Educational Session: Pediatric Pain Management - From Sucrose to Propofol

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Advances in Pain Management and Sedation in Children

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Children Remember Pain!

- Archives of Ped Adol Medicine Feb 98.
- Looked at 48 children who had participated in a prior study.
- Previously children had received Fentanyl or placebo for a painful procedure.
- Placebo treated patients had increased pain scores on subsequent visits with equal analgesia.

Parents and Practitioners are Poor Judges of Young Children's Pain Severity

- 63 children age 4-7 underwent painful procedures.
- Patients graded their pain using the Smiley Analogue Score.
- Pain was also assessed by parents and providers on analogue scale.
- Correlation was 0.47 between children and parents.
- 0.08 between child and practitioner.

Singer et al. Acad Emer Med June 2002
Brutaine
- Papoose Board
- Sheet
- Relaxed calm voice
- Ear Plugs!

Topical Agents
- Good for cooperative patients.
- Most effective on face and scalp.
- Multiple formulations.
- Avoid cocaine products.
- Lidocaine, Adrenaline and Tetracaine is our formulation.

EVALUATION OF NONPHARMACOLOGIC METHODS OF PAIN AND ANXIETY MANAGEMENT FOR LACERATION REPAIR IN THE PEDIATRIC ED
- 240 Children aged 6-18.
- Randomized to standard repair using lidocaine or lidocaine plus age appropriate distraction.
- Video games, music, movies, books.
- No change in pain scores but significant decrease in anxiety scores.
- Sinha et al. Pediatrics April 2006
Effects of Parental Presence During Young Children’s Venipuncture

- Randomized controlled trial of 96 children.
- 48 children had parents present and 48 didn’t.
- Procedures videotaped.
- Distress scores were significantly lower for the child AND parent when the parent was present.

Wolfram et al. Ped Emer Care Oct 1997

ORAL SUCROSE FOR PROCEDURAL PAIN IN SICK HOSPITALIZED INFANTS

- Releases endogenous opioids.
- Also a distractant.
- 128 infants randomized to receive 1 ml of D25 or H2O 2 min before heel stick.
- Mean facial distress score lower.
- Decreased crying time.


EFFECTIVE PAIN REDUCTION FOR MULTIPLE IMMUNIZATION INJECTIONS IN YOUNG INFANTS

- 116 children aged 6-16 weeks scheduled to receive immunizations.
- 10 ml of 25% sucrose or control.
- Mean duration of crying was 92 seconds vs. 118 in the control group.

ETHYL CHLORIDE AS A CRYOANALGESIC IN PEDIATRICS FOR VENIPUNCTURE

- Cryoanalgesic
- Randomized trial of Ethyl Chloride vs. EMLA vs. nothing
- Mean Pain scores
  - 0-2 in 13/18 patients using ethyl chloride
  - 0-2 in 13/18 patients using EMLA
  - 0-2 in 17/19 using nothing

A NOVEL NEEDLE-FREE POWDER LIDOCAINE DELIVERY SYSTEM FOR RAPID LOCAL ANALGESIA

- Pressurized helium drives powdered lidocaine into the skin.
- Venipuncture 3 minutes after numbing.
- Mean pain ratings 1.52 with Zingo vs. 2.42 in controls.

Buffered Lidocaine: Analgesia for IV Line Placement in Children

- Randomized controlled study in children 8-15.
- Children were treated with buffered lidocaine vs. plain lidocaine.
- Buffered Lidocaine mixed 1:10
- Median pain score 2.3 vs. 4.4
Efficacy and Safety of Acetaminophen vs. Ibuprofen for Treating Children’s Pain or Fever

- Meta-Analysis of 30 studies and 3084 children.
- Analgesia was equivalent for Acetaminophen 15/mg/kg vs. Ibuprofen 10/mg/kg.
- Antipyresis favored Ibuprofen at 2, 4 and 6 hours.

