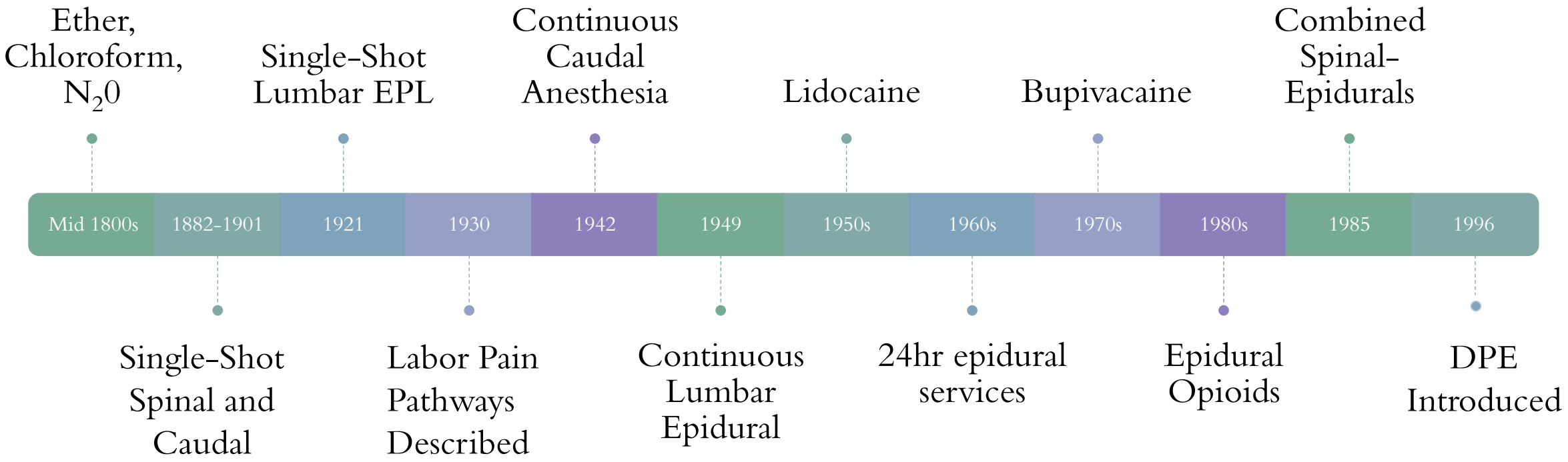
DURAL PUNCTURE EPIDURAL

A HOLE LOT BETTER?

