VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

1. LÉKAŘSKÁ FAKULTA Univerzita Karlova

Co dělám, když zperforuji duru mater

Pavlína Nosková
KARIM VFN a 1. LF UK Praha

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ORIGINAL ARTICLE Open Access

Complications of unintentional dural puncture during labour epidural analgesia: a 10-year retrospective observational study

S. Poma[1*], M. C. Bonomo[2], G. Gazzaniga[3], M. Pizzulli[1], A. De Silvestri[4], C. Baldi[1], F. Broglia[1], M. Ciceri[1], M. Fuardo[1], F. Morgante[1], S. Pellicori[1], E. M. Roldi[1], M. P. Delmonte[1], F. Mojoli[3] and A. Locatelli[1]

Incidence 1,5%

UDP-related complications during labour	N (%)
Total spinal anaesthesia	1 (1)
Extended motor block (Bromage = 3)	3 (3)
Partial motor block (Bromage = 1/2)	5 (5.1)
Hypotension	4 (4.1)
Inadequate or failed analgesia	14 (14.4)
Foetal heart rate abnormalities secondary to maternal issues	2 (2)
Second unintentional dural puncture	2 (2)
Conversion to general anaesthesia for caesarean section	5/15[a] (33)

[a] 15 = number of caesarean sections

UDP-related complications during postpartum	N (%)
Subdural hematoma	0
Cerebral venous sinus thrombosis	0
PRES	1 (0.9)[a]
PDPH	52 (53.6%)
Neurological symptoms	13 (13.4)
Neurological consultant	14 (14.4)
Intracranial hypotension on neuroimaging	8 (8.2)
Hospital stay > 96 h	80 (82.5)

[a] Preeclamptic patient

Další pokus o epidurální punkci při perforaci ?

Riziko opětovné perforace

Riziko průsaku LA subarachnoidálně



V individuálních případech

Zvážit i ponechání katétru subarachnoidálně

Katétr epidurálně i subarachnoidálně

Individuální případy



CAVE pečlivé označení

Katétr intrathékálně při perforaci dura mater?



