



Failed epidural or spinal in OB anesthesia:

Profs Thierry Girard and Georges Savoldelli

SAOA Satellite Meeting

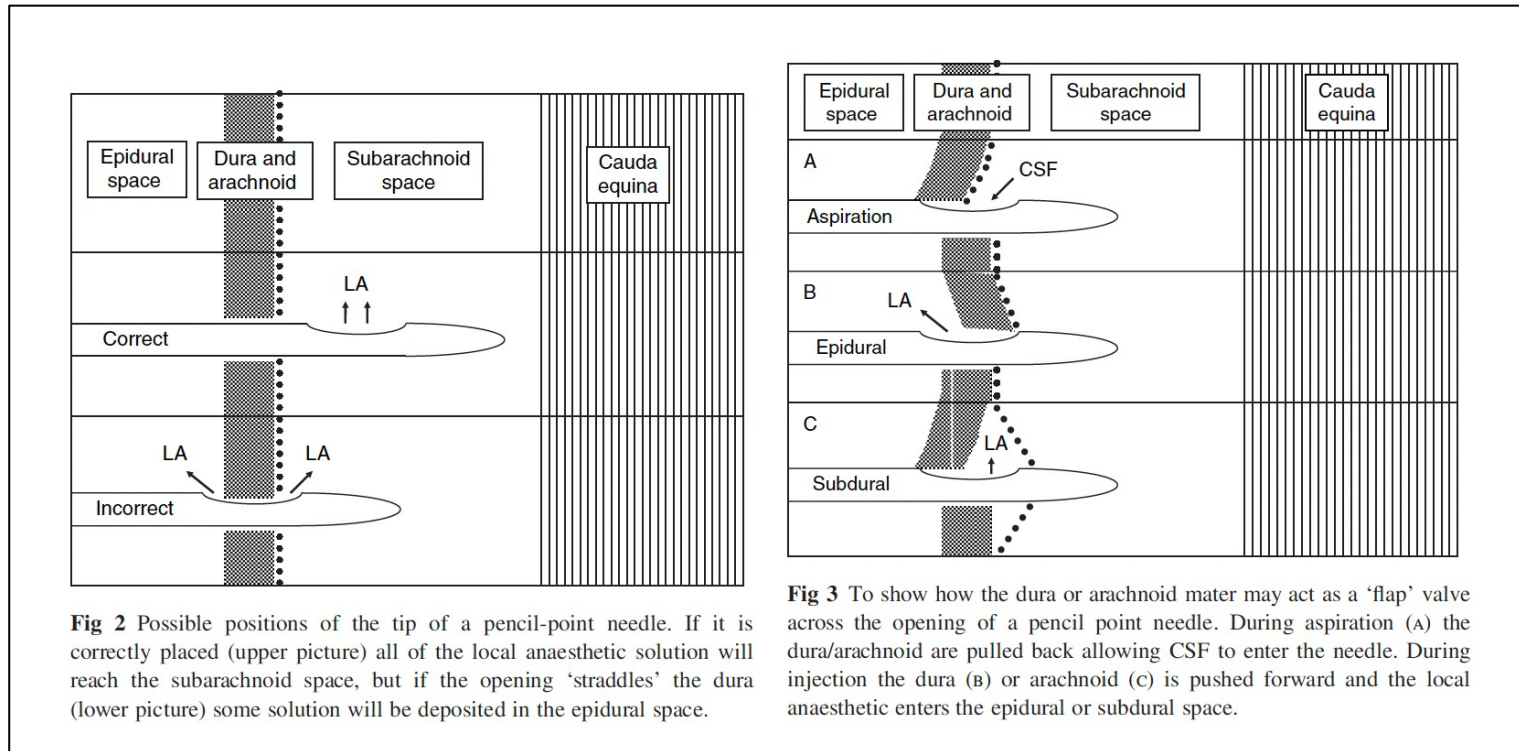
Swissanaesthesia 02.11.2023

Lausanne

Why does spinal anesthesia fail ?