Ora Bollinger DNAP, CRNA

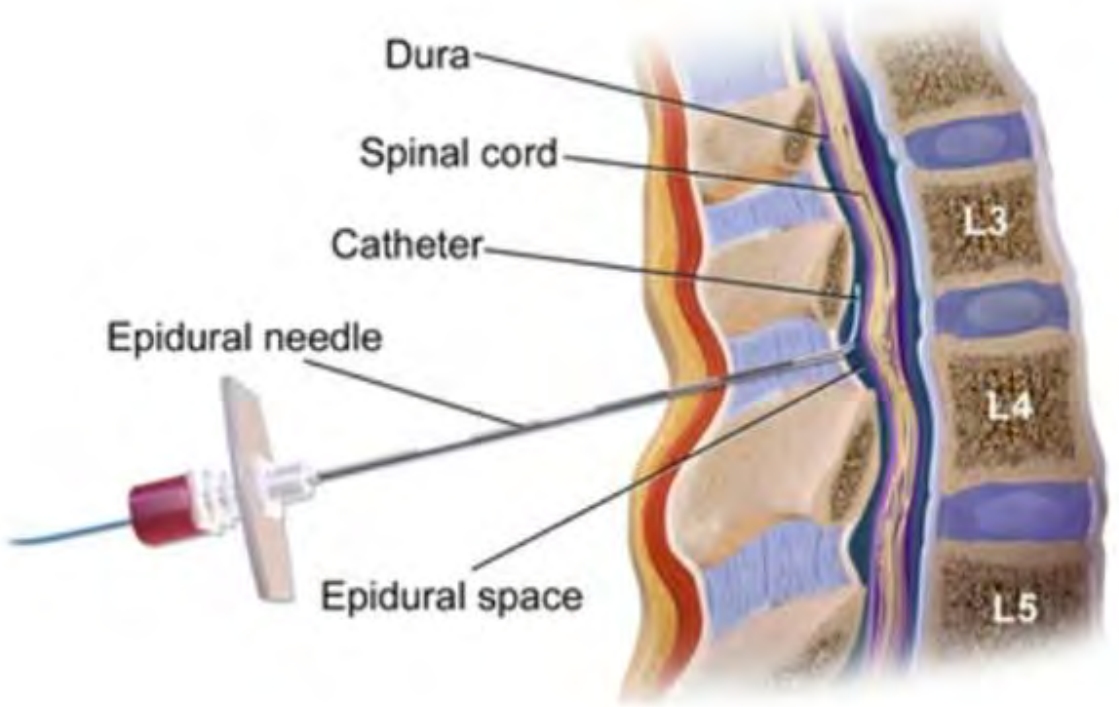
CANA Fall 2024

Obstetric Anesthesia Timeline



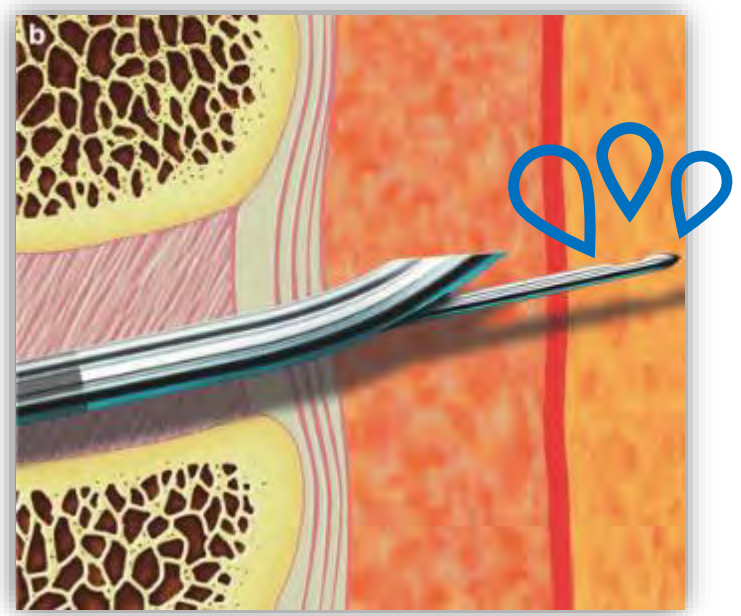
Traditional Labor Epidural Technique

- An epidural needle is placed in the lumbar epidural space through which a catheter is threaded
- Combination of local anesthetic (LA) +/- opioids are injected
- The injectate slowly diffuses to the site of action and stops pain transmission
- The catheter is placed on an infusion pump for continuous labor analgesia

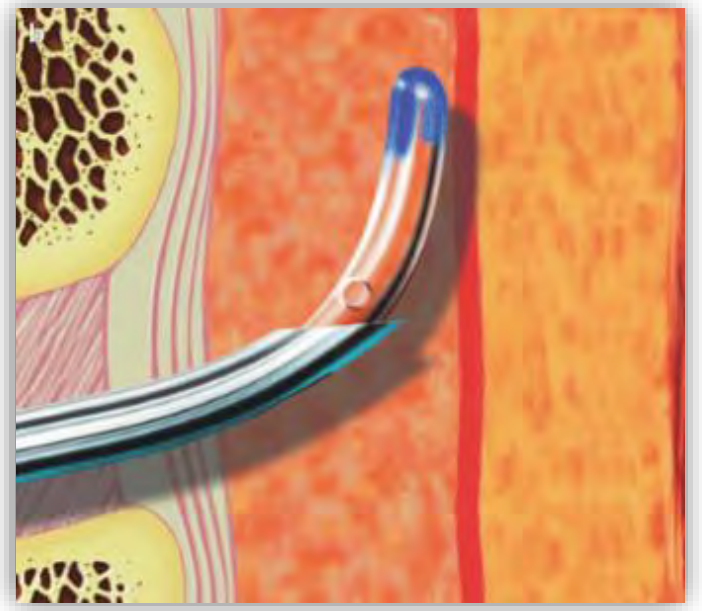


https://www.phsmedicalsolutions.com/blog/epidural-risks-mother-baby

Combined Spinal-Epidural (CSE)