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Intrathékální katétr 2021

Anaesthesia 2021, 76, 1111–1121 doi:10.1111/anae.15390

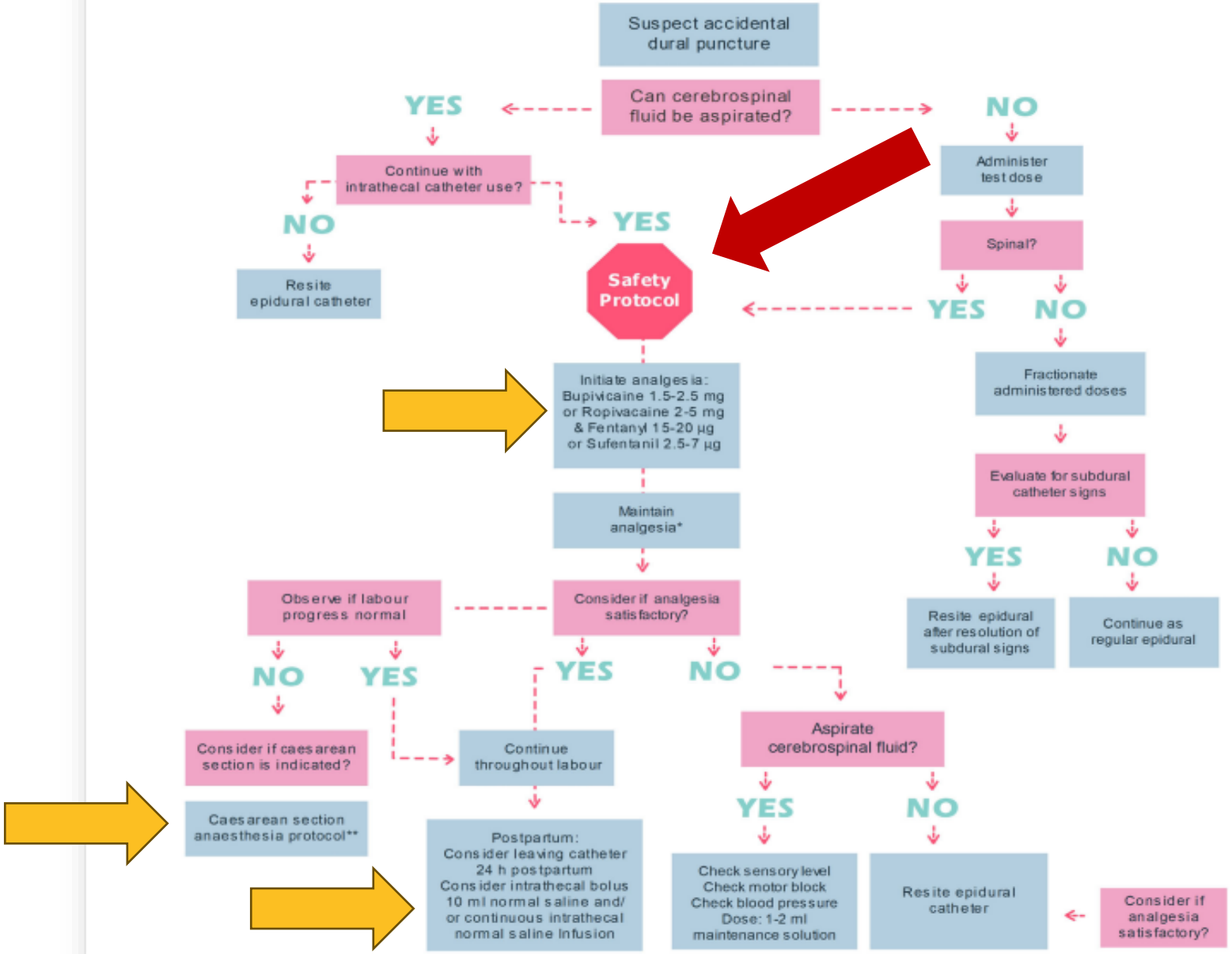
Review Article

Intrathecal catheter use after accidental dural puncture in obstetric patients: literature review and clinical management recommendations

S. Orbach-Zinger,[1] A. Jadon,[2,3] D. N. Lucas,[4,5] A. T. Sia,[6] L. C. Tsen,[7] M. Van de Velde[8,9] and M. Heesen[10]

Summary

If an accidental dural puncture occurs, one option is to insert a catheter and use it as an intrathecal catheter. This avoids the need for a further injection and can rapidly provide labour analgesia and anaesthesia for caesarean section. However, there are no recommendations for managing intrathecal catheters and, therefore, significant variation in clinical practice exists. Mismanagement of the intrathecal catheter can lead to increased motor block, high spinal anaesthesia, drug error, hypotension and fetal bradycardia. Care must be taken with an intrathecal catheter to adhere to strict aseptic technique, meticulous labelling, cautious administration of medications and good communication with the patient and other staff. Every institution considering the use of intrathecal catheters should establish a protocol. For labour analgesia, we recommend the use of dilute local anaesthetic agents and opioids. For caesarean section anaesthesia, gradual titration to the level of the fourth thoracic dermatome, with full monitoring, in a facility equipped to manage complications, should be performed using local anaesthetics combined with lipophilic opioids and morphine or diamorphine. Although evidence of the presence and duration of intrathecal catheters on the development of post-dural puncture headache and need for epidural blood patch is limited, we suggest considering leaving the intrathecal catheter in for 24 hours to reduce the chance of developing a post-dural puncture headache while maintaining precautions to avoid drug error and cerebrospinal fluid leakage. Injection of sterile normal saline into the intrathecal catheter may reduce post-dural puncture headache. The level of evidence for these recommendations was low.


Suspect accidental dural puncture
Can cerebrospinal fluid be aspirated?
YES
NO
Continue with intrathecal catheter use?
NO
YES
Resite epidural catheter
Safety Protocol
Administer test dose
Spinal?
YES
NO
Fractionate administered doses
Evaluate for subdural catheter signs
YES
NO
Resite epidural after resolution of subdural signs
Continue as regular epidural
Initiate analgesia: Bupivicaine 1.5-2.5 mg or Ropivacaine 2-5 mg & Fentanyl 15-20 µg or Sufentanil 2.5-7 µg
Maintain analgesia*
Observe if labour progress normal
Consider if analgesia satisfactory?
NO
YES
YES
NO
Consider if caesarean section is indicated?
Caesarean section anaesthesia protocol**
Continue throughout labour
Postpartum: Consider leaving catheter 24 h postpartum Consider intrathecal bolus 10 ml normal saline and/ or continuous intrathecal normal saline infusion
Aspirate cerebrospinal fluid?
YES
NO
Check sensory level Check motor block Check blood pressure Dose: 1-2 ml maintenance solution
Resite epidural catheter
Consider if analgesia satisfactory?

