter) then relaxes to accommodate the bolus and it is transported by peristaltic muscle contractions to the stomach - the third phase of swallowing.

The larynx as a vocal organ

The physical act of something vibrating in a column of air is the basis of all wind instruments, including the human voice. The vocal cords are set in motion by the passage of expired air across them (Bernoulli phenomenon) - the basic sound so produced being exemplified by humming. This sound can be modified by doing things with the lips and tongue. With the lips closed, the 'M' sound is produced but when open the 'Aah' sound results. (A combination of these two is the easiest modification to make, and it is a possible reason that the word for mother in almost every language in the world is 'muma' or thereabouts.) By holding larynx and lips closed, allowing a little pressure to build up and then releasing them, the 'P' sound results. Repeat this using the tip of the tongue instead of the lips and a 'T' is produced. Thus by using the basic vibration of the larynx, adjusting flow of air over the cords, and altering the volume and shape of the resonating chamber into which the sound projects (pharynx, oral cavity, nasal cavity, and sinuses) the vast variety of sounds that a human being is capable of creating can be produced. The developing child experiments with teeth, tongue, and palate positions (provided he or she can hear to imitate - deaf children do not acquire speech) and this babbling becomes the basis of speech.

In summary, the functions of the larynx are:

- A rigid conduit for respiratory exchange.
- A sphincter mechanism to prevent aspiration.
- A reflex protective mechanism (cough).
- A vocal organ.
- Fixation of the thorax for effort. Effort such as straining and lifting is more efficient if the glottis is closed and the thorax stable.

11. Structured approach to examination of the throat, head, and neck

The summary in Table 11.1 will assist in an examination of the throat, head, and neck.

Table 11.1 Aids to examination of the throat, head, and neck

General inspection of the head and neck

Is there any obvious asymmetry or are there any obvious deformities?

General inspection of the face

Is there any obvious bony structure or soft tissue asymmetry or are there any obvious deformities?

Inspection of the lips

Is there any abnormality in appearance or of movement?

Assessment of mouth opening

Is there any trismus or asymmetrical jaw movement? Are dentures present?

Assessment of the tongue

Is there any abnormality of tongue movement or appearance?

Assessment of the oral cavity and visible pharynx

Is there any visible abnormality of:

- the buccal sulcus
- the dental arches
- the floor of the mouth
- the hard and soft palate
- the tonsils and base of tongue
- the visible pharynx?

What additional information is gained from palpation and bimanual palpation?

Palpation of the neck

Are any palpable masses present and if so, what is the site, size, consistency, contour, attachment, and degree of tenderness of any mass?

Step 1

Begin with a general visual inspection of the head and neck. Does the area appear to be normal or abnormal?

- Asymmetry: consider congenital causes.

- Deformities: consider congenital causes, acquired deformities.

Pay attention to:

- The parotid area.
- The retromandibular area.
- The submental area.
- The visible, anterior neck above the collar.

Are there any obvious deformities, abnormal masses, sores, or scars? If any of these deformities are present, question the patient concerning them, inspect them closely, and bear them in mind for closer examination when examining the neck.

Step 2

Focus in on the face, particularly around the mouth.

Is there facial asymmetry? If this is due to a bony structural asymmetry you can sometimes accentuate this if you place a spatula horizontally between the teeth:

Does the spatula lie horizontally or is it angled? If there is structural asymmetry, consider congenital hemifacial microsomia, acquired maxillary or mandibular deformity. Asymmetry may be the result of a facial nerve palsy. Assess facial muscle movements by asking patients to raise their eyebrows, shut their eyes tight, wrinkle up their nose, show you their teeth. If this is the cause of the asymmetry, consider all the causes of facial nerve palsy.

Are there any obvious deformities, scars, masses, or sores? If present, question the patient concerning these deformities, inspect them closely, including palpation, and initiate thought processes for a differential diagnosis. Bear in mind the possibility of basal cell and squamous cell carcinoma in any ulcerating facial lesions.

Step 3

Ask patients to show you their teeth in order to get them to move the lips apart.

Is there any abnormality of lip movement? If there is any abnormality, then consider facial palsy, scarring, inhibition of movement by trauma, tumour, or inflammatory masses.

Is there any abnormality in the appearance of the lips? Abnormalities include: colour, sores and other ulcerations (benign and malignant), swellings, and traumatic lesions.

If there is any abnormality of movement or appearance, initiate thought processes for a differential diagnosis.

Step 4

Ask patients to open their mouth wide.

Is there any trismus? If there is trismus, consider temporomandibular joint disorders, inflammatory or invasive disorders of the tonsils, pharynx, pterygoid muscles. To examine the temporomandibular joint, place the tips of your index fingers into the conchal bowl of the ears with the pulp facing forwards. Ask patients to open and close their mouth and feel the movements in the joints. Does this cause pain? This may be indicative of temporomandibular joint dysfunction.

Is there asymmetrical movement of the jaw? If there is such movement, consider temporomandibular joint disorders, congenital or acquired mandibular deformity.

Are dentures present? Ask patients to remove them.

Step 5

Ask patients to put out their tongue.

Does it deviate? If it does, consider hypoglossal palsy, invasive disorders of tongue or floor of mouth.

Inspect the surface of the tongue.

Is it normal or abnormal? Abnormal appearances include smooth, 'hairy', fissured, 'geographic', leukoplakia, ulceration, visible tumours (benign and malignant). Note any abnormalities as you will come back to palpate this area later. In the meantime, initiate thought processes for a differential diagnosis.

Step 6

Ask patients to put their tongue back into their mouth. Using a light and a spatula - two spatulas if you use a headlight:

Examine the buccal sulcus and extend this to the inner aspects of the cheek. Inspect the openings of the parotid ducts. Is the area, in particular mucosa, normal or abnormal? Abnormalities include: colour, ulceration, 'spots', sloughs/deposits, leukoplakia, masses, pigmented lesions. Initiate thought processes for differential diagnosis.

Examine the dental arches - dentulous/edentulous, caries, gingivitis, gingival ulceration (infection, malignant), alveolar masses. Consider the need for dental referral.

Step 7

Move inside the dental arches, push the tongue out of the way with a spatula, and examine the floor of the mouth anteriorly, laterally, and far back into the 'hidden area'. While here, examine the retromolar trigone area.

Are these areas normal or abnormal? Abnormalities include: ulceration (differential diagnosis of oral ulceration), malignant-looking ulceration or masses, cysts (ranula, cystic hygroma), other masses (haemangioma, impacted stones in submandibular duct). Note any

abnormalities as you will come back to palpate this area later.

Step 8

Ask patients to relax their tongue. Inspect the hard palate.

Is it normal or abnormal? Abnormalities include: ulcers (differential diagnosis of oral ulceration including malignant), high arched, cleft palate (scarred, fistula), torus palatinus.

Step 9

Depress the tongue a little and inspect the soft palate/uvula.

Is it normal or abnormal? Abnormalities include: inflamed, swollen, oedematous, ulceration, malignant-looking ulceration, masses, cleft palate, bifid uvula.

Ask patients to say 'Aah' and observe palatal movement.

Is it normal or abnormal? Abnormalities include bilateral/unilateral paralysis or inhibition of movement by tumour or inflammatory masses.

Step 10

Place the spatula a little further back and depress the tongue. Inspect the base of the tongue, the tonsillar area, and the visible pharynx. Request patients to say 'Aah' as this makes the tonsils more prominent.

Is the base of tongue normal or abnormal? Abnormalities include: lingual thyroid nodule, cyst in base of tongue, lingual tonsil enlargement.

Are the tonsils absent or present? If present, are they normal or abnormal? Abnormalities include: inflammation (generalized, follicular), enlargement (bilateral, unilateral - the tonsil itself or a mass lateral to the tonsil pushing it medially), slough/membrane, inclusion cysts/bodies, malignant ulceration.

Is the visible pharynx normal or abnormal? Abnormalities include: lymphoid nodules, visible adenoid, postnasal drip, malignant-looking ulceration.

Note any abnormalities for attempted palpation but in the meantime initiate thought processes for a differential diagnosis.

