Umeå 19-22 September 2023

Svensk Förening för
Anestesi och Intensivvård

SFAI

Last Five Years of Obstetric Anesthesiology

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USA

NO FINANCIAL DISCLOSURES

Emerging Neuraxial Techniques

Intraoperative Hypotension

Clinical Assessment

Postpartum Hemorrhage

Risk of Neuraxial Hematoma

Post Dural Puncture Headache

Risk of Neuraxial Hematoma

Risk of Spinal Epidural Hematoma and Low Platelet Count

Three Articles

Guidelines

Additional Article

Risk of Epidural Hematoma after Neuraxial Techniques in Thrombocytopenic Parturients

A Report from the Multicenter Perioperative Outcomes Group

Linden O. Lee, M.D., Brian T. Bateman, M.D., M.Sc., Sachin Kheterpal, M.D., M.B.A., Thomas T. Klumpner, M.D., Michelle Housey, M.P.H., Michael F. Aziz, M.D., Karen W. Hand, M.D., Mark MacEachern, M.L.I.S., Christopher G. Goodier, M.D., Jeffrey Bernstein, M.D., Melissa E. Bauer, D.O., on behalf of the Multicenter Perioperative Outcomes Group Investigators*

573 obstetric patients with thrombocytopenia

951 cases from the literature

Total of 1524 patients

Lee et al. Anesthesiology. 2017;126:1053–1063.

no spinal epidural hematomas

Risk of Epidural Hematoma after Neuraxial Techniques in Thrombocytopenic Parturients

A Report from the Multicenter Perioperative Outcomes Group

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	Systematic Review Data			MPOG Data Combined with Systematic Review Data		
Platelet Range, mm^{-3}	n (%)	Frequency of Epidural Hematoma Requiring Surgical Decompression	95% CI for Risk of Epidural Hematoma, %	n (%)	Frequency of Epidural Hematoma Requiring Surgical Decompression	95% CI for Risk of Epidural Hematoma, %
0–49,000	12 (1)	0	0–25	27 (2)	0	0–11
50,000–69,000	53 (6)	0	0–6	89 (6)	0	0–3
70,000–100,000	764 (80)	0	0–0.4	1,286 (84)	0	0–0.2
Total	951 (100)	0		1,524 (100)	0	

Lee et al. Anesthesiology. 2017;126:1053–1063.

Neuraxial block for delivery among women with low platelet counts: a retrospective analysis

N. Levy,[a] O. Goren,[a] A. Cattan,[a] C.F. Weiniger,[a,b] I. Matot[a]
[a]*Division of Anesthesiology, Intensive Care and Pain Medicine, Tel Aviv Medical Center, Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel*
[b]*Department of Anesthesiology and Critical Care Medicine, Hadassah Hebrew University Medical Center, Jerusalem, Israel*

471 obstetric patients with thrombocytopenia

no spinal epidural hematomas

Levy et at Int J Obstet Anesth. 2018 Aug; 35:4-9

Table 3 95% confidence interval for the risk of spinal epidural hematoma

	Levy et al.		Lee et al.[9]		Lee et al.[9] + Levy et al.	
Platelet count range	NB (n)	CI (%)	NB (n)	CI (%)	NB (n)	CI (%)
0–49 000/μL	5	–	27	0–11	32	0–9
50 000–69 000/μL	23	–	89	0–3	112	0–2.6
70 000–99 000/μL	280	0–1	1286	0–0.2	1566	0–0.19
<100 000/μL	308	0–0.9	1524	0–0.19	1816	0–0.16

Upper limit 95% CI was calculated using the 'rule of 3' method.[12] NB: neuraxial block. CI: 95% confidence interval.

Levy et at Int J Obstet Anesth. 2018 Aug; 35:4-9

Platelet range, mm^{-3}	n (%)	Frequency of Epidural Hematoma Requiring Surgical Decompression	95% CI For Risk of Epidural Hematoma, %
0–49,000	15 (3)	0	0–20
50,000–69,000	36 (6)	0	0–8
70,000–99,000	522 (91)	0	0–0.6
Total	573 (100)	0	

3/number of times event happens

3/15 = 1/5 = 20 %

Lumbar neuraxial procedures in thrombocytopenic patients across populations: A systematic review and meta-analysis

FIVE Obstetric spinal epidural hematomas with a platelet count range of 44,000–91,000

Bauer et al. J Clin Anesth. 2020 May;61:109666

SPECIAL ARTICLE

The Society for Obstetric Anesthesia and Perinatology Interdisciplinary Consensus Statement on Neuraxial Procedures in Obstetric Patients With Thrombocytopenia

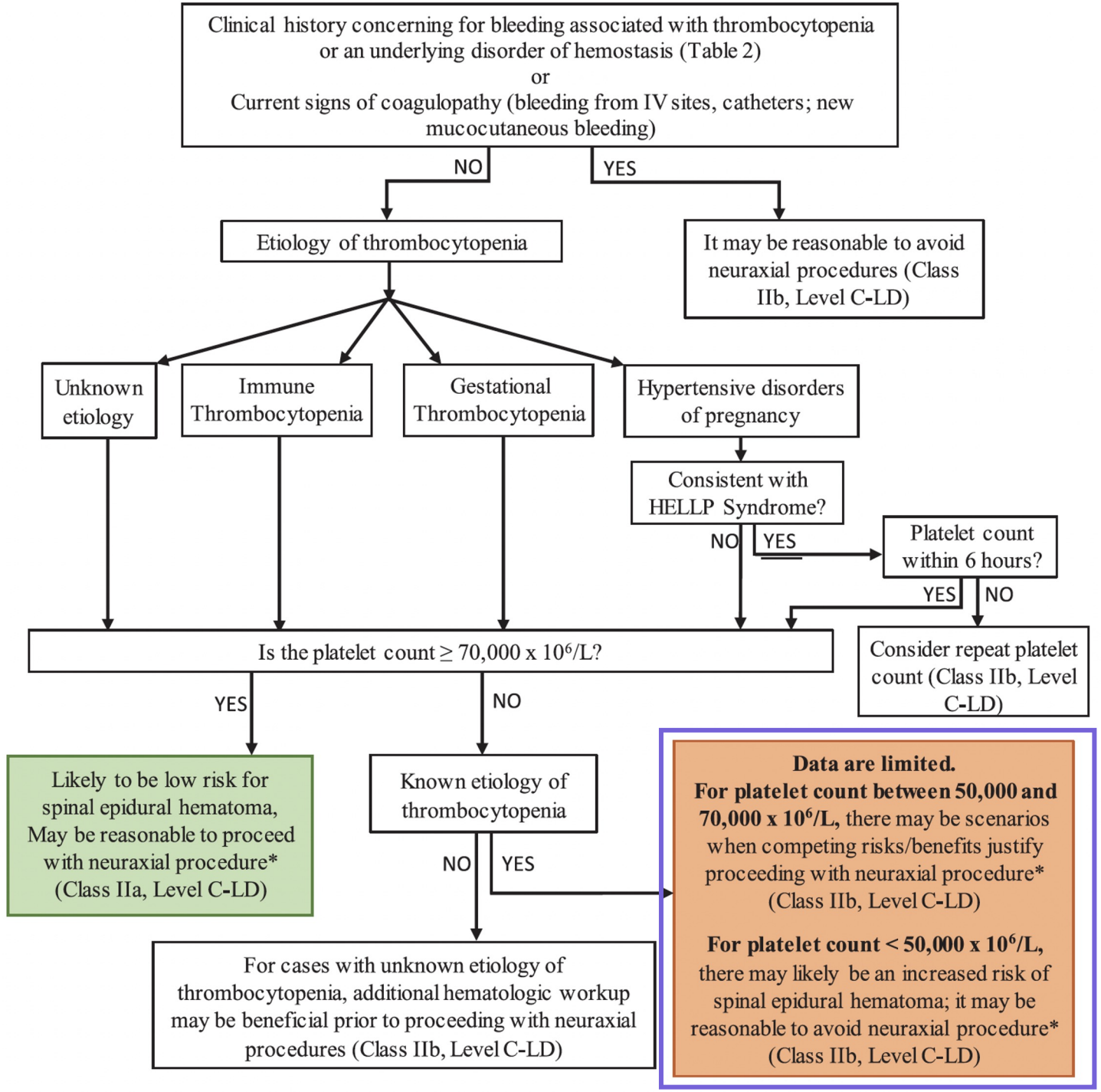
Anesth Analg. 2021 Jun 1;132(6):1531-1544

Literature and Systematic Review

The taskforce reviewed the relevant literature to create this consensus statement. The search strategy is available in a previously published systematic review and meta-analysis that identified all published cases of neuraxial procedures (lumbar puncture; spinal, epidural, and combined spinal epidural procedures; and epidural catheter removal) performed in diverse populations of patients with thrombocytopenia with subsequent development of spinal epidural hematoma.[6]

Bauer Lee Levy

Anesth Analg. 2021 Jun 1;132(6):1531-1544


Clinical history concerning for bleeding associated with thrombocytopenia or an underlying disorder of hemostasis (Table 2)
or
Current signs of coagulopathy (bleeding from IV sites, catheters; new mucocutaneous bleeding)
NO
YES
Etiology of thrombocytopenia
It may be reasonable to avoid neuraxial procedures (Class IIb, Level C-LD)
Unknown etiology
Immune Thrombocytopenia
Gestational Thrombocytopenia
Hypertensive disorders of pregnancy
Consistent with HELLP Syndrome?
NO
YES
Platelet count within 6 hours?
YES
NO
Consider repeat platelet count (Class IIb, Level C-LD)
Is the platelet count ≥ 70,000 x 10⁶/L?
YES
NO
Likely to be low risk for spinal epidural hematoma, May be reasonable to proceed with neuraxial procedure* (Class IIa, Level C-LD)
Known etiology of thrombocytopenia
NO
YES
Data are limited.
For platelet count between 50,000 and 70,000 x 10⁶/L, there may be scenarios when competing risks/benefits justify proceeding with neuraxial procedure* (Class IIb, Level C-LD)
For platelet count < 50,000 x 10⁶/L, there may likely be an increased risk of spinal epidural hematoma; it may be reasonable to avoid neuraxial procedure* (Class IIb, Level C-LD)
For cases with unknown etiology of thrombocytopenia, additional hematologic workup may be beneficial prior to proceeding with neuraxial procedures (Class IIb, Level C-LD)

SPECIAL ARTICLE

The Society for Obstetric Anesthesia and Perinatology Interdisciplinary Consensus Statement on Neuraxial Procedures in Obstetric Patients With Thrombocytopenia

Anesthesiologists should assess risks and benefits

Anesth Analg. 2021 Jun 1;132(6):1531-1544

BE AWARE OF THE GUIDELINES

and

USE YOUR CLINICAL JUDGMENT

ORIGINAL CLINICAL RESEARCH REPORT

General Anesthesia for Cesarean Delivery for Thrombocytopenia in Hypertensive Disorders of Pregnancy: Findings From the Obstetric Airway Management Registry

Thrombocytopenia suspected but not excluded in 46 patients

Platelet Count Retrieved Retrospectively

41 Patients > 75000

5 Patients < 75000

Seymour et al. Anesth Analg. 2023 May 1;136(5):992-998.

ORIGINAL CLINICAL RESEARCH REPORT

General Anesthesia for Cesarean Delivery for Thrombocytopenia in Hypertensive Disorders of Pregnancy: Findings From the Obstetric Airway Management Registry

there are circumstances in which the clinician opts
for a neuraxial block when a platelet count is unavailable

Seymour et al. Anesth Analg. 2023 May 1;136(5):992-998.

Clinical Assessment

Safety in Neuraxial Clinical Assessment

MATERNAL NERVE INJURY
IS INCREASING
And MAY BE PREVENTABLE

Damage to the conus medullaris following spinal anaesthesia

Reynolds Anaesthesia 2001 Mar;56(3):238-47.

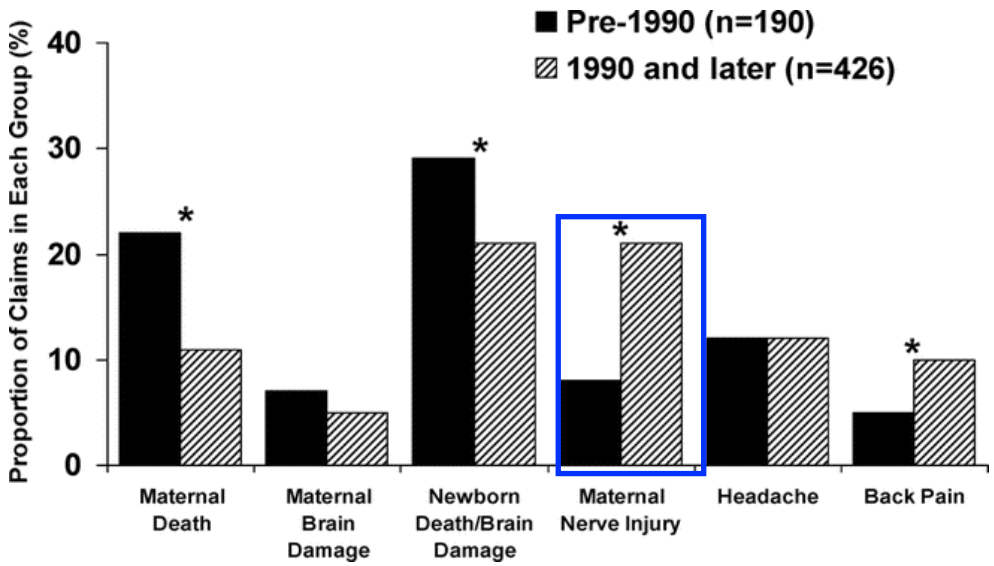
Six Obstetric cases with permanent nerve injury following Spinal or Combined-Spinal Epidural

Case no.	Pain on insertion	MRI appearance of conus medullaris	Neurological outcome		
			Urinary problems	Sensory	Motor
1	Right leg	Syrinx right side (Fig. 1)	Yes	L_4-S_1 on right	Right foot drop
2	Left hip	Syrinx left side	No	L_5-S_1 on left	Left foot drop
3	Back, left leg	Syrinx left side (Fig. 2)	Yes	L_4-S_1 on left	Left foot drop
4	Right side	?Normal	No	T_4-S_2 on right	Only lasted one week
5	Right leg	Syrinx right side (Fig. 3)	Yes	L_4-S_3 on right	Right foot drop
6	?Left leg	High signal in conus at L_1	No	L_4-S_1 on left	Left leg weakness

Reynolds Anaesthesia 2001 Mar;56(3):238-47.

