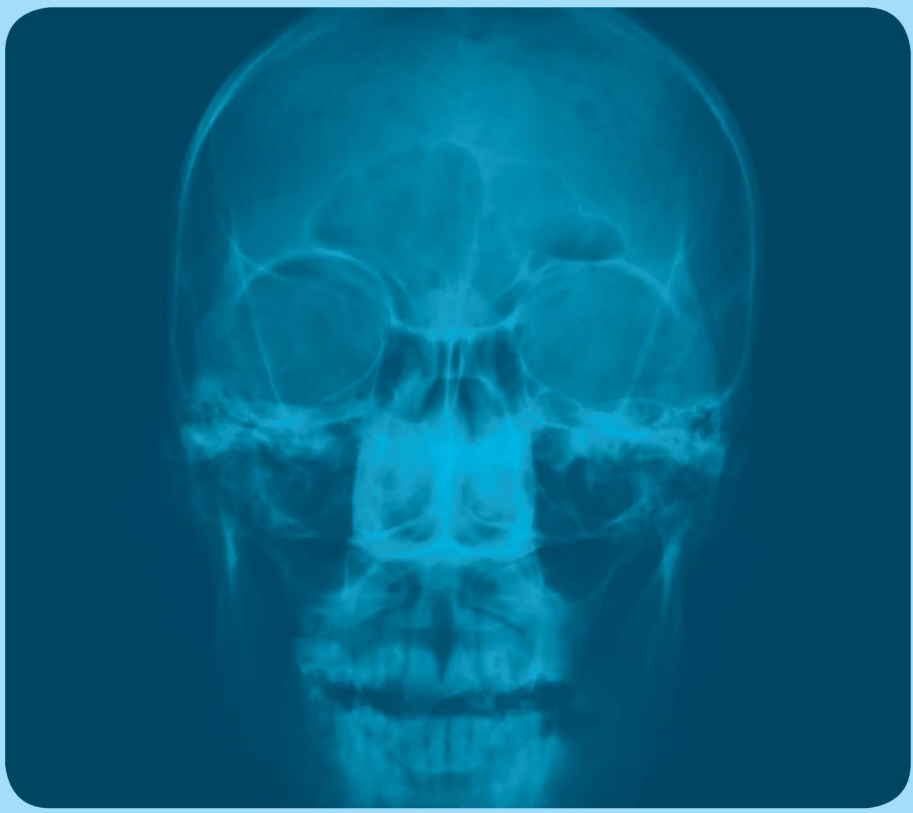
Key Clinical Topics in Otolaryngology

Edited by
Neeraj Sethi • Amy Pearson
Yogesh Bajaj

Foreword by John Watkinson



Contents

		Page
Foreword		v
Dedications		vi
Preface		vii
Contributors		xi
Abbreviations		xvi
1	Acute otitis media	1
2	Adenoidectomy	4
3	Anaesthesia – general	8
4	Anaesthesia – local	11
5	Anterior skull base surgery in ENT	14
6	Audiometry – evoked response	17
7	Audiometry – impedance	21
8	Audiometry – paediatric	25
9	Audiometry – pure tone	29
10	Audiometry – speech	32
11	Cervical lymphadenopathy	35
12	Chemoradiotherapy	40
13	Choanal atresia	44
14	Chronic cough	48
15	Chronic otitis media – complications	51
16	Chronic otitis media – mucosal	54
17	Chronic otitis media – squamous	57
18	Clinical hearing assessment	60
19	Cochlear implants	63
20	Cutaneous malignancy	67
21	Dizziness – assessment	72
22	Dizziness – benign paroxysmal positional vertigo	75
23	Dizziness – labyrinthitis/vestibular neuronitis	78
24	Dizziness – Ménière's disease	83
25	Dizziness – vestibular migraine	86
26	Drooling	89
27	Epistaxis	92
28	Examination of the ear	95
29	Examination of the nose	98
30	Examination of the throat	100
31	External ear disorders – acquired	103
32	External ear disorders – congenital	106

		Page
33	Facial nerve palsy	110
34	Fistulae in the head and neck	113
35	Foreign bodies	117
36	Genetic syndromes and ENT	120
37	Globus pharyngeus	124
38	Granulomatous nasal disease	127
39	Halitosis	131
40	Hearing aids	135
41	Hearing loss – acquired	138
42	Hearing loss – congenital	141
43	Hearing loss – nonorganic	146
44	HIV and otolaryngology	148
45	Hypopharyngeal cancer	151
46	Imaging in head and neck	155
47	Imaging in otology	161
48	Imaging in rhinology	167
49	Laryngeal cancer	170
50	Laryngeal papillomatosis	175
51	Laryngectomy	178
52	Lasers	181
53	Mastoid surgery	185
54	Nasal reconstruction	188
55	Nasal trauma	191
56	Nasopharyngeal cancer	194
57	Neck dissection	197
58	Neck lumps	200
59	Neck space infection	203
60	Nerve monitoring in ENT	208
61	Oral cancer	211
62	Oral lesions – potentially malignant	214
63	Oropharyngeal cancer	218
64	Otalgia	221
65	Otitis externa	224
66	Otitis media with effusion	227
67	Otosclerosis	230
68	Ototoxicity	234
69	Paediatric airways	237
70	Paediatric endoscopy	241
71	Parathyroid disease	245
72	Patient reported outcome measures	248
73	Penetrating neck injury	251