Examination of the deeper areas of the pharynx and the larynx requires special techniques which are not difficult to learn - indirect examination using a mirror or direct examination using a flexible fibre-optic endoscope. In general, when symptoms relate to the hypopharynx/upper oesophagus ('lump in throat', dysphagia) or to the larynx (change in voice, hoarseness), referral for specialist examination is required.

Step 11

If any abnormality had been noted as indicated above, palpate the area at this stage using a gloved index finger to probe around inside the oral cavity.

In the floor of mouth, carry out a bimanual palpation, feeling the tissues between the gloved, intra-oral finger and the fingers of the other hand probing in the submental area. Try and determine the nature of any masses felt - lymph nodes, submandibular salivary gland, Wharton's duct stone, or ranula.

In the tongue, palpation gives a fairly accurate idea as to whether any lesion is superficial or involves the deeper tongue tissues.

In many patients lesions of the tonsils and base of tongue may be palpated as well, although most will gag as you attempt to do this.

Step 12

View the neck with the collar undone, the sternal notch exposed, and the neck exposed out to the shoulder. Bear in mind any abnormalities noted earlier for closer examination.

Are there any abnormalities, scars, masses that were not seen earlier? Question patients concerning these. Do anterior masses move when you ask them to swallow or put out their tongue? Movement indicates association with the thyroglossal tract and the larynx.

Stand behind patients and palpate the whole of the neck region. Start in the submental area, move back to the submandibular area, then to the retromandibular area. Move up to the parotid area and then back to the upper posterior triangle. Move down the posterior triangle, forwards along the clavicle, and up the posterior aspect of the sternomastoid. Move down the anterior aspect of the sternomastoid, digging your finger tips deep in beneath the muscle. Move up to the hyoid, clasp it gently between index finger and thumb and rock it gently. Move down the thyroid cartilages, clasp them gently between index finger and thumb, and move them gently sideways and back feeling for laryngeal crepitus as they grate over the cervical spine. Move down and palpate the cricoid cartilage with the tip of the index finger. With both hands try to palpate the thyroid gland on either side and its isthmus centrally (normal glands are impalpable). Palpate the trachea, check that it is central. Finally palpate in the sternal notch.

For any masses felt you need to elucidate the following:

- Site.
- Size.
- Consistency - hard, firm, rubbery, cystic, soft.
- Contour - smooth, irregular.
- Attachment - to skin, deeper structures, other structures ('matted').
- Tenderness.

With this information, initiate thought processes for a differential diagnosis.

Step 13

Piecing together all the information obtained from the history regarding patients' throat, head, and neck complaint and the findings on examination as far as you have been able to examine should enable you to make a diagnosis in many cases and initiate treatment. Problems relating to the deeper areas of the pharynx and larynx may require referral for an ENT specialist opinion.

12. Core knowledge of throat, head, and neck disorders

The mouth

Ulcers

The main causes of oral ulceration are:

- Aphthous/herpetic.
- Traumatic.
- Allergic/auto-immune.
- Infective.
- Neoplastic.

These can usually be distinguished from a combination of the history and examination.

Aphthous/herpetic. Aphthous ulcers tend to be recurrent and are sited predominantly on mobile mucosal surfaces such as the cheek and gingivobuccal sulcus. Herpes ulcers tend to predominate on non-mobile mucosal surfaces such as the hard palate. They both have similar clinical features, usually starting as small vesicles that rapidly ulcerate. They may be of any size and number, are intensely painful but resolve spontaneously over two or three weeks. If any treatment is needed, topical antiseptics/adstringents may be used or protective paste applied. Hydrocortisone pellets may be helpful with aphthous ulcers. Acyclovir may be considered for herpes ulcers.

Traumatic. These usually arise from contact with jagged teeth or rough areas on dentures, from biting the cheek or tongue or from other trauma. Apart from removal of the underlying cause, no specific treatment is usually required.

Allergic/auto-immune. Painful ulceration of the oral mucosa is occasionally related to allergy or an auto-immune disease. Some names to remember are:

- Stevens-Johnson syndrome tends to occur in young adults. They present with a maculopapular rash; anal, genital, and oral mucosal ulcers; a fever; headache; and arthralgia. It is thought to be an allergic reaction to foods, drugs, viral, and bacterial infections.

- Behçet's syndrome is a combination of iritis, oral and genital ulceration. The cause is unknown.

- Pemphigus is a rare disorder affecting the elderly in which successive crops of blisters occur that heal with scarring.

Treatment of these causes for oral ulceration is non-specific with local, topical therapy supplemented by use of systemic steroids.

Infective. Vitamin deficiencies, particularly vitamin C, may present with infected gingival ulceration.

Haematological disorders (agranulocytosis, leukaemia) often present with infected oral and pharyngeal ulceration.

Vincent's angina - acute ulcerative stomatitis - tends to occur in patients with poor nutrition, low general resistance, and poor oral hygiene. Infection (a combined spirochaete/anaerobic bacterial infection) starts in the gingival margin, spreads and coalesces, and often progresses to cellulitis with swelling of the soft tissue of the floor of mouth. Treatment is with IV penicillin/metronidazole.

Always bear in mind the possibility of TB and syphilis (primary chancre, secondary snail track ulcers, tertiary gumma).

Neoplastic. Always consider malignant neoplastic change when there is persistent ulceration, particularly in tobacco users (smoking, chewing). These are often asymptomatic until infected. They have a typical 'craggy' appearance, usually with hyperkeratosis and infiltration of surrounding soft tissue. Urgent referral is required for biopsy, diagnosis, and treatment.

White/red lesions

Thrush. Candidiasis occurs in the very young, in debilitated adults, in patients on broad-spectrum antibiotics, in patients who are immunocompromised (steroids, immunosuppressants, HIV), and in patients with long-term feeding tubes. Typically the infected mucosa is covered by a white membrane which, when removed, reveals a raw mucosal surface. When arising beneath dentures, the infected area is usually just red and raw. On the lips infection produces raw cracks at the angles (angular cheilitis). Treatment is with topical fungicides as either tablets (pessaries) or solutions.

Leukoplakia. This term is used to describe white plaques of hyperkeratosis on mucosal surfaces. The underlying pathological spectrum range from squamous metaplasia through squamous dysplasia to squamous neoplasia. It is usually caused by irritants such as local trauma from teeth or from tobacco usage, but leukoplakia is commonly seen in AIDS patients. Sometimes this same spectrum of pathology may present with predominantly red plaques which are then given the name 'erythroplakia'. Both types of lesion always require biopsy because about 10 per cent will have already progressed to carcinoma in situ by the time they present. In those that have not, resolution frequently follows removal of the irritant. Those that do not resolve require regular follow-up and re-biopsy.

Pigmented lesions

People with naturally pigmented skin may have patchy areas of melanotic pigmentation in the oral mucosa. Peutz-Jeghers syndrome is an association between freckles on the face, patchy pigmentation in the oral mucosa, and gastro-intestinal polyposis. Increased melanin deposition from ACTH stimulation is a feature of Addison's disease - adrenal atrophy - and this may occur on the tongue and in the oral mucosa. Malignant melanoma may also arise in the oral and nasal mucosa.

Swellings

Prominent '**sucking pads**' and **cysts** of dental origin are occasionally seen in infants.

Fibrous traumatic **polyps** occur when the cheek mucosa is repeatedly trapped between teeth or dentures. Treatment involves correction of dentition and surgical excision.

Retention cysts may occur due to obstruction of minor salivary gland ducts. They most frequently occur in the floor of the mouth, when they are known as 'ranula' (*L. rana* = frog). Here they sometimes reach considerable size. Treatment is by surgical marsupialization.

Lymphangioma arises from developmental malformation of lymphatic drainage channels which results in oedematous swelling and deformity of the involved soft tissue - in the oral cavity this may be cheek, lips, tongue, or submandibular area. When multiple cysts form in the involved tissue, the condition is known as **cystic hygroma**. These patients require referral to a specialist service for assessment for surgical excision or debulking as these malformations do not involute spontaneously.

