

Post-Dural Puncture Headache

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I - PATHOPHYSIOLOGY

- ◉ August Bier (intrathecal cocaine 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 :
 $\text{Vol}(\text{CSF}) + \text{Vol}(\text{Brain}) + \text{Vol}(\text{Intracran. blood}) = \text{cte}$)

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

(Quincke, Tuohy)

> Pencil Needle

(Sprottle, Whitacre, Gertie Max)

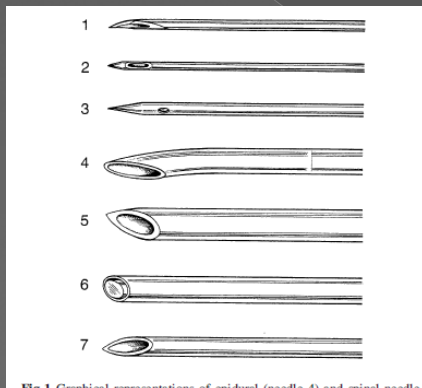


Fig 1 Graphical representations of epidural (needle 4) and spinal needle tip design. Note the large orifice and conical tip of the Sprotte® Needle 2, compared with the small orifice and diamond tip of the Whitacre Needle 3. Needles 5, 6 and 7 were provided by the Sheffield Anaesthetic Museum and are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

○ Size of Needle

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

Needle tip design	Needle gauge	Incidence of post-dural puncture headache (%)
Quincke	22	36 ¹²⁸
Quincke	25	3-25 ⁴⁷
Quincke	26	0.3-20 ^{45 107}
Quincke	27	1.5-5.6 ^{25 69}
Quincke	29	0-2 ^{45 47 69}
Quincke	32	0.4 ⁴⁶
Sprotte	24	0-9.6 ^{13 107}
Whitacre	20	2-5 ¹⁷
Whitacre	22	0.63-4 ^{17 112}
Whitacre	25	0-14.5 ^{13 98}
Whitacre	27	0 ²⁵
Atraucan	26	2.5-4 ^{115 131}
Tuohy	16	70 ²⁶

○ Pencil Needle Tuohy 18 Ga
 → 1,5% ADP → 50-70% PDPH

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
 - ...

IHS	Diagnosis	ICD-10
7.2.1	Post-dural (post-lumbar) puncture headache [G97.0]	G44.820

Diagnostic criteria:

- A. Headache that worsens within 15 minutes after sitting or standing and improves within 15 minutes after lying, with at least one of the following and fulfilling criteria C and D:
- neck stiffness
 - tinnitus
 - hypacusia
 - photophobia
 - nausea
- B. Dural puncture has been performed
- C. Headache develops within 5 days after dural puncture
- D. Headache resolves either¹:
- spontaneously within 1 week
 - within 48 hours after effective treatment of the spinal fluid leak (usually by epidural blood patch)

Note:

- In 95% of cases this is so. When headache persists, causation is in doubt.

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

IV - MANAGEMENT

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)
<-> 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
→ Adrenocorticotrope hormone
(adrenocortical function, MS, WESTΣ)
- 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 than 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 then 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-Patching 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

Study	Subgroup	Total number of subjects	Comparison	Outcomes	Results
Apfel et al, ¹ 2010	4 RCTs ^{16,18-20}	173	No PEBP	PDPH	RR 0.32 (95% CI 0.10 to 1.03)
				TEBP	RR 0.33 (95% CI 0.14 to 0.78) ^a
Boonmak & Boonmak, ⁷ 2010	2 RCTs ^{18,19} RCT ¹⁶	88	Conservative treatment Sham procedure	PDPH	OR 0.06 (95% CI 0.03 to 0.14) ^a
				Severe PDPH	OR 1 (95% CI 0.38 to 2.66)
	Non-RCT ¹⁷	44	Conservative treatment Epidural saline patch	Any headache	OR 0.60 (95% CI 0.22 to 1.62)
				Backache	OR 0.87 (99% CI 0.23 to 3.31)
Bradbury et al, ¹³ 2013	4 RCTs ^{16,18-20} 3 RCTs ^{16,19,20}	173	No PEBP	PDPH	RD -0.48 (95% CI -0.88 to -0.086) ^a
				No PEBP	RD -0.37 (95% CI -0.78 to 0.038)
Stein et al, ¹⁵ 2014	RCT	109	Conservative treatment	11 of 60 PEBP subjects compared with 39 of 49 conservative treatment subjects ^b	

Table 2. Evidence Examining Epidural Blood Patch as Prophylaxis for Postdural Puncture Headache Following Accidental Dural Puncture During Epidural Placement for Obstetric Anesthesia
Abbreviations: CI, confidence interval; LOS, length of stay; OR, odds ratio; PDPH, postdural puncture headache; PEBP prophylactic epidural blood patch; RCT, randomized controlled trial; RD, risk difference; RR, relative risk; TEBP, therapeutic epidural blood patch.
^aP < .05.

