# CHAPTER 125
# OTORHINOLARYNGOLOGY

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## Introduction

This chapter covers the common diseases of the ear, nose, and throat (ENT). The aim is to present a brief but practical insight into the common childhood otorhinolaryngology (ORL) diseases in Africa. ORL diseases are among the least understood in Africa because ORL does not feature prominently in the syllabus of many medical schools, and many countries have only a handful of practicing ORL specialists.[1–3] It is therefore important to highlight common problems that can be treated by the paediatric surgeon in the absence of an ENT specialist.

## EAR

### Hearing Assessment

Assessment of hearing in a young child can be challenging. Otoacoustic emissions (OAEs) and auditory brainstem response (ABR) are objective tests, which require little to no interaction from a child. OAE is used routinely in newborn screening in most developed countries, but for most African countries, the challenge is obtaining resources and funding for such programs. In the absence of such universal screening programs, practicing clinicians in Africa depend on behavioural hearing tests, which are subjective and generally not possible prior to the age of 6–7 months. Behavioural hearing tests include:

- *Distraction testing:* A frequency-specific sound is presented to the child. The child is observed for head turning. This test is inexpensive and quick, when compared to visual reinforcement audiometry, which is also a variant of the distraction test.
- *Visual reinforcement audiometry (VRA):* A sound is presented in the environment or through earphones or headphones. The child is observed for a response and is rewarded with a lighted toy when he or she responds.
- *Conditioned play audiometry (CPA):* A child is nonverbally instructed to wait, listen, and respond with a repetitive task when he or she hears a sound. The response is a play task, such as placing blocks in a box.
- *Conventional audiogram:* An auditory stimulus is presented through headphones, and the child is asked to raise the hand on the side of the sound presentation.

### Conductive Hearing Loss

Once a conductive hearing loss (CHL) has been identified, its aetiology may be determined. In cases of cerumen impaction and foreign bodies, removal of the offending object will resolve the problem.

#### Otitis media

Otitis media (OM) is the leading cause of hearing loss in African children.[4–5] OM presents with pain, fever, chills, perforation of the tympanic membrane, and drainage. A higher prevalence is seen in males and in young children (birth to 5 years of age).[6]

The organisms responsible for OM vary, depending on the region and the human immunodeficiency virus (HIV) status of the child:

- Nigeria, HIV-negative children: *Streptococcus*, *Klebsiella*, and *Pseudomonas*
- Nigeria, HIV-positive children: *Klebsiella*, *Proteus*, *Staphylococcus*, and *Pseudomonas*
- Sudan: *Proteus*, *Klebsiella*, *Staphylococcus aureus*, *Pseudomonas*, and *Escherichia coli*

In developed countries, day care attendance, exposures to second-hand smoke, and adenoid hypertrophy are often correlated with high rates of OM. In West African countries, low social status and malnutrition are more highly correlated with developing chronic OM.[7] Without treatment, OM may result in significant morbidity and even mortality.

Treatment of OM consists of (1) removing otorrhea with suctioning, wicking, or irrigations, and (2) topical antimicrobials and antiseptics if there is fluid/inflammatory changes in the ear canal; (3) systemic antibiotics. Surgical treatment, such as a tympanomastoidectomy, may be required with acute infections that have resulted in mastoiditis and in chronic infections that do not respond to antibiotic therapy. "Ear camps" have been established in Namibia and other countries to help with treatment.

Prevention of OM infections may be accomplished through widespread use of vaccinations, improving nutrition, and increasing education and health care access.

#### Otitis externa

Otitis externa (OE) is inflammation of the external auditory canal. It presents with otalgia, otorrhea, itching, and CHL. In addition to the bacterial aetiologies mentioned above, OE may also be caused by fungal infections. Malnourished children and males are at higher risk of developing otomycosis.[8] In Nigeria, the most commonly isolated fungi are *Aspergillus* species, *Candida*, and *Mucor*.

Treatment consists of debridement and application of 1% clotrimazole cream.[9] Bacterial OE is generally treated with suctioning of the ear canal as well as topical and occasionally systemic antibmicrobials. Malignant OE, a condition typically seen in diabetic patients, is sometimes seen in malnourished, nondiabetic children younger than 2 years of age.[10] Malignant OE is considered a medical emergency and should be treated aggressively with debridement and intravenous (IV) antibiotic therapy. Left untreated, it may result in death.

OE may be prevented in some instances by keeping fingers and objects out of the ear canal, as local trauma may introduce bacteria into the skin.

#### Congenital anomalies

Less common reasons for a CHL include congenital anomalies. Congenital malformations of the ear can include one or multiple parts of the ear and are dependent upon the timing of the insult, which results in arrested development during embyrogenesis.

##### *Microtia*

Microtia is evident upon examination at birth and is variable in presentation. In its mildest form, a fully developed ear is present, but it is noted to be smaller in size than the opposite, normal ear. In its extreme

forms, only a small rudimentary skin tag or no ear (anotia) is present. Microtia and anotia are often associated with auditory canal atresia or stenosis, varying degrees of ossicular malformation, and CHL. In utero exposures to thalidomide, retinoid, and mycophenolate mofetil, among other agents, have been implicated.[11–12] Microtia is more commonly seen in males and more often affects the right ear in unilateral cases. It results in a CHL, which can significantly impact a child's ability to develop socially and academically. Nonsurgical options include sign language and/or bone conduction hearing aids. Surgical options are a bone-anchored hearing aid (BAHA) or atresia repair with ossicular reconstruction. Prior to consideration of aural atresia repair, a computed tomography (CT) scan to evaluate the anatomy and an audiogram to confirm the existence of cochlear function are recommended.

