ENT update

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ENT anaesthesia is a routine part of most anaesthetists' work. Here I present aspects of my personal practice which may be less common and hopefully of some interest.

"The provision of a clear, free and unobstructed airway is the principle concern of all ENT procedures" in Miller, 2010

- Anaesthesia for FESS
- Controlled Hypotension
- Laryngeal Mask Airway in ENT
- Laryngeal Surgery
- High Frequency Jet Ventilation
- Laser Airway Surgery
- Anaesthesia for Free Flap Surgery

Anaesthesia for FESS

Excellent summary article by Alex Baker and Baker[1].

Although usually low risk, FESS can rarely result in serious morbidity. Good surgical field conditions may improve surgical technique and reduce risk. Although there are patient and surgical factors that will influence surgical field conditions, the anaesthetic can also influence surgical happiness.

Table 1

Indications for endoscopic sinus surgery.
Nasal Surgery
Chronic sinusitis refractory to medical treatment
Nasal polyposis
Recurrent sinusitis
Control of epistaxis
Sinus mucocoeles
Excision of selected tumours
Skull base surgery
Cerebrospinal fluid leak closure
Endoscopic pituitary surgery
Orbital surgery
Orbital decompression (e.g., Graves ophthalmopathy)
Dacryocystorhinostomy
Optic nerve decompression

Table 2

Complications of endoscopic sinus surgery.
Nasal
Haemorrhage
Synechiae
Anosmia
Intracranial
Haemorrhage
Cerebrospinal fluid leak potentially causing meningitis
Orbit
Nasolacrimal duct damage
Extraocular muscle injury
Intraorbital haemorrhage
Optic nerve damage
Pain

Table 3

Patient and surgical factors that contribute to bleeding and poor surgical conditions during sinus surgery.
Patient factors
Severity of sinus disease
Active infection/inflammation
Anticoagulation
Antiplatelet medications
Clotting disorders
Vascular tumours
Surgical factors
Extensive surgery
Duration of surgery
Revision of surgery

Assess: Usual anaesthetic assessment plus risk factors that would contra-indicate hypotension: CVS, cerebrovascular disease; severe respiratory disease; uncontrolled hypertension; reno-vascular disease. Airway assessment, including nasal obstruction from surgical pathology making BVM more difficult.

Discuss contraindications to hypotension with surgeon – they may change their plans if you feel it is unsafe to provide hypotension. Consider separate consent for deliberate hypotension – this is not what the general public expect from a normal anaesthetic and it may involve increased risk.

Surgical field bleeding depends on: Systolic BP, HR, capillary flow, venous pressure. You and the surgeon can influence all of these.

Arterial BP:
Smooth anaesthetic, no tachycardia, hypertension, no coughing on ETT.
Monitor depth of anaesthesia, NMB. Topicalise airway, consider using LMA, not ETT.

HR
Keep it low – see later

Capillary flow
Control CO2, so IPPV. Topical adrenaline, LA, cocaine applied by the surgeon (also reduces surgical stimulation)

Venous Pressure
Tilt head up, avoid tying ETT tightly round neck veins (!) Avoid coughing and straining. IPPV with low pressure strategy. Don't flood with IV fluid.

TIVA
There is reasonable evidence that remifentanil and avoidance of volatile improves surgical field conditions (at same BP). This only applies in patients with severe sinus disease. Less than severe, the surgeons cannot tell the difference when they are 'blinded'.

Remifentanil will, of course, help you keep your BP and HR under control.

Hypotensive agents
Using above strategy, I usually have no problem getting the BP to 20% less than resting awake BP. In the rare patient whose BP is not in this range, often because they develop a responsive tachycardia then a beta-blocker is my first choice (eg. Metoprolol, 1-2mg increments). Clonidine 50mcg increments is 2nd choice, but I find it delays recovery. I have only very rarely had to start a GTN infusion at low dose.

I much more frequently end up starting a Metaraminol infusion because reasonable doses of Propofol and remifentanil take the BP lower than I am happy with.

Monitoring
Routine monitoring in relatively healthy and BP down 20%. IABP if patient with risk factors and/or more than minor doses of deliberate hypotensive agents are required (e.g. GTN infusion). BIS if you're anxious about TIVA, but most patients get more than adequate Propofol/Remifentanil and don't have to have NMBA.

Hypotensive Anaesthesia

Does it work?

Does it cause Harm?
(What BP is "safe"?)

Should we get separate consent?