Prophylactic Intrathecal Catheter

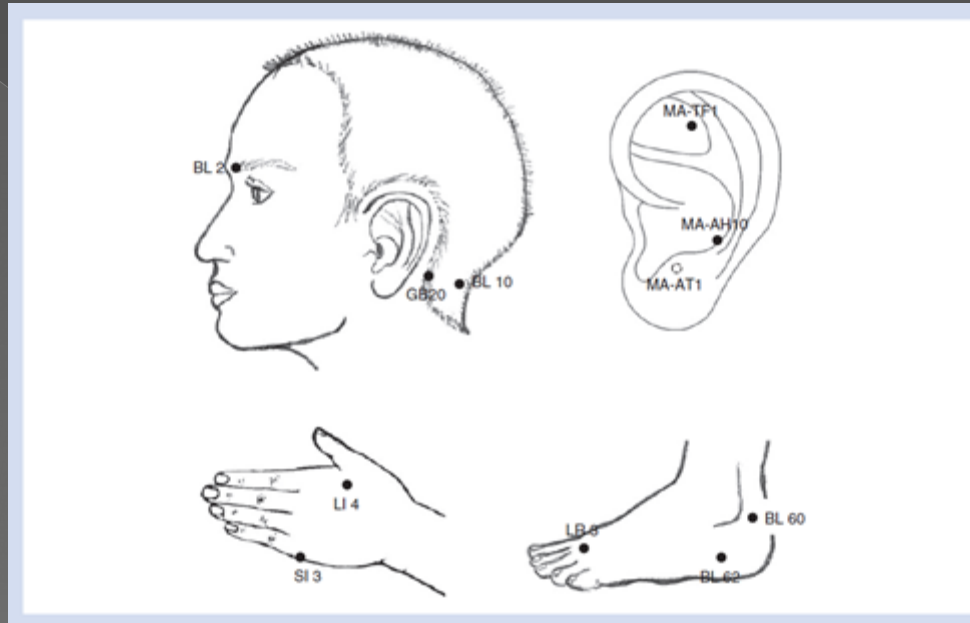
Study	Subgroup	Total number of subjects	Comparison	Outcomes	Results
Apfel et al, ¹ 2010	ITC > 24 hours: 3 Retrospective chart reviews ^{22,24,27}	318	NO ITC	PDPH	RR 0.21 (95% CI 0.02 to 2.65)
				TEBP	RR 0.19 (95% CI 0.02 to 2.37)
	ITC < 24 hours: 5 Studies: 1 Non-RCT ²⁶ 3 Retrospective chart reviews ^{24,27,29} 1 Prospective audit ²⁸	306	No ITC	PDPH	RR 0.88 (95% CI 0.68 to 1.14)
				TEBP	RR 0.58 (95% CI 0.42 to 0.80) ^a
Bradbury et al, ¹³ 2013	1 RCT ²⁵	115 (18 excluded)	Repeated epidural	PDPH	ITC 36 of 50 subjects Repeated epidural 29 of 47 subjects (P = .2)
Heesen et al, ¹⁴ 2013	9 Studies: 1 RCT ²⁵ 2 Non-RCTs ^{26,31} 5 Retrospective chart reviews ^{22,24,27,29,32} 1 Prospective audit ²⁸	939 PDPH 963 TEBP	Repeated epidural or no treatment	PDPH TEBP	RR 0.82 (95% CI 0.67 to 1.01) RR 0.64 (95% CI 0.49 to 0.84) ^a

Table 3. Evidence Examining Intrathecal Catheter Placement as Prophylaxis for Postdural Puncture Headache Following Accidental Dural Puncture During Epidural Placement for Obstetric Anesthesia
Abbreviations: CI, confidence interval; ITC, intrathecal catheter; PDPH, postdural puncture headache; RCT, randomized controlled trial; RR, relative risk; TEBP, therapeutic epidural blood patch.
^aP < .05.

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 (1 RCT)
- 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.

Diagnosis of PDPH	<ul style="list-style-type: none"> - Headache develops within 14 days after dural puncture [22]. - Patient has head or neck ache within 15 minutes of sitting/standing and is relieved within 15 minutes of lying down [22]. - Patient has at least one of the following symptoms in association with the headache: neck stiffness, tinnitus, hypacusia, photophobia, or nausea [22].
At time of accidental dural puncture	<ul style="list-style-type: none"> - 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) - If an epidural catheter is in place, two doses of 3 mg epidural morphine given 24 hours apart is recommended [34] [56]. (Ib)
Prevention of PDPH after accidental dural puncture	<ul style="list-style-type: none"> - Consider giving a dose of 1 mg IV ACTH [57] [58]. (Ib) - Consider giving a dose of 500 mg IV caffeine [51] [52] [55]. (Ib) - Routine prophylactic epidural blood patch cannot be recommended [34] [35] [38]-[42]. (Ib) - 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]. (IIb)
Symptomatic treatment of PDPH within 48 hours of dural puncture	<ul style="list-style-type: none"> - Treatment of symptoms with gabapentin 300 mg TID [62]-[64] or pregabalin 75 mg BID is recommended [65] [66]. (Ib) - The recumbent position may be recommended to reduce symptoms, but strict bed rest is not necessary [45]-[48]. (Ib) - Oral caffeine and aggressive hydration are NOT recommended [50] [51] [53] [54]. (Ib) - An epidural blood patch should be offered to those with significant symptoms after 48 hours of dural puncture [28] [67]-[70]. (Ib)
Treatment of PDPH after 48 hours post dural puncture	<ul style="list-style-type: none"> - There is no ideal volume of blood for individual patients. Inject up to 20 ml or until patient feels pressure from the injection [28]. (IIb) - A second blood patch should be offered if the first blood patch resulted in no relief or if symptoms return [28] [69]. (IIb) - 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)
Treatment of PDPH refractory to conventional epidural blood patch	<ul style="list-style-type: none"> - Consider head CT to rule out other causes of headache [71]-[78]. (III) - Consider fluoroscopically guided and CT guided epidural blood patch [79] [80]. (III) - Consider neurosurgery consult for surgical dura repair [81]. (III)

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