Liability associated with obstetric anesthesia: a closed claims analysis

Anesthesiology. 2009 Jan;110(1):131-9.



Anesthesiology. 2009 Jan;110(1):131-9.

89 nerve injuries associated with neuraxial blockade

2 direct injections into the spinal cord

Anesthesiology. 2009 Jan;110(1):131-9.

Major complications of central neuraxial block: report on the Third National Audit Project of the Royal College of Anaesthetists

14 NERVE INJURIES

7 Permanent

2 Obstetrics

Cook et al. Br J Anaesth 2009; 102:179–90

Obstetric anaesthetic practice in the UK: a descriptive analysis of the National Obstetric Anaesthetic Database 2009-14

Complication	NOAD data 2009–14
Complication rate per 100 000 women who had regional anaesthesia or analgesia	
High block resulting in loss of consciousness	15 (95% CI, 13–17)
Local anaesthetic toxicity: Number of women who cardiac arrest or convulsions with regional anaesthesia/ analgesia	2 (95% CI, 0–3.0)
Number of women who had permanent nerve damage after regional anaesthesia or analgesia	5 (95% CI, 3–7)
Complication rate per 100 000 women who had general anaesthesia for CS	
Failed intubation	264 (95% CI, 224–308)
'Cannot intubate, cannot ventilate'	25 (95% CI, 14–41)

Bamber et al. Br J Anaesth 125 (4): 580-587 (2020)

NERVE INJURY

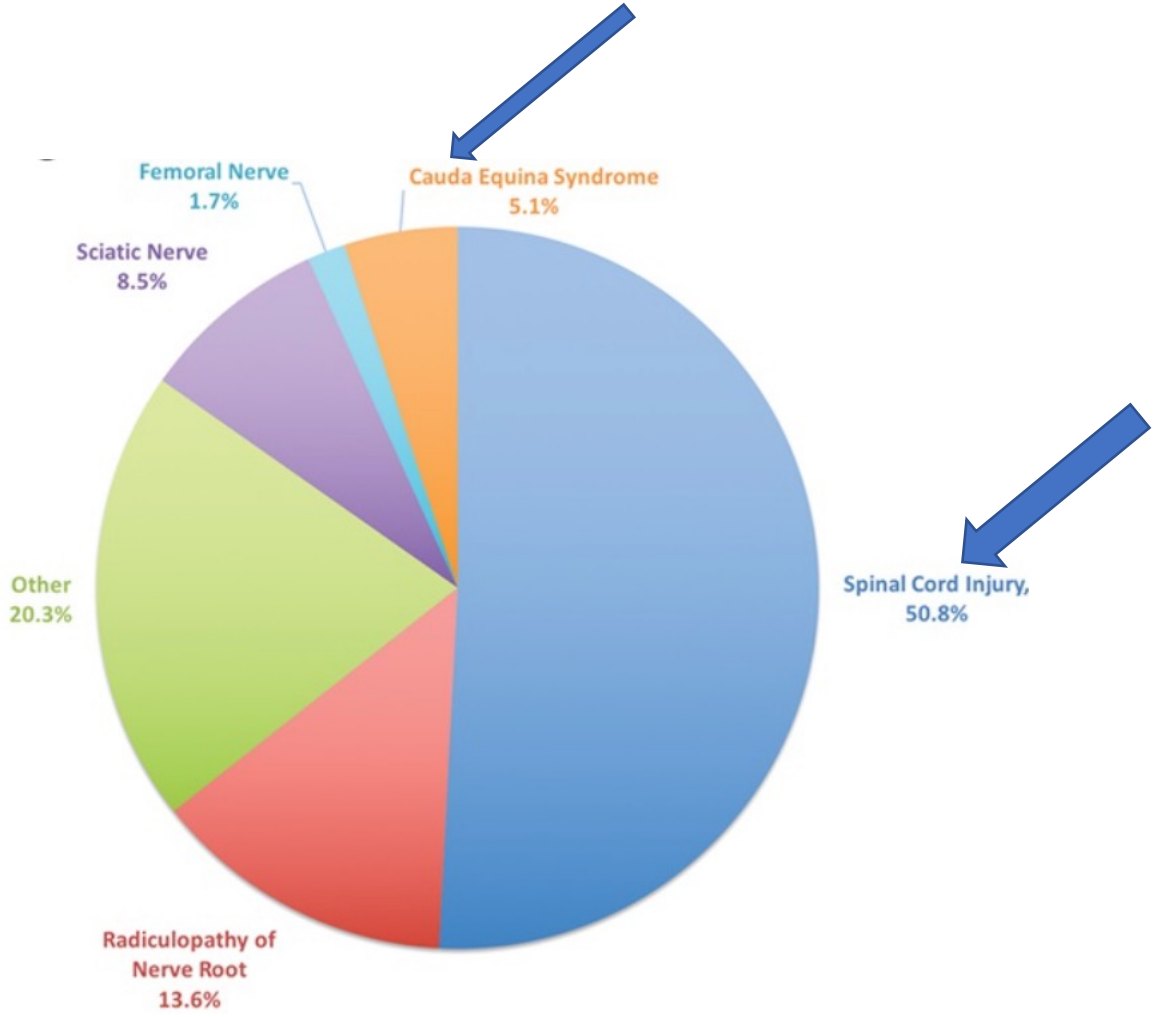
1 per 20,000 (95% [CI] 1/14,286 – 1/33,333)

Bamber et al. Br J Anaesth 125 (4): 580-587 (2020)

A Contemporary Analysis of Medicolegal Issues in Obstetric Anesthesia Between 2005 and 2015

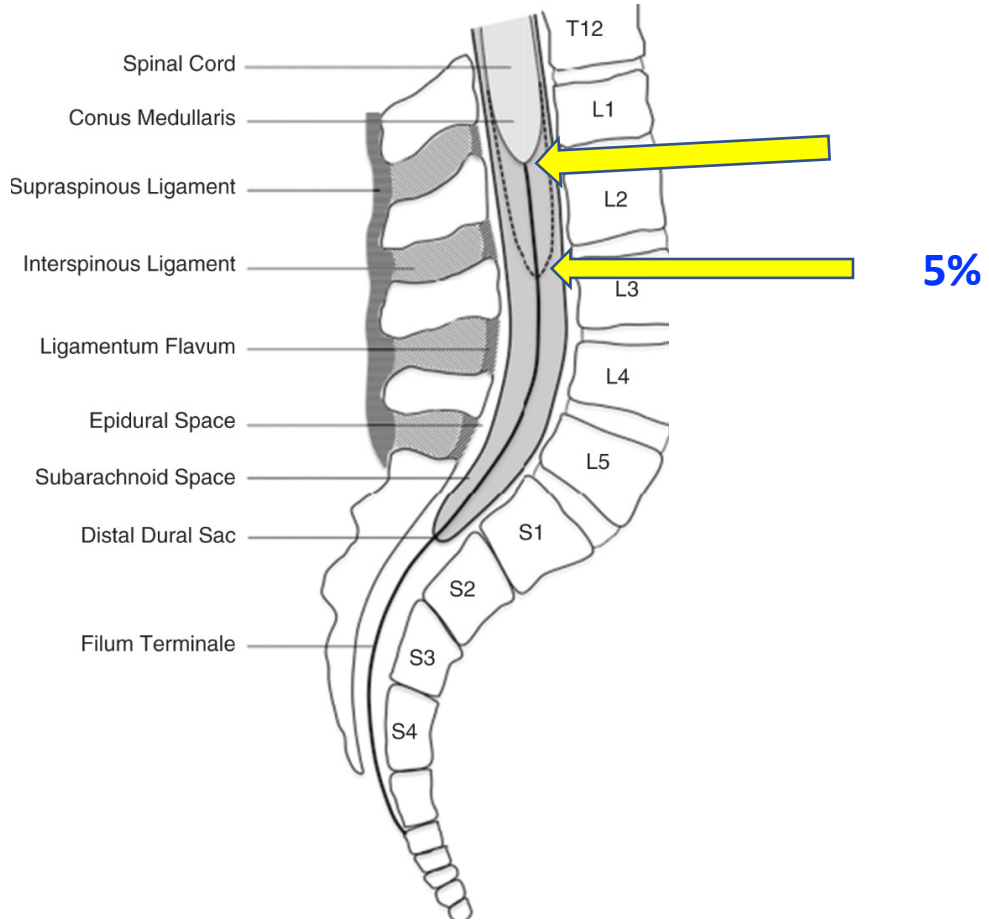
Kovacheva et al. Anesth Analg. 2019 Jun;128(6):1199-1207

N = 58



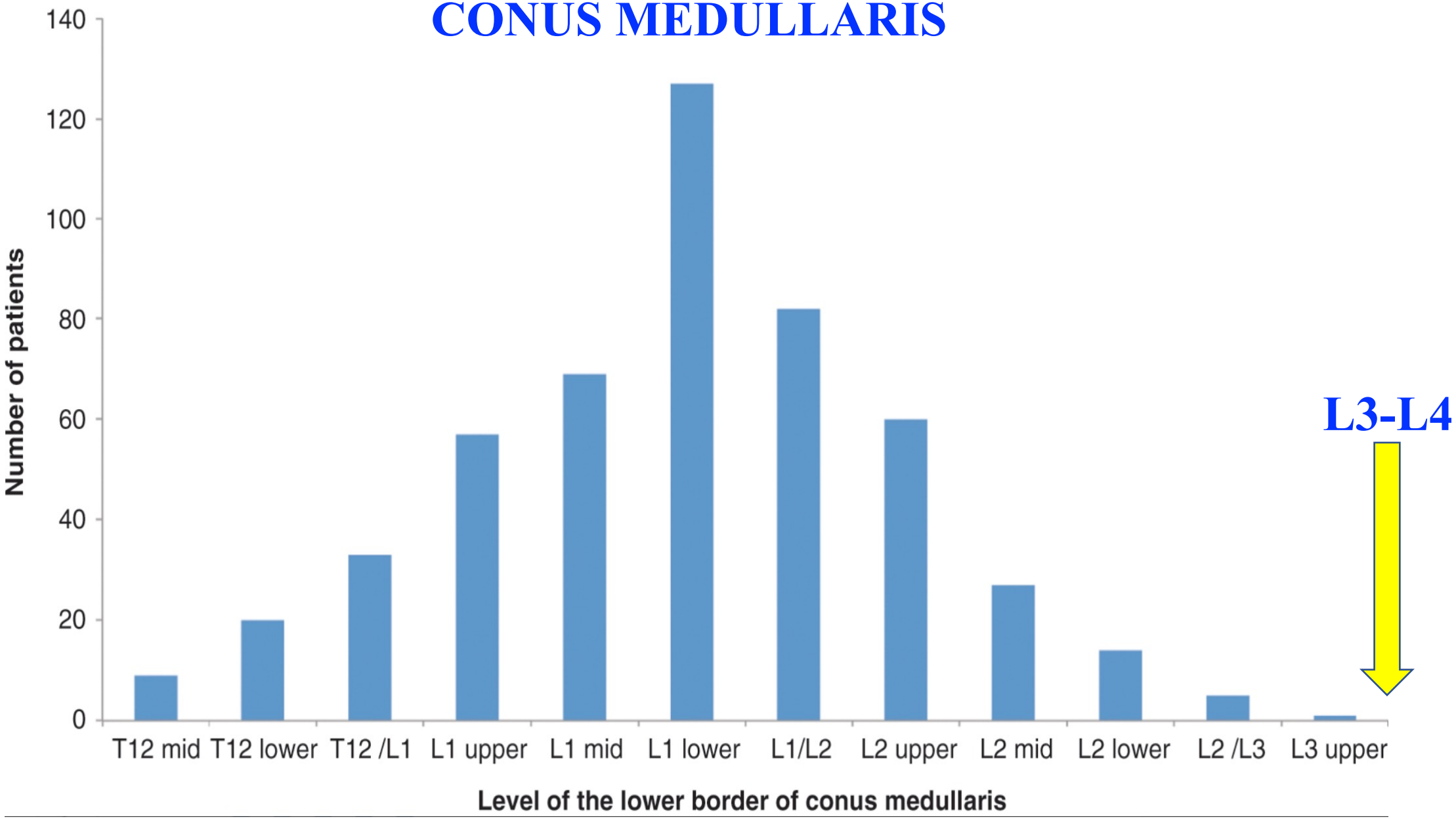
Kovacheva et al. Anesth Analg. 2019 Jun;128(6):1199-1207

Anatomical Variability of the Conus Medullaris



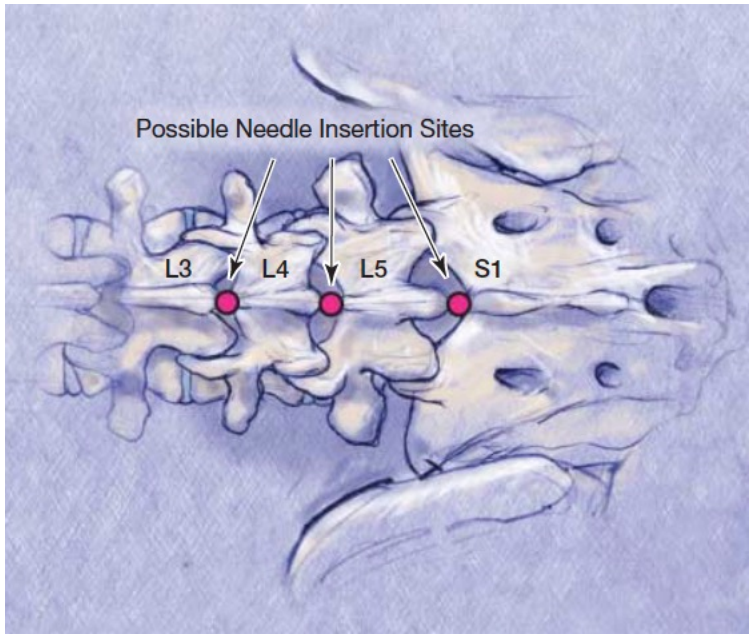
Chau and Tsen. Cambridge University Press

