MEDICAL TRANSPORT OF UNSTABLE NEWBORN & INFANTS IN TRANSATLANTIC AIRLINER

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DEFINITION

• Precose medical repatriation by airliner (AVL)
• From Martinique FWI to Paris
• For all medico-chirurgical emergencies in pediatrics more often delayed
• That cannot be taken cared of on site.
• With professional assistance, logistic and all medico-technical support imposed by the baby's condition.
CONGENITAL CARDIOPATHY (1)

• Differed surgical emergencies with early transfer
• No open heart surgery or close at FDF Unless vital prognostic
• Eventual use of interventional catheterism of “rescue” exclusively before secondary transfer:
  ✓ to open PA / stent Ductus Arteriosus / Ao Stenosis dilatation: Anomalies of pulmonary venous connection
  ✓ Critical pulmonary valve stenosis
  ✓ TGA with fossa oval
  ✓ Total blocked AO Coarctation with MOF, failure PGE 1
CONGENITAL CARDIOPATHY (2)

Notion of DUCTODEPENDANCE
( complete patent ductus arteriosus [DA] or not )

COMPLETE DUCTODEPENDANCE :

✓ Any situation when the closing of DA that unites AO & PA (2 systemics circulation & pulm) is incompatible with the infant 's life

✓ Formal indication of PGE 1 IV continuous (Prostin VR)

Ex : - Pulm. atresia without VSD, critical pulm. valve stenosis
   - Tetralogy of Fallot with pulm. Atresia
   - certain forms of TGA
   - interruption of Ao ark
   - severe forms of AoCo or congenital valvar AO stenosis
   - special case : left heart hypoplasia Sd
CONGENITAL CARDIOPATHY (3)

- Hemodynamics stabilization is essential before travelling to France
- Assisted ventilation, PGE 1, inotropic drugs
- Good understanding of principles of cardiopathy & TRT
- Prior interview with doctor to anticipate risks during the flight and actions items
CONGENITAL CARDIOPATHY (4)

• An infant with a cardiopathy & with a ductodependance should not be neither too pink nor too blue during transportation

• Ideal balance for CO₂ cardiopathy under PGE1 during flight to France:

  Satisfactory peripheral circulation (HR/Cutaneus Recoloring Time [CRT], warm extremities)
  Pulm flow SpO₂ 85-90%
PROSTIN

- Powerful arterial vasodilator
- Half life 5 mn
- Indication guided by sonogram (US)
- IV dilution SSI or D5W
- Dose MD: 0,025 to 0,05 (max 0,1) µg/kg/mn
- Efficiency depends on the type of obstacle
  - increase in PaO₂, SaO₂, reopening of DA, femoral pulse, diuresis, nonrespiratory acidosis controlled, improvement cardiac failure, etc
- 2nd Effects:
  - Apnea and cyanosis (10%)
  - Transitory fever (15%) Flush (10%),
  - Bradycardia, cardiac arrest (1%)

In all the cases, transitory therapeutics ➔ surgical procedures
INOTROPIC drugs & CONGENITAL CARDIOPATHY

• Make the different between big **shunt L-R with low flow** ( systolic function conserved ) and **ventricular systolic dysfunction** ( restrictive AoCo, AO stenosis, critical pulm, severe P H, immature myocardus )

• **Copping mechanism** principle of Q for NN & infants = **tachycardia +++**

**DOBUTAMINE** : 5-12 µg/kg /mn

**COROTROPE** : 0,3 à 0,7 µg/Kg/mn

**ADRENALIN** : 0,05 à 0,2 µg/Kg/mn

• Small dose of ADR & corotrope in association
« IDEAL » TRANSPORT PREPARATION OF NN

- Prior cardio pediatrics expertise:
- 1 CV line well fixed + 1-2 PV line checked, bladder KT & gastric tube
- if necessary, NTI with fixation x2
- XR control early morning and kinesiology if atelectasis
- Ultrasound control
- Parameter: Spontaneous Breathing or Controlled Ventilation of the last 6 hours with blood gas control in the morning before departure (Hb >12 g/dl)
- Ventilation under FIO2 (ideal < 0.6) using PCV + PEP (< 5) Note ventilatory sets
- If PGE1: single pathway of verified administration, TRT started > 3h
- IV Médications: dilutions, doses, electrolytes composition, volumes: double control (nurse / sénior), only electrics syringes
8 GOLDEN RULES FOR NN TRANSPORTATION

