DIAGNOSIS AND MANAGEMENT OF THE DIFFICULT OR SHARED AIRWAY

Paul Harvey FRCA
Derriford Hospital, Plymouth.

- Diagnosis and management of the difficult airway
- Failed intubation/ventilation
- Airway obstruction
- Airway management devices
- Awake intubation
- Anaesthesia and laser surgery
More than 85% of respiratorily related closed malpractice suits involve brain damage or death.

30% of deaths attributable wholly to anaesthesia are from the inability to successfully manage very difficult airways (estimate).

J. Caplan
Anesthesiology 1990

Editorial

Predicting difficult intubation – worthwhile exercise or pointless ritual?

S.M. Yentis Anaesthesia, 2002, 57 p 105-9
Preoperative airway evaluation using multi-slice three-dimensional computed tomography for a patient with severe tracheal stenosis


Female 71  Thyroid carcinoma – severe tracheal stenosis

Multi-slice CT scan – simulated fibrescopic intubation showed tracheal mobility

Uneventful anaesthesia using same technique.
Review

Training in airway management


• Training aids
• Structured training programmes
• Learning curves and assessment
• Ethics
• Recommendations
**Natural airway**

**Easy - chin lift only**

**One person - jaw thrust/ mask seal**

**One person - jaw thrust/ mask seal**

**Two person - jaw thrust/ mask seal**

**Gas exchange unsatisfactory or non-existant**

**MASK VENTILATION**

**Oropharyngeal(orNP) Airway (or both)**

**ditto**

**IF NOTHING FURTHER DONE = BRAIN DAMAGE OR DEATH**

**1 attempt, increasing lifting force**

**1 attempt, increasing force and reposition head**

**Multiple attempts, external pressure, different blades, introducers and bougies**

**Multiple attempts by more than one laryngoscopist**

**Failure /impossible**

**LARYNGOSCOPY AND INTUBATION**

**GRADE 1 or 2 view**

**GRADE 3 or 4 view**

**If oxygenation not guaranteed by other means**

**BRAIN DAMAGE / DEATH**

*(Benumof, Anesthesiology 1991)*
**INCIDENCE OF EACH DEGREE OF AIRWAY DIFFICULTY**

- 2 or 3: 1 to 18%
- Definite 3: 1 to 4%
- Failed intubation (? severe grade 3 or 4): 0.05 - 0.35%

**CAN’T INTUBATE / CAN’T VENTILATE**

- 0.01 - 2 of 10,000 patients

(Multiple authors)

*However, in pregnancy –*

- Obesity
- Restricted cervical spine movement
- Difficult laryngoscope insertion
- Reduced cardiorespiratory reserve
- Airway oedema (pregnancy induced HT)
- Haste, anxiety, stress
Failed tracheal intubation in obstetrics: no more frequent but still managed badly


SW Thames region of UK  1999-2003
4768 obstetric general anaesthetics
20 failed intubations  (incidence 1:238)
Notes examined - half failed to follow accepted FTI protocol

Trainees’ experience of difficult and failed intubation in obstetrics

NL Lewis, F Plaat  Anaesthesia 2006,61,64-5  (letter)

173/390 OAA trainees responded
79% reported experience of difficult intubation
42 failed intubations
### Initial management of failed intubation

<table>
<thead>
<tr>
<th>Method</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facemask +/- airway</td>
<td>17</td>
</tr>
<tr>
<td>Facemask, followed by LMA</td>
<td>13</td>
</tr>
<tr>
<td>LMA</td>
<td>10</td>
</tr>
<tr>
<td>Intubating LMA</td>
<td>1</td>
</tr>
<tr>
<td>Immediate intubation by senior help</td>
<td>1</td>
</tr>
</tbody>
</table>

