Pain-free Dermatology: Minimizing Discomfort in Procedures for Children and Adults

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Inspiration
• Pediatrics vs. Dermatology...

Trauma
• Me > Patient!

Minimizing Pain
• Everybody wins:
  – The patient has less pain
  – The parents have less stress
  – The dermatologist has a smoother procedure!
Outline

• The History and Science of Pain
• A Model for Ensuring Procedure Success
  – Pharmacologic
  – Non-pharmacologic
• Practical Take Home Points

Procedural Distress

Procedure Strategy

Procedure Strategy
“Suffering so great as I underwent cannot be expressed in words, and thus fortunately cannot be recalled. The particular pangs are now forgotten; but the blank whirlwind of emotion, the horror of great darkness, and the sense of desertion by God and man, bordering close upon despair, which swept through my mind and overwhelmed my heart, I can never forget, however gladly I would do so.”

Patient to Sir James Simpson mid 19th century.

Definitions

“an unpleasant sensory and emotional experience associated with actual or potential tissue damage”

International Association of the Study of Pain

Nociception

• “perception of injury or painful stimuli by nerve endings, spinal tract, midbrain, and cortex and does not involve the affective or evaluative components of pain”

• Nociception + “OUCH” = PAIN
Pain Transmission Theory

- **A delta fibers**
  - 2-5 mm in diameter and myelinated
  - have a fast conduction velocity (5-40 meters/sec)
  - localized pain sensations, sharp pain
- **C fibers**
  - 0.4-1.2 mm in diameter and unmyelinated
  - slow conduction velocity (0.5-2.0 meters/sec)
  - transmit dull, poorly localized pain sensation
  - 70% of all noxious pain transmission


Cry duration

Neural Pathways

Skin-to-skin is analgesic

Skin-to-skin is analgesic
Breastfeeding is analgesic

“A sucker consisting of a sponge dipped in some sugar water will often suffice to calm a baby.”

Modern Surgical Technique, 1938


Sucrose is an effective analgesic in newborns for single, limited procedures.

Sucrose likely works on opioid receptors.

Optimal dose is unclear but 24% does the trick

(1 packet of table sugar to 10 cc sterile water)

Procedure Strategy

Topical Anesthetics

- There are many different topical anesthetics available
- Act via a “numbing effect”: reversible block in nerve conduction for minutes to hours
- Very safe overall


Topical Anesthetics

- 1:1 mixture of 2.5% lidocaine and 2.5% prilocaine (EMLA: eutectic mixture of local anesthetics)
- They melt at a lower temperature than they do separately → a liquid at room temperature
- The combination is more effective than using both drugs together


Topical Anesthetics

- Applied about 60 minutes before the intended procedure, it penetrates up to a depth of 10 mm
- Penetration can be increased with occlusion
- Possible side effects: methemoglobinemia
  - Usually concern in < 3 months of age and when using large amounts (>2 g per 10 cm²)

Topical Anesthetics

- A review of 8 trials (n = 458 children) of painful procedures compared tetracaine to EMLA
- Both were comparable for pain relief with 60 min application for EMLA and 30 min for tetracaine


Topical Anesthetics

- Liposomal lidocaine is newer anesthetic
- Appears to have superior effect with faster onset (30 min)
- A trial of liposomal lidocaine vs. tetracaine found no significant difference in pain scores


Pearl

- Cryotherapy pain has both immediate and delayed component
- Applying a topical anesthetic (e.g., 4% lidocaine cream) right after freezing can render the lesion painless within 30 seconds!
- Theory: ice crystals during freezing damage epidermal barrier, thus increasing penetration


Local Anesthetics

- Injectable anesthetics are the mainstay of dermatologic procedures
- They are very safe, work rapidly, and are very cost effective
- There can be significant discomfort as they are injected, however, both from the needle and the infiltration

For the **Needle Pain**

- Consider a topical anesthetic first
- Dr. McQueen will talk about distraction techniques shortly that are fantastic

For the **Infiltration Pain**

- pH of lidocaine solution is between 3.5-7.0
- The acidity is thought to be responsible for the pain
- Alkalinization of the lidocaine can reduce this pain

Buffer

- A systematic review of 23 studies determined that pain from injection of buffered lidocaine was less than from unbuffered lidocaine
- Buffering is generally achieved by adding 1 mL of 8.4% sodium bicarbonate to 9 mL of 1% or 2% lidocaine

A little out there...

