MANAGEMENT OF THORACIC TRAUMA

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Chest Trauma: Big threat !!!!
CAUSES OF THORACIC TRAUMA

- **Blunt Trauma**
  - Motor vehicle accidents, intentional or non intentional blows, high-rise, etc.

- **Penetrating injuries**
  - Penetrating weapons, gun shots, small dogs v/s large dogs, etc.

- **Multiple Trauma**
  - Dog fights, animal-animal interaction, etc.
GENERAL RULES IN THORACIC TRAUMA

- Restore and insure permeable airway
- Restore normal intra-pleural pressure
- Preserve normal alveolar ventilation
- Maintain effective circulation, blood pressure, volemia and hemoglobinemia
I.- PNEUMOTHORAX

- Air accumulation in the pleural space
- 47% of thoracic trauma in dogs and cats
- 63% of cats with high-rise syndrome
- Is classified as “open” or “closed”
- Tension and/or valve pneumothorax
- Not all have clinical transcendence
PNEUMOTHORAX

- SHOULD BE RULE OUT IN EVERY TRAUMA PATIENT
- THE DIAGNOSIS IS CLINIC, NOT RADIOGRAPHIC
  \(\text{(tap it before rad it!!)}\)
- PHYSICAL EXAMINATION - THORACOCENTESIS
Pneumothorax: Radiographs... bad decision
PNEUMOTHORAX

• PHYSICAL EXAMINATION
  • Dyspnea - Silence at dorsal auscultation - Orthopneic position - Cyanosis - Sat.O2 Hb< 90%

• THORACOCENTESIS
  • Patient in sternal position
  • 8°- 11° inter costal space as dorsally as possible
  • 3 way stop-lock - butterfly/catheter 21 - 23 G
  • More than 10 cc/kg of air? Repeat in 2 hours
  • Avoid damage to pulmonary parenchyma
II. - HEMOTHORAX

- Blood accumulation in the pleural space
- 8% of thoracic trauma in dogs and cats
- 5% of cats with high-rise syndrome
- 12% of dogs in vehicle accidents
- Potentially volume entrapment
- Not all have clinical importance
- Of lousy prognosis when associated to shock
HEMOTHORAX

- Unfrequent presentation but it should be investigated
- Physical exam diagnosis (not radiographic)
- Thoracocentesis: Dx and therapeutic

Shock signs? Serious !!!!!

- Pale mucous membranes, long CRT, cold limbs, tachycardia, etc.
- BP<60 mm Hg, HR > 180 bpm (dogs), CVP< 3 cm H₂O
"HEMOTHORAX MYTH"

ACCUMULATED BLOOD PREVENTS EXPANTION

INTRAPELURAL PRESSURE RISES
HEMOTHORAX

• PHYSICAL EXAMINATION
  • Dyspnea - Silence at ventral auscultation - Cardiac silence - Painful respiration - Costal fracture?

• THORACOCENTESIS
  • 8° - 11° intercostal space as ventrally as possible
  • 3 way stop-cock - Butterfly catheter 21 - 23 G
  • When and how much to drain?.... CONTROVERSIAL
    • More than 20 cc/Kg?  Auto-transfusion?
    • Continual hemorrhage  SURGERY
KEY IN HEMOTHORAX

IF THERE ARE HYPOTENSION or PENETRATING INJURIES or COSTAL FRACTURES, SURGICAL EXPLORATION MUST BE DONE
TRAUMA AFFECTING PLEURAL SPACE

III.- DIAPHRAGMATIC HERNIA

Traumatic rupture of the diaphragm with abdominal organs in the pleural space due to an increase in abdominal pressure

- 28% of multiple trauma patients in dogs and cats
- 43% associated to other injuries (JAAHA, 1998)
- Not all have clinical transcendence
- It is an ABDOMINAL trauma
DIAPHRAGMATIC HERNIA

- MOST PATIENTS SHOW FEW CLINICAL SIGNS
- DIAGNOSIS IS BY PHYSICAL EXAMINATION AND CONFIRMED BY X-RAYS
- THORACIC AUSCULTATION
DIAPHRAGMATIC HERNIA