### Definitive management of failed intubation

<table>
<thead>
<tr>
<th>Method</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Converted to regional block</td>
<td>10</td>
</tr>
<tr>
<td>Awake fibreoptic intubation</td>
<td>2</td>
</tr>
<tr>
<td>Woken then re-anaesthetised by senior help</td>
<td>2</td>
</tr>
<tr>
<td>Spontaneous ventilation via LMA</td>
<td>12</td>
</tr>
<tr>
<td>Intubated by another anaesthetist</td>
<td>11</td>
</tr>
<tr>
<td>Spontaneous ventilation via facemask and airway</td>
<td>2</td>
</tr>
<tr>
<td>(Unreported)</td>
<td>3</td>
</tr>
</tbody>
</table>
Failed intubation in obstetrics
Derriford 2004

“A Survey of Emergency Airway Management in the United Kingdom”
B. Ratnayake & R. Langford Anaesthesia October 96

Questionnaire to all R.C.A. tutors
( Response rate 74.9% )

Portex Minitrach (58.6 %) most often used

Complication rate 65 %, > half serious
- failure to cannulate
- multiple attempts
- pneumothorax
- severe bleeding
Jet-Ventilation-Catheter (acc. to Ravussin)
For transtracheal puncture

- 10ml Syringe
  - acts insertion
  - and handling
  - for identification
  - of the Trachea

- Luer-Lock Connection
  - for Jet-Ventilator

- 16mm Connection
  - for conventional
  - ventilators

- Fixation Flange
  - with Foam/Velcro
  - Neckstrap

- the Teflon-Cannula
  - is kink resistant
  - has an anatomical angle

- two lateral eyes
  - reduce the "Venturi" effect
  - keep the cannula away from
  - the tracheal wall

- the Puncture Needle with
  - the trocar and
  - allows easy insertion without
  - prior incision

Anatomy

- Hyoid bone
- Thyroid cartilage
- Cricothyroid membrane
- Tracheal ring
Emergency cricothyrotomy: a randomised crossover trial comparing the wire-guided and catheter-over-needle techniques


10 anaesthesiology, 10 ENT residents

Pig larynxes

Correct positioning 85% (WG) and 95% (CON)

Complication rate 5 and 1 respectively
"Quicktrach"

VBM Medizintechnik
COMPLICATIONS OF AIRWAY DIFFICULTY

DIRECT TRAUMA - face, teeth etc., upper airway
eyes, cervical spine, pulmonary

REFLEX ACTIVITY - laryngovagal, laryngosympathetic

INTERRUPTION OF GAS EXCHANGE -
hypoxia, hypercarbia

Increased difficulty = increased force = more complications
(63% in prolonged difficult intubation)
- Bellhouse 1988, Anaes. and Intens. Care)
A. Pathological

- congenital facial and upper airway deformities
- maxillofacial airway trauma
- airway tumours and abscesses
- requirement for stable cervical spine
- fibrosis
- surgically induced deformities
- some systemic diseases

- ALL CONDITIONS WHICH MAY MAKE MASK VENTILATION DIFFICULT IN ITSELF.
( * NOT the cause of much morbidity or mortality )
Airway assessment
B. Anatomical

1. RELATIVE TONGUE TO PHARYNGEAL SIZE

Mallampati et al
Canadian Anes Soc J 1985

- may be 50 % false + predictor of difficult intubation

Wilson M.E.
Anaesthesia 1990
2. ATLANTO-OCCIPITAL JOINT EXTENSION

35 degrees extension possible at the normal A-O joint

Grading and reduction of A-O extension

Grade 1  None
2      One third
3      Two thirds
4      Complete

(Implies very small occiput to C1 Gap)

3. MANDIBULAR SPACE

Thyromental/hyomental distance

Short T-M distance - laryngeal axis makes a more acute angle with pharyngeal axis.

T-M distance > 6 cm and horizontal mandibular length
> 9 cm, direct laryngoscopy (probably) easy

4. OWN TEETH, OVERBITE
RADIOGRAPHIC PREDICTORS

A : B > 3.6 : 1

+ reduced atlanto-occipital gap

White & Kander  *Anaesthesia* 1975

Why not a combination test?

e.g. Mallampati + thyromental distance (Frerks, *Anaesthesia* 91)
Sternomental distance as the sole predictor of difficult laryngoscopy in obstetric anaesthesia

SAL Ramadhani et al  BJA 1996;77:312-316

523 parturients undergoing LSCS under GA
18 (3.5%) classified as grade 3 or 4
Significant difference between sternomental distance in these as compared to grade 1 and 2
But – sensitivity 67% and specificity 71% only

