From Back to Head

(แทงข้างหลัง....ร้าวไปถึงหัว)

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Advisor

Lecturer Choopong Luansririsakul
Case

• 62 year-old Thai male
  – Diagnosis: CA Colon
  – Operation: Rt. hemicolectomy

• No known drug or food allergy

• No underlying disease

• Planned anesthetic technique
  – GA with ETT with controlled ventilation with epidural block
Procedure

• Perform epidural block

  1st attempt at T12 - L1 (paramedian)

  >> Wet tap

What will you do?
Outline

• Accidental dural puncture
• Post dural puncture headache
  – Pathophysiology
  – Diagnosis
  – Risk factors
  – Treatment
• Prophylaxis of PDPH after ADP
ACCIDENTAL DURAL PUNCTURE
Accidental dural puncture

- Unintentional dural puncture or Wet tap
- 0.19%-3.6% during epidural catheter placement
- PDPH develops in more than 50% of these patients.


Incidence in Siriraj 2018

• Which choice is ADP incidence in Siriraj?
  A.  < 0.19%
  B.  0.19-3.6%
  C.  > 3.6%
Incidence in Siriraj 2018

<table>
<thead>
<tr>
<th>Month</th>
<th>ADP</th>
<th>Epidural</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>3</td>
<td>84</td>
<td>3.5%</td>
</tr>
<tr>
<td>February</td>
<td>2</td>
<td>81</td>
<td>2.4%</td>
</tr>
<tr>
<td>March</td>
<td>3</td>
<td>85</td>
<td>3.5%</td>
</tr>
<tr>
<td>April</td>
<td>4</td>
<td>88</td>
<td>4.5%</td>
</tr>
<tr>
<td>May</td>
<td>1</td>
<td>78</td>
<td>1.3%</td>
</tr>
<tr>
<td>June</td>
<td>1</td>
<td>86</td>
<td>1.2%</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>502</td>
<td>2.8%</td>
</tr>
</tbody>
</table>
• Puncture site: lower thoracic or lumbar
• Advanced age

**Factors related to ADP in epidural anesthesia patients**

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Results of multivariable logistic regression analysis</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Site for intervertebral puncture</td>
<td><strong>OR</strong></td>
<td><strong>95% CI</strong></td>
<td><strong>P</strong></td>
</tr>
<tr>
<td>10th-12th thoracic vertebrae</td>
<td>5.19</td>
<td>1.41-19.14</td>
<td>.01</td>
</tr>
<tr>
<td>First to third lumbar vertebrae</td>
<td>5.45</td>
<td>1.23-24.12</td>
<td>.03</td>
</tr>
<tr>
<td>Sex (if male)</td>
<td>0.58</td>
<td>0.19-1.75</td>
<td>.33</td>
</tr>
<tr>
<td>Age (per y)</td>
<td>1.04</td>
<td>1.01-1.07</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Body weight (per kg)</td>
<td>0.98</td>
<td>0.95-1.01</td>
<td>.19</td>
</tr>
</tbody>
</table>

POST-DURAL PUNCTURE HEADACHE
Circulation of Cerebrospinal Fluid (CSF)

1. CSF is produced by the choroid plexus of each ventricle.
2. CSF flows through the ventricles and into the subarachnoid space via the median and lateral apertures. Some CSF flows through the central canal of the spinal cord.
3. CSF flows through the subarachnoid space.
4. CSF is absorbed into the dural venous sinuses via the arachnoid villi.

Pathophysiology

• Loss of CSF through the dural puncture site
  – Decreased CSF pressure & volume
  • Loss of cushioning effect
    – Traction on intracranial pain-sensitive structures
  • Release of adenosine
    – Cerebral vasodilatation
Diagnosis

• The 3rd edition of International Classification of Headache Disorders (ICHD-3) 2018
  – Orthostatic headache
  – Dural puncture has been performed
  – Develops within 5 days of the dural puncture
  – Remits spontaneously within 2 weeks, or after sealing of the leak with autologous epidural lumbar patch

https://www.ichd-3.org/7-headache-attributed-to-non-vascular-intracranial-disorder/7-2-headache-attributed-to-low-cerebrospinal-fluid-pressure/7-2-1-post-dural-puncture-headache/
Diagnosis