#### *Ossicular malformations*

While microtia, anotia, and canal atresia are evident on physical examination, ossicular abnormalities cannot be identified without high-resolution CT scan imaging. Isolated ossicular abnormalities must be considered in an individual with CHL and no evidence of middle ear dysfunction. The ossicles begin to develop at around 5 weeks gestational age and are usually completed by 24 weeks. Of the three ossicles, the stapes is most likely to be affected because its development occurs over a longer time period than the malleus and incus. Nonsurgical treatment involves hearing aids. If the canal is patent, a conventional hearing aid may be used. Surgically, the ossicular chain may be reconstructed.

### Sensorineural hearing loss

Sensorineural hearing loss (SNHL) continues to remain a challenging problem for most developing countries. It may be congenital or acquired, hereditary or nonhereditary, and syndromic or nonsyndromic.

Genetic mutations, intrauterine exposure to viruses, intrauterine exposure to toxoplasma gondii, and perinatal anoxia are a few of the identifiable aetiologic agents for congenital hearing loss. Acquired losses are often the result of bacterial meningitis and cochlear ossification. Meningococcal meningitis epidemics have been reported in parts of Africa with subsequent SNHL noted in 25% of the cases.[13]

Children with a hearing loss may appear socially disinterested and lag behind their peers in the development of speech and language skills. The prevalence of childhood SNHL has been reported to be as high as 14%;[14] however, the prevalence is likely to be much higher. Given the limited health care resources in Africa, diagnosis is often delayed and sometimes not made at all.

Treatment depends upon the severity of the hearing loss. With a mild, unilateral hearing loss, no treatment may be needed. Amplification with conventional hearing aids is helpful for many losses. In the case of bilateral profound hearing loss, a child should be taught sign language. Cochlear implantation is an alternative, but not one that is readily accessible for most African children.

In the developing world, emphasis must be placed on early diagnosis of hearing loss and prevention. Some countries are advocating universal hearing screening of newborns.[14] More important, prevention of acquired causes of hearing loss may be implemented in the short term. Widespread immunisation against viruses such as measles, mumps, and rubella would help to curb some of the viral causes of SNHL. Similarly, education regarding hygiene and proper handling and cooking of meats may help decrease the incidence of congenital toxoplasmosis, one of the causes of SNHL.

## Nose

## Nasal Airway Obstruction in the Infant

### Presentation

Infants are obligate nasal breathers up to approximately 6 months of age; therefore, nasal obstruction can be life threatening. Infants may present with difficulty feeding, stertor, cyanosis, and apnoea. If purulent secretions are also present, an infectious aetiology may be suspected.

### Diagnosis

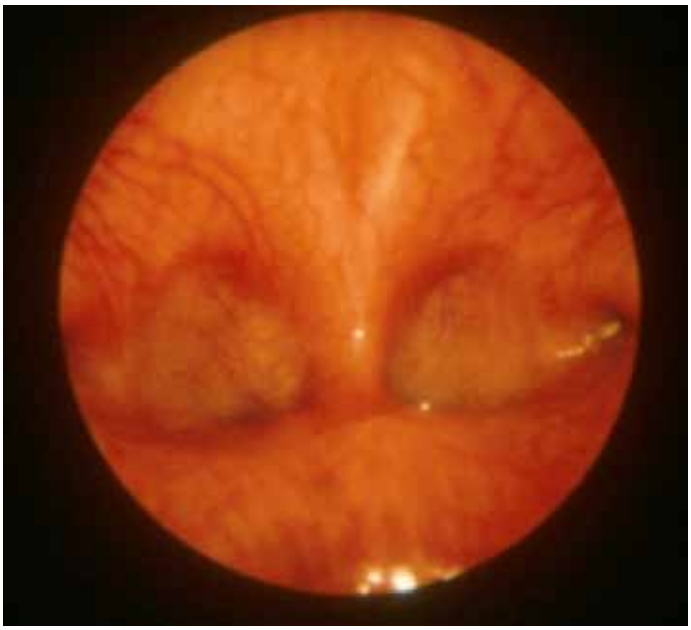
Examination may be completed by placing an otoscope in the nostrils. A quick examination of airflow may be accomplished by placing a small mirror beneath each nostril. In addition, a suction catheter may be placed through each nostril to confirm patency of the choanae. A flexible nasopharyngoscope, if available, can be used for a more comprehensive examination.

### Differential diagnosis and treatment

A diagnosis of *rhinitis of infancy and gastroespophageal reflux disease* (GERD) may be considered in the absence of anatomic abnormalities, purulent discharge, or cough. Treatment is with a short course of topical decongestants or topical steroids. Improvement in symptoms with $H_2$-blocker or proton pump inhibitor therapy supports the diagnosis of GERD.

*Infections* are characterised by rhinorrhea, fevers, and cough. Clear secretions suggest viral infection. Purulent secretions are often bacterial. Chlamydia in the newborn period presents with congestion, purulent nasal discharge, and cough in the absence of a fever. If chlamydial infection is suspected, the child should be treated empirically with a macrolide antibiotic. In contrast, congenital syphilis presents with clear, watery rhinorrhea and may be diagnosed with serologic testing. If diagnosed, the child should be treated with penicillin.

*Choanal atresia* (CA) has been reported to have an incidence of 1 in 3,100 in certain parts of Northern Africa.[15] An atresia may be bony, membranous, or a combination of both. Unilateral atresia is more common than bilateral (Figure 125.1). CA may be suspected in a child in whom no airflow is noted on a mirror placed under the nostril and in whom a catheter does not pass through the nostril. Definitive diagnosis is made with flexible endoscopy and CT scanning. Temporising measures include placement of an oral airway or intubation. In the long run, surgical correction is recommended. CA may be corrected through an endoscopic approach or a transpalatal approach. Intranasal stents are placed postoperatively to prevent stenosis. Stents must be cleaned meticulously to keep them open during the healing period. This involves use of nasal saline and suctioning. Revision procedures are sometimes needed to keep the choanae patent.