- Failed lumbar puncture
- Pseudo-successful lumbar puncture
- Solution injection errors
- Inadequate intrathecal spread
- Ineffective drug action
- Failure of subsequent management

Pseudo-successful lumbar puncture - Misplaced injection



Managing inadequate blocks in OB: what do the textbooks say?

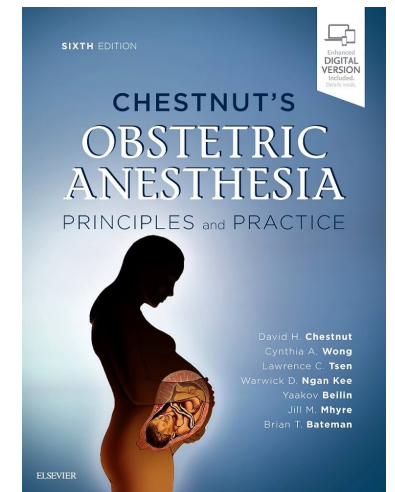
Inadequate labor epidural => “...first evaluate the extent of bilateral sensory blockade in both the cephalad and caudad directions”

Inadequate extension => “...injection of a large volume of LA”

Adequate extension => “...using a more concentrated solution of LA.”

Unilateral block => “limiting the length of catheter within the epidural space to 3 cm or less...catheter withdrawal followed by injection of LA ”

“... If analgesia cannot be rescued ... **the catheter should be removed and replaced at another interspace.**”



Chapter 12
Nathan & Wong

Managing inadequate blocks in OB: what do the textbooks say?

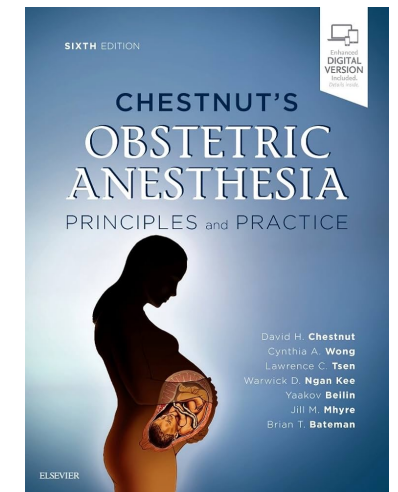
Failed spinal for cesarean section:

*“..., the anesthesia provider **may augment the block with additional local anesthetic by either performing a second spinal anesthetic procedure or placing an epidural catheter, or both. However, care must be taken if performing a second spinal anesthetic procedure.**”*

“...determine the presence of anesthesia in the sacral dermatomes before administering additional LA into the subarachnoid space”

“ If partial blockade is present (even if limited to the sacral dermatomes), the second dose should be reduced accordingly.”

*“It may also be advisable to perform the second procedure at a **different interspace** or make other changes to the original procedure (e.g., alter the patient's **position**, use a LA with different **baricity**, or straighten the lumbosacral curvature).”*



Chapter 12
Nathan & Wong

What are the concerns when repeating a spinal (epidural) block

- (1) Limited spread of the solution => localized high concentration of LA
- (2) Excessive spread => high block
- (3) Unilateral block may be reinforced by a second injection
- (4) Barriers to spread within the subarachnoid space may also affect epidural spread (and vice versa)
- (5) Repeating the injection at a higher level adds risk (if level > L3)
- (6) Adjacent anesthetized nerve tissue increases the risk of direct needle trauma.

Potential complications of repeat spinal injection

High spinal or total spinal

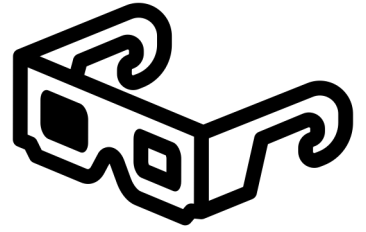
Hypotension

Cauda equina syndrome

PDPH

Nerve injury

Epidural haematoma



Let's take a closer look at each of these potential complications/risks !

