DIFFICULT AIRWAY SOCIETY

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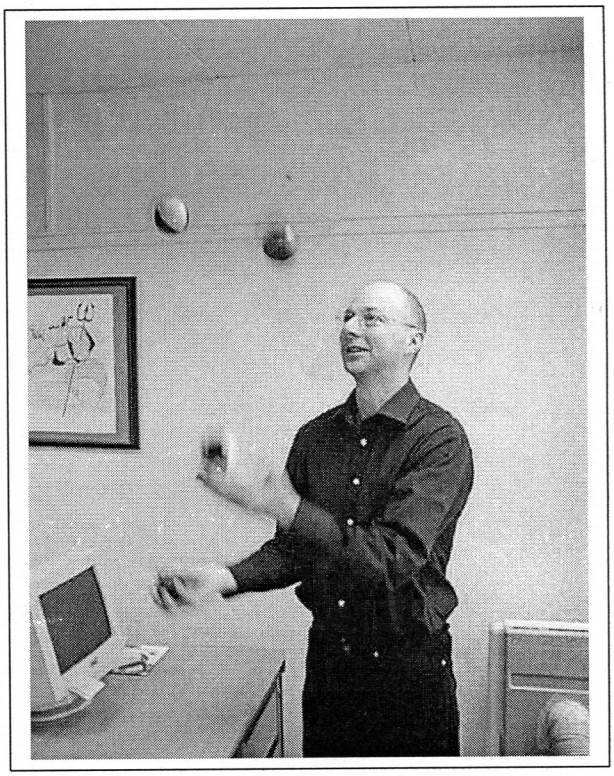

INSIDE THIS ISSUE

Newsletter

This newsletter was written by members of the Difficult Airway Society. The opinions expressed are those of the individual members and do not represent necessarily the view of the Society.

Any feed-back on this Newsletter, submissions for future editions or correspondence should be sent to;

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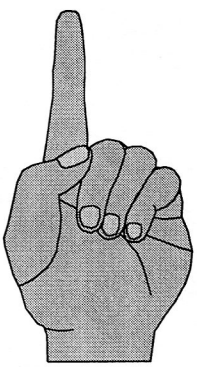
From The Editor: Welcome to a bumper issue of the Newsletter, and only 2 months behind schedule! Obviously trying to keep too many balls in the air at once (picture front page). Many thanks as always to contributors this month. I have had several comments on the failed intubation scenario from the last issue. Ideas, suggestions, criticisms always make a newsletter interesting and also hopefully valuable. Remember, as always, when you've read as much as you want of this leave it in your juniors room, they may fancy joining DAS, the application form is on the back, you could even encourage consultant colleagues to join!

In the papers you may have missed there's one about atropine for hiccups after LMA insertion . what are those hiccups all about? As usual our contributors have asterixed papers they consider particularly interesting– thank you to them all.
If you have any suggestions for style or content of this publication let us know – the address is on the front page. Letters are more than welcome – if you are sending them via email it would help if you could send stuff as attachments in word. If you know of meetings / courses that need publicising or you've got a clinical conundrum or a story of a particularly scary / hairy airway case let us know.

There's a pull out and keep section this issue about the history of fibreoptics which is well referenced – a fair bit of work obviously went into it so anyone who may be interested it's there for your enjoyment or to pass on to others.

We've got another book review towards the end of this issue about research in anaesthesia, it's not directly related to the airway but relevant for anyone. And of course we have a report of the DAS meeting at Oxford for those of you who were there as a reminder and for those who weren't as encouragement to come next year. On the serious side we start this issue with feedback following the piece submitted by Adrian Pearce in the last issue.

Chris Frerk



Forthcoming Meetings

15 March 2002

Torbay Difficult Airway Course.

TREC Lecture Theatre, Postgraduate Medical Centre.
Information: Dr Snow/Dr Pappin Anaesthetic Dept
Torbay Hospital, Lawes Bridge, Torquay, TQ2 7AA
Tel: 01803 654311,
Fax: 01803 654312.
E mail: nicola.woodbridge-smith@sdevonhc-tr.swest.nhs.uk.

