

Review Article on Airway Management Modalities

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Abstract: *Airway management is an essential part of life saving procedure. it is perform to protect the airway, it is necessary to individual those are unconscious, trauma and severe illness. The obstruction due to secretion of body fluids and presence of foreign body. The airway management is necessary for the individual to protect one's life. This review is helpful for provide the education regarding how to manage the modalities of airway obstruction. In this review we know about the airway obstruction like choking. There are several types of airway obstruction in here Upper airway obstructions, Lower airway obstructions, Partial airway obstructions, Complete airway obstructions, Acute airway obstructions, Chronic airway obstructions. The causes of airway obstruction are Inhaling or swallowing a foreign object, Small object lodged in the nose or mouth. Allergic reaction, Trauma to the airway from an accident Respiratory illness that causes upper airway inflammation (croup), Swelling of the tongue or epiglottis. Collapse of the tracheal wall (tracheomalacia). There are five Airway management modalities like Jaw thrust maneuver, Suctioning, Oropharyngeal airway, Nasopharyngeal airway, Intubation, Tracheostomy and in here each procedure have indication article and procedure and each procedure helpful for reduce the complication /risk of airway obstruction.*

Keywords: ET. Tube - Endotracheal tube, Oropharyngeal airway

1. Introduction

A airway management requires a sound of knowledge and skill sets—specifically, the ability to predict difficulty in airway management, to formulate an airway management plan, and to have the skills necessary to execute that plan using the wide range of available airway devices. Development of these skills should be an ongoing endeavour for all anaesthesiologists. As within any manually skill, continued practice improves performance and may reduce the likelihood of complications. Airway devices are continually being introduced into the clinical field, each with unique properties that may be used in certain situations. Becoming familiar with new devices under controlled conditions is important for the anaesthesia practitioner—the difficult airway is not an appropriate setting during which to experiment with a new technique. ⁽¹⁾

Definition

Airway management is the, planning, and uses of medical procedures and devices for the purpose of maintaining ventilation in a patient. These procedures are indication that patients is undergoing general anaesthesia and in patients with. respiratory failure. or acute *airway* obstruction.

Airway

The passage from your nose and throat down into your lungs, through which you breathe.

The **breathing** passage in the pathway through which air flows into the lungs. This starts from your nose and mouth, it includes your throat, windpipe and lungs.

Airway Obstruction

An airway obstruction is a blockage of airway. The airway is a complex system of tubes that conveys inhaled air in the lungs by nose and mouth into your lungs. An obstruction may totally prevent air from getting into the lungs. Some airway obstructions are life - threatening emergencies that require immediate medical attention.

Types of Airway Obstructions

- **Upper airway obstructions:** Occurs in the nose, mouth and larynx (voice box).
- **Lower airway obstructions:** Occurs between larynx and lungs the narrow passageways of air.
- **Partial airway obstructions:** Allow some air to pass. Can still breathe with a partial airway obstruction, but difficulty in breathing.
- **Complete airway obstructions:** Don't allow air to pass. Can't breathe if a complete airway obstruction.
- **Acute airway obstructions:** A blockages that occur quickly by a foreign object is an example of an acute airway obstruction.
- **Chronic airway obstructions:** Occur two ways: blockages that take a long time to develop and blockages that last for a long time.

Causes of Airway Obstruction

- Inhaling or swallowing a foreign object
- Foreign object lodged nose and mouth
- Allergic reaction
- Traumatic injury in the airway during an accident
- Vocal cord problems
- Breath a large amount of smoke from a fire
- Viral and Bacterial infections
- Respiratory disease that causes upper and lower airway inflammation (croup)
- Inflammation of epiglottis.

Airway Management

Airway management includes a set of maneuvers and medical procedures perform for airway. It ensures an open pathway for gas exchange between lungs and atmosphere. It is accomplished clearing the obstructed airway; and prevent the airway obstruction. Airway obstructed by, foreign objects, body fluids such as blood and gastric contents.