Source: With kind permission of Dr. Bruce Benjamin, University of Sydney, Australia.

*Figure 125.1. Bilateral choanal atresia.*

*Pyriform aperture stenosis* (PAS) is less common than CA. It is a narrowing of the nostril anteriorly at the pyriform aperture. It may be seen with other anomalies, notably holoprosencephaly and megaincisors. The stenotic region may be visible with an otoscope or flexible endoscope. If a catheter can be passed through the stenotic segment, it will pass into the nasopharynx. Definitive diagnosis is on CT scanning. A temporising measure is placement of a nasal airway. In some cases, a child with this anomaly may be observed expectantly—the child can be observed indefinitely and with growth will have a large enough nasal airway to not require surgical intervention. Conservative management includes the use of nasal saline and topical decongestants and steroids as needed. Surgical correction is reserved for those children in whom breathing difficulties lead to slow growth or cyanotic episodes. A stent is placed postoperatively for approximately 1 week.

A small pit or hair extending from the nasal dorsum should lead one to suspect an *intranasal dermoid*. If a dermoid is suspected, a CT scan or magnetic resonance imaging (MRI) would be recommended to delineate the extent of the cyst and assess for an intracranial component. If the lesion is small, excision can be undertaken by making an elliptical incision around the pit or hair and dissecting around the cyst.

*Intranasal encephaloceles* are a herniation of brain tissue through the foramen caecum. If the neural tissue is not in continuity with the brain, it is considered a *glioma*. In addition to an intranasal mass, one might see widening of the nasal dorsum and lateral displacement of the medial canthi. In Dakar, fronto-ethmoidal encephaloceles account for approximately 10% of all encephaloceles.[16] Surgical removal may be approached endoscopically in cases of smaller gliomas. A combined neurosurgical approach is necessary for larger fronto-ethmoidal encephaloceles.

## Nasal Airway Obstruction in the Child

Presentation of nasal airway obstruction may be unilateral or bilateral; differential diagnosis and treatment for specific presentations follows.

### Unilateral obstruction

A child with unilateral congestion should be suspected of having a foreign body or unilateral CA. Diagnosis is made by examination. If a unilateral CA is suspected, work-up and treatment should proceed as discussed earlier in this chapter for infants. If a foreign body is noted, removal may be accomplished with the use of small tools such as a suction or ear curette. In rare instances, an object is too large to remove through the nostril, and a lateral rhinotomy may be required. Note that alkaline batteries must be removed as quickly as possible because they can result in significant intranasal necrosis, scarring, and subsequent stenosis. Necrotic tissue may need to be debrided with multiple surgical procedures.

### Allergic rhinitis

Congestion associated with clear rhinorrhea, sneezing, and cough are most consistent with a viral upper respiratory tract infection or allergic rhinitis (AR). If symptoms are short lived and resolve spontaneously, the likely aetiology is viral. If symptoms are chronic and associated with itchy, watery eyes, however, the diagnosis may be allergic rhinitis. Individuals with AR may also have a personal or family history of eczema or asthma. Dust mites and cockroaches are the most common allergens in the Ivory Coast.[17] In Egypt, 40% of school children have AR. It is more common in children attending state-run schools, in boys, and in children exposed to cigarette smoke.[18] Definitive diagnosis is made with allergy testing. Alternatively, successful treatment of suspected AR with antihistamines and nasal steroids may help to establish the diagnosis.

### Bacterial rhinosinusitis

Nasal congestion associated with mucopurulent rhinitis and a cough, especially a nocturnal cough, suggests bacterial rhinosinusitis. Chronic mucopurulent rhinitis may be seen with HIV infections.[19] Bacterial rhinosinusitis is treated with antibiotics. Commonly identified bacteria by geographic location are:

- Ethiopia: *Streptococcus pneumonia* and *Hemophilus influenza*[20]
- Sudan: *Staphylococci*, *Streptococci*, and *Escherichia coli*[21]
- South Africa: *Streptococcus milleri* and *Hemophilus influenza*[22]

The choice of antibiotics is based upon the most common pathogens and resistance patterns in an area.[23] When antibiotics do not resolve the infection or if a complication of acute bacterial sinusitis occurs, surgical intervention is warranted. Prior to surgical intervention, ideally a CT scan should be obtained (Figure 125.2).

In the case of a complication such as a subperiosteal periorbital abscess or orbital abscess (Figure 125.3), an ethmoidectomy and drainage of abscess would be advocated. To determine the proper timing and selection of patients requiring ethmoidectomy, South African otolaryngologists studied patients with orbital complications. Those patients with only cellulitis were successfully treated with intravenous antibiotics alone. Those with cellulitis and proptosis with or without eye movement limitation fared better with surgical intervention.[24] Endoscopic sinus surgery has largely replaced open surgical procedures. Either would be appropriate, however, depending upon the extent of disease and the skills of the surgeon. Complications of surgery include injury to the eyes or brain with possible double vision, loss of vision, CSF rhinorrhea, loss of sense of smell, and intraorbital haematoma.