Haemangioma is a similar malformation affecting the vascular channels and is characterized by the bluish discoloration of the swelling. These lesions tend to increase in size over the first year or two of life but usually then involute over the next two to three years. These patients require referral to a specialist service for assessment as surgical excision is sometimes required.

Torus palatinus and **torus mandibularis** are terms used to describe non-neoplastic, localized overgrowths of the underlying bone in these areas. Surgical excision or debulking may be required if the swelling interferes with denture fitting.

Neoplasia. Benign neoplasms of structures beneath the oral mucosa (bone, dental elements, glandular tissue) tend to present as an intra-oral mass. Malignant neoplasia occasionally presents as a swelling rather than an ulcerated lesion. A combination of examination and palpation gives some idea of the extent of the lesion which is best assessed by CT scanning. Patients in whom this is the suspected diagnosis require referral to a specialist service for assessment and management.

The tongue

Macroglossia (uncommon) refers to a tongue that is large in relation to the size of the oral cavity and **microglossia** (rare) to one that is small.

Fissured tongue is usually a congenital condition. Debris accumulation can precipitate infection with soreness and halitosis.

Black hairy tongue is caused by overgrowth of filiform papillae and is usually associated with tobacco usage. Treatment is by removal of the irritant, scraping, and brushing.

Geographic tongue is the term used to describe red patches on the tongue surface in which there is an absence of filiform papillae. Characteristically these patches gradually coalesce and change pattern with time. Treatment is not required.

Median rhomboid glossitis refers to a red mass just anterior to the circumvallate papillae which is a remnant of the embryological tuberculum impar. It needs to be distinguished from a **lingual thyroid remnant**. (Remember that if there is lingual thyroid tissue the thyroid gland may have not descended during embryological development and this may be the only functioning thyroid tissue. Sometimes these bleed and surgical excision may be contemplated, in which case a thyroid scan is mandatory.)

Strawberry tongue is the appearance seen in scarlet fever.

Glossitis (painful inflammation) is seen in vitamin B (pellagra) and vitamin C deficiencies.

'**Smooth tongue**' is seen in iron deficiency anaemia.

The teeth

Dental caries, gingivitis, and associated dental problems are common. Dental-related infection may present as apical abscess, maxillary sinusitis, cellulitis of the cheeks, submandibular cellulitis, or indeed abscess formation anywhere around the face and upper neck. It may also be a cause for lymphadenitis.

An epulis is a granulomatous mass arising between teeth, usually related to pregnancy but also sometimes seen in infants before the teeth have erupted.

A variety of tumours arise from dental elements that present with expansion of the upper or lower jaws.

Edentulous patients, partial or complete, may present with otalgia as a consequence of temporomandibular joint dysfunction. Following removal of teeth, the alveolar ridges gradually atrophy with consequent malocclusion and 'strain' on the TM joint from overclosure during the action of chewing - see Chapter 11 for how to examine the TM joint when this is a suspected cause of otalgia. When dentures are fitted they need to be adjusted every few years to compensate for this atrophy.

The pharynx

Pharyngitis

Infective. Viral infections are the most common but the infection may be primarily bacterial - usually streptococcal - when there is more systemic upset and more local inflammation than with viral infections. Uncommonly it may be due to candida infection - usually in immunocompromised patients.

Non-infective. Non-infective pharyngitis usually arises from inhalation or ingestion of irritants of which tobacco smoke is the most common. A painful, dry throat is common after radiotherapy.

Tonsillitis

The tonsils form part of a ring of lymphoid tissue around the upper aerodigestive tract - Waldeyer's ring. This is the first site of contact between allergens, organisms, and pathogens and the body immune system. An infant starts life with very little resistance to infection and gradually progresses through childhood to a stage of immunocompetence as contact is made with those things that stimulate the immune system. During this time the tonsils will be continually reacting to each new contact. These episodes of reaction may be regarded as being part of normal development and in most children mean that throughout this period the tonsils will be somewhat enlarged. Occasionally the reaction will be inflammatory in nature, usually associated with a viral pharyngitis, but these minor inflammatory episodes require only symptomatic treatment.

Sometimes the tonsils become acutely inflamed - acute tonsillitis. This happens when bacteria, often streptococcal, which are resident in the tonsil crypts multiply and invade the tonsil stroma to cause infection. The result is an inflammatory swelling of the tonsils with pus discharge from the tonsil crypts, accompanied by fever, systemic upset, and dysphagia. In this situation antibiotics are indicated to both shorten the course of the illness and to reduce the possibility of streptococcal complications (rheumatic fever, glomerulonephritis).

Tonsillectomy is an operation to remove the tonsils and this is indicated for several different reasons:

- Recurrent infection - as a general rule in childhood a tonsillectomy has to be 'earned' since episodes of tonsillitis can generally be treated with antibiotics. The usual indication is when a child has been getting more than four episodes per year for more than two years.

- Persistent infection - this is a different indication and in this state the tonsil infection doesn't resolve with antibiotics. The tonsillitis is either chronic or recurs frequently over a short period of time. This is often the case in adolescents and adults.

- Obstructive sleep apnoea - see under *Snoring*, Chapter 8. The tonsils may not necessarily be inflamed but often enlarge and cause airway obstruction during sleep (the adenoid is often enlarged as well). Tonsillectomy may form part of the surgery to relieve obstructed sleep, usually in children, but tonsil hypertrophy may be part of the problem in

obese adults.

- Suspicion of neoplasia or chronic disease when there is unilateral tonsil enlargement or persistent cervical adenopathy. In these cases the tonsils are removed for histological examination.

- Following a quinsy - see below.

Quinsy

Sometimes during an episode of tonsillitis, an abscess forms in the tonsil bed. This is heralded by the onset of intense pain and dysphagia with spasm of the muscles of mastication causing trismus. When examined, the tonsil pillar and adjacent soft palate are inflamed and swollen, and the tonsil is pushed across to the midline (see Figure 12.1). Relief of the intense pain is achieved by either aspirating or draining the abscess (see *Draining a quinsy* in Chapter 14) and the infection is treated with intravenous antibiotics. (If general anaesthetic is required for drainage, a 'hot' tonsillectomy may be considered.) Following resolution of the infection tonsillectomy is indicated - see above.

Parapharyngeal abscess

When infection of either tonsil or dental origin spreads posteriorly and laterally, an abscess may form in the parapharyngeal space. Here the predominant swelling will be posterior to the tonsil pillars. With enlargement a 'dumb-bell' abscess may form with presentation in the neck as well. It is a potentially serious infection because of the risk of inferior spread to the mediastinum. Treatment is by drainage - internally via the pharynx, externally via the neck - and intravenous antibiotics.

Retropharyngeal abscess

Retropharyngeal abscesses usually occur in infancy when retropharyngeal adenitis progresses to abscess formation. These infants present with fever, systemic upset, and progressive upper airway obstruction. The diagnosis is easily missed until the airway obstruction becomes life-threatening - see *Emergency aspiration of a retropharyngeal abscess*, Chapter 14. If this diagnosis is suspected and the situation is less urgent, a lateral neck X-ray will show widening of the retropharyngeal soft tissue shadow. The retropharyngeal swelling may be palpated for confirmation. Drainage is undertaken under anaesthetic and the infection treated with intravenous antibiotics.

When a retropharyngeal abscess occurs in an adult, suspect TB.

Retropharyngeal adenopathy presenting as a retropharyngeal mass may be part of the generalized cervical adenopathy of AIDS.

Infectious mononucleosis (glandular fever)

Infectious mononucleosis is sometimes known as the 'kissing disease' and is seen most often in young adults who then present with acute sore throat. When examined the tonsils are

inflamed, enlarged, and covered by a membranous exudate (suspect diphtheria when this appearance is seen in infants). There is a marked cervical lymphadenopathy and there may also be hepatosplenomegaly. Atypical lymphocytes are seen in a blood smear (a differential white cell count is mandatory as acute leukaemia sometimes presents with a similar clinical picture) and the Paul-Bunnell titre rapidly rises. Treatment is symptomatic - a skin rash developing when ampicillin is prescribed is virtually diagnostic!