- A technique in which a spinal needle is passed through the epidural needle puncturing the dura mater



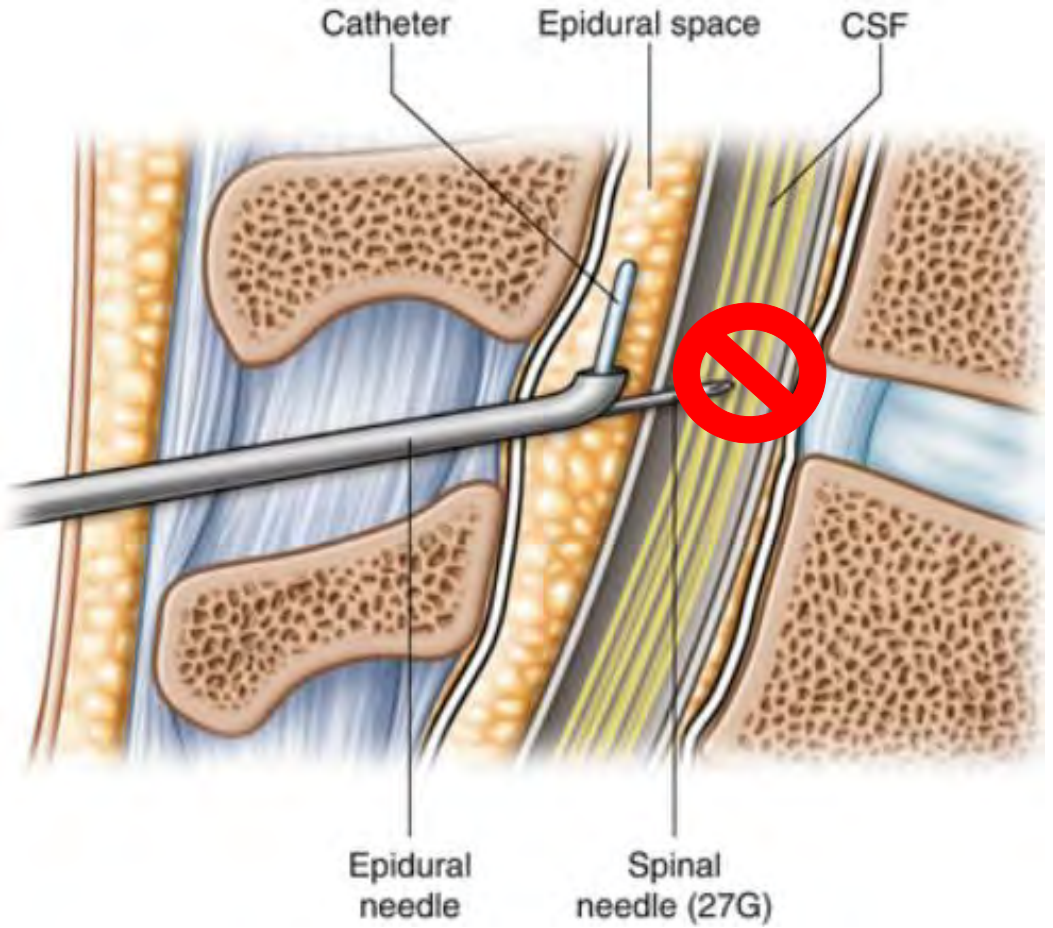
- LA +/- opioid are injected into the subarachnoid space, the spinal needle is withdrawn, and the catheter is threaded into the epidural space

- Combines the rapid onset of spinal anesthesia with the ability to supplement and extend the duration of the block via the epidural catheter

Jankovic, D. (2015). Combined Spinal and Epidural Anesthesia (CSE).