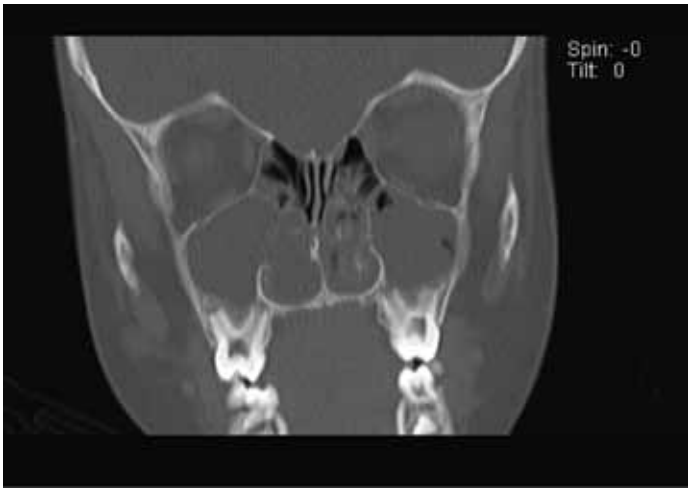



*Figure 125.2: Choronal CT scan showing diseases in the maxillary and anterior ethmoidal sinus (chronic sinusitis).*

*Figure 125.3: Orbital abscess.*

### Fungal rhinosinusitis

Fungal infections are commonly seen in parts of Africa. The most common presenting symptom of nasosinus aspergillosis is congestion secondary to nasal polyposis. Infection with *Aspergillus flavus* is a common form of sinusitis in Sudan.[25] Unlike bacterial infections, fungal infections must be treated with surgical debridement followed by antimicrobial treatment such as itraconazole. Recurrence is seen in approximately 10% of patients and is generally the result of incomplete antifungal treatment following surgery.

### Cystic fibrosis

In addition to a work-up for fungal infections, nasal polyposis in any child should prompt a work-up for cystic fibrosis (CF). The prevalence of CF in African populations remains largely unknown. Mutations of the cystic fibrosis transmembrane regulator (CFTR) gene have been identified in Egyptian, Algerian, Tunisian, and other Northern African populations.[26–28] Presentation is quite variable and can include recurrent respiratory problems, recurrent sinusitis, failure to thrive, steatorrhea, diarrhoea, and jaundice. Sweat chloride testing and genetic testing for CFTR mutations are two ways of diagnosing the disease. Sinusitis in patients with CF is treated with a combination of medical therapy and surgical intervention. Patients may be treated with steroids to reduce inflammation, antibiotic irrigations, and surgery.

### Burkitt lymphoma

Burkitt lymphoma (BL) is endemic in certain parts of Africa. In Nigeria, it accounts for nearly 40% of all childhood malignancies.[29] It is a B-cell, non-Hodgkin's lymphoma seen primarily in children. Infection with Epstein-Barr virus (EBV) and plasmodium falciparum malaria have been implicated in the pathogenesis of this disease.[30–32] Children with HIV infections are also at higher risk of developing BL.[30–31] Nearly three-quarters of all cases present in the head and neck region. The male-to-female distribution is 3:1, and peak presentation is often in the first decade of life. The paranasal sinuses are the second most common site of presentation after the jaw. When presenting in the paranasal sinuses, BL may present as nasal congestion, epistaxis, loose teeth, trismus, proptosis, and a mass in the maxilla. Diagnosis is made with a biopsy. Treatment generally consists of a combination of chemotherapeutic drugs. The protocol in Nigeria includes cyclophosphamide, oncovin, methotrexate, and prednisolone. In Kenya and Uganda, cyclophosphamide, doxyrubicin, vincristine, methotrexate, and prednisolone are in use.[33] The treatment protocols are very expensive and, in many cases, too toxic for malnourished children. As a result, physicians in Cameroon and Malawi have advocated using a regimen of cyclophosphamide and intrathecal methotrexate with comparable results, reserving vincristine for those who relapse.[33] Drug resistance is seen in 2% of patients in certain parts of Africa.[29] Despite treatment, mortality remains high. Three-year survival is only 61%.[34] There is evidence to suggest that malaria prevention with the use of mosquito nets may help to reduce the risk of developing BL.[30,31]

### Nasopharyngeal carcinoma

Nasopharyngeal carcinoma (NPC) has a high prevalence in Northern Africa, especially in Tunisia, Algeria, and Morocco. In Uganda, the disease is more prevalent in the Nilotic and Para-Nilotic tribes of the north compared to the Sudanic and Bantu tribes of the south.[35] In Northern Africa, NPC has a bimodal age distribution, including one peak between the ages of 10 and 20 years.[36] In addition to a genetic predisposition, exposure to EBV and other environmental factors, such as consumption of rancid butter, rancid sheep fat, and cured meats, may increase the likelihood of developing NPC.[37] In Kenya, exposure to carcinogenic hydrocarbons generated from burning of wood in wattle and mud huts has been associated with a higher incidence of NPC.[35] Avoidance of these environmental factors may help to reduce the incidence of the disease.

NPC may present with nasal congestion, epistaxis, otitis media, otalgia, cranial nerve palsies, headache, and a neck mass from metastasis. Examination of the nasopharynx by using either a flexible fibre-optic endoscope or a nasopharyngeal mirror will reveal a mass in the nasopharynx. Imaging studies such as an MRI or CT scan help to determine the extent of disease and may assist in differentiating it from a juvenile nasopharyngeal angiofibroma (JNA). NPC, similar to BL, is diagnosed by a biopsy. There are three distinct forms, as described by the World Health Organization (WHO): type I is the keratinising form, type II is nonkeratinising, and type III is undifferentiated. In addition, serologic testing for antibodies to EBV may assist in making the diagnosis.[35] Treatment consists of concurrent radiation therapy and chemotherapy with cisplatin.[38] In the past, it was felt that the location of the tumour prevented surgical intervention. In certain situations, however, an NPC may be surgically removed. Overall disease-free survival at 5 years is reported at just under 70%.[39]