Risk of high/total spinal and its consequences

Risk of high spinal (SA) when it is performed after failed epidural

Can J Anesth/J Can Anesth (2016) 63:1170–1178
DOI 10.1007/s12630-016-0701-3



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REPORTS OF ORIGINAL INVESTIGATIONS

Evaluation of failed and high blocks associated with spinal anesthesia for Cesarean delivery following inadequate labour epidural: a retrospective cohort study

263 patients in total
29 failed spinals (11%)
9 high spinals (3%)

Spinal anaesthesia for caesarean section following epidural analgesia in labour: a relative contraindication

A. Gupta, G. Enlund, M. Bengtsson, F. Sjöberg

Department of Anaesthesiology, University Hospital, S-581 85 Linköping, Sweden

IJOA 1994

3 cases of total spinal
Requiring tracheal intubation
(bupi HB 10 mg, 12.5 mg and 15 mg)

Suspected total spinal in patient having emergent Caesarean section, a case report and literature review

H. Virgin (MD) (Senior Consultant), E. Oddby (MD PhD) (Senior Consultant),
J.G. Jakobsson (Adj. Professor Senior Consultant Director of Doctoral Education Clinical
Research and Development)*

International Journal of Surgery Case Reports 28 (2016) 173–175

Total spinal => tracheal intubation
(bupi HB 13 mg, FTN 25mcg , Mo 100 mcg)

Spinal (SA) after “functioning” labor epidural (ELA)

Original Article

A comparison of spinal and epidural anesthesia for cesarean section following epidural labor analgesia: A retrospective cohort study



Chia-Hsiang Huang¹, Yi-Jer Hsieh¹, Ko-Hsin Wei¹, Wei-Zen Sun², Shao-Lun Tsao^{1*}

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Acta Anaesthesiologica Taiwanica 53 (2015) 7e11

190 SA after ELA

Bupi HB 10-12 mg +/- Mo

27 failed spinals (14%)

163 success (86%)

No high/total spinal was noted

KJA
Korean Journal of Anesthesiology

2017

Clinical Research Article

pISSN 2005-6419 • eISSN 2005-7563



Comparing epidural surgical anesthesia and spinal anesthesia following epidural labor analgesia for intrapartum cesarean section: a prospective randomized controlled trial

Hea-Jo Yoon¹, Sang-Hwan Do², and Yeo Jin Yun¹

RCT 360 patients ESA vs SA after cath removal

SA: Bupi HB 10mg + 15 mcg FTN

Pain-free cesarean: SA (97.4%) vs ESA (84.7 %)

No difference in incidence of high block

Spinal (SA) after “functioning” labor epidural (ELA)

PROC (BAYL UNIV MED CENT)
2023;36(4):473–477
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<https://doi.org/10.1080/08998280.2023.2204288>



A comparison of anesthetic outcomes between activation and removal of epidural catheters for patients who underwent unscheduled intrapartum cesarean delivery

Bailey Shepherd, MD^a, Emily E. Sharpe, MD^b , Kendall Hammonds, MPH^c, and Michael P. Hofkamp, MD^a 

retrospective observational study
propensity matching
124 patients ELA removal
124 patients ELA activation

New neuraxial technique

Single injection spinal	23 (18.5%)
Combined spinal-epidural	97 (78.2%)
Epidural	1 (0.8%)
Unable to obtain new neuraxial technique	3 (2.4%)

Removal of catheter followed by new Neuraxial was associated with less GA

1 case of high spinal (0.8%)



The risk of high/total spinal in obstetric anesthesia



DOI: 10.1111/1471-0528.14521
www.bjog.org

General obstetrics

The CAPS Study: incidence, management and outcomes of cardiac arrest in pregnancy in the UK: a prospective, descriptive study