Book Review

Conducting Research in Anaesthesia and Intensive Care Medicine.
Edited by Zbinden & Thomson
Butterworth Heinemann £45.00 ISBN 075064544X

The title sounds a little dull and the book is quite thick at 500 plus pages which I suspect is why I had trouble finding anyone to agree to review it. This meant that I ended up doing it myself, and in fact I'm very glad that I did. To cut a long story short, I was very pleasantly surprised and would suggest this is a "must read" for any anaesthetist considering embarking on research for the first time, or indeed any anaesthetist involved in research (with or without previous experience).
It is not a substitute for having an experienced mentor / supervisor (but it comes a close second). It is fairly easy to read and despite having 38 contributing writers from around the world has a consistent style throughout the book which is a tribute to the authors and editors and it is broken down into sensible chapters. Points are well made with the use of different tools such as humour, apocryphal tales, fables and well referenced works. The book covers the subject of research from start to finish, performing searches, designing trials, funding studies, how to write, get published and present the material at scientific meetings. Whilst the book is comprehensive enough to help anyone involved in large multi-centre drug trials, it also contains the kernels of good practice for anyone setting up or designing an individual research project in a department ensuring that it is done properly.

I am sure that having read this book the quality of my research will improve and I would recommend that every department should have a copy on its' shelves. Any anaesthetist wanting to start a research project should read this book first.

SPORTS PAGE

Weekday 09.00 a consultant anaesthetist was asked by an ENT consultant to help the anaesthetic registrar with a case scheduled for later that morning, a 70 year old 44kg lady post supraglottic laryngectomy, neck disection and radiotherapy for EUA and biopsy. Last anaesthetic 3 months previously was a gas induction – very difficult to maintain the airway and a small air bubble located the tumorous larynx. For extra **sport** the entire ENT surgical team arrived to enjoy the anaesthetic. How would you manage that one?

As usual no absolute rights or wrongs, this particular case was managed successfully as described below (thanks for sending it in):
After a glycopyrolate premed, iv access was obtained and 1.5mg of midazolam given, the trachea was marked and transtracheal injection of lignocaine given. Using the same puncture site a 13g jet catheter was inserted and secured, CO2 confirmed and then a sanders injector set to 2bar was connected. TCI propofol was started and the patient's lungs ventilated with the jet. The patient was paralysed with atracurium and was pushed past the surgeons into the operating theatre with the casual phrase "whenever you're ready chaps" from the anaesthetists.
The surgeons view of this- a) That was no bloody fun we all came in here to watch you lot sweat! And b) We get a good view without your usual tube in the way.
Ho hum

Application Form For Membership of Difficult Airway Society

If you would like to join the DAS, a non threatening, non expensive society then just photocopy this form fill it in and return it to the membership secretary: Dr Mansukh Popat, Dept Anaesthesia, John Radcliffe Infirmary, Headley Way, Headington, Oxford OX3 9DU. Or email him secretary@das.uk.com

Name .....
Address .....
.....
.....
email .....
Grade **Cons SpR SHO Staff Grade Other**.....
In which specialty do you meet difficult airways .....

Responses to Dr Pearce's report of a case of failed intubation

A Brief review of the case goes like this: Trainee anaesthetist, Emergency c/section. Thio sux, failed intubation, more sux, failed ventilation, cricothyroid puncture and cardiac arrest, baby delivered, senior help arrives intubation acheived – recovery.
The questions were – would an LMA have been a good plan? Was cricoid force contributory? What about experience and training in transtracheal access to the airway?
Full text available in last issue and on DAS website

