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Croatian Society of Difficult Airway Management
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S MEĐUNARODNIM SUDJELOVANJEM**

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WITH INTERNATIONAL PARTICIPATION***

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Sažeci pozvanih predavanja / Abstracts of invited lectures (L1-L21)

L1.

Identification of difficult and failed airway

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Abstract

The maintenance of optimal oxygenation and ventilation of the patient's lungs is a fundamental goal of every anesthetist and essential to patient safety. Morbidity and mortality result when oxygenation cannot be provided. This may occur if there is difficulty or failure with face mask, supraglottic device, tracheal tube and transtracheal devices.

The Difficult Airway-There is no consensus about the definition of difficult airway in the literature. Safe airway management is an interplay between patient factors, clinical settings and skills, experience and behavior of the individual anaesthetist. Thus an appropriate definition for the difficult airway would be: *The clinical scenario when safe oxygenation and ventilation cannot be achieved in the desired way with the use of an individual's usual practice.*

In clinical practice, the difficult airway has four dimensions: Difficult BMV, Difficult laryngoscopy and intubation, Difficult EGD, difficult cricothyroidotomy. These four dimensions can be easily recalled for rapid use in the emergency setting by using the mnemonics: MOANS, LEMON, RODS, SHOR.

The Failed Airway. A failed airway may be considered as: failure to maintain acceptable oxygen saturations during or after one or more failed laryngoscopic attempts (CICO-can't intubate, can't oxygenate), and three failed attempts at orotracheal intubation by an experienced intubator, even when oxygen saturation can be maintained.

Clinically, the failed airway presents itself in two ways, depending on the urgency created by the two different conditions: 1. there is not sufficient time to evaluate or attempt a series of rescue options, the airway must be secured immediately because of an inability to maintain oxygen saturation by BMV (this is the CICO scenario), 2. there is time to evaluate and execute various options because the patient is in a "can't intubate, can oxygenate" situation.

The most important way to avoid airway management failure is to identify in advance those patients for whom difficulty can be anticipated with intubation, BMV, insertion of an EGD or cricothyroidotomy.

Unanticipated difficult tracheal intubation presents a major problem for anaesthetists, intensivists and emergency physicians. The incidence in the operating room has been reported as 1-18%. Most approaches to the prediction of difficult intubation involve simple bedside physical examinations but despite the presence of these numerous preoperative tests to predict a difficult airway, there is no reliable bedside method.

Assessing the airway preoperatively allows us to choose the most appropriate and safest management technique, prepare back-up plans, organize any extra equipment and personnel that may be required.

Effective airway management requires careful planning. The techniques which have been recommended in management of difficult airway should be an integral part of continuing airway training. This can be achieved by acquisition of knowledge in classroom teaching, learning practical skills and used in clinical practice, when appropriate.

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L2.

I-gel and I-gel O2

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Abstract

Dr Nasir will be exploring the history & development of the i-gel supraglottic airway, as well as reviewing the published clinical evidence for the device. The presentation will also cover extended indications for use, paediatrics and the new i-gel O2 Resus Pack.

The i-gel airway is a novel and innovative supraglottic airway management device, made of a medical grade thermoplastic elastomer, which is soft, gel-like and transparent. The i-gel is designed to create a non-inflatable anatomical seal of the pharyngeal, laryngeal and perilaryngeal structures whilst avoiding the compression trauma that can occur with inflatable supraglottic airway devices.

L3.

Difficult airway management algorithms: from past to future

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Maintenance of oxygenation of the patient during anaesthesia is the first and the most important task for the anaesthetist

Airway management is also the most important patient safety issue in the anaesthetic practise. Although the difficulties in airway management, is not very seldom, the complications and adverse events related with difficult airway can be serious, even life threatening. During the last two decades some national societies had published algorithms and/or guidelines for the difficult airway management. They had been published by American, German, French, Canadian, Italian, UK and most recently by South African. 1 – 9

The main topics of this lecture are definition of terms, the advantages and/or disadvantages of the use of these guidelines, comparison of different DAM algorithms and guidelines and the expectations from the future.

The term algorithm, originated from al_Khwarizmi, the famous Persian mathematician, is a step by step procedure for calculations in mathematics and computer science. (<http://en.wikipedia.org/wiki/Algorithm>) Every field of science including medicine has its own problems and needs efficient algorithms.

A medical algorithm is any computation, Formula nomogram or look up table useful and helpful in healthcare. Medical algorithms include decision tree approaches to healthcare treatment. (http://en.wikipedia.org/wiki/Medical_algorithm) .

Algorithms are stepwise procedures developed from a great number recommendations and are well suited for automation and training procedures. The terms "Guidelines" and "Practice Guidelines" are used instead of algorithms in medicine. A medical guideline is a document with the aim of guiding decisions and criteria regarding diagnosis, management and treatment in specific areas of healthcare, such as "Difficult Airway Management". (http://en.wikipedia.org/wiki/Medical_guideline)

They are systematically developed recommendations which assist the physician and patient to make decisions. In practical point of view, this is the nearly same

with algorithm. Both of them are not intended as standards which are defined as generally accepted principles for patient management are obligatory. The algorithms of Difficult Airway Management are also called as "Guidelines" or "Practise Guidelines" since 1993.¹

The first Difficult Airway Management Algorithm" had been released from United States by ASA as a consequence of the high number of perioperative respiratory adverse events during airway management in 1993. 1 It was followed by a number of guidelines from other countries. 2 – 8 ASA revised its own guidelines in 2003. 5 The latest existed in South Africa in 2008. 9

Although they are not mandatory, it is well known that some benefits has been resulted in anaesthesia respiratory adverse events after the use of guidelines. The analysis of anaesthesia related adverse respiratory events has shown that there has been a significant decrease in the rate of respiratory adverse events after the use of ASA Guidedlines in 1990's. 10,11

DAM Guidelines facilitate airway management, with presenting alternatives for different clinical situations and improve the quality of the clinical practise and patient outcome. The most important advantage provided by the guidelines is the increasing success rate in airway management.

Although the task of all guidelines are same, there are some differences between them. Almost all strongly recommend the preoperative evaluation to predict the difficulty and maintenance of oxygenation of the patient during the procedure.

The main common recommendations of different national societies or groups are for unanticipated difficult airway. Some also includes recommendations for anticipated difficult airway (ASA, Italy, France, Germany). 1,2,5,7,8 Guidelines which include management of the anticipated difficult airway recommend an awake intubation technique incase of anticipated difficult airway. If awake technique is not possible, a technique with maintenance os spontaneous breathing is recommended. 1,2,5,7,8

Guidelines of DAS from UK cover both routine and rapid-sequence induction in a non-obstetric patient. They also recommend the use of back-up plan s. if the primary tecnique fails. DAS guidelines contains four steps, inwhich the last stes, Plan D, describes rescue techniques for the "cannot intubate, cannot ventilate" "CVCI" situation. 6

The recommendation of the German Society depends on the condition of the patient, the type of the surgery, and the skills of the anaesthetist. It looks like the 2003 ASA Guidelines. 7

Italian guideline which was published first in 1998 and revised 2005 separates anticipated and unanticipated into two flow charts. Strategy for anticipated DAM depends on differentiation between borderline and severe cases in Italian guideline. 4 – 8

Many other algorithms for airway management have been released from different fields of medicine by special societies or groups. Mostly the emergency societies or groups produced their airway management algorithms, the European Resuscitation Council produced as well. Obviously none of them are applicable to the anaesthetic practise. 12 – 14

As mentioned previously, the last guideline regarding difficult airway has been released from The South African Society of Anaesthesiologists in 2008. Actually it is

not a guideline for difficult airway management. It is a recommendation for "Airway management Resources in Operating Theatre". It focuses on the needs for different situations in different types of hospitals. 9

Extubation of the patient is one of the aspects of the airway management. But considerable little consideration has given to the extubation. Some guidelines contains some recommendations for extubation of difficult airway. ASA2003 recommends to have a preformulated strategy for extubation of the difficult airway which should depend , in part,on the surgery, the condition of the patient, and the skills and preferences of the anaesthesiologists. 5 The guideline specified for extubation of difficult airway was published in 2012 by DAS in UK. 15 It describes the basic algorithm which is continued as guidelines for at risk and high risk patients.

Although it is very well known that the use of algorithms have improved airway management, there is no evidence for the superiority of any algorithm. It is much more important that each department, even each anaesthetist,should have and practise its own accepted algorithm rather than discussing the superiority of algorithms and devices.

It is expected the renovation of the present difficult airway management algorithms. There are a number of devices introduced in this field with the improvement of technology. Seperated guidelines for different patient groups, such as obstetrics, paediatrics, ICU, etc., should be expected in the near future.

Guidelines depending on the resources of the health care units or hospitals will appear in the future more.

It is strongly recommended not to forget that "The patients do not die because of failed intubation, but hypoxia/anoxia kills them.

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L4.

Airway management disasters, lessons from UK

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Abstract

The Forth National Audit Project (NAP4) was set up by the Royal College of Anaesthetists and Difficult Airway Society to provide an insight into major complications of airway management in the United Kingdom. The NAP 4 found that one serious airway complication such as death, brain damage, the need for surgical airway or unexpected intensive care admission, was reported for every 5500 general anaesthetics. Most of the events happened during day-time to a senior experienced clinicians. Airway Assessment was not recorded before surgery in 74% of patients that ended up with life threatening airway complications. Aspiration was responsible for 26% of life threatening airway complications and

for 50% of all deaths. The NAP4 found that airway problems were twice as common in obese patients (BMI 30 – 35) and four times as common in morbidly obese (BMI > 35). Awake fiberoptic intubation was indicated and not performed in a significant number of reported incidents. Thirty percent of serious airway complications were associated with extubation or removal of laryngeal mask airway at the end of anaesthesia. The findings of the NAP4 have the potential to significantly influence airway management practice of all anaesthetists irrespective of where in the world they practice anaesthesia.

Sažetak

Kraljevsko udruženje anesteziologa i Društvo za zbrinjavanje otežanoga dišnog puta u Velikoj Britaniji su započeli Četvrti nacionalni istraživački projekt (NAP4) kako bi se pobliže istražile značajne komplikacije povezane sa zbrinjavanjem dišnoga puta u Ujedinjenom Kraljevstvu. Projekt NAP4 je pokazao da na svakih 5500 općih anestezija dolazi do jedne ozbiljne komplikacije povezane s dišnim putem; radilo se o smrti, oštećenju mozga, potrebi za kirurškim osiguravanjem dišnoga puta ili neplaniranom prijemu u jedinicu intenzivnog liječenja. Većina tih komplikacija dogodila se tijekom dnevne smjene i to starijim, iskusnim anesteziolozima. U 74% pacijenata kod kojih je došlo do životno ugrožavajućih komplikacija povezanih sa zbrinjavanjem dišnoga puta procjena istoga nije bila zabilježena prije operacije. Aspiracija je bila uzrok životno ugrožavajućih komplikacija u 26% slučajeva, a odgovorna je i za 50% smrtnih ishoda. Projektom NAP4 pokazano je da su problemi s dišnim putem dva puta češći kod pretilih (BMI 30 – 35 kgm⁻²) i četiri puta češći kod patološki pretilih bolesnika (BMI > 35 kgm⁻²). U značajnom postotku uočenih incidenata fiberoptička intubacija u budnosti bila je indicirana, no nije bila korištena. Trideset posto ozbiljnih komplikacija u zbrinjavanju dišnoga puta bilo je povezano s ekstubacijom ili uklanjanjem larinealne maske na kraju anestezije. Rezultati nacionalnog projekta NAP4 mogli bi značajno utjecati na način zbrinjavanja dišnoga puta bilo gdje u svijetu.

L5.

Airway management safety in critical care

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Abstract

Airway management (AM) in emergency for critically illness is more challenging than in OR: this is true regarding AM in ICU as for every intervention in the emergency department (ED), including those requested for the Rapid Response System who

care for critically ill patients answering to the ward emergencies. Critical care staff must consider the risks of many factors, starting from the limited physiologic reserve of these patients; moreover, waking up the patient is often impossible. As a consequence, the likelihood of difficult bag mask ventilation or/and difficult intubation are strongly increasing. Unfortunately too often the practitioners who must care for emergency management of critically ill patients, have a limited experience in airway safety strategies and the incidence of failed airway control and of cardiac arrest related to airway management in critical care systems is higher than in the anaesthesia field (OR). Reasons for adverse outcome include: progressive illness, requiring rapid intubation; reduced time for preparation; hypoxaemia despite preoxygenation; increased risk of profound hypotension or cardiac arrest at anaesthetic induction; risk of aspiration, due to a full stomach; associated injuries, making intubation difficult (e.g. maxillofacial trauma, potential cervical injury, etc.); challenges related to the location (e.g. limited availability of difficult intubation equipment, less experienced assistance, lack of capnography, limited access to the patient). In these situations skills are crucial, but the physicians and the nurses managing the airways of the critically ill patient, particularly out of high dependency care area, may be relatively inexperienced to solve the crisis and the adverse events are too often related to the failure of the organization of the rescue team.

The literature underlines that the need to implement airway management protocols to reduce the incidence of severe and life-threatening complications associated with advanced AM in critical care patients. The strategy suggested by Jaber et al for the management of intubation in the ICU describes a 'ten-point care bundle' which could be adapted for every AM in emergency. The more recent results from the fourth National Audit Project (NAP4), underline that deaths or severe neurological injuries among all the examined cases in critical care are due to failed or unrecognised oesophageal intubation, airway displacement, haemorrhage, airway problems during patient transfer, other. This means that we must improve safety strategies for AM in critical care, considering the causes of errors and adverse events:

- a) Communication (includes verbal, written and non-verbal: between individuals, teams and/or organizations)
- b) Education and training (i.e. availability of training)
- c) Equipment/resource factors (i.e. clear machine displays, poor working order, size, placement, ease of use)
- d) Medication (where one or more drugs directly contributed to the incident)
- e) Organization and strategic (i.e. organizational structure, contractor/ agency use, culture)
- f) Patient (i.e. clinical condition, social/physical/psychological factors, relationships)
- g) Task (including work guidelines/procedures/policies, availability of decision-making aids)
- h) Team and social (including role definitions, leadership, support and cultural factors)
- i) Work and environment (i.e. poor/excess administration, physical environment, work load and hours of work, time pressures)
- j) Others

Equipment and back-up planning must be adequate and a difficult airway trolley or bag, composed of a wide range of devices and regularly checked, should be immediately available. The use of continuous capnography, the recognition of difficult AM, a back-up planning and rescue strategy must be included in training strategies regarding education in human factors and simulation.

The human factors and the role of the Anaesthetic Non-Technical Skills (ANTS) must be underlined to improve human performance and to enhance patient safety in critical care.

