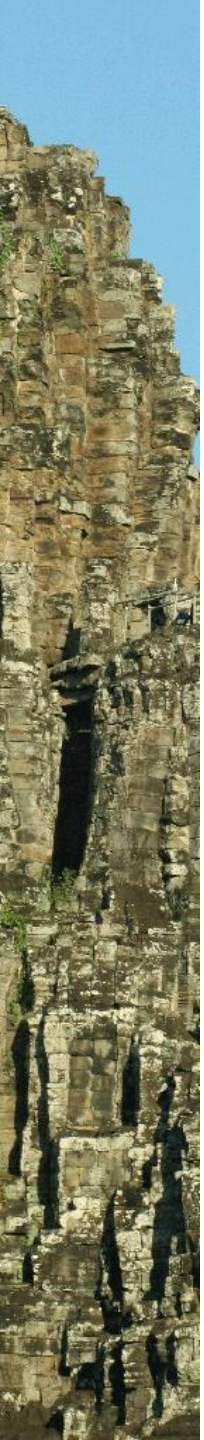

Snakebite in Children & Pregnant Women

Lecture 15: Snake Bite Management Course

Introduction

- Snake bite in children is complicated by a number of differences from snake bite in adults; this lecture discusses the differences in terms of:
  - Exposure to snakes
  - Psychology, Communication & History
  - Anatomical & Physiological differences
  - Treatments
  - Monitoring & Ongoing Care
- Snake bite in pregnancy is complicated by:
  - the presence of a second patient, the fetus
  - the increased risk to both patients in the presence of coagulopathy, shock or neurotoxicity

Snakebite in Children - Exposure

- Exposure to snakes:
  - children younger than walking age are rarely bitten
  - babies may be bitten by snakes which enter a dwelling, especially those which are active at night
  - children are more curious & less careful
  - children have less knowledge of the dangers of snakes
  - children are less likely to be wearing shoes
  - a bite may lead to more rapid onset of envenomation, or more severe envenomation, due to their smaller size & thinner skin

Snake Bite in Children - Psychology, Communication, History

- Psychological differences:
  - less likely to respond appropriately once bitten
  - may not admit to a bite
  - may not notice a bite when it occurs
  - may not think a bite is significant
  - might not be old enough to talk or too frightened to, especially once at hospital
  - may not want to admit they were playing in an area their parents warned them not to
  - may not be able to give an accurate history about such things as the time of the bite & the appearance of the snake
  - may develop symptoms of neurotoxicity early because of their low weight & so be unable to talk
  - may present in atypical ways after snake bite

Children - Anatomical & Physiological Differences.1

- Overview - main differences:
  - Size & weight
  - Upper & lower airway differences
  - Breathing & ventilation differences
  - Cardiovascular differences
  - All will be discussed again in practical sessions

Children - Anatomical & Physiological Differences.2

- Size & weight:
  - Every child should be weighed on arrival (unless they require immediate resuscitation)
  - This is essential for calculation of:
    - drug doses
    - IV fluid requirements
    - all tube sizes
  - Few parents will know the weight of their child
  - Weight can be estimated by:
    - age charts or formulas
    - Broselow tape or child's length/height
  - Weight estimation by staff is discouraged, except as a last resort

Children - Anatomical & Physiological Differences.3

- Upper & lower airway differences:
  - all mean that basic & advanced airway management are more difficult (BVM & ETT)
  - smaller airway, so more easily obstructed (even with small changes in head position)
  - relatively large head, so need no pillow, or need a towel between shoulder blades, to keep airway open
  - soft floor of the mouth, so take care to put your fingers on the mandible when holding mask to avoid obstructing the airway
  - may have loose teeth
  - delicate mucosa & lips (care inserting OPA, ETT, OGT)
  - smaller ETT: size = age/4 + 4, eg. 4yr old needs size 5.0; or use size of little finger, or size of child's nostril
  - large tonsils & large floppy epiglottis
  - higher, more anterior, angled larynx