### Juvenile nasopharyngeal angiofibroma

Seen only in prepubertal and adolescent males, JNA presents with nasal congestion and epistaxis. It is an idiopathic, benign tumour that originates near the sphenopalatine foramen. It is highly vascular and can be locally aggressive and extend intracranially (Figure 125.4). Without treatment, JNA can result in significant morbidity from bleeding. The primary treatment is preoperative embolisation of feeding vessels followed by surgical excision. The approach to excision varies based upon the size and extent of the tumour. This includes an endoscopic approach, a transpalatal approach, a midface degloving, or lateral rhinotomy. Tumours that extend intracranially may require a combined neurosurgical approach. Radiation therapy has been used in selective "inoperable" cases in the past. In general, if this benign tumour can be removed, radiation should be avoided due to concerns of future malignancy.[40]

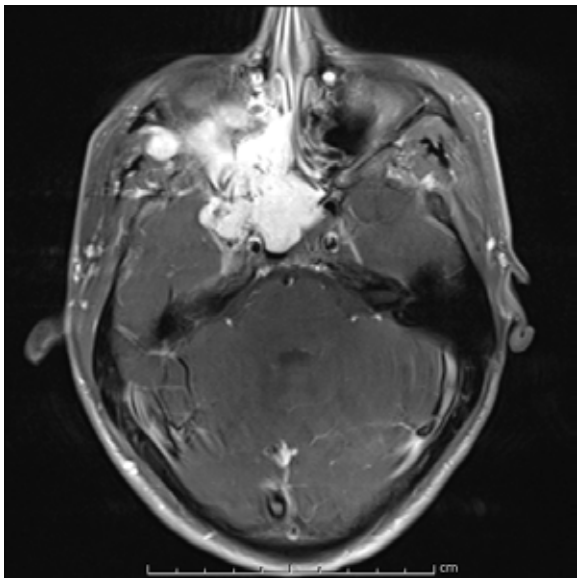


*Figure 125.4: Axial view of CT showing an extensive JNA.*

## Epistaxis

Epistaxis (nose bleed) is a common occurrence in children of all ages. The aetiology varies from minor trauma to large skull-base tumours.

### Demographics

Epistaxis patterns in Africa are as follows

- Zaire: up to 50% of children younger than 13 years of age with sickle cell anaemia[41]
- Ethiopia: 20% of children infected with louse-born relapsing fever[42]

- Zimbabwe: common presentation of autoimmune thrombocytopenic purpura[43]
- Other regions: seen with immune thrombocytopenic purpura and onyalai[44-45]

### Investigations

Laboratory examinations may be useful in the diagnosis of some of the infectious and haematologic disorders listed.

### Treatment

Conservative treatment for epistaxis includes topical pressure and vasoconstrictive medications such as topical phenylephrine or topical oxymetazoline, Common procedures involve nasal packing and cauterisation using silver nitrate or electrocautery. In refractory cases, the treatment is embolisation or arterial ligation. Arterial ligation of the sphenopalatine artery in children may be performed endoscopically. Transantral ligation of the internal maxillary artery may be difficult due to the lack of midface development and poor maxillary pneumatisation at younger ages.

## The Pharynx: Tonsillitis

In children, the common diseases of the pharynx are due to infection. Infection of the tonsils accounts for most pharyngeal infections. In Africa, due to the common complaint of sore throat and presence of other significant infectious diseases, adequate recognition and treatment of tonsillitis is not often achieved. The other diseases include the common cold, infectious mononucleosis, candidiasis, HIV, diphtheria, Vincent's angina, and acute leukaemia.

A study from a tertiary centre in Benin, Nigeria, has shown that tonsillitis accounts for 10.5% of children with acute admission for febrile illness.[47] It is therefore a significant workload for paediatricians. The widespread practice of uvulectomy by traditionalists for "sore throat", with its fatal outcome in some children, [48,49] exemplifies the challenges for paediatricians and surgeons in Africa with regard to management of pharyngeal infections.

### Aetiology

The palatine tonsils are part of Waldeyer's ring of lymphoid tissue surrounding the oropharynx and nasopharynx. The palatine tonsils are covered by stratified squamous epithelium, which extends deep into the tonsillar tissue, resulting in crypts. Desquamated epithelium can get stuck in the pits; this has been implicated in the aetiology of infection of the tonsils.

Group A beta haemolytic streptococcus accounts for the majority of tonsillitis. In Africa, it appears that this strain type has a predilection to the heart and kidneys, as there is a high rate of rheumatic heart disease from tonsillitis and pharyngitis.[50–52]

### Clinical Presentation

Tonsillitis presents as an acute episode that is characterised by sore throat associated with odynophagia, and sometimes secondary otalgia and a febrile illness. In the acute phase, the tonsils are enlarged and red, with associated erythema of the tonsillar pillars. There may be pus within the tonsil crypts. The jugulodiagastric nodes are often enlarged and tender.

Children often present with recurrent episodes of tonsillitis. This can have significant implications in children with sickle cell anaemia or those who are at a risk of developing rheumatic heart disease.

### Investigation

Diagnosis is based on clinical evaluation. Microbiology of throat swabs is generally not helpful.

### Management

Management is supportive, with antibiotics. Children who are not pyrexic and complain only of sore throat should be given analgesia and adequate hydration, whereas those with fever and failure to eat should also be treated with antibiotics. Penicillin remains the first choice of antibiotics to be used.[53] The use of antibiotics for all should be discouraged, however, because sore throat is a common complaint from nonbacterial infection. Amoxicillin is contraindicated in patients with mononucleosis.