- Exclude other causes
  - Infection
    - Meningitis, encephalitis
  - Vascular cause
    - Migraine, thrombosis, infarction, subdural & subarachnoid hematoma
  - Neoplasm

• Exclude other causes
  – Pharmacological, metabolic
    • Dehydration, caffeine withdrawal
  – Others
    • Pre-eclampsia, tension headache, pneumocephalus, lactation headache
• Neck stiffness
• Auditory symptoms
  • Tinnitus, hearing loss, hyperacusis
• Vestibular disturbance
  • Dizziness, vertigo
• Visual symptoms
  • Blurred vision, photophobia, diplopia
• Nausea

https://www.ichd-3.org/7-headache-attributed-to-non-vascular-intracranial-disorder/7-2-headache-attributed-to-low-cerebrospinal-fluid-pressure/7-2-1-post-dural-puncture-headache/
Risk factors

Patient factors
- Age 20-30 years old
- Female
- Pregnancy
- Low body mass index
- History of prior PDPH
- Non-smoker

Technical factors
- Cutting needles
- Larger needle size
  - ↑ PDPH rate, severity, associated symptoms
- Perpendicular bevel direction
- Operator inexperience
  - Larger number of meningeal punctures
Risk factors

Patient factors

Age 20-30 years old

• Age 20-30 years old
  – 3-5 times more than those after 60
• PDPH began to decrease after age of 40
• Multifactorial mechanism
  – Pain perception
  – Psychological factors
  – Hormonally related difference in cerebral vessel reactivity
  – Elasticity of the dura

Female

• High incidence of PDPH in parturients: 76-85%
• May be attributed to
  – Increased estrogen level
  – Increased CSF pressure during vaginal delivery
  – Dehydration secondary to NPO status, blood loss, postpartum diuresis

<table>
<thead>
<tr>
<th>BMI</th>
<th>PDPH incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 25</td>
<td>62% (95% CI 50-73%)</td>
</tr>
<tr>
<td>25 to &lt; 30</td>
<td>55% (95% CI 48-61%)</td>
</tr>
<tr>
<td>≥ 30</td>
<td>42% (95% CI 36-49%)</td>
</tr>
</tbody>
</table>

Table 2 Postdural puncture headache (PDPH) prevalence in patients with and without a previous history of PDPH

<table>
<thead>
<tr>
<th>PDPH history</th>
<th>New PDPH episodes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>No previous PDPH history</td>
<td>12/113</td>
<td>10.6</td>
</tr>
<tr>
<td>Women</td>
<td>12/113</td>
<td>10.6</td>
</tr>
<tr>
<td>Men</td>
<td>3/103</td>
<td>2.9</td>
</tr>
<tr>
<td>Both genders</td>
<td>15/216</td>
<td>6.9</td>
</tr>
<tr>
<td>Previous PDPH history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>8/33*</td>
<td>24.2</td>
</tr>
<tr>
<td>Men</td>
<td>0/9</td>
<td>0.0</td>
</tr>
<tr>
<td>Both genders</td>
<td>8/42†</td>
<td>19.0</td>
</tr>
</tbody>
</table>

*P = 0.0452 in the $\chi^2$ test vs. the group of women without PDPH previous history.
†P = 0.0118 in the $\chi^2$ test vs. the group of both gender without PDPH previous history.