Children - Anatomical & Physiological Differences.4

- Breathing & ventilation differences:
  - tidal volume (the volume of a normal breath) = 8-10ml/kg, eg 160-200ml for 20kg child
  - higher resting respiratory rate
  - more delicate lungs, easier to cause a pneumothorax (lung collapse) with artificial ventilation
  - higher metabolic rate, less O_2 reserve, tissues more sensitive to hypoxia, so less tolerant of hypoxia
  - more difficult to BVM ventilate - very dependant on head position
  - less oxygen reserve than adults, with higher basal metabolic rate, so are much less tolerant of hypoxia
  - therefore less able to tolerate
    - aspiration
    - long attempts at intubation (**hold your own breath**)
    - unilateral/right main bronchus (RMB) intubation
    - pneumothorax

Children - Anatomical & Physiological Differences.5

- Breathing & ventilation differences (cont'd):
  - easy to inflate stomach when assisting ventilation, hence:
    - increasing chance of gastric regurgitation & pulmonary aspiration
    - inhibiting lung expansion
  - more delicate lungs - easier to over-inflate lungs & cause pneumothorax
  - so, ETT has no cuff to reduce risk of over-pressurising lungs during ventilation; should hear slight air leak around the tube as ventilate the child
  - narrowest point of airway is below larynx; no cuff on smaller ETTs, as prolonged pressure causes mucosal necrosis
  - over-ventilation can also cause hypotension by impeding venous return
  - shorter distance to insert the ETT: black line goes just through cords, or for oral ETT, distance = age/2 + 12, eg 2 year old needs tube to approx. 13cm at the teeth
  - OVERINTUBATION/RMB INTUBATION IS VERY COMMON

Right Main Bronchus Intubation

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

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Children - Anatomical & Physiological Differences.6 Approximate Physiological values for Children

Age	HR	BP	RR
birth-6 mths	120-140	70/40	40-45
7-36 mths	100-110	80/55	30-40
4-7 yrs	80-100	90/60	20-30
8-10 yrs	70-80	95/65	20
11-14 yrs	60-80	100/70	15-20

Children - Anatomical & Physiological Differences.7

- Cardiovascular differences:
  - higher resting HR, lower BP
  - more resilient cardiovascular system:
    - maintain BP & perfusion by increasing HR
    - then suddenly deteriorate with falling HR & BP, soon leading to cardiac arrest
  - higher basal metabolic rate & less oxygen reserve:
    - less able to tolerate short periods of hypoxia
    - with less ability to store glucose - require higher content of glucose in IV fluids
  - less able to tolerate lack of fluid intake - if NBM need to start IV fluids to within a few hours of last intake
  - smaller, more delicate veins

Snake Bite in Children - Treatments

- Treatments:
  - Antivenom:
    - require the **same amount of AV as an adult**
    - dose is not dependant on the size or weight of the child
    - infuse in 100ml saline over 30 mins, as for an adult
  - Adrenaline premedication 10-20mcg/kg = 0.1-0.2ml/kg of 1:10,000) SC
  - **All** other drugs are also **weight-based, including IV fluids**
  - Prednisone 1mg/kg for 5 days after antivenom
  - Always watch for the anticipated therapeutic effect of any medications & any side effects
  - Tetanus toxoid immunising dose is also the same as for an adult (there may be a paediatric formulation available); give IM - but NOT if coagulopathy is present - administration can wait until this is reversed

Snake Bite in Children - Monitoring & Ongoing Care

- Children:
  - tend to deteriorate quickly
  - are relatively less able to tolerate hypoxia
  - have a poorer understanding of what is happening to them
  - are able to pull out an ETT, even though they can't maintain their airway or breathe
- So, YOU MUST WATCH THEM MORE CLOSELY!
- Take 1/2-hourly vital signs & snakebite observations
- All the same nursing care is required as for adults, ie.:
  - gentle oral suctioning
  - turning
  - urinary catheter and fluid balance
- Do not leave unattended or with inexperienced staff
- Do not leave solely in the care of parents - they don't know what to watch for!