Predicting difficult intubation: a multivariable analysis

K. Karkouti et al  Can J Anesth
2000/47:8/730-739

444 randomly selected patients + 27 classed as difficult previously
10 patients excluded – 38 of 461 classed as difficult to intubate
7 different airway tests used by one assessor blinded to intubation difficulty information
87% sensitivity
96% specificity

Multivariable analysis predicted three tests that were highly significant in predicting difficult intubation

• Mouth opening
• Chin protrusion
• Atlanto-occipital extension
## Diagnostic Plan for Difficult Airway Prediction

1. Exclude pathological problems (from history) + CHECK
   
   Anaesthetic Records. Ask about dentures etc.

2. Perform Mallampati

3. Check mouth opening from in front

4. Thyromental distance

5. Atlanto-occipital movement

6. Look for maxillary overbite and ability to jaw thrust from the side

Simple, Quick – includes Karkouti and more.
Difficult Airway Society guidelines for management of the unanticipated difficult intubation

J.J.Henderson et al Anaesthesia, 2004, 59, 675-694

Plan A: Initial tracheal intubation plan
Plan B: Secondary intubation plan
Plan C: Maintenance of oxygenation & ventilation
Plan D: Rescue techniques for “Can`t intubate, can`t ventilate situation”

Basic structure of DAS
Guidelines flow-chart
Management of unanticipated difficult tracheal intubation – during routine induction of anaesthesia in an adult patient
Management of unanticipated difficult tracheal intubation – during rapid sequence induction of anaesthesia (with succinylcholine) in a non-obstetric patient.

Management of failed intubation, increasing hypoxaemia and difficult ventilation in the paralysed anaesthetised patient.
“Fiddle, larry and stick!”

“A J Mulcahy & S M Yentis

Anaesthesia 2005, 60, 1144

“Airway Alerts”. How UK anaesthetists organise, document and communicate difficult airway management

F.A. Barron et al. Anaesthesia, 2003, 58, 73-77

Airway alert scheme encompassing principles of ASA Task Force on Difficult Airway Management, Canadian Airway Focus Group and DAS (UK)

Who to inform, what documentation, nature of the airway problem, ? Medicalert bracelet etc.
The Management of Airway Obstruction
Management of Tracheal Obstruction

CASE REPORT

Male 57  Known laryngeal carcinoma

Presentation inspiratory/expiratory stridor

Declining laryngectomy

Problem: surgeon wishing to debulk tumour without performing tracheostomy

Anaesthetic technique?
CASE REPORT 2  Female 67  Recurrent Ca upper oesophagus
High resection (Ivor Lewis) 5 years prior
Presenting with extreme dysphagia + inspiratory/expiratory stridor

Intended procedure - insertion of oesophageal stent under Xray control

Anaesthetic considerations?
Management of the partly obstructed airway should be a carefully planned procedure between senior surgical and anaesthetic staff. This is a clinical situation for which a local protocol could be devised.

Wherever possible the level and the full extent of the airway difficulty should be defined by preoperative investigations including the use of fibreoptic nasendoscopy.
• Early consultation between surgeon and anaesthetist is essential, with consideration of all options and the formation of a management plan.

• Awake fibreoptic intubation and tracheostomy using local anaesthesia should be considered amongst the options.

• Fibreoptic intubation is an established part of anaesthetic practice. Several individuals within a department need to ensure that they maintain these skills.