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Patient factors</th>
<th>Non-smoker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PDPH incidence</td>
<td>Odd ratio</td>
</tr>
<tr>
<td>Smokers</td>
<td>13.7%</td>
<td></td>
</tr>
<tr>
<td>Non-smokers</td>
<td>34.1%</td>
<td>3.3 (95% CI 1.3-8.1)</td>
</tr>
</tbody>
</table>

Fig. 17.10 Comparative needle configuration for (1) 18-gauge Tuohy, (2) 20-gauge Quincke, (3) 22-gauge Quincke, (4) 24-gauge Sprotte, (5) 25-gauge Polymedic, (6) 25-gauge Whitacre, and (7) 26-gauge Gertie Marx. (From Schneider MC, Schmid M. Postdural puncture headache. In Birnbach DJ, Gatt SP, Datta S, eds. Textbook of Obstetric Anesthesia. Philadelphia: Churchill Livingstone; 2000:487-503.)
Atraumatic needles VS traumatic needles

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Illustrative comparative risks* (95% CI)</th>
<th>Relative effect (95% CI)</th>
<th>No of participants (studies)</th>
<th>Quality of the evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assumed risk</td>
<td>Corresponding risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atraumatic needles</td>
<td>30 per 1000</td>
<td>64 per 1000 (52 to 80)</td>
<td>RR 2.14 (1.72 to 2.67)</td>
<td>9378 (36 studies)</td>
</tr>
<tr>
<td>Onset of PDPH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Needle bore size</td>
<td>Approximate incidence rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quincke (cutting)</td>
<td>Whitacre (non-cutting)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size decreases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-19 G</td>
<td>&gt;70%</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20G</td>
<td>40%</td>
<td>2–5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22G</td>
<td>36%</td>
<td>0.63–4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24G</td>
<td></td>
<td>0–9.6% (Sproule needle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25G</td>
<td>3–25%</td>
<td>0–14.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26G</td>
<td>0.3–20%</td>
<td>2.5–4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27G</td>
<td>1.5–5.6%</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29G</td>
<td>0–2%</td>
<td>–</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FIGURE 1. Pooled estimate of incidence of postdural puncture headache. This figure shows the weighted (pooled) estimate for the incidence of postdural puncture headache (PDPH). “n” Represents the actual number of PDPHs and “N” represent the actual number of dural punctures. The entire diamond (pooled estimate) lies to the left of the odds ratio (OR) = 1 (which represents “no difference”), suggesting that insertion of a beveled needle in a parallel orientation is associated with a significant lower odds (OR = 0.29; 95% CI, 0.17–0.50) of PDPH than that inserted in a perpendicular orientation.
Treatment of PDPH
**Conservative**

- Non-pharmacologic
  - Bed rest
  - Hydration
- Pharmacologic
  - Caffeine
  - Theophylline
  - Gabapentin, pregabalin
  - Corticosteroids
  - Sumatriptan
  - Cosyntropin

**Invasive**

- Epidural blood patch
- Epidural colloids
- Greater occipital nerve block
- Sphenopalatine ganglion block

• Use for the first 24 to 48 hours
  – More than 85% of PDPH resolves

• Bed rest in the supine position
  – Sometimes, the prone position relieves PDPH

• Oral or intravenous hydration
  – No evidence that aggressive hydration is beneficial in a patient with normal fluid intake.
  – Avoidance of dehydration is advisable to help limit headache severity.

• Mechanism of action
  – Block adenosine receptors
  • Increase cerebral vasoconstriction
  – Stimulate sodium-potassium pumps
  • Augment CSF production
• Caffeine was superior to a placebo for pain relief in PDPH
• Dose: 300-500 mg oral or IV, once or twice daily
Amount of caffeine per cup:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Conservative</th>
<th>Caffeine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decaf coffee</td>
<td>3 mg</td>
<td>95 mg</td>
</tr>
<tr>
<td>Hot chocolate</td>
<td>19 mg</td>
<td>80 mg</td>
</tr>
<tr>
<td>Green tea</td>
<td>20 mg</td>
<td>82 mg</td>
</tr>
<tr>
<td>Shot of espresso</td>
<td>27 mg</td>
<td></td>
</tr>
<tr>
<td>Can of cola</td>
<td>40 mg</td>
<td></td>
</tr>
<tr>
<td>Black tea</td>
<td>45 mg</td>
<td></td>
</tr>
<tr>
<td>Red Bull</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instant coffee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brewed coffee</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

https://www.billi-uk.com/caffeine-content-favourite-drinks/

• Transient, non-sustained relief in PDPH
• Not reduce the need for an epidural blood patch
• Adverse events including
  – Cardiac arrhythmias and maternal seizures.
  – In high doses (probably >300mg) caffeine may enter breast milk and potentially lead to neonatal irritability.
• Mechanism of action
  • Block adenosine receptor
    • Cerebral vasoconstriction
Theophylline is a safe and effective treatment for PDPH