Deliberate hypotension dates from 1950's and was used to principally to reduce bleeding in increasingly complex surgery – "to make the impossible possible"[2]. There has always been an acknowledged risk associated with deliberate hypotension. Historical evidence included "The pooled series reviewed here suggest non-fatal complications in one in 39 cases and fatal complications in one in 167 cases." (Lindop, 1975)[3] and a series of 1802 ORL patients in whom 4 had symptoms of cerebral damage and 1 died, giving an incidence of severe cerebral complication of 1 in 450 (Pasch & Huk, 1986)[4].

Hypotensive anaesthesia became much less popular once trials showed worse outcome after neurosurgery[5]. Over the past two decades, the scope and complexity of endoscopic nasal surgery has expanded, equipment has improved (stealth CT -guided) and surgeons have increasingly required good surgical field conditions to achieve good surgical outcome.

Deliberate hypotension in the form of "Hypotensive Epidural Anaesthesia" (HEA) has been strongly advocated by one US group to reduce blood loss and improve outcome in lower limb joint replacement (Sharrock)[6]. Epidural-induced hypotension (MAP 45-55) in this group's data does not seem to adversely affect cardiac, renal or cerebrovascular outcome and does not affect cognitive function up to 4 months post-op (small numbers in trials, so rare badness not excluded). Deliberate TIVA-induced hypotension does not improve blood loss as much as HEA[7].

Blood loss per-se is not an issue in FESS. Transfusion is extremely rare. Surgical field conditions are the subjective view of the surgeon. Some studies have suggested that the blinded surgeon can tell the difference between TIVA and volatile-based anaesthesia[89] and is sensitive to MAP[10]. Other studies show no difference in surgical happiness dependent on anaesthetic technique[11]. A recent systematic review excluded many papers on the subject because of poor design or risk of bias. The remaining papers suggested that hypotensive anaesthesia does reduce blood loss in transfusion prone surgery, but the evidence for benefit in surgical field for FESS was "inconclusive" [12].

Beyond rare cerebral disasters, it has been suggested that deliberate hypotension may cause at least temporary cognitive decline. In a small study, there was no difference in detectable neurocognitive function at 24 hours between GTN induced hypotension (MAP 60-70) and normotension[13].

LMA for ENT

First described for use in nasal surgery in 1995[14]. Several papers have compared ETT with Reinforced LMA, some using fibreoptic bronchoscope[15] to assess airway soiling, some assessing extent of blood soiling of device[16]. Most also assess clinical outcome – ease of emergence, extubation, coughing and desaturation during recovery.

Surgical field conditions have been judged better with LMA for the first 15mins of surgery and required lower rates of remifentanil compared to an ETT after that[17].

LMA has repeatedly been shown to provide a satisfactory airway for tonsillectomy, with less bronchospasm, laryngospasm, bleeding and desaturation compared to the use of an ETT (most trials in kids)[18]

Most studies showed superior protection of the larynx from soiling with blood. One study suggested that the incidence of blood in the distal trachea was higher with an LMA[19]. Older studies have shown significantly better emergence with a LMA, but these studies used volatile/fentanyl based anaesthetics. No study yet has compared emergence characteristics of LMA vs ETT when Propofol/Remifentanil are used.

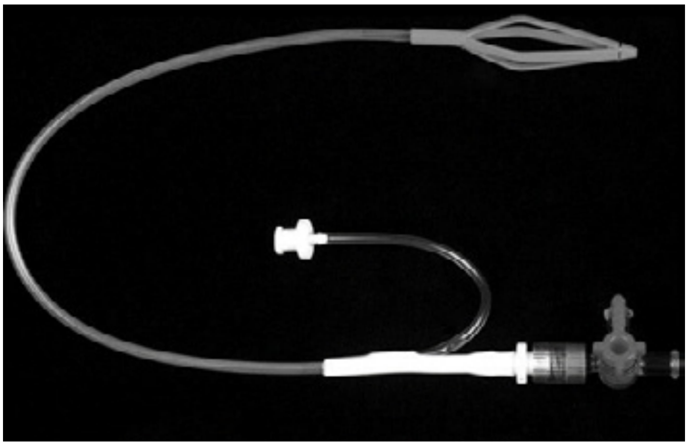
Proseal LMA has been used successfully for prolonged middle ear surgery[20].

If a LMA is contraindicated, then topicalisation of the airway may improve emergence/extubation.

Lignocaine spray to the larynx seems to reduce cough at extubation for up to 2 hours[21]. Additional effect may be gained by inflating the endotracheal cuff with alkalinised lignocaine, although the results in adults are inconsistent. One study using Rusch reinforced ETT showed prolonged suppression of adverse extubation phenomenon and measureable systemic lignocaine concentrations from intra-cuff lignocaine[22].