VA Beckett,^a M Knight,^b P Sharpe^c

25% of cardiac arrest in pregnancy is caused by anesthesia (n=16)
> 50% of anesthesia-related cardiac arrests were caused by total spinal anesthesia

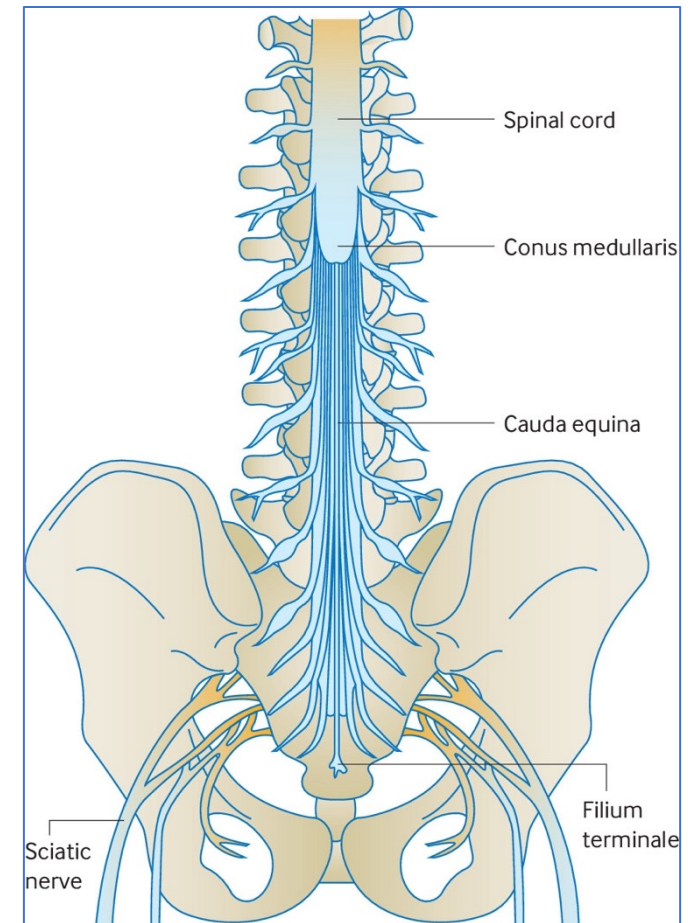
3 cardiac arrest were related to problems with intubation

All of these women survived !!

Risk of cauda equina syndrome
after repeat spinal

What are the causes of Cauda Equina Syndrome (CES)

- Compression (herniated disk, spinal stenosis, tumor...)
- Direct or indirect trauma
- Infection
- Hematoma
- Ischemia of spinal cord
- Manipulation/stretching of the spinal cord
- Arachnoiditis (Multiple causes: epidural abscesses, infection, traumatic punctures, **LA**, detergents, antiseptics, or other toxics)
- **Direct toxicity from injected LA**



K Barraclough. BMJ 2011

Pathophysiology and risk factors

What's the evidence supporting this risk in OB anesthesia when repeating SA ?

Likely mechanism

- Maldistribution of LA in CSF
- Sacral pooling of LA in the dural sac
- Localized high concentration of LA
- Neurotoxicity of LA at high concentration

Risk factors

- Use of spinal catheter (directed caudally)
- Anatomical factors that can restrict distribution and cause sacral pooling of LA
 - Accentuated lordosis
 - Spinal stenosis / disk bulging
 - Spine deformity
 - Lithotomy position
- Use of “neurotoxic” LA (tetracaine, HB lidocaine)
- High intrathecal dose of LA

Anesthesiology
75:713-714, 1991

Drasner & Rigler

Repeat Injection after a "Failed Spinal": At Times, a Potentially Unsafe Practice

To the Editor:—A significant and particularly frustrating limitation of spinal anesthesia is the occasional failure to achieve an adequate sensory block. Basic textbooks of clinical anesthesia specify that, when such failures occur, it is permissible to repeat the lumbar puncture and administer the same or a lesser amount of local anesthetic.^{1,2} We believe this practice to be, at times, potentially harmful.