**TABLE 1: SOME CAUSES OF LARGE AIRWAY OBSTRUCTION IN CHILDREN**

<table>
<thead>
<tr>
<th>Category</th>
<th>Causes</th>
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</thead>
<tbody>
<tr>
<td>Depressed conscious level</td>
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<tr>
<td>Foreign body</td>
<td></td>
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<tr>
<td>Infection:</td>
<td></td>
</tr>
<tr>
<td>Viral: croup, papillomatosis</td>
<td></td>
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<tr>
<td>Bacterial: epiglottitis, tracheitis, tonsillitis, abscess adjacent to airway</td>
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</tr>
<tr>
<td>Trauma</td>
<td></td>
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<tr>
<td>Thermal injury</td>
<td></td>
</tr>
<tr>
<td>Congenital abnormalities: choanal atresia, choanal stenosis, micrognathia, macroglossia, laryngomalacia, laryngeal web</td>
<td></td>
</tr>
<tr>
<td>Neoplasm: haemangioma, lymphoma, mediastinal mass</td>
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<tr>
<td>Peripheral neurological disease</td>
<td></td>
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<tr>
<td>Neuromuscular disease</td>
<td></td>
</tr>
<tr>
<td>Iatrogenic: subglottic stenosis, post-intubation stridor, neck haematoma</td>
<td></td>
</tr>
<tr>
<td>Anaphylactoid reactions</td>
<td></td>
</tr>
</tbody>
</table>
The obstructed airway in head and neck surgery

Questionnaire to experienced anaesthetists asked specifically about the management of laryngeal carcinoma and stridor (McSorley P. and Farling P. 1999)

74% said “awake fibreoptic intubation“

No universal answer

Consider each patient according to the level of the obstruction and the individual clinical circumstances.

Broadly, three groups of patients:

- Obstruction above, in and around the glottis
- Mid tracheal obstruction (e.g. goitre)
- Lower tracheal and bronchial obstruction
1. Obstruction in and around the glottis (upper airway)

e.g. supraglottic, pharyngeal, pyriform fossa, epiglottic, vocal cord and subglottic lesions.

Stridor at rest (implies < 50 % of normal airway diameter)

Diagnosis - flexible nasendoscopy +/- CT scan

? Nocturnal dyspnoea, panic attacks - suggests critical obstruction

If significant stridor at rest:

Is intubation considered possible?

Yes - inhalational induction of G.A. in theatre (PLAN A)
  - surgeon ready to perform tracheostomy (PLAN D)
  - rigid bronchoscopy

No - tracheostomy under topical anaesthesia

If GA induction, oral airways, nasopharyngeal airways
If severe stridor, a large tumour, fixed hemilarynx, gross anatomical distortion

or - larynx not visible with nasendoscope

**PLAN D only** - tracheostomy under local anaesthesia

**DON'T**

- Induce anaesthesia with intravenous agents
- Immediately reach for the fibrescope!

**DO**

- Have surgical expertise immediately available
- Consider insertion of jet ventilation cannula
  
  pre-induction.

Management of mobile laryngeal tumours  (Letter)

N. Randhawa Anaesthesia 2002, 57, 721-2
2. Mid tracheal obstruction

Fibrescope *may* be useful when obstruction is further down the airway.

CT scan is mandatory for lesions of the trachea and main bronchi, except in life-threatening situation.

**PLAN A** - fibrescopic airway evaluation/intubation - awake if possible

**PLAN D** - is a tracheostomy feasible?

Most cases of retrosternal goitre have sufficient airway diameter.

3. Lower tracheal and bronchial obstruction

Sudden airway obstruction can occur at **any** stage of the anaesthetic

- after muscle relaxant administration
- on inhalational induction
- after reversal of NM blockade
- on extubation
- in recovery
Anterior mediastinal masses: an anaesthetic challenge

M.H. Goh et al. Anaesthesia 1999, 54, 670-682

Case Report
20 year old female - 1 month cough, no stridor

CXR - 2/3 chest cavity filled by ant. mediastinal mass

CT scan showed bilateral main bronchi compression

Anaesthesia for biopsies - awake fibreoptic intubation

thio, atracurium, isoflurane

peak airway pressure ++

peak airway pressure ++
Frozen section revealed lymphoma

NM blockade reversed - airway pressure still high

Transferred to ITU still intubated and ventilated

On waking, airway pressure falling

Extubated 4 hours after ITU admission
The anaesthetic management of the patient with an anterior mediastinal mass

Neuman GG et al  Anesthesiology 1984: 60: 144 - 7

3 reasons for obstruction under GA

• lung volume reduced under GA
• relaxation of bronchial smooth muscle = greater airway compressibility from any overlying mass
• loss of spontaneous diaphragmatic movement with muscle relaxants reduces the normal transplural pressure gradient which dilates the airway