### When to Offer Tonsillectomy

In the United Kingdom, children who have five episodes or more of tonsillitis per year are offered tonsillectomy. In Africa, however, a lower threshold of three or more in a year with a significant history of febrile illness should be considered for tonsillectomy[54] due to the higher risk of developing rheumatic heart disease from beta haemolytic streptococcus infection, and issues of access to a specialist.

Affected children should be screened for sickle cell anaemia, and adequate preparation must be made before tonsillectomy of children with sickle cell disease. These children presenting for elective tonsillectomy should be transfused to reduce the haemoglobin S ratio to less than 40% in an attempt to reduce postoperative complications.[55–58] In addition, aggressive hydration is important in these children. If possible, such children should be managed in centres that have a good paediatric anaesthetist who is familiar with sickle cell disease. Otherwise, a team approach among surgeons, anaesthetist, and paediatricians should be developed.

### Complications

Nonsuppurative complications of tonsillitis include scarlet fever, rheumatic fever, and glomerulonephritis. Suppurative complications include peritonsillar, parapharyngeal, and retropharanyngeal abscesses.

#### Peritonsillar abscess

Peritonsillar abscess is common in the adolescent age group but rarely occurs in younger children. Patients present with poor intake or inability to eat. Drooling of saliva and trismus associated with high fever are some of the clinical features. The uvula may be deviated to the opposite side. Younger children and adolescents who cannot tolerate aspiration or incision and drainage under local anaesthesia should be offered tonsillectomy.

#### Parapharyngeal abscess

Parapharyngeal abscess is characterised by a toxic-appearing child, trismus, dysphasia, and increasing airway difficulties. Urgent US or CT scans should be followed by either an internal or external drainage of the abscess. Intravenous antibiotics are also administered.

#### Retropharyngeal abscess

Retropharyngeal abscess is rare and seen mainly in children younger than 5 years of age.

## The Larynx

A multidisciplinary approach in the management of children with airway disease offers the best outcome; therefore, each local hospital should strive to form a team among paediatric nurses, anaesthetist, paediatricians, and paediatric surgeons.

### Congenital Laryngeal Lesions

The incidence of congenital laryngeal lesions in Africa is not known. Worldwide, it is thought to be in the region of 1 in 10,000 to 1 in 50,000 live births.[59,60] It is important to recognise laryngeal abnormalities early.

#### Laryngomalacia

The most common (60%) of all laryngeal abnormalities is laryngomlacia, with a male-to-female ratio of 2:1. The aetiology involves redundant posterior arytenoids tissue, laryngopharyngeal reflux disease,[61] or poor development of the cartilage.[62]

Patients present within 1 to 2 weeks after birth with a history of noisy breathing. Symptoms include inspiratory stridor, retractions, cyanotic episodes, growth disturbance, or any combination of these. Symptoms are worse in a supine position, during feeding, and when the

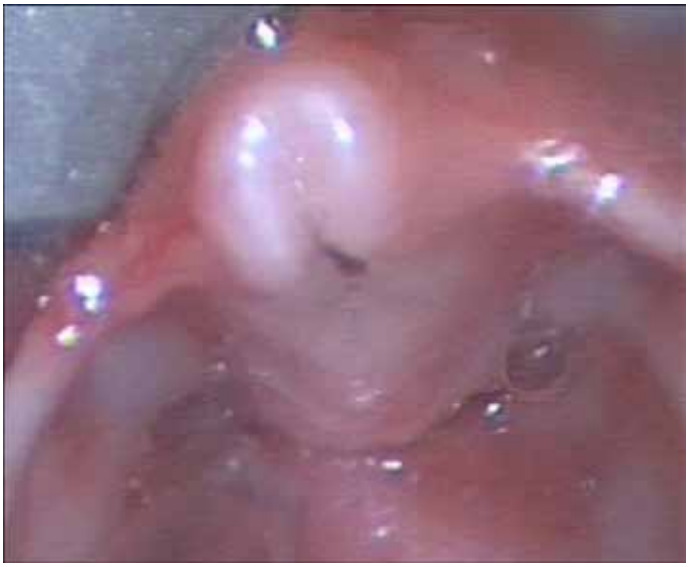


*Figure 125.5: Laryngomalacia with the classic "omega-shaped" epiglottis and short aryepiglottic folds.*

child is agitated. Prone and lateral decubitus positioning relieves the symptoms. The cry is normal.

Examination by a flexible laryngoscopy, transnasal or oral, in clinic is often satisfactory.[63] Children with severe stridor should have a microlaryngoscopy and bronchoscopy. A bronchoscopy should also be considered in a child whose symptoms are out of proportion to the degree of laryngomalacia or whose symptoms are atypical (e.g., biphasic stridor) because a small but substantial number of patients (18%) will have a second airway lesion.[64]

Examination reveals an omega-shaped epiglottis and short aryepiglottic folds (Figure 125.5). Redundant posterior arytenoid tissue, which on inspiration is prolapsed anteromedially, is also present.

Most laryngomalacias are self-limiting and require only assurance to the parents. A few require an aryepiglottoplasty,[65] which is generally reserved for those children with cynaosis or growth delays secondary to excessive calories used for the increased work of breathing.

Complications from laryngomalacia are rare and are generally the result of untreated severe laryngomalacia (e.g., recurrent cyanotic attacks, obstructive apnoea, pulmonary hypertension, right heart failure, and failure to thrive).

