Respiratory distress in neonatal period medical conditions

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1. Estrathoracic Causes
   Intracranial
   - Hemorrhage
   - Tumor

   Neuromuscular
   - Narcotized chíld
   - Myasthenia
   - Muscular dysírophy
   - Cord laceration

   Abdominal
   - Mass
   - Perforation
   - Obstruction

   Sysíemic
   - Anemia
   - Sepsis

2. Chest Cage Abnormalities
   - Asphyxiating thoracic dystrophy
   - Thanatophoric dwarflsm
   - Achondrogenesis, osteogenesis imperfecta

3. Medical Causes
   - Retained fetal fluid
   - Jmmature lung
   - Hyaline membrane disease
   - Chronic íung disease
   - Wilson-Mikity Syndrome
   - Meconium aspiration
   - Aspiration
   - Atelectasis
   - Neonatal pneumonía
   - Pulmonary hemorrhage
   - Pulmonary lumphangiecíasia
   - Erythrocythemia
   - Removal of Fetal Lung Fluid
   - Squeezed out by cervix, vagina
   - Sucked out by obstetrician
   - Drained out by pulmonary lymphatics
   - Drained by pulmonary **capillaries,** vein

4. TTN - Differential Diagnosis
   - Pulmonary anomalous venous **type** IV
   - Lymphangiectasis
   - Neonatal pneumonía

5. Neonatal Pneumonía
   - Etiology - prolonged rupture of membranes, sepsis
   - Presentation
     - Foul smelling amniotic fluid
     - No speciñc pattern on chest radiographs

6. Pleural Effusion
   - Etiology

Radiólogo Pediatra. Jefe de Radiología, Hospital de niños UCLA Medical Center. Los Angeles, Fl. USA.

- Birth trauma with damage to thoracic duct in some cases
- Associated to Down Syndrome

- Opaque chest, with slow clearing
- US may be helpful

7. Hyaline Membrane Disease
   - Defíciency of surface active phospholipids in the alveoli
   - Early onset of tachypnea, chest retractions and worsening cyanosis **from** venous admixture associated with atelectasis
   - Used to be the leading cause of death in live-horn pre-term infants- 10.000/year in 197(Ts; 5000/year in 1980's

Hyaline Membrane Disease
- Membranes are the **result,** not the cause

Respiratory Distress Syndrome
- Non - specifíc

Surfactant Deficiency Disease
- Proposed nomenclaíure Swischuk,ARJ 1996; 166:917-918

Sudden Opacifícation of Lungs in HMD:
- PDA
- Decrasing ventiiatory settings
- Diffuse pulmonary hemorrhage
- CNS - mediated edema

Hyaline Membrane Disease - Therapy
- Administration of steroids to the mother 24-48 hours before delívery
- Ventiiatory support and continuous positive end-expiratory pressure
- Surfactant repíacement therapy

8. Surfactant Repíacement Therapy (SRT)
   - Most important recent therapeutic advance in treatment of premature babies
   - Signifícant decrease in infant mortality rate(1990)
   - Types - animal derived (porcíne, bovine) synthetic (slower action)

SRT
- Administrated soon after birth in symptomatic infants
- Repeat doses every 12h, up to 3-4 times
- Intratracheal volume bolus
- Careful monitoring **of ventiiatory** requirements

SRT-Results
- Improvement in respiratory status
- Decreased incidence of pneumothorax and BPD
- Complicaron - pulmonary hemorrhage (4%)
- Not aíl infants respond to the therapy

9. Long Term Sequela of RDS
   - Chronic lung disease
   - Neurologic impairment
   - Visual impairment
10. Bronchopulmonary Dysplasia (BPD)
    - Described by Northway and colleagues in 1967
    - Chronic pulmonary disease that occuvs *m* infants given mechanical ventilation and high O2 concentrations for respiratory di stress syndrome
    - It is the most common form of pediatric lung disease in the U.S. with 7,000 new cases/year

Northway's Classiflcatión of BPD

- Stage I - mucosa! necrosis, picture ofHMD
- Stage II-4-10 days of age - exsudative necrosis, edema
- Stage **III** - 10-20 days of age - "bubbly" lung, due to overdistention of alveoli
- Stage IV - after 1 month of age, mortality less than 40%

Prevention of BPD

- Inspired O2 below 60%
- Low ventilatory pressure and rate
- Extubation a.s.a.p.