Need of Airway

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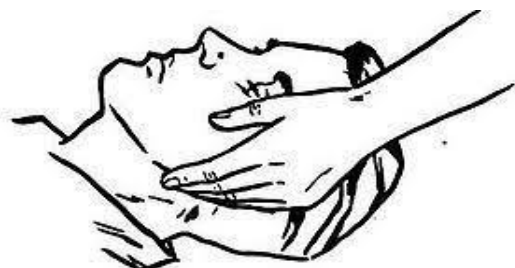
The airway is the most important management of the severely injured patient. It is essential to open and clear the airway to allow air to the distal endobronchial tree. Manual methods of opening the airway is jaw thrust manoeuvre. Numerous methods for establishing definitive control of the airway as well as the associated devices currently available for maintaining and controlling the airway obstruction. Airway is maintained, by adequate oxygenation supply. Modern devices are useful for ventilation and protect the airway obstruction dioxide in each breath. These devices allow to supply air as well as to continuously monitor the efficacy of ventilation.

Types of Airway Management Modalities

- 1) Jaw thrust manoeuvre.
- 2) Suctioning.
- 3) Oropharyngeal airway/Nasopharyngeal airway.
- 4) Intubation.
- 5) Tracheostomy/ Cricothyroidotomy.

Jaw thrust maneuver

The jaw - thrust maneuver is a medical procedure it used to prevent the tongue back fall obstructing the upper airways. the head - tilt and chin - lift maneuver are two main tools of basic airway management, and this procedure is often used in conjunction with other basic airway techniques including bag - valve - mask ventilation. The jaw - thrust maneuver is often used those patients they have cervical neck problems. (2) Stand at the head of the stretcher. And place palms on the patient's temples and fingers under the mandible. Next lift the mandible upward with fingers.



The maneuver performed in a supine position. This procedure is performed by placing the index and middle fingers to push the backside of the upwards while their thumbs push down on the chin to open the mouth. When the mandible is displaced onward, it pulls the tongue forward and relief from obstructing airway the entrance of the trachea. (3)

The jaw - thrust maneuver is considered the better alternative (rather than the head - tilt/chin - lift maneuver) when suspects that may have a spinal injury. International liaison committee has reviewed various studies that found no spine - protecting advantage to the jaw - thrust maneuver. (4) Its "Treatment Recommendation" under Opening the Airway "performer should open the airway using the head tilt–chin lift maneuver procedure.

It is a Part of pre - intubation and emergency airway obstruction procedures, the head tilt–chin lift maneuver. The jaw - thrust maneuver is 2 non invasive, manual technique to

help open upper airway when the tongue back fall the glottis, which commonly occurs in an unconscious patient.

Indications

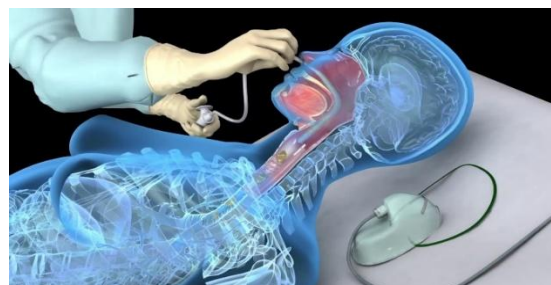
The **jaw - thrust maneuver** is relieve upper airway obstruction due to move the tongue anteriorly with the **mandible**, minimizing the tongue's ability to obstruct the airway. Treatment of suspected upper airway obstruction in unresponsive patients. It is Part of initial emergency treatment for impending respiratory arrest. Improvement of airway patency during BVM (bag valve mask) ventilation and sometimes during spontaneous breathing and confirmation of apnea. (5)

Suctioning

Suctioning is 'the act of sucking by mechanical aspiration of secretions from airway and oral cavity it place'. It is life saving procedure perform for preventing airway obstruction.