• Gabapentinoids are similar in structure to the endogenous GABA neurotransmitter
  – Unclear mechanism
  – Some of their activity may modulate the release of excitatory neurotransmitters
  • Via an interaction with voltage-dependent calcium channels
• The mean VAS score was significantly lower in pregabalin group compared with others 24, 48 and 72 h after the onset of headache (P = 0.001 for all of them) and lower in Gabapentin group compared with Acetaminophen group 24, 48 and 72 h after the onset of headache (P = 0.001 for all analyses).

• Unclear mechanism
• Favoring the reabsorption of CSF from extradural space
  – Increase CSF volume
• Block production of proinflammatory cytokines such as IL-1, IL-2, and TNF-α
  – Analgesic action

<table>
<thead>
<tr>
<th>Hour</th>
<th>Conventionally treated*</th>
<th>Conventional + IV hydrocortisone</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9.17 ± 1.69</td>
<td>9.32 ± 0.83</td>
<td>0.6642</td>
</tr>
<tr>
<td>6</td>
<td>6.02 ± 2.46</td>
<td>2.06 ± 1.98</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>24</td>
<td>3.77 ± 1.85</td>
<td>0.94 ± 2.67</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>48</td>
<td>1.95 ± 1.12</td>
<td>0.69 ± 1.64</td>
<td>0.0010</td>
</tr>
</tbody>
</table>

*Conventional treatment = Recumbent positioning, i.v. or oral hydration, analgesics with caffeine, stool softeners and soft diet

The use of oral prednisolone was effective in relieving both severity and duration of PDPH after spinal anesthesia.
• Serotonin receptor antagonist
  – Cerebral vasoconstriction
• A few case reports have described the relief of PDPH with sumatriptan

• Synthetic derivative of adrenocorticotropic hormone (ACTH)

• Mechanism of action
  – Stimulate endorphin release
  – Anti-inflammatory action
  – Fluid and electrolyte retention
  – Stimulate CSF production

No difference between intravenous cosyntropin and EBP in reducing PDPH pain scores prior to ED discharge and at 3 and 7 days following treatment.

Treatment

Conservative

Caffeine
  • Decrease PDPH persistence, supplementary intervention

Gabapentinoids, hydrocortisone, theophylline
  • Decrease pain severity scores

Sumatriptan and cosyntropin
  • Lack of conclusive evidence

Conclusion

Invasive Treatment

When the symptoms persists for > 24-48 hr despite the conservation treatment.

- Epidural blood patch
- Epidural colloids
- Sphenopalatine gangion block
- Greater occipital nerve block
• The treatment of choice
• Success rate of 61–98%

• Mechanism
  – Epidural blood adheres to the thecal sac.
    • Clot formation and sealing the dural puncture site
  – Increase the lumbar CSF pressure
    • Reflex cerebral vasoconstriction

• Less effective within 24-48 hour of dural puncture
  – Initial high CSF flow may displace the clot
  – Clot degradation may occur.

The optimal volume of blood is unknown.

Ranging from 5 to 30 ml.

Paech et al. randomized 121 patients to receive 15, 20, or 30 ml of blood

- Similar efficacy in all of the three groups, with a success rate of 70%

• Contraindications
  – Coagulopathy
  – Infection at the injection site
  – Patient refusal or lack of cooperation
• Complications
  – Failure (15-20%),
  – Worsening of PDPH by creating additional dural puncture
  – Infection eg. Meningitis, arachnoiditis
  – Subdural hematoma

  – Seizures
  – Spastic paraparesis
  – Cauda equina syndrome
  – Back pain, neck pain
    • Self-limited
• Alternative to epidural blood patch
• Dextran-40 or hydroxyethyl starch.
• Mechanism of action
  – Increased epidural pressure
  – Decreased CSF leakage
• Low level evidence

