

High Volume Epidural Blood Patches: Practical Aspects

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October 13, 2018

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 :
- <https://spinalcsfleak.org/symposium/symposium-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
- Taivainen T, et al. Efficacy of epidural blood patch for postdural puncture headache. *Acta Anaesthesiol Scand* 1993; 37: 702-705

More Recent Report of Large Volume Epidural Blood Patches (2017)

- Wu JW, Hseu SS, Fuh LJ, Lirng JF, Wang YF, Chen WT, Wen SP, Wang SJ.
- 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)

- **Multilevel, ultra-large-volume epidural blood patch for the treatment of neurocognitive decline associated with spontaneous intracranial hypotension: case report.**
- 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**

Tatsuya O et al. Excellent Outcomes of Large-Volume Epidural Blood Patch Using an Intravenous Catheter in 15 Consecutive Cases with Cerebrospinal Fluid Leak . World Neurosurgery, Vol 118 , **Oct 2018**, Pages e276-e282

- N= 15 pts w SIH +/- chronic subudral 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

- Consensus Guidelines for Acute Pain from ASRA, AAPM, ASA:
[Reg. Anesth. Pain Med. \(7/18\):](#)
- <https://www.ncbi.nlm.nih.gov/pubmed/28043956>

Jouguelet-Lacoste, J., La Colla, L., Schilling, D., & Chelly, J. E. (2015). The use of intravenous infusion or single dose of low-dose ketamine for post-operative analgesia: A review of the current literature. *Pain Medicine*, 16(2), 383-403.

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 mg/kg/h** continuous infusion and < **1 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

Loftus RW, Yeager MP, Clark JA, et al. Intraoperative ketamine reduces perioperative opiate consumption in opiate-dependent patients with chronic back pain undergoing back surgery. *Anesthesiology* 2010;113: 639–46.

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)

Sen H, Sizlan A, Yanarates O, et al. A comparison of gabapentin and ketamine in acute and chronic pain after hysterectomy.

Anesth Analg 2009;109(5):1645–50.

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**

ISHak WW, Wen RY, Naghdechi L, Vanle B, Dang J, Khosp M, Dascal J, Marcia L, Gohar Y, Eskander L, Yadegar J, Hanna S, Sadek A, Aguilar-Hernandez L, Danovitch I, Louy C. Pain and Depression: A Systematic Review. Accepted at the Harvard Review of Psychiatry on March 27, 2018.

- 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

FUTURE DIRECTION beyond EPIDURAL BLOOD PATCHES

- 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

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