A core competencies curriculum should consider to improve the training in Anaesthesiology, Pain and Intensive Care Medicine: the Competency-Based Training in Intensive Care in Europe (CoBaTrICE) project and training programme (www.cobatrice.org), defined the core (minimum) competencies required to a specialist in Intensive Care. Nevertheless, the NTS role is better emphasized in the Postgraduate Training Program from the Standing Committee on Education and Training of the Section and Board of Anaesthesiology (UEMS/EBA Guidelines and Syllabus). The specialist in "Anaesthesiology" can be considered an expert for the airway management, but something can be improved, moreover in critical care systems.

L6.

Complications of airway management in intensive care medicine

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Abstract

Introduction: Maintaining the airway in patients in ICU is often vitally important issue in the successful treatment of patients.

Aim: In our work we try to show complications as the most common causes of difficult ventilation in patients in ICU.

Methods: A study is retrospective which included 12 patients with difficult pulmonary ventilation, aged 12-70 years, 8 male and 4 female. All patients were intubated for a period of 7-14 days on mechanical ventilation, and to the need for prolonged mechanical ventilation the patients underwent surgical tracheotomy and a tracheal cannula was placed in 5 patients. Patients with unilateral atelectasis of the lung underwent bronchoscopy and airways lavage. All patients are regularly conducted intensive clinical observation and diagnosis, X-ray, CT and MRI. All patients were under antibiotic protection, as well as symptomatic and supportive therapy.

Results: 5 patients underwent tracheotomy. One patient with Down syndrome, two hours after general anesthesia, tracheal rupture had been done. He developed a massive pleural, mediastinal and subcutaneous emphysema. 7 patients with unilateral atelectasis of the lung underwent bronchoscopy and airways lavage. In 2

patients the therapeutic bronchoscopy with lavage was repeated twice, while we are in one patient repeated bronchoscopy 4 times in a period of 6 months. Eight patients died, whereas 4 patients survived. Of the patients with polytrauma two were in vigil coma, one has survived a period of 6 months, while the other died for respiratory failure.

Conclusion: It is important to promptly recognize and appropriately treat complications in maintaining airway in patients in the ICU, especially in patients with multiple trauma or conditions after extensive surgery. Prevented hypoxemia, as a result of hypoxia, has far-reaching significance to the clinical course and success in treating patients.

Sažetak

Uvod: Održavanje dišnog puta kod bolesnika u jedinici intenzivnog liječenja je često vitalno bitan problem u uspješnom liječenju bolesnika.

Cilj: U našem radu nastojimo prikazati komplikacije kao najčešće uzroke otežane ventilacije bolesnika u JIL-u.

Metode: Studija je retrospektivna u koju je uključeno 12 bolesnika s otežanom plućnom ventilacijom, starosti od 12-70 godina, 8 muškog i 4 ženskog spola. Svi bolesnici su bili intubirani u periodu od 7-14 dana, na mehaničkoj ventilaciji, a radi potrebe za produženom ventilacijom bolesnika.

Kod bolesnika sa unilateralnom atelektazom dijela pluća rađena je bronhoskopija i lavaža dišnih puteva. Kod svih bolesnika se redovno provodila intenzivna klinička opservacija i dijagnostika, RTG, CT, MRI. Svi bolesnici su bili pod antibiotskom zaštitom, uz ostalu simptomatsku i suportivnu terapiju.

Rezultati: Kod 5 bolesnika učinjena je traheotomija. Jedan bolesnik sa sindromom Down, dva sata nakon opće anestezije imao je rupturu traheje. Razvio se masivni pleuralni, medijastinalni i podkožni emfizem. Kod 7 bolesnika sa unilateralnom atelektazom dijela pluća rađena je bronhoskopija i lavaža dišnih puteva. Kod 2 bolesnika terapijska bronhoskopija sa lavažom ponavljana je dva puta, dok smo kod jednog ponavljali bronhoskopiju 4 puta u periodu od 6 mjeseci. Osm bolesnika je umrlo, dok su 4 bolesnika preživjela. Od bolesnika sa politraumom dva su bila u stanju vigilne kome, jedan je preživio period od 6 mjeseci, dok je drugi umro radi respiratorne insuficijencije.

Zaključak: Komplikacije u očuvanju dišnog puta kod bolesnika u JIL-u važno je blagovremeno prepoznati i adekvatno tretirati, naročito kod bolesnika s politraumom ili stanjima nakon ekstenzivnih operativnih zahvata. Spriječena hipoksemija kao posljedica hipoksije ima dalekosežan značaj na klinički tijek i uspjeh u liječenju bolesnika.

L7.

The role of ultrasound on the airway management of critically ill patients

Uloga ultrazvuka u zbrinjavanju dišnog puta

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Sažetak

Primjena ultrazvuka u zbrinjavanju dišnoga puta predstavlja relativno novi, ali vrlo koristan i u praksi sve prisutniji način primjene ultrazvuka u anesteziji i intenzivnoj medicini. Moguća primjena je vrlo široka i uključuje preintubacijski ultrazvučni pregled, verifikaciju pravilnog položaja endotrahealnog ili endobronhalnog tubusa ili laringealne maske, procjenu točnog izbora veličine tubusa kao i potencijalnu predikciju neuspješne ekstubacije u mehanički ventiliranih bolesnika tijekom procesa odvajanja od respiratora. Također, ultrazvuk može biti vrlo koristan pri perkutanoj traheostomiji ili u loko-regionalne anestezije gornjih dišnih puteva.

Preintubacijski ultrazvučni pregled uključuje procjenu debljine pretrahealnog mekog tkiva kao dobrog prediktora otežane intubacije, detekciju tumoroznih tvorbi vrata i štitnjače ili drugih uzroka kompresijske opstrukcije gornjeg dišnog puta, a u slučaju hitne intubacije ultrazvuk se koristi za procjenu količine i karaktera želučanog sadržaja. Ultrazvukom se jednostavno može vericirati pravilan položaj endotrahealnog tubusa ili laringealne maske direktnom vizualizacijom istih ili indirektno na temelju respiratornog gibanja diafragme odnosno pomicanja pleure. Na isti način, putem indirektnih znakova, moguće je verificirati korektan položaj dvoluminalnog endobronhalnog tubusa. Ultrazvučnim mjerenjem dušnika moguće je učiniti ispravni probir veličine endotrahealnog tubusa što je neobično bitno u pedijatrijske i neonatološke populacije, a također, na temelju dobro poznate korelacije između dijametra traheje i glavnog bronha, na isti način je moguće procijeniti veličinu dvoluminalnog tubusa. Predikciju neuspješne ekstubacije pomoću ultrazvuka vršimo procijenjući (dis)funkciju dijafragme i količinu neventiliranog („kondenziranog“) plućnog parenhima na početku i na kraju tzv. „testa spontanog disanja“ („spontaneous breathing trial“).

Ultrazvučno-vođena pukcija dušnika prilikom perkutanog postavljanja traheostome predstavlja poznatu i u literaturi višestruko opisanu tehniku pomoću koje se značajno reduciraju ozbiljne potencijalne komplikacije perkutane traheostomije: krvarenje, kranijalni (subkrikoidni) plasman kanile i hiperkarbija. Također, ultrazvuk može biti koristan u ciljanoj, topičkoj aplikaciji lokalnog anestetika u dušnik („translaringealni blok“) ili pri direktnoj, ultrzvučno-vođenoj blokadi gornjeg laringealnog živca.

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L8.

Airway management in intensive care medicine

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Abstract

Airway management in the ICU is a challenging procedure and is frequently associated with life threatening complications. The number of difficult intubations ranges from 10% to 22%, depending on the setting and the patients in need for endotracheal intubation. Regularly multiple attempts are needed to secure the airway. Despite the high risk for patients in the ICU setting, equipment for airway management such as capnometry or alternative devices are not always present. The novel technique of video laryngoscopy has been recently introduced into clinical practice in the operating room. First results from larger studies are very promising that these new devices are helpful for successful intubation with viewer attempts in difficult intubation scenarios. At the same time several reports show that successful use of video laryngoscopes in emergency situations need substantial practical training and expertise in airway management. Use of a protocol for airway management has been shown to decrease complications. Part of this protocol is appropriate staffing, pre-oxygenation and strategies to avoid cardiovascular complications. In summary, a high practical skill of airway management is needed in critically ill patients. Monitoring such as capnography and alternative equipment for securing the airway is not just mandatory in the operating room but also in the intensive care unit.

Sažetak

Zbrinjavanje dišnog puta u Jedinici intenzivnog liječenja (JIL) je izazovan postupak i često se povezuje sa životno opasnim komplikacijama. Incidencija otežane intubacije varira 10% do 22%, ovisno o uvjetima i bolesnicima kojima je potrebna endotrahealna intubacija. Uobičajeno je potrebno više pokušaja kako bi osigurali dišni put. Unatoč visokom riziku za bolesnika u JIL okruženju, oprema za osiguranje dišnih putova kao što su kapnometrija i alternativna pomagala često nisu prisutna. Nova tehnika video laringoskopije je nedavno uvedena u kliničku praksu u operacijskoj dvorani. Prvi rezultati većih studija su vrlo obećavajući jer pokazuju da su ti novi uređaji korisni za uspješno intubaciju s manje pokušaja kod otežane inubacije. Istodobno je nekoliko izvješća pokazalo da uspješna uporaba video laringoskopa u hitnim situacijama zahtjeva stalnu praktičnu uvježbanost i stručnost u osiguranju dišnog puta. Primjena protokola za zbrinjavanje dišnih putova je smanjila komplikacije. Dio ovog protokola čine odgovorajuće osoblje, pre-oksigenacija i strategije za izbjegavanje kardiovaskularnih komplikacija. Ukratko, u bolesnika u jedinici intenzivnog liječenja je potrebna visoka praktična vještina zbrinjavanja dišnog puta. Praćenje, kao što su kapnografija i alternativna pomagala za osiguranje dišnog puta nisu samo obvezna u operacijskoj dvorani, nego i u jedinici intenzivnog liječenja.

L9.

Management of the difficult airway

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Abstract

Management of difficult airway is one of the most challenging tasks for anaesthesiologists, and failure of securing it could have fatal consequences. Anaesthesiologists must be prepared to deal with problems in management of difficult airway at any time. Difficult intubation can either be anticipated or unanticipated. An anaesthesiologist must be aware of the possibility of both situations to arise and preparations must be taken to deal with such cases and improve the safety of our patients. Practice guidelines are systematically developed recommendations that help anaesthesiologists in the management of difficult airway.

Sažetak

Zbrinjavanje otežanog dišnog puta je jedan od najzahtjevnijih postupaka u anesteziologiji i neuspjeh pri tome može imati fatalne posljedice. Anesteziolog mora biti u svakom trenutku pripremljen za ovaj postupak. Teška intubacija može biti očekivana i neočekivana. Posjedovanje posebnih znanja i vještina u zbrinjavanju navedenih situacija je ključni čimbenik za sigurnost bolesnika. Na temelju iskustava i preporuka su nastale smjernice koje pomažu anesteziologu u zbrinjavanju otežanog dišnog puta.

L10.

Supraglottic airway devices: an alternative for difficult airway

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- Introduction
- Difficult and failed airway
- Difficult airway in prehospital setting

Introduction

Endotracheal intubation has been considered the gold-standard for safe airway control over several decades. Therefore, advanced airway management was primarily focused on laryngoscopy and intubation. This attitude has changed after the introduction of the Laryngeal Mask Airway (LMA), an ingenious supraglottic

airway device that was designed, developed and first described in 1981-83 by Dr AIJ Brain. (1) It is considered a milestone in the field of airway management and the single most important development in airway devices in the past 25 years. (2) The standard version, the Classic model (cLMA) is made of silicone and consists of a curved tube, which is attached to the lumen of an elliptic bowl with an inflatable cuff designed to provide a seal around the laryngeal inlet. The index finger of the dominant hand is used to guide the cLMA in the hypopharynx until the tip of the mask has reached the upper oesophageal sphincter. The cuff is then inflated with air to establish an effective airway, allowing appropriate ventilation of the lungs without relevant leakage. Two elastic bars are positioned over the bowl aperture to prevent obstruction by the epiglottis. The device is available in the appropriate size to fit the larynx of neonates up to large adults.

Following the success of the cLMA encountered among clinicians, a considerable number of other 'supraglottic airway devices' (SADs), also called 'extraglottic devices' (EGAs) (using a more accurate, but less used term) were developed and dozens of different devices are currently available. Some of them, the so called "second generation SADs", incorporate features to allow easy placement with predictable ventilation, to improve airway seal and to minimize the risk of aspiration. (3)

Furthermore some SADs are specifically designed to enable or assist in tracheal intubation, e.g. the LMA Fastrach™ (Intubating LMA, ILMA), the LMA Classic Excel™, the Air-Q™ Laryngeal Airway Device, the i-gel and the Ambu Aura-i™ laryngeal mask.

SADs allow to ventilate patients by delivering anesthetic gases/oxygen above the level of the vocal cords thanks to an appropriate bridging of the oral/pharyngeal space. They should guarantee low resistance to respiratory gas flow, protection of the respiratory tract from gastric and nasal secretions, suitability for positive pressure as well as spontaneous ventilation, and lack of adverse events associated with their use. (4) The main advantages of SADs include: avoidance of laryngoscopy, less traumatism for the respiratory tract, better tolerability by patients, improved hemodynamic stability during emergence, less coughing, less sore throat, ease of placement (even by inexperienced personnel), hands free airway.

At present the cLMA, the ILMA, the laryngeal tube (LT), and the oesophageal tracheal combitube (OTC), are the best evaluated and most widespread devices.