BPD - Treatment

- Steroids to decrease inflammation and **mobilize** pulmonary fluids
- Complications include infections, **hypertension,** growth failure
- Intermittent pulse method is preferred

BPD - Late Sequela

- íncreased respiratory infecííons, more wheezing than control subjects
- Airway function tests decreased by 25-50%, physioiogic **evidence** of airway obstruction is more than 50% airway hyperreactivity

11. Mikity - Wilson Syndrome
    - Cystic lung in chiidren without RDS, occurs **fírst** few weeks of life
    - Damage to immature Iungs caused by breathing the normal room concentration of oxygen
12. MAS - Defmition
    - Presence of Meconium below the vocal cords
    - See in 1 - 5% of newborns
    - Treatment - succioning, ventilatory support, antibiotics
    - Mortality rate - 25% of babies

Meconium Aspiration Syndrome (MAS) - Causes

- Postmaturity
- Small for gestational age
- Hypoxemia caused by intrauterine stress

MAS - Radiographic Findings

- Depend on **severity** of aspiration
- Large, patchy densities **with** increased lung volumes
- Pneumothorax present in 25-40% of cases, pleural effusion 10%
- D.D. - neonata! pneumonía

13. Persisten! Pulmonary Hypertension (PPHN)
    - Peri/postnatal hypoxia causes puimonary vasoconstriction
    - Rt to it shunt through foramen ovale or ductus arteriosus
    - Severe cyanosis, high morbidity and mortaüty

Persisten! Pulmonary Hypertension (Cont'd)

- Use of vasodilators, such as nítric oxide
- High frequency ventilation
- ECMO

14. Complications of ICU Therapy
    - Pneumothorax - differential diagnosis with skin folds
    - Pneumopericardium - does **not** extend above the ascending aorta
    - Pneumoperitoneum - extending from mediastinum
    - Line placement - UVL, UAL
    - Tube placement - ETT, NGT, CT

PEDIATRIC TRAUMA UPDATE

M. ínes Boechat*

1. Epidemiology
   - Trauma is leading cause of death for children after 1y of age in the USA
   - It causes more íhan 22,000 deaths/y for children 19 and younger(1988)
   - Hospital admíssions exceed 250,000/y for trauma victims age 0-14 **years,** accounting for 13% of admissions

2. Pediatric Trauma
   - 50% of deaths in children over one year of age is attributed to múltiple trauma
   - nearly 23,000 pediatric lives are lost each year
   - for each child that dies, there are four survivors who are left permanently disabled (approximately 100,000/y)

3. Unique characteristics of pediatric trauma
   - Features that predispuse children to certain injuries
   - Blunt vs. penetrating trauma
   - The role of head injury
   - Child abuse: non-intentional injuries

4. Primary Mechanism - Blunt Trauma
   - Automobiles cause most signifícant injuries to children (88%), both as passengers and as pedestrians
   - Other forms of injury:

     Falls, burns, bicycle accidents

     The incidence of penetrating is small, but is increasing

5. MVA's and Children
   - There is an inverse relation with MVA's between age of victim and death rate through age 12
   - íneffectiveness of currently body restraints? Failure to use thoseaviable?
   - Result: MVA's deaths account for most fatal accidents childhood, particularly for those under 6 months

6. Seat Belts: Prons and Cons
   - Seat belt have reduced fatalities in collisions by 50%
     Hingson et.al. AMJ Public Health 1988;78:548
   - Unrestrained children suffer more muítisystem injuries, more serious injuries & higher level of functional impairment
   - Belted children may have injuries: intra-abdominal / lumbar spine injuries