Dural Puncture Epidural (DPE) Technique

- Dura is intentionally punctured with spinal needle, but *without* administration of medication
- Spinal needle is withdrawn, followed by catheter placement
- Creates a conduit between the epidural space and intrathecal space
- Translocation of LA and opioids thought to:
  - speed onset
  - improve quality of analgesia
  - improve bilaterality of block
  - enhance sacral analgesia



Turnbull, J.H., Aleshi, P. (2015). Spinal and Epidural Anesthesia. In: Sikka, P., Beaman, S., Street, J. (eds) Basic Clinical Anesthesia. Springer, New York, NY.

Early Conflicting Studies

Dural puncture with a 26-gauge spinal needle affects spread of epidural anesthesia

N Suzuki [1], M Koganemaru, S Onizuka, M Takasaki

Suzuki et al (1996) showed that dural puncture technique using a 26-gauge Whitacre spinal needle increases caudal spread of analgesia when compared to CLE

A Randomized Trial of Dural Puncture Epidural Technique Compared with the Standard Epidural Technique for Labor Analgesia

CONCLUSIONS: Dural puncture with a 25-G spinal needle immediately before the initiation of epidural analgesia improves the sacral spread, onset, and bilateral pain relief produced by analgesic concentrations of bupivacaine with fentanyl in laboring nulliparous patients.

(Anesth Analg 2008;107:1646-51)

Early Conflicting Studies

Dural Puncture with a 27-Gauge Whitacre Needle as Part of a Combined Spinal–Epidural Technique Does Not Improve Labor Epidural Catheter Function

John A. Thomas, M.D., Peter H. Pan, M.D.,† Lynne C. Harris, B.S.N.,‡ Medge D. Owen, M.D.,† Robert D'Angelo, M.D.†*

DURAL PUNCTURE EPIDURAL ANALGESIA IS NOT SUPERIOR TO CONTINUOUS LABOR EPIDURAL ANALGESIA

DEEPAK GUPTA*, ARVIND SRIRAJAKALIDINDI*, VITALY SOSKIN**

International Journal of Obstetric Anesthesia (2019) 40, 24–31
0959-289X/$ - see front matter
https://doi.org/10.1016/j.ijoa.2019.05.007

2019: 5 RCTs

ELSEVIER
www.obstetanesthesia.com

ORIGINAL ARTICLE

Dural puncture epidural versus conventional epidural block for labor analgesia: a systematic review of randomized controlled trials

M. Heesen,[a] K. Rijs,[b] R. Rossaint,[c] M. Klimek[b]
[a]*Department of Anesthesia, Kantonsspital Baden, Baden, Switzerland*
[b]*Department of Anesthesiology, Erasmus University Medical Centre, Rotterdam, The Netherlands*
[c]*Department of Anesthesia, University Hospital RWTH Aachen, Aachen, Germany*

Conclusion: There is a lack of clear evidence on either the benefits or the risks of the DPE technique, such that a recommendation for or against its routine use is premature. Two of the three studies showing a beneficial effect of DPE came from the same institution and replication of the findings by other groups is warranted.

2019: 6 RCTs

Contents lists available at ScienceDirect

Journal of Clinical Anesthesia

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

A systematic review of DURAL puncture epidural analgesia for labor☆

Sebastián Layera[a], Daniela Bravo[a], Julián Aliste[a], De Q. Tran[b,*]

[a] Hospital Clínico Universidad de Chile, Department of Anesthesia, University of Chile, Office B222 second floor, sector B, 999 Santos Dumont, Independencia, Santiago 8380456, Chile

[b] St Mary's Hospital, Department of Anesthesia, McGill University, 3830 Ave Lacombe, Montreal, Quebec H3T-1M5, Canada

Conclusions: The current evidence regarding DPEA for labor analgesia remains ambiguous. Future research should investigate the optimal (spinal) needle size for dural puncture as well as factors governing transmeningeal flux of local anesthetics and opioids in the presence of a dural hole.