The ILMA is a modified LMA specifically developed to allow for blind tracheal intubation through the device. Its rigid (stainless steel) and anatomically curved airway tube makes the ILMA apparently not intended for routine use as an airway device for ventilation, but rather for management of difficult tracheal intubation. A high cumulative success rate (> 95%) with a maximum of three attempts is reported for ILMA, which has been used successfully in many instances of failed tracheal intubation. (5, 6)

The LT consists of an airway tube with a small cuff attached at the tip (distal cuff) to block oesophageal inlet and a larger balloon cuff at the middle part of the tube (proximal cuff) to stabilize the airway tube and to seal the airway proximally. The cuffs are inflated through a single inflation line and are low-pressure cuffs. Two ventilation holes, lying in front of the larynx, are located between the cuffs. The device should be inserted while the patient's head and neck are placed either in

the sniffing position or in the neutral position. The tip of a well lubricated laryngeal tube is placed against the hard palate behind the upper incisors and then is slid down the centre of the mouth until resistance is felt or the device is almost fully inserted. There are three black lines on the proximal tube which indicate adequate depth of insertion when aligned with the teeth. The device is made of silicone (reusable model) or of PVC (disposable model). There are six sizes, suitable for neonates up to large adults. (7)

The OTC is a double-lumen, double cuffed tube that allows ventilation independent of its position, either in the oesophagus or the trachea. This feature is achieved by two independent tubes fused together both equipped with the standardized 15 mm tracheal tube connector. One lumen resembles an endotracheal airway with an open distal end while the second resembles an oesophageal obturator type airway, with a blocked distal end and eight small ventilation outlets at pharyngeal level, allowing ventilation if the distal end of the OTC is placed in the oesophagus. The ETC is inserted blindly along the surface of the tongue with a gentle downward, caudal movement until the printed marking lies between teeth. After insertion, the proximal and distal cuffs are inflated with air. Blind insertion places the ETC in the oesophagus in more than 95% of cases. A major concern regarding the ETC is the fact that it has a double lumen, and the user must verify the correct lumen through which ventilation is possible. The OTC is available in two different sizes, 37 French (for patients up to 180 cm height) and 41 French for use in taller patients. (8)

Furthermore, newer SADs include a gastric port in their design to better protect the patient against aspiration and to have a diagnostic tool for confirming the proper position of the device. These devices are the ProSeal LMA (PLMA), the Supreme LMA (SLMA), the laryngeal tube with integrated suctioning tube (LTS II/LTS-D), the i-gel, the Air-Q Blocker, the Guardian CPV, the Baska mask.

The PLMA is a reusable LMA with some modifications, designed to enable separation of the gastrointestinal and respiratory tracts, improve the airway seal, enable controlled ventilation and diagnose mask misplacement. These features are designed to improve safety of the LMA and broaden its scope especially when used with positive pressure ventilation. It was introduced in 2000. 85 randomized controlled trials or other clinical studies and 270 case reports, letters or abstracts about PLMA were identified. (9)

The SLMA is a single-use, latex-free laryngeal mask airway with gastric access and is made of medical grade PVC. The semirigid, elliptical and anatomically shaped airway tube encloses a drainage tube and facilitates easy insertion, without placing fingers in the patient's mouth or requiring an introducer tool for insertion. The new shaped cuff is designed to provide high seal pressures. It was first launched in 2008. (10)

The LTS II (with the disposable version LTS-D) was developed in 2002 based on the LT, and the main difference between both is rooted in the second lumen of the LTS, allowing for free gastric drainage and evacuation of stomach contents by an oesophageal catheter (11)

The i-gel is a novel single use supraglottic airway device consisting of a mask and a tube. The mask is made of soft, gel-like, transparent medical grade thermoplastic elastomer (styrene ethylene butadiene styrene - SEBS), and changes its form, based

on each patient's laryngeal anatomy. Unlike the conventional LMA it does not have an inflatable cuff, but it is designed to create a non-inflatable anatomical seal of the pharyngeal, laryngeal and perilaryngeal structures whilst avoiding compression trauma. A gastric channel runs through the device from its proximal opening at the right hand side of the connector to the distal tip of the non-inflatable cuff. (12)

The Air-Q Blocker. The air-Q/Intubating Laryngeal Airway is a SAD for use as a primary airway device or as an adjunct to tracheal intubation. It has an elliptical, inflatable, cuffed mask and a slightly curved airway tube with a detachable connector. This device is available as a disposable or nondisposable device. The Air-Q Blocker is a new model with an integrated channel to access the esophagus. The clinician can now place a dedicated blocker or a naso gastric tube through the air-Q blocker channel. (2)

The Guardian CPV is a new single-use silicone laryngeal mask that integrates an oval gastric port for passage of fluids without compromising the seal. A patented Cuff Pilot™ Valve constantly monitors pressure in the cuff, providing at-a-glance feedback on any changes in pressure before they can affect patient safety. (13)

The Baska mask has many of the features of other SADs, with a number of innovations. These include a non-inflatable cuff, which is moulded to take up the shape of the supraglottic airway, potentially reducing the risk of oropharyngeal tissue and/or nerve damage induced by cuff overinflation. The cuff differs from other 'non-inflatable' cuffs in that it is continuous with the central channel of the device and, as the pressure increases with positive pressure ventilation, the cuff itself is 'inflated'. This may improve the seal, reducing leak and make ventilation more efficient. The Baska mask incorporates an inlet that fits into the upper oesophagus, and the dorsal surface of the cuff is moulded to direct any oropharyngeal contents away from the glottis and towards the side channels to which suction can be attached to facilitate aspiration of this space. In addition, there is an integrated bite-block, which reduces the risk of patients' biting and blocking the airway. Finally an extended hand-tab attached to the cuff that permits the operator to control the degree of flexion of the device during the insertion. (14)

Except the PLMA, a well established SAD with a large body of evidence proving safety and efficacy and known advantages with respect to the efficacy of seal and protection against aspiration, the other new devices has to prove to be at least equivalent to the current clinical gold standard, the LMA, with respect to safety, airway morbidity, effectiveness, easiness of use, even by emergency medical service personnel. However, experienced anaesthesiologists, with a wide range of skills in many different aspects of advanced airway management, will unlikely have the opportunity to use all of them and become proficient in all of them. Therefore, it is a reasonable approach to develop expertise in one or two tried, tested and universally applicable techniques. (15)

Difficult and failed airway

Difficult airway control could be defined as ventilation difficulty (using either face mask or extraglottic devices) and/or intubation difficulty with standard equipment (curve blade laryngoscope and simple endotracheal tube). (16)

Strategies and guidelines have been established to aid management of the difficult airway and have been published by American, German, French, Canadian, Italian national societies, and by the Difficult Airway Society of the UK. (16-21) These documents support a major paradigm shift in airway management, emphasizing gas exchange (ventilation and oxygenation) over tracheal intubation and SADs rapidly found a significant role in the management of the difficult airway. First because, according to experts, factors making facemask ventilation and laryngoscope-guided tracheal intubation difficult do not usually influence SADs insertion and function. Furthermore because many SADs can be used not just as ventilatory devices, but also as guide for intubation of the airway while the patient is being oxygenated. Finally, the widespread use of SADs in routine anaesthesia practice means that most anaesthesiologists are skilled in their use. (22) Therefore in all guidelines SADs like the LMA, the ILMA, the PLMA and the OTC are incorporated into difficult airway algorithms and specifically mentioned. It's interesting to notice that since the development of the above mentioned guidelines, some newer SADs have been designed because of potential benefits over the cLMA (i.e. improved airway seal and protection against aspiration). It is therefore arguable that several SADs other than the standard LMA and ILMA should be included in updated difficult airway algorithms. For example this is the case of the Polish guidelines for "unanticipated difficult endotracheal intubation", based on the Difficult Airway Society guidelines but modified by the Polish Society of Anaesthesiology and Intensive Therapy. (23) In this document the laryngeal tube, the Cobra PLA, the I-Gel and especially the LMA Supreme are mentioned.

Anyway all documents emphasize particularly the efficacy of the ILMA for ventilation and blind intubation, which has been reported in emergency patients with normal and difficult airways. (19, 23) In addition, this device has a high success rate and its use can be learnt quickly. The ILMA follows a two-step concept: a) it may be used as a rescue airway when tracheal intubation has failed and in 'cannot intubate, cannot ventilate' (CICV) situations, allowing rapid oxygenation and ventilation; b) it serves for securing the airway as a conduit for tracheal intubation through the ILMA (blind or under vision). (24) With the same purposes (ventilation before or during intubation attempts) other SADs are now available, allowing intubation through their lumen: the LMA Classic Excel™, the Air-Q™ Laryngeal Airway Device, the i-gel™, the Cobra PLA™ and the Ambu Aura-i™ laryngeal mask. However, due to their design and lower percentages of successful „blind" tracheal intubations, their use with optic guides or fiberoptic is recommended.

The role of the LMA is emphasized in the paediatric difficult airway guidelines developed by the Association of Paediatric Anaesthetists of Great Britain and Ireland and the Difficult Airway Society, and is also included in the recommendations of the working group on Paediatric Anaesthesia of the German Society of Anaesthesia and Intensive Care Medicine. The LMA (or other SAD) is indicated by the Italian Task Force on paediatric difficult airway management (SIAARTI) to overcome difficult face mask ventilation or tracheal intubation. (25-26)

The cornerstones of neonatal resuscitation are rapid establishment of a patent airway and providing positive pressure ventilation, generally delivered using either a bag and face-mask device or an endotracheal tube. (27,28). Endotracheal intubation is an invasive technique that requires considerable technical skill

and experience. Studies have shown that providers frequently require multiple attempts to successfully intubate the neonatal trachea during resuscitation. (29) In these situations, the laryngeal mask airway (LMA) may be a life-saving device; however, its role as a primary airway device remains to be established. (30-32) It has been used as an effective and less invasive alternative to endotracheal intubation. (33-37) The LMA has been included in the International Guidelines for Neonatal Resuscitation since 2000. In their most recent guidelines for neonatal resuscitation, the American Heart Association and the American Academy of Pediatrics have stated that "the laryngeal mask airway may be considered as an alternative to face mask for positive-pressure ventilation among newborns weighing >2000 g or delivered at ≥ 34 weeks' gestation. The laryngeal mask airway may be considered as an alternative to endotracheal intubation as a secondary airway for resuscitation among newborns weighing >2000 g or delivered at ≥ 34 weeks' gestation." (27) A limit of LMA could be the requirement of high airway pressures for newborn's lung ventilation. Usually 20 cmH₂O may be effective, but 30–40 cmH₂O or higher may be required in some term babies. (28) This need overcomes the performance of the cLMA, the only available model for neonates until recently. In 2008 and in 2011 the neonatal size 1 respectively of the PLMA and of the SLMA became available. The first in vitro and clinical experiences with these devices are encouraging. (38-41) Further clinical research will establish whether they will be more effective than the cLMA in those newborn infants in whom a tracheal tube would have been chosen, in anticipation of requiring high airway pressures for ventilation. The role of SADs (LMA in particular) is important also for neonates with airway congenital malformations. (42)

Difficult airway in prehospital setting

Securing the airway in emergency patients is among the key requirements of appropriate pre-hospital therapy. A 3-fold higher rate of difficult intubations has been reported by Adnet et al. in a prehospital setting than in the operating room. (43) The cuffed tracheal tube (ETT) is considered the ideal device for airway management outside the operating room when placed by experienced personnel. The advantages of tracheal intubation over bag-mask or SADs ventilation include maintenance of a patent airway, protection from the aspiration of gastric contents or blood from the oropharynx, the ability to provide an adequate tidal volume during chest compressions, the ability to suction tracheal secretions, providing a route for administering drugs, and the ability to deliver higher positive pressure ventilation. (44-47) Endotracheal intubation (ETI) is a relatively complex technique requiring significant training, experience and constant practice. The placement of the tube tip in the trachea needs to be monitored and reliably confirmed. Undetected intubation of the oesophagus and the inadvertent, unnoticed extubation of the trachea are the most serious incidents complicating ETT airway management. (48) For these reasons the type of airway device that should be used is not only dependent on the patient's requirements or on the equipment available; it also depends on the skill level of the medical personnel who are in charge of the patient's care. Whereas experienced anaesthesiologists with a wide range of expertise in many different aspects of advanced airway management

skills are available in the operating room, this level of experience can hardly be achieved by non-anaesthesiologist pre-hospital medical service personnel. (49) In the emergency setting, the presence of debris, secretions, blood, vomitus, subcutaneous emphysema, anatomic derangement, and dental damage or the application of cervical spine immobilization devices and in-line axial stabilization can further reduce the ability to use direct or indirect laryngeal visualization techniques and face mask ventilation. Additionally, difficult out-of-hospital airway management is mostly unanticipated, airway equipment is limited, respiratory dysfunction leading to hypoxia is often present, and the position of the patient can make access to the head difficult. Other issues complicating airway management in this setting include simultaneous performance of cardiopulmonary resuscitation or other medical procedures, altered and varying levels of patient consciousness, and lack of professional help. When the position of out-of-hospital placed tracheal tubes was re-examined by independent observers, either on arrival in the emergency department or in the field, unrecognized oesophageal intubation was recorded in 6–23% of patients. (50,51) Even when tracheal intubation was performed by experienced anaesthesiologists, a significantly increased incidence of difficult laryngoscopy, number of intubation attempts, and the use of SADs in the out-of-hospital setting was reported. (52)

According to many other authors, the ILMA is recommended as an ideal device for inexperienced medical personnel because the ILMA provides both ventilation and intubation. Ventilation and intubation using the ILMA is faster and has a higher success rate than bag–mask ventilation and laryngoscopic intubation (LG-ETI). In addition, ILMA-ETI is usually successful in patients in whom LG-ETI had failed. (53-56) A Task Force commissioned by the Scandinavian Society of Anaesthesia and Intensive Care Medicine published guidelines on pre-hospital airway management. They recommended a supraglottic device such as the LT or the ILMA as a backup device for anaesthesiologists in failed ETI. (47)

More recently a group of French anaesthesiologists and Emergency Physicians applying in more than 2,500 patients, a simple airway algorithm including gum elastic bougie, ILMA, and cricothyroidotomy, successfully managed all the 160 difficulty airway situations encountered. (57)

In a paper characterizing 32,592 out-of-hospital airway management across the United States in 2008, the Authors observed that out-of-hospital ETI was reported as successful in only 6482 out of 8418 procedures (77.0%). Interestingly, alternative airways (SADs) were used with higher success rates. This was the case for the OTC (successfully used in 971 of 1162 cases; 83.6%) and for the Laryngeal Mask Airway (successfully used in 505 of 530 cases; 95.3%). (58)

Other supraglottic airway devices have been successfully used for ventilation and oxygenation in prehospital emergencies. The apparent advantages for the newer devices, i.e. SLMA, i-gel, LTS II remain in the realm of speculation until sufficient data are present for substantiating the respective claims. (59,60)

A proposed framework for deciding suitable SAD for paramedics to use in pre-hospital environment was recently published. (61,62) The authors of this paper have examined the use of SADs from a Paramedic's perspective, with regard to areas of teaching, learning, patient safety and ease of use. A comprehensive list of features which most likely ensure that a SAD is suitable for paramedics to use has been developed:

- Proven safety and efficacy (preferably in pre-hospital environment)
- Suitable for spontaneous breathing and positive pressure ventilation
- High sealing pressure
- Easy to use (even by novices)
- Minimal “steps” to insert
- Minimal “extra” equipment needed (e.g. syringe, bite block, tape, etc.)
- High skill retention
- Can be positioned during other life saving interventions (i.e. chest compressions, etc.)
- Suitable as “dedicated airway” but provides conduit for tracheal intubation
- Efficacy not drastically impaired by sub-optimal placement
- Stable in situ
- Built-in bite block
- Suitable for a range of airways (abnormal, normal, paediatric, adult)
- Limits aspiration risk (allows gastric suctioning/venting/collection)
- Negligible side effects (airway irritation, cardiovascular responses, spinal movements)
- Disposable but compact packaging (eliminates autoclaving, portable and minimizes waste)
- Training package available online (video and instructions)
- Suitable manikins available for realistic training.