7. Seat Belt Syndrome
   - injury if intestinal viscera and mesentery
   - Concomitant lumbar spine fracture, distraction or subluxation

- Caused by sudden deceleration with flexión of upper torso around lap belt

8. Lap Bell Syndrome
   - Intra-abdominal injury: mid lumbar leveí, directly underlying lap belt
   - Jejunum and retroperitoneal structures (duodenum, cecum & root of mesentery) commonly injured

9. Lap Belt Syndrome
   - Posterior and anterior elements are compressed
   - Injury: horizontal fracture through spinous processes. laminae, transverse process and pedicles (Chance fracture)

10. Improving Seat Belt Safety
    - At mínimum, three point restraint
    - Booster seats better position chiídren
    - "'Safe Fít" devices: provide large surface área over chiid's abdomen & pelvis

11. Kids and Seat Belts: Problems
    - Wearing them at all
    - Ensuring that they fít properly
    - Two and three point restraints: are four and five point restraints better?
    - Booster seats: "I am not a baby!"
    - Sitting in the front seat
    - AIR BAGS

12. Air Bag Perspective
    - Air bags DO save lives: 2,505 to date
    - 83 peopfe died due to air bags, most small adults and chiídren not wearing seat beíts
    - 1998 car have two air bags in front and option to deactivate air bag

13. Air Bags-SRS
    - Use required by government
    - Developed to protect a 165 Ib adult maie
    - Air bags deploy with and explosión of sodium azide at 200 mph

14. Air Bag Perspective
    - Short adults or unbelted children take the air bag impact on the head, especially if they are leaning forward or are thrown forward when driver brakes
    - Result: Massive head injury or cervical spine injury, even death

15. The Air Bag (SRS) Dilemma
    - Children should never ride on front seat
    - If seated in front, child must use seat belts & seat should be posítioned as far back as possible

16. Pediatric vs. Adult Trauma
    - The PATHOPHYSIOLOGY of traumatic injuries is essentially the same, however children have special vulnerabilities when it comes to trauma

17. Abdominal Organs
    - Liver and spleen are the most commonly injured organs in children; kidneys are more easily injured than in adults
    - Páncreas and duodenum may also by injured, usually by high speed deceleration or from abuse

- Hollow viscera may be lacerated by deceleraron injuries, or torn at siteof attachment

18. Blunt Abdominal Trauma
    Check hemodynamic condition of child
    Unstable - Surgery, no imaging
    Stable - Imaging performed

19. Abdominal Organs
    - Suspect injury to abdominal organs when there are concomitant injuries to ribs or pelvis
    - Hemorrhage due to blunt trauma of the liver or spleen, or disruption of the major vessels should be the main focus of attention

20. Blunt Abdominal Trauma
    Is there perforation of a hollow viscus? Is there free peritoneal fluid? How much? Can the ongin of Bleeding be assessed? ís there loss of function of one or both kidneys?

21. Blunt Abdominal Trauma
    ís there perforation of a hollow viscus?
    - Abdominal series

22. Blunt Abdominal Trauma
    Free fluid of bleeding, renal function
    USA-Abdominal CT
    Canadá, Europe - US, CT in selected cases

    Füiatrauit D. Garel L - US in the evaluation of children after blunt abdominal trauma. Applied Radiology 1998;vol (25) No. 7:6-17

23. Most CT examinations (50%-80%) performed as a "routine" are normal.
    Taylor GA, Eichelberger MR: Abdominal CT ín children with neurological impaírment following blunt trauma. Ann Surg 1989;210:229-233.