Early Studies Inconclusive

- Early RCTs contradictory and inconclusive
- Two systematic reviews drew ambiguous conclusions
- Limited early studies published showed marked heterogeneity
  - *size of spinal needles (25G, 26G, 27G)*
  - *epidural catheter design (multi-orifice vs. open tip)*
  - *local anesthetic volume and concentration (loading doses and infusions)*
  - *epidural pump programming (continuous infusion, boluses PRN, PCEA, PIEB)*
- DPE technique not fully embraced by anesthesia community
- Remains to be an underutilized neuraxial technique and controversial

What *DID* we know?

EPL

- Slower onset
- Inadequate analgesia:
  - sacral sparing
  - patchy, or unilateral analgesia coverage
- Minimal adverse effects

CSE

- Rapid onset
- Favorable block qualities
- Higher patient satisfaction
- Maternal adverse events
- Fetal adverse events

DPE: inadequate body of evidence → resurgence of RCTs

Published 2024
Seven RCTs (2008-2022)

Dural puncture epidural with 25-G spinal needles versus conventional epidural technique for labor analgesia: A systematic review of randomized controlled trials

Wenqian Lin[a,b,c], Jun Lin[a,b,c], Yongyong Yang[a,b,c], Lianhe Lin[d,*] and Qun Lin[a,b,c,*]
[a]*Department of Anesthesiology, The First Affiliated Hospital, Fujian Medical University, Fuzhou, Fujian, China*
[b]*Department of Anesthesiology, National Regional Medical Center, Binhai Campus of the First Affiliated Hospital, Fujian Medical University, Fuzhou, Fujian, China*
[c]*Anesthesiology Research Institute, The First Affiliated Hospital, Fujian Medical University, Fuzhou, Fujian, China*
[d]*Department of Ultrasound, The First Affiliated Hospital of Fujian Medical University, Fuzhou, Fujian, China*

Summary of Findings

- DPE was faster to achieve pain scores < 3/10
- DPE was associated with greater frequency of sacral sensory blockade
  - more rapid sacral blockade
  - fewer patients without S2 blockade
  - more patients with bilateral S2 blockade
- DPE associated with fewer top up doses
- DPE was associated with a reduced incidence of asymmetric block
- No difference in adverse effects or patient satisfaction

The *Ideal* Technique

EPL vs. CSE vs. DPE

- Confirmation of location
- Quick onset
- Sacral coverage
- Bilaterality
- Tested catheter

- Progress of labor
- ↓ maternal adverse events
- ↓ fetal adverse events
- ↓ workload

TECHNIQUE ADVANTAGES

Confirmation of Location

- Thomas JA, Pan PH, Harris LC, Owen MD, D'Angelo R. *Anesthesiology*. 2005.
  - DP-No CSF 22.2% Fail
  - DP-CSF 9.3% Fail
- Gupta D, Srirajakalidindi A, Soskin V. *M.E.J Anesth*. 2013.
- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg*. 2008.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg* 2017.