CONUS MEDULLARIS



Saifuddin et al. Spine 1998;23:1452-56

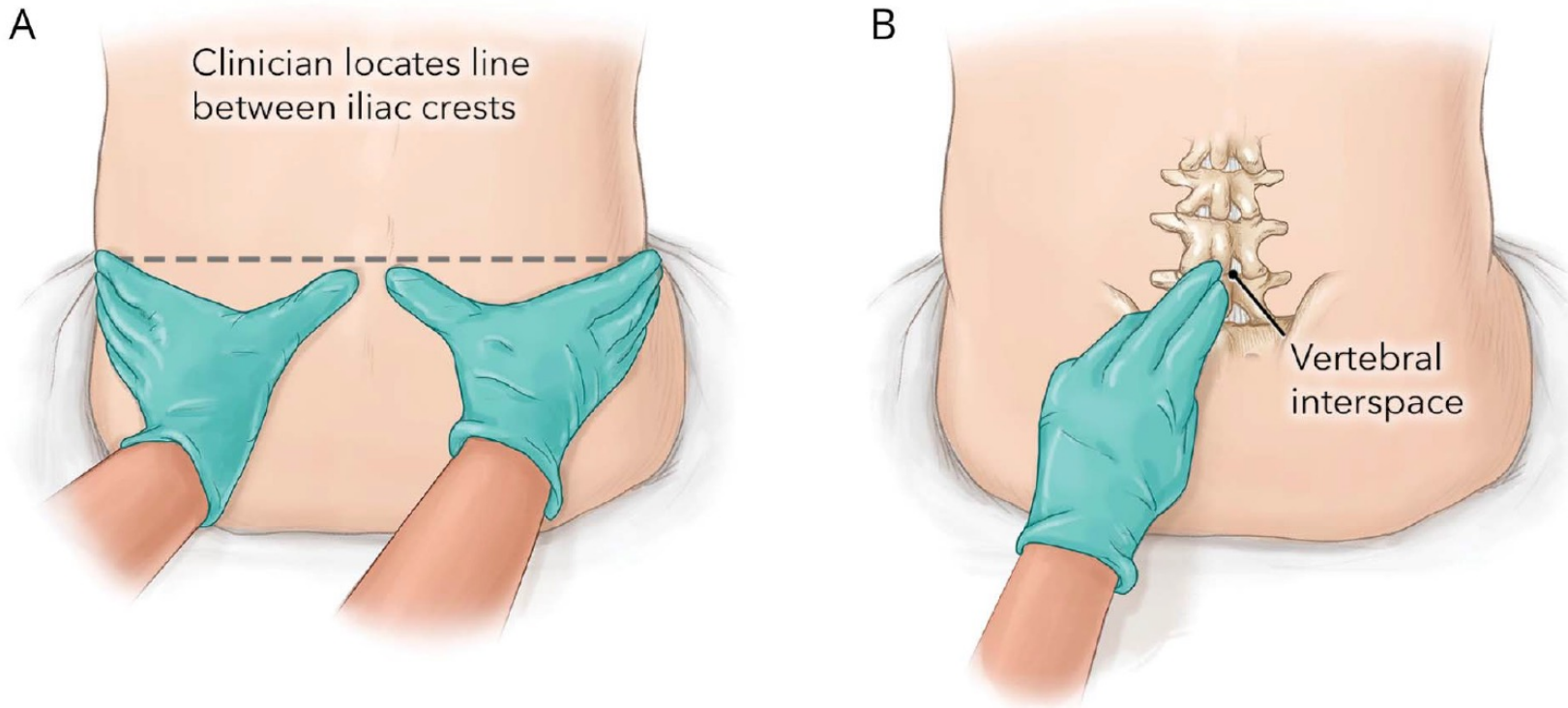
L3-L4 L4-L5 L5-S1



Straus et al. JAMA October 25 (2006) Vol 296, No. 16

Clinical Assessment of the Targeted Interspace

Intercristal line (classic) technique

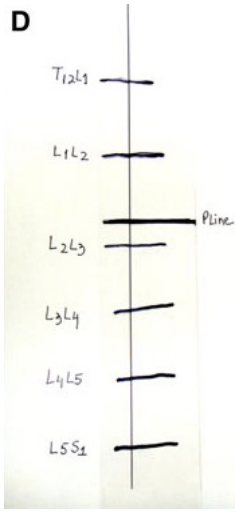


Ability of Anesthetists to Identify a Marked Lumbar Interspace

The marked space was correctly identified in only 29% of patients

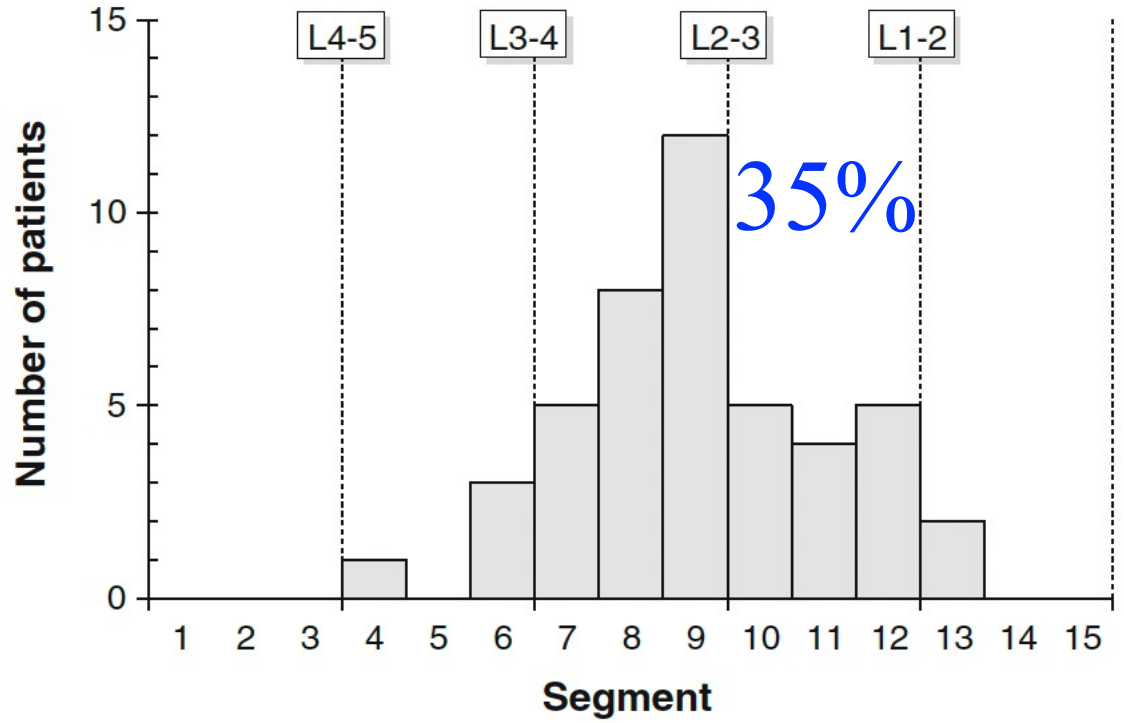
Broadbent et al. Anaesthesia 2000;55:1122-26

The intercristal line determined by palpation is not a reliable anatomical landmark for neuraxial anesthesia



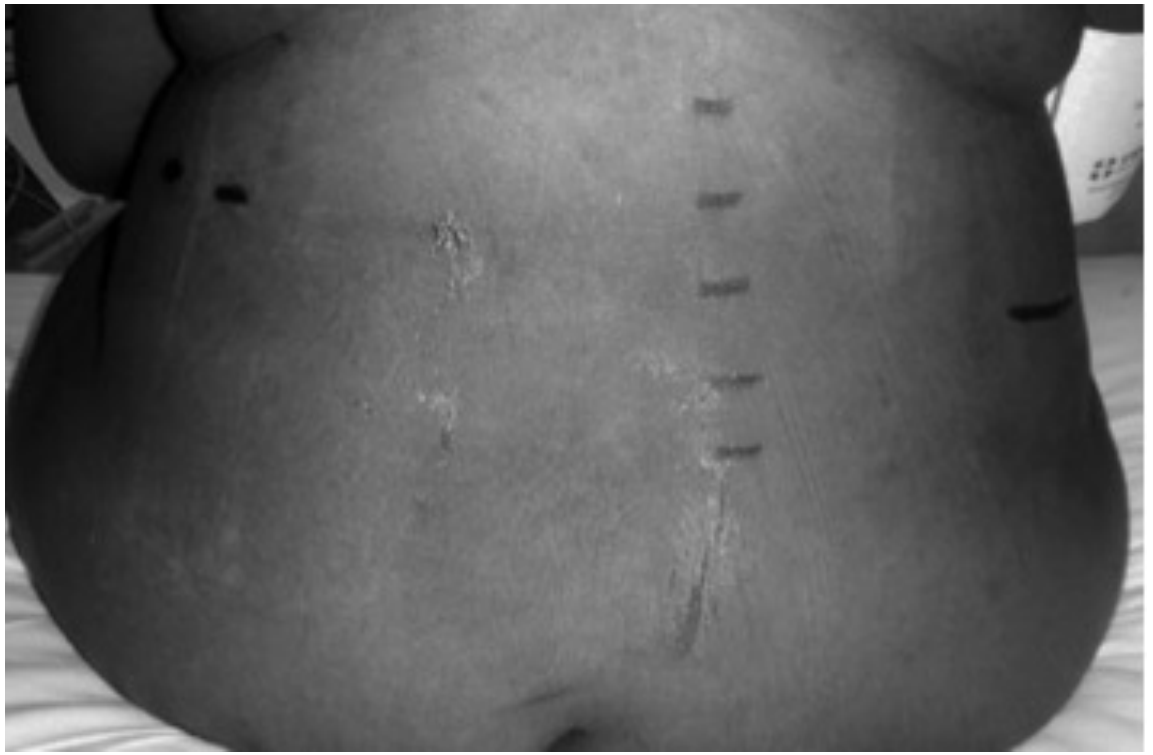
Margarido et al. Canad J Anesth (2011) 58:262–266

The intercristal line determined by palpation is not a reliable anatomical landmark for neuraxial anesthesia



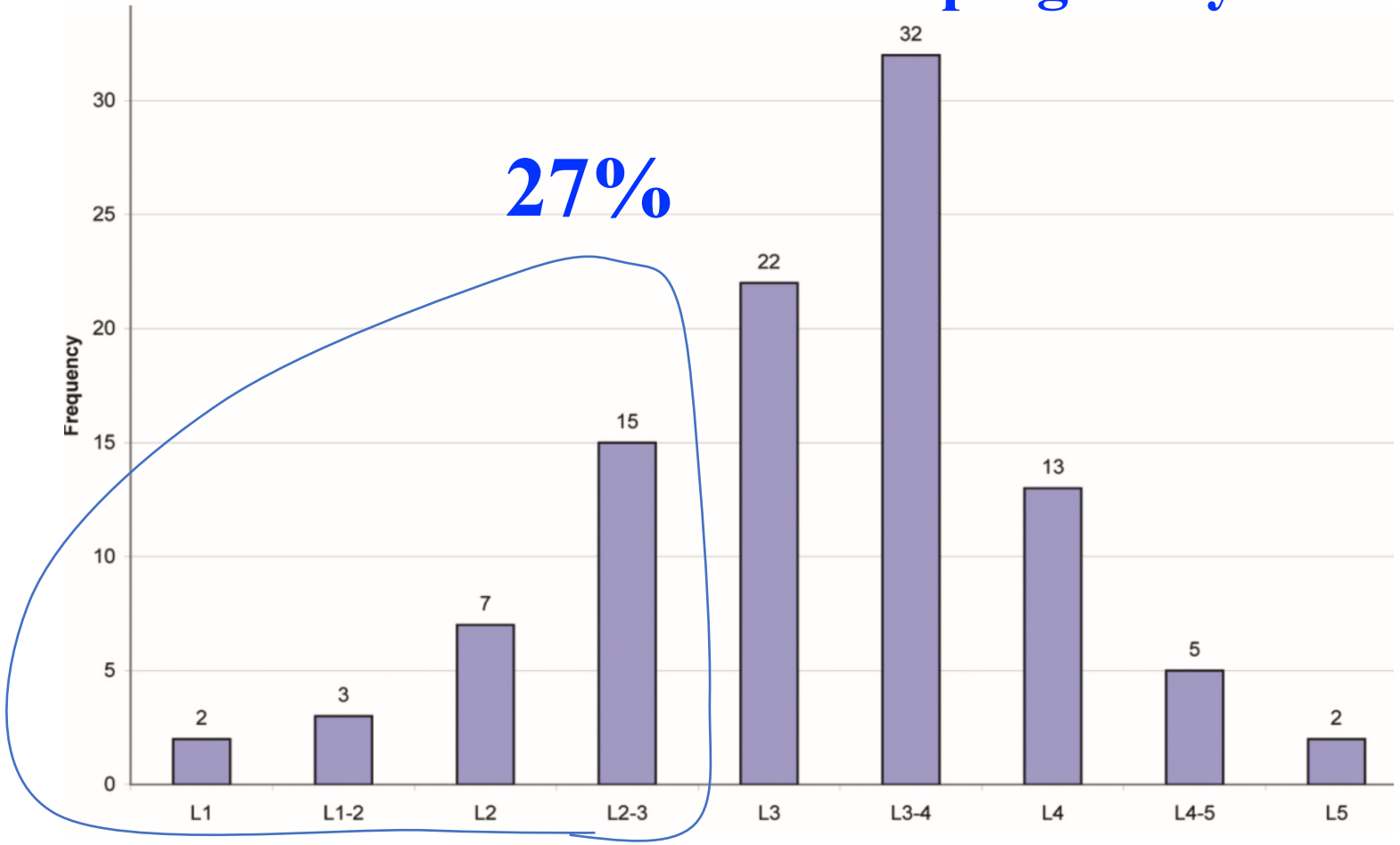
Margarido et al. Canad J Anesth (2011) 58:262–266

Ultrasound assessment of the vertebral level of the intercristal line in pregnancy



