High Volume Epidural Blood Patches: Practical Aspects

Charles Louy, Ph.D., M.D., M.B.A.
Director, Inpatient Pain Service
Department of Anesthesiology
Cedars-Sinai Medical Center

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Two-level epidural blood patching with patient in LLD position
Two-level epidural blood patching: simultaneous insertion of needles
Epidural Blood Patch: patient in prone position
Spinal (20g) vs Tuohy (17g) needles
Types of needles

- Smaller puncture hole size with 20g
- Greater danger to damage spinal cord with 20g spinal needle (Tuohy is more blunt)
- Can thread an epidural catheter through a Tuohy needle
- More painful to insert a Tuohy in the thoracic level (hence more anesthesia required)
Rationale for two-level blood patches

- Started with low thoracic epidural blood patches
- In a significant percentage of patients the symptoms of SIH reappeared within days
- A significant percentage of these returning patients responded to an additional blood patch in the lumbar area
- Hence, we started doing simultaneous thoracic and lumbar epidural blood patches
Mixing contrast with blood
Mixing contrast with blood: benefits

• Follow the spread of the injected blood
• Beneficial in patients with discontinuous epidural spaces
• Provides guidance for more than two injections
Limitation of Activity Level for 8 wks

- Avoid activities that require sudden contraction of the abdominal muscles:
- Minimize coughing, sneezing
- **NO** sudden bending forward, or twisting of the trunk; no running, jumping, bumpy rides
- No lifting of anything heavier than 5 lbs/arm, 10 lbs with both arms. See Laura Freed, MPT’s lecture 2017:
- Sexual intercourse restricted to woman-on-top-man-on-bottom-position (regardless of who is the CSF leaker) (4 cases of blood patch failure)
Limitation of Activity Level (2)

• Prevention of constipation with prophylactic polyethylene glycol +/- mineral oil
• Avoid laxatives that cause cramping, e.g. bisacodyl, senna, enemas
• Avoid opiates (constipation, secondary headaches)
• Unless contraindicated, avoid anticoagulants, including ASA, ibuprofen, naproxen, etc.
Fixed vs Variable Volume Patching

• Studies comparing different preset volumes of blood without creating symptoms did not show a difference in outcome


• Factors predicting response to the first epidural blood patch in spontaneous intracranial hypotension.
• Brain 2017; 140: 344-352
• One of the factors predicting response to EBP: volume of blood injected (>22.5 ml, up to 55 ml)
Reports of Large Volume Patches

• Griauzde et al developed a catheter-based protocol for patients with SIH that resulted in an average volume of 54.1 ml per EBP; improvement or resolution of symptoms was seen in eight out of nine patients and no complications were reported.

• (AJNR 2014; 35: 1841-1846)
Ultra High Volume Epidural Blood Patches (2017)


- Staudt MD, et al. J Neurosurg. 2017:

- Transient responses to multiple small-volume (SV) single-site EBP (SV-EBP) injections

- Resolution of the cognitive dysfunction after ultra high volume (60-120 ml) multilevel blood patches with catheter

- N = 15 pts w SIH +/- chronic subdural hemtma
- Bld patches w 4Fr IV catheter (single insertion)
- 44.8 +/- 21.6 mL (16.0-85.0 mL)
- Result: Symptom relieved 80% of cases, “even when conventional EBP or fibrin-glue patch failed”
- Complication: Thoracic ventral epidural hematoma x 1 (Resolved spontaneously)
Safety Protocol

• Radiographic confirmation with a contrast injection of epidural placement prior to injecting blood.
• Reconfirm epidural placement with another contrast injection, if after injecting 20 ml of blood, the patient does not report symptoms, or there is no increase in the pressure needed to inject blood at the same rate. Now we only need to view the distribution of injected blood mixed with contrast material in the lateral view.
• Minimum time between consecutive high-volume EBPs for the same patient: 5 days
Conclusions

• High volume epidural blood patches can be done, as supported by our data and by the literature BUT
• Fluoroscopic assistance highly recommended
Safety Measures

• Most important complications to avoid: 1) unintended intrathecal injection of blood; 2) radiculopathy (continuous feedback from pt during blood injection)

• Given significant variability in intrathecal elastance, injecting even a small preset volume of blood (4 ml) may not be safe
Post-procedure Pain Management

- Gabapentin 300 mg PO
- Tramadol 50 mg PO (synergism with gabapentin)
- Methocarbamol (Robaxin) 500 mg PO
- Acetaminophen 1g PO (for synergism)
- PRN opiate, either oral or IV
- For post-laminectomy opioid tolerant pts, use hydromorphone- or morphine-ketamine PCA, or ketamine continuous infusions up to 60 mcg/kg/h
Rationale for the use of perioperative IV Ketamine