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Intrathékální katétr – Guidelines 2024

Anaesthesia 2024, 79, 1348-1368 doi:10.1111/anae.16434

Guidelines

Intrathecal catheter placement after inadvertent dural puncture in the obstetric population: management for labour and operative delivery. Guidelines from the Obstetric Anaesthetists' Association

Sarah K. Griffiths,[1] **Robin Russell,**[1] **Malcolm A. Broom,**[2] **Sarah Devroe,**[3,4] **Marc Van de Velde**[3,4] and **D. N. Lucas**[5]

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Vliv na rozvoj PDPH a nutnost BP

Table 1 Summary of systematic reviews and meta-analyses evaluating the role of intrathecal catheters in preventing postdural puncture headache (PDPH) and epidural blood patch (EBP) after observed inadvertent dural puncture.

Author	Number of studies included in review or meta-analysis	Findings
Apfel [82]	6 (5 full papers, 1 abstract)	No reduction in incidence of PDPH or need for EBP in patients who had received an intrathecal catheter
Heesen [80]	9 (6 full papers, 3 abstracts)	No difference in PDPH rates but reduced requirement for EBP
Heesen [2]	13 (12 full papers, 1 abstract)	Relative risk (RR) in PDPH 0.82 (95%CI 0.71–0.95); RR in EBP 0.62 (95%CI 0.49–0.79) Finding negated by trial sequential analysis, which suggested insufficient data to exclude a type 1 error of statistical analysis
Deng [83]	13	Intrathecal catheter significantly reduced the incidence of PDPH (pooled RR 0.82, 95%CI 0.70–0.97, p = 0.018) and requirement for EBP (pooled RR 0.62, 95%CI 0.44–0.86, p = 0.004)
Creazzola [84]	16	Intrathecal catheter significantly reduced incidence of PDPH compared with epidural catheter replacement (pooled RR 0.81, 95%CI 0.72–0.91, p < 0.001)



Praktické využití katétru intrathékálně

Periporodní analgézie

Spinální anestézie k akutní SC

Periporodní analgézie

Není vliv na poporodní adaptaci novorozence

Úvodní bolus (lit. zdroje)

- A) 1-2,5 mg (objem1-2,5 ml) 0,1-0,25% bupivakain + Fe 12,5-25 µg nebo SF 1-5 µg
- B) 1,25-2,5 mg bupivakain + 2-7 µg SF
- Max Fe 15 a SF 2,5 µg

Vedení analgézie (lit. zdroje)