Goh et al

Management plan

• consider femoral vessel cannulation prior to anaesthesia
• awake fibreoptic intubation after invasive monitoring established
• avoid muscle relaxants if possible
• expect to have to intubate (least obstructed) main bronchus
• have ENT or cardiothoracic surgeon ready for rigid bronchoscopy
• as last resort, convert to CPB anaesthetic
• ITU admission post biopsy is mandatory
The following cases with known airway obstruction illustrate a variety of airway management strategies:

<table>
<thead>
<tr>
<th>Age</th>
<th>Diagnosis</th>
<th>Operation/Intervention</th>
<th>Airway control</th>
<th>Anaesthetic Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laryngeal edema</td>
<td>Fibreoptic intubation</td>
<td>Intravenous</td>
<td>Ketamine, fentanyl</td>
</tr>
<tr>
<td>2</td>
<td>58 Subglottic edema and epiglottic</td>
<td>Tracheotomy</td>
<td>no intubation</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>swelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>09 Congenital tracheal atresia</td>
<td>Tracheotomy</td>
<td>General anaesthesia</td>
<td>No intubation</td>
</tr>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>4</td>
<td>76 Infantile respiratory distress</td>
<td>Intubation</td>
<td>General anaesthesia</td>
<td>No intubation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>85 Congenital tracheal stenosis</td>
<td>Intubation</td>
<td>No intubation</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>38 Laryngeal stenosis</td>
<td>Tracheotomy</td>
<td>No intubation</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>88 Congenital tracheal stenosis</td>
<td>Tracheotomy</td>
<td>No intubation</td>
<td>None</td>
</tr>
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<td></td>
<td></td>
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</tbody>
</table>

Cases of congenital tracheal stenosis were managed with tracheotomy and intubation, while cases of congenital laryngeal stenosis were managed with intubation alone.

Extract from NCEPOD 1996/7

RELAXANTS
AIRWAY OBSTRUCTION
MANAGEMENT PLAN

- Preoperative evaluation
- Provisional diagnosis
- Planning of anaesthetic management
- Preparation of patient
- Preparation of equipment and drugs
- Planning escape route!
- Postoperative period

Airway devices: where now and where to?

Charters P  Editorial BJA 2000 504-5

- Efficient conduit for ventilation, bypassing upper airway
- Easy insertion, even by non-specialists
- Efficacy not drastically impaired by sub-optimal position
- Stable in use ( “hands free” operation )
- Works equally well in abnormal airways
- Easily converted to tracheal tube placement
• Minimal/no aspiration risk
• Easy seal allowing IPPV
• Sealing should minimally distort the pharynx
• Cricoid pressure friendly!
• Negligible side effects profile

Alternatives to LMA Classic:
• Disposable LMA (LMA – Unique) 1998
• C.O.P.A.
• PA Xpress
• Intubating LMA (Fastrach)
• LMA Proseal
• Airway Management Device (AMD)
• Laryngeal tube/Cobra etc etc
• (Oesophageal Obturators)
As experts in the production of airway management products, Portex can offer an integrated solution to all your airway management requirements.

The Portex **SOFT SEAL** Laryngeal Mask is an important addition to this wide portfolio of products, offering many benefits to clinicians.
A randomised comparison of the Portex Softseal™ laryngeal mask airway with the LMA-Unique™ during anaesthesia

T M Cook et al Anaesthesia, 2005, 60, 1218 - 1225
Airway Management Device

“AMD“

PAXpress
The intubating laryngeal mask - Results of a multicentre trial with experience of 500 cases


Successful insertion in all 500 cases
Satisfactory ventilation in 475 (95%)
Difficult ventilation in 20 (4%)
Unsatisfactory in 5 (1%)

ILMA (continued)

Blind tracheal intubation successful in 481 (96.2%) within 3 attempts - (79.8% at the first attempt)

Unsuccessful intubation - 19 (3.8%)

No relationship between Mallampati grade and success rate

Appears to be about a 20 case learning period for most people.
The intubating laryngeal mask airway compared with direct laryngoscopy