Failure to achieve spinal anesthesia has been attributed to a variety of causes, but most often to technical error^{3,4}. Cullen asserted that

Continus spinal anaesthesia

esthetic has important implications to the further management of such cases. We recently reported four cases of cauda equina syndrome that occurred following continuous spinal anesthesia.⁸ In all four, there was evidence of a restricted sacral block and, in order to achieve adequate anesthesia, additional doses of local anesthetic were administered incrementally; the total dose administered was greater than that usually administered with a single-injection technique. We contend that, because of the restricted distribution, local anesthetic was not diluted by CSF, and regional concentrations were neurotoxic. In related spinal

Cauda equina syndrome after single shot SA

equina syndrome*; three of these cases involved a subarachnoid block. In two, a "failed spinal" had occurred, followed by a repeat injection. Tetracaine was used in one and lidocaine in the other. Unfortunately, there is no information about the concentration and/or total doses of local anesthetic. Additionally, the documentation in the closed-claims database for the third case was inadequate to determine whether a repeat injection had been performed. Clearly, the information from these closed claims is insufficient to substantiate our concerns about the risk of neurologic injury from a repeated single-injection spinal anesthetic. Nonetheless, we suggest that the following be considered:

1. Aspiration of CSF should be attempted immediately before and

Case reports of cauda equina syndrome after repeat SA in non-OB anesthesia

Anesthesiology
1998; 89:1294-5
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Lippincott Williams & Wilkins

Neurologic Symptom Associated with a Repeated Injection after Failed Spinal Anesthesia

To the Editor:—A repeated single-injection spinal anesthetic after failed spinal anesthesia has been proposed to be potentially harmful.¹ We present a patient in whom neurologic symptoms developed associated with repeated single injection after failed spinal anesthesia. In this patient, dibucaine was repeatedly injected into the subarachnoid space. Although this is an agent virtually never used in the United States, the clinical course of the patient may provide

patient was turned to the supine position on a horizontal operating table, and sensory analgesia to pin-prick was reached at S₁ 10 min after the subsequent spinal injection. After the patient was placed in the lithotomy position, the gynecologic procedure was uneventful and lasted 25 min. When the operation was terminated, a pin-prick test revealed the sensory analgesia to be L₁, and a Foley urinary catheter was inserted into the bladder. On the morning of the first

32-year-old woman

Conization

Hyperbaric dibucaine 7.5 and 6 mg

Few case reports of cauda equina syndrome in OB anesthesia

- Several reports using combined spinal epidural for Cesarean section

Peach MJ. Reg Anesth 1997

Chow J et al. Aust N Z J Obstet Gynaecol 2008

Takasu M et al. Br J Radiol 2010

Sarifakioglu et al. Am. J. Phys. Med. Rehabil 2013

Chen et al. Journal of Clinical Anesthesia 2015

Marinho et al. Rev Esp de Anest y Reanim 2021

- No report after repeated SA in OB anesthesia

Proposed measures to prevent neurologic injury in repeat SA ?

- (1) When facing with a failed spinal: alter patient's position, wait 10min, assess sacral dermatomes
- (2) Assume LA as been injected in the CSF
- (3) Limit the total intrathecal dose of LA, i.e., reduce the dose of the 2nd SA
- (4) Avoid adjuvants in the 2nd dose if given in the 1st (epinephrine in particular)
- (5) Use a different loco-regional technique (CSE/ESA)
- (6) Alter the technique: **baricity**, patient's position, lumbar curvature
- (7) Some authors advise repeating the injection at a higher level

Fettes et al. BJA 2009

Parikh & Seetharamaiah. Indian Journal of Anaesthesia 2018

Nathan & Wong. In Chestnut's OB anesthesia 2020

But ... use the ultrasound to assess/confirm level before repeating SA at a higher level !