□ Air transport

Restricted access, constant movement and noise make airway management during air transportation potentially difficult. The equipment carried in rescue helicopters concerning airway management is not standardized. This is not surprising as different operators with different skill levels run the bases and there is presently no common standard for the equipment. Two recent surveys indicate that in Germany the most frequent types of SADs equipment were LMAs (67.2%), OTCs (32.8%) and LTs (29.7%); (63) in UK the most popular device on UK rescue helicopters is the LMA: 88% had a cLMA, a lLMA or PLMA available, while 19% had a LT and 4% a OTC. (62) As the LMA gains acceptance for emergency air transport, (64) the frequency of its use at altitude will likely increase. It is important to recognize the potential for complications from overinflated LMA cuffs due to the effect of altitude. It seems reasonable to recommend the monitoring of LMA (or other SAD) cuff pressures during air medical transport especially because data for LMA cuff expansion failed to show significant predictable correlation with altitude change. (65,66)

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L11.

New techniques and devices in difficult airway

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Abstract

The purpose of this review is to make comparison between old conventional techniques and devices for difficult airway management and new, sophisticated techniques and devices.

Recent techniques and devices are defined as the ASA (American Society of Anesthesiology) practice guidelines for management of the difficult airway,

published in 1992, reviewed in 1993 and updated in 2003. According to ASA the techniques for difficult airway management are divided in techniques for difficult intubation and techniques for difficult ventilation.

Awake fiberoptic intubation is the technique of choice for difficult airway management prescribed by WHO document for patient safety in the operating theater. Conventional techniques for intubation used direct visualization. The new generation of devices does not require direct visualization of the vocal cords for endotracheal tube placement. They allow better glottis view and successful endotracheal placement of the tube with indirect laryngoscopy. New intubation devices such as video-laryngoscopes, facilitate endotracheal intubation by indirect visualization of glottis structures without aligning the oral, pharyngeal and laryngeal axes in patients with cervical spine abnormality. Video laryngoscopes such as V-Mac and C-Mac, Glide scope, McGrath, Airway Scope, Airtraq, Bonfils and Bullard laryngoscope are widely available at the market. Airway gadgets are lighted stylets and endotracheal tube guides. The principal conclusion of this review is that utilization of these devices can be easily learned. The technique of indirect laryngoscopy is currently used for managing the difficult airway in the operating room as well as for securing the airway in daily anesthesia routine.

Sažetak

Cilj ovog osvrta je usporediti stare konvencionalne tehnike i uređaje za tretman poteškoća u disanju i nove sofisticirane tehnike i uređaje. Dosadašnje tehnike i uređaje propisala je ASA (Američko udruženje Anesteziologa) kao praktične smjernice u tretmanu poteškoća u disanju, iste su objavljene 1992, revidirane 1993 i ažurirane 2003. Prema ASA tehnike za tretman poteškoća u disanju su podjeljene na tehnike za poteškoće pri intubaciji i poteškoće pri ventilaciji. Budna fiberoptička intubacija kao tehnika izbora pri tretmanu poteškoća u disanju, je propisana dokumentom Svjetske zdravstvene organizacije o sigurnosti pacijenata u operacionoj dvorani. Konvencionalne tehnike intubacije koriste direktnu vizuelizaciju. Nova generacija uređaja ne zahtjevaju direktnu vizuelizaciju glasnih žica pri postavljanju endotrahealnog tubusa. Oni omogućavaju bolju vizualizaciju i uspješnu endotrahealnu intubaciju putem indirektno laringoskopije. Novi uređaji za intubaciju, kao videolaringoskop, olakšavaju endotrahealnu intubaciju indirektnom vizuelizacijom struktura grla bez premještanja oralne, faringealne i laringealne osi pacijenata sa abnormalnostima vratne kralježnice. Video laringoskopi kao V-Mac i C-Mac, Glide skop, McGrath, Airway skop, Aertracq, Bonfils i Bullard su lako dostupni na tržištu. Uređaji za disanje su svjetleće sonde i endotrahealni vodiči (ili vodiči endotrahealnog tubusa). Zaključak ovog osvrta je da se korištenje ovih uređaja može lako naučiti. Tehnika indirektno laringoskopije već se koristi pri tretmanu poteškoća u disanju, kao i u svakodnevnoj anesteziološkoj praksi.

L12.

Clinical use of HFJV (high frequency jet ventilation)

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Abstract

High Frequency Jet Ventilation (HFJV) is an alternative ventilatory technique with specific advantages when used for diagnostic or surgical procedures in patients with airway pathology. An endotracheal tube creates an obstacle for endoscopic examination during surgery of the larynx and especially the trachea. Though smaller endotracheal tubes were used, the competition in the airway between anaesthesiologists and laryngologists remained. Jet ventilation in the airway during general anaesthesia provides the endoscopist with an unobstructed view on a quiet operation field, preserves the anaesthesiologist's ability to control the patient's ventilation and oxygenation.

There are two main groups of indications for HFJV: first it was used as a special ventilation mode during diagnostic or surgical procedures in patients with airway pathology, second, HFJV was employed as a respiratory support technique to improve gas exchange during severe pulmonary failure in infants, children and adults.

During HFJV gas from a high pressure source is delivered through a small-bore cannula positioned in the airway. The gas delivered through the narrow outflow orifice produced jet effects and entraining gas around the cannula. HFJV achieves gas exchange by using subphysiologic tidal volumes applied at extreme rates.

The mechanism of jet ventilation can be explained only hypothetically as the interaction of several different mechanisms such as: coaxial flow through the cannula, direct ventilation of alveolar units (bulk flow), convective dispersion, facilitated diffusion (Taylor)- asymmetrical velocity profiles during inspiration and expiration, molecular diffusion (in the more distal air spaces near the alveolo-capillary membrane; bulk flow cannot penetrate to this level), Venturi effect -"air entrainment" (depending on the degree of airway patency above the jet). There are specific risks and possible complications for the high frequency jet ventilation. Complications were partly those which are also observed during CV, i.e. the use of inevitable or inadvertent high airway pressures prolonged use of high oxygen concentrations, inadequate humidification and warming of inspiratory gases or installation of HFJV by personal who are not adequately trained. The main risk of jet ventilation is pulmonary barotrauma when expiration of delivered gas is impeded by an upper airway obstruction.

High Frequency Jet Ventilation may be considered an effective, safe technique for the anaesthetic management during the airway surgery. The technique provides surgeons with an essentially unobstructed view of the larynx and a laser-safe environment. The clinical use of jet ventilation requires: the knowledge of physical properties of jet ventilation, clinical experience in the use of high pressure gas source and clinical training in skill.

Jet ventilation should be used more frequently in routine practice both in elective and emergency settings.

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L13.

Out-hospital use of non-invasive ventilation **Neinvazivna ventilacija u izvanbolničkim uvjetima**

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Sažetak

Neinvazivna ventilacija pozitivnim tlakom (NIPPV) podrazumijeva mehaničku respiratornu potporu respiratorno insuficijentnom bolesniku bez primjene endotrahealnog tubusa. Ona uključuje primjenu pozitivnog kontinuiranog tlaka (CPAP) sa ili bez inspiratorne tlačne potpore, a pri tome koristi volumno ili tlačno ciklirane sustave i proporcionalno asistiranu ventilaciju.

Ciljevi primjene NIPPV-a kod akutne respiratorne insuficijencije (ARI) vezani su za reverziju simptoma ARI, redukciju rada disanja, stabilizaciju plućne izmjene plinova. Njenom se primjenom nastoji izbjeći intubacija i reintubacija, odnosno prevladati insuficijencija disanja tijekom prelaska s mehanički potpomognutog disanja na suficijentnu spontanu ventilaciju.

Na odabir NIPPV-a kao izbora ventilatorne potpore utječu:

1. osnovna bolest,
2. odabir bolesnika koji imaju jasne prediktore uspješne primjene NIPPV,
3. odabir modaliteta ventilatorne potpore kao i titracija njezine razine prema respiratornim potrebama bolesnika,
4. educirano medicinsko osoblje.

Indikacije za primjenu NIPPV-a kod akutne respiratorne insuficijencije u izvanbolničkim uvjetima su egzacerbacija kronične opstruktivne plućne bolesti (KOPB) i akutni kardiogeni edema pluća bez odgovora na predhodnu konzervativnu terapiju, ali i višesatni interhospitalni transport granično suficijentnog bolesnika (hipoksemična i/ili ventilatorna respiratorna insuficijencija) nakon velikih operativnih zahvata u kardijalnoj, torakalnoj kirurgiji i neurokirurgiji. Nakon što se postavi indikacija, neinvazivnu mehaničku ventilaciju ne treba odlagati jer svako neopravdano odlaganje može povećati mogućnost neuspješnog liječenja.

Tijekom primjene NIPPV-a potrebno je osigurati minimalni monitoring koji uključuje neinvazivno mjerenje krvnoga tlaka u intervalima od 5-15 minuta, kontinuirani 12-kanalni EKG, pulsnu oksimetriju, respiratornu frekvenciju uz kontinuirani nadzor aukultatornog nalaza na plućima. U izvanbolničkim uvjetima cilj je postići i zadržati perifernu saturaciju izmjerenu pulsним oksimetrom većom od 90%. Monitoring ima dvostruku funkciju i služi kao nadzor vitalnih funkcija i uspješnosti primjenjene terapije, a s druge strane omogućava optimalizaciju namještanja ventilatornih parametara. Kada se i pored optimalno postavljenih ventilatornih parametara javljaju klinički znakovi pogoršanja, NIPPV je potrebno prekinuti.

NIPPV se danas nameće kao terapijska alternativa u izvanbolničkim uvjetima kod bolesnika koji razvijaju akutnu respiratornu insuficijenciju (ARI) kao posljedicu egzacerbacije kronične opstruktivne plućne bolesti (KOPB) ili akutnog kardiogenog

plućnog edema jer se ovim oblikom ventilatorne potpore otvara mogućnost smanjenja bolničkog morbiditeta i mortaliteta. No, tek će naredna klinička ispitivanja postaviti jasne preporuke primjene NIPPV u navedenim, a možda i drugim, indikacijama za izvanbolničke uvjete

L14.

ICT integration of the Institute of Emergency Medicine the City of Zagreb and hospital emergency department: Care MonX ePCR module

ICT povezivanje Zavoda za hitnu medicinu grada Zagreba s hitnim bolničkim prijemom: Care MonX ePCR modul

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Abstract

In the last two years, The Institute of Emergency Medicine The City of Zagreb, has been using ePCR – Electronic Patient Care Record system that has enabled doctors to keep electronic record of patient's status.

ePCR system consists of two basic parts: ePCR program and special portable computers. By using a „touch screen“ graphical user interface of a special portable computer, doctors are in the position that, quickly and efficiently collect all information about the patient and the intervention completed in the field. Information collected includes patient's medical history and physical examination, recorded vital signs, medications given, timing of the initial call and time of arrival at the field, time of leaving patient's residence and time of arrival at the hospital etc. ePCR is an integral part of dispatching system of The Institute of Emergency Medicine The City of Zagreb. In real time, ePCR receives all the information about new interventions, and enables sorting and forwarding of information obtained for further analysis and use. By using portable computers in the field, the doctor obtains all the information from the dispatcher, including patient's name and surname, time of the call, address, provisional diagnosis or summary of patient's symptoms as a reason for initial call, as well as triage code for each intervention.

The next step in improvement of cooperation between EMS and ED is their collaborative use of ePCR system. ePCR is able to send medical report about patient's status even before patient's arrival to a hospital.

Clinical Hospital Sveti Duh is the first hospital in Zagreb that has implemented this type of application in their ED. Cooperation with outpatient HMP service has an essential role in providing care for patients with life threatening conditions, ensuring quick and efficient arrival and transfer of care for the patient, as well as ongoing triage and further care.

Sažetak

Zavod za Hitnu medicinu Grada Zagreba unazad dvije godine u svom procesu rada koristi ePCR – Electronic Patient Care Record sustav koji omogućuje liječnicima na terenu elektronsko bilježenje prikupljenih podataka o stanju pacijenta.

ePCR sustav se sastoji od dva osnovna dijela: ePCR programa i specijalnih prenosnih računala. ePCR program putem grafičkog sučelja na prijenosnom računalu omogućuje liječniku da na brz i kvalitetan način, koristeći „touchscreen“ ekran, upiše sve podatke o pacijentu i učinjenoj intervenciji na terenu. Podaci koji se upisuju su anamneza i klinički status pacijenta, izmjereni fiziološki parametri, primijenjeni lijekovi, vrijeme odlaska i dolaska na intervenciju, vrijeme odlaska od pacijenta i dolaska u bolnicu itd.

ePCR modul je integriran u dispečerski sustav Zavoda za hitnu medicinu Grada Zagreba. U realnom vremenu prima sve podatke o novim intervencijama, raspoređuje ih i razvrstava za daljnju uporabu i analizu. Liječnik na terenu zaprima od dispečera putem računala sve podatke vezane za novu intervenciju kao što su ime i prezime pacijenta, vrijeme poziva, adresa, radna dijagnoza ili opis simptoma kao razlog poziva, te stupanj hitnosti za svaku pojedinu intervenciju.

Slijedeći korak u unaprijeđenju rada HMP-a i hitnog bolničkog prijema je njihovo međusobno povezivanje putem ovog sustava. ePCR omogućuje slanje medicinskog izvješća sa terena o stanju pacijenta u bolnicu prije dolaska samog pacijenta.

Klinička bolnica Sveti Duh je prva bolnica u Zagrebu koja je nadogradila ovu vrstu aplikacije u svom hitnom prijemu. Povezivanje sa vanbolničkom službom HMP od posebnog je značenja u zbrinjavanju vitalno ugroženih pacijenata obzirom da je omogućen kvalitetniji i brži prihvata i primopredaja pacijenta, te daljnja trijaža i zbrinjavanje samog pacijenta.

L15.

Out- hospital airway management

Posebnosti zbrinjavanja dišnog puta u izvanbolničkim uvjetima

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Sažetak

Zbrinjavanje dišnog puta prvi je korak sustavnog, sekvencijalnog zbrinjavanja svih pacijenata i najvažniji zadatak koji treba izvršiti na terenu.