### Vocal cord paralysis

Vocal cord paralysis is the second most common congenital anomaly of the larynx. It accounts for 15–20% of all cases.[66] It has a male-to-female ratio of 1:1. The aetiology is multifactorial, including Idiopathic causes; central neuromuscular immaturity; lesions in the central nervous system (including Arnold-Chiari malformation[67,68]; cerebral palsy; hydrocephalus; myelomeningocele; spina bifida; hypoxia;[67,69] lesions in the mediastinum (e.g., tumours or vascular malformations); and birth trauma. Even though birth trauma is an acquired cause, it is included because it is a major problem in Africa, which has a high number of forceps deliveries and poor maternal services. Iatrogenic vocal cord paralysis from cardiac surgery, such as patent ductus arteriosus (PDA) ligation, is rare in Africa.

Congenital vocal cord palsy is often a bilateral palsy characterised by inspiratory stridor that is present at rest but made worse by agitation and can quickly lead to airway obstruction. This can rapidly progress to an emergency requiring airway intervention. Aspiration may present with recurrent chest infection. This is common with bilateral vocal fold paralysis. Unilateral vocal fold paralysis may manifest during the first few weeks of life, or it may go unnoticed. Symptoms are a hoarse, breathy cry that is aggravated by agitation. Feeding difficulties and aspiration may also occur.

On examination, the stable child has minimal symptoms and does not appear to be in significant respiratory distress. The unstable child, in contrast, presents in respiratory distress (nasal flaring, supraclavicular or intercostal recession, cyanosis).

Flexible endoscopy usually elucidates the diagnosis. Direct laryngoscopy and rigid bronchoscopy are often necessary to confirm the diagnosis and to evaluate the airway for other anomalies.[70]

Other investigations include a CT scan of the neck and chest. Where available, laryngeal electromyography has been used for both evaluation and management.

Reassurance is all that is required in a child who has a stable airway and no aspiration. This is more common in those with unilateral vocal cord palsy.

A child with an unstable airway requires urgent endotracheal intubation followed by tracheostomy.

The suitability of a child for decannulation is undertaken by laryngoscopy and bronchoscopy, processes that also help to remove granulation above the tracheostomy. The child may be decannulated if there is sufficient airway size or when there is recovery of the palsy. This is commonly after the ago of 2 years.[71]

Children who fail to recover would require vocal cord lateralisation procedures, which can be either arytenoidectomy or endoscopic laser cordotomy.

### Congenital subglottic stenosis

Congenital subglottic stenosis is the third most common congenital anomaly of the larynx, with a male-to-female ratio of 2:1. It is the most common indication for tracheostomy in infants. Two types of congenital subglottic stenosis are recognised: membranous (the most common) and cartilaginous.

The aetiology of this anomaly is incomplete recanalisation of the laryngotracheal tube.

An inflammatory process tends to initiate symptoms. Biphasic stridor with or without symptoms of respiratory distress is the most common presenting symptom. The presentation of congenital subglottic stenosis is similar to croup, but the cry is normal. Recurrent croup-like symptoms commonly are seen in children with subglottic stenosis.

Flexible endoscopy under local anaesthesia is inadequate to make a diagnosis; therefore, a rigid bronchoscopy under general anaesthesia is required.

Spontaneous resolution occurs in most cases as the child grows. If there is significant airway obstruction, however, management is by endotracheal intubation followed by tracheostomy.[72] Decannulation can be performed when the subglottic space widens, by about age 3–4 years.[73] Laryngotracheoplasty is reserved for severe cases of subglottic stenosis.

## Laryngeal Infection

Laryngeal infection in children is a life-threatening disease. This is because a child's laryngeal diameter is very small, and any degree of oedema would narrow the laryngeal diameter significantly. For example, the neonate subglottic cross-sectional area is about 4 mm, compared to that of an adult, which may be 14 mm. Therefore, 1 mm of subglottic oedema at that level would result in approximately 65% reduction of the airway area in a neonate, compared to approximately 25% reduction in adults.

It is important to recognise early signs of laryngeal inflammation and aggressively treat children. The two common but dangerous infections of the larynx in children are acute epiglottitis and laryngotracheobronchitis (LTB, or croup). Other important differential diagnoses that are common in Africa include laryngeal candidiasis and tuberculosis. These infections have been attributed to the high prevalence of HIV infection in children in Africa,[74] and they should be considered if a child presents with unusual symptoms.

*Table 125.1: Key features of acute epiglottitis and laryngotracheobronchitis.*

| Key Features | Acute Epiglottitis | Laryngotracheobronchitis |
|---|---|---|
| Age | 3 years and older | 3 months to 3 years |
| Onset | Abrupt | Gradual |
| Progression | Rapid | Gradual |
| Cough | None | Barking |
| Hoarseness | Yes | More from barking cough |
| Stridor | Inspiratory | Inspiratory or biphasic |
| Posture | Sitting and leaning forward | Supine |
| Drooling | Yes, with odynophagia | No |
| Soft tissue neck x-ray | Thumb sign (enlarged epiglottis), on lateral view (X-ray not recommended) | Steeple sign (narrowed subglottis), on AP view |
| Aetiology | *Haemophilus influenza* type B | Viral (parainfluenza virus in two-thirds of cases) |
| Findings | Red swollen epiglottis (cherry red) | |
| Treatment | • Examine in the operating theatre and secure airway by endotracheal intubation. Convert to nasotracheal intubation, if possible.<br>• Under no circumstances should a child with a suspected diagnosis of epiglottitis be disturbed until the team is ready to evaluate the child in the theatre.<br>• Cephalosporins/ chloramphenicol.<br>• Steroids. | • Supportive (oxygen/steroids/ antibiotics/).<br>• Steroids: dexamethasone (0.6 mg/kg) or nebulised budesonide.<br>• Antibiotics are indicated if associated bronchial pneumonia or pyerixia or aetiology is thought to be bacterial LTB.<br>• Note that in Africa prognosis is poor when infection follows measles; early airway support should be considered.<br>• The Westley croup score system can be used to determine the severity and need for airway support. |

Diphtheria of the larynx is another infection that remains a concern. Immunisation remains the key to its eradication. Sadly, this is still a public health problem in a number of African countries. It is important to note that laryngeal diphtheria tends to occur after a pharyngeal infection.