Types of Suctioning

- Nasal suction (suctioning in the nose)
- Oral suction (suctioning the mouth)
- Nasopharyngeal suctioning
- Oropharyngeal suction (suctioning the throat)
- Deep suctioning.



Nasal suction (suctioning in the nose)



Oral suction (suctioning the mouth)

Airway suctioning is a procedure done in most care of settings, acute care, sub - acute care, long term care, and home care settings. Suctioning is performed to effectively move secretions from the respiratory tract. It may occurs when airway obstruct due to production of secretions, which leads to the accumulation of secretions in the upper and lower respiratory tract. It can be lead to possible airway obstruction and ineffective airflow. It ultimately leads to an impaired exchange of gases like oxygen and carbon dioxide, which need for cellular function.

It is a medical, devices and need for suctioning. Suctioning may be used for clearing the airway due to obstruct by blood, saliva, food content, so that the upper and lower airway may open. Suctioning can prevent airway obstruction, which can cause of lung infections. In

pulmonary hygiene, suction is used to remove fluids from the airways (6) It is clearer airway and prevent growth of microorganisms. Suction - devices are often called aspirators.

Suctioning is a procedure that help to open airway obstruction and free from mucous. Mucous is none as "secretions". When an endotracheal tube is placed for breathing, it will require discontinuously suctioning. The repetition will depend on the amount and thickness of the secretions.

During suctioning, a small suction catheter is inserted into the endotracheal tube. The suction tube is applied for removing secretion. The suction catheter is contained within a sterile plastic bag. It allows to quickly suction body flood, thick secretion without punctuate the machine. Some time, during suctioning coughing will appear in the procedure. It actually helps to bring more and more secretions come forward.

Airway suctioning is indication some obstruction appear in upper and lower airway and multiple reasons for it. Mostly suctioning is done for removal of secretions to the respiratory tract, but sometimes suctioning need for removal of blood, meconium in specific cases. Suctioning is also performed for diagnostic purposes.

Equipment

Vacuum with collection container and Personal defensive articles like gloves, masks, and goggles (clean and sterile) Sterile saline Manual resuscitation bag for ventilation, a stethoscope, and continuous measurement of pulse oximetry and heart rate. (7) Sterile suction catheter different sizes one being smaller than the appropriate Gauge needed. Supplementary medications as needed for relief.

Suction Catheter Size

S. No	Suction Catheter Size (Fr)	Suction Catheter External Diameter (mm)	Area of Suction Catheter (mm ²)
1	16	5.3	21.9
2	14	4.7	16.8
3	12	4.0	12.3



Oropharyngeal Airway

Oropharyngeal airway (known Guedel pattern airway) is a medical device and an airway accessory used to maintain airway. It protected to tongue back fall and preventing the tongue from covering the epiglottis, which can prevent the airway obstruction promote breathing. It mostly used unconscious, person and relax the muscles of their jaw protect the tongue to unobstructed the airway. (8)

Oropharyngeal airways get in a variety of sizes, Infant to adult, and are used commonly in hospital emergency and Intensive careunit and Neonatal care unite for short term airway management. When manual methods are insufficient to maintain an airway. This type of medical device is used, by staff and other health professionals. It is used when endotracheal intubation is not done it is short term duration procedure to protect airway obstruction.

Types of Oropharyngeal Airway

The oropharyngeal airway is divided into three section nasopharynx, oropharynx, and hypopharynx. The nasopharyngeal muscles of the pharyngeal wall and soft palate maintain palatal tension in order to prevent airway obstruction during sleep.