		Page
74	Pharyngeal pouch	255
75	Preoperative assessment	259
76	Radiotherapy	263
77	Reconstruction in the head and neck	267
78	Rhinitis – allergic	271
79	Rhinitis – nonallergic	275
80	Rhinosinusitis – acute	278
81	Rhinosinusitis – chronic with/without nasal polyps	281
82	Rhinosinusitis – complications	284
83	Salivary gland disease – neoplastic	289
84	Salivary gland disease – non-neoplastic	293
85	Septal perforation	296
86	Septorhinoplasty	299
87	Sinonasal neoplasms	302
88	Sinus surgery	306
89	Smell and taste disorders	309
90	Snoring and obstructive sleep apnoea	312
91	Speech and language therapy in benign disease	315
92	Speech and language therapy in malignant disease	319
93	Statistics	322
94	Stridor and stertor	325
95	Sudden hearing loss	330
96	Supraglottitis	335
97	Temporal bone cancer	338
98	Temporal bone trauma	342
99	Thyroid disease – benign	346
100	Thyroid disease – malignant	350
101	Tinnitus	355
102	Tonsil disease and tonsillectomy	359
103	Tracheostomy	362
104	Tympanoplasty	365
105	Vestibular function tests	368
106	Vestibular schwannoma	371
107	Vocal cord palsy	376
108	Voice disorders	380
	Index	385

Anaesthesia – general

Key points

- Shared airway procedures require good communication between surgeon and anaesthetist
- Anaesthesia for elective surgery is generally very safe
- Patients who require airway surgery can be very challenging to anaesthetise

Definitions

The first reported use of ether for surgical pain relief and anaesthesia was in 1846 by William Morton at the Massachusetts General Hospital in what is now known as the Ether Dome. The new practice quickly spread around the world: the first surgical anaesthetics in London were given in December 1846.

General anaesthesia, literally lack of sensation, is a reversible state of unconsciousness that is induced using intravenous drugs or inhaled vapours. The mechanism of action of these drugs is not clear, but they cross the blood–brain barrier to interact with various neurotransmitter receptors and ion channels. A combination of anaesthetic, analgesic and muscle relaxant drugs may be used and this depends on the conditions required by the surgery.

Consent

The patient needs to give informed consent for anaesthesia following a discussion with the anaesthetist about the risks and benefits involved. There may be a separate consent form for anaesthesia, but often it is included on the surgical consent form. Many anaesthetists will document the risks discussed in the patient's notes.

As for surgery common and serious risks should be discussed. The risk of dying purely from the anaesthetic is probably around 1 in 100,000. This may be lower in healthy subjects over the age of 1 year.

Preoperative starvation

During anaesthesia there is a risk of passive regurgitation of stomach contents that can cause significant morbidity, even mortality, if the lungs are contaminated. To minimise this risk patients are starved before surgery. Evidence for the optimal duration is relatively weak because it is based on surrogate endpoints (gastric volume) but standard practice is 6 hours for food, 2 hours for water and, in children, 6 hours for milk and formula and 4 hours for breast milk.

As prolonged starvation is closely linked to decreased patient satisfaction, these times are preferable to the traditional nil by mouth from midnight.

If the surgery is urgent, or an emergency, then the risk of aspiration must be balanced against the risk of delaying the operation.

Premedication

Any drug that is administered before theatre is premedication. They include:

- *Analgesics:* Paracetamol and a nonsteroidal anti-inflammatory drug such as ibuprofen may be given at least 30 minutes before anaesthesia
- *Topical anaesthesia:* This may be used, especially in children, to decrease the pain of cannulation. Common preparations include amethocaine (Ametop), lignocaine (LMX4) and a lignocaine and prilocaine mixture (EMLA.) They take between 30 minutes and an hour to work
- *Anticholinergic drugs:* Atropine or glycopyrrolate may be given preoperatively to decrease airway secretions that may decrease airway complications during induction
- *Sedation:* The increase in day surgery and same day admission has led to decreased use of sedative premedication in adults. It is still used with anxious and uncooperative children. Oral or buccal midazolam is often adequate, but oral or intramuscular ketamine may be added.

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Traditionally sedative premedication has been avoided in obstructive sleep apnoea or in patients with potential airway compromise, but if necessary it can be used with caution if the patient is monitored closely

- *Regular medication:* Most patients should take their regular medication before surgery. Exceptions to this include antiplatelet drugs. Anticoagulants and drugs for diabetes need to be managed carefully

Perioperative

Intravenous induction is most common in adults using a short-acting drug such as propofol. Inhalational induction may be used in children or in patients with a compromised airway that may obstruct suddenly following intravenous induction and relaxation of the airway musculature. It may be safer to manage potential airway compromise by intubating the trachea under local anaesthetic using a fibreoptic scope.