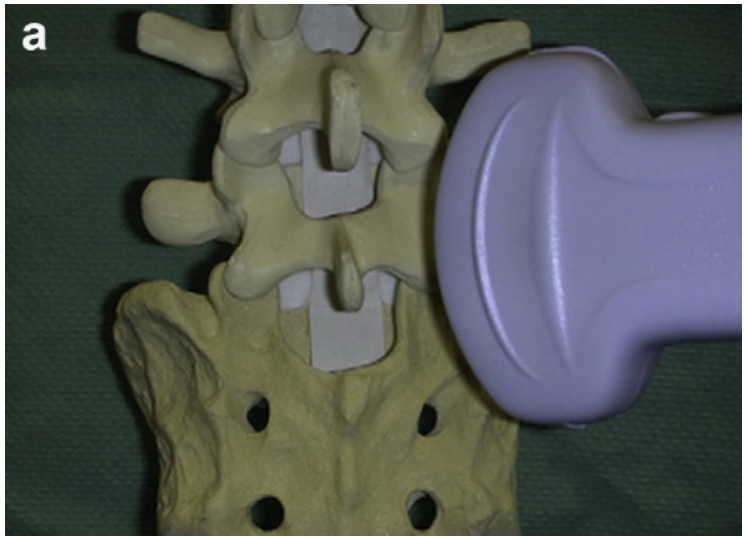
Lee et al. Anesth Analg. 2011 Sep;113(3):559-64

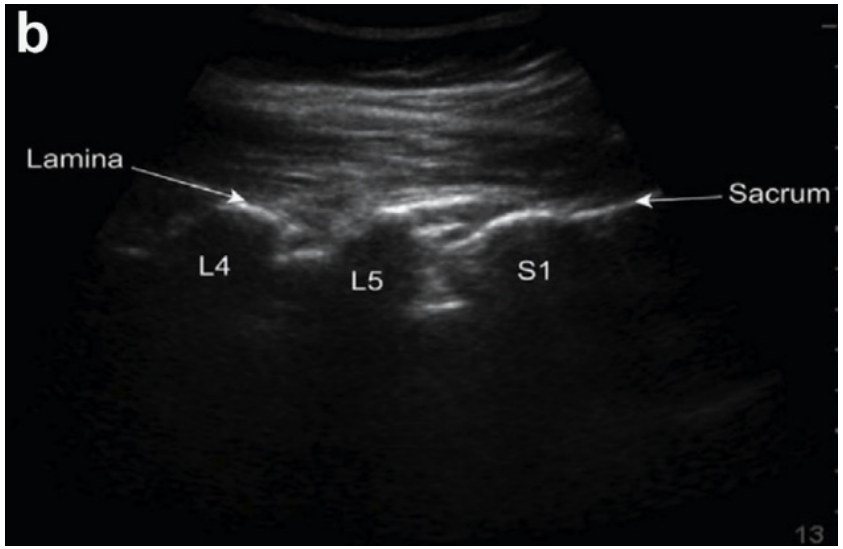
Ultrasound assessment of the vertebral level of the intercristal line in pregnancy



Lee et al. Anesth Analg. 2011 Sep;113(3):559-64

ROUTINE USE OF ULTRASOUND





Sadeghi et al. BJA Education, 21(10): 369-375 (2021)

Alternative Landmark Techniques

Spinal anaesthesia for caesarean section: an ultrasound comparison of two different landmark techniques

GROUP **A**

AT the level or **ABOVE**

45%

L2–3

GROUP **B**

BELOW

7%

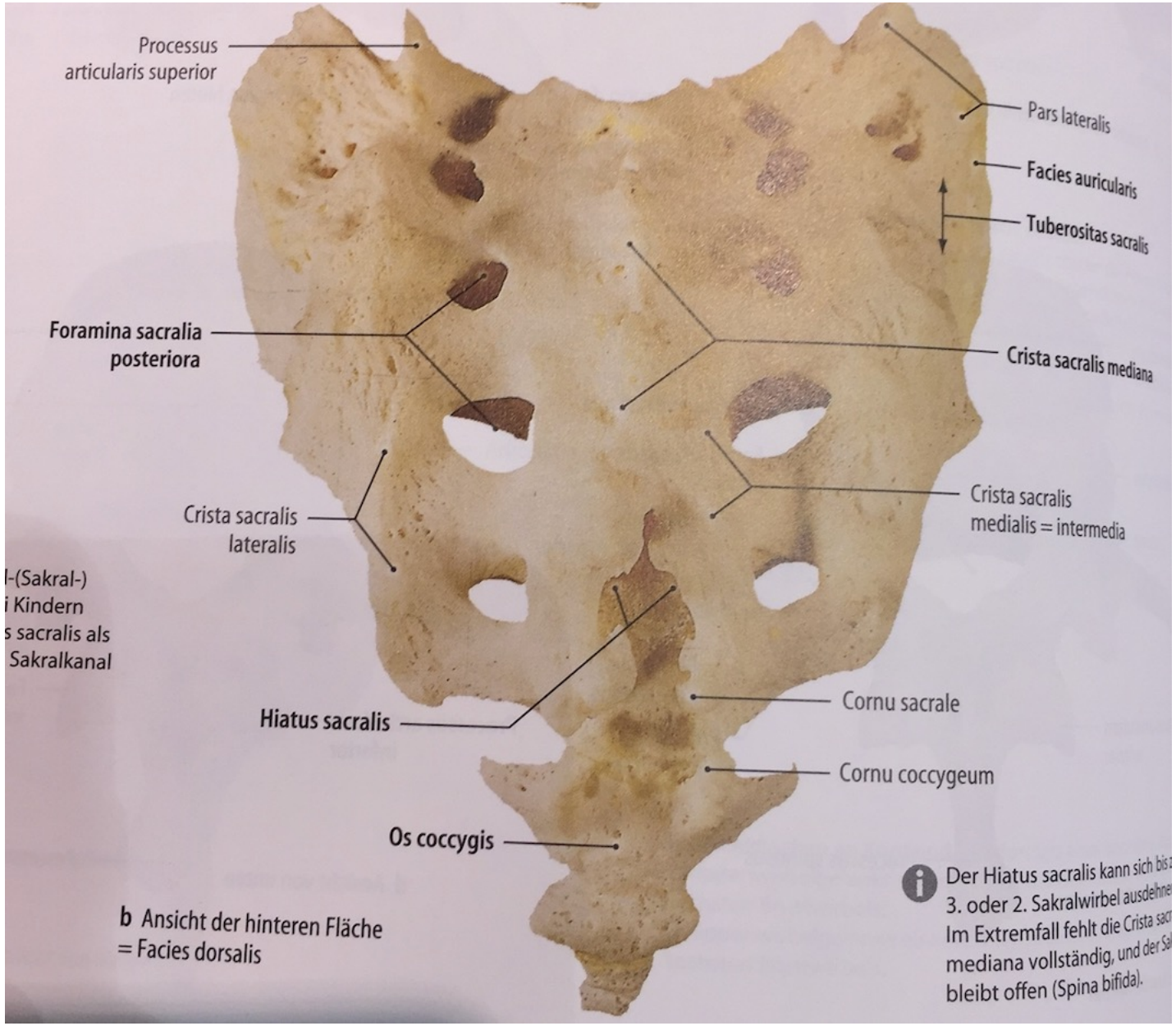
Srinivasan et al. Int J Obstet Anesth. 2014 Aug;23(3):206-12

EDITORIAL

Keeping in the Reynolds zone

“ Feel the space, down ONE place. Bone poke through, go down TWO !”

Bogod Int J Obstet Anesth. 2014 Aug;23(3):201-203



-(Sakral-)
Kindern
s sacralis als
Sakralkanal

b Ansicht der hinteren Fläche
= Facies dorsalis

Der Hiatus sacralis kann sich bis
3. oder 2. Sakralwirbel ausdehne
Im Extremfall fehlt die Crista sac
mediana vollständig, und der Sa
bleibt offen (Spina bifida).

S A I L

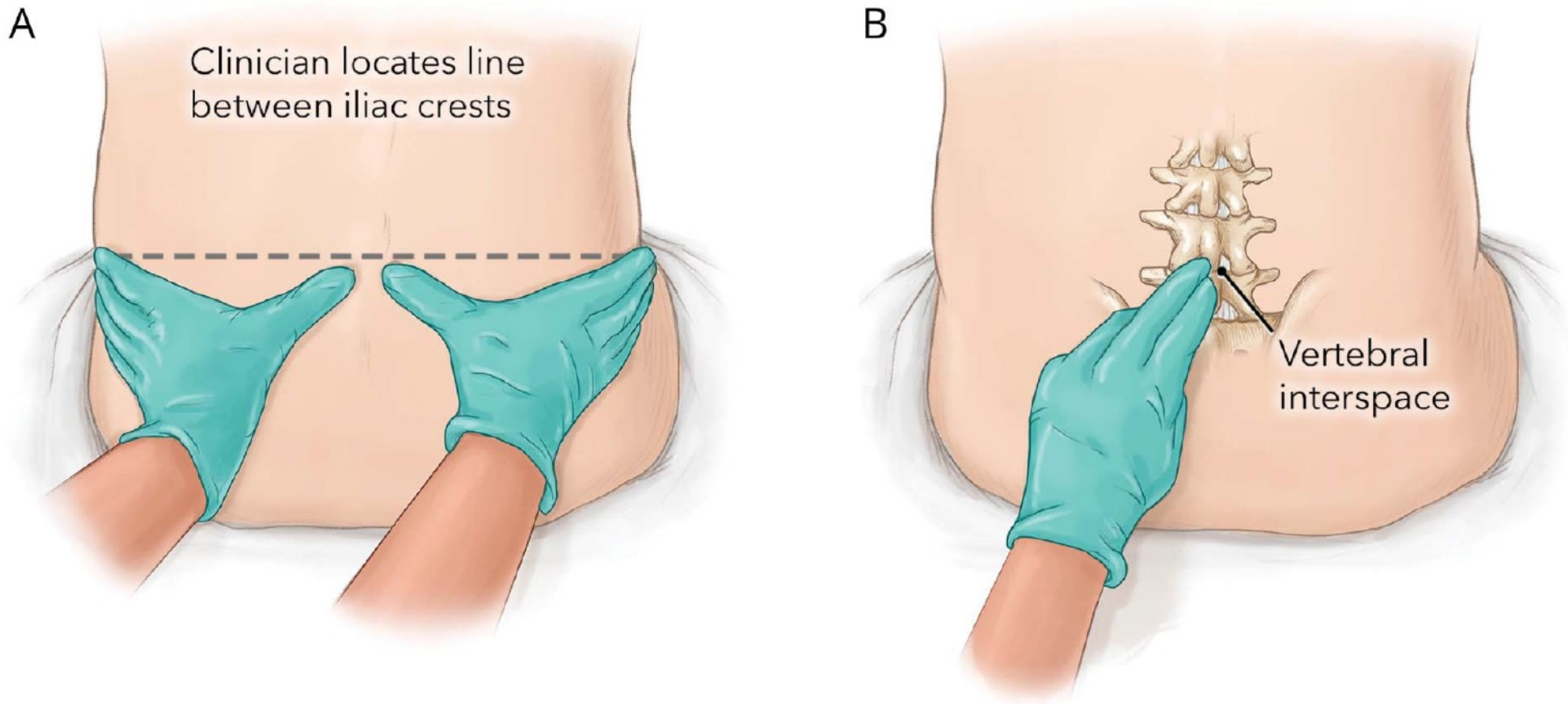
Sacral anatomical interspace landmark for lumbar puncture in pregnancy

A randomized trial

Carlo Pancaro, MD, Baskar Rajala, MD, Christie Vahabzadeh, MD, Ruth Cassidy, MA, Tom Klumpner, MD, Joanna A. Kountanis, MD, Madeline McCabe, Dana Rector, Casey Aman, Keerthana Sankar, Robert Schoenfeld, and Milo Engoren, MD

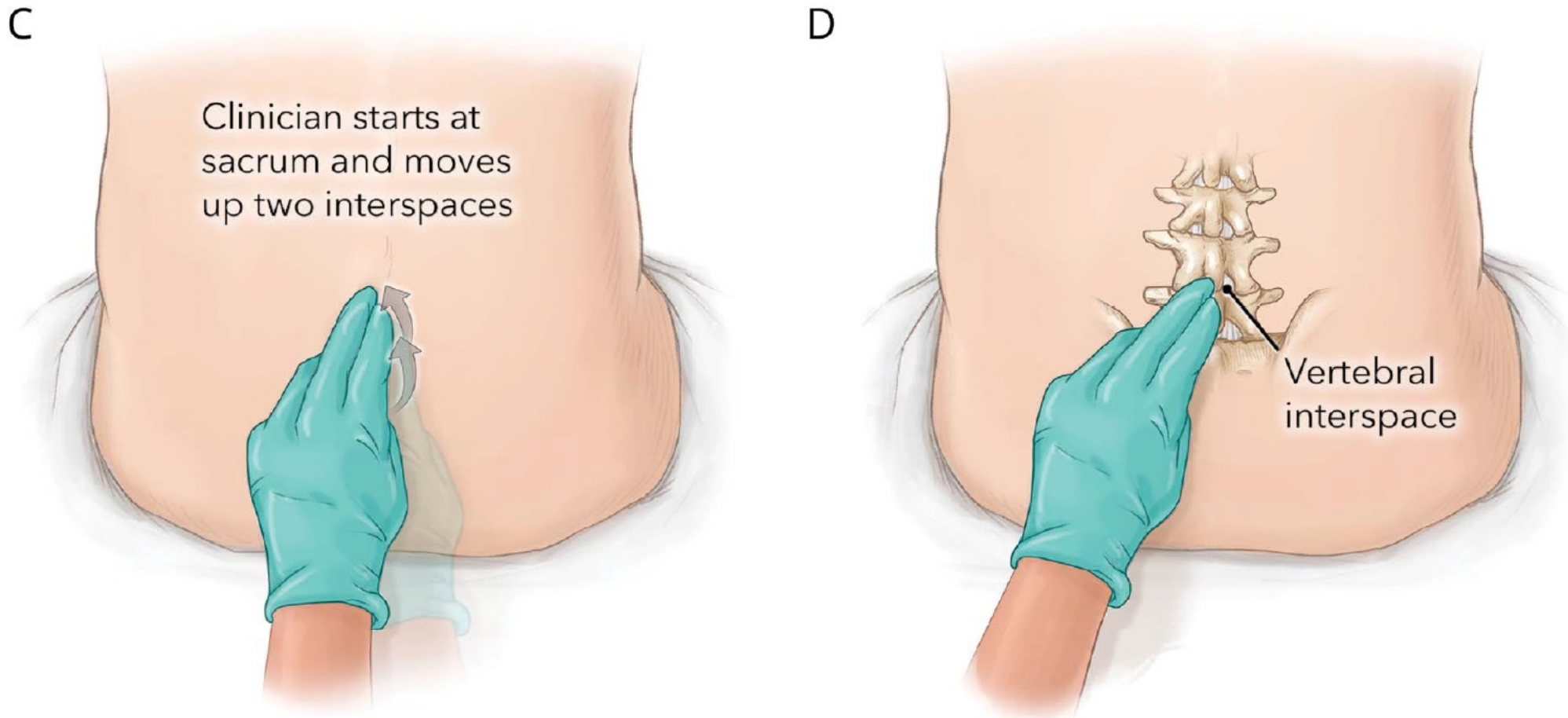
Pancaro et al. Neurology 2020 Feb 11;94(6)

