I - PATHOPHYSIOLOGY

- August Bier (intrathecal cocaïn 1898) → first 2 cases PDPH
- CSF leak through dura mater
- CSF loss → headache, 2 mechanisms:
  - loss of traction on intracranial structures
  - compensatory venodilatation
    (Monro-Kelli doctrine = closed box: \( \text{Vol(CSF)} + \text{Vol(Brain)} + \text{Vol(Intracr. blood)} = \text{cte} \))
II - RISK FACTORS

- HIGH = 18-30 years
  → young pregnant with low BMI

- Low incidence in Elderly:
  → less distensible meninges (atherosclerosis)

- < 10 years ?
Type of Needle: Cutting Needle (Quinke, Tuohy) > Pencil Needle (Sprotte, Whitacre, Gertie Max)

Pencil Needle Tuohy 18 Ga → 1.5% ADP → 50-70% PDPH

Table 1 Relationship between needle size and incidence of post-dural puncture headache

<table>
<thead>
<tr>
<th>Needle tip design</th>
<th>Needle gauge</th>
<th>Incidence of post-dural puncture headache (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quincke</td>
<td>22</td>
<td>36(^{128})</td>
</tr>
<tr>
<td>Quincke</td>
<td>25</td>
<td>3.25(^{47})</td>
</tr>
<tr>
<td>Quincke</td>
<td>26</td>
<td>0.3(^{205})</td>
</tr>
<tr>
<td>Quincke</td>
<td>27</td>
<td>0.3-0.65(^{107})</td>
</tr>
<tr>
<td>Quincke</td>
<td>29</td>
<td>1.5-5.6(^{69})</td>
</tr>
<tr>
<td>Quincke</td>
<td>29</td>
<td>0.4-7.6(^{69})</td>
</tr>
<tr>
<td>Sprotte</td>
<td>32</td>
<td>0.46</td>
</tr>
<tr>
<td>Whitacre</td>
<td>24</td>
<td>0.9-6.13(^{107})</td>
</tr>
<tr>
<td>Whitacre</td>
<td>20</td>
<td>2-5(^{17})</td>
</tr>
<tr>
<td>Whitacre</td>
<td>22</td>
<td>0.63-1.7(^{112})</td>
</tr>
<tr>
<td>Whitacre</td>
<td>22</td>
<td>0-14.5(^{13})</td>
</tr>
<tr>
<td>Whitacre</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Whitacre</td>
<td>27</td>
<td>2-5(^{17})</td>
</tr>
<tr>
<td>Attaucan</td>
<td>26</td>
<td>2.5-4(^{115})</td>
</tr>
<tr>
<td>Tuohy</td>
<td>16</td>
<td>0.5(^{25})</td>
</tr>
</tbody>
</table>

Fig 1 Graphical representation of epidural (needle 4) and spinal needle tip design. Note the large orifice and conical tip of the Sprotte® Needle 2, compared with the small orifice and flattened tip of the Whitacre Needle. Needles 5, 6 and 7 were provided by the Sheffield Anaesthetics Museum and are an indication of the style of spinal needle used in the past. 1, 26G Anesthesia® Double Bevel Design; 2, 26G Sprotte® Style Pencil Point; 3, 22G Whitacre Style Pencil Point; 4, 16G Tuohy Needle; 5, 17G Bakers Spinal Needle; 6, Large Gauge Spinal Needle; 7, 18G Crawford Needle.

Lower Incidence of ADP (Meta-analysis 2013)

54 articles (13 non-RCTs and 41 RCTs) total of 98,869 patients
- A reduction of the risk of ADP was found for liquid use for the loss of resistance (lower quality studies)
- No recommendation regarding any of the techniques under study
- Focus on measures to prevent or treat PDPH once ADP has occurred

III - DIAGNOSIS

- International-Headache-Classification-III

- 24–48 h after meningeal puncture

- Not sensitive enough:
  - postural neck ache
  - with/without headache
  - with tinnitus
  - hypacusia
  - dizziness
...
Differential Diagnosis