N= 5 MAs and 39 clinical trials (2,482 patients, 1403 received ketamine)

**Methods:**
- Medline search of clinical trials or meta-analysis between 1966 and 2013.
- Pts who received low dose IV ketamine infusion (\(< 1.2 \text{ mg/kg/h} \) continuous infusion and \(< 1 \text{ mg/kg} \) when given as a bolus)

**Results & Conclusions:**
- 40% drop in opioid consumption; Decreased pain scores
- 39 clinical trials show reduction in pain scores.
- 6 intraop infusion studies: **4 with long term effect** on pain reduction, 2 with neither long term nor short term effects
- 2 single dose studies: **no difference** in long-term pain management or in the recovery process

**N** = 102 (52 in the treatment group)

**Methods:** Double Blind RCT

- **Intraoperative** infusion of 0.5 mg/kg (on induction) + 0.6 mg/kg/h of ketamine vs NS

**Results & Conclusions:**

- Total opiate consumption (morphine equivalents) significantly reduced in the treatment group at 24h, 48h, and **6 weeks**
- Average reported pain intensity significantly reduced in PACU and at **6 weeks**
- No differences in known ketamine- or opiate-related side effects
- At 6 wks ketamine grp pts used antidepressants 10% less freq than placebo grp pts but not at baseline (P=0.023)

N=60 for TAH

**Methods:** Double blind RCT

- (Gabapentin 1.2 g vs placebo)+(ketamine vs NS)
- 0.3 mg/kg + 0.05 mg/kg/hr (on induction) until end of surgery

**Results & Conclusions:**

- Postop pain scores lower in the gabapentin group
- PCA morphine reduced in both treatment groups vs control (P<0.001)
- Patient satisfaction with pain treatment improved in ketamine and gabapentin groups compared with control group (P<0.001)
- At 1-, 3-, 6-mo: Incidence of incisional pain + related pain scores: lower in the gaba grp compared with ketamine and control grps (P<0.001)
Ketamine Dosages vs Outcomes

Loftus: 0.5 mg/kg + 0.6 mg/kg/h intraoperative.......... (Positive outcome)
De Kock: 0.25 mg/Kg + 0.125 mg/kg/h Intraoperative........(No advantage)
          0.5 mg/Kg + 0.25 mg/kg/h Intraoperative.......(Positive outcome)
Perrin:  0.5 mg/kg + 0.24 mg/kg/h Intraoperative.....(Positive outcome)
Remerand: 0.5 mg/kg + 0.12 mg/kg/h x 24 hrs.................(Positive outcome)
Katz:    0.2 mg/kg + 0.15 mg/kg/h x 70 minutes..............(No advantage)
Sen:     0.3 mg/kg + 0.05 mg/kg/h Intraop + GABA preop.....(No advantage)
Kwok:    0.15 mg/kg single d pre- or post-incision.(No adv at 7days and 4wks)
Dullenkopf:0.15 or 0.5 mg/kg single dose ...(No advantage at 3 months postop)
Perioperative effectiveness of ketamine: Summary

• No long-term benefits without short term benefit
• Benefits are dose dependent
• Single dose IV ketamine is ineffective long- and short-term (even when given before incision)
• Pre-incision timing is mandatory
• Effect is probably mediated by the NMDA receptor
• Gabapentin is good alternative or adjunct to ketamine
Perioperative effectiveness of ketamine: Recommended Doses

- 0.5 mg/kg + 0.25 mg/kg/hr until end of surgery
- 0.5 mg/kg + 0.12 mg/kg/hr x 24 hrs
- Start ketamine before incision
Pain and depression are intertwined

Patients with pain and depression experience reduced physical, mental, and social function as opposed to patients with only depression or pain

Extensive literature on the use of ketamine for depression, but no studies on the effect of ketamine for pain and depression

Ketamine and cannabinoids appear to be safe and effective options for improving depressive symps and ameliorating pain
Oral Ketamine Therapy: our limited experience

- Poor bioavailability
- Yet, small dose seems effective: 10 mg PO TID
- **Contraindications:**
  - poorly controlled cardiovascular disease
  - pregnancy
  - active psychosis
  - severe hepatic dysfunction (e.g. cirrhosis)
  - elevated ICP
  - elevated intraocular pressure
Refine protocols and create algorithms to select patients for IV ketamine infusions

Oral ketamine maintenance therapy

Propose initiation of ketamine infusion in an outpatient or observation unit to avoid “unnecessary” admission 2/2 acute on chronic pain
Contact Information

• Christine.Easterling@cshs.org (assistant)