Intercristal line (classic) technique

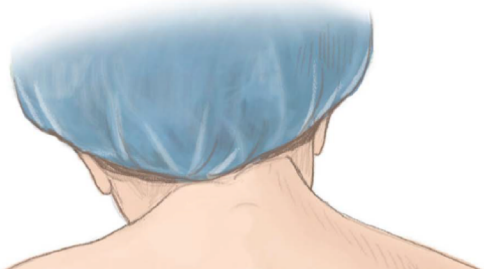


Pancaro et al. Neurology 2020 Feb 11;94(6)

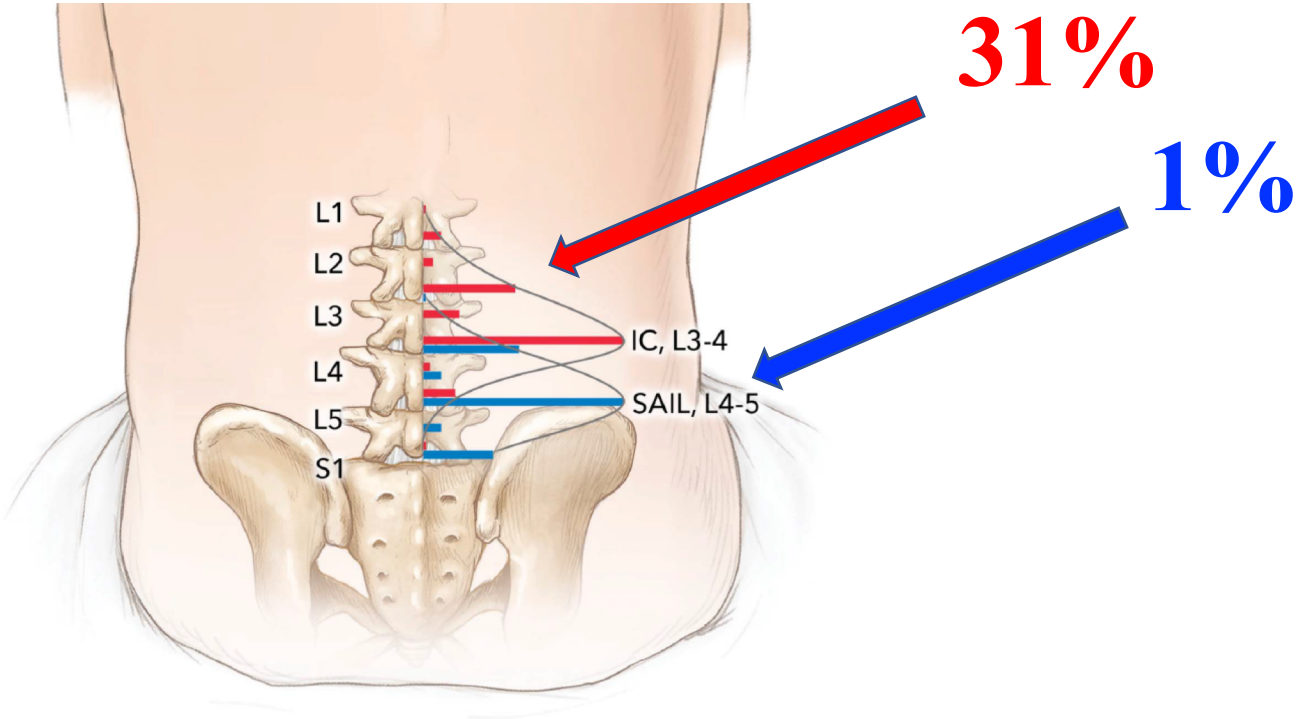
SAIL (novel) technique



Pancaro et al. Neurology 2020 Feb 11;94(6)



SAIL might decrease the risk of needle contact with the spinal cord

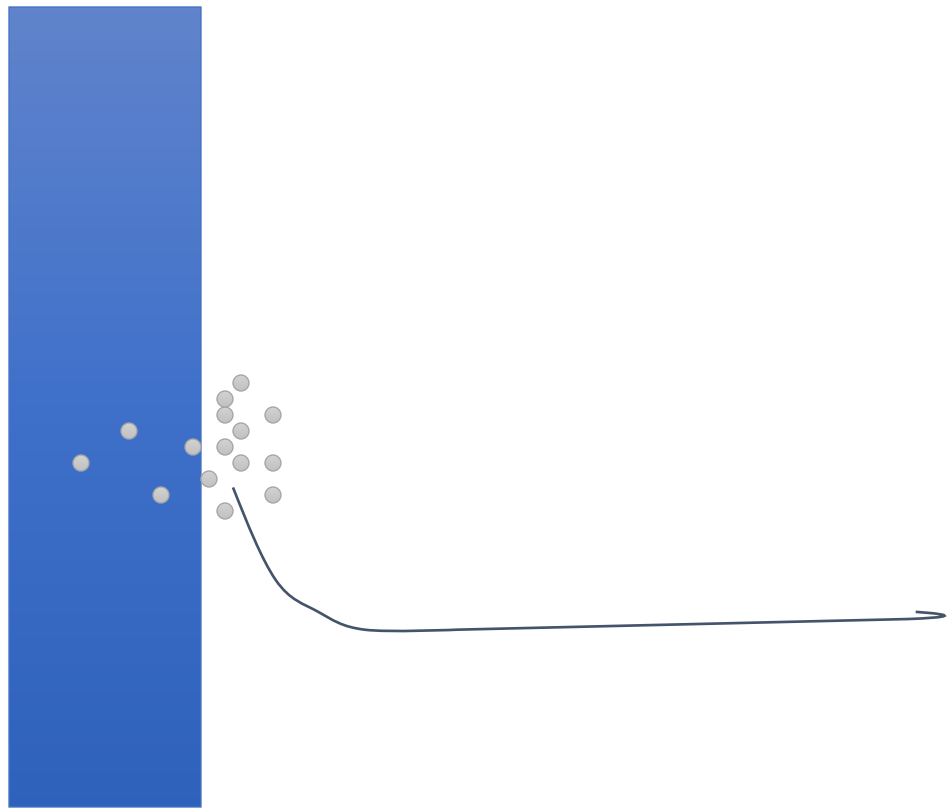


Pancaro et al. Neurology 2020 Feb 11;94(6)

1) Nerve Injuries are increasing
2) Routine Ultrasound
3) Intercristal line – go down one or two
4) SAIL Assessment

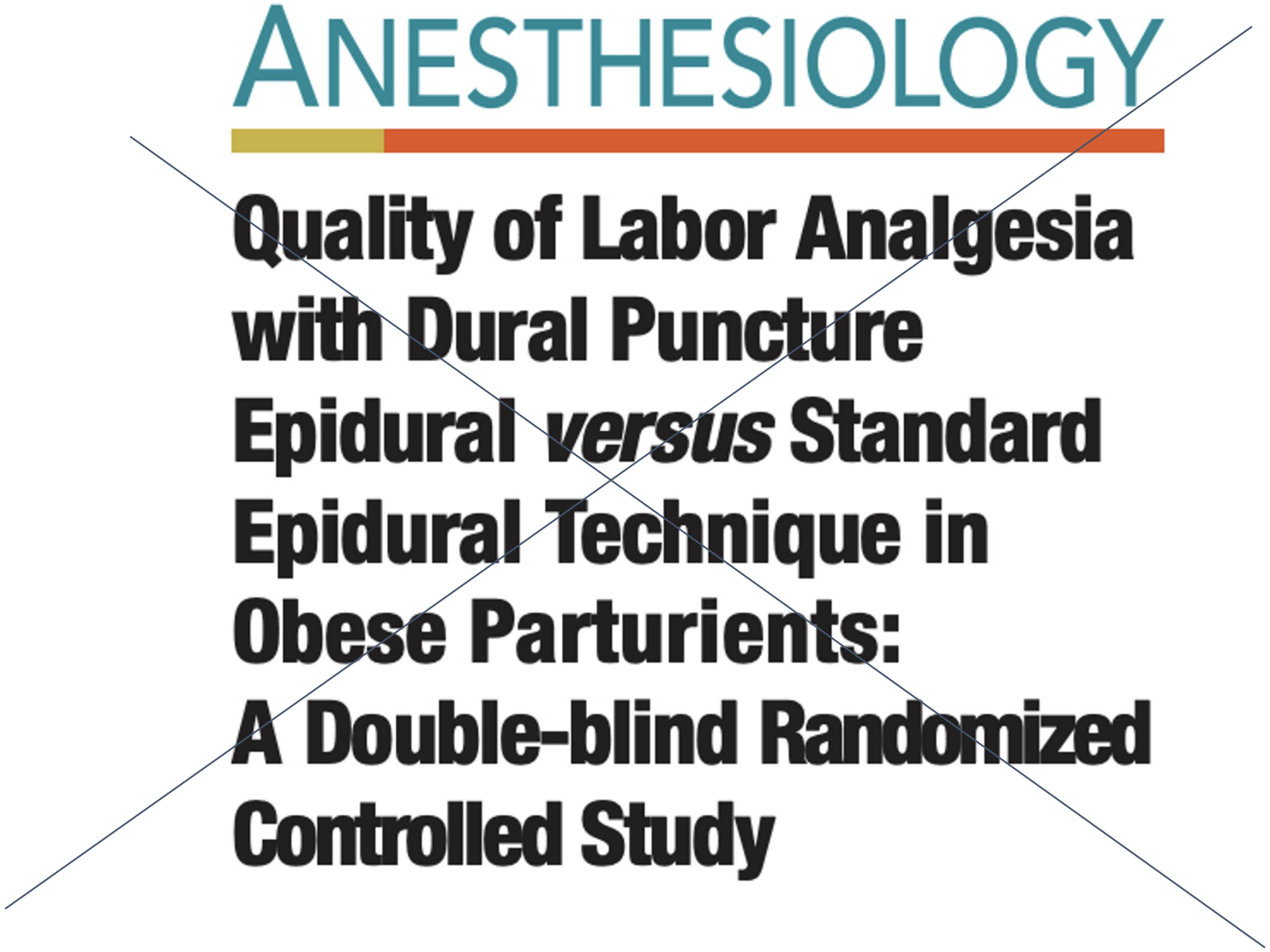
Emerging Neuraxial Techniques

Dural Puncture Epidural

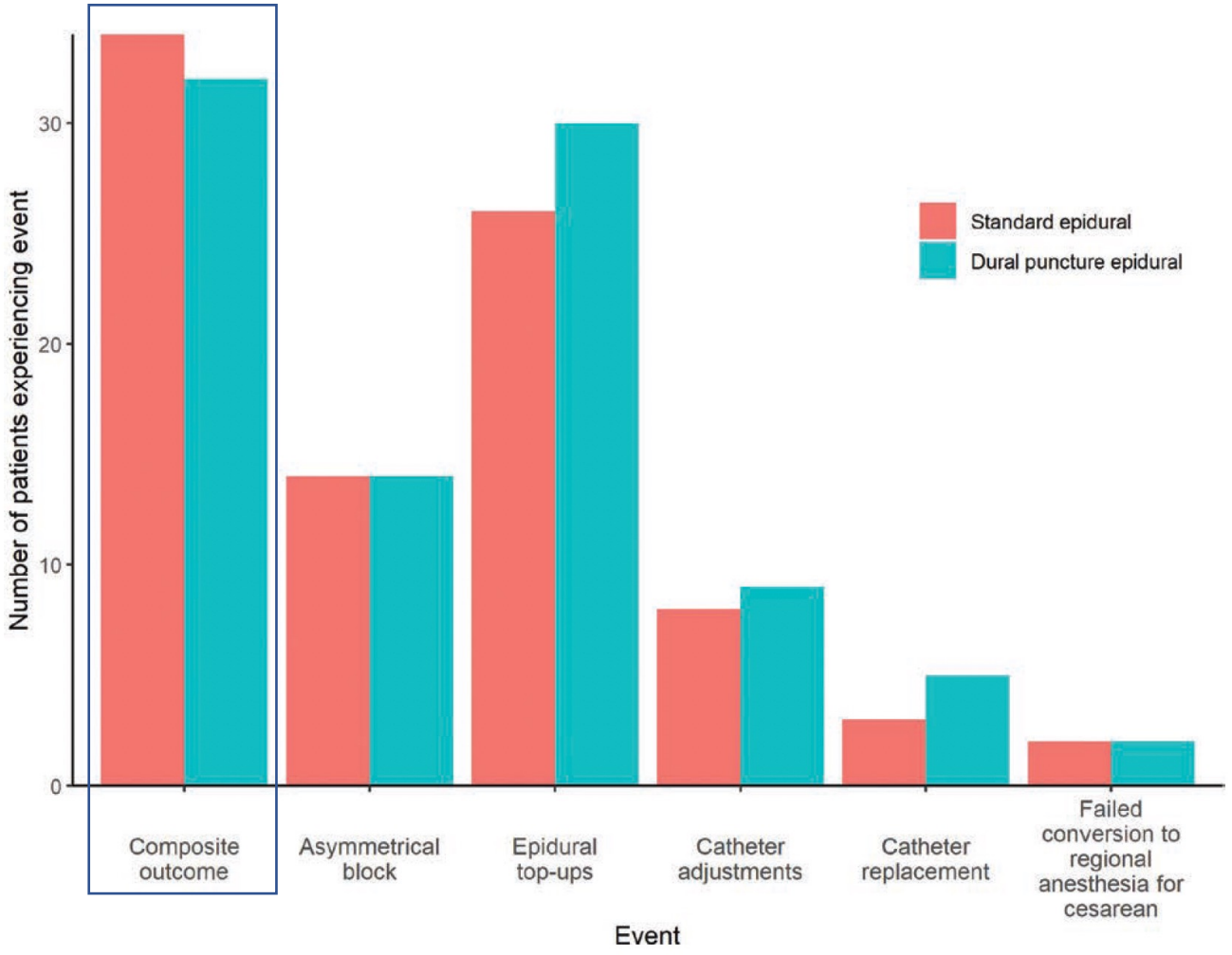


Needle Size Matters

	Needle size	DPE
Suzuki	26G Whitacre	Increased caudal spread
Thomas et al.	27G Whitacre	No difference
Cappiello et al.	25G Whitacre	Increased caudal spread
Chau et al.	25G Whitacre	Increased caudal spread better block symmetry
Wilson et al.	26G Whitacre	Analgesia 2 min earlier
Tan et al.	25G Whitacre	No difference
Sharawi et al.	25G Whitacre	Increased speed of Onset



Tan et al. Anesthesiology. May 2022, Vol. 136, 678–687.