Release cricoid pressure or never apply it?
Dr Richard Vanner
It is becoming fairly clear that cricoid pressure should be released completely when ventilation of the lungs is difficult following a failed intubation. We know that cricoid pressure can cause airway obstruction and also difficulty with the insertion of the laryngeal mask. What is less clear is whether cricoid pressure should be released earlier when intubation is difficult.Cricoid pressure can improve the view at laryngoscopy so why release it? The problem is cricoid pressure could make the use of the bougie more difficult when only the epiglottis is visible. This is because the bougie is normally passed under the epiglottis in the midline. The larynx is never in the midline when cricoid pressure is applied. The cricoid cartilage inevitably is pushed to one side or the other even during carefully and correctly applied cricoid pressure. This is because two convex structures are being pressed together, this is demonstrated on axial CT scans during cricoid pressure. The left tilt of the table makes it more likely that the larynx is pushed to the left with a right-handed assistant. I suggest that if only the epiglottis is visible, then cricoid pressure should be released to allow more precise passage of the bougie in the midline.If cricoid pressure is released during laryngoscopy and intubation still fails, cricoid pressure could be reapplied before mask ventilation to prevent gases entering the oesophagus. It can be released again if ventilation becomes difficult. Cricoid pressure is a reversible step, unlike giving another dose of suxamethonium. Why can't we continue to use cricoid pressure but release it if airway problems occur (suction to hand)? Cricoid pressure may be beneficial in the vast majority of cases where no airway problems occur. Therefore I will continue to use it when patients are likely to have a full stomach but I will release it when the risks of hypoxia outweigh the risks of aspiration.

Try an LMA before cutting the throat
Failed intubation, failed ventilation with facemask, the next step should be a laryngeal mask, it has saved lives before. It won't always work but if it doesn't and if you've used it early enough you'll still have time to go on to cricothyrotomy. You do need to release cricoid pressure to get the best chance with an LMA but you can insert it under vision with the scope in the mouth and suction if required. Strang *(No ref given. Ed.)* demonstrated that once the LMA is in cricoid pressure still works so it should be reapplied once ventilation is confirmed successful.

Training improves performance
Dr Pearce is right when he says hands on training is essential. Mannikin practise has been shown by Goodwin to improve performance in exactly the situation described (**ref *Simulation as a training and assessment tool in the management of failed intubation in obstetrics International Journal of Obstetric Anesthesia 2001:10;273-7***). Despite this many hospitals including my own still rely on the old tutorial method which may not be as effective when the chips are down.

Ed's comments:
I would agree with all of the above, training is crucial in all sorts of skills. Starting at the beginning with the cricoid pressure – I was hoping that lots of people would see the cricoid pressure training poster set up at the DAS meeting. Unfortunately the scales broke on the journey from base hospital – but as I understand it it's a lump of plastic (shaped a bit like cricoid cartilage) stuck onto a set of bathroom scales that you leave in theatres and the Odps and anaesthetic nurses can practise on it till 30 Newtons is easy with their eyes closed. **How about getting one set up in your suite as a new years resolution it could save a life?**
Mannikin training in cricothyrotomy was the subject of 2 posters and much chat at Oxford too. The evidence seemed to suggest that you need regular training to keep your skills up and that you should choose your cannula carefully. Sadly we are a way off this yet but its something to work towards. Crisis management training in simulators is becoming more widespread from the big simulators down to the Access simulators and similar mentioned above in the paper from the International Journal of Obstetric Anesthesia
Finally my own thought on Rapid sequence induction: after induction and muscle relaxant are in and starting to work (and the cricoid pressure is on) I give a gentle manual ventilation by facemask while waiting for the full effect of the relaxant. I think that this should not inflate the stomach as we have cricoid pressure and it serves as a diagnostic test:– If I can't see the cords I know already that I can ventilate the patient so I'm not in a panic, or I know already that ventilation is difficult so I can already be planning to move swiflty to LMA or transtracheal access while the patient is still pink. Is this heresy or have I missed something or is it part of a good idea?

AIRWAY PAPERS YOU MAY HAVE MISSED

Todays Anaesthetist

Nothing airway related this time

European Journal of Anesthesiology May-Aug 2001

Large floppy epiglottis as a cause of difficult intubation **18:**339-40
Intubation without relaxants in children **18:**384-8
Fibreoptic view through the LMA vs ILMA **18:**471-5