Održavanje prohodnosti dišnog puta i primjerena ventilacija pacijenta uvijek predstavljaju izazov, a u nepovoljnim terenskim uvjetima, pri lošoj osvjetljenosti, u kaosu kakav obično vlada na mjestu događaja, neobičnom položaju u kojem je pacijent zatečen, zbog neprijateljski nastrojenih promatrača, u vožnji pod svjetlima i sirenom, ovaj zadatak može biti gotovo nemoguće izvršiti.

Zbog nepredvidive prirode mjesta događaja, djelatnici izvanbolničkih hitnih medicinskih službi dišni put u prilici su zbrinjavati u gotovo svim zamislivim situacijama: u smrskanim vozilima, na stubištima višekatnica, usred trgovačkog centra ili nasred prometne autoceste.

Utopljenici, djeca, ozljeđenici, osobe starije životne dobi, pretili pacijenti, pacijenti s opeklinama, ronoci, osobe s kroničnim bolestima i trudnice, samo su dio raznovrsnog spektra pacijenata čiji je dišni put potrebno zbrinuti na terenu.

Standard skrbi jednak onome u bolnici, na terenu se mora pružiti s ograničenim brojem osoba (dva, odnosno tri djelatnika u timu), bez neposredno dostupne stručne pomoći anesteziologa i bez sofisticirane opreme.

Djelatnici izvanbolničkih hitnih službi, stoga, moraju poznavati anatomske i fiziološke varijacije među različitim skupinama pacijenata, suvereno vladati tehnikama otvaranja i održavanja prohodnosti dišnog puta, te imati na raspolaganju i znati koristiti opremu za odrasle pacijente i opremu za djecu.

Zbrinjavanje dišnog puta u izvanbolničkim uvjetima ovisno je o nizu faktora koji mogu utjecati na strategiju (postojeće protokole) i kvalitetu potrebnih postupaka. Uz učinkovitu multiprofesionalnu i multidisciplinarnu suradnju, kvaliteta zbrinjavanja dišnog puta ovisi i o kliničkoj kompetentnosti i iskustvu izvanbolničkih timova, njihovim tehničkim sposobnostima i netehničkim vještinama (komunikacija, timski rad, procjena i donošenje odluka).

Zbrinjavanje dišnog puta u izvanbolničkim uvjetima, nedvojbeno, jedno je od najsloženijih područja hitne medicine. To je vještina čije se izvođenje ne može odgoditi do dolaska u bolnicu i koja (nerijetko) čini razliku između uspjeha i neuspjeha, života ili smrti pacijenta.

L16.

Foreign bodies in tracheobronchial tree: what we have to know?

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Abstract

Airway foreign body (AFB) is a life-threatening condition. AFBs are the fifth most common cause of death in children younger than one year of age. Most of aspiration occurs in children younger than three years. The most common are food items such as nuts, raisins, seeds and small particles of toys. The most common site of aspirated AFB is the right main bronchus, more than 50% of cases. This is due to anatomical characteristics of pediatric airway where right bronchus is wider and less angled than left bronchus. There is a slight male predominance.

AFB aspiration is difficult to diagnose. A prompt diagnosis and prompt removal of AFB are essential. Mortality occurs due to acute aspiration. Morbidity is related to nonrecognized long-standing AFB which causes lung and airway damage.

Removal of a AFB is a demanding procedure. This airway endoscopy with removing AFB is colloquially called bronchoscopy although it is a comprehensive examination of the entire airways. There is a need to have a well-trained and experienced team which consists of otolaryngologist, anesthesiologist, pediatricians, radiologist and scrub nurses.

L17.

Uloga fiberbronhoskopije u jedinici intenzivnog liječenja **The Role of Fiberoptic Bronchoscopy in Intensive Care Unit**

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Abstract

Fiberoptic bronchoscopy (FOB) has a rising role in diagnostics and therapeutic procedures in patients admitted in intensive care unit (ICU).

In cases of hemoptysis or massive hemoptysis FOB can help in localizing the site and cause of bleeding. In severe pulmonary infections, nonresolving pneumonia, pulmonary infections in immuno-compromised patients and ventilator-associated pneumonia, FOB is an important tool for diagnosing the potential infective agent(s). Two quantitative bronchoscopic methods that are particularly useful are bronchoalveolar lavage (BAL) and protective specimen brush. According to the literature the detection of pneumonia by quantitative BAL culture has a sensitivity of 40-90% and a specificity of 45-100%.

Therapeutic FOB in ICU is most commonly performed for aspiration of retained secretions and mucous plugs, in intubated and nonintubated patients. Patients with weakness of respiratory muscles (neuromuscular diseases, postoperative state, COPD) or disorders leading to recurrent aspiration, critically ill and mechanically ventilated patients are very often candidates for frequent therapeutic FOB. Control of massive hemoptysis and evaluation (and removal) of aspirated foreign body is often performed by FOB, mainly in ICU.

L18.

Difficult airway management in University Hospital Centre Split Postupak otežanog uspostavljanja i održavanja dišnog puta u KBC Split

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Abstract

Difficult intubation and ventilation of patient is extremely stressful for the anesthesiologist.

Incidence of difficult intubation of trachea varies from 3-18%. American Society of Anesthesiologists (ASA) defined this problem as attempting intubation for more than 10 min, or more than three times.

For the possibility of difficult intubation there are some warning signs, such as physical aspect of the patient, prior difficult attempts of intubation, Mallampati score, thyreo and sterno-mental distance, but not one of them is a sufficient predicting factor. In spite of thorough examination and preparation, difficult intubation of trachea is possible. In such cases protocol must be prepared. In the University Hospital Center Split such protocols exist.

A. Three attempts of intubation followed by changing position of the patient, or blade of laryngoscope, or entire laryngoscope, including „Airtraq“ with ventilation of the patient between the attempts.

B. Two attempts of intubation using ILMA/LMA.

C. Attempt of intubation by fiberoptic bronchoscope. If the attempts are unsuccessful anesthesia is discontinued.

In cases of „can't intubate, can't ventilate“

D. conicotomy is performed by intravenous cannula or conicotomy set.

In our hospital we have not had cases with tragic consequences. Some time ago we purchased fiberoptic laryngoscopes but still haven't obtained it.

Sažetak

Nemogućnost intubacije i ventilacije bolesnika predstavlja izuzetan stres za svakog anesteziologa. Učestalost otežanih intubacija se procjenjuje na 3-18 %. Američko društvo anesteziologa (engl. akronim ASA) je definiralo otežanu intubaciju kao pokušaj intubacije koji traje više od 10 minuta ili u više od tri pokušaja.

Postoji nekoliko pokazatelja koji nas mogu upozoriti na mogućnost otežane intubacije

(vanjski izgled bolesnika, otežana intubacija u anamnezi, Mallampati klasifikacija, tireomentalna i sternomentalna udaljenost), no nijedan sam po sebi nije dovoljan.

Usprkos pažljivom pregledu bolesnika i pripremi uvijek postoji mogućnost neočekivane otežane intubacije. Stoga je potrebno imati razrađen plan i protokol.

U KBC Split se koristimo već razrađenim protokolima.

- A: početna tri pokušaja intubacije uz pokušaj rješavanja problema bilo boljim namještajem bolesnika, promjenom špatule ili vrste laringoskopa, uključujući „Airtraq“ uz ventilaciju bolesnika na masku između pokušaja.
- B. podrazumijeva dva pokušaja intubacije preko ILMA / LMA.
- C. Pokušava se provesti intubacija uz pomoć fiberoptičkog bronhoskopa. Ako pokušaji nisu uspješni odustaje se od daljnjih pokušaja i bolesnik se budi uz održavanje ventilacije i oksigenacije, a ako ne možemo ni ventilirati ni oksigenirati bolesnika pribjeći ćemo
- D. konikotomiji bilo uz pomoć intravenske kanile ili seta za konikotomiju.
- Do sada nismo imali slučajeve koji su tragično završavali. Sada smo u fazi nabavke „fiberoptičkog laringoskopa“.

L19.

Difficult airway management in University Hospital Center

“Sisters of Charity”

Zbrinjavanje otežanog dišnog puta u Kliničkom bolničkom centru

“Sestre milosrdnice”

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Abstract

The difficult airway has gained increasing interest due to a relatively high number of adverse effects following unsuccessful intubation. Besides traditional techniques, several alternative methods are available today. It is crucial for an anaesthesiologist and intensive care physicians the maintenance of sufficient oxygenation and ventilation of the patient. Hypoxia is one of the most frequent causes of death or causes of severe neurological defects in anaesthesia. Therefore, it is necessary to have an easy alternative to secure the airways in the critical situations.

Sažetak

Otežani dišni put predstavlja sve veći izazov zbog relativno velikog broja različitih posljedica nastalih neuspješnom intubacijom. Osim tradicionalnih tehnika, postoje danas na tržištu alternativne metode i tehnike. Izuzetno je važno za anesteziologa i liječnika u Jedinici intenzivnog liječenja održavanje dostatne ventilacije i oksigenacije u bolesnika. Hipoksija je jedan od najčešćih uzroka smrti ili uzroka neuroloških ispada u anesteziji. Stoga je važno imati alternativno rješenje zbrinjavanja otežanog dišnog puta u hitnim stanjima.

L20.

Strategic approach to extubation Strateški pristup ekstubaciji

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Abstract

Airway management relates to the period of tracheal intubation, maintenance of an endotracheal tube in situ, and finally extubation. Problems related to difficult extubation still pose a significant challenge for both anesthesiologists and intensivists. This article reviews current approach to extubation strategy following difficult intubation. Guidelines and algorithm may be helpful in order to ensure safe management of the patient during this delicate period of airway management.

Sažetak

Osiguravanje dišnog puta se odnosi na razdoblje intubacije, održavanje endotrahealnog tubusa in situ, i konačno na razdoblje ekstubacije. Problemi u vezi s otežanom ekstubacijom još uvijek predstavljaju značajan izazov za anesteziologe i intenziviste. Ovaj članak prikazuje suvremeni strateški pristup ekstubaciji nakon otežane intubacije. Smjernice i algoritami mogu biti korisni kako bi se osigurala sigurnost bolesnika u tom osjetljivom razdoblju osiguravanja dišnog puta.

L21.

Incidence of unexpected difficult intubation- a pilot study Učestalost neočekivano otežane intubacije- pilot studija

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Abstract

Endotracheal intubation under directoscopic visualisation is well established procedure for securing airway. Anesthesiologists are experts for this due to extensive practice. However it is sometimes difficult and, occasionally failed. The true incidence of difficult and failed intubation in Croatia has as far as the authors

would know, never been actually assessed by a study. Therefore, we started with 2 operating theatres in our hospital, General surgery and Ear, nose and throat for 2 months. After signing consent, each patient which is to be intubated the next day was examined for predicting factors. Only elective cases who were not suspected in advance to be hard to intubate entered the study. Post-intubation IDS (Intubation Difficulty Score) was assessed. Difficulty is defined as: Easiest IDS=0, slightly difficult 1-5, moderately difficult 6-10, very difficult >10, while failed intubation is marked IDS= ∞ . Preliminary results of this pilot study on relatively small number of intubations (115) shows overall same incidence of difficult intubations as reported in the literature. Level 0 were 53,91%, while IDS 1-5 were 40.87%, leaving only 5,22% of moderately and very hard intubations. There were no failed intubations. When we split the data on different clinics, we see that ENT has only easy and slightly difficult intubations, assumedly because they are more sensitive to proclaim expected difficulties since these patients weren't entered in this study. We hope to widen the study all over Croatia later to reach at least 2000 intubations.

Key words: difficult airway, directoscopic intubation, endotracheal intubation, failed intubation, IDS, intubation difficulty score

Sažetak

Endotrahealna intubacija pod direktoskopskom vizualizacijom je dobro uhodani postupak za osiguranje dišnog puta. Anesteziozisti su u tome vrlo iskusni zbog stalne prakse. Međutim, intubacija je ponekad otežana, a u rjetkim slučajevima i neuspješna. Koliko je autorima poznato u Hrvatskoj do sada nije proučena stvarna učestalost otežane intubacija. Za početak smo uzeli 2 operacijska trakta, Klinike za kirurgiju i ORL klinike kroz 2 mjeseca. Nakon potpisanog pristanka, svaki pacijent za kojeg je bila predviđena operacija s endotrahealnom intubacijom slijedeći dan bio je pregledan obzirom na prediktore otežane intubacija. Samo elektivni slučajevi i oni koji nisu bili ocijenjeni kao rizični za otežanu intubacija su ušli u ispitivanje. Nakon intubacije pacijenti su skorirani IDS skorom (intubation difficulty score). Težina je definirana kao Najlakša (IDS=0), neznatno otežana 1-5, umjereno teška 6-10, vrlo teška >10 i neuspjela IDS= ∞ . Preliminarni rezultati na relativno malom broju pacijenata (115) pokazuju uglavnom jednaku učestalost kao i u literaturi. IDS 0 je bilo 53,91%, a 1-5 40,87%, dok su umjereno i vrlo teške intubacije bile samo u 5,22% slučajeva. Nije bilo neuspješnih intubacija. Kad usporedimo podatke iz dva operacijska trakta, vidimo da u ORL salama uopće nije bilo otežanih intubacija, što je vjerojatno posljedica veće spremnosti anesteziologa da proglašavaju očekivanu otežanu intubaciju, pa takvi pacijenti nisu ušli u ovu studiju. Nadamo se da ćemo uskoro organizirati multicentričnu studiju diljem Hrvatske kako bismo obuhvatili najmanje 2000 intubacija.

Ključne riječi: otežani dišni put, direktoskopska intubacija, endotrahealna intubacija, neuspješna intubacija, IDS, intubation difficulty score

Oralne prezentacije / Oral presentations (OP1-OP12)

OP1.

Postintubation tracheal injuries – case series and literature review Poslijeintubacijske ozljede traheje - prikaz slučaja i pregled iz literature

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Abstract

Postintubation tracheal injury is a rare and potentially fatal complication. The most common causes are overinflation of endotracheal-tube cuffs and multiple intubation attempts in emergency cases. The diagnosis is based on clinical and radiological suspicion of tracheal injury confirmed by fiberoptic bronchoscopy. The decision between conservative and surgical management of the injury depends on the clinical presentation (respiratory instability, concomitant diseases), lesion characteristics (lesion site, size, and number), and time from injury to diagnosis. We present three cases of postintubation tracheal injury. In two cases, the patients were treated conservatively; in the third case, the patient died from asphyxia caused by thrombus occlusion of the trachea after a longitudinal tracheal lesion. Preanesthetic examination did not indicate any possibility of difficult intubation in any of the patients; however, in one of the patients admitted through the emergency department, emergency intubation was performed.