24. Data from St. Justin Hospital
    282 children over 3 years:
    - Surgery - 5
    - CTfírst-18
    - Plam films and U - 259

25. Results
    US - sensitivity - 89%, specifícity - 96%
    12 patients died from CNS **injury** - no abdominal lesions disclosed on autopsy
    222 survivors seen at f/u examination - no missed injuries

26. Injured Organs
    - Spleen-38%
    - Kidneys-35%
    - Liver-12%
    - Múltiple injuries - 14%

27. Primary Indications for CT (Canadá)
    - Associated spine or peivic trauma
    - Pancreatic or mesenteric injury
    - Hollow viscus injury
    - No contact between skin and probé due to wounds

28. Secondary Indications for CT (Canadá)
    - Free peritoneal fluid noí explained byUS
    - Unexplained clinical status

29. CT also:
    - Influence decisión on level of monitoring while in the hospital
    - Duration of restriction from activities
    - Need and time for clinical follow up

30. Blunt Abdominal Trauma
    - In a stable child, a hemoglobin dropping to 7 gm% may be conservatively treated without blood transfusión

- Algorithms for management of blunt splenic or liver trauma are helpful
- Transfusión requirement exceeding 40-50ml/Kg acutely may necessiíate laparoíomy

31. Nonoperative Management of Splenic ínjury
    - Nonoperative management of bl uní splenic injury is the most accepted modality for children
    - Failure rates are oniy 2% to 5%
    - Mechanisms **of injury** for children:
      FalI-25.4%
      Motor vehicle crashes - 23.7%
      Sporting mishaps - ***16.9%***
      These are iow veiocity mechanisms

32. Splenic Injury
    - 7% of children requíre immedíate laparotomy:
      Hemodynamic instabilíty
      Physical exam - Other suspected abdominal injuries
      CT **fíndings**

    Powell et. ai. Management of biuní spfenic trauma. Significan! diíTerences between **adults** and children Surgen,-. 1997;122:654-60.

33. Spienectomy
    - Once performed almost routinely biunt trauma, now avoided if possible because of increased susceptibility to sepsis
    - Non-operative approach to spienic **injury** is folfowed, using blood transfusión if needed
    - If spienectomy is required, administer pneumococcal and HIB vaccines preoperatively

34. Renal Trauma
    Children vs. Adults
    Islated kidney injury twice as common
    Pedicle injury ten times more common (3% of injuries)
    Pre-existing abnormality 2-3 time more common (10% of injuries)

35. Renal Trauma Classification (Sargent/Marquad
    Grade í - localized contusión of kidney
    Grade II - localized lesión communication with perineal área or pelvicalyceal system
    Grade **Til** - partial or complete renal fracture
    Grade IV - vascular injury

36. Bicycle Injuries
    5% of injured are less than 5 y
    75% of injured were male
    helmet sledomiy used
    motor vehicle involved in 3IS of cases
    65% of joung children injured in falls from bicycle
    Poweli et. Al Ann Emerg Med 1997;30:260

37. Bicycie Injuries
    Al least 45% of young children injured in non-street location; these injuries can be serio us
    Anatomic injury pattern similar in children 0 to 4 and 5 to 14: head trauma is most common injury (45%, 56%)
    Extremity fracture is also one of the most common severe injuries (38%, 37%), also skin'soft tíssue injuries (49%, 59%)

38. Child Abuse
    - By conservative estimates nearly 1,000 children are killed by parents or guardians each year in the USA
    - For each killed, 500 or more are severely injured

    > 500 others suffer lesser injuries or are not fed, supervised, educaíed, immunized or kept clean

39. Child Abuse
    - The range of physical irtjury that adults inflict on defenseless infan and young children is enoimous
    - Many abused children present to Emergency Room without a hisío of trauma
    - Awareness of range of clinical sings & symptoms is essential for abuse recognition

40. Suspecíed Child Abuse
    What should be done:
    Careful examination of the patienί Meticulous documentation of all findings, including new and oíd injuries

41. Prevention of pediatnc Mortal íty from Trauma
    - Motor vehícle accidents remain the leading cause of death of USA children
    - Despite mandatory child restraint laws in 50 states, 40-60% young children are unrestrained
      Wagenareí.a!. J Trauma 1987;27:726-31
    - Nearly 75% seat belts are used incorrectly

42. Pediatnc Trauma- Conclusions
    - Traumatic injuries are likely to remain a great public health and pediatric medical problem
    - Prevention efforts, including education, must continué
    - Trauma systems can reduce death due to trauma
    - The world is a very dangerous place!