Anesthesiology May-Aug 2001

Gel lubrication of the tracheal tube cuff reduces pulmonary aspiration. **95:** 377-81.
Acromegaly, the Mallampati, and difficult intubation. **94:** 1149-50.
** Intubating laryngeal mask airway and muscle relaxants: Never together? **94:** 1151. *Thoughtful letter from Swansea*
LTA cannula can facilitate a difficult tracheal intubation. **94:** 1153.
** Pharyngolaryngeal morbidity with the laryngeal mask airway in spontaneously breathing patients: does size matter? **94:** 760-6
** A comparison of tracheal tube tip designs on the passage of an endotracheal tube during oral fiberoptic intubation. **94:** 729-31
Hemoglobin desaturation after succinylcholine-induced apnea: a study of the recovery of spontaneous ventilation in healthy volunteers. **94:** 754-9.
Use of the esophageal Doppler with the LMA-Proseal. **95:** 274.
Use of esophageal doppler with the LMA-Proseal. **95:** 274.
** Comparison of the intubating laryngeal mask airway with the fiberoptic intubation in anticipated difficult airway management **94:** 968-72.
Airway bleeding in negative-pressure pulmonary edema. **95:** 272.
** Fiberoptic orotracheal intubation on anesthetized patients. Do manipulative skills learned on a simple model transfer into the operating room? **95:** 343-8.
Mask tolerance and preoxygentaion: A problem for anesthesiologists but not for patients. **94:** 546.
Acromegaly, the Mallampati, and difficult intubation. **94:** 1150.
Head extension angle required for direct laryngoscopy with the McCoy laryngoscope blade. **94:** 939.

Anesthesia and Analgesia May-Aug 2001

Restoration of circulation after cessation of positive pressure ventilation in a case of "Lazarus syndrome". **93:** 241.
Gastric insufflation with the Proseal laryngeal mask. **92:** 1614-5.
Unlighted stylet tracheal intubation. **92:** 1356.
Difficult airway in a patient with Coffin-Siris syndrome. **92:** 554-5.
Grading intubating conditions: How and by whom? **93:** 804a.
** Fiberoptically-guided insertion of transtracheal catheters. **93:** 663-6.
Video imaging of the larynx needs careful examination. **93:** 143-244.
Intraoperative monitoring of the recurrent laryngeal nerve in 151 consecutive patients undergoing thyroid surgery. **93:** 396-9.
The implications of different failed endotracheal intubation rates. **93**: 241.
** The intubating laryngeal mask airway after induction of general anesthesia versus awake fiberoptic intubation in patients with difficult airways. **92:** 1342-6.
Atropine for the treatment of hiccup after laryngeal mask insertion. **93:** 791-2.
** Two-person technique for fiberscope-aided tracheal intubation in a patient with a long and narrow retropharyngeal air space. **92:** 1611-3.
Issues of concern for the aging anesthesiologist. **92:** 1487-92. *Not airway. May interest some members*
Resting esophageal sphincter pressure and deglutition frequency in awake subjects after oropharyngeal topical anesthesia and laryngeal mask device insertion. **93:** 226-9.
Reexamined: The recommended tracheal intubating dose for nondepolarizing neuromuscular blockers of rapid onset. **93:** 954-9.
The use of remifentanil to facilitate the insertion of the laryngeal mask airway. **93:** 359-62.
Pediatric endotracheal tubes: The advantage of outer diameter. **93:** 801-2.

The patient recovering from alcohol or drug addiction: special issues for the anesthesiologist. **92:** 1601-8. *Not airway – general interest*
The disposition of the cervical spine and deformation of available cord space with conventional- and balloon laryngoscopy-guided laryngeal intubation: A comparative study. **92:** 1331-6.
Gastroesophageal reflux and aspiration of gastric contents in anesthetic practice. **93:** 494-513.
Preoxygenation with tidal volume and deep breathing techniques: the impact of duration of breathing and fresh gas flow. **92:** 1337-41.
The influence of the laryngeal mask airway on the shape of the submandibular gland. **93:** 1069-72.
Maternal mortality during hospital admission for delivery: a retrospective analysis using a state-maintained database. **93:** 134-41.
Learning endotracheal intubation in a clinical skills learning center: A quantitative study. **93:** 656-62.
A comparison of the endotracheal tube and the laryngeal mask airway as a route for endotracheal lidocaine administration. **92:** 1505-9.
Anesthetic management of acquired tracheobronchial fistula: A brief report. **93:** 903-5.
The anesthetic management of a case of tracheogastric fistula. **93:** 1076-7.
Salbutamol prevents the increase of respiratory resistance caused by tracheal intubation during sevoflurane anesthesia in asthmati children. **93:** 898-902.
Can pediatric anesthesiologists detect an occluded tracheal tube in neonates? **93:** 66-70.
Comparing the articulating laryngoscope and external laryngeal pressure. **93:** 1078-9.
Arytenoid dislocation while using a McCoy laryngoscope. **92:** 1347-8.
Mouth-to-mouth ventilation during cardiopulmonary resuscitation: Word of mouth in the street versus science. **93:** 4-6.
Unlighted stylet tracheal intubation. **92:** 1355-6.
Reexpansion pulmonary edema after thoracoscopic mediastinal tumor resection. **92:** 1416-7.
The inability to detect expired carbon dioxide after endotracheal intubation as a result of ono-way valve obstruction of the endotracheal tube. **93:** 971-2.
Transient recurrent laryngeal nerve palsy after failed placement of a transesophageal echocardiographic probe in an anesthetized patient. **92:** 1422-3.