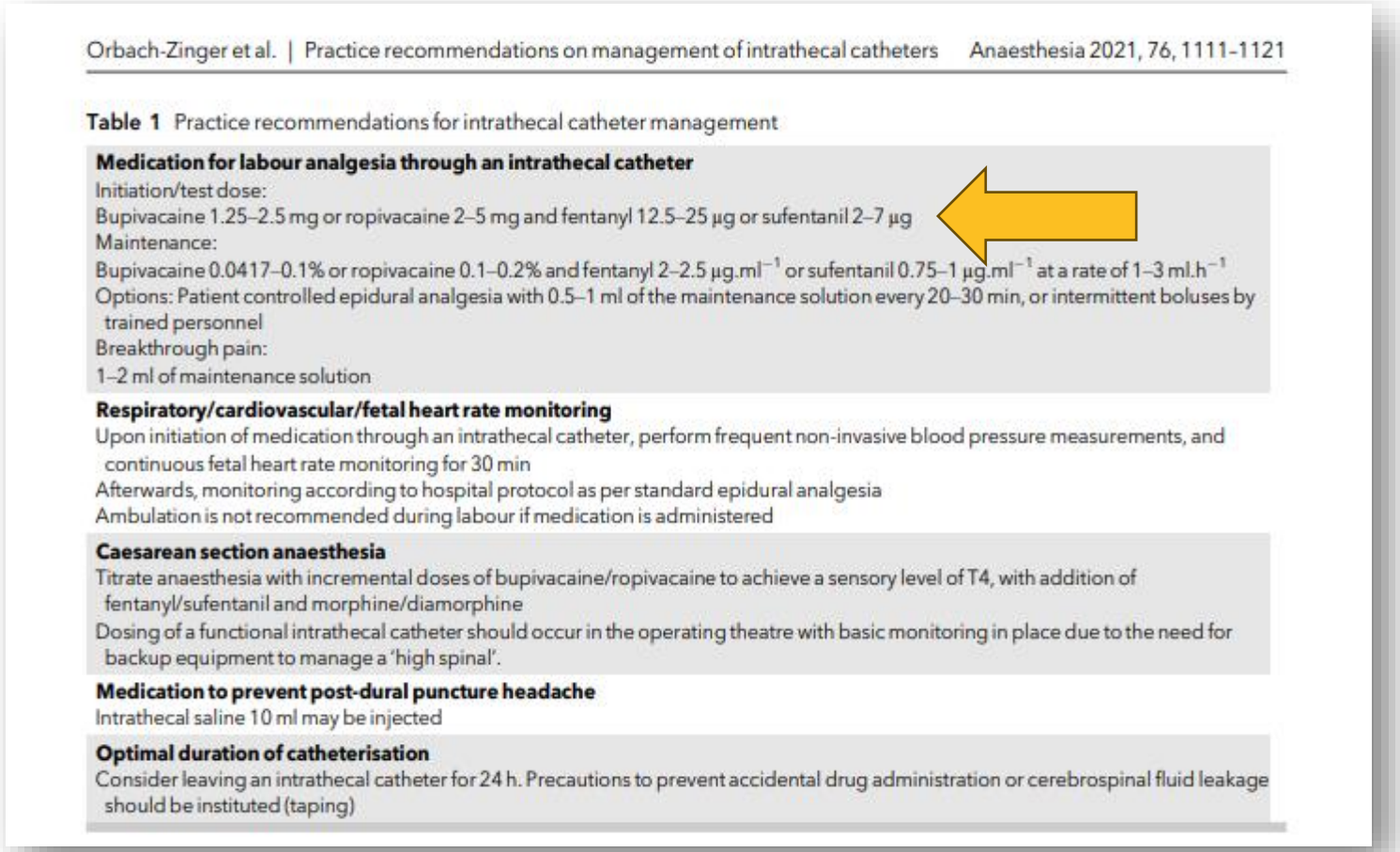
- Bolusy (lépe pumpa), a 1-1,5h 1-5 ml 0,1 nebo 0,125% bupi + Fe 2 µg/ml
- Kontinuálně: 0,04-0,125% bupivakain + SF 1 µg/ml nebo Fe 1,5-5 µg/ml, R:1-4 ml/h
- PCEA málo dat

Guidelines 2024

- **For initiation of labour analgesia via an intrathecal catheter, an initial bolus of 2.5 mg bupivacaine (or equivalent) may be used, with the addition of up to 15 µg fentanyl (or equivalent) (moderate level of certainty).**

- **For maintenance of labour analgesia via an intrathecal catheter, bupivacaine 0.1–0.125% (or equivalent) with 2–2.5 µg.ml^{-1} fentanyl (or equivalent) are suitable solutions (moderate level of certainty).**
- **Low-dose local anaesthetic solutions for maintenance of labour analgesia via an intrathecal catheter may be given either as intermittent boluses (up to 2.5 mg) by an anaesthetist, or as a continuous infusion (1–3 ml.h^{-1}) (low level of certainty).**

Sufentanil intrathékálně ?