- Without postural features (40% headache after delivery without PDPH link)
  - pre-eclampsia
  - drugs withdrawal (i.e. caffeine)
  - migraine
  - sinus headache
  - meningitis (viral, chemical, or bacterial)
  - intracranial hemorrhage
  - cerebral infarction
  - intracranial tumor
  - pituitary apoplexy
  - cerebral sinus thrombosis
  - non-specific headaches
Inconsistency in management exists all around the world

- aggressive hydration, oral caffeine, NSAIDS, and bed rest
- avoid new techniques (IV cosyntropin and neuraxial morphine)
- epidural blood within 24 hours!! (evidence suggesting more effective if performed after 24 to 48 hours)
Cochrane 2013 – Drug Therapy for Preventing PDPH

10 RCTs, 1611 patients

**WITH** significant Risk Reduction

- **Opioids:** epidural morphine significant RR (0.25)
  
  \( \leftrightarrow \) spinal morphine or sufentanil no difference vs. placebo (RR=1.18)

  - dose? 20 µg sufentanil = 2 mg morphine à 0.2 mg

- **IV Cosyntropin** significant RR (0.49)

  Tetracosactide = Synacten Belgium

  \( \rightarrow \) Adrenocorticotrope hormone

  (adrenocortical function, MS, WEST∑)

  - dose? 1mg IV

- **IV Aminophylline** significant RR (till 0.16)

  Xanthine (respiratory diseases: copd astma)

  1-1.5-mg/kg

Cochrane 2013 – Drug Therapy for Preventing PDPH

WITHOUT significant Risk Reduction

- oral caffeine
- rectal indomethacin (NSAID)
- IV dexamethasone (even increase of PDPH!)

Adverse events:
- spinal morphine → increases pruritus
- epidural morphine → increases nausea and vomiting
- oral caffeine → increases insomnia

(Saline epidural = no statistical significance)

Cochrane 2016 - Posture and Fluids for Preventing PDPH

24 trials, 2996 patients

- Bed rest vs. immediate mobilization RR=1.24 → more cases PDPH with bed rest then ambulant
- Prone vs. supine position: no difference
- Supplementary fluids: no difference

Conclusion:
- Bed rest probably increases PDPH
- No benefits for fluid supplementation

Cochrane 2015 - Drug Therapy for Treating PDPH

13 RCTs 479 patients

- Caffeine reduces numbers PDPH
- Gabapentine reduces VAS
- Hydrocortisone + conventional treatment reduces more PDPH than only conventional (= bed rest, fluids, paracetamol, pethidine)
- Theophylline best VAS and lower ‘SUM OF PAIN’
- Sumatriptan and ACTH no relevant effect

Cochrane 2010 - Epidural Blood-Patch for Preventing and Treating PDPH

9 studies, 379 patients

→ withdrawal:
- out of date
- authors not available for update
→ no recommendation for prophylactic epidural blood patch because too few trials
→ therapeutic blood patch shows evidence over conservative treatment

Epidural Blood Patch

- 20-30 ml injection of autologous blood into the epidural space
  - increases pressure in the intraspinal space
  - increases the distribution of CSF intracranial

- Risks
  - transient complications (backache)
  - rare complications (neurologic deficit or infection)
  - spinal: arachnoiditis, meningitis, cauda equina syndrome and permanent nerve damage

- MRI studies: blood migrates 3.5 intervertebral spaces above and 1 intervertebral space below (20ml)

- Therapeutic EBP:
  - 95% immediate short-term relief
  - 5-10% second EBP
Prophylactic Epidural Blood Patch

EBM Article 02/2016 (4 systematic reviews with meta-analysis + 1 RCT)

- various methodologic problems (lack of homogeneity, controls, randomization, blinding) + many studies underpowered
- Prophylactic EBP effective in preventing PDPH (1RCT)
- No evidence of epidural saline for preventing PDPH
- Intrathecal catheter placement does not prevent PDPH, may decrease need for therapeutic EBP.

Accupuncture?