Pharyngeal pouch

These pouches are uncommon but when they do occur they usually arise in late middle-age with a male to female predominance of 4:1. A hernia develops posteriorly through a weakness in the inferior constrictor muscle of the pharynx (Killian's dehiscence), the resulting pouch thus communicates with the pharynx. Food and liquids sometimes enter the pouch to cause the symptoms of dysphagia, gurgling, and regurgitation. The diagnosis is made radiologically (barium swallow) and the treatment is surgical.

Corrosive ingestion

Ingestion of corrosive chemicals is either accidental (usually in children) or suicidal. The corrosive is usually either alkaline (caustic soda) or acid (battery acid) but potassium permanganate may produce deep burns in addition to staining the mucosa brown. Both acids and alkali burn the oral cavity, the pharynx, the larynx, and the oesophagus but acids may burn the stomach and duodenum as well. The burns may only be superficial in areas of rapid transit but tend to be deep in areas of hold-up - at the oesophageal inlet in the pharynx, at the level of the heart in the mid-oesophagus, and at the gastro-oesophageal junction. Superficial burns sometimes heal with minimal scarring (although adhesions may develop between adjacent burnt surfaces) but deep burns heal with fibrosis, which subsequently contracts to cause either stenosis or obliteration of the lumen.

Management is initially concerned with identification of the extent of mucosal injury and any potential complications - laryngeal oedema causing airway obstruction, airway aspiration causing respiratory distress, oesophageal perforation causing mediastinitis, gastric perforation causing peritonitis. This requires endoscopy. A nasogastric feeding tube is then passed both for nutrition and to maintain a lumen. Prophylactic antibiotics are given to combat secondary infection and antacids given to reduce further injury from gastro-oesophageal reflux.

Healing of superficial burns and return of swallowing takes one to two weeks but follow-up is needed to ensure that no dysphagia results from adhesions. Deeper burns take many weeks to heal and invariably regular dilatation of the lumen is required thereafter to reduce the stenosing effect of the healing fibrosis. Occasionally this is unsuccessful, when oesophageal resection with colon replacement becomes necessary.

The larynx

Inflammatory disorders

Laryngitis. Primary infection is usually viral in origin as part of a generalized respiratory tract infection. The exception is epiglottitis - see below. Secondary infection or inflammatory swelling is associated with bacterial infection of either upper or lower respiratory tract. The inflammatory reaction of the laryngeal mucosa (which is exacerbated by coughing) consists of both mucosal induration and oedema within Reinke's space (a potential space between the mucosa and the underlying fibromuscular cord).

In an adult, with a larger larynx than in a child, hoarseness is the predominant symptom of laryngitis, together with pain and irritation (coughing). Treatment of viral infections is symptomatic - steam inhalations may be soothing - but when laryngitis is associated with other bacterial infection antibiotics are recommended. The patient should be told to avoid overuse of the voice as this may prolong resolution of the oedema.

In an infant, laryngitis is a more sinister disorder. It is given the name **laryngo-tracheo-bronchitis (LTB)** which indicates the generalized nature of the infection. Its other name, croup (of Scottish origin), refers to the sound of the typical cough. It tends to affect infants in the ages between six months to three years and starts as a viral respiratory tract infection which gradually worsens into a croupy cough with stridor. Oedema and induration of the laryngeal mucosa predominates, particularly in the immediate subglottic area below the vocal cords. Airway narrowing at this level may progress to total obstruction. Stridor, which is indicative of airway obstruction, becomes the predominant symptom. The difficulty in LTB lies in determining the severity of the obstruction. Perhaps the best guide is to observe the characteristics of the stridor - see *Hoarseness and stridor*, Chapter 13. Nebulized adrenaline inhalations are given to improve the airway.

In addition to management of the airway, consideration has to be given to use of steroids which, by reducing inflammatory swelling, may reduce the need for airway intervention and shorten the course of the illness. Secondary bacterial, lower respiratory tract infection is common and antibiotics may be needed when the sputum becomes purulent.

Epiglottitis/supraglottitis. This is a primary bacterial infection (*Haemophilus influenzae*) of the supraglottic mucosa. Not common, it is usually seen in children of a slightly older age group than LTB but it also occurs in young adults. It is an even more sinister condition than LTB because of the rapid onset of total laryngeal airway obstruction by the inflamed (cherry red) epiglottis. What begins as a sore throat accompanied by fever and malaise, rapidly progresses to painful dysphagia with stridor and increasing airway obstruction. These patients sit upright with the head and neck rigidly held in one position as they struggle to maintain an airway. Upon presentation, emergency airway intervention (intubation or tracheostomy) is usually required but, if time permits, a lateral neck X-ray will show an enlarged epiglottic shadow. Once the airway is secured, intravenous antibiotics are given (chloramphenicol, cephalosporin) and the infection resolves over four to five days.

Irritants. Exposure to irritants, of which the most potent is tobacco smoke, produces either a non-specific induration/oedema or, of more concern, leukoplakia - see *Neoplasia* on

next page. Resolution usually follows removal of the irritant (unless neoplasia has already occurred).

Other causes of laryngeal inflammation include:

- Gastric acid irritation, which occurs with severe gastro-oesophageal reflux, may cause laryngeal mucosal inflammation. Management is of the underlying reflux (antacids, motility agents, surgery).

- Trauma from inhalation of steam, hot air, or flame in burns.

- Trauma from ingestion of corrosives - caustic soda, battery acid - accidental in children, suicidal in adults.

- TB - usually associated with advanced pulmonary TB - causes a granulomatous ulceration of the laryngeal mucosa. Treatment will produce resolution but the fibrosis that results may permanently affect laryngeal function (airway, voice).

Vocal abuse

Acute vocal abuse (screaming, shouting) may precipitate a haematoma of the vocal cord at the contact site in the middle third of the vocal cords.

Chronic vocal abuse may have two effects:

- A localized thickening of the vocal cords at the contact sites - 'singer's' or 'screamer's' nodes.

- A generalized oedema of Reinke's space along both vocal cords.

Both acute and chronic vocal abuse cause hoarseness. The treatment is cessation of vocal abuse by correction of the speech production disorder - speech therapy can aid in this. Persistent hoarseness despite speech therapy is an indication for surgery to excise nodules or 'strip' away mucosal oedema. The laser is a useful instrument for this type of laryngeal surgery.

Neoplasia

Suspicion of neoplasia should always remain high in patients with persistent hoarseness (the larynx is the most common site for neoplasia in the head and neck) and, because examination of the larynx is a specialized procedure, remember the dictum 'Any hoarseness persisting for more than a month requires urgent referral for specialist examination'.

There is a wide spectrum of **benign neoplasms** that arise in the larynx of both adults and children, none of which are common. The symptoms they cause - hoarseness, stridor, airway obstruction - depend on their site and size. They all require specialist referral for evaluation and management.

One that is worth remembering, and it is more strictly a hyperplasia than a neoplasia, is **juvenile recurrent laryngeal papillomatosis**. This is a warty growth caused by infection of the laryngeal mucosa by human papilloma virus. It usually arises in infancy and may be associated with genital tract papillomatosis in the mother (look for it and treat before subsequent pregnancies). Hoarseness and stridor are the symptoms and because of airway obstruction the warty growths require removal. As the name implies, they tend to recur until spontaneous remission ensues after several years (in common with other warts, this is the basis for many patent 'wart cures'). Tracheostomy may be required.

Malignant neoplasms are more common. They are usually squamous carcinomas whose aetiology is smoking and they tend to present in middle- and old-age. As mentioned previously, the pathological progression is squamous metaplasia - squamous dysplasia - squamous neoplasia. (Leukoplakia in the larynx is a potentially premalignant state and always requires biopsy with regular follow-up and repeat biopsy if it does not regress.)