• Complications
  – Transient discomfort
  – Burning sensation

***Long term effect of colloid particles in the epidural space is unknown

Sphenopalatine block

Treatment

Invasive

Sphenopalatine ganglion

somatic sensory afferent branches

middle nasal turbinate

Parasympathetic

Post-ganglionic sympathetic neurons

• Traditionally used to treat chronic conditions
  – migraine, cluster headache, trigeminal neuralgia, and atypical facial pain.
• Case series: treat PDPH in obstetric patients.
• Mechanism of action
  – Inhibit parasympathetic activity
  => Inhibit vasodilatation => relieve pain

Treatment | Invasive | Sphenopalatine block

https://youtu.be/-Ez7VCj_kgk
• is derived from the dorsal root of the C2 nerve.
• The main sensory nerve in the occipital region.

• Injection sites
• Have been used for the treatment of different types of headache

• PDPH: reduce pain severity, less invasive and leads to prompt symptom relief.

• Side effects
  – Local alopecia
  – Transient dizziness
  – Worsening of the headache
Back to the case

• 2nd attempt at T11 – T 12 (paramedian)  
  >> successful

• After GA was conducted, the surgeon operated the patient.
• The intraoperative period was uneventful.
Post-operative analgesia

• Continue PCEA
  – 0.0625% bupivacaine + morphine 0.02 mg/ml
  – Basal rate 5 ml/hr
  – PCA dose 2 ml

• Off PCEA on POD 3

• No PDPH
Up to 80% patients with ADP have PDPH.
Conservative

- Hydration
- Bed rest
- Prophylactic drugs
  - Epidural Morphine
  - IV Cosyntropin
  - IV Aminophylline

Invasive

- Epidural blood patch
- Intrathecal catheter placement
- Epidural saline administration
• Aim to
  – decrease CSF loss through the dural hole
  – restore CSF with additional fluid intake.
• Simple
• No serious adverse effects
• 24 trials with 2996 participants.
• Fluid supplementation VS no supplementation
  – The incidence of PDPH
    • RR 1, 95% CI 0.59 to 1.69

No significant difference
• Bed rest VS immediate mobilization
  – The incidence of PDPH
    • RR 1.24; 95% CI 1.04 to 1.48

No significant difference

Prophylaxis

Conservative

Prophylactic drugs

• Epidural morphine
• Intravenous cosyntropin
• IV caffeine
• IV aminophylline
Epidural Morphine

• RCT; 25 parturients with ADP

<table>
<thead>
<tr>
<th></th>
<th>Morphine (n = 25)</th>
<th>Saline (n = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence of PDPH</td>
<td>3.0 (12%)</td>
<td>12.0 (48%)</td>
</tr>
<tr>
<td>Onset of PDPH; days</td>
<td>3.0 (3–4 [3, 4])</td>
<td>2.0 (1–2.5 [1–3])</td>
</tr>
<tr>
<td>Maximum VRSP; (0–10)</td>
<td>5.0 (4–5 [4–5])</td>
<td>6.0 (4–7 [3–8])</td>
</tr>
<tr>
<td>Recommended therapeutic EBP</td>
<td>0.0</td>
<td>6.0 (24%)</td>
</tr>
<tr>
<td>Therapeutic EBP performed</td>
<td>0.0</td>
<td>4.0 (16%)</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>11.0 (44%)</td>
<td>4.0 (16%)</td>
</tr>
<tr>
<td>Itching</td>
<td>3.0 (12%)</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Significant reduction in Incidence of PDPH and requirement of TEBP