Snake Bite in Pregnancy

- A knowledge of the anatomical & physiological changes in pregnancy are required to manage a pregnant snakebite patient well
- The differences from the non-pregnant female depend on the gestation of the pregnancy
- In general, the changes are more pronounced later in pregnancy
- Specific risks occur

Pregnancy - Anatomical Changes

- These increase with increasing gestation:
  - displacement of intra-abdominal organs
  - pressure on bladder, IVC, diaphragm
  - requires 3rd trimester woman to be lain in a **left lateral position** to reduce compression of the IVC & subsequent hypotension

Pregnancy - Physiological Changes

- Include:
  - Mild BP reduction (unless develop pre-ecclampsia - seriously raised BP & other symptoms)
  - Increased intravascular volume (larger cardiovascular reserve before developing hypotension)
  - Tachycardia
  - Tachyapnoea
  - Reduced lung capacity (vital capacity)
  - Gastro-oespohageal reflux - a problem when intubating
  - Increased breast size - can be a problem when intubating
  - Urinary frequency
  - Reduced gastric & ureteric motility
  - Reduced Hb, raised WBC & platelet counts in blood

Pregnancy - Specific Risks

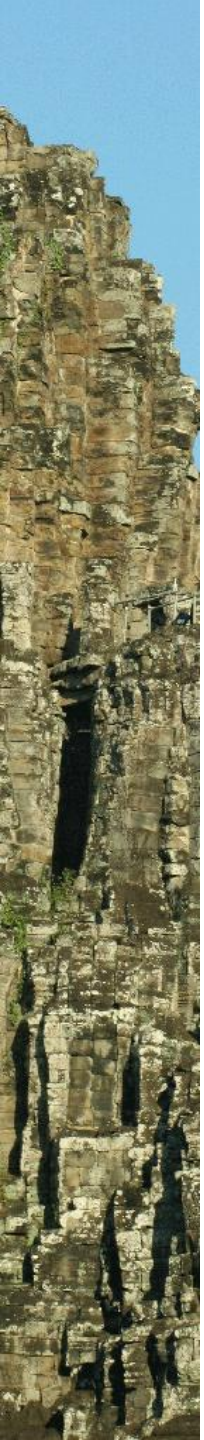
- Anything causing hypoxia in the mother will cause even greater fetal hypoxia
- Shock in the mother may cause critical reduction in placental blood flow
- Shock may be difficult to identify because of the lower BP in pregnancy & greater blood volume
- Increased risk of retro-placental bleed if develops a coagulopathy
- Increased risk of premature labour is possible
- There has been no study of the fetal effects of snake venoms reported, though it is reasonable to imagine that some of the smaller toxins might cross the placenta

Pregnancy - Treatment

- Most drugs used to treat patients for snake bite are safe in pregnancy, depending on the gestation - check your local guidelines
- Some antibiotics may be relatively contraindicated
- Antivenom is safe in pregnancy; the smaller fragment Fab' antivenom antibodies might be small enough to cross the placenta
- There is certainly NO reason to withhold antivenom from a pregnant woman

Summary - Key points

- Children:
  - high incidence of snake bite
  - more rapid onset & more severe envenomation
  - higher mortality rate because of management issues
  - different vital signs & physiological parameters
  - airway, ventilation & cardiovascular considerations
  - less O_2 reserve, more cardiovascular reserve, more rapid deterioration
  - closer/more frequent observations & reassessment required
  - same dose of antivenom as adults, administer the same way
  - weight-adjusted dose of adrenaline & all other drugs
- Snakebite in pregnancy:
  - involves 2 patients
  - requires a knowledge of the changes in pregnancy
  - remember the L lateral position in late pregnancy



Questions please