Management of (obstetric) accidental dural puncture

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“Dural tap”...

NOT a subject that you should be proud to be considered an expert on......

so a good idea to invite a foreigner to talk!
"Don’t eat the hard bit on its back, they make you fart!"
Disclosures

Personal: Nil

Presentation caveat:

some information is extrapolated from spinals with large needles & levels of evidence are at best moderate and often, low
Objectives

- Briefly review approaches to initial management of accidental dural puncture

- Consider strategies for prevention of PDPH after ‘dural tap’

- Review evidence for management of PDPH
  - ie. what works (if anything other than epidural blood patch)
  - how to get the best from an EBP
Levels of Evidence

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level Ia
systematic review (with homogeneity)* of all relevant randomised controlled trials (RCTs)

level Ib
at least one RCT (with narrow confidence intervals)

level IIa & IIb
cohort studies or low quality RCT

level IIIb
case control studies

level IV
case series

level V expert opinion or physiology / bench research

Jadad score 0-5 for trial quality
What is 'accidental dural puncture' (ADP)?

Penetration of the dura & arachnoid meninges that was:

- **accidental** (‘happening without intent or through carelessness’)
- **inadvertent** (‘unintentional or inattentive’)
- **unintentional** (‘not done willingly’)

Oh whoops!

Options:

1. Insert the epidural catheter as intrathecal ‘macro-catheter’
2. Re-locate the epidural space & catheterise
3. Abandon for an alternative analgesic method
4. Utter expletives & leave to contact your indemnifier?
Initial management

Tell the patient & reassure them that:

- pain will be controlled or alternative analgesia or anaesthesia provided
- they will be closely observed
- they will be reviewed later in case any problems arise*
- if they are likely to be discharged within a short time frame, information about possible symptoms and how to contact a relevant person will be provided

* inform them about PDPH (incidence 50-80%) & that there are treatments available
Initial management

Tell other staff* what has happened & ‘the plan’

* obstetric carers, esp. midwives & all relevant colleagues

Document (highlight)
- what sort of catheter this now is
- what the drug/delivery protocols are
- what monitoring is required

//e-learningforhealthcare.org.uk 08_03_01
Using a spinal catheter

Technique:
• insert the catheter ~3 cm but do not persist if difficult to insert or resistance is met
• confirm CSF can be aspirated
• give IT local anaesthetic and fentanyl using a familiar regimen (boluses, infusions or patient-controlled spinal analgesia)

Caveats:
• protocols exist
• the catheter is clearly identified as a spinal catheter on the filter/catheter as well as the medical record
• monitoring protocols exist (BP, dermatomes, leg strength)
• extra vigilance and asepsis are emphasised
Re-inserting an epidural catheter

Caveats:

• protocols exist
• a test dose has excluded IT spread
• an anaesthetist is available to administer subsequent doses and check responses (local policy)
• midwifery staff are educated about abnormal responses

Disadvantages:

• repeat dural tap
• uncertainty of needle or catheter tip location if CSF is seen
• greater difficulty establishing effective analgesia
• uncertainty about late IT spread of epidural solution
Can we reduce the (high) risk of PDPH?

Not easily in obstetrics!

Lower risk populations are:

- older adults (> 60 years) level IIb
- children (< 12 years) level IIb
- males level IIb
- morbidly obese level IV
Does the insertion technique influence the outcome if you have a ‘dural tap’?

- CSE vs Epi
- Epidural needle bevel orientation during insertion
- Loss-of-resistance saline vs air
- Type of epidural needle
- Ultrasound-guided insertion

Bradbury CL et al Acta Anaesthesiol Scand 2013
CSE vs Epidural

- 18 RCTs, n=5703
- low quality (Jadad 2)

No significant difference in ADP/PDPH risk
Epidural needle orientation

- 4 RCTs, n=2357
- low quality & heterogeneous

Norris et al Anesthesiology 1989
n=1558 with 41 punctures (Jadad score 1)
PDPH 1.4% parallel vs 2.1% perpendicular

Evidence insufficient to draw conclusions
Loss-of-resistance medium. Saline or Air?

- 5 RCTs, n=874
- medium quality (Jadad 3)
- no significant difference in PDPH rate

but... Aida S et al Anesthesiology 1998
n = 3,730 quasi-randomised, one epiduralist

Same ADP rate but more PDPH from 1.8% (air) vs 0.3% (saline)
Type of epidural needle


- 1 RCT, n=1077 (Jadad 5)
- 18 G Special Sprotte vs 17 G Tuohy PDPH 55% vs 100%

......but lower operator satisfaction with Sprotte needle

Cohort studies suggest lower risk with 18 G vs 16 G Tuohy

Use an 18 G needle? Level IIa
Ultrasound-guided insertion

- 2 RCTs, n=670
- Low quality

No apparent difference in PDPH risk
What do YOU do to prevent PDPH?


- encourage fluid intake (93%)
- regular non-opioid analgesics (96%)
- recommend caffeine (30%)
- limit second stage or avoid pushing (18%)
- prescribe opioid analgesics (11%)
- leave spinal catheter in situ 18-36 h (15%)
- epidural crystalloid infusion/bolus (13%)
- prophylactic blood patch (2%)
- IV hydrocortisone (1%)
Do these strategies work?