Size of Oropharyngeal Airway

S. No	Size	ISO Size	Colour	Length
1	000	3	Clear	30mm
2	00	4	Pink	40mm
3	0	5	Blue	50mm
4	1	6	Black	60mm
5	2	7	White	70mm
6	3	8	Green	80mm
7	4	9	Yellow	90mm
8	5	10	Red	100mm
9	6	12	Purple	120mm



Oropharyngeal airway

Nasopharyngeal Airway

Nasopharyngeal airway is known as nasal trumpet. It is an airway accessory, tube that is designed to be inserted into the nasal passageway to secure an airway opening. First time it was introduce by Hans Karl Wendl (de) in 1958. (9) As with other accessory of, Nasopharyngeal airway catheter are measured using by French catheter scale, but sizes are measured also quoted in millimetres (10)

Typical sizes include: 6.5 mm/28FR, 7.0 mm/30FR, 7.5 mm/32FR, 8.0 mm/34FR, and 8.5 mm/36FR. (11)

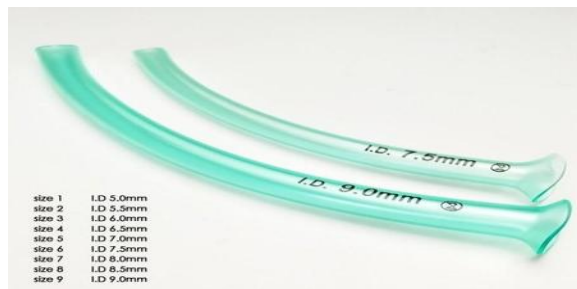
Nasopharyngeal Airway Uses

Nasopharyngeal airways can be used for providing oxygen due to cause of airway obstruction. It inserted to the nostril to posterior pharynx and avoids airway obstruction. It used when oraltrauma and chronic infection appear in oral cavity. Nasopharyngeal airways may also be help for bag - valve - mask ventilation.

Types and Number of Nasopharyngeal Airway

Adult nasopharyngeal airway size from 6 to 9 cm. and Sizes 6 to 7 cm should be considered in the small adult, 7 to 8 cm in the medium size adult, and 8 to 9 cm in the large adult.

S. No	Size	I. D MM
1	1size	5.0
2	2size	5.5
3	3size	6.0
4	4size	6.5
5	5size	7.0
6	6size	7.5
7	7size	8.0
8	8 size	8.5
9	9 size	9.0



(Nasopharyngeal airway)

Intubation

The Intubation is a process to putting a hollow tube in to the trachea for artificial breathing. Through the oral cavity to secure the life and relieve the airway obstruction.

Types of Intubation

- **Endotracheal intubation** - Endotracheal intubation, simply referred as intubation, In this procedure a flexible plastic tube is placement into the trachea (windpipe) to maintain an airway. It is frequently performed for reliving airway obstruction in critically ill, an injured, Endotracheal intubation facilitate breathing of the lungs, it provide by mechanical, and to prevent the airway obstruction.
- **Nasotracheal intubation** - Nasotracheal intubation procedure is an endotracheal intubation tube is inserted through nose to the vocal apparatus into the trachea and the tracheotomy, it used primarily in situations where the need of airway support is excepted. .
- **Fibreoptic Intubation** - Fiberoptic intubation (FOI) is an effective technique for establishing airway accessing for both anticipated and unanticipated difficult airways obstruction. It first described in 1960s, this approach can facilitate airway management in a variety of clinical scenarios given proper preparation and clinical techniques, and indications for and complications of its use. The Fiberoptic intubation is a procedure of airway obstruction management process is discussed. with regard in difficult airway management.
- **Tracheostomy intubation** - Tracheostomy intubation is surgical procedure it consists of making an incision (cut) on the anterior aspect (front) of the neck and opening a direct airway through an incision in the buccal cavity (windpipe). The resulting hole can serve independently relieve to the airway obstruction in this procedure inserted a tube in the stoma tube allows to breathe without the use of the nose and mouth.

Need of Intubation

Endotracheal intubation (EI) is an emergency procedure that's performed for management of airway obstruction. E. T maintains an airway and helps prevent suffocation. The most widely used route for endotracheal intubation is oral cavity in which an E. T tube is inserted through the mouth to vocal card into the trachea. In a nasotracheal procedure, an endotracheal tube is passed through the nose to vocal apparatus into the trachea.