The general principles of management of malignant neoplasia of the larynx include:

- Diagnosis - suspicion, examination, and biopsy.
- Assessment - staging (see *Overview of head and neck cancer*).
- Therapy - radiotherapy, surgery (local excision, partial laryngectomy, total laryngectomy).
- Rehabilitation - oesophageal speech, tracheo-oesophageal fistula with speaking valve.
- Follow-up - second primaries, nodal metastasis, distant metastasis.

The earlier treatment is begun for laryngeal malignancy, the better the prognosis - hence the importance of early diagnosis. Typically, treated Stage I cancer has a 90 per cent five-year survival, whereas Stage IV has only a 50 per cent five-year survival.

Laryngeal dysfunction

Laryngeal dysfunction implies some impairment of either the sensory nerve supply to the mucosa or the motor nerve supply to the laryngeal muscles. These affect the predominant functions of the larynx as an airway, a sphincter, and a producer of voice.

Sensory loss is probably more common than motor dysfunction although not as commonly diagnosed because it is almost impossible to detect on examination. Reduced sensation impairs the efficient reflex responses that co-ordinate the sphincter action of the larynx and result in choking or aspiration on swallowing (laryngeal incompetence). Loss of sensation may also impair reflexes needed for swallowing and contribute to dysphagia or a feeling of a lump in the throat - a symptom known as 'globus'.

Motor loss (**recurrent laryngeal nerve palsy**) results in the affected vocal cord taking up a position towards the midline of the glottis (there are three muscles for adduction of the cords - sphincter action - but only one muscle for abduction).

Unilateral palsy is more common than bilateral. The left vocal cord is more commonly affected than the right because of the intrathoracic course of the left recurrent laryngeal nerve, a branch of the vagus. Causes include thyroid surgery or malignancy, cardiac surgery, mediastinal nodes (TB), involvement from carcinoma of the bronchus or oesophagus, and many cases that can only be labelled idiopathic - probably some form of viral neuritis. It presents with a breathy hoarseness from inefficient closure of the cords during speech.

Bilateral palsy, in contrast, presents with stridor and airway obstruction because both cords lie paralysed in the midline. Causes include hydrocephalus, base of skull lesions, congenital mediastinal vessel anomalies, and sometimes cardiac surgery when dissection around the right subclavian artery has been needed to place an arterial line. Many cases, however, can only be labelled idiopathic.

Patients with suspicion of recurrent laryngeal nerve palsy require referral for specialist evaluation.

Other laryngeal disorders

Hypothyroidism. Chronic oedema of the vocal cords (myxoedema) may cause hoarseness.

Angioneurotic oedema. An alarming manifestation of a type I allergic reaction that may rapidly progress to fatal airway obstruction from generalized laryngeal oedema. First aid - give adrenaline by subcutaneous injection and intubate.

Rheumatoid arthritis. The crico-arytenoid joint - the basis for vocal cord movement - may be involved in this disorder when fixity of the cords causes airway obstruction requiring tracheostomy.

Foreign bodies. If large, these will cause total airway obstruction. Small people can be turned upside down and thumped on the back. If this does not dislodge the object, resort to Heimlich's manoeuvre. If not dislodged by this, you will have to perform an emergency tracheostomy - see *Securing an emergency airway* in Chapter 14. Smaller foreign bodies not causing total obstruction require urgent anaesthetic and removal.

The head and neck

Neck lumps

Neck lumps may arise from:

- The skin and subcutaneous tissues.
- Congenital remnants.
- The thyroid gland.
- The salivary glands.

- Bony and cartilaginous structures.
- Blood vessels.
- Lymph nodes.

The skin and subcutaneous tissue

Sebaceous cysts and lipomas are readily identified by the ability to lift up the lump in the skin. If required, treatment is by surgical excision.

Congenital remnants

Frequently these do not present until adolescence or early adulthood.

- **Dermoid cysts** usually present as midline, submental swellings but may occur along any of the other lines of embryological fusion.

- **Thyroglossal cysts** may present anywhere in the midline along the line of embryological descent of the thyroid from base of tongue to the thyroid gland but are most commonly situated either just above or just below the hyoid bone. Classically they move upward with protrusion of the tongue. Usually painless, they may become inflamed with infection. Abscess formation with discharge may result in a chronic discharging sinus. Treatment involves surgical excision of the cyst and its tract - the mid-portion of the hyoid bone has to be removed as well to prevent recurrence behind it.

- **Branchial cysts** are classically situated beneath the middle third of the sternomastoid muscle and protrude anterior to the muscle (second branchial arch). Usually painless, they can become inflamed because of their association with lymphoid tissue. Treatment involves surgical excision and this can be complicated if there is a tract that travels from the cyst, between the carotid arteries, to terminate in the tonsil.

- **Cystic hygroma** is one presentation of a lymphangioma (abnormality of lymphatic vessels) in which cystic spaces (remember transillumination) enlarge within the soft, irregular mass of tissue that results from impaired lymphatic drainage. Present at birth, they usually enlarge and (unlike haemangioma) do not involute so that surgical excision is required - an extremely difficult procedure as the malformation is diffuse throughout all the involved soft tissues.

Thyroid gland

The thyroid gland is normally impalpable so that all thyroid enlargements are pathological. They move upwards with both tongue protrusion and swallowing. Remember that clinically a patient may be thyrotoxic, euthyroid, or hypothyroid; thyroid function tests may be required and the gland may require to be 'scanned' for radio-active isotope uptake.

- Whole gland enlargement:
 - physiological in adolescents
 - multinodular goitre - one lobe may be more enlarged than the other
 - Hashimoto's disease - auto-immune thyroiditis

- Solitary nodules:
 - benign cysts
 - adenomas
 - malignancy.

These are differentiated by isotope scan, needle aspiration for cytology and biopsy.

The salivary glands

The **parotid gland** extends behind the angle of the mandible - swellings here can be confused with lymph nodes. There is also a deep lobe - swellings here may present in the pharynx in the region of the tonsil. The gland is normally impalpable and all swellings are pathological.

- Acute swellings:
 - Mumps - bilateral, painful, diffuse enlargements. Be aware of complications (orchitis, pancreatitis, deafness).
 - Bacterial parotitis - uncommon, usually in the debilitated, dehydrated elderly, it usually presents as a unilateral, painful inflammatory swelling with purulent discharge from the duct orifice. Treatment requires rehydration, IV antibiotics, and drainage if there is any abscess formation.

- Intermittent swellings:
 - Calculi. Large calculi obstructing Stensen's duct are uncommon. The parotid gland swells whenever there is increased salivation (thought and taste of food) and this is painful. They require surgical removal. Smaller calculi obstruct the ductal system within the gland and cause distal dilatation (sialectasis) which is diagnosed by injection of radio-opaque dye (sialogram). If troublesome these glands require total excision (parotidectomy).
 - Auto-immune disease is uncommon but when it does occur it affects middle-aged women more than men. One example is Sjögren's syndrome - intermittent, painless, bilateral parotid swelling, dry eyes, and rheumatoid arthritis. The associated dry mouth is known as xerostomia. Lymphoma may develop as a late complication.

- Persistent swellings:
 - Neoplasia, a persistent, unilateral parotid swelling, is invariably neoplastic. Ninety per cent are benign adenomas for which the surgery is 'superficial' parotidectomy (not a simple lumpectomy because of the high recurrence rate). Pain and facial nerve palsy are indicators of malignancy but these generally occur late and diagnosis is made either by needle aspiration cytology or by histology. When malignant, these tumours have a low sensitivity to radiotherapy and therefore total parotidectomy is required with sacrifice and grafting of the facial nerve.

The submandibular gland

- Inflammatory swelling secondary to infection in the oral cavity is related to the close association with lymphoid tissue.
- Calculi are more common than in the parotid gland.
- Neoplasia is more likely to be malignant than in the parotid gland.

Bony and cartilaginous structures

Normal structures may be mistaken for pathological lumps, for example, transverse process of axis, hyoid bone, thyroid and cricoid cartilages, and accessory cervical rib.

Blood vessels

- Carotid pulsations are palpable but not the artery itself unless thickened by atherosclerosis - remember to listen for a bruit.
- Carotid body tumours (chemodectoma) are rare and arise in the carotid bifurcation. They are pulsatile with an audible bruit.
- In some people the external jugular vein may massively enlarge with straining or when there is mediastinal obstruction.