Tan et al. Anesthesiology. May 2022, Vol. 136, 678–687.

EDITORIAL

Dural Puncture Epidural for Labor Analgesia: Is It Really an Improvement over Conventional Labor Epidural Analgesia?

Scott Segal, M.D., M.H.C.M., Peter H. Pan, M.D., M.S.E.E.

"Dural puncture epidural appears to be a clever idea in search of an indication."

Anesthesiology. May 2022, Vol. 136, 667–669.

POSSIBLE INDICATION

JAMA Network Open

RCT: Dural-Puncture Epidural vs Standard Epidural for Epidural Extension in Elective Cesarean Delivery

POPULATION

140 Women

Women scheduled for elective cesarean delivery

Mean [SD] age, 30.1 [5.2] y

INTERVENTION

140 Participants randomized

70 Dural-Puncture Epidural (DPE)
Analgesia was initiated using a DPE technique in the labor and delivery room

70 Standard Epidural
Analgesia was initiated using a standard epidural technique in the labor and delivery room

233 [104-369] seconds

SETTINGS / LOCATIONS

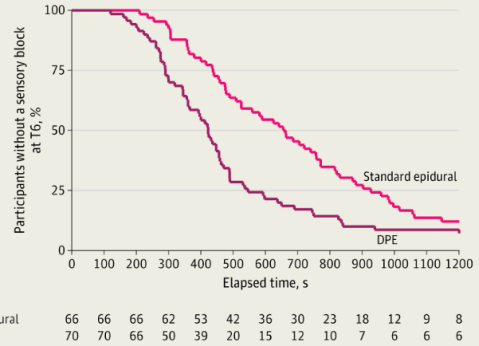
A tertiary care university hospital

PRIMARY OUTCOME

The primary outcome was the onset time to surgical anesthesia, which was defined as the start of epidural extension anesthesia to the loss of sharp sensation at the T6 level

FINDINGS

The DPE group had a statistically significant faster onset time to surgical anesthesia compared with the standard epidural group



DPE: 422 (290-546) seconds

Difference, 233 (104-369) seconds; $P < .001$

Sharawi N, Williams M, Athar W, et al. Effect of dural-puncture epidural vs standard epidural for epidural extension on onset time of surgical anesthesia in elective cesarean delivery: a randomized clinical trial. *JAMA Netw Open.* 2023;6(8):e2326710. doi:10.1001/jamanetworkopen.2023.26710

© AMA

JAMA Netw Open. 2023 Aug 1;6(8):e2326710.

Utility of DPE Technique

Potential applications for DPE technique

Epidural Difficulty

- Patient with h/o difficult epidural
- Dubious loss-of-resistance during epidural

Unique Anatomy

- Scoliosis
- Spine surgery

Other Indications

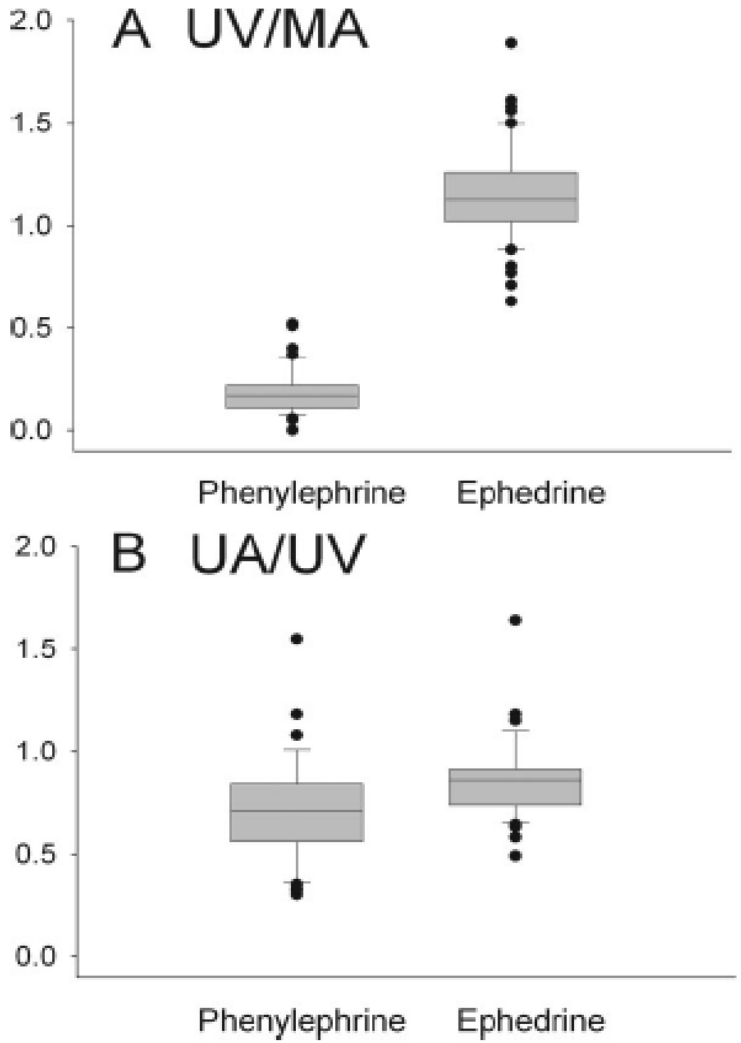
- Category II tracing
- Where CSE not preferred because fetus not continuously monitored or obstetrician not in-house

Intraoperative Hypotension

Misplaced Popularity of Ephedrine

Phenylephrine very commonly used

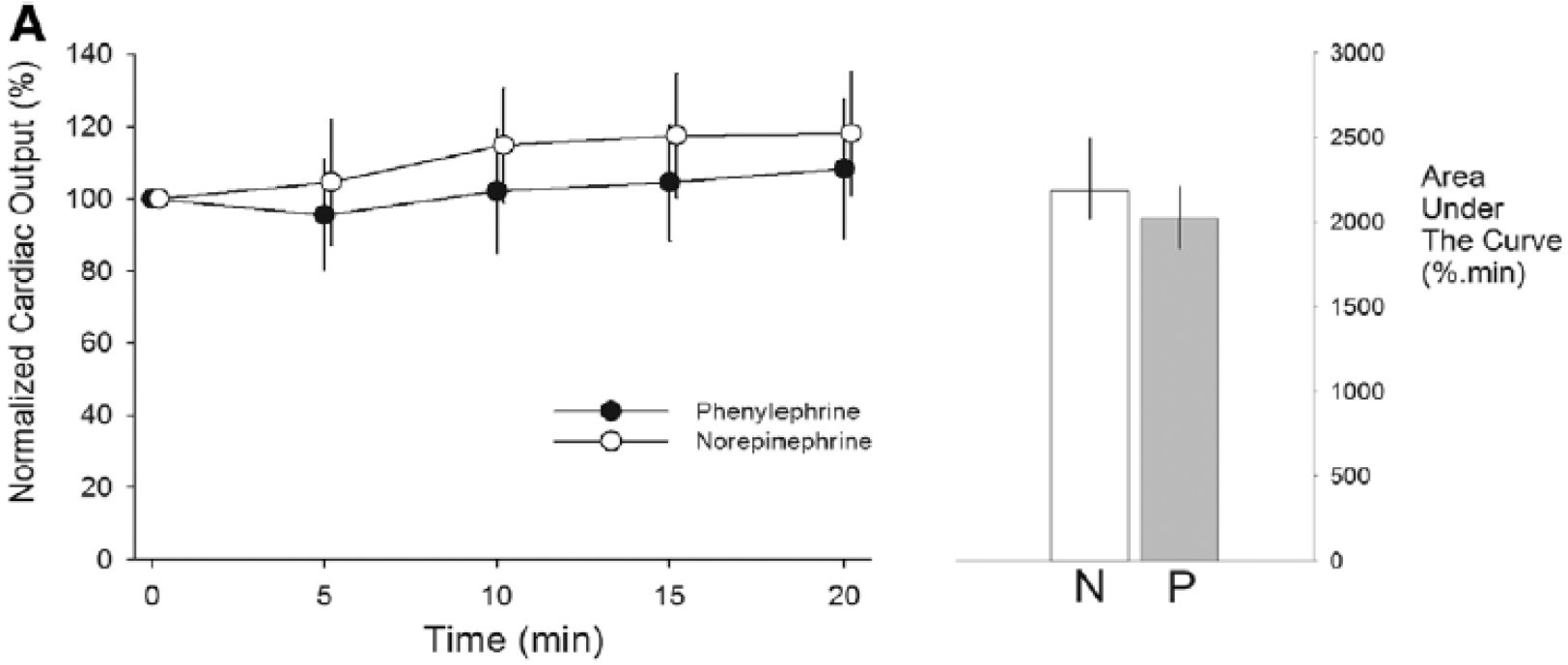
Ngan Kee et al., Anesthesiology 2009



- **Placental transfer:** Ephedrine > phenylephrine
- **Ephedrine:** stimulation of fetal metabolism, increased catecholamines
- UA/UV ratio for ephedrine higher: less fetal metabolism or redistribution
- **Remember:** no significant differences in clinical outcomes

Norepinephrine: The next Big Change ?

Ngan Kee et al., Anesthesiology 2015



Greater Cardiac Output and Lower incidence of Maternal bradycardia in Norepinephrine

Norepinephrine Infusion Regimen

Hasanin et al., Anesthesiology 2019

Question: What is the ideal norepinephrine infusion regimen?

Methodology: RCT involving 284 patients undergoing elective cesarean delivery at term

Arms: NE infusion at 0.025, 0.05, or 0.075 mcg/kg/min (8 mcg/mL concentration)

Primary outcome: Frequency of post-spinal hypotension

Norepinephrine Infusion Regimen

Hasanin et al., Anesthesiology 2019

Table 2. Maternal Outcomes

	0.025-μg · kg^{-1} · min^{-1} Group (n = 95)	0.050-μg · kg^{-1} · min^{-1} Group (n = 93)	0.075-μg · kg^{-1} · min^{-1} Group (n = 96)	OR or *Mean Difference* between 0.050-μg and 0.025-μg Groups (95% CI)	OR or *Mean Difference* between 0.075-μg and 0.025-μg Groups (95% CI)
Postspinal hypotension	40 (42.1)	23 (24.7)*	25 (26.0)†	0.45 (0.24 to 0.82)	0.48 (0.26 to 0.89)
Severe postspinal hypotension	7 (7.4)	4 (4.3)	4 (4.2)	0.57 (0.16 to 2)	0.55 (0.16 to 1.93)
Postdelivery hypotension	5 (5.3)	6 (6.3)	6 (6.3)	1.27 (0.37 to 4.32)	1.2 (0.35 to 4.07)
Bradycardia	4 (4.3)	3 (3.2)	7 (7.3)	0.76 (0.17 to 3.49)	1.79 (0.51 to 6.32)
Intraoperative hypertension	6 (6.3)	8 (8.6)	7 (7.3)	1.34 (0.47 to 4.19)	1.17 (0.38 to 3.61)
Nausea	8 (8.4)	10 (10.8)	8 (8.3)	1.31 (0.49 to 3.48)	0.99 (0.36 to 2.75)
Vomiting	7 (7.4)	7 (7.5)	6 (6.3)	1.02 (0.34 to 3.04)	0.84 (0.27 to 2.59)
Ephedrine requirements, mg	7 ± 10	5 ± 9*	5 ± 9†	*2.38 (–0.29 to 5.04)*	*2.49 (–0.14 to 5.11)*
Atropine requirements, mg	0.04 ± 0.15	0.02 ± 0.09	0.04 ± 0.13	*0.19 (–0.18 to 0.06)*	*0.001 (–0.039 to 0.042)*

Data are presented as mean ± SD, frequency (%), odds ratio (OR; 95% CI: lower limit to upper limit), and *mean difference (95% CI: lower limit to upper limit)*.
*Denotes statistical significance between the 0.025-μg · kg^{-1} · min^{-1} group and the 0.050-μg · kg^{-1} · min^{-1} group. †Denotes statistical significance between the 0.025-μg · kg^{-1} · min^{-1} group and the 0.075-μg · kg^{-1} · min^{-1} group.

Norepinephrine in Obstetrics

Dose Equivalence

Norepinephrine	:	Phenylephrine
8 µg		**100 µg**

Ngan Kee et al. Anesthesiology 2017; 127: 934–41.
Liu et al. Eur J Obstet Gynecol Reprod Biol. 2015 Nov;194:136-40.
Onwochei et al. Anesth Analg. 2017 Jul;125(1):212-218.

Norepinephrine in Obstetrics

Vasopressor drugs for the prevention and treatment of hypotension during neuraxial anaesthesia for Caesarean delivery: a Bayesian network meta-analysis of fetal and maternal outcomes

Preet M. Singh[1,*], Narinder P. Singh[2], Matthew Reschke[3], Warwick D. Ngan Kee[4], Arvind Palanisamy[1] and David T. Monks[1]

British Journal of Anaesthesia 124 (3): 95-107 (2020).

Norepinephrine in Obstetrics

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Ephedrine, Phenylephrine, Norepinephrine

Mephentermine, Metaraminol

British Journal of Anaesthesia 124 (3): 95-107 (2020).

Norepinephrine in Obstetrics

Norepinephrine and Mephentermine

lowest probability of adversely affecting fetal acid base status

Singh et at. British Journal of Anaesthesia 124 (3): 95-107 (2020).

