Upper Airway Obstruction

This lecture was taken with Dr.AL-Ammar

Special thanks to our old colleague Dr.Hz

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ψ Anatomy of the larynx and trachea:

1. Laryngeal anatomy:

The laryngeal framework is composed of a cartilage.

*three unpaired cartilages:

a. cricoid: the only complete ring in the airway. Unable to expand. The narrowest part of airways in children. Liable to injury.

b. thyroid: the biggest.

c. epiglottis.

*three paired cartilages:

a. aryteroids: pyramid shape. Base on the cricoids lamin. Attached anterior to the vocal ligament. Posterior to crycoaryteroid muscle. Most important as it's responsible for movement of vocal cord.(most imp. One)

b. corniculate.

c. curiform.

d. trieceaus.

*laryngeal membranes and ligaments:

- extrinsic: attach the larynx to other structures.

- intrinsic: between the laryngeal cartilage.

- thyrohyoid membrane.

- coricothyroid membrane: part of conus elasticus.

(coricohyroidectormy: easiest approach to emergency airway obstruction) but not in children

Tracheostomy which done in 2^{nd}, 3^{rd}, or 4^{th} tracheal ring.

- quadrangular membrane.

*muscles:

-extrinsic.

- intrinsic: all supplied by recurrent laryngeal nerve, except the cricothyroid muscle supplied by external laryngeal nerve.

***infant and pediatric larynx:**

- position is higher at birth. In adult from 2C to 3C.

-epiglottis lying at the nasopharynx makes the neonate an obligate nasal breather, for 4-6 months.

- cartilage and soft tissues are softer.

- soft tissues are less adherent to the underlying cartilage→ susceptible to collapse, and less resistance to develop submucosal edema.

- subglottis is the narrowest part of airway in children. It's surrounded by cricoied cartilage.

- in adults the narrowest part of glottis.

2. tracheal anatomy:

- consists of 16-20 incomplete cartilagous ring, the posterior wall is a membranous part.

- diameter: 19 mm in males.

16 mm in females.

- length is approximately 11 cm.

***pediatric trachea**:

- diameter:
  - -at birth- 6 mm
  - -6 months- 7.2 mm
  - -1 yr- 7.8 mm
  - -4 yrs- 11 mm

} don't worry about this

- significance of knowing these diameter: in case of intubation and use of bronchoscopy.

<u>ψ Signs of airway obstruction:</u>

- stridor is harsh high pitched musical sound produced by turbulence of air flow → partial obstruction of AW. It can be inspiratory or expiratory depends on: site and degree of obstruction.

***stridor indicates:**

1. pathologic narrowing of AW.

2. potential respiratory obstruction.

3. even death.

- Usually: ➔supraglottic is expiratory.

➔Glottis and infraglottic is biphasic.

➔Lower trachea is inspirotory.

- stridor is a very important sign of upper airway obstruction.
[note: table: causes of stridor and respiratory distress originating within upper respiratory tract in children….ect.]

***Other signs of upper airway obstruction:**

- flaring of nasal alae.

- retraction of the neck, intercostals and abdominal muscles.

- dysponoea.

- tachypnea.

- restlessness.

- cyanosis.(Sub costal emphysema.)

***history:**

- time of onset.

- characteristic of cry.

- Possible trauma.

- Hx of previous intubation.

- relation of airway to problem to feeding, position.

- question about possible aspiration of foreign body.

***if stridor present since birth:**

1. congenital laryngomalacia.

2. subglottic stenosis.

3. vocal cord paralysis.

4. vascular rings.

***if stridor is gradual and progressing:**

- subglottic hemangioma appear between 1-3 months of age.

- papilloma of the larynx appear at 6 months of age.

ψ Differential diagnosis of upper airway obstruction:

1. Congenital: a. laryngeal web.

b. laryngiomalasia.

c. subglottic haemangioma.

2. acquired: a. inflammatory: e.g. epiglottitis, laryngobronchitis.

b. infectious: laryngeal diphtheria.

c. traumatic: corrosive inhalation.

d. neoplastic: papillomatosis, laryngeal cancer.

e. forgein body.

ψ Radiologic Evaluaion:

- indicated for patients without respiratory distress.

1-plain view soft tissue of the neck.

A.P , lateral . chest (inspiratory + expiratory)

2- mobile pharyngeal tissue may bulge during expiration in normal infants.

3- high kilovoltage techniques (crowp series) AP view assesses subglottis region.