- hydration & bed rest: **NO** level Ib  Cochrane 2002
- regular analgesics or opioids: **NO?** no evidence
- caffeine: **NO** level Ia
- limit bearing down: **MAYBE** level IIb
- bed rest & posture: **NO** level Ia  Cochrane 2002
- IV hydrocortisone: **NO?** no evidence
- intrathecal N saline bolus: **NO** level Ib  Apfel et al 2010
- epidural crystalloid: **NO** level Ia  Apfel et al 2010

- prophylactic blood patch ?
- spinal catheter ?
Prophylactic epidural blood patch (PEBP) [needs a correctly located epidural catheter]

- 4 RCTs, n=173
- low quality (Jadad 2)
- no significant difference in incidence of PDPH

- meta-analysis 9 studies (PINK CIRCLES) shows non-significant RR 0.32 (CI 0.10-1.03) & publication bias

Apfel et al. BJA 2010
Scavone B et al. Anesthesiology 2005

No difference in-

- incidence PDPH
- maximum severity of PDPH
- therapeutic EBP

PEBP not recommended as a routine
Subarachnoid (epidural) catheterisation

Heesen M et al. IJOA 2013
9 non-randomised studies, n=963

RR PDPH 0.82 (CI 0.67-1.01)
RR EBP 0.64 (CI 0.49-0.84)

Russell I et al IJOA 2011
• 1 quasi-RCT, n=97
• medium quality (Jadad 3)
PDPH 72% spinal catheter vs 62% epidural catheter

Possibly reduction in severity of PDPH Level IIa
Anything else helpful?

Epidural morphine

Al-Metwalli RR. Anaesthesia 2008

- 1 RCT, n = 50, post-epidural obs
- epi morphine 3 mg x 2 post-delivery

PDPH 12% vs 48%

EBP 0% vs 24%

Requires confirmation & not very practicable
Anything else helpful? Cosyntropin

Hakim SM. Anesthesiology 2010

- 1 RCT, n = 90, post-epidural obs
- 1 mg IV

PDPH  33% vs 69%

EBP   11% vs 29%

Requires confirmation (some support from dexamethasone studies)
Treatment of PDPH

- Judiciously & sympathetically do nothing
- Provide analgesia for headache
- Epidural blood patch (EBP)
Option 1:
Judiciously & sympathetically do very little!

What is the natural history of PDPH after dural tap? We aren’t sure!

• 80% probably DO NOT resolve by 1 week
  Van Kooten et al J Neurol Neurosurg Psychiatry 2008
• 10% are still present at 1 month
  Sprigge et al Anaesthesia 2008

These women may be at risk of:
• chronic headache
  Webb et al Anesth Analg 2012
• serious complications

FIGURE 1: Bilateral subdural haematomas (1), haemorrhage in the basal ganglia bilaterally (2) and in the right thalamus.
Judiciously & sympathetically do very little

What are the consequences of symptomatic treatment and waiting?

- Greater suffering & increased length of hospital stay
  Vilming et al Cephalalgia 2005

- Increased anaesthetic workload due to visits for evaluation & treatment
  Angle et al Can J Anaes 2005

- Possibly a higher risk of serious complications
  Fiala A et al BJA 2012
Popular therapies for PDPH

Harrington et al RAPM 2009 US data

- Aggressive Oral Hydration
- Epidural Blood Patch
- Oral Caffeine
- Oral Non-opioid Analgesics
- Encourage Bedrest
- Aggressive IV Hydration
- Oral Opioid Analgesics
- IV Caffeine
- IV Opioids
- Epidural Saline
- Abdominal Efferent
- E-TH Analgesics
- ACTH or Synthetic Analgesics
- Epidural/Synpal Opioids

Darvish et al Acta An Scand 2011 Nordic data

- Oral or IV hydration
- Oral non-opioids
- Oral or IV opioids
- Oral or IV caffeine
- Bed rest
So, can we provide headache relief?

The majority of PDPHs after 'dural tap' are moderate or severe in intensity.

**Moderate & severe headache** does not respond well to pharmacological treatment.

& Drug side effects may be an issue eg. caffeine at best modest benefit [level Ia] but agitation, insomnia & seizures.

Ineffective

- non-opioids & opioids? no evidence
- sumatriptan level IIb
- ACTH level IIb
Does anything help?

**IV Hydrocortisone**

Ashraf et al Middle East J Anaesthesiol 2007

- 1 RCT, n = 60 post-spinal
- 200 mg IV + 100 mg tds x 2 days

Requires confirmation & safety data
Does anything help?

**Oral gabapentin or pregabalin**

Erol DD Acute Pain 2006 +
- 2 RCTs, n=62, post-spinal, gabapentin 300 mg tds

Huseyinoglu U et al J Clin Neurosci 2011
- RCT, n=40, post-spinal, pregabalin 150-300 mg/day

Other case series support benefit.
More effective than caffeine.