And From the Archives (Anaesthesia) As quoted by Adrian at the after dinner speech - the way difficult airways used to be managed by those in Welsh Wales!
The original = Callander & Thomas 1988:43;703-4
A variety of comments followed I may not have them all but here's five:
1989:44; 269 ,358, 619, 793, 870

The DAS Annual Meeting at Oxford 2001

The elegant and ornate Victorian Town Hall, Oxford, was the setting for this year's meeting of the Difficult Airway Society. Delegates were greeted by a DAS style market place: a plethora of fibreoptic workshops, airway equipment stalls as well as the ladies from the local charity Christmas card shop who thought that we were a band of British Airways subversives. After a warm welcome from Dr. Mansukh Popat, we we taken for a gentle stroll through the history of anaesthesia, culminating in rapid sequence induction as we know it today. Dr. David Levy questioned our current practice of suxamethonium and the 'rapid' component of rapid sequence induction and suggested advantages of administering rocuronium to provide optimum intubating conditions and lessen the hurry of 'getting the tube in'.

Professor Andy Ovassapian, presented his unrivalled experience of over 3000 awake fibreoptic intubations. He emphasised adequate preoperative preparation, the correct level of 'conscious sedation' and good quality local anaesthesia. Fibreoptic video footage of cases of 'redundant tissue' in the supra epiglottic region illustrated the difficulties and pitfalls of misinterpreted anatomy and the importance of a back-u plan, which might be a surgical airway, in the event of the failure of awake fibreoptic intubation. Professor Richard Cooper, our second North American guest speaker, gave a wonderfully lucid account of extubation strategies backed-up by a most extensive chapter in the symposium booklet. A selection of case scenarios illustrated principles of risk assessment and possible solutions, including his practice of leaving a trachea tube exchanger in the suspect airway to permit rapid reintubation. Comments from the floor indicated a UK practice of using the laryngeal mas as a conduit in suitable cases. The poster presentations featured sections on equipment, airway and training topics, during which we appeared t hear from most, if not all, of the members of the Oxford anaesthetic department who have been especially busy this year with audits. Of course our flexible friend the fibrescope had a starring role.

At teatime, the Annual General Meeting convened with a parallel, splinter group exchanging equally important ideas down the road at the Bear Darkness already upon us by 4pm, some delegates appeared to have started their night out far earlier than the 7.30pm kick off for the DAS dinner. This was held in the ballroom of the prestigious Randolph Hotel where in evening dress, under dimmed lights and the influence of a good nosh up, certain delegates looked markedly different. Commendably brief speeches didn't delay after dinner activity but it was evident th the Society's meeting had grown from 100 delegates (and 35 for dinner) in 1995 to 375 delegates and 180 for dinner at Oxford. Shortly after dinner certain amigos 'went loco' on the dance-floor, kicking up their heels and their skirts (yes, that includes you in the kilt) into the wee smal hours.