M.S. Avidan et al, BJA 1999

60 patients - randomised crossover study

Doctors, nurses and med students with no intubating experience

Initial manikin training + demonstration on anaesthetised patient

Each participant attempted intubation in up to five adult patients using both DL and ILMA in random sequence (max 2 attempts with each technique)

Also asked to ventilate with mask and bag (but no Guedel airway)

Results

<table>
<thead>
<tr>
<th></th>
<th>Success rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILMA insertions</td>
<td>98%</td>
</tr>
<tr>
<td>ILMA intubations</td>
<td>43%</td>
</tr>
<tr>
<td>DL intubations</td>
<td>35%</td>
</tr>
<tr>
<td>ILMA ventilations</td>
<td>98%</td>
</tr>
<tr>
<td>Face mask ventilations</td>
<td>72%</td>
</tr>
<tr>
<td>ILMA intubations by investigators</td>
<td>89%</td>
</tr>
</tbody>
</table>
Comparison of laryngeal mask and intubating laryngeal mask insertion by the naïve intubator

Choyce A et al, BJA 2000

• 75 inexperienced participants inserting LMA and ILMA into one of five cadavers
• ILMA insertion was faster and ventilation better - 89% compared to 71% adequacy when compared to LMA
• Results suggest ILMA is the best airway adjunct for emergency ventilation by the inexperienced

The intubating laryngeal mask airway does not facilitate tracheal intubation in the presence of a neck collar in simulated trauma

Wakeling HG and Nightingale J BJA 84 (2) 254-6

10 patients - ILMA used in simulated trauma scenario
  - neck collar ( “Stiffneck Select” ) + CP
  - difficult insertion and ventilation
  - only 2 successful intubations
Intubating laryngeal mask airway allows tracheal intubation when the cervical spine is immobilised by a rigid collar


50 patients undergoing cervical spine surgery in tracheostomy Philadelphia collar

Vs

50 patients undergoing general surgery without collar

No sig. difference in intubation success (96v98%)
“Philadelphia” Collar
An unexpected complication of the intubating laryngeal mask

M. Branthwaite, Anaesthesia 1999

Case report of fatal oesophageal perforation following ILMA use in cataract surgery.
Intubation achieved with difficulty in a 77 year old (who might or might not have had an oesophageal diverticulum).

Awake tracheal intubation with the intubating laryngeal mask in a patient with diffuse idiopathic skeletal hyperostosis

Palmer JHM, Ball DR Anaesthesia 2000,55, 70-78

Case report

Female 48  BMI 34.2  Known grade 4 laryngoscopy
For laparotomy
TCI low dose propofol, fentanyl + topical/injected airway anaesthesia.
ILMA size 3 - fibrescope examination - awake intubation
“Diffuse idiopathic skeletal hyperostosis - D.I.S.H.”

Anaesthesia 2000, 55 p70-78
J H MacG Palmer, D R Ball
Selected cases for ILMA

- Known C & L grade 3
- Overbite and TMJ mouth opening limitation - ? Gd 3
- 140 kg female, very short neck
- Severe RA - previously only intubated nasally
- More than one consultant said “very difficult“
- Limited mouth opening - probable grade 3
- Overbite - previous grade 3 (2 cases)
- Card carrying grade 4 (severe RA + retrognathic)
Failures

1. Patient with Marfan`s syndrome
2. Wrong size ILMA selected
3 and 4. Don`t know why!
5. Late failure – severe RA, small mouth, bleeding from attempted FONI. Even ventilation difficult. Abandoned and FOOI performed with extreme difficulty.

How good is it really?

- Emergency airway management - SPEED + superior ventilation to standard LMA
- Steep learning curve
- Assisted fibreoptic oral intubation
- Cervical spine rigidity - head in neutral position
- Cervical spine trauma?
Intubating laryngeal mask use in neck injury patients

Letters x 2 Anaesthesia 2002,57, 407-410

- Cervical injury patients must be treated as needing RSI.
- ILMA insertion hindered by cricoid pressure.
- Always some (albeit slight) C spine movement.
- Securing the airway should be near 100 % guaranteed.
- No room for “blind” technique in these circumstances.
- (Little mention of fibreoptic intubation).