Sažetak

Poslijeintubacijska ozljeda traheje je rijetka i potencijalno fatalna komplikacija. Najčešći uzroci ozljeda su prenapuhnuti balončić tubusa i višekratni pokušaji intubacije u hitnim slučajevima. Dijagnoza se bazira na kliničkoj i radiološkoj sumnji koja se potvrđuje fiberoptičkom bronhoskopijom. Odluka o konzervativnom ili kirurškom zbrinjavanju ozljede ovisi o kliničkoj slici bolesnika (respiratornoj nestabilnosti, pratećim bolestima), karakteristikama lezije (mjestu, duljini i broju oštećenja) i vremenu koje je proteklo između trenutka oštećenja i postavljanja dijagnoze. Prikazujemo tri bolesnika s poslijeintubacijskom ozljedom traheje, dvoje od njih liječeni su konzervativno, a jedna je bolesnica preminula zbog asfiksije izazvane začepljenjem traheje ugruškom nastalim nakon longitudinalne lezije. Niti u jednog od njih u prijeoperacijskom anesteziološkom pregledu ništa nije ukazivalo na moguću otežanu intubaciju, osim što je jedan bolesnik zaprimljen i operiran kao hitan slučaj.

OP2.

Huge multinodular goitre with mid trachea obstruction: indication for fiberoptic intubation

Velika multinodularna struma s opstrukcijom traheje: indikacija za fiberoptičku intubaciju

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Abstract

Goitre or thyromegaly is one of the most frequent causes of mid tracheal obstruction (external compression or stenosis) where difficult degree of larynx visualization and/or difficult airway management may be presented, depending on goitre's size, type and ingrowth into surrounding tissue. Iodine deficit disorders is still one of the most frequently cause of goitre in population in the Africa continent. Mostly of the patients with goitre are able to visit medical staff at an advanced stage of disease. Mallampati test, thyreo-mental distance and inter-incisor gap appear to provide the optimal combination in prediction of difficult visualization of larynx. Video laryngoscopy examination of subglottic region and inspection of tracheal deviation in presence of tracheal compression, without detected stenosis of trachea is standard and preferred technique in comparison with direct laryngoscopy. Intubation could be performed when vocal chords are visualized. The major difficulty of intubation in presented only in 5.3% of patients with goitre. Large goitre could not be always associated with higher incidences of difficult endotracheal intubation. Predicting factors for difficult airway assessment in these patients were only two: cancerous goitre (specially, if compressive signs are present) and Cormack and Lehane grade III/IV. Indication for fiberoptic intubation is presented by tracheal compression or initial tracheal stenosis. Conventional tracheostomy have to be made in goitre's patients whit identified tracheomalacia and/or high degree or tracheal stenosis.

Sažetak

Multinodularna eutiroidna tiromegalija je jedan od najčešćih uzroka kompresije traheje i otežanoga pristupa dišnome putu. U 90% slučajeva je etiološki vezana uz pomanjkanja peroralnog unosa joda i/ili selana, a jednim dijelom i tireostatskim učinkom tvari poput tiocijanata). Tipične kliničke slike uznapredovale gušavosti susreću se i u endemskim područjima Afričkog kontinenta (Zair, Južno Afrička Republika, Uganda, Sudan, Etiopija, Tanzania, Nigerija). Većina ovih bolesnika dolazi sa uznapredovalom bolešću kada usljed ekstenzivnosti strume već postoji prisutnost otežane vizualizacije larinksa i/ili teško dostupan dišni put. Pojedini bolesnici mogu izražavati simptome stenoze (kompresije) traheje uz disfagiju, promukost i različiti stupanj respiracijske insuficijencije, osobito uz medijastinalni

prodor uvećane žlijezde. Specifičnost endotrahealne intubacije tada podliježe visokom proceduralnom morbiditetu i mortalitetu. Neovisno o veličini strume, otežani pristup dišnome putu je kod ovih bolesnika zabilježen uz incidenciju od 5,3%. Prediktorni testovi (Mallampati, Cormack-Lehane, tiromentalna udaljenost, pokretljivost vrata i sl.) uz prepoznavanje kliničkih simptoma pridonose najoptimalnijem odabiru tehnike endotrahealne intubacije. Standardno pravilo uključuje video-laringoskopsku eksploraciju supra- i infra-glotične regije te fiberoptičku endotrahealnu intubaciju otežanog pristupa dišnoga puta.

OP3.

Difficult airway management of a polytraumatised patient with osteogenesis imperfect and multiple congenital spinal and thoracic deformities and severe kyphoscoliosis: a case report Zbrinjavanje dišnog puta kod politraumatiziranog bolesnika s teškom osteogenezom imperfekta i multiplim kongenitalnim deformitetima kralješnice i prsnog koša i teškom kifoskoliozom: prikaz slučaja

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Abstract

Airway management of polytraumatised patient with severe spinal and thoracic deformities demands detailed investigation of anatomical characteristics of the head, neck and airways, as well as thoracic configuration, before attempting endotracheal intubation. This enables the physician of predicting a difficult airway and preparing for difficult airway management. We present a case of a 50-year-old polytraumatised patient with multiple congenital bone deformities associated with syndrome of osteogenesis imperfect and severe kyphoscoliosis, unable of laying on his back due to gibus, who was successfully intubated in first attempt using videolaryngoscope and only mild sedation. In cases of patients with such severe multiple deformities use of videolaryngoscope or Bonfils rigid endoscope should be mandatory in order to ensure success of intubation in first attempt and to avoid possible aspiration of gastric contents.

Sažetak

Zbrinjavanje dišnog puta kod politraumatiziranog bolesnika s teškim deformitetima kralješnice i prsnog koša zahtijeva detaljan pregled anatomskih karakteristika glave, vrata i dišnih puteva kao i konfiguracije prsnog koša, prije pokušaja endotrahealne

intubacije. To omogućava liječniku da se pripremi za zbrinjavanje eventualnog otežanog dišnog puta. Prikazali smo slučaj 50- godišnjeg politraumatiziranog bolesnika s višestrukim prirođenim deformitetima kostiju povezanim sa sindromom osteogenesis imperfecta i teškom kifoskoliozom, nesposobnog da leži na leđima zbog velikog gibusa, koji je uspješno intubiran u prvom pokušaju uz upotrebu videolaringoskopa, samo uz blagu sedaciju. U slučaju zbrinjavanja bolesnika s višestrukim deformitetima, videolaringoskop ili Bonfils rigidni endoskop bi se trebali redovno koristiti zbog sigurnosti intubacije u prvom pokušaju i izbjegavanja mogućnosti aspiracije želučanog sadržaja.

OP4.

Difficult airway and one lung ventilation Otežani dišni put i ventilacija jednog pluća

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Abstract

The number of indications for lung collapse during different procedures is rising. Difficult upper airway is more often encountered with the need for single lung ventilation. In patients with difficult airway, the safest approach is by placing a single-lumen endotracheal tube with the aid of a flexible fiberoptic bronchoscope. Lung isolation in these patients is then achieved by the means of a bronchial blocker. An alternative technique is exchanging the single-lumen for a double-lumen tube using an airway exchange catheter. When there is a tracheostomy in place, an independent bronchial blocker is recommended.

Sažetak

Broj indikacija za kolaps pluća tijekom različitih kirurških postupaka je u porastu. Otežani gornji dišni put je češće povezan s potrebom ventilacije jednog pluća. U bolesnika s otežanim dišnim putem, najsigurniji pristup zbrinjavanja dišnog puta je postavljanje jednolumenskog endotrahealnog tubusa pomoću fleksibilnog fiberoptičkog bronhoskopa. Izolacija jednog plućnog krila se u tim slučajevima postiže postavljanjem bronhijalnog blokera. Alternativna tehnika je izmjena jednolumenskoga u dvolumenski endotrahealni tubus s pomoću specijalnog katetera tzv. „izmjenjivača“. Kada je prisutna traheostoma preporuča se postavljanje neodvisnog bronhijalnog blokera.

OP5.

Difficult airway in advanced Bechterew' disease: case report Otežani dišni put kod uznapredovale Behterevljeve bolesti: prikaz slučaja

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Abstract

Advanced Bechterew's disease presents with increasing ossification of spinal column, from lower lumbar segments upwards, causing first: impossibility to place spinal block in lumbar region, and later, due to stiffness of cervical spine, difficult intubation because of inability to extend and/or flex the neck during direct laryngoscopy and intubation. Mask ventilation, on the other hand, usually is possible. We report a case of 77-year-old man scheduled for elective hernioplasty, with recently advanced Bechterew's disease. According to recently accepted Mainz algorithm¹ we first intended to perform awake intubation through nose by fiberbronchoscope. The bronchoscope passed easily till tracheal bifurcation, but the placing the endotracheal tube was unexpectedly impossible due to consequences of broken nose in the age of 8. Fiberbronchoscope was therefore retracted, and we used the Bonfils rigid fiberscope after induction of general anesthesia, achieving intubation in first attempt.

Sažetak

Karakteristike uznapredovale Behterevljeve bolesti (ankilozirajući spondilitis) su sve veća osifikacija kralježnice od donjih, lumbalnih dijelova prema višim, cervikalnim uzrokuje prvo: nemogućnost izvođenja spinalnog bloka u lumbalnoj regiji, a kasnije, zbog ukočenosti vratnog dijela kralježnice, otežanu intubaciju zbog nemogućnosti ekstenzije i /ili fleksije vrata u tijeku direktne laringoskopije i intubacije. S druge strane, ventilacija na masku je obično izvediva. Ovdje prikazujemo 77-godišnjeg pacijenta koji je bio predviđen za elektivnu operaciju ingvinalne hernije, a čiji je ankilozirajući spondilitis u zadnje vrijeme jako uznapredovao. U skladu s nedavno prihvaćenim „Mainz algoritmom“ najprije smo pokušali intubirati fleksibilnim fiberbronhoskopom na budnom pacijentu. Bronhoskop je lako prošao sve do bifurkacije traheje, ali je neočekivano plasman endotrahealnog tubus zapeo na preuskoj nosnici zbog prijeloma nosa koji je pacijent zadobio u dobi od 8 godina. Zato smo izvukli fiberbronhoskop i nakon indukcije opće anestezije uspjeli intubirati od prve rigidnim fiberskopom po Bonfilsu.

OP6.

Emergency anesthesiological approach to patient with osteogenesis imperfecta type III Hitni anesteziološki pristup oboljelom od osteogeneze imperfekta tip III

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Abstract

Osteogenesis imperfecta (OI) is a rare congenital disease of the connective tissue caused by a mutation in type-1 collagen genes. Type III OI is characterized with high susceptibility to bone fracture at the slightest trauma, impaired fracture healing with consequent skeletal deformities, short stature, hearing impairment, skin changes and changes on eyes, blood vessel walls and teeth.

When anesthetising a patient with OI type III one should be aware of increased risk of difficult airway management and intubation, malignant hyperthermia, increased risk of bone fractures (positioning of the patient should be done while the patient is still awake) and increased risk of bleeding during (normal coagulogram with increased capillary fragility, platelet aggregation disorder, or decreased levels of factor VIII).

In emergency cases, special attention should be given to airway evaluation and management as well as the careful positioning and transport of the patient. Intubation with deep sedation and spontaneous breathing is the mode of choice which can maintain an airway and ensure adequate ventilation in the absence of a fiber bronchoscope. A thorough examination, obtaining a patient history, optimization of the patient's condition, as well as a careful preparation and choice of the anesthetic technique are crucial for these patients.

Herein, we describe our experience with 85 cm height and 15 kg weight 45 year female with OI type III, operated for ileus due to descending colon tumor obstruction. Balanced endotracheal anesthesia proved to be a good choice and did not result in any adverse events. To our knowledge this is the first case which describes anesthesiological particularities of OI when faced with emergency abdominal surgery setting.

Sažetak

Osteogenesis imperfecta (OI) je rijetka prirođena bolest vezivnog tkiva, a posljedica je mutacije na tipu -1 kolagenih gena. Tip II OI karakterizira je izrazita lomljivost kostiju na najmanju traumu, otežano zarastanje prijeloma sa posljedičnim deformacijama skeleta, nizak rast, poremećaj sluha, promjene na koži, očima, stjenci krvnih žila i zubima. Anestezija oboljelih od OI tip III povezana je sa rizicima otežanog zbrinjavanja dišnog puta, razvoja maligne hipertermije, prijeloma kostiju (namještanje bolesnika u položaj za operaciju dok je budan) i pojačanog krvarenja tijekom operacije.

U hitnoj kirurgiji osobitu pozornost treba posvetiti evaluaciji dišnog puta, pažljivim namještanju i transportu bolesnika. Intubacija u dubokoj sedaciji uz održano spontano disanje, u slučaju nedostupnosti fiberoptičke intubacije, optimalna je tehnika zbrinjavanja dišnog puta. Balansirana tehnika opće endotrahealne anestezije pokazala se dobrim izborom i protekla je bez neželjenih pojava. Pregled bolesnika uključujući povijest bolesti, optimizacija općeg stanja kao i pažljiv izbor anesteziološke tehnike od osobite su važnosti u zbrinjavanju ovih bolesnika.

Ovdje smo opisali naše iskustvo sa 45 godišnjom bolesnicom tjelesne visine 85 cm i mase 15 kg sa OI tip III, koja je operirana radi ileusa koji je nastao kao posljedica opstrukcije descendnog kolona tumorom.

Balansirana tehnika opće endotrahealne anestezije pokazala se dobrim izborom i protekla je bez neželjenih pojava.

Prema našem saznanju ovo je prvi prikaz bolesnice sa OI tip III koja je operirana radi hitnog abdominalnog operacijskog zahvata

OP7.

Troublesome intubation with patients suffering from pharynx cancer Otežana intubacija u bolesnika s karcinomom ždrijela

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Abstract

Introduction: Troublesome intubation is a situation when it is not possible to see any part of glottis during classical laryngoscopy. Troublesome endo-tracheal intubation is if an experienced anesthesiologist needs more than three attempts or more than ten minutes for induction of endo-tracheal tube.

Tumor processes in the area of pharynx, larynx, tongue and mandible can be cause of troublesome intubation. Cancers of post-cricoid region are the most difficult in terms of prognosis, and in terms of surgery are the most complicated because in advanced stage they can expand to cervical esophagus, larynx (trachea) at the same time.

Data taken from classical literature on anesthesiology points out that frequency of troublesome intubations in general population is 1%.