Lymph nodes

There are more than a hundred lymph nodes on each side of the neck with several named groups of nodes and a definite pattern of drainage. Supraclavicular nodes also drain from the thorax and on the left side (thoracic duct) from the abdomen. (See Figure 12.2.) Inflammatory reaction with enlargement in regional lymph nodes is a normal response to inflammation/infection in the upper aerodigestive tract but should settle as the inflammation/infection resolves or responds to treatment. Persistent palpable, painless lymph node enlargement is normal in childhood but in adults a persistently palpable node should be investigated to exclude a primary underlying neoplasia.

- **Lymphadenitis** is lymph node enlargement due to inflammation and is usually painful at some stage. Occasionally frank infection may establish in a node and progress to cellulitis and abscess formation.

- Lymphadenopathy:

- Consider infectious mononucleosis - in adolescents with significant, multiple, bilateral nodes. Other body nodes may be involved and there may be hepatosplenomegaly.
 - Consider TB for persistent cervical lymphadenopathy.
 - Persistent, generalized lymphadenopathy is an early feature of HIV infection.
- **Neoplastic lymphadenopathy** - remember the 80:20 rule - see Chapter 13.
- Lymphoma, usually Hodgkin's, occurs in both children and adults. It presents

with either an isolated node swelling or as a unilateral lymphadenopathy.

- Metastatic neoplasia - remember the general rule that any neck lump appearing for the first time in an adult over 40 years of age (20:40 rule) should be regarded as metastatic neoplasia until proven otherwise. Remember also that the prognosis for survival is markedly decreased if a metastatic node is biopsied. Therefore, on suspicion of a metastatic node a search for the primary site of the neoplasm should be made - usually this will be a squamous carcinoma of the upper aerodigestive tract but other malignancies do occur. If not obvious, urgent referral to a specialist service is mandatory for primary site identification and biopsy. If the primary site cannot be identified, needle aspiration for cytology or needle biopsy are preferred to open biopsy of the neck node. Management of metastatic neoplastic disease involves management of the primary site together with a radical neck dissection in which all likely metastatic node-containing tissue in the drainage area is excised.

Overview of head and neck cancer

The head and neck region is a common site for cancer, and malignancy in the upper aerodigestive tract accounts for 15 to 20 per cent of all cancer. In this region both the cancerous lesion and any surgery required for treatment affect eating, drinking, speaking, and respiration as well as producing cosmetic deformity with its associated psychological effects. On the brighter side, malignancy tends to remain confined to the primary site and its regional nodes, with distant metastasis usually a late event. Local treatment with radiotherapy and surgery, especially if the cancer is identified early, offers reasonable prospect of cure. Typically, patients with treated Stage 1 cancers have a better than 75 per cent chance of five-year survival.

The majority of cancers arising from mucosal surfaces are squamous carcinoma. Often the onset of malignancy is preceded by leukoplakia or erythroplakia and in these lesions a histological progression of disease may be recognized - squamous metaplasia, squamous dysplasia, carcinoma in situ, frank carcinoma. Alcohol and tobacco (smoked, chewed, or inhaled as snuff) appear to act synergistically as the predominant aetiological factors for development of squamous carcinoma. Some of the other cancers encountered in the head and neck have known aetiological factors:

- Adenocarcinoma arising within the sinuses has been associated with long-term exposure to hardwood dust in woodworkers.

- Sarcomas and thyroid malignancies are associated with previous radiation exposure.

- Immunocompromised patients (immunosuppressants, HIV infection) may develop non-Hodgkin's lymphomas, squamous cell carcinoma, or Kaposi's sarcoma.

- Epstein Barr virus is linked to carcinoma of the nasopharynx and Burkitt's lymphoma.

The principles of management of malignancy in this area are:

1. **Diagnosis.** Examination and biopsy of the primary site - see *Neoplastic lymphadenopathy*.

2. **Assessment:**

- Identification of the primary site.
- Determination of the extent of disease at the primary site by inspection, palpation, CT and MRI scanning, and hence staging - see below.
- Identification of nodal metastasis by palpation with needle aspiration for cytology.
- Determination of the extent of nodal disease by palpation, CT and MRI scanning, and hence staging.
- Identification of distant metastasis.

From this information, the patient's cancer is staged according to a staging classification known as the TNM system:

T = Primary tumour. T0, T1 to T4. The exact description of each T stage differs for the various anatomical sites.

N = Nodes. N0, N1 to N3.

M = Distant Metastasis. M0 to M1.

3. **Formulation of treatment plan.** This is largely determined by the staging of primary disease and nodal metastases. In this region distant metastasis renders the disease incurable.

- Early stage disease - radiotherapy with the option of salvage surgery for radiation failure.
- Later stage disease - a combination of surgical ablation and radiotherapy.
- Late stage disease:
 - potentially curable - a combination of chemotherapy, radiotherapy, and surgical ablation.
 - incurable - palliative chemotherapy and/or radiotherapy; terminal care.

4. **Rehabilitation.** Surgical ablation and reconstruction produces not only cosmetic but functional disability. Rehabilitation of swallowing and speaking are usually required.

5. **Follow-up.** Recurrence of disease is most likely to manifest within the first two to three years after treatment and thereafter becomes less and less likely. After a five-year disease-free interval the cancer is regarded as cured.

- Salvage surgery may be possible for disease recurrence detected early.

- Second-site primary disease will arise in about 15 to 20 per cent of head and neck cancer patients - particularly if the aetiological factors persist. This may be within the same region, in the lower respiratory tract or, perhaps surprisingly, within the lower gastro-intestinal tract.

- Distant metastasis, although not common, is an ever-present concern, the usual sites being the lungs and liver.

ENT aspects of head and neck trauma

Head injury without skull fracture

Closed head injury may cause avulsion of the olfactory (1st) nerve at the cribriform plate with loss of the sense of smell. This will be permanent.

Similar injury may affect the cochleovestibular (8th) nerve (rare) as it leaves the brain stem to enter the internal auditory canal causing deafness and vertigo. Deafness will be permanent but loss of balance usually compensates with time. (Occasionally there is some recovery of hearing, in which case it is assumed that the nerve was only stretched and not avulsed.)

Whiplash injury to the cervical spine often causes imbalance.

Head injury with skull fracture

Frontal bone. Fractures extending to the cribriform plate or into the frontal sinuses open a tract for cerebrospinal fluid leak. (Remember that CSF can be detected by the presence of glucose when tested with a Dextrostrix.) Spontaneous closure usually occurs but there is potential for intracranial spread of infection from the nose - prophylactic antibiotics. Persistent CSF leaks require surgery.

Petrous portion of the temporal bone (base of skull fracture). Fracture lines frequently involve the roof of the middle ear and tear the tympanic membrane - hence bleeding from the ear may be indicative of a base of skull fracture (it may also occur from lacerations of the external canal skin). CSF leak may not be noticed when mixed with blood but can be detected by halo sign on the ear dressing. As above, spontaneous closure is usual but prophylactic antibiotics are required. This injury frequently disrupts the middle ear - if the deafness is purely conduction, middle ear surgery is warranted. Fracture lines also disrupt the inner ear - sensorineural deafness and vertigo. The facial nerve canal may be disrupted - facial nerve palsy - in which case surgical exploration is required with an attempt to repair the nerve.

Facial fractures

Nasal bones - see *Nasal trauma*, Chapter 8.

Mandible. Potential sites for fracture are the neck, the angle, the body, or the symphysis; see Figure 12.3. Clinically, jaw movement is limited by reflex muscle spasm,

there is haemorrhage from the fracture site with localized tenderness, and the teeth are usually displaced out of alignment. The fracture is reduced and immobilized by wiring the upper and lower teeth together and sometimes additional plating of the fracture line may be required.

Maxilla. Three classical fracture lines were described by Le Fort (see Figure 12.4) and severe facial trauma may result in any combination of these with posterior displacement. Severe haemorrhage and a fatal airway obstruction complicates this type of injury. Management initially involves securing an airway followed later by fracture reduction and fixation with a combination of internal, external, and interdental fixation.