- In a mouse model of post-op pain:
- Inhalation of Atlantic cedar oil markedly reduced mechanical hypersensitivity to painful stimulus
- This effect was prevented by pre-treatment with naloxone
- Odors may activate the descending pain modulation pathway

Closer to home

- Aromatherapy may help with the autonomous response to pain
- 73 children with type 1 diabetes
- Orange and lavender oil were dispersed with an aromatherapy device vs. placebo
- Lower ΔHR% was associated with essential oil application (p=0.0252)

Cooling

- Cooling the skin may decrease nerve conduction velocity of C and A[delta] fibers, thus decreasing the transmittance of pain
- A study of 60 subjects found no significant difference between buffered anesthetic and skin cooling in reducing pain of infiltration
- Suggests that cooling could be as effective as the pharmacologic effect of buffering

More Cooling...

- A study randomized 39 patients before injecting anesthesia to skin cooling (termed “cryo-preparation”) or no skin cooling
- They found significant reduction in injection pain with cryo-preparation
  - 24.6% reduction in pain score that was statistically significant (p = 0.039)
Many Ways to Cool

- Evaporative refrigerant sprays such as ethyl chloride to a simple ice pack
- One study compared ice cubes wrapped in latex or latex-like glove material to cubes wrapped in aluminum foil and found that the aluminum foil wrapping was more effective at reducing skin temperature before neurotoxin injection
- After 120 seconds of exposure, only the aluminum foil wrap was able to achieve a 2°C skin temperature—thought to be necessary to reduce nerve conduction and increase the pain threshold


Good Vibrations

- Application of vibration to the skin proximal to the procedure site has been shown to decrease pain perception during procedures
- More than simple distraction, vibration physiologically mediates the transmission of painful stimuli under Melzack and Wall's Gate Control Theory of pain


Vibration

- A study of 20 neonates found application of vibration during heel stick reduced pain (measured by the Neonatal Infant Pain Scale)
- In adults, at least one study demonstrates vibration outperforming vapocoolant for pain reduction during venipuncture


Vibration + Cooling

- Vibration + Cooling may be even more effective
- Numerous studies demonstrate statistically and clinically significant reduction in pain perception when both are applied proximal to the painful procedure
- A randomized prospective trial of 81 children who received standard therapy versus use of a device combining cooling and vibration lower pain scores and improved venipuncture success

Use verbal reassurance with caution, especially for kids under 6 years.

Instead of: "The medicine will burn."
Try: "Some kids say it feels warm, other kids say it feels tingly."

Instead of: "I’m sorry.
Try: "You’re being very brave."

Instead of: "Tell me when you’re ready.
Try: "When I count to three, blow the feeling away from your body."

Procedure Strategy

- Analgesia
- Anxiolysis
- Distraction
Can distraction out-perform drugs?

- 112 children age 4-12 undergoing elective surgery
- Anxiety assessment at admission and at induction
- Postoperative effects measured


Can distraction out-perform drugs?

- Parent presence alone (PPIA)
- Parent presence + video game (VG)
- Parent presence + midazolam (M)


Can distraction out-perform drugs?

Active vs Passive Distraction

Active vs Passive Distraction

- Children 3-16 years undergoing painful procedures
- Randomized to active distraction (tablet) or passive distraction (cartoon)
- CHEOPS and self report pain scale measured at baseline, during procedure, and recovery

Results: self-reported pain

Results: CHEOPS*

Apps that work

- Are easy to learn
- Have many choices
- Have an auditory component
- Do not require long term investment
Strategies for App success

- Have several to choose from
- Introduce it several minutes before the procedure starts
- Know the basics of how your apps work
Take Home Points

- Encourage a calm, relaxed atmosphere
- Use topical anesthetics whenever possible
- Buffer lidocaine for injection
- Distraction is key: Music, apps, or talking

Thank you!

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