• SURGICAL MANAGEMENT

• CONTROVERSIAL

• MORTALITY IS GREATER IN THE FIRST 24 HOURS POST TRAUMA ***

• WHENEVER POSSIBLE, STABILIZE THE PATIENT
  - BLOOD PRESSURE AND NORMAL HR
  - Hb SATURATION and/or ARTERIAL GASES
  - AVOID SIRS AND SEPSIS
KEY IN DIAPHRAGMATIC HERNIA

EMERGENCY SURGERY IS RARE ... DON´T RUN!!
I. PULMONARY CONTUSION

- Parenchyma haemorrhage & edema
- Ends in alveolar collapse and pulmonary consolidation
- Caused by sudden thoracic compression and decompression
- Causes hypoxemia due to:
  - Perfusion: ventilation inadequate, vascular shunt, hypoventilation, diffusion failure

TRAUMA AFFECTING PULMONARY PARENCHYMA
PULMONARY CONTUSION

• CLINICAL SIGNS
  - DIFFERENTIATE BY HEMITHORAX
  - HYPOXEMIA
  - DYSPNEA - TACHYPNEA
  - COUGH
  - HEMOPTISIS
  - THORACIC AUSCULTATION WITH MULTIPLE SOUNDS
Pathophysiology and Significance

- Blunt force to lung parenchyma resulting in capillary damage
- Increased interstitial and intra-alveolar fluid
- Decreased pulmonary compliance
- Increased pulmonary shunt
- Hypoxemia
PULMONARY CONTUSION

- **RADIOGRAPHICAL SIGNS**
  - STRONGLY UNDERESTIMATE REAL DAMAGE
  - RADIOGRAPHICAL SIGNS APPEAR LATER THAN CLINICAL SIGNS
  - INTERSTITIAL and/or ALVEOLAR PATTERN
  - "PATCHES" ALL OVER
  - MANY OTHER TRAUMATIC INJURIES

PULMONARY CONTUSION
ALI ≠ RADS

- Lesión pulmonar aguda ALI
  - Oxigenación: PaO2/FiO2 igual o menor a 300
  - Rx de tórax: infiltrado pulmonar bilateral
  - PaO2 Art. Pulmonar: igual o < de 18 mmHg

- Síndrome Distres Respiratorio Agudo SDRA
  - Oxigenación: PaO2/FiO2 igual o menor de 200
  - Los otros dos parámetros igual que la ALI
37,0°C
PH ______ 7.349
PCO2 ______ 31.8 mmHg
PO2 ________ 34 mmHg
HCO3 ________ 16 mEq/L
BEcalc _______ -8 mEq/L
SOb* ________ 63 %

*calzulado

Temp. paciente
PH _______ 7.328
PCO2 _______ 33.9 mmHg
PO2 ________ 36 mmHg

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PULMONARY CONTUSION

- TREATMENT

- MAINLY VITAL SUPPORT

- OXYGEN THERAPY 100 - 200 ml/Kg/min UNTIL ACHIEVING SatO$_2$ Hb $> 95$

- CRISTALLOID + COLLOID FLUID THERAPY UNTIL ACHIEVING Art Pr $> 80$ mm Hg & URINE PRODUCTION OF 1 ml/Kg/hr
• My personal experience....

- Stabilize the patient
- Oxygen UNTIL GET SatO₂ Hb>95% / PO₂>60 mmHg
- Small amount of crystalloids + colloids and
- LOBECTOMY
PULMONARY CONTUSION

- CONTROVERSIAL TREATMENTS
  - FUROSEMIDE 0.5 - 2 mg/Kg
    - NOT ACTUALLY RECOMMENDED
  - CORTICOSTEROIDS
    - NOT CURRENTLY RECOMMENDED
  - ANTIBIOTICS
    - SECONDARY PNEUMONIA IS MOST FREQUENT IN HUMANS THAN ANIMALS
    - REQUIERES ANTIBIOTICGRAM (BRUSHING OR LAVAGE)
    - AMPICILIN 15 mg/Kg TID + GENTAMICIN 2-3 mg/Kg BID
    - DOXICICLIN IS MORE EFFECTIVE IN CATS
MECHANICAL VENTILATION
LIQUID VENTILATION
Secondary Issues in Thorax Trauma

- Pneumonia
- DIC
- RADS
- Cardiac contusion
- Arrhythmias