Malar bones. Fractures following a direct blow are usually depressed with a 'step' in the orbital margin and may disrupt the infra-orbital nerve. Open reduction is required with internal fixation.

Zygomatic arch. Fractures following a direct blow are usually multiple and depressed. Movement of the underlying temporalis muscle may be affected, causing trismus, or the fracture may impinge on the coronoid process of the mandible, preventing jaw closure. Open reduction is required.

Orbital blow-out fracture. A direct blow to the orbital contents causes a dramatic rise in pressure that may cause blow-out fractures of either the orbital floor or its medial wall. Extrusion and trapping of orbital contents result in limitation of globe movement. Open reduction, freeing of trapped content, and reinforcement of the fractured wall is required.

Laryngo-tracheal trauma

The cartilaginous skeleton of the larynx in children is usually flexible and does not fracture but the internal soft tissues may be disrupted. The adult skeleton is more rigid and subject to fracture dislocation. Clinically, trauma may produce any combination of bleeding, stridor, dysphonia, painful dysphagia, and surgical emphysema. Airway obstruction necessitates emergency tracheostomy (see *Securing an emergency airway* in Chapter 14), as it may be impossible to pass an endotracheal tube. Once the airway is secured, examination can be undertaken and surgical exploration with repair contemplated. Healing involves fibrosis and invariably there will be persistent hoarseness. Sometimes the fibrosis contracts into a stricture and the consequent airway obstruction may mean the tracheostomy has to be permanent.

13. A practical approach to thorax, head, and neck disorders

As mentioned earlier, patients do not usually complain of a specific disorder or disease, but rather complain about their symptoms and discomforts. Disorders causing symptoms and signs relating to the head and neck may be obvious - swellings, inflammations, or trauma - but often the site of the primary pathology is in the throat. In the throat, disorders may have localized symptoms but sometimes these are referred, particularly otalgia. The head, the neck, and the oral cavity can be readily examined but when pathology is situated deeper in the aerodigestive tract, specialist referral will probably be needed to adequately examine the nasopharynx, the pharynx, and the larynx.

Symptoms

The type of complaints from disorders in this region that are likely to bring patients for consultation include:

- Pain
- Dysphagia
- Ingested foreign body
- Problems of salivation
- Hoarseness and stridor
- Neck lump
- Head and neck trauma.

A practical approach to disorders in this region starts with trying to make a diagnosis through consideration of the symptoms expressed and findings on examination. The cause may be identified and appropriate treatment for the problem may then be initiated. A precise diagnosis may not be possible if the site of possible pathology cannot be seen. When this is the case, an appropriate specialist referral will be necessary.

Pain

Pain in the throat, head, and neck is a common problem. The anatomical structures in this area are all supplied by either the 5th cranial nerve - sensory to the skin of the face, neck, and ear; the mucosa of the nose, sinuses and oral cavity; the anterior tongue; and to the teeth - or the 9th and 10th cranial nerves - sensory to the pharynx; the posterior tongue; the larynx; the eustachian tube; and the middle ear. To complicate the problem of pain it can either be localized to the site of disorder or referred to other areas of distribution of the nerves.

The approach to pain therefore involves first a good history regarding the nature and characteristics of the pain to try and separate out facial pain and sore throats from sinusitis and other types of head and neck pain. This is then followed by a careful examination to identify or exclude any disease or disorder that could possibly be the cause for the pain.

Potential cause

Diseases and disorders that have to be considered include:

Sore throat:

- Tonsillitis/pharyngitis.
- Oral and pharyngeal disease - ulcers, infection, tumour (benign and malignant).

- Dental disorders - caries, erupting or impacted teeth, gingivitis, temporomandibular joint dysfunction.

- Malignant disease - an ever-present worry particularly in tobacco users (smoking, chewing, sniffing). Remember particularly the 'red flag' situation of sore throat with otalgia.

Sinusitis:

See Chapter 9 for consideration of this type of pain.

Others:

- Localized inflammation from a variety of causes:
- superficial - minor injury, insect bites, cellulitis, impetigo and other ulceration, shingles.

- deeper seated - cervical adenitis, infection in congenital cysts (branchial, thyroglossal, pre-auricular), dental abscess, other abscesses.

- Cervical osteo-arthritis and muscle spasm.

- Neuralgias:

- trigeminal, glossopharyngeal, postherpetic.

- herpetic - migraine, cluster, tension, temporal arteritis.

- atypical.

Treatment

Having done your best to exclude any of these diseases or disorders there will still be a substantial proportion of patients for whom the cause can only be labelled idiopathic. Referral for specialist opinion is warranted if there is suspicion of an underlying disease or disorder that you have not been able to exclude.

Dysphagia

Potential causes

Dysphagia may be caused by any of the diseases or disorders of the mouth, pharynx, larynx, or oesophagus. These are discussed in Chapter 12, *Core knowledge of throat, head, and neck disorders*. Classically, painful dysphagia (odynophagia - Greek odyne = pain) is distinguished from painless dysphagia, the former usually indicative of an inflammatory pathology. A good history provides many clues as to the nature of the underlying disorder and examination of the oral cavity should identify disease in this area. Specialist referral is required for adequate examination of the pharynx, larynx, and oesophagus. This will often be supplemented by the mainstay of investigation of dysphagia, the barium swallow.

Even after this there will remain many patients with dysphagia - particularly those with symptoms such as 'difficulty getting the food back and down' or 'a feeling of a lump in the throat' - for which no obvious disease will be found. The term 'globus' is often given to

these types of dysphagia. Since swallowing is a complex mechanism involving the co-ordinated contraction and relaxation of something like 20 different muscles, it is probable that the cause is some inco-ordination of the mechanism. Inco-ordination as a cause is obvious when the disorder is gross as in bulbar palsy or cerebral palsy. The cause for the minor degrees of inco-ordination may lie in either the afferent (sensory) or the efferent limb of the neural pathways. Efferent problems are sometimes detected on examination but afferent problems are almost impossible to detect clinically, which explains why precise diagnosis is difficult when dealing with globus.

Treatment

Treatment of dysphagia is determined by the nature and extent of identified disease or disorder.

It is as well to remember that complications sometimes arise from disease causing dysphagia that may also require attention and these include:

- weight loss, dehydration, cachexia
- aspiration into the lower airway
- perforation of the oesophagus with mediastinitis, a potentially fatal infection.

Ingested foreign body

The common sites for impaction of swallowed foreign bodies are the tonsils, the base of the tongue, the pharynx, the oesophageal inlet, or within the oesophagus.

In the oral cavity and the visible oropharynx, localization is good and it should be possible to see and remove the foreign body. In the pharynx, localization is still quite good, but this is a more difficult area to examine and may require use of ENT mirrors or anaesthetic laryngoscopes. Knowing where to concentrate on looking aids identification of a foreign body and radiology may be helpful if the foreign body is radiopaque. These foreign bodies can often be removed without the need for a general anaesthetic, although the services of an ENT specialist may be required to do this. Sometimes the foreign body may injure the mucosa before passing on and the feeling of impaction may persist. If the foreign body cannot be seen on mirror, direct, or radiological examination, then expectant management may be employed. If there is indeed no foreign body, the sensation should settle over a few hours. If the sensation persists or gets worse, it is probable that the foreign body was missed on examination, and examination under general anaesthesia will be needed to find or exclude it.

Once the foreign body is in the oesophagus, patients have difficulty localizing the site, feeling the sensation in the midline at the level of the larynx. If movement of the larynx exacerbates the sensation, this localizes the site of impaction at the oesophageal inlet. Dysphagia is common in oesophageal impaction and may include inability to swallow even saliva - salivary pooling in the hypopharynx is one clinical sign of impaction. Radiology is helpful if the foreign body is radio-opaque. Oesophageal foreign bodies generally require an anaesthetic for removal. For this reason, if the object is not obstructing, is not sharp, and is

not potentially corrosive (for example, button batteries), it is reasonable to wait until the next day to see whether it will pass spontaneously into the stomach.