Intubation is procedure in which a tube is inserting, in trachea through the mouth and then into the airway. It is done so that the airway obstruction prevents and breath can be provided by mechanical support to assist with breathing during severe illness trauma. The tube is then connected to a ventilator, which pushes air into the lungs to deliver a breath. Intubation is also performed for respiratory failure. There are many reasons a patient may be too ill to breathe well enough on their own. They may have an injury to the lungs; they might have severe pneumonia, or a breathing problem such as COPD ⁽¹¹⁾

Intubation, procedure performs due to illness injury, which allows the mouth and airway to relax. It is typically flat on their back and inserting the tube is standing at the head of the bed, looking at the head to feet. The mouth is open gently and using a lighted instrument to keep the tongue out of the way and to light the throat, that why the tube is gently guided into the throat and promoted into the airway. There is a small balloon around the tube that is inflated to hold the tube in place and to keep air from come out. Once this balloon is inflated, the tube is securely positioned in the airway and it is fixed at the mouth. Successful placement is checked first by listening to the lungs sound with a stethoscope and often verified with a chest X - ray. A device that measures carbon dioxide—which would only be present if the tube is in the lungs, rather than in the esophagus—is used to confirm that it was placed correctly ⁽¹²⁾

Tracheal intubation, usually inserted a plastic tube into vocal card (windpipe) to maintain an airway obstruction. It is frequently performed in critically ill and injured, to provide breath to the lungs, including mechanical support and to prevent the airway obstruction.

Intubation Equipment List

- Laryngoscope: Confirm that light source is functional prior to intubation. . . .
- Laryngoscope blade, No.3 to 4. . .
- Endotracheal (ET) tube.7.5 to 8.5 No.
- Stylet bougie
- Disposable Syringe, 10 mL (to inflate ET tube balloon)
- Suction catheter (eg, Yankauer)

Laryngoscope

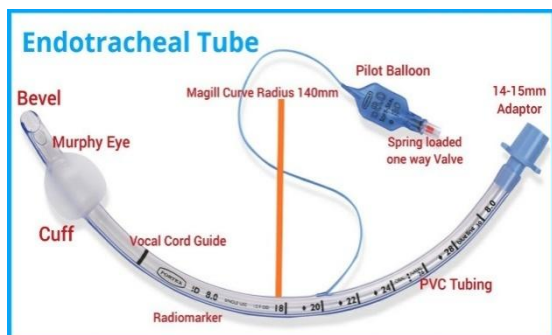
The traditional laryngoscope is a device designed to assist to visualization the trachea during intubation. It consists in two parts: a handle with battery and a blade. The most common laryngoscope blade use for intubation in adults is curved Macintosh blade. It is inserted into the right side of the mouth to displace the tongue horizontally. The tip of the

blade sits in the vallecula and it lifted forward to elevate the epiglottis and expose the larynx.



Intubation Tube

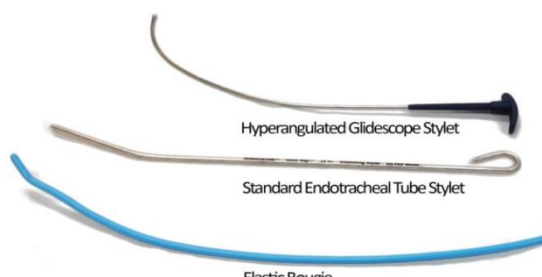
The mostly commonly used E. T. Tube is made of polyvinyl chloride (PVC), it is transparent plastic that allows the visualization of expiration condensation (“breath fogging”), secretions, and foreign substance easily visualize in the tube. PVC is a tough material it store in room temperature, but relatively more pliable as it warms easily placement in the trachea, which permits easy manipulation of the tube tip during intubation reducing the risk of mucosal injury.