Requires confirmation (& more data on safety incl. with breast-feeding)
Option 2: Epidural (blood) patch (EBP)
Does it work?


“Therapeutic EBP showed a benefit over conservative treatment, based on limited evidence” level Ib

Popular in UK/USA/Australia
Not in many European national guidelines

Not easy to study
Efficacy post-dural tap

level IIb

POOR if within 24-48 h of puncture
Need for second EBP also predicted by short time from dural tap to onset of headache

MODERATE if delayed at least 1 day post onset PDPH

• complete & permanent relief 30%
• permanent or partial relief 75%
Efficacy post-dural tap

MORE EFFECTIVE than expectant treatment – 3 RCTs, n=86, majority post-LP

van Kooten F et al J Neurol Neurosurg Psychiatry 2008

Incidence PDPH at 1 week: 16% vs 86%

Figure 3 Recovery from post dural puncture headache.
What should you tell the patient about EBP?

• It is very likely to provide some or complete relief initially

• The headache may return but can be treated in the same way again (second EBP in ~15% & similar success rates?)

• The procedure has some common risks (procedural and post-procedural back pain); some uncommon risks (repeat dural puncture; failure) and some very rare risks (serious pathologies: but chicken or egg?)
Aseptic (2 operators)
Lateral positioning if possible for comfort
Near the dural puncture if possible
Recumbent 2 h
How much blood?

- 2 ml, 10-15 ml, 20 ml or as much as the patient tolerates?

Unsure (correlation between high volumes and compressive neurological complications Diaz et al, Pain Prac 2005)

Paech M et al Anesth Analg 2011 level IIb

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<tr>
<th>Table 4. Incidence of Headache Relief After Epidural Blood Patch</th>
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<td>Permanent or partial relief</td>
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Values are percentages (Clopper-Pearson binomial 95% confidence intervals). Summaries are shown for both strata and overall.

a Statistically significant differences in the rates of permanent relief were found between the groups on chi-square test (P = 0.048), with the less-than-expected number of permanent responses seen in the 15-mL group. Further comparisons using logistic regression analysis showed that the response achieved in the 20-mL group was significantly higher than that achieved in the 15-mL group (odds ratio [OR] = 4.49, confidence interval [CI] = 1.31–15.42; P = 0.017), while the higher response in the 30-mL group was not significantly different from that in the 15-mL group (OR = 3.56, CI = 0.99–12.73; P = 0.051).
Problems with EBP

1. Procedural back pain limiting injected volume

2. Post-procedural back pain very common but mild

3. Risks: not quantified but very uncommon (< 1 in 100)
Case reports: serious complications

- subdural hematoma
- cortical vein thrombosis
- lumbar nerve root pain / chronic pain
- arachnoiditis
- infection
- seizures
- nerve palsies
- posterior reversible encephalopathy / visual loss
- subarachnoid haemorrhage
- unmasking CNS pathology
- epidural space fibrosis
Indications for EBP post-dural tap
level V

1. moderate or severe PDPH of at least 24-48 h duration that interferes significantly with function

2. unresolved PDPH (at any time from 2 days to years) + no contraindications

- fever / sepsis
- vertebral canal bleeding risk
- high-risk of repeat dural tap
- atypical headache not yet investigated by neurologist & imaging
- concurrent CNS pathology (raised ICP)
- autologous blood an unsuitable medium
Other “patches’

Repeat EBP

Yes if diagnosis certain
Preferably 24 h or more post recurrence
Success rate similar

Other media

• Saline infusion
• Dextran 40
• Colloid
• Fibrin glue

Require confirmation ± safety data
In the streets?....
Summary: Initial management

• Re-insert the epidural & use as normal, with added caution

• Insert the epidural catheter intrathecally & provide spinal analgesia/anaesthesia, with caution
  - avoids risk of repeat dural tap
  - more effective
  - only if logistically safe in your unit

• Change to an alternative method
Can dural tap / PDPH be prevented?

- Use an 18 gauge epidural needle & loss-of-resistance to saline?
  (make your mistakes in women of very high BMI?)

- Consider epidural morphine 3 mg if clinically indicated

- Consider cosyntropin 1 mg IV if available
When is 'expectant' treatment recommended?

- For the first few days if the PDPH is mild and not debilitating (not confined to bed much of the day)

- In the first 24-48 h after PDPH commences, even if it is moderate or severe

- When an epidural blood patch isn’t!
What ‘expectant’ treatment is recommended?

- Reassurance, explanation & review (beware mis-diagnosis)

- Patient recumbency as much as is practical

- Avoid what most of the books and reviews tell you about fluids & drugs!

- Consider oral pregabalin for analgesia
When is an epidural blood patch recommended?

1. PDPH that is moderate to severe, interferes significantly with function & has been present for 24-48 h

2. PDPH that has not resolved (at any time from 2 days to years) & if no contraindications
How should you do the blood patch?

• Aseptically & skilfully

• Any way you like?
  - woman lateral
  - near the puncture site
  - with at least 20 mL of blood if tolerated (inject slowly)
  - with colloid, saline or fibrin glue if blood unsuitable
  - keep flat for 2 h
Perth: visitors welcome!