Case report: The patient H.H., aged 60, was hospitalized in the Center for Heart to the Clinical Center of the University of Sarajevo and was prepared for surgical treatment of cardio and pulmonary bypass, patient underwent induction to general anesthesia. Seven years ago, the patient was hospitalized at the Clinic for

Maxillofacial Surgery when tongue and mandible cancer was diagnosed

The patient underwent cardio surgery preparation; the patient was placed in supination position. On i.v. approach, it was ordered as follows: Hypnomidate 20 mg, Sufentanyl 50 mg, Pavulon 8 mg, Xylocain 60 mg. After establishment of sleep and sufficient relaxation, five minutes after induction in OET, intubation started. Following slight extension of cervix, a standard medium spatula was introduced, with cold light with Sellik's maneuver but it was not possible to visualize glottis of larynx.

In repeated attempt, spatula was changed, a one large one was used, and intubation was repeated but without success. We decided to do intubation for the third time with flat spatula of standard laryngoscope with Sellic maneuver by using introducer for tube, and after visualization of lower segment of rimae glottis we managed to do intubation of the patient and we could proceed with further anesthesiologic procedure and surgery.

After two attempts of oro-tracheal intubation with curved spatula, (Mackintosh spatula), after the third attempt, we managed to intubate the patient by flat spatula and, laryngoscope with camera was prepared and available. Necessary diagnostic of respiration way was done by using (CT, X-RAY) methods.

Based on urgent CT of cervical organs it was proved that area of larynx plicae vocalis was narrowed and, it was not possible to follow its lumen on two scans.

Discussion: Goal of case report and pre-surgery preparation is to point out that adequate pre-surgery evaluation and preparation of the patients with whom there is a tendency for possible troublesome establishment of respiration way is in direct relation with changed anatomic morphological relations, as well as post operational consequence of surgical removal of tumor or radiation changes in the region of face and cervix. Possible pre-surgical injuries occur as consequence of fracture easily breakable bones e.g.: hyper extension of cervix may cause fracture of cervical vertebra, a fracture of mandible can occur during intubation, and fasciculation as consequence of depolarizing mio-relaxant (sukcinil-holin) can also cause fracture of bones.

Conclusion: A diagnoses of respiratory way, as well as preparation for troublesome intubation by means of all available utilities (fiber-optical bronchoscope, spatulas flat and curved, set for conicotomia and tracheortomia, airway, tubes in various sizes and mandrels) is necessary with patients suffering from tumor processes in area of pharynx, larynx, tongue and mandible.

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OP8.

Comparison of Airtraq and standard laryngoscope in morbidly obese patients

Usporedba Airtraqa i standardnog Macintosh laringoskopa kod trahealne intubacije u patološko pretilih bolesnika

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Sažetak

Uvod: Airtraq je laringoskop koji omogućava pogled na glotis bez promjene normalne orofaringealne osi te se najčešće koristi kod otežanih intubacija. Budući da se smatra da je povećan indeks tjelesne mase (BMI) jedan od prediktora otežane intubacije proveli smo istraživanje u kojem smo uspoređivali mogućnost intubacije sa standardnim Macintosh laringoskopom i Airtraq-om kod patološko pretilih bolesnika.

Metode: U istraživanje smo uključili 40 patološko pretilih bolesnika ($BMI > 35 \text{ kg/m}^2$), ASA status I-III, predviđenih za elektivni operacijski zahvat koji zahtijeva intubaciju. Bolesnici su slučajnim odabirom podijeljeni u dvije skupine. Prva skupina bolesnika ($n=20$) intubirana je uz pomoć standardnog Macintosh laringoskopa, dok je kod bolesnika u skupinu II ($n=20$) korišten Airtraq. Praćen je broj pokušaj i vrijeme potrebno za intubaciju, te promijene u perifernoj saturaciji kisikom (SaO_2). Takođe je praćena korelacija između Mallampati klasifikacije i obujma vrata sa brojem pokušaja intubacije.

Rezultati: Vrijeme potrebno za intubaciju uz pomoć Airtraqa bilo je statistički značajno kraće u odnosu na intubacijski postupak sa standardnim Macintosh laringoskopom ($P < 0.05$). Statistički značajan veći pad SaO_2 zabilježen je u skupini I ($P < 0.05$). Svi bolesnici iz skupine II uspješno su intubirani dok je 5 bolesnika u skupini I zahtijevalo intubaciju uz pomoć Airtraqa.

Zaključak: Upotreba Airtraqa skraćuje vrijeme intubacije i smanjuje pad periferne saturacije kisikom, te se njegova upotreba preporuča kod patološko pretilih bolesnika.

OP9.

Difficult airway management with Bonfils fiberoscope in case of emergency: acute abdomen with ileus

Zbrinjavanje otežanog dišnog puta s Bonfils fiberoskopom u hitnom stanju: akutni abdomen s ileusom

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Abstract

In our clinical report, we are going to show an emergency case of 49 year old man, ASA E III status, with clinical symptoms of acute abdomen and ileus, who was scheduled for urgent surgery. Predictors of difficult intubation (Mallampati test Class III, short thyro-mental /<6 cm/, and sterno-mental distance /<10 cm/ with limited mouth opening /inter-incisor gap <3 cm/ were associated with significant comorbidity (rheumatoid arthritis, hearth disease, obesity /Body Mass Index 32.6 kg m⁻²/, cervical spine mobility and generalized vascular disease). Specialist experienced in airway management, had decided for one attempt of Bonfils fiberoptic intubation as primary and urgent tracheotomy, if needed, as secondary intervention. Immediately after supine position on the operating table, patient had lost consciousness and cardiac arrest developed. Successful intubation with oxygenation was followed by cardio-pulmonary resuscitation. After patient vital function stabilisation, urgent surgery was performed. In the presented emergency case, we succeeded quickly to secure the airway with Bonfils fiberoptic intubation what allowed appropriate oxygenation and start of resuscitation. The high risk of possible aspiration was avoided by timely provision of airway in experienced anaesthetist's hands.

Sažetak

U našem opisu, želimo prikazati hitan slučaj 49-godišnjeg bolesnika, E ASA III statusa sa evidentnim kliničkim simptomima akutnog abdomena i ileusa koji je bio predviđen za hitan kirurški zahvat. Uz začajan komorbiditet (reumatoidni artritis, bolesti srca, pretilost /BMI 32.6 kg m⁻²/, deformitet vratne kralježnice te generaliziranu ateroskleroza) u kliničkom pregledu su bili prisutni i prediktori teške intubacije (Mallampati test Class III, kratka tiromentalna /<6 cm/, i sterno-mentalna udaljenost /<10 cm/ sa ograničenim otvaranjem usta /razmak između sjekutića <3 cm/). Iskusni anesteziolog u zbrinjavanju dišnog puta se primarno odlučio za fiberoptičku intubaciju Bonfilsom, odnosno sekundarnu hitnu traheotomiju ukoliko se intubacija Bonfilsom ne uspije učiniti iz prvoga pokušaja. Neposredno nakon

premještaja bolesnika na operacijski stol te njegovog namještanja u leđni položaj, bolesnik gubi svijest uz razvitak asistolije srca. Promptno je izvedena uspješna intubacija, omogućena oksigenacija bolesnika praćena sa kardio-pulmonalnom reanimacijom. Nakon stabilizacije vitalnih funkcija bolesnika uspješno je dovršen i hitni kirurški zahvat. U prikazanom hitnom slučaju smo fiberoptičkom intubacijom uz Bonfis uspješno i brzo osigurali dišni put te time osigurali adekvatnu oksigenaciju i brzi početak reanimacije. U ovom slučaju je pravovremena intubacija u rukama iskusnog anesteziologa bila presudna za zaštitu dišni put bolesnika od prijeteće aspiracije uz prisutan ileus.

OP10.

Bronhoskopija i traheotomija kod ozljeda vratne kralježnice s tetraplegijom / Bronchoscopy and tracheotomy in cervical spine injuries with tetraplegy

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Abstract

This retrospective study investigated airway management and treatment of respiratory complication in 94 patients with cervical spine injury and accompanied tetraplegia admitted to ICU of Trauma Clinic during 2008 - 2012 period. Cervical spinal cord injury was determined according to ASIA scale and management of the airway was conducted by the recommendation of spinal surgeon. Only 6 patients underwent early tracheotomy and after day 10 tracheotomy was done in 49 patients. In remaining 39 patients which did not undergo tracheotomy, spontaneous breathing was accomplished by respiratory therapy, orotracheal intubation, bronchoscopy and therapy with bronchodilators and oxygen. Same treatment approach was used in patients who underwent tracheotomy in order to accomplish spontaneous breathing.

KEY WORDS: tetraplegy, respiratory insufficiency, tracheotomy, bronchoscopy

OBJECTIVE

Objective of this paper is to explicate the time course of airway management in tetraplegic patients regarding trauma and operative procedures.

INTRODUCTION

Cervical spine injuries are commonly associated with clinical presentation of tetraplegia with developing spinal shock and progressive respiratory failure. Spinal shock develops as a failure of sympathetic nervous system needing prompt use

of vasopressors. Respiratory failure can occur immediately after the injury, if the lesion is above C4 segment or can arise during 48 hour period after the occurrence or surgery.

Respiratory insufficiency is caused by incapability to cough and because of retention of secretions in airways, which are the consequence of intercostal muscles paralysis. Ventilatory function is usually preserved as the function of diaphragm is intact, except in injuries that have occurred on level C4 or above or due to postoperative/post-injury ascending oedema as a part of reperfusion injury.

Emergency intubation is rarely needed and tracheotomy immediately after the injury is indicated only in type ASIA A tetraplegia above C4 segment and tetraplegia where there is no need for surgical treatment. There is a controversy when to proceed to tracheotomy. Some intensive care specialist assume that tracheotomy after the 3rd post-injury day significantly cuts the time to achieve spontaneous ventilation. In the period after the postoperative day 10 it is assumed that infection pathways from tracheostomy opening to the operative wound are blocked.

PATIENTS AND METHODS

This retrospective study was conducted by analyzing medical charts of 94 patients admitted to the ICU of Trauma clinic within 48 hours from the injury, during January 2008 and September 2012 period. Male to female ratio was 85:9. Average patient age was 53 years old (13 - 93). Level and spinal cord lesion intensity caused by spinal injury was determined according to ASIA scale (A 76, B 8, C 6, D 4, E 0). All patients were continuously monitored (SpO₂, ABG, CXR).

RESULTS

Urgent surgery and surgical management was indicated, according to radiological findings, in 79 patients. Postoperatively, all patients underwent bronchoscopy each day until tracheostomy was done. After tracheostomy procedure in a period of three weeks spontaneous ventilation was trying to be accomplished. Postoperatively 42 patients were extubated, of which 31 were reintubated due to incapability to cough up excretions and developing respiratory insufficiency. Delayed tracheostomy was done in 49 patients after the day 10. 66 out of 94 patients were mechanically ventilated and in 17 patients spontaneous ventilation has not been achieved during their stay in ICU.

DISCUSSION

Airway reassessments and monitoring is crucial in treating and survival of patients with tetraplegia. During first three weeks atelectasis and pneumonia develop in 80% of patients. Worsening of respiratory function usually starts to develop after second day due to incapability to expel secretions, which demands orotracheal intubation with a wider gauge tube or an early tracheotomy. Respiratory therapy and bronchoscopy are indicated in all patients from the beginning of the treatment. Because respiratory insufficiency is a rule these patients, it is recommended to continue with postoperative sedation and ventilation, without trying to restore spontaneous breathing, until arrival to intensive care unit. According to results, in Trauma Clinic, tracheotomy was conducted in 59% of patients with an acute tetraplegia. Early tracheotomy was done in 6 patients with an injury about C4 level.

In 39 out of 94 patients spontaneous breathing was established or maintained without tracheotomy. It was accomplished with an intensive respiratory therapy comprising breathing and coughing exercise and treating with bronchodilators and oxygen and occasional bronchoscopies via orotracheal tube, after a retention of secretions and atelectasis were identified on CXR. Most intensive care specialists insist on an early percutaneous tracheotomy explaining it with a faster respiratory recovery and shortened treatment period. Tracheotomy procedure approach is determined by immobilisation of neck and position of implants (Figure 1 and 2). The aim of tracheotomy is to reduce ventilatory support and death space, to achieve sufficient respiratory function and to facilitate bronchial toilet.

Bronchial aspiration of secretions with bronchoscope is much more rational than blind catheter aspiration, but with a potential more relevant injury to mucosa. Main goal of bronchoscopy procedures on a daily basis is to achieve spontaneous ventilation and to prevent complications (eg. pneumonia and atelectasis). It has to be emphasized that many cervical spine injuries are accompanied by other injuries of thoracic region which further prolong treatment period. In the Clinic a delayed tracheotomy algorithm is implemented. A delayed tracheotomy is done on postoperative day 10 or later, depending on wound healing (Figure 3), potential infection and fistula formation. In patients whose injuries do not demand surgical intervention and injuries above C4 level with failure of diaphragm, tracheotomy is recommended as soon as possible. The frequency of bronchoscopy procedures is determined by accompanied injuries such as chest injuries and complications such as pneumonia and atelectasis.

CONCLUSION

- Airway management is crucial in treating patients with tetraplegia in their survival.
- Delayed tracheotomy after day 10 is indicated in those patients who undergo surgery.
- Bronchoscopy is indicated in all intubated and tracheotomy patients.
- Bronchoscopy is indicated when a retention of secretions and developed atelectasis is suspected on clinical examination, SpO₂ monitoring, ABG findings and radiological imaging.

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Figure 1. C-spine X-ray of 31 year old male after jumping into shallow water resulting in C6/7 luxation and tetraplegia with spinal shock. Notice the shift of C7 for whole of its length.

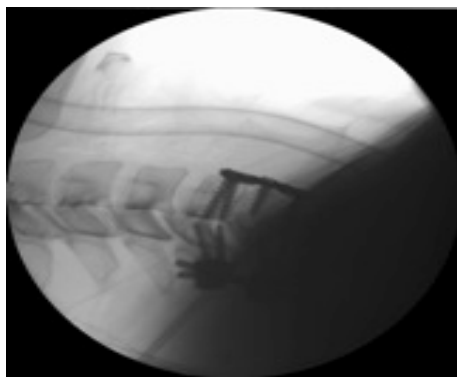


Figure 2. C-spine X-ray of the same patient after a frontal and posterior stabilisation surgery with metal implants was done.



Figure 3. Image of the same patient after a tracheotomy. This image shows principle of tracheotomy approach regarding the healing process of surgical wound and development of an infection. Spontaneous ventilation has been achieved under 3 week period.

OP11.

New paradigm of clinical skill teaching as an answer to existing inadequate airway management skills

Nova paradigma učenja kliničkih vještina kao odgovor na postojeće neadekvatne vještine u zbrinjavanju dišnog puta/

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Abstract

Aim: to analyse the current practice of airway management at the Department of emergency medicine of Split-Dalmatia County and to estimate the effects of Clinical Skills courses at the Split University School of Medicine.