Is Peripheral Norepinephrine Safe?

Methodology: Retrospective chart review from 2 hospitals in Utrecht and Amsterdam

Arms: No NE infusion (n=165426) vs. NE infusion (n=14385) (20mcg/mL concentration) for hypotension management under GA (non-OB patients)

Primary outcome

Frequency of extravasation: 5 (0.03%)

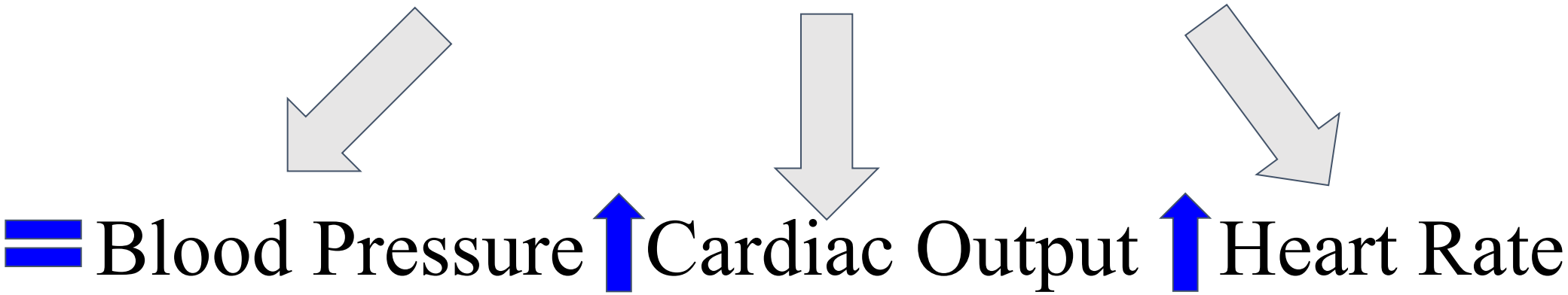
1-8 events per 10000 patients

Medical or surgical intervention: 0

Pancaro et al., Anesth Analg 2019

Norepinephrine in Obstetrics

Norepinephrine *vs* Phenylephrine



Norepinephrine in Obstetrics

When to use it

Norepinephrine in Obstetrics

When Phenylephrine is not effective

Norepinephrine in Obstetrics

Hypotension in suspected Maternal Sepsis

Escobar et al. Am J Obstet Gynecol MFM. 2020 Aug;2(3):100149.

Norepinephrine in Obstetrics

When β-adrenergic agonism is necessary beyond the phenylephrine α-adrenergic stimulation

Meng and Arendt. Anesthesiology 2021; 135:164–83.

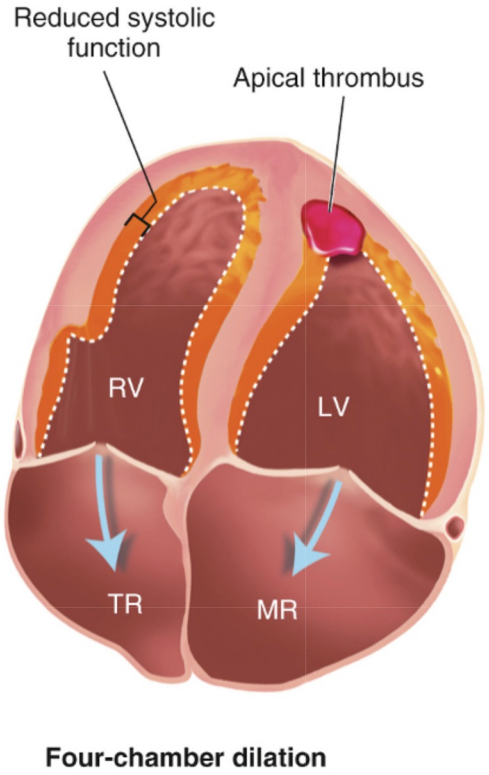
Norepinephrine in Obstetrics

Aortic and Mitral Regurgitation

Meng and Arendt. Anesthesiology 2021; 135:164–83.

Norepinephrine in Obstetrics

Peripartum and Dilated Cardiomyopathy

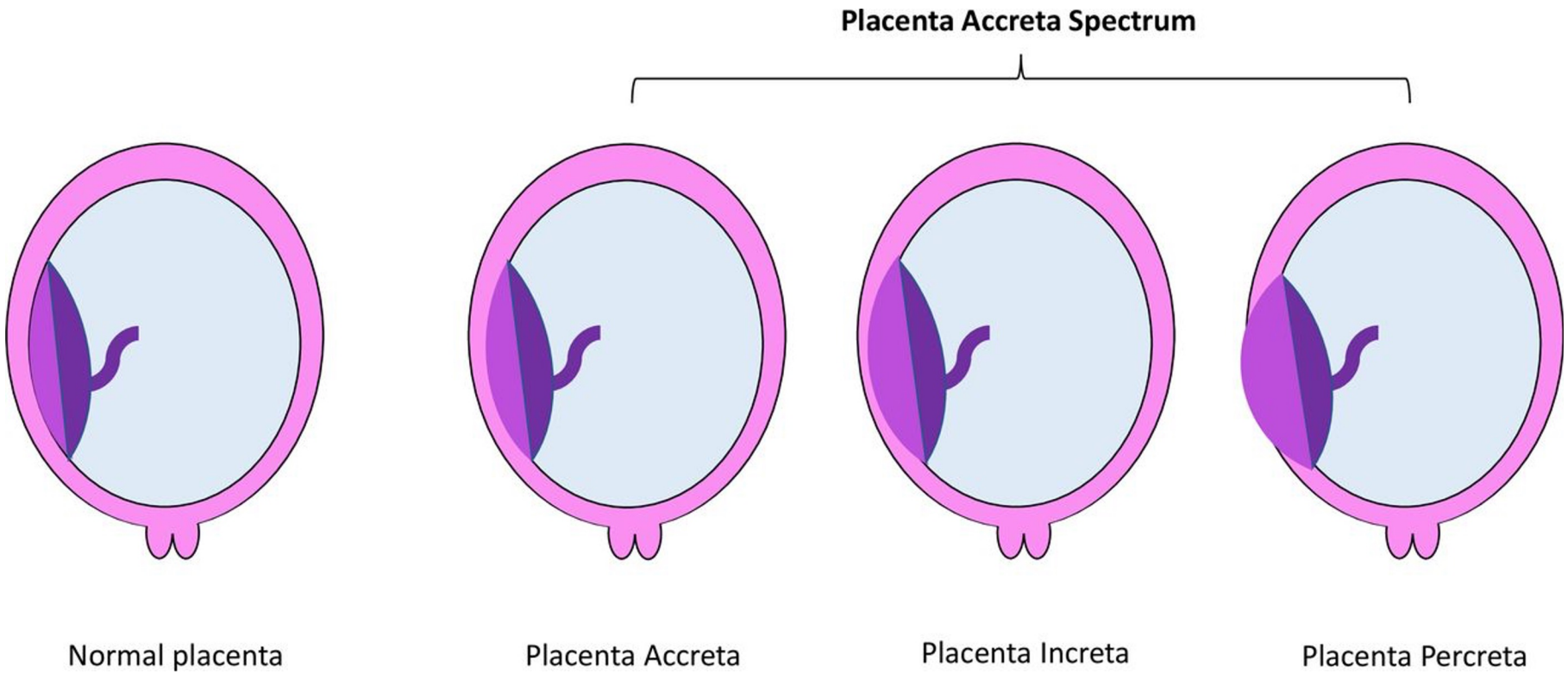


Meng and Arendt. Anesthesiology 2021; 135:164–83.

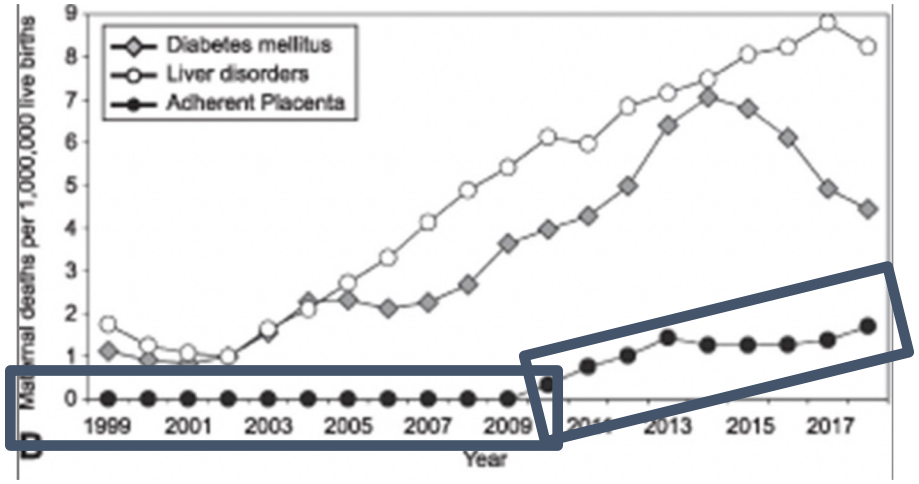
Figure from Otto Textbook of Clinical Echocardiography

Postpartum Hemorrhage

Placenta Accreta Spectrum



Placenta Accreta Spectrum



1:282

Joseph et al. Obst & Gynecol May 2021 - Volume 137 - Issue 5 - p 763-771

Intraoperative Multivessel Embolization

Placenta Accreta Spectrum Treatment With Intraoperative Multivessel Embolization: the PASTIME protocol

Intraoperative Uterine vessels Embolization **Deaths n=0/15**

vs

Iliac Artery Balloons **Deaths n=2/30**

Melber et al. Am J Obstet Gynecol. 2021 Oct;225(4):442.e1-442.e10.

Intraoperative Multivessel Embolization

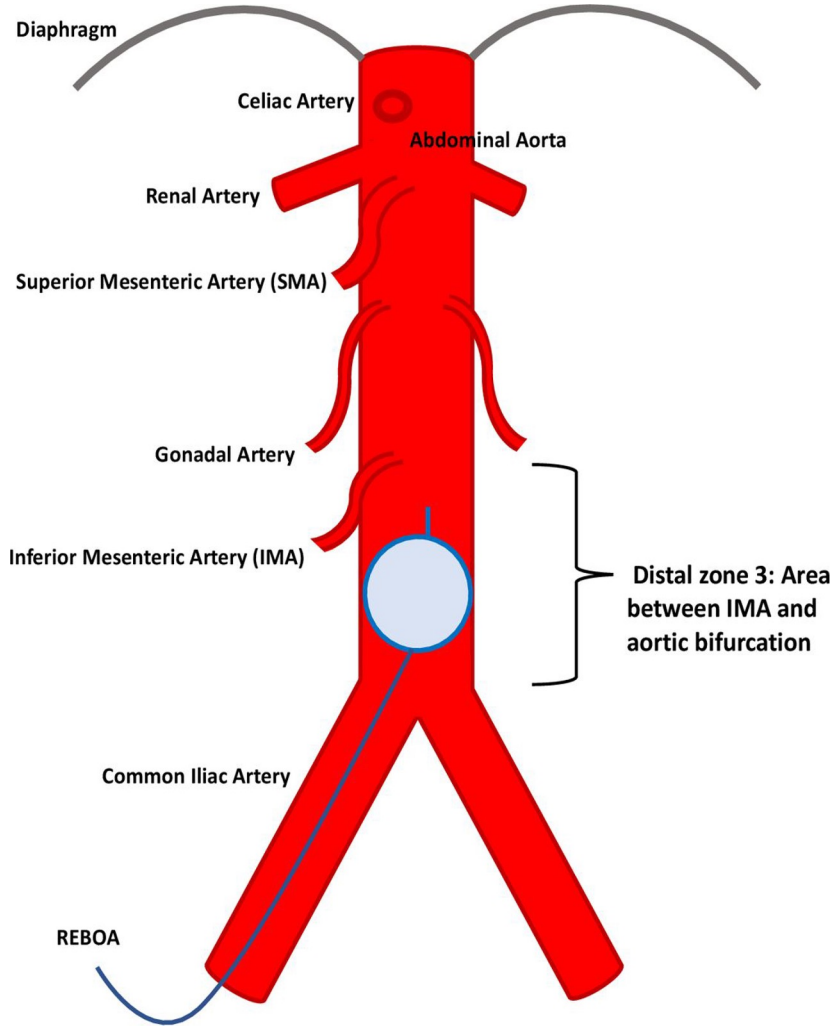
Placenta Accreta Spectrum Treatment With Intraoperative Multivessel Embolization: the PASTIME protocol

Intraoperative Uterine vessels Embolization — Blood loss **750 ml**

vs

Iliac Artery Balloons — Blood loss **1750**

Melber et al. Am J Obstet Gynecol. 2021 Oct;225(4):442.e1-442.e10.



Resuscitative **E**ndovascular **B**alloon **O**cclusion of the **A**orta

When the balloon goes up, blood transfusion goes down: a pilot study of REBOA in placenta accreta spectrum disorders

90 Patients

17 **REBOA** *vs* 73 **controls**

≥ 4 PRBC

17% *vs* 49% p=0.03

Ioffe et al. Trauma Surg Acute Care Open. 2021 Aug 13;6(1):e000750

Predicting Severity

External Validation of a Multivariable Prediction Model for Placenta Accreta Spectrum

Shubhangi Singh, MD,*† Daniela A. Carusi, MD,‡ Penny Wang, MS,‡ Elena Reitman-Ivashkov, MD,§ Ruth Landau, MD,§ Kara G. Fields, MS,* Carolyn F. Weiniger, MB ChB,‖ and Michaela K. Farber, MD, MS*

Does combining clinical risk factors and ultrasound findings predict which patients have placenta accreta compared to ultrasound alone?

The clinical utility of the model for predicting accreta is variable depending on the case mix of the target population

Anesth Analg. 2023 Sep 1;137(3):537-547

Predicting Severity

Predicting Placenta Accreta Spectrum Disorder: Are We There Yet?