4-fluroscopy : dynamic airway changes (it's video x-ray , without contrast)

5-barium swallow

. assess swallowing (slow swallowing can lead to aspiration)

. rule out : presence of vascular rings → can affect the airway

MRI

CT scan

} ARE GOOD IN EVALUATING MEDIASTINUM.

ψ ENDOSCOPIC EVALUATION:

1-minor examination : is not endoscopic in older children + adults

Can provide information about hypo pharynx and larynx.

2-telescopic examination:

Fibroeoptic endoscopy: excellent to assess the movement of vocal cords.

3-rigid bronchoscopy:

-done under GA

-may enable removal of foreign body.

-assess the AW down to the main stem bronchi.

ψ Therapeutic options for upper airway obstruction:

1-observation / medical support: ➔ a-I.C.U

b- SECURE AIRWAY

c- OXYGENATION

d- STEROIDS

e- ANTIBIOTICS

2- heimlick maneuver.

3- nasopharyngeal airway.

4- oral airway.

5- esophageal airway.

6- trans oral intubation.

7- nasal intubation.

8- flexible fibrotic intubation.

9- trans tracheal intubation.

10- cricothyroidotomy

11- .....

***SURGICAL techniques:**

<u>1-transtracheal needle ventilation (for short time in emergency):</u>

a-when immediate ventilation is required.

b-support ventilation for several hours.

c-technique:-

➔ 12,14,16, gauge cannula

➔ high pressure ventilation system (50 p.s.i) is attached.

d-complications:

- failure to establish airway.
- misplaced catheter in soft tissue of the neck (esp. in child coz the cartilage is soft normally and it'll compressed not penetrated) can lead to pneumomediastinum or pneumothorax.
- total obstruction of airway preventing adequate ventilation.

<u>2-cricothyroidotomy:</u>

-generally for ER UAWO (if intubation has failed or it's contraindications)

- elective for head & neck & c.v.s procedures.

- also used where access to tracheal rings in limited (e.g kyphosis)

*** procedures :**

a- may use horizontal or vertical insicion.

b- use small tracheal tube or endotracheal tube

***complications:**

a-injury to int. Jugular vein (great vessels)

b- injury to recurrent laryngeal nerve

c- subglottic or laryngeal stenosis (esp. in child)

3-tracheostomy:

-for ER or elective upper airway obstruction , also for acute or chronic upper airway obstruction.

-in ER: ➔ vertical incision is preferred

➔maintain homeostasis after establishing airway.

ψ Other diagnostic test :

1. flow volume loop.
2. ABG (arterial blood gases).

@late indicator of upper airway obstruction , that's why it shouldn't be used routinely or in ER to asses the degree of obstruction .

ψ AIRWAY EMETGRNCY :

1)TUMOR :-
-commonly, tumours of aerodigestive tract goal to stabilization.

-organization should happen between surgeon and anaesthetist.

-avoidance of blind attempt of intubation .

- *stabilization should be either by: -*

a- elective awake tracheotomy under local Anaesthesia (preferred)(is the safest).

b- fiberoptic intubation .

NOT cricothyrotomy because it may precipitate complete obstruction.

2)TRAUMA :-
-Elective awake tracheotomy under local anaesthesia .

3)BURN PATIENT :-

-Endotracheal intubation is preferred .

we secure airway for burn patients when there is :

a-burn to face , oropharynx & upper airway in general .

b-intubation injury .

ψ epiglottitis (supraglottitis):-

-infection of the epiglottis .

-commonly affect children between 2-6 years.

***causes :-**

-almost always bacterial in origin (H.influenza type B account for 90% of cases, with H.influenza type B vaccine the incidence of it is less (commonest cause in children).

-other organisms: pneumococci , sterpt. Beta hemolytic .

[if you suspect patient with epiglottitis ➔ you have to examine him under controlled situation in OR not in ER because , you mau stimulate the epiglottis then the patient will collapse (die)]

***clinical feature:-**

-sudden onset and rapidly progressive course.

-high fever , respiratory distress , drooling and painful swallowing.

-may quickly progress to respiratory obstruction .

-examination of pharynx can reveal cherry red or edematous epiglottis.

-should avoid manipulation (e.g. intubations) of the pharynx ➔may lead to complete obstruction of the larynx .

-x-ray (lateral view) of the neck can show the thumb sign (edema of the epiglottis) if necessary.

***management:-**

-in children airway should be opened either 1)endotracheal tube.

2)trachestomy tube.

-in adult 1)observe in ICU.

2)may need intubation.

@antibiotic should be started:-

1- initially: cefuroxime , cefotaxime or ceftrixone.
2- Then change antibiotics according to sensitivity.