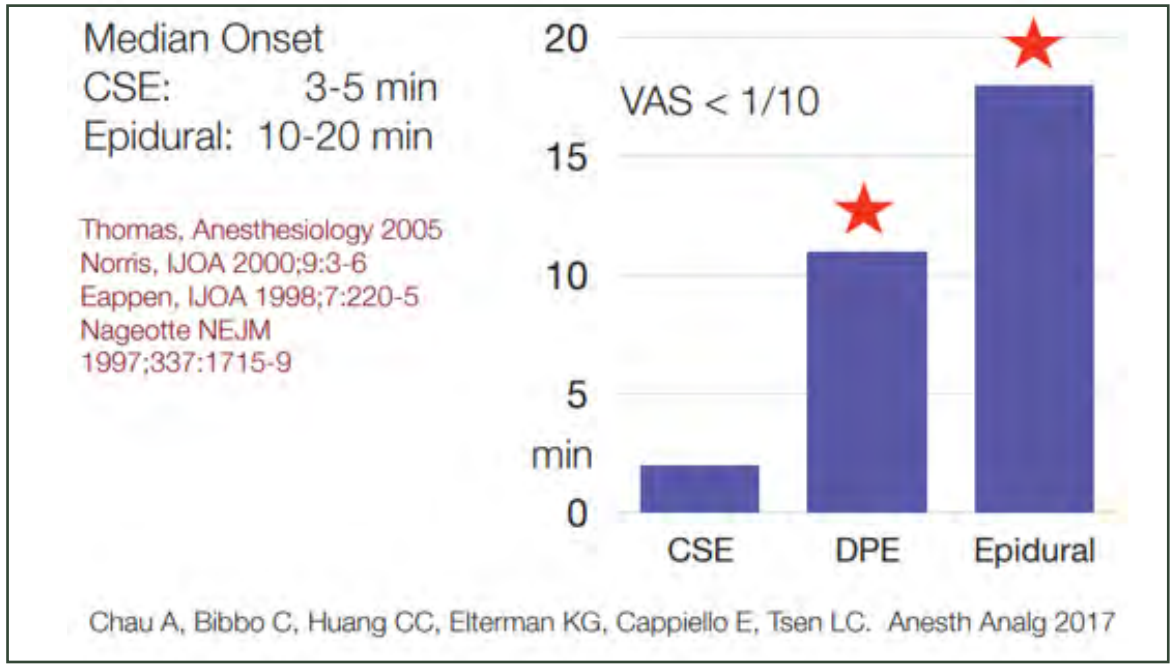
CHARACTERISTIC	CSE	DPE	EPL
Location Confirmation	X	X	