(p = 0.014)  
(p = 0.028)  
(p = 0.458)  
(p = 0.06)
IV Cosyntropin

- A synthetic analogue of adrenocorticotropic hormone (ACTH)
IV Cosyntropin

- RCT; 90 parturients with ADP

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cosyntropin Group (n = 45)</th>
<th>Control Group (n = 45)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence of PDPH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDPH occurred</td>
<td>15 (33.3)</td>
<td>31 (68.9)</td>
<td>0.001</td>
</tr>
<tr>
<td>PDPH did not occur</td>
<td>30 (66.7)</td>
<td>14 (31.1)</td>
<td></td>
</tr>
<tr>
<td>Need for EBP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBP needed</td>
<td>5 (11.1)</td>
<td>13 (28.9)</td>
<td>0.035</td>
</tr>
<tr>
<td>EBP not needed</td>
<td>40 (88.9)</td>
<td>32 (71.1)</td>
<td></td>
</tr>
<tr>
<td>Need for repeat EBP (number received second EBP/number received EBP)</td>
<td>2/5 (40)</td>
<td>4/13 (30.8)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**IV Cosyntropin might be useful in prophylaxis of PDPH.**

Hakim SM. Cosyntropin for prophylaxis against postdural puncture headache after accidental dural puncture. Anesthesiology 2010; 113: 413-20.
IV aminophylline

- RCT study 120 patients operates C/S under SB.

<table>
<thead>
<tr>
<th>Headache in each group</th>
<th>IV aminophylline (n = 60)</th>
<th>Control (n = 60)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 h</td>
<td>3 (5%)</td>
<td>19 (31%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>48 h</td>
<td>3 (5%)</td>
<td>14 (23.3%)</td>
<td>&lt;0.004</td>
</tr>
</tbody>
</table>

- Later retrospective cohort study also supports

*IV Aminophylline might be useful in prophylaxis of PDPH.*

Need more evidence.

Prophylaxis

Conservative
• Hydration
• Bed rest
• Prophylactic drugs
  – Epidural Morphine
  – IV Cosyntropin
  – IV Aminophylline

Invasive
• Epidural blood patch
• Intrathecal catheter placement
• Epidural saline administration
• attractive option as it is highly successful in treatment of PDPH.
• It can be performed through the epidural catheter just before the epidural catheter is removed.
Prevention of postdural puncture headache after accidental dural puncture: a quantitative systematic review

C. C. Apfel¹*, A. Saxena¹, O. S. Cakmakkaya², R. Gaiser³,⁴,⁵, E. George¹ and O. Radke⁶

• Pooled results of the 4 RCT
  – RR of 0.32 (0.10–1.03): no significant difference

Not recommend to perform PEBP.

• **Benefits**
  – Allows immediate analgesia through the intrathecal catheter.
  – No addition risk of repeated dural punctures

• **Risks**
  – Meningitis or abscess
  – Arachnoiditis
  – Cauda equina syndrome
Two hypotheses of mechanism

1. The catheter plugs the dural hole and stops the CSF leakage.

2. The inflammatory reaction in the dura surrounding the puncture site may facilitate sealing the hole and prevent leakage of the CSF.
A retrospective study of 218 ADP cases
A re-sited epidural group VS a spinal catheter group.
  - the incidence of PDPH: no significant difference
  - the number of EBPs: significantly reduced in ITCP group
    • 52.0% versus 20.3% (OR, 4.2; 95% CI, 2.4–7.6; P < 0.001)

The long-term intrathecal catheter might be an option. The evidence is insufficient to provide a strong recommendation.
• Epidural Saline administration
• Intrathecal Saline administration

Current evidence fails to show prophylaxis effect.
Next time when you perform Epidural block,

Beware of ADP
If the ADP does happen... consider these prophylaxis methods

**Conservative**
- **×** Hydration
- **×** Bed rest
- **• Prophylactic drugs**
  - **✓** Epidural Morphine
  - **✓** IV Cosyntropin
  - **✓** IV Caffeine
  - **✓** IV Aminophylline

**Invasive**
- **×** Epidural blood patch
- **✓** Intrathecal catheter placement
- **✓** Saline (intrathecal or epidural)

**Need more evidence**
If PDPH occurs

Conservative

• Non-pharmacologic
  - Bed rest
  - Hydration

• Pharmacologic
  - Caffeine
  - Theophylline
  - Gabapentin, pregabalin
  - Corticosteroids
  - Sumatriptan
  - Cosyntropin

Invasive

- Epidural blood patch
- Epidural colloids
- Sphenopalatine ganglion block
- Greater occipital nerve block
Thank you