A RANDOMIZED, CONTROLLED TRIAL OF ACETAMINOPHEN, IBUPROFEN AND CODEINE FOR ACUTE PAIN RELIEF IN CHILDREN WITH MUSCULOSKELETAL TRAUMA

- Children aged 6-17 randomized to a single dose of:
  - 15 mg/kg of Tylenol
  - 10 mg/kg of Ibuprofen
  - 1 mg/kg of Codeine
- Measured mean reduction in VAS score
  - Ibuprofen -24
  - Tylenol -12
  - Codeine -11

Nitrous Oxide

- Heavily used in dental procedures with remarkable safety and efficacy.
- Dissociative type of anesthesia.
- Administered by hand held mask.
- 50% NO appears to be best compromise.
- Disadvantages: Expensive equipment required. Child must be cooperative.
High Concentration NO for Procedural Sedation in Children: Adverse Events and Depth of Sedation

- Prospective study from Australia.
- 762 children age 1-17.
- NO concentrations of 70% in 73% of children
- 50% NO in 13%
- Deep sedation in 3.3% of 70% group
- 0.2%(2 pts) had O2 desaturation
- Vomiting in 3.9%

Narcotic Analgesics

- Block pain transmission.
- Morphine and Fentanyl.
- Oxycodone.
- Codeine.

Morphine

- Onset 2 minutes, duration 1-3 hours.
- Dose 0.1mg/kg IV.
- Complications: respiratory depression, hypotension, urticaria.
Fentanyl

- Onset 1-5 minutes, duration 30 minutes.
- Dose 1 microgram/kilogram.
- 100 times more potent than Morphine.
- No hypotension or urticaria
- Complications: Rigid Chest Syndrome.

OXYCODONE VERSUS CODEINE FOR TRIAGE PAIN IN CHILDREN WITH SUSPECTED FOREARM FRACTURE

- 107 children aged 4-17 randomized to codeine 2 mg/kg vs. oxycodone 0.2 mg/kg by triage nurse.
- 68% of children had fractures.
- Oxycodone gave better pain relief and was preferred by more parents.
- Children rated the X-ray as one of the most painful parts of the encounter.

MYTH: CODEINE IS A POWERFUL AND EFFECTIVE ANALGESIC

- Meta-analysis of 29 trials adding codeine to acetaminophen.
- Typical dose of codeine was 1 mg/kg.
- Codeine only improved pain relief by 5%.
- Side effects were 2.5 times more common with codeine.
Do Opiates Affect The Clinical Evaluation of Patients with Acute Abdominal Pain

- Meta analysis of 12 Randomized Controlled Studies.
- Nine Adult  Three Pediatric.
- 1,353 patients.
- 11/15 comparisons patients getting opiates reported decreased pain.
- No effect on management errors in any study
- Ranji et al. JAMA October 11,2006

Efficacy and Impact of Intravenous Morphine Before Surgical Consultation in Children with RLQ Pain Suggestive of Appendicitis: A Randomized Controlled Trial

- 90 Children 8-18.
- Received 0.1 mg/kg Morphine up to 5 mg or placebo.
- No difference in reported pain.
- No difference in neg appy rate or management errors.

PARENTAL PERCEPTION OF THE ADEQUACY OF PAIN CONTROL IN THEIR CHILD AFTER DISCHARGE FROM THE ED

- Prospective study of children discharged from the ED after 6 painful conditions.
- Providers underwent training program.
- 96% of children were discharged with prescription for pain medications.
- Tylenol #3, NSAID’s or Tylenol.
- 96% of parents were satisfied with their child’s pain control. None sought additional medication.
Indications for Sedation

- Painful procedures.
- Diagnostic studies.
- Recurrent procedures.
- Amnesia.

Physiology

- Pain is caused by a stimuli and perception.
- Opiate agonists block the reception of pain transmission.
- Sedatives alter the perception of pain.