**Direct trauma to the conus medullary can lead to cauda equina syndrome
Risk is higher when performing SA at too high a level**

CASE REPORT

Damage to the conus medullaris following spinal anaesthesia

Anaesthesia, 2001, **56**, pages 235–247

F. Reynolds

Emeritus Professor of Obstetric Anaesthesia, Department of Anaesthetics, St Thomas' Hospital, London SE1 7EH, UK

7 cases of direct lesions to the conus

6 were obstetric patients

None of these occurred after repeat SA

«anaesthetists need to relearn the rule that a spinal needle should not be inserted above L3»

Risk of PDPH

Risk of direct traumatic nerve injury

Risk of epidural hematoma

A survey.....

Research Article

Labor Epidural Analgesia to Cesarean Section Anesthetic Conversion Failure: A National Survey

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TABLE 3: Usual next management step of respondents if a top up of an existing labor epidural for a category-two cesarean section resulted in an inadequate or failed sensory block*.

Management	No objective sensory block (<i>n</i> = 709)	Bilateral T10 sensory block (<i>n</i> = 699)	Unilateral T6 sensory block (<i>n</i> = 691)	<i>p</i> value (no objective sensory block vs bilateral T10 sensory block)	<i>p</i> value (bilateral T10 sensory block vs unilateral T6 sensory block)
CSE	87 (12.3)	129 (18.5)	105 (15.2)	<0.001	0.10
General anesthesia	67 (9.4)	120 (17.2)	150 (21.7)	<0.001	0.03
Repeat epidural	2 (0.3)	11 (1.6)	13 (1.9)	0.01	0.66
Spinal	524 (73.9)	398 (56.9)	310 (44.9)	<0.001	<0.001
Withdraw in situ epidural catheter	6 (0.8)	10 (1.4)	65 (9.4)	0.30	<0.001
Other	23 (3.2)	31 (4.4)	48 (6.9)	0.25	0.04

Data are presented as number (%). CSE = combined spinal-epidural. *In these scenarios, respondents were told to assume that neither further epidural top ups nor time would result in any change in the dermatomal level of the sensory block, and assessment of the parturient would demonstrate no undue concerns about the airway and no obvious difficulties in achieving a neuraxial technique if needed.

TABLE 4: Dose of intrathecal local anesthetic which would be used, compared to that used in their routine clinical practice, by respondents who selected to perform a combined spinal-epidural or spinal as their usual next management step after a top up of an existing labor epidural had resulted in an inadequate or failed sensory block for a category-two cesarean section.

Dose of intrathecal local anesthetic	No objective sensory block (<i>n</i> = 604)	Bilateral T10 sensory block (<i>n</i> = 520)	Unilateral T6 sensory block (<i>n</i> = 409)	<i>p</i> value (no objective sensory block vs bilateral T10 sensory block)	<i>p</i> value (no objective sensory block vs unilateral T6 sensory block)
Normal	317 (52.5)	66 (12.7)	68 (16.6)	<0.001	<0.001
75 to <100% of normal	206 (34.1)	188 (36.2)	134 (32.8)	0.39	0.75
50 to <75% of normal	70 (11.6)	213 (41.0)	150 (36.7)	<0.001	<0.001
25 to <50% of normal	3 (0.5)	43 (8.3)	45 (11.0)	<0.001	<0.001
<25% of normal	0 (0)	2 (0.4)	6 (1.5)	0.13	0.003
Other	8 (1.3)	8 (1.5)	6 (1.5)	0.75	0.83

Data are presented as number (%).

Let's summarize !

Repeating the block ?