Materials and Methods: two years ago a survey was done among 70 physicians using a questionnaire with 23 questions pertinent to airway protection and maintenance. In sequence, training of basic and general clinical skills was implemented into undergraduate curriculum at the Split University School of Medicine in the academic year 2010/2011 with particular attention being paid to airway management. Upon completion of the training, students' theoretical knowledge and their practical skills were assessed by multiple choice tests and Objective Structured Clinical Examination (OSCE).

Results and Discussion: 38 physicians completed the questionnaire which disclosed inadequate mastery of airway management: supraglottic devices, except oropharyngeal airway, were used rarely or never and surgical opening of airway was never instituted. Such findings influenced our reform of undergraduate medical studies which resulted in an unexpectedly favourable outcome. Being trained in accordance with the 2010 guidelines on resuscitation, students demonstrated outstanding skills and knowledge of airway management: the average score was 4,91 points (out of 5) in 2010/2011 generation and 4,57 in 2011/2012 generation.

Conclusion: our two years' experience with clinical skills courses shows it is possible to achieve favourable results with airway management after intensive training. Hence we suggest implementation of such training early into medical studies. However, training should be repeated on regular basis, as a part of lifelong learning strategy.

OP12.

The Effectiveness of Video Laryngoscopy for Airway Management in Case of Difficult Intubation

Učinkovitost video laringoskopije pri zbrinjavanju dišnog puta kod otežanih intubacija

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Abstract

Introduction: Difficult intubation occurs commonly in patients with poor general health status, when most complications occur during the introduction of general anesthesia and in case of emergency patients during resuscitation procedure, among patients whose life is endangered. Airway injuries occur most often in difficult intubation. Approach with use of video laryngoscopy reduces mortality and complications in all areas when handling compromised airway. **Material and methods:** The study was conducted on thirty patients of different age and gender in order to assess the effectiveness of video laryngoscopy.

The goal: of this study was to clearly show that both for patients and physicians the method of video laryngoscopy is more comfortable and practical and is therefore a good choice for a successful resolution of difficult airway.

Results: Thirty patients with difficult intubation were all successfully intubated without complications which usually occur after a difficult intubation.

Conclusions: Video laryngoscopy is a successful method for airway management which it decreases the percentage of damage in case of difficult airway intubation and the occurrence of laryngospasm.

Sažetak

Uvod: Otežana intubacija nastaje najčešće kod bolesnika lošeg općeg stanja, pri čemu dolazi do komplikacija najčešće pri uvodu u opću anesteziju i kod hitnih bolesnika prilikom reanimacijskog postupka, kod životno ugroženih bolesnika. Ozljede dišnog puta nastaju najčešće pri otežanim intubacijama. Pristupom video laringoskopiji smanjuje se smrtnost i komplikacije u svim domenima prilikom zbrinjavanja otežalog dišnog puta. Ispitivanje je provedeno na trideset bolesnika različite starosne dobi i spolne pripadnosti u cilju procjene učinkovitosti video laringoskopije.

Cilj ovog ispitivanja je jasno prikazati da je kako za bolesnike tako i za liječnike metoda video laringoskopije komfornija i praktičnija pa je stoga dobar izbor kod uspješnog rješavanja otežanog dišnog puta.

Rezultati: od trideset bolesnika sa otežanom intubacijom svih trideset je uspješno intubirano bez komplikacija koje najčešće nastaju nakon otežane intubacije.

Zaključak: Video laringoskopija je metoda uspješnog zbrinjavanja dišnog puta nakon koje je smanjen postotak oštećenja dišnog puta pri otežanoj intubaciji i nastanka laringospazma.

UVOD

Zbrinjavanje dišnog puta kod otežanih intubacija se najčešće javlja kod bolesnika lošeg općeg stanja. Ispitanici na kojima je provedena ova metoda su bili bolesnici kod kojih je intubacija bila otežana prilikom uvoda u opću anesteziju i prilikom zbrinjavanja bolesnika u hitnim reanimacijskim postupcima.

Komplikacije kod uvoda u opću anesteziju dijele se prema sustavima na respiratorne, kardiovaskularne, gastrointestinalne i one od strane CNS-a. Respiratorne komplikacije su znatno umanjene primjenom video laringoskopije. Obzirom na broj komplikacija u ovom ispitivanju pokazalo se da je ova metoda pouzdanija od direktoskopije koja je još uvijek na našoj klinici standardna metoda kojoj se pribjegava kao najsigurnijoj i jedinoj koja se koristi zbog nedostatka aparata.

CILJ ISTRAŽIVANJA

Retrospektivnom studijom prikazati manji broj komplikacija koje nastaju pri korištenju video laringoskopije u odnosu oštećenja koja nastaju primjenom rutinske metode direktoskopijom kod endotrahealne intubacije.

ZADACI ISTRAŽIVANJA

Utvrđiti uvjete za ocjenjivanje mandibularnog prostora pri otežanoj endotrahealnoj intubaciji:

1. Tireoentalna udaljenost
2. Sternentalna udaljenost
3. Mandibulohioidni razmak
4. Test protruzije mandibule

Utvrđiti predznake otežane endotrahealne intubacije uvidom u raspored i kvalitet zuba, brkova, oblik brade, odnos gornjih i donjih zuba (sjekutića) pri zatvaranju usta, dužini i debljini vrata, prikazu nepčanih lukova, elastičnosti submandibularnog prostora.

Kod bolesnika koji su u stanju izvršavati komande kroz anamnezu i klinički pregled tražiti od bolesnika da koliko može usta otvori, maksimalno isplazi jezik, da li može izvršiti protruziju mandibule i koliko može zabaciti glavu (ekstendirati), te utvrditi da li je bio prije intubiran i ako jeste da li je bilo komplikacija i kakve su bile.

Obzirom na relativnu točnost navedenih pregleda, mogućnost komplikacija pri endotrahealnoj intubaciji uvijek postoji, jer ne postoji test kojim bi smo sigurno uočili otežanu intubaciju.

U slučaju da dođe do trenutačne nemogućnosti intubacije ne gubiti vrijeme i čekati da eventualno nastupi hipoksija već dobro adaptiranom maskom pažljivo kontinuiranim pritiskom ubacivati čisti kisik između spastično stegnutih glasnica. Ovakvim pristupom ako i nastane laringospazam najčešće popusti.

REZULTATI ISTRAŽIVANJA

Obzirom na težinu općeg stanja ispitivanih bolesnika, rezultati sprovođenja ove metode idu u prilog potrebi za korištenje video laringoskopa. U period od travnja do svibnja 2012.god. ispitano je 30 bolesnika različite starosne i spolne strukture te se retrospektivnim uvidom konstatira da u tim slučajevima nije bilo ne riješive otežane endotrahealne intubacije. Kod navedenih ispitanika nije bilo oštećenja dišnog puta pri endotrahealnoj intubaciji. Kod bolesnikakoji su uvedeni u opću

anesteziju, a imali su predznake otežane intubacije, nije bilo komplikacija nakon ekstubacije uzrokovanih intubacijom. Bolesnici koji su bili predviđeni za hitni reanimacijski postupak a njihovi testovi procjene su pokazali da će intubacije biti otežana bez dodatnih komplikacija su intubirani te po stabilizaciji općeg stanja ekstubirani bez prisustva oštećenja dišnog puta. Pregledom bolesnika nakon sprovede metode saznaje se da nije bilo negativnih rezultata.

DISKUSIJA

Prije upotrebe video laringoskopa na bolesniku liječniku je potrebno iskustvo sa rukovanjem ovim aparatom te se zahtjeva od njega da izvježba na lutki manipulaciju video laringoskopom. Uz adekvatnu edukaciju ova metoda se pokazala izuzetno uspješnom.

Postavljanje tubusa nekada može biti teško bez obzira na dobru vidljivost te se dodatim žljebom na špatuli tubusa određuje pravac nakon vizualizacije glasnica. Dizajn špatule je različit kod raznih modela i liječnik treba odabrati adekvatnu špatulu. Video laringoskopija ima prednost da gledanjem u ekran imamo kompletan uvid u usnu šupljinu te je stoga konfornija i za liječnika, sigurnim uvidom u kompletnu sliku smanjen je i stres koji je neizbježan kod otežane intubacije.

ZAKLJUČAK

Video laringoskopija je metoda uspješnog zbrinjavanja dišnog puta nakon koje je smanjen postotak oštećenja dišnog puta pri otežanoj intubaciji. Obzirom na broj bolesnika i vremenski period u kojem smo koristili video laringoskop naša iskustva su pozitivna, ali se ne može garantirati uspjeh jer otežana intubacija je nepredvidiva i uvijek pored ove metode moramo biti dobro pripremljeni na nemogućnost intubacije te osigurati čisti kisik kako ne bi došlo do hipoksije te suzbiti laringospazam.

OP13.

McGrath® Series 5 Videolaryngoscop for Tracheal Intubation in Patient with Ankylosing Spondylitis and Failed Spinal Anesthesia for Total Hip Arthroplasty at the Orthopaedic Clinic Lovran **McGrath® Series 5 videolaringskop za trahealnu intubaciju bolesnika s ankilozantnim spodilitisom nakon neuspješne spinalne anestezije za totalnu artrosplastiku kuka u Ortopedskoj klinici u Lovranu**

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Abstract

Background. McGrath® Series 5 Portable Video Laryngoscope is a new videolaringskop device. The aim of this case report was to present the use of the McGrath® Series 5 for tracheal intubation in patient with ankylosing spondylitis (AS) under general anesthesia at The Orthopaedic Clinic in Lovran.

Case Description

We report the case of a 57-year-old patient scheduled for hip surgery. The patient had severe ankylosing spondylitis (AS) with complete vertebral immobility making conventional neuraxial and general endotracheal anesthesia impossible.

Literature Review

The previous works suggest that new different videolaringskop techniques may be superior to direct laryngoscopy, particularly in management of the difficult airway.

Purposes and Clinical Relevance

We achieved successful tracheal intubation in the general anesthesia by McGrath® Series 5 Portable Video Laryngoscope for total hip arthroplasty.

Case Report

A 57-year-old man with a history of severe ankylosing spondylitis and constant pain in the left hip was scheduled for total hip replacement surgery. He was regularly treated by rheumatologists and he used corticosteroids and biological therapy with no pain regression.

His clinical gait was limping along considerably, the neck was completely motionless, mobility of the lower back reduced to half anteflexion, retroflexion was blocked, the rotation of both hips were blocked, the flexion of right hip possible to 90 degrees and of the left hip to 80 degrees with intensive pain.

A radiograph showed severe ankylosing spondylitis with so called bamboo spine (Fig 1, 2, 3).



Fig 1



Fig 2



Fig 3

Anesthetic assessment of the airway revealed atlanto-occipital extension completely blocked, the Mallampati classification was 4, thyromental distance 2 cm and interincisor gap was 3,5 cm.

The patient was informed of his situation and our recommendation: attempting conventional neuraxial anesthesia first and if that failed to proceed to deep sedation and McGrath® Series 5 videolaryngoscopy and if possible finishing with complete general anesthesia and intubation.

On arrival in the operating room, routine noninvasive monitoring was applied and equipment for difficult intubation was checked and on standby. Two intravenous lines and intravenous hydration were continued.

The patient was placed in the supine position supporting the head and neck with pillows to fill in the space below.

The patient was sedated with midazolam 2 mg and sufentanyl 2,5 microg progressively followed by bolus infusion of propofol when we confirmed that mask ventilation is possible.

The mouth was entered in midline following the anatomy until a clear image of the vocal cords is obtained. The endotracheal tube, curved to a "hockey stick" form, was guided through the vocal cords viewing in real time on the video display and the patient was successfully intubated.

Discussion

Patients with ankylosing spondylitis often need total hip replacement surgery. The long-standing ankylosing spondylitis led to spontaneous fusion of the spine from the cervical to the lumbar regions (1).

Because of frequent complete vertebral rigidity these patients are known to present difficulties as with spinal anesthesia as well with conventional tracheal intubation (2). The previous works suggest that new different videolaryngoscopic techniques may be superior to direct laryngoscopy, particularly in management of the difficult airway (3).

Recent experimental, manikin study has suggested that the use of different videolaryngoscopes: glidescope, CMAC, Storz DCI, during simulated difficult laryngoscopy resulted in a better glottic view than the Macintosh blade (4). The C-MAC was found to provide a better laryngoscopic view than the Storz videolaryngoscope with statistically significant expediency of successful intubation among investigated videolaryngoscopes (4).

The patients with ankylosing spondylitis have significant difficulties with direct laryngoscopy but in the majority the GlideScope[®] improved the outcome scores ($P < 0.01$) (5). Naso-tracheal intubations by the GlideScope[®] were successful on 17/20 occasions, including 8 of the 11 difficult laryngoscopy (5).

Furthermore, in elective patients with ankylosing spondylitis a higher level of security is needed: awake fiberoptic intubation while maintaining spontaneous breathing or the use of GlideScope for tracheal intubation in those patients who prefer airway management under anaesthesia (5).

Airtraq videolaryngoscope in difficult airways also provides a view of the glottis without a need to align the oral, pharyngeal, and tracheal axes, and therefore requires less force to be applied during laryngoscopy (3).

The McGrath[®] Series 5 Video Laryngoscope (AircraftMedical, Edinburgh, UK) is designed to simplify intubation of difficult airways. The McGrath[®] Series 5 incorporates a light source and miniature camera within the CameraStickTM assembly to view the larynx during the procedure of intubation. The image is displayed on an coloured liquid crystal display screen mounted to the top of the handle of the device (6).

In a recent case report study it was found that the use of the McGrath[®] Series 5 videolaryngoscope resulted in an excellent laryngoscopic view in all anticipated patient with a difficult airway. Tracheal intubation was completed quickly and without complication during the first laryngoscopy. These results mirror authors wider experience with the McGrath[®] videolaryngoscope (7).

Our experience with McGrath[®] Series 5 videolaryngoscope in The Orthopaedic Clinic Lovran is quite meager compared to these but we successfully intubated all our patients with impossible direct intubations during last year. The more anterior view of the larynx is obtained with the McGrath[®] and this potential difficulty can be overcome by a rigid stylet and shaping the tracheal tube before attempting insertion (7).

It should be noticed that McGrath should not be used as a first-line laryngoscope instrument by inexperienced anaesthetists. In a randomized study comparing McGrath and the Macintosh laryngoscopes during routine tracheal intubation

performed by inexperienced anaesthetists on 120 patients duration of intubation was significantly longer ($P < 0.001$) in the McGrath group with no significant differences in other outcomes (8).

In conclusion, the McGrath® Series 5 Videolaryngoscop was showed as a useful tool for tracheal intubation in our patient with severe ankylosing spondylitis.

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