Anaesthesia is maintained either with inhalational agents such as sevoflurane or by a continuous infusion of propofol. Both techniques can be supplemented with muscle relaxation and analgesia as appropriate. All patients will be given oxygen that may be mixed with air or nitrous oxide.

All anaesthetised patients are fully monitored. The minimum required is ECG, noninvasive blood pressure, pulse oximetry and end-tidal carbon dioxide but temperature, direct arterial blood pressure monitoring and central venous pressure may be added in more complex procedures.

There have been various attempts to develop a depth of anaesthesia monitor. Perhaps the most commonly used is the bispectral index that is derived from a measurement of the patient's EEG. The index produced is between 0 and 100 and anaesthesia is considered to be appropriate if it is in the range 40–60. Its use may minimise the incidence of awareness under anaesthesia, but it is less reliable with some agents and in children.

Postoperative nausea and vomiting are common following ear, nose and throat procedures. The best prophylaxis is achieved using a combination of drugs such as dexamethasone and ondansetron.

Airway support

During surgery the airway is supported using either a supraglottic airway, which sits above the larynx, or by intubation of the trachea using an endotracheal tube (ETT).

- *Supraglottic airways:* There are many supraglottic airways but the most commonly used are the laryngeal mask airway (LMA) and the iGel. The LMA has a breathing tube similar in size to an ETT and is a good alternative for operations such as adenotonsillectomy. Studies have shown that it protects the trachea from blood soiling better than an uncuffed ETT
- *ETTs:* Cuffed ETTs are a definitive airway because the cuff inflates below the laryngeal inlet and protects the lower airway from soiling. Traditionally uncuffed ETTs have been used in children because it had been thought that the anatomy differed from the adults. But following MRI studies looking at the paediatric larynx, there has been increased usage of cuffed tubes in children. However, it has been suggested that this may cause an increased incidence of subglottic stenosis

The size of the ETT refers to its internal diameter in millimetres. Size 7 and 8 cuffed ETTs are used in adults. In children the tube size is estimated using the formula:

(Age/4) + 4 for an uncuffed ETT or (age/4) + 3.5 for a cuffed ETT.

Special surgical requirements

- *Laser:* Regular ETTs will ignite if hit by laser light and, in the presence of oxygen enriched air, this can cause an airway fire. The risk is minimised by using <60% oxygen, laser safe tubes, saline in the cuff, and saline-soaked pledgets should be packed around exposed parts of the ETT where possible
- *Nerve stimulation:* In operations such as mastoidectomy or parotidectomy where

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the facial nerve is at risk muscle relaxants are avoided so that the nerve can be monitored during the operation
- *Laryngeal surgery:* Surgery to the larynx may be impeded by the presence of an ETT. To avoid this, the patient may be oxygenated using jet ventilation, through a side port on a rigid bronchoscope (e.g. Storz) or, in a technique predominantly used in children, spontaneous ventilation
- *Middle ear surgery:* The larynx may be sprayed with lignocaine to reduce coughing at intubation. Nitrous oxide is avoided because it preferentially diffuses into the middle ear and can increase the pressure

Complications

Many of the complications of anaesthesia are minor. They include nausea, vomiting, headache, itching, shivering, dental damage and sore throat. In addition:
- *Anaphylaxis:* It is often difficult to diagnose under anaesthesia as the patient may be tachycardic due to pain, hypotensive and the rash is hidden under the drapes. Muscle relaxants are the most likely anaesthetic cause of anaphylaxis
- *Malignant hyperthermia (MH):* This is an inherited disorder of skeletal muscle. Exposure to volatile anaesthetic agents and suxamethonium triggers a potentially fatal metabolic acidosis. MH is treated by removing the cause, 100% oxygen and dantrolene. All family members should be tested to see if they have MH. Patients with MH can have safe anaesthetics by avoiding the trigger drugs
- *Awareness:* Patients are able to recall surroundings or events while under general anaesthetic
- *Hypotension:* All anaesthetic agents cause vasodilatation so there is a potential for significant hypotension in patients who are dehydrated, septic or unable to increase their cardiac output
- *Chest infection:* More common in people who smoke
- *Corneal abrasions:* Due to the loss of the corneal reflex. Therefore eyes are taped shut or protected using lubricating gel

Further reading

Carlisle J, Stevenson CA. Drugs for preventing postoperative nausea and vomiting. Cochrane Database Syst Rev 2006; (3):CD004125.

Tobias JD. Pediatric airway anatomy may not be what we thought: implications for clinical practice and the use of cuffed endotracheal tubes. Pediatr Anesth 2015; 25:9–19.

Williams PJ, Bailey PM. Comparison of the reinforced laryngeal mask airway and tracheal intubation for adenotonsillectomy. Br J Anaesth 1993; 70:30–33.

Related topics of interest

- Anaesthesia – local (p. 11)
- Preoperative assessment (p. 259)
- Snoring and obstructive sleep apnoea (p. 312)

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