A question of balancing risks and benefits

Cons



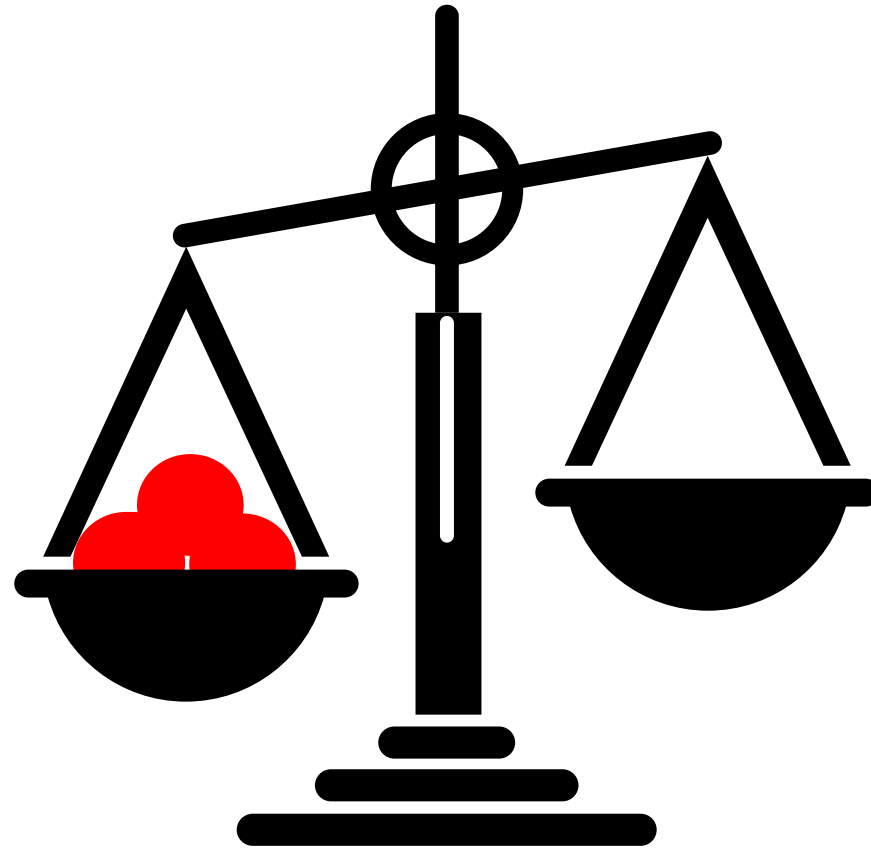
Pros

Repeating the block ?