E. T. tube size depend on the inner diameter of its lumen in millimetres. Available sizes range of 2.0 to 12.0 mm. For oral intubations, a 7.0 - 7.5 No. E. T. Tube is generally used for woman and a 7.5 - 8.5 No. E. T. Tube use for man. However, the appropriate tube size is a multifactorial clinical decision based on height and weight, this procedure done for surgery, and sever illness, trauma and presence of airway obstruction. . Nasotracheal tube is almost 2 cm short than endotracheal tubes. Due to anatomic variations of tracheas may be difficult to predict, several sizes of E. T. Tube should be readily available for intubation.

Stylet or Bougie

The Eschmann stylet is a tool designed for guide to intratracheal intubation that is despite scientific information confirming that it is highly useful in difficult intubation



Trecheostomy

Tracheostomy is an incision made to relieve for airway obstruction. It is a surgical procedure. Which is consist an incision on the neck and opening a direct airway through cut in the trachea 2 and 3rd ring. The result of an incision may be serve independently provide breath and prevent airway obstruction. A tracheostomy tube (¹³) to be inserted in this cut and allows to breathe without the use of the nose and mouth.

A tracheostomy is performed during sever ill, and oral injured due to cause of airway obstruction when need access, airway protection and mechanical support to provided for a long time. This procedure can be easily and rapidly performed at the bedside in Intensive care unit and O. T The incidence of these complications often depends on the experience of the operator and while bronchoscopy guidance has been used to reduce the number of complications, due to procedure, requires a separate operator and maybe cause hyper capnoea.

Need of Trecheostomy

A tracheostomy is performed due to several reasons, restricted airways. It may be done during an emergency when upper airway and oral trauma obstructed the breathing pattern. They are following –

- Anaphylaxis.
- Birth defects of the airway.
- Lung cancer
- Coma and tumour's.
- D dysfunction.
- Facial burns or surgery, infection.
- Injury to the larynx or laryngectomy.
- Injury to the chest wall.
- Need for prolonged ventilator support.
- Obstruction by a foreign body
- Sleep apnea
- Paralysis of the respiratory muscles and swallowing through.
- Severe neck or mouth injuries.
- Vocal cord paralysis.

Nurses Role in Tracheostomy Care

- To maintain airway patency by suctioning mucus and encrusted secretions.
- To maintain hygiene and prevent infection at the tracheostomy site
- To facilitate the site and prevent skin excoriation around the tracheostomy incision
- To promote comfort
- To prevent displacement

Assessment

- Respiratory rate (ease of breathing, rate, rhythm, depth, lung sounds, and oxygen saturation level)
- Pulse rate
- Secretions to the tracheostomy site (character and amount)
- Presence of drainage and tracheostomy dressing.
- Appearance of (redness, swelling, purulent discharge,)

Planning

Tracheostomy care is a sterile procedure sound of knowledge, sterile technique, and problem solving methods, it performed by a trained staff nurse.

Equipment

- Sterile disposable kit for tracheostomy cleaning (sterile containers, sterile nylon brush or pipe cleaners, sterile applicators, gauze squares).
- Sterile suction catheter (suction catheter and sterile container for collection).
- Normal saline (Check agency protocol for soaking solution).
- Sterile gloves (2 pairs).
- Clean gloves.
- Drape to protect bed linens.
- Moisture - proof bag.
- Commercially available tracheostomy dressing, gauze dressing.
- Cotton twill ties.
- Clean scissors.