Anaesthesia for Laser Micro-laryngoscopy

The traditional approach of Laser-resistant ETT or supraglottic jet ventilation is not without risks. Sub-glottic catheter jet ventilation was first described in 1970's, but carries highest risk of barotrauma. Transtracheal jet ventilation has been described but is associated with the highest incidence of barotrauma resulting from airway outflow obstruction, most often laryngospasm[23].



Hunsaker described his Mon-jet tube in 1994. It is effectively laser safe (CO_2, NdYAG, KTP)[24] and provides the optimum conduit for safe automated high frequency jet ventilation[25]. Barotrauma is minimised by monitoring airway pressure through the secondary lumen and setting the ventilator to pause if the pressure rises above a safe level.

The Hunsaker Mon-jet tube in conjunction with an automated jet ventilator, has been successfully used in most types of microlaryngeal surgery work, including in patients with severe co-morbidities, obesity and difficult airway access. Only 2% of patients required change to ETT.

High frequency jet ventilation HFJV is generally considered safer than other forms of supra or infra-glottic high pressure source ventilation (HPSV)[26]. HFJV provides good MV with adequate CO_2 elimination[27] (typical starting settings: 150cpm, I:E, 0.5, driving pressure 1.5 – 2.0bar, 100% O_2).

Laser airway surgery

Historically CO_2 laser – line of sight via microscope and surgical laryngoscope. Now Nd-YAG used for subglottic and tracheal surgery since it can be directed down an optical fibre placed through the working channel of a fibrescope. KTP laser is also focused through an optic fibre but photo-ablates much more superficially, so can be used in the airway with local anaesthesia +/- sedation, potentially in an outpatient setting.

Laser Airway Fire

- 0.14% of CO_2 laser operations.
- O_2 (or N_2O) + fuel (ETT) + ignition -> burn++ (and toxic fumes)
- Cuff deflation -> Incr O_2 at operation site

Prevention: Protect ETT
Venturi/jet ventilate
Intermittent apnoea / spont vent.
Low FiO_2
"No Volatile" - toxic products

ETT metalised foil tape – historical method
Integral laser resistant coating – Xomed Laser-Shield
Metal tube- 'Laser-flex': Mallinckrodt with 2 cuffs
'Fome-Cuf'
All are relatively resistant. None are licensed for use with Nd-YAG laser.

High Pressure Source Ventilation (HPSV)
- Supra-glottic jet ventilation or Infra-glottic catheter (Hunsaker Mon-jet)
- need high cost high frequency ventilator
- need IV anaesthetic
- need relatively compliant lungs
risk barotrauma, pneumothorax, crepitus, gastric distension.

Apnoea or Spont Vent
Via surgical laryngoscope
+/- O_2 catheter or O_2 insufflation

Treat Airway Fires: Surgeon reports.
Stop ventilation / disconnect
Extinguish flames – Drench area with saline
Remove burning material into bucket of water
100% O2 via face mask
Continue anaesthetic -> direct laryngoscopy, rigid bronchoscopy +/- fibreoptic to assess damage.
? re-intubate, prolonged IPPV.

Free flap surgery

Pre-op assessment: Multiple potential co-morbidities. Older smokers. 9% incidence of post-operative systemic medical complications. Meticulous pre-operative preparation would include optimisation of medical conditions, evaluation by nutritionists and physiotherapists and pre-operative preparation and selection of the appropriate surgical procedure[28].

Blood Pressure Control: From physiological first principles, both hypotension and use of vasopressors could adversely affect flap flow. There is some evidence in animal models that vasopressors can cause vasoconstriction in the microcirculation of the flap. In clinical studies use of vasopressors does not seem to affect early flap failure.
Dobutamine in high doses has been shown to increase flap flow when measured by in-situ ultrasonic flow meters. This, however, also resulted in what would probably be clinically unacceptable increases in CI and HR in a potentially vulnerable patient group. Noradrenaline has also been shown to increase CI and free flap blood flow.
"In practice the basis of intra and post-operative management is the maintenance of normothermia, normo- or mild hypervolaemia, low blood viscosity and reduction of systemic sympathetic stimulation[29].

Fluid Therapy: Excessive crystalloid infusion has been associated with poor flap outcome, possibly due to increased flap oedema and increased risk of thrombosis[30]. Most anaesthetists aim for +ve balance 0-2L for the case.
Transfusion trigger should be low, as viscosity, and therefore flap flow, improve with a lower haemoglobin. All patients should be kept normothermic.

Post-operative Care: Despite the length of most operations there is no specific need for post-operative ventilation. HDU may be required for monitoring and maintenance of BP and for monitoring of flap perfusion.

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Hypotensive Anaesthesia

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LMA for ENT

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Lignocaine to the cords

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Jet ventilation/Hunsaker

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Free Flap Surgery

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