The second day began with a multidisciplinary session on the management of the unstable cervical spine. The experience from Oxford's Traun centre was transmitted through excellent talks from experienced surgeons and anaesthetists. We were reassured that there was no evidence of detrimental effects of direct laryngoscopy under general anaesthesia with manual in-line stabilisation. Other take home messages were to bewa of adjacent vertebral cervical spine injury, to consider the possible hazard of placement of an LM/ILMA with a damaged upper cervical spine and the benefit of a bougie. The free paper session is usually one of the highlights and gives trainees a chance to shine, or in the case of Dr. N. Bhandal, to 'illuminate'. Her presentation 'The comparison of the illumination generated by a Macintosh laryngoscope (with and without a Laryguard) and a disposable laryngoscope blade' won her the generous Storz prize of a trip to the anaesthetic department facilities and helicop ambulance in Mainz. Of course, the audience was 'enlightened' by her knowledge that 'Lux' was not just a bar of soap. The tongue featured heavily in other case reports which included the management of two cases of macroglossia, unexpected lingual tonsillar hyperplasia causing problems at extubation and C1 esterase inhibitor deficiency, where there is potential for lingual oedema.

In the last session, Professor Alan Brown from Michigan described his long-established difficult airway evaluation clinics which consist of not only clinical examination, but also dynamic radiological assessments with the C-arm and fibrendoscopic airway visualisation. This highly experienced speaker provided a wealth of practical advice. The meeting concluded with current Society projects. Adrian Pearce described the draft generic airway skills detailed in the Royal College of Anaesthetists SpR ½ competence based training document. John Henderson followe with a Society flowchart for management of failed ventilation and failed intubation using the core skills outlined earlier. There is still much to in airway teaching and training, but noticeable progress has been made and some structure to the syllabus has emerged. The relationship betwe the Society and the Royal College was discussed and Andy Ovassapian noted his North American experience that good practice was maintaine and developed by hard work at 'grassroot' level ultimately supported by higher bodies, and not the other way around.

It remained only to present the KeyMed prize of a top-quality Olympus digital camera to Dr Stringer for her poster 'Comparison of three mannequins used as models for fibreoptic intubation', to thank our overseas speakers for missing Thanksgiving and for Mansukh Popat to drav the meeting to a close. Many medical and non-medical people from the Oxford Region had put on a splendid meeting. Invigorated with ideas f research or training, determined to sort out that difficult airway trolley, and really determined to start a proper training programme delegates le to do battle with Oxford's one-way system or to suffer the vagaries of British Rail. There is always next year's fix for airway enthusisasts – 21st/22nd November 2002 at the Commonwealth Institute, London.

Dr Cheng Ong, SpR 5 airway fellow, Guy's and St Thomas' hospital

HISTORY OF FLEXIBLE FIBREOPTIC ENDOSCOPY AND INTUBATION

Dr V Hariharan FFARCSI

INTRODUCTION

The use of flexible intubating fibrescope for awake intubation in patients known to have a difficult airway is highly recommended [1]. Many indications were subsequently described. The use of flexible fibreoptic instruments in medicine was first described in gastroenterology in 1957 [2]. In 1967, Dr Peter Murphy described the first fibreoptically guided tracheal intubation using a choledochoscope [3]. The 1996/1997 NCEPOD report highlights the importance of fibreoptic intubating skill [4]. The need for training in fibreoptic intubation techniques is emphasized in the Royal College of Anaesthetists Specialist Training document [5] and in recent editorials [6]. It is therefore timely to add some interesting facts and anecdotes about the history and development of fibreoptic intubation.

EVOLUTION OF FIBREOPTIC TECHNOLOGY

Endoscopy was first developed to look into gastro intestinal structures [Greek Endon = within, Scopo = to look into]. Endoscopy as we know it today is a little over 100 years old. Three major inventions mark the progression to modern endoscopy. These are Edison's incandescent lamp, fibreoptics, and the charged couple device [7]. In 1806 Bossini used reflected candle light for various rectal specula [8]. With dependable and convenient illumination the period between 1882 and 1907 saw the development of a number of endoscopic instruments along three design lines

1. Open tubes without lenses but with proximal telescopes
2. Flexible gastroscopes which had to be straightened after passage
3. Rigid angulated instruments with lens systems; the most successful of which were the cystoscopes.