Orbach-Zinger et al. | Practice recommendations on management of intrathecal catheters Anaesthesia 2021, 76, 1111–1121

Table 1 Practice recommendations for intrathecal catheter management

Medication for labour analgesia through an intrathecal catheter
Initiation/test dose:
Bupivacaine 1.25–2.5 mg or ropivacaine 2–5 mg and fentanyl 12.5–25 μg or sufentanil 2–7 μg
Maintenance:
Bupivacaine 0.0417–0.1% or ropivacaine 0.1–0.2% and fentanyl 2–2.5 $\mu g.ml^{-1}$ or sufentanil 0.75–1 $\mu g.ml^{-1}$ at a rate of 1–3 $ml.h^{-1}$
Options: Patient controlled epidural analgesia with 0.5–1 ml of the maintenance solution every 20–30 min, or intermittent boluses by trained personnel
Breakthrough pain:
1–2 ml of maintenance solution

Respiratory/cardiovascular/fetal heart rate monitoring
Upon initiation of medication through an intrathecal catheter, perform frequent non-invasive blood pressure measurements, and continuous fetal heart rate monitoring for 30 min
Afterwards, monitoring according to hospital protocol as per standard epidural analgesia
Ambulation is not recommended during labour if medication is administered

Caesarean section anaesthesia
Titrate anaesthesia with incremental doses of bupivacaine/ropivacaine to achieve a sensory level of T4, with addition of fentanyl/sufentanil and morphine/diamorphine
Dosing of a functional intrathecal catheter should occur in the operating theatre with basic monitoring in place due to the need for backup equipment to manage a 'high spinal'.

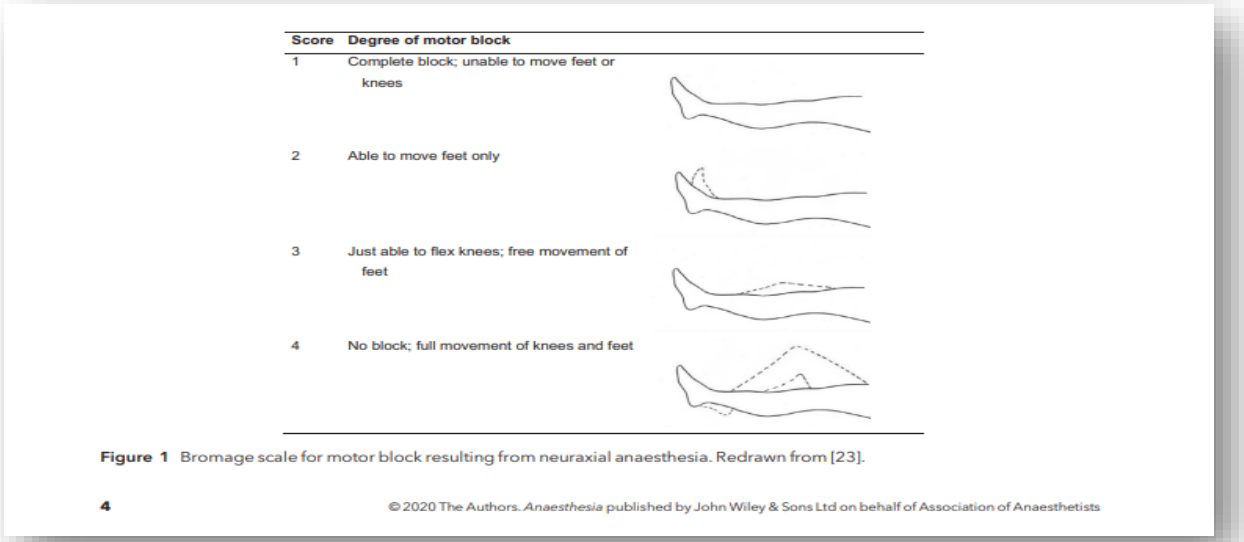
Medication to prevent post-dural puncture headache
Intrathecal saline 10 ml may be injected

Optimal duration of catheterisation
Consider leaving an intrathecal catheter for 24 h. Precautions to prevent accidental drug administration or cerebrospinal fluid leakage should be instituted (taping)

ČR off label aplikace, ale zdroje v literatuře EBM

Monitorace během intrathékální analgézie

- TK matky po 5 min po dobu 15 min po první dávce a každém bolusu
- Kardiotokografie kontinuálně
- Senzorická a motorická blokáda a 1 hod



Score	Degree of motor block
1	Complete block; unable to move feet or knees
2	Able to move feet only
3	Just able to flex knees; free movement of feet
4	No block; full movement of knees and feet

Figure 1 Bromage scale for motor block resulting from neuraxial anaesthesia. Redrawn from [23].