Jessica R. Ansari, MD, and Alexander J. Butwick, MBBS, FRCA, MS

More work is needed

Anesth Analg. 2023 Sep 1;137(3):534-536

PREDICTING MAJOR BLOOD LOSS

- **ESTIMATED BLOOD LOSS 30 L**
- pRBC: 45 units
- FFP: 47 units
- PLTs: 8 packs
- Fibrinogen: 15 grams
- Calcium gluconate: 54 grams
- Tranexamic Acid: 3 grams
- Cell Saver: 852 mL
- Crystalloids: 3 L
- Rapid Infusion Total Volume: 33 L
- Prophylactic REBOA

PREDICTING MINOR BLOOD LOSS

"You might consider a SPINAL and a LARGE BORE IV access"

- **ESTIMATED BLOOD LOSS 30 L**
- pRBC: 23 units
- FFP: 22 units
- PLTs: 6 packs
- Fibrinogen: 11 grams
- Cryoprecipitate: 1unit
- Cell Saver: 1 L
- Crystalloids: 7 liters
- Emergent Aortic Cross Clamping

PREDICTING MINOR BLOOD LOSS

"You might consider a SPINAL and a LARGE BORE IV access"

- **ESTIMATED BLOOD LOSS 30 L**
- pRBC: 23 units
- FFP: 22 units
- PLTs: 6 packs
- Fibrinogen: 11 grams
- Cryoprecipitate: 1unit
- Cell Saver: 1 L
- Crystalloids: 7 liters
- **Emergent Aortic Cross Clamping**

Neuraxial Anesthesia During Cesarean Delivery for Placenta Previa With Suspected Morbidly Adherent Placenta: A Retrospective Analysis

129 Suspected Percreta

72 Hysterectomy

15 Required General Anesthesia

3 Difficult Intubations

Markley et al. Anesth Analg. 2018 Oct;127(4):930-938

EDITORIAL

Maternal Hemorrhage—Regional Versus General Anesthesia: Does It Really Matter?

Yaakov Beilin, MD

Anesth Analg. 2018 Oct;127(4):805-807

RISK FACTORS FOR POSTPARTUM HEMORRHAGE

RISK FACTORS

- Retained placenta/membranes
- Morbidly adherent placenta
- Failure to progress
- Lacerations
- Instrumental delivery
- Large for gestational age newborn
- Hypertensive disorders
- Prolonged first stage of labor
- Prolonged second stage of labor
- Induction of Labor

Validation of Postpartum Hemorrhage Admission Risk Factor Stratification in a Large Obstetrics Population

257 California hospitals

2 million women

40% of postpartum hemorrhages occurred in low risk hospitalizations

Ruppel et al. Am J Perinatol. 2021 Sep;38(11):1192-1200

Risk Factors

IS IT TIME TO STOP USING RISK-ASSESSMENT TOOLS?

Ende and Butwick Obstet Gynecol 2021 Dec 1;138(6):924-930

2015 NEAR-MISS POSTPARTUM HEMORRHAGE

Healthy in the Labor & Delivery room

Systolic Blood Pressure 60s at least for 30 min

Many Obstetricians and Nurses in the room

We were notified when patient arrived unconscious in the OR

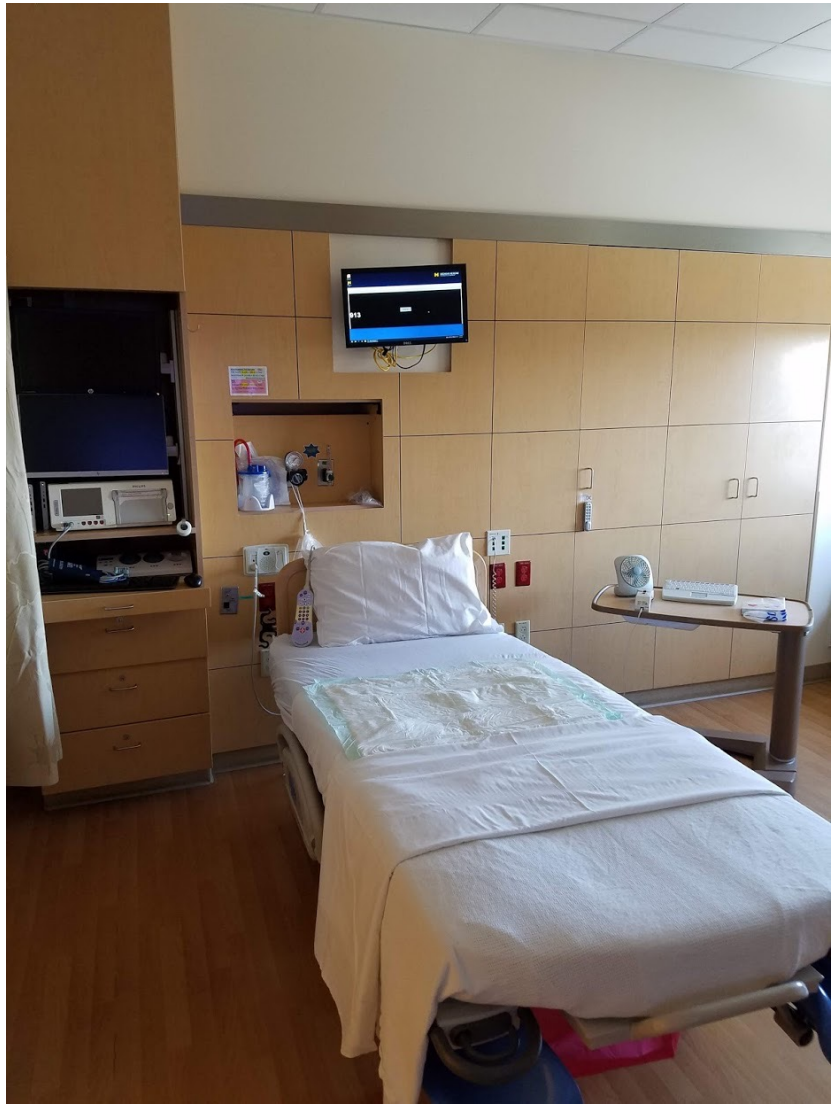


Table 1. The Maternal Early Warning Criteria

Systolic BP (mm Hg)	<90 or >160
Diastolic BP (mm Hg)	>100
Heart rate (beats per min)	<50 or >120
Respiratory rate (breaths per min)	<10 or >30
Oxygen saturation on room air, at sea level, %	<95
Oliguria, mL/hr for ≥2 hours	<35
Maternal agitation, confusion, or unresponsiveness; Patient with preeclampsia reporting a non-remitting headache or shortness of breath	

Mhyre J. et. al. Obstet Gynecol 2014;124:782–6

Automating a Maternal Early Warning System

~~Nurse~~

~~Room~~

~~Team~~

Use of a Novel Electronic Maternal Surveillance System and the Maternal Early Warning Criteria to Detect Severe Postpartum Hemorrhage

Thomas T. Klumpner, MD,*† Joanna A. Kountanis, MD,*† Sean R. Meyer, MBA,‡ Justin Ortwine, BS,* Melissa E. Bauer, DO,*† Alissa Carver, MD,† Anne Marie Piehl, MSN, RN, CNM,‡ Roger Smith, MD,† Graciela Mentz, PhD,* and Kevin K. Tremper, PhD, MD*

Ten of 120 Postpartum hemorrhages were identified by the automatic system but not by the early warning vital signs criteria

…and especially one…

Klumpner et al. Anesthesia & Analgesia: September 2020 - Volume 131 - Issue 3 - p 857-865

Post Dural Puncture Headache

JAMA Network Open

Consensus Statement | Anesthesiology

Consensus Practice Guidelines on Postdural Puncture Headache From a Multisociety, International Working Group

A Summary Report

Vishal Uppal, MBBS, MSc; Robin Russell, MBBS; Rakesh Sondekoppam, MD; Jessica Ansari, MD; Zafeer Baber, MD; Yian Chen, MD; Kathryn DelPizzo, MD; Dan Sebastian Dîrzu, MD; Hari Kalagara, MD; Narayan R. Kissoon, MD; Peter G. Kranz, MD; Lisa Leffert, MD; Grace Lim, MD; Clara A. Lobo, MD; Dominique Nuala Lucas, MBBS; Eleni Moka, MD; Stephen E. Rodriguez, MD; Herman Sehmbi, MD; Manuel C. Vallejo, MD; Thomas Volk, MD; Samer Narouze, MD, PhD

95% Positional

5 % Non-Positional

Russell et al. IJOA 2019; 38, 93-103

Conservative Management

Bed Rest

Oral Fluids

Abdominal Binders

Intravenous Fluid

Russell et al. IJOA 2019; 38, 93-103

Pharmacological Management

ORAL ANALGESICS SHOULD BE OFFERED

CAFFEINE < 200 mg/24 if Breastfeeding

CAFFEINE < 900 mg/24 if not Breastfeeding

STEROIDS/Triptans/Gabapentinoids/Other Medications

Russell et al. IJOA 2019; 38, 93-103

Pharmacological Management

Cosyntropin for Prevention and Treatment of Post-Dural Puncture Headache

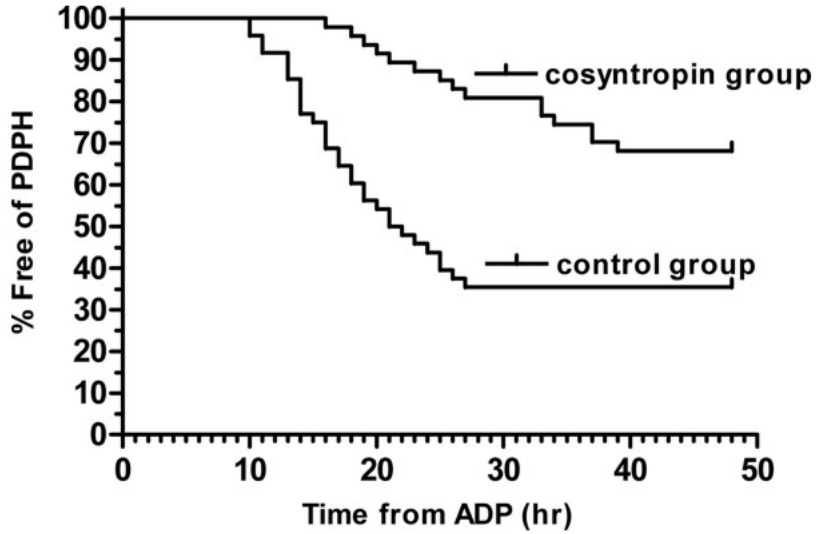
Cosyntropin for Prophylaxis against Postdural Puncture Headache after Accidental Dural Puncture

Sameh Michel Hakim, M.D.*

Anesthesiology. 2010;113:413–420.

Cosyntropin for Prophylaxis against Postdural Puncture Headache after Accidental Dural Puncture

Sameh Michel Hakim, M.D.*



Anesthesiology. 2010;113:413–420.

Contents lists available at ScienceDirect

International Journal of Obstetric Anesthesia

journal homepage: www.elsevier.com/locate/ijoa

Original Article

Role of cosyntropin in the management of postpartum post-dural puncture headache: a two-center retrospective cohort study

C. Pancaro *, K. Balonov, K. Herbert, N. Shah, S. Segal, R. Cassidy, M.C. Engoren, V. Manica, A.S. Habib

Departments of Anesthesiology at the University of Michigan, Tufts, Duke University School of Medicine, Wake Forest University School of Medicine and Medical University of South Carolina, USA

PROPHYLACTIC COSYNTROPIN

Characteristics	**Unexposed** (n=32)	**Exposed** (n=32)	P Value
Post-Dural Puncture Headache	**17 (53%)**	**19 (59%)**	**NS**
Epidural Blood Patch	6 (19%)	12 (38%)	NS
Hours from UDP to PDPH	16.5 [6.5-25]	20 [9-29]	NS
Highest Pain Score in PDPH	7 [7,8]	7 [6,9]	NS
Repeat Epidural Blood Patch	1 (3%)	0 (0%)	NS
Full Relief following Blood Patch	4 (67%)	9 (75%)	NS

Pancaro et al. Int J Obstet Anesth. 2023 Aug 3;103917

THERAPEUTIC COSYNTROPIN			
Characteristics	**Unexposed** (n=153)	**Exposed** (n=36)	P Value
Epidural Blood Patch	**43 (28%)**	**20 (56%)**	**0.002**
Hours from UDP to PDPH	24 [24,48]	24 [12,36]	0.008
Pain scores at the PDPH onset	5 [4, 8]	6 [3, 8]	NS
Pain scores one day following PDPH	3 [0, 7]	5 [2, 8]	NS
Difference in pain scores before and one day after drug exposure	0 [−3, 2]	0 [−4, 0]	NS
Highest pain score in pt with PDPH	8 [5, 9]	9 [7, 10]	0.002
Repeat Epidural Blood Patch	0 (0%)	6 (17%)	<0.001
Full Relief following Blood Patch	7 (16%)	10 (50%)	0.005

Pancaro et al. Int J Obstet Anesth. 2023 Aug 3;103917

NO ROLE FOR INTRAVENOUS COSYNTROPIN

Pancaro et al. Int J Obstet Anesth. 2023 Aug 3;103917

Invasive Procedures

Acupuncture

Sphenopalatine Ganglion Block

Greater Occipital Nerve Block

Prophylactic Blood Patch

Epidural Morphine

Epidural Crystalloid

Epidural Fibrin Glue

Russell et al. IJOA 2019; 38, 93-103

Epidural Blood Patch

Timing > 48 h

Volume - no benefit if > 20 ml given

Intervertebral Level - at the site or lower

Efficacy
60-70% Full Relief 90-100% Partial Relief
Second Blood patch sometimes necessary

Russell et al. IJOA 2019; 38, 104-118

Epidural Blood Patch

If second blood patch not successful – Head Imaging

Back pain in 50% -Backache follows in 24 hours 80%

Backache lasts up to FOUR weeks

Aracnoiditis and Spinal Hematoma are rare complications

Russell et al. IJOA 2019; 38, 104-118

Two women died following accidental dural puncture not adequately followed up

MMBRACE-UK Saving lives and Improving Mothers' Care

Russell et al. IJOA 2019; 38, 93-103

Differential Diagnosis List is Long

Post-Partum Preeclampsia

Cerebral Hemorrhage

Subdural Hematoma

Cerebral Vein Thrombosis

Russell et al. IJOA 2019; 38, 93-103

Epidural Blood Patch

Important to follow-up after Unexpected Dural Puncture and following Epidural Blood Patch

Russell et al. IJOA 2019; 38, 104-118

Svensk Förening för
Anestesi och Intensivvård

Umeå 19-22 September 2023

Tusen Tack!

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@CarloPancaro