Conscious Sedation

- Depressed LOC.
- Patient maintains airway reflexes.
- Patient able to follow some commands.
Deep Sedation
- Further decreased LOC.
- Airway is now at risk.
- Patient is unable to follow commands.

Sedatives
- Midazolam
- Propofol
- Chloral Hydrate
- Barbiturates
- Nitrous Oxide

Ideal Sedative
- Safe.
- Rapid onset and resolution.
- Predictable.
- Easy to administer.
- Causes analgesia and amnesia.
Midazolam
- Multiple routes of administration.
- Safe.
- Familiar and available.
- Reversible.

Routes of Administration
- IV 0.1mg/kg.
- Oral 0.5-1 mg/kg.
- Nasal 0.5-1 mg/kg.
- Rectal 0.5-1 mg/kg.

Onset and Duration
- IV: Onset 3 min. Duration 30 min.
- Oral: Onset 30 min. Duration 30 min.
**Flumazenil**
- Reverses the effects of Benzodiazepines.
- Dose 0.1mg/kg.
- Duration 20 minutes.
- Must be given IV.

**Chloral Hydrate**
- Can be given PO or PR.
- 75-100mg/kg.
- Onset 30 minutes.
- Duration 1 hour.
- Prolonged drowsiness.
- Adequate sedation in 80% of cases.

**Barbiturates**
- Thiopental.
- IV 3-5mg/kg IV. Onset 1 minute.
- Rectal 30 mg/kg. Onset 15 minutes.
- Causes sedation but no analgesia.
- Hypotension and apnea at higher doses.
- Well studied in Head Injuries.
Ketamine

- Dissociative Anesthetic.
- Anesthesia, Analgesia, and Amnesia.
- Extremely Safe.
- Long successful history.

Ketamine

- Excellent Efficacy.
- Rapid Onset.
- Duration about 1 hour.
- Easily Administered.

Ketamine

- 4mg/kg IM with .01mg/kg Atropine.
- Can be mixed together.
- Adequate sedation in over 90% of cases.
- 1 mg/kg IV.
**Ketamine**

- Can cause nightmares.
- Vomiting on emergence.
- Recommended for children under 7.
- Increases ICP and IOP.

**Ketamine Studies**


**Propofol**
**Propofol**
- Can produce moderate or deep sedation.
- Relatively narrow therapeutic window.
- Ultra Short acting
- Can produce rapid swings in LOC.
- Most popular deep sedative in EM.

**Indications**
- Fracture reduction.
- Dislocations.
- I and D.
- Cardioversion

**Special Considerations**
- Must be pushed by MD.
- Need dedicated anesthetist.
- Very short acting.
- Can cause general anesthesia.
Pharmacology

- 1-1.5 mg/kg (induction 2-2.5 mg/kg)
- Onset 30 seconds.
- Effects completely resolve within 6 minutes.
- Doses higher than 1 mg/kg associated with increased respiratory depression.

Clinical Practice Advisory: ED Procedural Sedation with Propofol

- Excellent position statement with guidelines for propofol sedation in the ED.
- Great review of the literature and bibliography.

Propofol for Procedural Sedation in Children in the ED

- Used Propofol for 393 sedation events in children 1-18. Mean age 8.
- Median dose was 2.7 mg/kg.
- Procedure duration 11 min.
- Transient hypotension in 84%.
- 4 patients required brief BVM.
Pediatric Procedural Sedation in the Community ED: Results from the Prosed Registry

- 1,028 episodes of procedural sedation in patients 0-20 years in 14 ED’s.
- Ketamine (41%), midazolam (32%), etomidate (16%), fentanyl (15%), propofol (14%).
- Complication 0.6%. (supplemental O2)

Discharge

- Control of head.
- Follows commands.
- Not vomiting.
- Interactive.

Hospital Sedation Protocols

- 02 Sat monitor.
- BP monitor.
- IV not necessary.
- Airway management skills and equipment.
- Reversal agents.