Other differential diagnoses for laryngeal infection are foreign body aspiration, acute laryngeal trauma, angioneurotic oedema, and retropharyngeal abscess. A good history often leads to the diagnosis of any of these differentials.

In Africa, acute epiglottitis and LTB remain challenges as a result of poor immunisation and a significantly poor socioeconomic living standard for children. Table 125.1 summarises the key features of acute epiglottitis and LTB and their management.

## Hoarseness

Hoarseness is underestimated in children, and in Africa it does not receive adequate attention. This situation has been attributed to several factors, such as the changing pitch in normally growing children and a poor understanding of children's voice dynamics, among others.

Reports from many centres in Africa, for example, show a high rate of emergency tracheostomy for laryngeal papillomatosis in children due to late presentation. The need to increase awareness is challenging but necessary. A coordinated approach to dealing with children with hoarseness is key.

The causes of voice changes (dysphonia) in children are commonly due to vocal nodules and functional voice disorders, laryngeal papillamatosis, intubation injuries, or vocal cord paralysis.

### Vocal nodules and functional voice disorders

The most common cause of dysphonia in children is vocal nodules and functional voice disorders. Diagnosis is usually by flexible laryngoscopy; however, rigid laryngoscopy under anaesthesia may be required if a child is unable or unwilling to cooperate. Voice therapy is the main treatment. Surgery for nodules is not recommended in children, but it can be considered after failed response to adequate voice therapy and after puberty. Antireflux medications are also recommended.

### Laryngeal papillamatosis

Laryngeal papillamatosis is also referred to as juvenile onset recurrent respiratory papillamatosis (RRP). It is due to the human papilloma virus, mainly types 6, 11, and rarely 16. Types 6 and 11 are associated with genital warts.

The peak age of presentation is 3 to 4 years. Firstborn children are more likely to be affected by laryngeal papillamatosis, and children born via vaginal delivery to mothers with genital warts are said to have a relative risk of developing the disease. No current evidence, however, supports caesarian section delivery as a means of prevention of laryngeal papillamatosis.

Commonly, RRP patients present with a history of hoarseness, chronic cough, and a gradual but progressive history of stridor. In Africa, a large number of children are diagnosed only when they present with stridor because RRP is often misdiagnosed as croup. Studies from Nigeria show that RRP is the most common cause of airway obstruction in children.[75] Late presentation accounts for the high incidence of emergency trachestomies in this population.

Any child with hoarseness that has not resolved within three weeks should have a laryngeal examination. Transnasal flexible laryngoscopy is recommended in children who can cooperate. If this is not possible, direct laryngoscopy under anaesthesia should be carried out.

The use of a powered microdebrider is a recent advancement in RRP treatment and is replacing laser ablation ($CO_2$, KTP, ND:YAG), the current gold standard. The use of a powered microdebrider might be a more affordable tool than laser for many centres in Africa. Other treatments include photodynamic therapy and adjuvant use of interferon, cidofouvir, acyclovir, indole-3-carbinol, and cimetidine.

Tracheostomy is indicated only for a child with severe diseases, where it is a life-saving procedure. This should be used as a last resort, however, especially in Africa, where management of trachestomy in children is very challenging. Furthermore, a tracheostomy in these children may result in seeding of the trachea.

### Intubation injuries

Intubation injuries often present as vocal cord granulation of the posterior larynx. In neonates, it can present as an acquired subglottic cyst or subglottic stenosis.

### Vocal cord paralysis

Unilateral vocal cord palsy presents with hoarseness and aspiration. Bilateral vocal cord paralysis has been described in this chapter in the subsection "Congenital Laryngeal Lesions".

## Key Summary Points

**Ears**

1. Children with a hearing loss may appear socially disinterested and lag behind their peers in the development of speech and language skills.
2. In the absence of universal screening programs, practicing clinicians in Africa should do a behavioural hearing test for any child with a hearing impairment
3. Otitis media (OM) is the leading cause of hearing loss in African children.
4. Low social status and malnutrition correlates with developing chronic OM.

**Nose**

5. Epistaxis (nose bleed) is a common occurrence in children of all ages.
6. Conservative treatment for epistaxis includes topical pressure and vasoconstrictive medications such as topical phenylephrine or topical oxymetazoline, Common procedures involve nasal packing and cauterisation using silver nitrate or electrocautery.

**Larynx**

7. Laryngeal abnormalities should be recognised early.
8. Noisy breathing or stridor in a child should be taken seriously; if in doubt, referral to an appropriate centre is urgently recommended.
9. Flexible laryngoscopy (transnasal or oral), microlaryngoscopy, or bronchoscopy, when appropriate, often confirms the diagnosis of congenital subglottic stenosis.

**Oropharynx**

10. Other congenital anomalies of the larynx that are rare include congenital subglottic cyst, laryngeal webs, and subglottic haemangioma, among others.
11. Sore throat is a common complaint, not always due to tonsillitis.
12. A majority of sore throats can be treated with supportive measures.
13. Penicillin remains the drug of choice for tonsillitis.
14. There is a low threshold for tonsillectomy for children in Africa due to the high prevalence of rheumatic heart disease and nephritic disease from beta haemolytic streptococcus infection.
15. Children should be screened for sickle cell anaemia before surgery for tonsillitis, and adequate pre- and postoperative management should be planned for children with sickle cell disease.

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