ψ foreign body:-

-death from foreign body aspiration in USA is about 3000 per year for all ages.

-complete airway obstruction may be recognized in the conscious child as sudden respiratory distress , inability to speech or breath or cough .

***types of foreign body:-**

1-vegtable matter are the most common in the children's airway.

2-plastic.

3-metal.

***location of foreign body in the airway:-**

-commonly the final destination is one of the main bronchi (right one is more common than left because it is more straight and wider).

-larynx : for sharp objects .

- trachea : if there is narrowing in the trachea .

***presentation :-**

(acutely)1-usually coughing , choking , gaging and wheezing .

(followed by) 2- no symptoms or signs (mimic different acute or chronic disease of the lung e.g. croup, bronchial asthma .

(finally)3-stage of complication (erosion, infection, abscess)

***diagnosis:-**

- radiological : extended soft tissue in the neck , PA, lateral chest (most efficacious)

- it can demonstrate foreign body : emphysema (commonest & earliest), then atelectasis of the lung.

[do it in inspiration & expiration you will see the findings in expiration]

@ the scope the best Dx & Rx method .

***management:-**

- endoscopic removal is both diagnostic & therapeutic .

!! note: table for first aid for the choking child , recommendations of the American academy of pediatric.(long table we couldn't write it)

ψ laryngomalagia:-

- accounts for 60% of laryngeal problems in newborn.

-characterizes by stridor in the first few weeks.

-due to flaccidity or incoordination of supralaryngeal cartilage which are pulled inside the lumen during inspiration leading to upper airway obstruction.

-cause is unknown

-Edema of the aryepiglottic folds and loose suspension of the epiglottis.

-Embryologically rapid growth of the 3rd branchial arch causes the epiglottis to curl open & self forming an omega shape .

-Neurological immaturity of brainstem and vague- infolding of the arytenoids in the airway .

***Diagnosis :-**

-Can only be confirmed by direct observation of movement of subglottis during respiration .
-Fibroptic evaluation is the most appropriate method of visualization .
-Radiologic evaluation by (high- voltage x-ray PA lateral) may help in excluding the presence of associated AW problem . e.g.: ➔ subglottis stenosis (SGS).
➔innominate artery compression .

***Complication of laryngomalacia :-**

1-failure to thrive (it's one of the high index indicate chronicity).

2-feeding difficulty .

***treatment :-** *" > 95% of cases are mild "*

- ✓ reassurance.
- ✓ Infant can outgrow this problem .
- ✓ Tracheostomy for sever cases only in case of children (because of high mortality rate) *not good for them because high mortality rate that happen because they have small trachea , small tube can easily obstruct it so we use Tracheostomy* .
- ✓ Epiglottoplasty for sever cases (definitive procedure for laryngomalacia , done under general anesthesia).

ψ SUBGLOTTIC STENOSIS :

-It's a narrowing of the subglottis. In newborn the subglottis diameter of less than 3.5 mm.

-Two type of subglottic stenosis :- 1- congenital .

2-acquired . (*the most common*)

[note : the most common cause of acquired stenosis is Endotracheal intubation .]

***subglottis stenosis presentation :-**

- mild cases may present as recurrent croup (laryngotracheobrochitis) secondary of upper respiratory tract infection .

- Generally present with symptoms and sign of upper respiratory tract obstruction .

*** subglottis stenosis evaluation :-** **1-**plain film of the neck (high KV) .
2-confirm the diagnosis by endoscopy .
3-MRI for difficult cases .

*** subglottis stenosis management :-**

1. Endotracheal intubation . } emergency situation
2. Tracheostomy (preferred) (the best) .
3. cricothyroidrctomy above the stenosis, we can pass a rigid tube to bypass the stenosis, sometime we cannot bypass → Tracheostomy .

4. endoscopic techniques :-

- dilatation . } for immediate scarring .
- laser .

5. open surgical technique :-
   a-cricoid split for small children + mild stenosis .
   b-resection and primary anastomosis .
   c-laryngotracheoplast + Rib graft + (stent for 6w).

ψ Choanal Artesia :

-uncommon anomaly .

-unilateral :- present late .
-bilateral :- birth emergency .
-mixed bone-membranous CA account 90% .
-remaining bony CA .

***associate of Choanal Artesia :-**
-associated with other anomaly in 20%- 50% :-

1. **CHARGE (** *the most common)*
2. **VATER**
3. **craniofacial anomaly .**

*****dear friends we are so so so sorry we couldn't write symptoms of this anomaly*****

,,done"