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Spinální anestézie k SC

Guidelines 2024

- Bolusy po 0,5ml, interval 3 min

- **Intrathecal long-acting opioid (300 μg diamorphine or 100 μg preservative-free morphine) may be given in addition to local anaesthetic for top-up for caesarean delivery (high level of certainty).**
- **Intrathecal top-ups of local anaesthetic for caesarean delivery should be given incrementally, with each bolus limited to 2.5 mg bupivacaine (or equivalent) (Grade I, low level of certainty).**

- **Individual intrathecal top-ups should ideally be given no more frequently than every 3 min with assessment of the block before each dose (Grade I, low level of certainty).**

- Při ASC zvážit při titraci kratší intervaly dle risk x benefit

Review Orbach-Zinger 2021

- Titrace k Th4

Caesarean section anaesthesia

Titrate anaesthesia with incremental doses of bupivacaine/ropivacaine to achieve a sensory level of T4, with addition of fentanyl/sufentanil and morphine/diamorphine

Dosing of a functional intrathecal catheter should occur in the operating theatre with basic monitoring in place due to the need for backup equipment to manage a 'high spinal'.

Jak hluboko ?

Evidence from randomised studies on the optimal length of catheter insertion for labour analgesia is lacking. The position of an intrathecal catheter deliberately placed for long-term drug administration is usually checked fluoroscopically, which is impractical in labour. Studies using intentionally placed narrow-gauge spinal catheters and epidural catheters sited after inadvertent dural puncture have reported placing 2–4 cm of catheter into the subarachnoid space [36–38]. Extrapolation from studies on catheters placed in the epidural space suggest that shorter lengths are more likely to result in catheter dislodgement. Insertion of longer lengths of catheter may increase the risk of paraesthesia, but whether this is likely to result in neurological complications is unknown.

- **The ideal length of catheter insertion is not known, although most publications report advancement of 2–4 cm into the subarachnoid space (low level of certainty).**