Tracheostomy tube made of mostly steel and PVC it use according to age group

S. No	Age Group	Tracheostomy tube Size
1	Preterm neonates	2.5 - 3.0
2	1 - 2 years	3.5 - 4.0
3	3 - 6 years	4.5 - 5.0
4	6 - 12 years	5.5 - 6.0
5	12 - 14	7.0
6	Adult	8.5 - 9.0

Roughly calculated with the following formula in children
Size (number) of tube = (age/4 +4. It indicate internal diameter in mm)⁽¹⁴⁾



Indications

There are four main causes to need a tracheotomy insertion;

- 1) Emergency airway access
- 2) Airway access for prolonged mechanical ventilation
- 3) Upper airway obstruction
- 4) Decreased clearance of tracheobronchial secretions

Contraindications

There are few absolute contraindications for percutaneous tracheostomy:

- 1) Active infection at the site of tracheostomy
- 2) Uncontrolled bleeding disorder
- 3) Unstable cardiopulmonary status (shock, extremely poor ventilatory status)
- 4) Patient unable to stay still
- 5) Abnormal anatomy of the trachea laryngeal structures

2. Conclusion

In this topic we got knowledge regarding airway management modalities definition of airway and airway obstruction, causes and types of airway obstruction, modalities of airway management and its indication with procedure and provide care to the patient with this condition.

References

- [1] Behringer EC: Anesthesiol Clin North America 20: 813, 2002.
- [2] *Surgeons, American Academy of Orthopaedic (2006). Emergency: Care and Transportation of the Sick and Injured. Jones & Bartlett Learning. p.225. ISBN 9780763744069. Retrieved 11 November 2017.*
- [3] Margolis, Gregg S. ; Surgeons, American Academy of Orthopaedic (2003). Paramedic: Airway Management. Jones & Bartlett Learning. p.106. ISBN 9780763713270. Retrieved 11 November 2017
- [4] *2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations (29 November 2005). "Part 2: Adult Basic Life Support". Circulation.112 (22 Supplement): III - 5. doi: 10.1161/CIRCULATIONAHA.105.166472 (inactive 15 January 2021)*
- [5] How To Do Head Tilt–Chin Lift and Jaw - Thrust Maneuvers by Dorothy Habrat, DO, Department of Emergency Medicine, University of New Mexico School of Medicine Last full review/revision Aug 2019.
- [6] Allen GS, Coates NE (November 1996). "Pulmonary contusion: A collective review". *The American Surgeon*.62 (11): 895–900. PMID 8895709.
- [7] AARC Clinical Practice Guidelines. Endotracheal suctioning of mechanically ventilated patients with artificial airways 2010. Respiratory care.2010 Jun; [PubMed PMID: 20507660]
- [8] Ed Dickinson; Dan Limmer; O'Keefe, Michael F. ; Grant, Harvey D. ; Bob Murray (2008). *Emergency Care (11th Edition)*. Englewood Cliffs, N. J: Prentice Hall. pp.157–9. ISBN 0 - 13 - 500524 - 8.
- [9] Wendl H K. The story of the Wendl tube and its use. In: Schulte am Esch J, Goerig M (eds.) Proceedings of the Fourth International Symposium on the History of Anaesthesia. Dräger Druck, Lübeck, 1998, S.531–534
- [10] *American Academy of Orthopaedic Surgeons (AAOS) ; Nancy L. Caroline (15 August 2017). Nancy Caroline's Emergency Care in the Streets. Jones & Bartlett Learning. pp.801–. ISBN 978 - 1 - 284 - 10488 - 2.*
- [11] *Mick J. Sanders; Lawrence M. Lewis; Kim D. McKenna; Gary Quick (2012). Mosby's Paramedic Textbook. Jones & Bartlett Publishers. pp.436–. ISBN 978 - 0 - 323 - 07275 - 5.*

- [12] *Michael Smith; Mike Smith; American Academy of Orthopaedic Surgeons (April 2006). ACLS for EMT - Basics. Jones & Bartlett Learning. pp.17-. ISBN 978 - 0 - 7637 - 4395 - 6.*
- [13] Medline Plus. Endotracheal Intubation. Oct 11, 2018
- [14] Artune CA, Hagberg CA. Tracheal extubation. *Respir Care*.2014 Jun; 59 (6): 991 - 10025. doi: 10.4187/respcare.02926
- [15] *Molnar, Heather. "Types of Tracheostomy Tubes"*