Respiratory distress in neonatal period medical conditions

M. Inés Boechat*

1. Estrathoracic Causes
   Intracranial
     • Hemorrhage
     • Tumor
   Neuromuscular
     • Narcotized child
     • Myasthenia
     • Muscular dysrophy
     • Cord laceration

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

3. Medical Causes
   • Retained fetal fluid
   • Immature lung
   • Hyaline membrane disease
   • Chronic ñung disease
   • Wilson-Mikity Syndrome
   • Meconium aspiration
   • Aspiration

   • Atelectasis
   • Neonatal pneumonia
   • Pulmonary hemorrhage
   • Pulmonary lymphangiectasia
   • Erythrocythemia
   • Removal of Fetal Lung Fluid
   • Squeezed out by cervix, vagina
   • Sucked out by obstetrician
   • Drained out by pulmonary capillaries, vein

4. TTN - Differential Diagnosis
   • Pulmonary anomalous venous type IV
   • Lymphangiectasis
   • Neonatal pneumonia

5. Neonatal Pneumonia
   • Etiology - prolonged rupture of membranes, sepsis
   • Presentation
     • Foul smelling amniotic fluid
     • No specific 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
- Deficiency 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-born pre-term infants-10,000/year in 1970's; 5000/year in 1980's

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

Respiratory Distress Syndrome
- Non - specific

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

Sudden Opacification of Lungs in HMD:
- PDA
- Decreasing ventilatory settings
- Diffuse pulmonary hemorrhage
- CNS - mediated edema

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

SRT - Results
- Improvement in respiratory status
- Decreased incidence of pneumothorax and BPD
- Complications - pulmonary hemorrhage (4%)
- Not all 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 occurs in infants given mechanical ventilation and high O2 concentrations for respiratory distress syndrome
- It is the most common form of pediatric lung disease in the U.S. with 7,000 new cases/year

Northway's Classification of BPD
• Stage I - mucosa! necrosis, picture of HMD
• Stage II - 4-10 days of age - exudative 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
• Increased respiratory infections, more wheezing than control subjects
• Airway function tests decreased by 25-50%, physiologic evidence of airway obstruction is more than 50% airway hyperreactivity

11. Mikity - Wilson Syndrome
• Cystic lung in children without RDS, occurs first few weeks of life
• Damage to immature lungs caused by breathing the normal room concentration of oxygen

12. MAS - Definition
• Presence of Meconium below the vocal cords
• See in 1 - 5% of newborns
• Treatment - suctioning, 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. - neonatal pneumonia

13. Persistent Pulmonary Hypertension (PPHN)
• Peri/postnatal hypoxia causes pulmonary vasoconstriction
• Rt to it shunt through foramen ovale or ductus arteriosus
• Severe cyanosis, high morbidity and mortality

Persistent Pulmonary Hypertension (Cont'd)
• Use of vasodilators, such as nitric 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 1 y of age in the USA
   • It causes more than 22,000 deaths/y for children 19 and younger (1988)
   • Hospital admissions 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 multiple 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 predispose 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 significant 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
   • Ineffectiveness 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 multisystem 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 level, 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 minimum, three point restraint
    • Booster seats better position children
    • "Safe Fit" devices: provide large surface area over child's abdomen & pelvis

11. Kids and Seat Belts: Problems
    • Wearing them at all
    • Ensuring that they fit 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 people died due to air bags, most small adults and children not wearing seat belts
    • 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 lb adult male
    • 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 positioned 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 be injured, usually by high speed deceleration or from abuse
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 origin of bleeding be assessed? Is there loss of function of one or both kidneys?

21. Blunt Abdominal Trauma
Is 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


23. Most CT examinations (50%-80%) performed as a "routine" are normal.

24. Data from St. Justin Hospital

25. Results
US - sensitivity - 89%, specificity - 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%
- Multiple injuries - 14%

27. Primary Indications for CT (Canadá)
- Associated spine or pelvic 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 not explained by US
- 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 necessitate laparotomy

31. Nonoperative Management of Splenic Injury
• Nonoperative management of blunt splenic injury is the most accepted modality for children
• Failure rates are only 2% to 5%
• Mechanisms of injury for children: Fall 25.4%
  Motor vehicle crashes - 23.7%
  Sporting mishaps - 16.9%
These are low velocity mechanisms

32. Splenic Injury
• 7% of children require immediate laparotomy:
  Hemodynamic instability
  Physical exam - Other suspected abdominal injuries
CT findings

33. Splenectomy
• Once performed almost routinely blunt trauma, now avoided if possible because of increased susceptibility to sepsis
• Non-operative approach to splenic injury is followed, using blood transfusión if needed
• If splenectomy is required, administer pneumococcal and HIB vaccines preoperatively

34. Renal Trauma
Children vs. Adults
Issolated kidney injury twice as common
Pedicile 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 I - localized contusión of kidney
Grade II - localized lesión communication with perineal area or pelvicalyceal system
Grade TII - 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 seldomly used
Motor vehicle involved in 31% of cases
65% of young children injured in falls from bicycle

37. Bicycle Injuries
At least 45% of young children injured in non-street location; these injuries can be serious
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 tissue 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, educafed, immunized or kept clean
39. Child Abuse
   • The range of physical injury that adults inflict on defenseless infants and young children is enormous
   • Many abused children present to Emergency Room without a history of trauma
   • Awareness of range of clinical signs & symptoms is essential for abuse recognition

40. Suspected Child Abuse
   What should be done:
   Careful examination of the patient Meticulous documentation of all findings, including new and old injuries

41. Prevention of pediatric Mortality from Trauma
   • Motor vehicle accidents remain the leading cause of death of USA children
   • Despite mandatory child restraint laws in 50 states, 40-60% young children are unrestrained
     Wagenare et al. J Trauma 1987;27:726-31
   • Nearly 75% seat belts are used incorrectly

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