Further advancement was construction of the semiflexible gastroscope by Schindler in 1932 [9] which depended on a series of short focus lenses to allow flexion to 30 ° with retention of most of the image. In 1928 John Logie Baird took out a British patent on technology of light transmission through glass bundles. However in practice the image transmitted was very poor[10]. Attracted by the construction of fibreoptic glass bundles by Hopkins and Kapany [11] and a practical understanding of the limitations and defects of the lens optic gastroscope, Hirschowitz designed the first fibreoptic gastroscope [12]. The transition from lens optic to fibreoptic endoscopes took place over much of the first half of the 1960s.

EVOLUTION OF FIBREOPTIC INTUBATION

Introduction, Evolution of the technique and equipment, Physical principles,Current developments

Introduction

Tracheal intubation under direct vision was first described with straight laryngoscopes in 1910 by Elsberg [13]. Macintosh introduced his curved blade laryngoscope and technique of laryngoscopy in 1943 [14]. In order to avoid the consequences of failed intubation following conventional laryngoscopes several equipments were developed, of which the flexible fibreoptic laryngoscope represents the ultimate in equipment design for facilitation of endotracheal intubation.

Advantages of fibreoptic intubation are

a) Related to the instrument

- flexible instrument adaptable to airway anatomy
- excellent visualisation of the airway
- applicable to all age groups
- applied orally or nasally
- ability to apply topical anaesthesia and insufflate oxygen
- ability to use camera and closed circuit television

- high success rate in difficult intubation
- prevention of unrecognised oesophageal and endobroncheal intubation
- definitive check of tube position
- less traumatic than rigid laryngoscope
- less cardiovascular changes during awake intubation than with rigid laryngoscopes
- excellent patient acceptability for awake intubation

Evolution of fibreoptic technique and equipment

In 1967, Dr Peter Murphy, then anaesthetic Senior Registrar at National Hospital for Nervous Diseases, Queen's Square, London, reported the first fibreoptically guided intubation, using a flexible choledochoscope [3]. This was the first report of flexible fibreoptic technology being applied to the airway.

The following is Dr Murphy's reply to the Difficult Airway Society published in Anaesthesia [15] .

" I will tell you the story as well as I remember it. An article appeared in the Lancet in 1965, while I was a Senior Registrar at Queen's Square, describing the use of a newly invented choledochoscope for common bile duct stone identification [16]. Keep in mind this was no modernday bronchoscope; the lens looked to one side and there was no control over the position of the tip. I wrote to American Cystoscope Manufacturers Incorporated, the US manufacturers, describing the intended use. To my absolute astonishment and delight a parcel arrived two weeks later containing a new instrument in a beautiful walnut case. My guess was that the instrument was worth well over two thousand pounds sterling. Since I had been moderately successful with blind nasal intubations, I decided to use this technique, inserting the choledochoscope inside the endotracheal tube to establish a good view of the glottis. Then I could poke the fibreoptic into the larynx first, and follow with the tube which proved to be relatively easy. Robert Beaver close to retirement and chairman of the department, had no idea that I had been sent this scope. That week a visiting professor came to call. In the middle of one of my first runs with the scope the professor passed by with Dr Beaver. He was obviously intrigued by the sight of a registrar trying to intubate with a long floppy stylet. He insisted on how this thing could "see round the bends". I remember launching into a discussion about light refraction when the rotund Dr Beaver insisted on taking over the lecture: "that black tube Dr Murphy is using for intubation is full of tiny Lucite balls you see", he said and as they turned to leave the room he completed the explanation "and the image passes naturally from one sphere to the other ".

A delightful explanation and much simpler and less tedious than the one I had in mind.

After the article was published I received hundreds of requests for reprints, from every corner of the globe. All these letters came from otorhinolaryngologists asking the same question " Can you see clearly enough to make a diagnosis of a tumor in the nasopharynx or larynx?". Not one request came from an anesthesiologist and this depressed me a little. However, I went on to use the scope to position double-lumen tubes and place right bronchial tubes, so I could see the upper right lobe bronchus was not obstructed by the tube."