Add-on conservative therapy
- 50% less headache after accupuncture
- none need EBP

V - COMPLICATIONS

- Intracranial subdural hematoma = tears in the bridging veins, from CSF loss

- Persistent PDPH:
  - fluoroscopically guided EBP
  - CT guided EBP
  - head CT
  - surgical dura repair
Conclusion: Proposed Standard 2014

Table 1. Proposed guideline for management of dural puncture and PDPH. This guideline is based on up to date evidence described throughout this paper. Levels of evidence are divided as follow: (Ia) Evidence from meta-analysis of RCTs, (Ib) Evidence from at least one RCT, (IIa) Evidence from at least one well designed controlled trial which is not randomized, (IIb) Evidence from at least one well designed experimental trial, (III) Evidence from case, correlation, and comparative studies, (IV) Evidence from a panel of experts.

<table>
<thead>
<tr>
<th>Diagnosis of PDPH</th>
<th>- Headache develops within 14 days after dural puncture [22].</th>
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<tbody>
<tr>
<td>- Patient has head or neck ache within 15 minutes of sitting/standing and is relieved within 15 minutes of lying down [22].</td>
<td></td>
</tr>
<tr>
<td>- Patient has at least one of the following symptoms in association with the headache: neck stiffness, tinnitus, hypacusia, photophobia, or nausea [22].</td>
<td></td>
</tr>
<tr>
<td>At time of accidental dural puncture</td>
<td>- Insertion of intrathecal catheter does not prevent PDPH, but does reduce the future need for epidural blood patch [34]-[36]. This is recommended if intrathecal catheters can be safely managed at your institution. (Ia)</td>
</tr>
<tr>
<td>- If an epidural catheter is in place, two doses of 3 mg epidural morphine given 24 hours apart is recommended [34] [56]. (Ib)</td>
<td></td>
</tr>
<tr>
<td>Prevention of PDPH after accidental dural puncture</td>
<td>- Consider giving a dose of 1 mg IV ACTH [57] [58]. (Ib)</td>
</tr>
<tr>
<td>- Consider giving a dose of 500 mg IV caffeine [51] [52] [55]. (Ib)</td>
<td></td>
</tr>
<tr>
<td>- Routine prophylactic epidural blood patch cannot be recommended [34] [35] [38]-[42]. (Ib)</td>
<td></td>
</tr>
<tr>
<td>- Epidural blood patch within 24 hours of dural puncture is NOT routinely recommended. It may be even better to wait at least 48 hours [28]. (Ib)</td>
<td></td>
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<tr>
<td>Symptomatic treatment of PDPH within 48 hours of dural puncture</td>
<td>- Treatment of symptoms with gabapentin 300 mg TID [62]-[64] or pregabalin 75 mg BID is recommended [65] [66]. (Ib)</td>
</tr>
<tr>
<td>- The recumbent position may be recommended to reduce symptoms, but strict bed rest is not necessary [45]-[48]. (Ib)</td>
<td></td>
</tr>
<tr>
<td>- Oral caffeine and aggressive hydration are NOT recommended [50] [51] [53] [54]. (Ib)</td>
<td></td>
</tr>
<tr>
<td>- An epidural blood patch should be offered to those with significant symptoms after 48 hours of dural puncture [28] [67]-[70]. (Ib)</td>
<td></td>
</tr>
<tr>
<td>Treatment of PDPH after 48 hours post dural puncture</td>
<td>- There is no ideal volume of blood for individual patients. Inject up to 20 ml or until patient feels pressure from the injection [28]. (Ib)</td>
</tr>
<tr>
<td>- A second blood patch should be offered if the first blood patch resulted in no relief or if symptoms return [28] [69]. (Ib)</td>
<td></td>
</tr>
<tr>
<td>- A head CT should be considered if patient has refractory headache despite receiving blood patches, altered mental status, or focal neurological defect [71]-[78]. (III)</td>
<td></td>
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<tr>
<td>Treatment of PDPH refractory to conventional epidural blood patch</td>
<td>- Consider head CT to rule out other causes of headache [71]-[78]. (III)</td>
</tr>
<tr>
<td>- Consider fluoroscopically guided and CT guided epidural blood patch [79] [80]. (III)</td>
<td></td>
</tr>
<tr>
<td>- Consider neurosurgery consult for surgical dura repair [81]. (III)</td>
<td></td>
</tr>
</tbody>
</table>

Do T. Nguyen, Standardizing management of post-dural puncture headache in obstetric patients: A literature review, Open Journal of Anesthesiology, 4, 244-253, 2014.
REFERENCES