2 až 4 cm



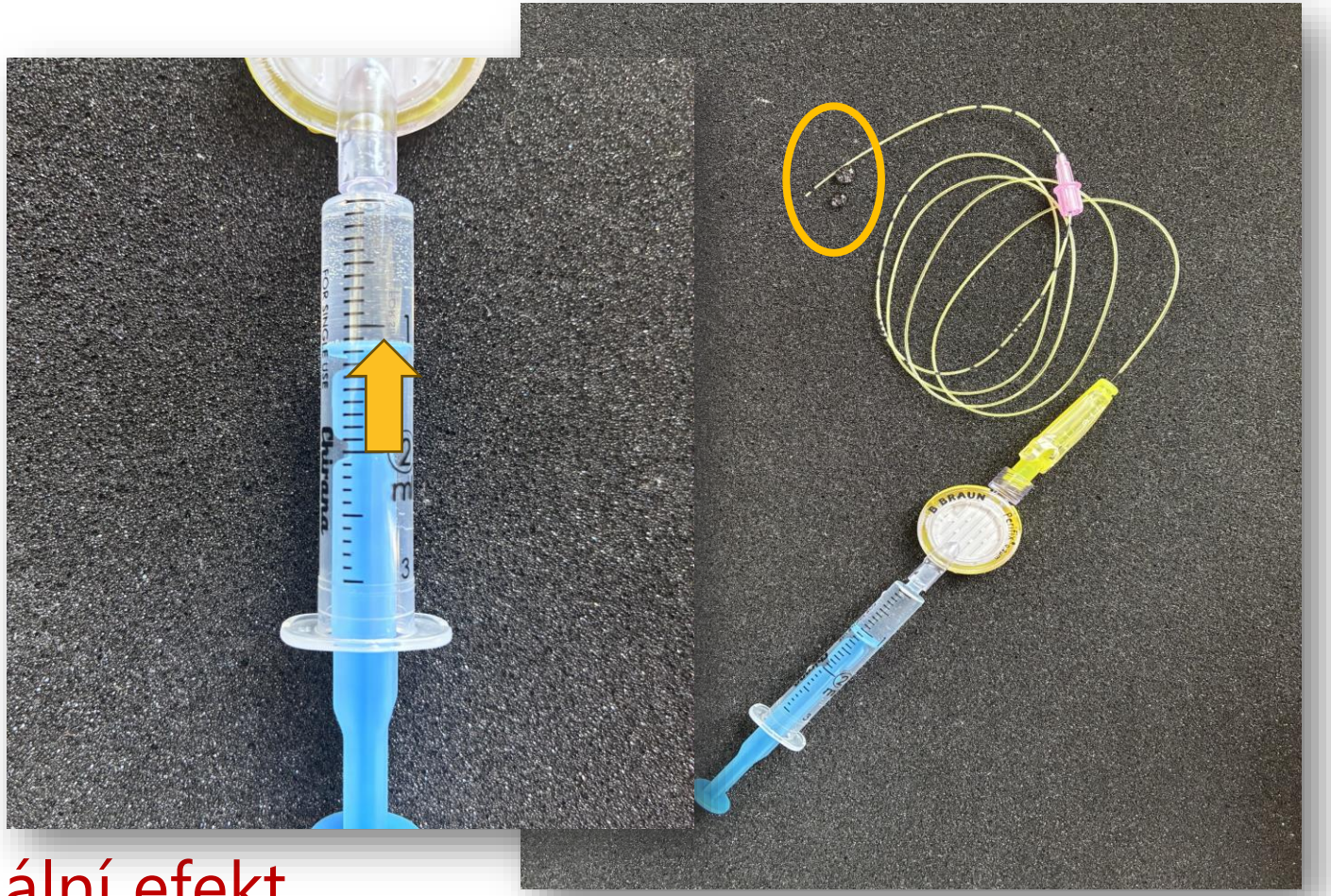
Nad 4 cm se zvyšuje riziko parestezií

Mrtvý prostor

Consideration of the dead space of the intrathecal catheter and filter

Anaesthetists must account for the dead space of the intrathecal catheter and filter (usually between 0.5 ml and 1 ml) when giving top-ups in labour [6, 34, 71] or for operative delivery. When administering the first dose through an intrathecal catheter in labour, the dead space of the catheter and filter may contain saline if this has been used for priming. This has implications for how much of the initial dose is delivered into the subarachnoid space. A further top-up of up to 2.5 mg bupivacaine (or equivalent) may be required to establish satisfactory labour analgesia if the first dose is only partially effective.

- **Anaesthetists should account for the dead space of the intrathecal catheter and filter when administering top-ups in labour or for operative delivery (Grade B, low level of certainty).**



1. dávka může mít jen parciální efekt

Význam při testování katétru

Kdy odstranit katétr?

Review Orbach-Zinger et al. 2021

Optimal duration of catheterisation
Consider leaving an intrathecal catheter for 24 h. Precautions to prevent accidental drug administration or cerebrospinal fluid leakage should be instituted (taping)

Guidelines OAA 2024

14 Intrathecal catheters should be removed at the earliest opportunity following delivery to reduce the risk of accidental overdose and infectious complications (Grade B, low level of certainty).

Co dělám při perforaci já?



- Zavedu epidurální katétr intrathékálně 2 cm do SA prostoru
- Pečlivá dokumentace a označení katétru
- Analgézie: bolusy sufentanil 5 µg do 3-5 ml FR dle NRS po1-2 hod
  zkusím místo FR 0,1% bupivakain spinal nebo i bez SF
- Anestézie k SC: bolus 2,5-3 ml 0,5% bupivakain heavy + morfin 0,1 ml
  antitrendelenburg dle postupu blokády
- Katétr ponechám in situ 12-24 hod bez aplikace
- Před vytažením ev aplikace 10 ml FR
- Při nejasnosti mok? Močový papírek: bílkovina +, glukóza+

Nepoznaná perforace dura mater - 1/3 případů

- Nutná vždy kontrola anesteziologem 5-10 min po zavedení EDA
- Negativní aspirace z katétru není 100% jistota k vyloučení perforace
- **Riziko průsaku epidurální dávky do subarachnoidálního prostoru**
- **Neadekvátní rozsah anestezie po bolusovém podání**
- Symptomatický postup

CAVE obtížné punkce a druhý anesteziolog

CAVE top-up anestezie k ASC

Spinální anestézie a PDPH



CAVE opakované pokusy při SAB

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Postpunkční syndrom v praxi

Practice Guideline > Reg Anesth Pain Med. 2024 Jul 8;49(7):471-501.
doi: 10.1136/rapm-2023-104817.

Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group

Vishal Uppal [1], Robin Russell [2], Rakesh V Sondekoppam [3], Jessica Ansari [4], Zafeer Baber [5], Yian Chen [6], Kathryn DelPizzo [7], Dan Sebastian Dirzu [8], Hari Kalagara [9], Narayan R Kissoon [10], Peter G Kranz [11], Lisa Leffert [12], Grace Lim [13] [14], Clara Lobo [15], Dominique Nuala Lucas [16], Eleni Moka [17], Stephen E Rodriguez [18], Herman Sehmbi [19], Manuel C Vallejo [20], Thomas Volk [21], Samer Narouze [22] [23]

Evidence-based clinical practice guidelines on the risk, prevention, and diagnosis of postdural puncture headaches (PDPH)

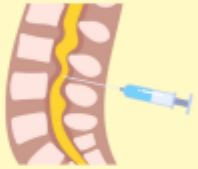
Methods

- A Multi-society international working group developed 10 review questions relevant to PDPH
  - Following a literature search via MEDLINE (Ovid), recommendations were graded using US Preventative Task Force definitions

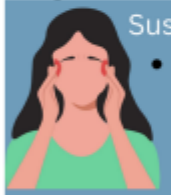
Risk Factors for PDPH



- Younger adults
- Female sex
- Cutting needles
- Wider-gauge needles



Diagnosis



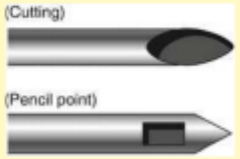
Suspect PDPH if:

- Headache and/or neurological symptoms (e.g. stiff neck, subjective hearing symptoms) develop within 5 days of a neuraxial procedure
  - Symptoms often improve when lying down

Prevention

To reduce the risk of PDPH:

- Wherever possible, use non-cutting spinal needles for lumbar puncture in all populations
- If cutting needles, use a narrower gauge



1. *Uppal V, Russell R, Sondekoppam RV, et al.* Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group. *Regional Anesthesia & Pain Medicine*. 15 August 2023. doi: 10.1136/rapm-2023-104817

Evidence-based clinical practice guidelines on the risk, prevention, and diagnosis of postdural puncture headaches (PDPH)

Treatment

- Regular multimodal analgesia, including acetaminophen and NSAIDs
- Caffeine in the first 24h of symptoms



Epidural Blood Patch (EBP)

- An EBP should be offered if PDPH doesn't respond to conservative therapy and impairs daily living activities



An EBP should be performed:

- Using a strict aseptic technique
- With informed consent on potential risks
- 15-20 ml blood injected slowly and incrementally and stop if headache or backache develops



Procedural Interventions

- Evidence does not support routine use of sphenopalatine ganglion blocks
- Greater occipital nerve block can help in certain cases of PDPH.* However, headaches may return, requiring an EBP

*PDPH following lumbar puncture with narrow gauge spinal needle (22 G or smaller)



Complications & Follow-up

- Inform the patient about PDPH sequelae and contact information
- Arrange appropriate follow-up until the headache resolves



- Inform primary care and other physicians about management
- Refer to appropriate specialist and neuroimaging if worsening headache, new neurological symptoms/deficits or change in headache

1. *Uppal V, Russell R, Sondekoppam RV, et al.* Evidence-based clinical practice guidelines on postdural puncture headache: a consensus report from a multisociety international working group. *Regional Anesthesia & Pain Medicine*. 15 August 2023. doi: 10.1136/rapm-2023-104817

Figure 2

Závěr

- **Využití intrathékálního katétru při perforaci**
- Omezit opakované pokusy při punkci
- Monitorace blokády
- Pečlivá dokumentace při komplikaci

- Poučení při dimisi: „red flags“
- Kontakty na zařízení při dimisi



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Děkuji za pozornost



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