The LMA “ProSeal” – a laryngeal mask with an oesophageal vent

A I J Brain et al

X 2 seal pressure at 60 cm H2O pressure of standard LMA

Successful blind NGT insertion in 30 adult females
The LMA “ProSeal”
A laryngeal mask with an oesophageal vent

A.I.J. Brain et al
BJA 84 (5) 650-4 (2000)

Essential – cuff fully deflated for insertion

Desirable – cuff over inflated compared to standard LMA
Randomised crossover comparison of the ProSeal with the classic laryngeal mask airway in unparalysed anaesthetized patients

T.M.Cook et al  BJA 88 (4)  527-33 (2002)

180 patients randomised ( no NMBA used )
First insertion 90% standard LMA, 80% ProSeal
Seal pressure > 20 cm H₂O in 41% standard LMA
  > 20 cm H₂O in 87% ProSeal
( NGT placement possible in 92% ProSeal patients )
Conclusion : ProSeal better for IPPV

At Derriford :

Bougies
McCoy
ILMA
Proseal LMA
Fibrescope
Quicktrach
The future?

? Glidescope

? Video guided ILMA

FOLLOWING FAILED INTUBATION

ELECTIVE, WHEN DIFFICULTY PREDICTED

AWAKE INTUBATION

( ? + SEDATION )

ORAL - ANTEROGRADE - ( FIBRESCOPE )

- RETROGRADE

NASAL - BLIND - now historical

- FIBRESCOPE

TRACHEOSTOMY UNDER TOPICAL ANAESTHESIA.
Securing tube
NASAL FIBREOPTIC INTUBATION

PBH

- Preoperative preparation and assessment
- Premedication (certainly a drying agent...) when
- Monitoring
- Cannulation
- Sedation + oxygen therapy
- Vasoconstrictor

(continued)
(continued)

- Nasal topical local anaesthesia
- Head position / nurse assistant
- View cords + LA spray (if no cricothyroid injection)
- Wait
- Pass fibrescope to above carina
- Intubate
- Complete anaesthetic
LASER SURGERY IN ENT AND MAXILLO-FACIAL SURGERY

MECHANISM

HIGH ENERGY SOURCE \rightarrow \text{LASER MEDIUM} \rightarrow \text{LIGHT GUIDE} \rightarrow \text{FOCUS}

Laser light - coherent, monochromatic, minimal dispersion

\textit{Intense energy to small target sites}

LASER ACTION

Depends on:

- \textit{Power Density}
- \textit{Duration}
- \textit{Wavelength}
- \textit{Absorption}
- \textit{Scatter}
- \textit{Thermal Conductivity}
- \textit{Local Circulation}
Types of surgical laser

**Argon** - 500 nm (blue/green visible) - skin, retinas

**Carbon dioxide** - 10600nm (far infra-red) – penetration only 200 microns – ideal surface laser

**NdYAG** - 1060 nm (near infra-red) – fibreoptic transmission – absorbed by dark pigments - ideal for GI work

Problems associated with the use of lasers

- Risk of explosion/fire in the airway (gas ignition)
  
  ( = internal )

- Risk of airway fire due to tracheal tube ignition
  
  ( = external )

- Hazard to operating department personnel
  
  ( skin, eyes )
Precautions:

- Theatre environment
- Eye protection
- Surgical instruments
- Patient – skin, eyes
- ETTs – composition, shielding, cuffs
- Effect of gas mixture

ETT FIRES!

EXTERNAL

INTERNAL - "BLOW - TORCH"

Clear PVC tubes laser resistant in vitro

( not necessarily in vivo )

Therefore tube protection ++

0r Special laser tube
FIRE!

- STOP VENTILATING
- DISCONNECT BREATHING CIRCUIT AT ONCE
- SURGEON REMOVES ETT
- VENTILATE WITH 100% OXYGEN ( + VOLATILE )
- LARYNGOSCOPY + / - RIGID BRONCHOSCOPY
- RE-INTUBATE + / - LAVAGE + / - VENTILATION
- ? STEROIDS
- CXR