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

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I have no relevant disclosures

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

Pain

Fear

Distress

Attention

Procedure Strategy

Pain

Procedure Strategy

Analgesia

Procedure Strategy

Analgesia

Fear

Procedure Strategy

Analgesia

Anxiolysis
Procedure Strategy

- Analgesia
- Anxiolysis
- Attention

Procedure Strategy

- Analgesia
- Anxiolysis
- Distraction

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

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

Analgesic Effects of Sweet-Tasting Solutions for Infants: Current State of Equipoise
Sucrose is an effective analgesic in newborns for single, limited procedures.

Optimal dose is unclear but 24% does the trick

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

- **Analgesia**
- **Anxiolysis**
- **Distraction**

**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

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- **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

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- **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)

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- **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

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From: https://www.youtube.com/watch?v=lFvR8XXDL0E
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
- We will talk about fantastic distraction techniques shortly

For the Infiltration Pain

- Warm lidocaine (37°C) is less painful than room temperature (21°C)
- Deep dermal injection is less painful than superficial wheal-producing injection
- Slow injection is less painful than rapid injection

- pH of lidocaine solution is between 3.5-7.0
- The acidity is thought to be responsible for the pain
- Alkalization 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

• Theoretical issues with adding sodium bicarbonate:
  – Causing precipitation
  – Decreasing potency
  – Reducing shelf life

• None of these found in the studies reviewed

Next-level Pearl:

• “Saline kiss” (Dr. Melanie Palm): inject with normal saline first (bacteriostatic) to raise a wheal
• Then inject the buffered lidocaine
• This may work in part because the bacteriostatic ingredient (benzyl alcohol) is also an anesthetic!
• Benzyl alcohol reduces pain and prolongs the anesthesia

Buffer

• Prospective, double-blind trial, 31 patients used a VAS of pain by two different solutions of lidocaine with epinephrine:
  • Solution A: 1 part 1% lidocaine + epinephrine in 10 parts of bacteriostatic 0.9% sodium chloride (1:10 ratio of Lido + Saline) → Mostly saline!
  • Solution B: 1 part 8.4% sodium bicarbonate solution in 10 parts 1% lidocaine + epinephrine (1:10 ratio of bicarb + Lido)
  • 28/31 patients reported that the solution of lidocaine diluted with normal saline was the least painful upon injection

Conclusion

• Use buffered, warm lidocaine and 30g needle. Inject the smallest amount slowly into the deep dermal tissue as the needle is being slowly withdrawn.

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


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


Procedure Strategy

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What about Parents?

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.”
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What we say to dogs:

"Hey, Cooper! I'm going to do something fast, and it's not going to hurt. Cooper loves the sound of the clicker!"

What they hear:

"Mommy is happy, and I'm happy, and the dog is happy!"

What we say to kids:

"Don't worry, it's not going to hurt. Just think about something fun while I get you ready."
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)


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
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

Apps

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Procedure Strategy

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Take Home Points

- Encourage a calm, relaxed atmosphere
- Use topical anesthetics whenever possible
- Buffer lidocaine for injection
- Inject slowly and deeply first
- Distraction is key: Apps, music or even talking
Thank you!

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