1. **cardio resp stabilization** essential before transportation
2. **Prior intubation** for all NN presenting a risk of ventilation failure
3. **Tech gestures limited** (Vesicle catherism)
4. Restraint of child
5. Regular reevaluation
6. **Optimal sedation** (curarization)
7. **Anticipation** of transport conditions (noise, turbulences, vibrations, temperature)
8. Asepsis
ON BOARD

(1) INSTALLATION: rigorous, strict, complete, stowage, head first

(2) MONITORING OF REA: ECG, 
   SpO$_2$ (above & under the ductus) 
   DINÂMAP - Et CO$_2$ - Temp – diuresis

(3) CLINICAL MONITORING: Hourly if complete, irregular VA
   - Complete, regular Auscultation, palpating, (liver, femoral & axillary pulse, temp of extremities, peripheral perfusion, glycemic, hemocue)
   - Syringe pump monitoring: PGE 1 effect (cyanosis, fever, flush, bradycardia, hypo BP, cardiac arrest, enterocolitis ++++)
   - 4 enemy: Relative hypoxia 
     Thermic dysregulation 
     Hypercapnia & dryness 
     Defibrillation
ON BOARD

(4) AIRWAY COMPLICATIONS

• « DOPE » Displaced Endotrachéal Tube (ET)
  • Obstructed (ET)
  • (progressive thickening of secretions)
  • Pneumothorax
  • Equipment failure

• OTHER maladjustment to VA
  • Gastric distension

• If blue skin Cyanosis ++ Check: Ventilation, perfusion, PGE 1, progressive and careful adaptation to ventilators parameters to $O_2$ intake & inotropes
(5) Careful Fluid intake (10-20 ml/kg) over an hour in Saline: If cold extremities CRT > 3”, grey tint, abundance of profuse diuresis for 2h (be aware of injected volumes)

- If progressive general degradation, start small doses of adrenaline (0.02 to 0.05 µg/kg/mn) continuous IV
- If progressive bradycardia sign of catastrophe ...
- Cares (suction, eye drops ...)
TRANSPORTATION OF INFANT

< 6 months

• Easier to do, less acute pathologies, less fragile
• Congenital path 2 risky situations:
  1. Big shunt L-R
     – With low pulmonary Pulmonary Resistance [PR] and pulmonary obturation: hypoxia well tolerated
     – Cautious O₂ therapy (SpO₂ + or - 90%) during flight if no signs of clinical hyper C0₂ possible use of lasilix 1 mg /kg
  2. T4F
     – With history of anoxic sickness (infundibular spasm) treated with β - :
     – PROPRANOLOL IV ready to use, in case of tachycardia, sudden hypotonia, syncope, disparition of heart murmur
this presentation does not concern ECMO nor in utero transfer (< 36 SA & TGA fetal malformations)
HELICOPTER TRANSPORT FEATURES

- Brief management, Short distance
- Regional Inter-hospital Transfer
ADVANTAGES

- Easy boarding and disembarkation
- Easy border control
- Low altitude
- Easy landing and Take off (Drop Zone)
- Low physiological changes
INCONVENIENCES

• In the cabin: Noise, small space
  Heavy vibrations, discomfort

• Contraintes:
  ✓ Weather constraints (instrument flight rules IFR)
  ✓ Short distance
  ✓ Training for the medical team (security, boarding rotating rotor ...)

• Significants costs: 2,5 k€ – 3 k€
CONCLUSIONS
TAKE HOME MESSAGES

• efficient logistic
• precise evaluation
• numerous partners to control (medical, financial, airliner)
• well trained, competent team
• mastering of physics laws & constraints
• Precarious, unstable, evolutive transport
• control of risks in each step
• fluids autonomy & adapted equipment
BIBLIOGRAPHIE

1. Quels respirateurs pour le transport néonatal
Dr Anne-Marie PETION, Hôpital d’enfants CHU Dijon (3 nov
(Journées nationales des SMUR pédiatriques)
Cette organisation édite un manuel de la réglementation du transport aérien internationale.

2. Medical repatriation via fixed-wing air ambulance : a review of patient characteristics and adverse events.
BIBLIOGRAPHIE


Unités utilisées

• 1 pied = 0,3048 m