A question of balancing risks and benefits

Cons

1. Risk of high spinal
2. Risk of cauda equina syndrome
3. Risk of nerve injury



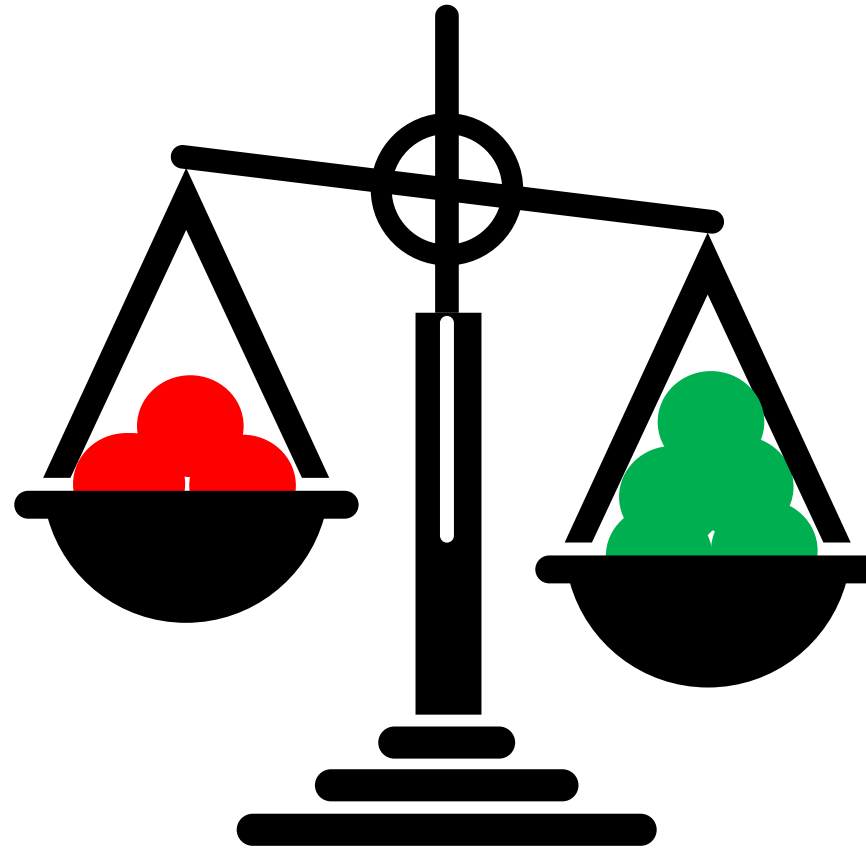
Pros

Repeating the block ?

A question of balancing risks and benefits

Cons

1. Risk of high spinal
2. Risk of cauda equina syndrome
3. Risk of nerve injury



Pros

1. Avoiding the risks of GA
2. More pain-free surgery
3. Participating mother
4. Birthing experience
5. Fetal benefits

Let's revote!

Possible recommendations

All statements are **before start of surgery**

Insufficient epidural labour analgesia with low dose mixtures (i.e., bupi < 0.1% or Ropi <0.175% or equivalent) with lipophilic opioid

If epidural labour analgesia is insufficient, then replacement of the epidural catheter should be strongly considered. There is no need of an interval before the catheter is replaced (via epidural, combined spinal epidural or dural puncture epidural).

Conversion of epidural labour analgesia to epidural anaesthesia for caesarean section

In case of unsatisfactory epidural labour analgesia, there should be a low threshold to remove the epidural catheter and perform spinal anaesthesia (or CSEA) for caesarean delivery.

An epidural labour analgesia is considered unsatisfactory if the effect is insufficient or if multiple manual top-up doses have been required.

Conversion of epidural labour analgesia to epidural anaesthesia for caesarean section

In case of non-urgent caesarean section: If 10 ml of higher concentrated local anaesthetics do not substantially increase motor block, success of epidural anaesthesia for caesarean delivery is unlikely. Therefore, conversion to spinal anaesthesia (or CSEA) should be considered.

In urgent (category 1) caesarean section under epidural anaesthesia, it is time-saving to apply the full epidural dose. In these patients, general anaesthesia should be considered in case of insufficient conversion.

Conversion of epidural labour analgesia to epidural anaesthesia for caesarean section

In case of insufficient anaesthesia following a full dose of epidural high concentrated local anaesthetic (15-25ml), spinal anaesthesia has an increased risk of high/total spinal. A reduction of the intrathecal dose (spinal or as CSE) should be considered. Epidural anaesthesia through a new epidural catheter (epidural or CSE) is a valuable alternative.

In case of urgent caesarean delivery (category 1) and insufficient anaesthesia following a full epidural dose, general anaesthesia should be considered.

Insufficient anaesthesia following spinal anaesthesia for caesarean section (category 2 or higher)

In the event of a failed spinal: alter patient's position, wait 10 min and assess sacral dermatomes

If there is no evidence of neuraxial block (including in the sacral dermatomes), a repeat spinal anaesthesia with standard doses can be performed

When partial neuraxial block is present (even if limited to sacral dermatomes), reduce the intrathecal LA dose of the repeat spinal/CSE or switch to epidural.

Consider using isobaric bupivacaine, especially if a low partial block is present

A repeat spinal should be performed without morphine or other adjuvants (if used in the 1st spinal)

A switch to the epidural compartment is recommended, epidural or CSE. Especially in case of partial effect of the 1st spinal anaesthetic.

In case of elective caesarean delivery another option is to postpone the surgery until complete regression of the block.