There should always be suspicion of a stricture or a tumour in adults who have had a foreign body impact in the oesophagus and, if oesophagoscopy was not performed, a barium swallow should be performed before discharging the patient.

Problems of salivation

Disorders of the salivary glands themselves - inflammation, calculi, neoplasia - are discussed in Chapter 12, salivation problems being considered here.

Salivation associated with dysphagia indicates the severity of the underlying disorder and requires an urgent diagnosis and initiation of appropriate treatment. Examples would include:

- Salivation after ingestion of a corrosive substance by children is the cardinal sign that there has been a significant burn of the mucosa of the mouth, pharynx, or oesophagus.

- Salivation after recent onset of sore throat and hoarseness/stridor is a strong indicator that the underlying disorder is epiglottitis - see below.

- Salivation after ingestion and impaction of a foreign body indicates total obstruction of the oesophagus - see above.

Inadequate salivation: The combined secretions from both the major and minor salivary glands produce a mixture of mucoid and serous saliva, the former having a lubricating and the latter a moisturizing function as well as containing the salivary enzymes. The combined reserve secreting capacity is such that diminution in secretion is not noticeable unless it involves all the glands. This may occur as a side-effect of medication, following radiotherapy and, rarely, in such conditions as auto-immune disease of salivary glands (sicca syndrome).

Drooling in children: Persistent drooling of saliva results not so much from an overall increase in production as from inability to adequately swallow the volume produced. This is seen particularly in patients with cerebral palsy. Medication to reduce salivary flow soon runs into the problem of tachyphylaxis. There are two surgical options, either to denervate the glands (remember that the nerves containing secretomotor fibres to the salivary glands run through the ear - tympanic plexus, chorda tympani) or to re-route the salivary gland ducts so that salivary flow is directed into the pharynx where there is a better chance that it will be swallowed. These surgical procedures, either alone or in combination, can do much to relieve the distress caused by continuous drooling.

Hoarseness and stridor

Hoarseness and stridor are the two cardinal symptoms of laryngeal disorders. There is a fundamental difference between these disorders when they occur in children compared with when they occur in adults. This relates to the size of the airway. In the small airway,

disorders will predominantly manifest as airway obstruction and voice changes will be a secondary consideration. In the larger airways, voice disorders will predominate with airway obstruction being a late manifestation of disease.

A good history provides many clues but examination is needed to make a diagnosis. Generally this will require specialist referral.

Regarding hoarseness the cardinal rule is that 'any hoarseness persisting for more than a month requires referral for a diagnosis'. This is because of the ever-present worry that it may be caused by neoplasia, usually benign in children but malignant in adults.

Potential causes

Causes for hoarseness include:

In children:

- Laryngitis - usually laryngo-tracheo-bronchitis (LTB or croup) in infancy.
- 'Screamer's' nodes.
- Congenital - laryngeal web, laryngeal cyst.
- Recurrent laryngeal nerve palsy.
- Laryngeal papillomatosis.

In adults:

- Laryngitis - acute and chronic.
- Vocal abuse - 'singer's' nodes, chronic oedema.
- Neoplasia.
- Recurrent laryngeal nerve palsy.
- Myxoedema.

When stridor - which is the clinical sign of airway obstruction - is the presentation, urgent or emergency referral, dictated by the degree of obstruction, is required. In severe cases first aid measures may be necessary while awaiting transfer:

- Attempt to dislodge foreign bodies (digital, laryngoscopic, Heimlich's manoeuvre).
- Nebulized adrenaline inhalations for inflammatory swelling.
- Intubation or tracheostomy.

Causes for stridor include:

In children:

- Laryngo-tracheo-bronchitis (LTB or croup) - see below.
- Epiglottitis - rapid onset of obstruction - see below.
- Congenital:
 - variable stridor: laryngomalacia.
 - fixed stridor: laryngeal web, laryngeal cyst.
- Foreign body.
- Laryngeal papillomatosis.

In adults:

- Neoplasia.
- Bilateral recurrent laryngeal nerve palsy.
- Rheumatoid arthritis with crico-arytenoid joint fixation.
- Trauma.
- Foreign body.

Laryngo-tracheo-bronchitis and **epiglottitis** require special mention because they are not uncommon in infants. Of the two conditions, LTB is by far the most common.

Laryngo-tracheo-bronchitis tends to affect a younger age group (6 to 18 months) and the precipitating viral respiratory tract infection gradually worsens into a croupy cough with stridor. The difficulty in LTB lies in determining the severity of the obstruction. Perhaps the best guide is to observe the characteristics of the stridor - see Figure 13.1.

Treatment

Consideration needs to be given to the use of systemic steroids in all children with LTB.

Grade 1: Inspiratory stridor - minor degree of obstruction - give nebulized adrenaline inhalations.

Grade 2: Inspiratory and expiratory stridor - obstruction is progressing to the stage of requiring intervention - continue nebulized adrenaline but observe closely.

Grade 3: Inspiratory plus expiratory stridor with a palpable pulsus paradoxus (a huge negative pressure is being generated by the inspiratory efforts which affects venous return and hence cardiac output) - airway intervention required by either intubation or tracheostomy under the controlled circumstances of an anaesthetic.

Grade 4: Cyanosis - almost too late - emergency airway intervention required.

Epiglottitis, on the other hand, tends to affect a slightly older age group (two to three years). What starts as a sore throat rapidly becomes a toxic illness. The sore throat worsens and swallowing becomes painful and difficult. Stridor heralds the onset of airway obstruction and this rapidly deteriorates until the child is sitting upright with the head and neck rigidly held in one position as it struggles to maintain an airway through the grossly inflamed (cherry red), swollen epiglottis.

Treatment

At this stage emergency airway intervention by either intubation or tracheostomy is required. Unless the situation is really desperate this should be done under anaesthetic. Once the airway is secured, begin intravenous antibiotics (chloramphenicol, cephalosporin).

Neck lump

Details of the possible structures in the neck that may give rise to lumps are given in Chapter 12 and details of their examination given in Chapter 11. Remember that when a malignancy is suspected the primary site needs to be identified. In a practical approach there are two general rules that may be usefully applied.

The first is the '20:40' rule that applies to the age of the patient:

Less than 20 years:

- Inflammatory neck nodes.
- Congenital lesions - thyroglossal cyst, branchial cyst, midline dermoid, cystic hygroma, haemangioma.
- Lymphoma.

20 to 40 years:

- Chronic infection - HIV, TB.
- Salivary gland pathology - calculus, infection, tumour.
- Thyroid pathology - goitre, tumour, thyroiditis.
- Lymphoma.

Older than 40 years:

- Metastatic or primary malignant disease.

The second is the '80:20' rule that applies to neoplastic disease presenting as a neck lump. In children, 80 per cent will be benign and isolated but 20 per cent will be malignant. In adults, 80 per cent will be malignant - most commonly metastatic nodes from primary squamous carcinoma of the upper aerodigestive tract - and only 20 per cent will be benign.

Once the cause for this neck lump has been identified, the appropriate treatment can be given - see Chapter 12.

Head and neck trauma

First aid principles of trauma resuscitation apply at the site of first contact with head and neck trauma - secure the airway, control bleeding, etc. Remember that concussive injury to the skull and dislocating injury to the cervical spine may be part of trauma to the head and neck. Once the situation is stable, individual sites of injury may be examined and are broadly classified as open (superficial, deep, or penetrating), or closed.

Areas of ENT involvement in head and neck trauma are discussed in Chapter 12. In general, further investigation of these areas will be required to determine the full extent of injury and the type of treatment likely to be involved. These investigations are tailored to the particular injury but include:

- Radiology - plain films, contrast studies, CT scan.
- Endoscopy - nasal cavities, pharynx, larynx, trachea, oesophagus.
- Audiometry for injuries with hearing impairment.
- Facial nerve conduction studies for injuries causing facial nerve palsy.

Treatment

The structures involved and the extent of injury determine management and this may be either immediate intervention, delayed intervention, or expectant management.