In 1968, the fibreoptic bronchoscope was first described and its use to visualize the upper and lower airway was reported by Shigeto Ikeda in 1970 on 100 lung cancer patients [17]. The use of the broncho fibrescope for difficult airway management was first suggested in 1972 by Taylor and Towey (UK). Thei technique involved introducing the fibrescope and endotracheal tube together, so that the fibrescope acte as a stylet and enabled the anaesthetist to visualize the progress of the tube towards the vocal cords. They also described the use of the suction port to spray local anaesthetic onto the vocal cords [18]. In the same year Conyers, Wallace and Woodhouse (Canada) reported use of the bronchofibrescope for awake intubation in a patient with rheumatoid arthritis. They introduced the fibrescope through the nose, identified the cords and railroaded the tube after the fibrescope tip had entered the trachea [19]. This technique is currently favoured.

In 1972 Stiles et al used a newly built dedicated fibreoptic laryngoscope with a working length of 45 cm and insertion cord diameter of less than 6 mm and reported a case series of 100 fibreoptic intubations, in 34 of whom tracheostomy was avoided. They also commented on difficulties in railroading and suggeste use of Magill latex armoured tubes and a spiral motion to facilitate railroading. They had four failures du to secretions. Their method also involved endoscopy first, followed by endotracheal tube railroading[20]

In 1973 Davies in conjunction with American Optical Corporation, designed and used a fibreoptic laryngoscope (Fig1) with an insertion cord 35 cm long and with a diameter of 5.5 mm commenting on th

Even at that stage an important design feature was the ability to supply light not only with an external fibreoptic illuminator but also by a snap on battery handle which enabled use without the external source. He described a patient with ankylosing spondylosis in whom an awake intubation was performed by passing tube first into the nasopharynx and then the fibrescope into it [21] .
In 1974 Prithiviraj and colleagues described the use of a similar fibreoptic laryngoscope. The diameter of the insertion cord was 6.25 mm and the length 49 cm (Fig2). It was different from the one described by Davies in that only a size 8 or larger endotracheal tube could be used [22].
Realising the limitations of the bronchofibrescope and early fibreoptic laryngoscopes, Olympus in Japan in 1980 marketed the first modern range of laryngofibrescopes (LF) starting with the LF-1. The insertion cord length (60 cm) was made long enough so that a tracheal tube could be easily loaded with enough length available to gain access to the trachea before railroading would start. The insertion cord was also made more robust to withstand the forces of railroading a tracheal tube and its diameter reduced to 4 mm to accommodate smaller size ET tubes of 5 mm and larger.

Physical principles

This depends on the phenomenon of total internal reflection of light first described by the Dutch phycist Christiaan Huygens in the 17th century. He noted that if light travels from one medium of high refractive index to another of low refractive index for example from water to air, then the beam is slightly bent as it crosses the interface. By suitably adjusting the angle of incidence of light, it is possible to reflect the beam within the glass itself without emerging into air.
By doing so the beam must emerge at the far end without loss of light. This is the principle of modern fibreoptic endoscopy. Glass fibres are arranged in bundles with many such bundles arranged together in the insertion cord. Two different bundles are recognized, one for image transmission and the other for light transmission. The image transmission bundles are coated with glass of low refractive index to avoid loss of light by a process, called 'Cladding'. The image transmission fibres are called coherent bundles and those transmitting light, non coherent bundles.

Current developments

Currently fibrescopes from different manufacturers are available for a wide range of applications in anaesthetic and intensive care practice. Some from the Olympus ® range are described here.
The successor to the LF-1 is LF-2 (Fig3) introduced in 1992, the major difference being the improvement in suction channel which is operated by a spring loaded suction valve.
Battery powered fibrescopes have recently become available to increase versatility and portability of these instruments. Examples include the LF-GP (G= General purpose, P= Portable) which is the battery powered version of LF-2. LF-TP
(T= Therapeutic, P= Portable) with insertion cord diameter of 5.5 mm for ICU use. A fibrescope for double lumen tube placement, the LF- DP (D=Double lumen, P= Portable) and for paediatric use, the LF-P with diameter of 2mm and no suction port. is also available.

CONCLUSION

Because fibreoptic technology eliminated the physical and anatomical limitations of rigid instruments and provided enough light for proper inspection, photography, and simultaneous teaching, endoscopy has undergone explosive growth and has engaged an ever-widening circle of practitioners who have in turn added literally dozens of improvements to instruments, applications and techniques. Perhaps the time has now come for the fibreoptic laryngoscope to be kept in the " routine" intubation trolley rather than the "difficult " intubation trolley.

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