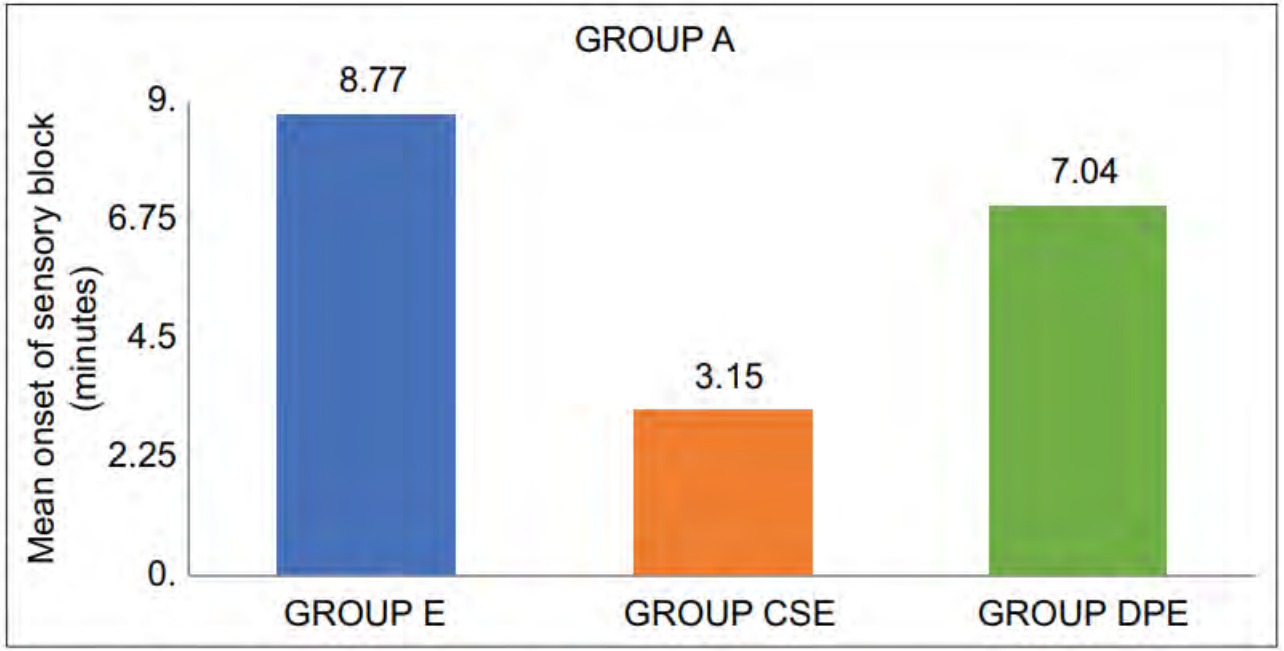
Speed of Onset

- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg* 2008.
- *Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg.* 2017.
- Song Y, Du W, Zhou S, Zhou Y, Yu Y, Xu Z, et al. *Anesthesia and Analgesia*. 2021.
- Wang J, Zhang L, Zheng L, Xiao P, Wang Y, Zhang L, et al. *Annals of Palliative Medicine*. 2021.
- Wang SY, He Y, Zhu HJ, Han B. *World J Clin Cases*. 2022.
- Pažur I, Ožegić O, Lijović L, Jaić KK, Pešić. Turk J *Anaesthesiol Reanim*. 2023.
- Sharawi N, Williams M, Athar W, et al. *JAMA Netw Open.* 2023.
- Lin, W., Yang, Y., Lin, J., Chen, J., & Lin, Q. *Journal of Pain Research*. 2023.
- *Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. J Obstet Anaesth Crit Care 2024.

CHARACTERISTIC	CSE	DPE	EPL
Location Confirmation	X	X	
Faster Onset	X	X	

Speed of Onset





Graph 1: Mean onset of sensory block (minutes)

Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. Comparison of epidural, combined spinal epidural and dural puncture epidural techniques for labor analgesia. J Obstet Anaesth Crit Care 2024;14:45-53.

A recent study compared three approaches to early labor pain relief.[1]

Although time to achieve pain relief was significantly shorter with CSE...

... with DPE, fewer patients needed physician top-ups.

Bibbo C, Huang CC, Elterman KG, Capiello EC, Robinson JN, Tsen LC. Dural puncture epidural technique improves labor analgesia quality with fewer side effects compared with epidural and combined spinal epidural techniques: a randomized clinical trial. *Anesth Analg*. 2017;124:560–569.

Sacral Coverage

- Suzuki N, Koganemaru M, Onizuka S, Takasaki M. *Anesth Analg.* 1996.
- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg.* 2008.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg.* 2017.
- Wang J, Zhang L, Zheng L, Xiao P, Wang Y, Zhang L, et al. *Annals of Palliative Medicine.* 2021.
- Song Y, Du W, Zhou S, Zhou Y, Yu Y, Xu Z, et al. *Anesthesia and Analgesia.* 2021.
- Wang SY, He Y, Zhu HJ, Han B. *World J Clin Cases.* 2022.
- Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. *J Obstet Anaesth Crit Care.* 2024.

CHARACTERISTIC	CSE	DPE	EPL
Location Confirmation	X	X	
Faster Onset	X	X	
Sacral Coverage	X	X	

Bilaterality

- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg.* 2008.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg.* 2017.
- Tan HS, Reed SE, Mehdiratta JE, Diomede OI, Landreth R, Gatta LA, et al. *Anesthesiology.* 2022.
- Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. *J Obstet Anaesth Crit Care.* 2024.

CHARACTERISTIC	CSE	DPE	EPL
Location Confirmation	X	X	
Faster Onset	X	X	
Sacral Coverage	X	X	
Bilateral Spread	X	X	

17G Touhy epidural needle, 25G Whitacre spinal needle

FOUR 60 KG LIVE, ANESTHETIZED, INTUBATED FEMALE PIGS

PLACED IN THE LEFT LATERAL DECUBITUS POSITION, EACH PIG HAD AN EPL, DPE, CSE OR INADVERTENT DURAL PUNCTURE USING LOR WITH AIR UNDER FLUOROSCOPY

RADIO-OPAQUE CONTRAST (1 ML) WAS ADMINISTERED VIA THE EPL CATHETER AT 0, 45, 90, 135, 3 HRS., AND 6 HRS.

SPREAD WAS ASSESSED WITH FLUOROSCOPY DURING INJECTIONS AND NECROSCOPY

CONCLUSION: DURAL SAC PUNCTURE ALLOWS TRANSLOCATION OF MEDICATION (DYE) FROM THE EPIDURAL SPACE TO THE SUBARACHNOID SPACE FOR *AT LEAST* 6 HRS.

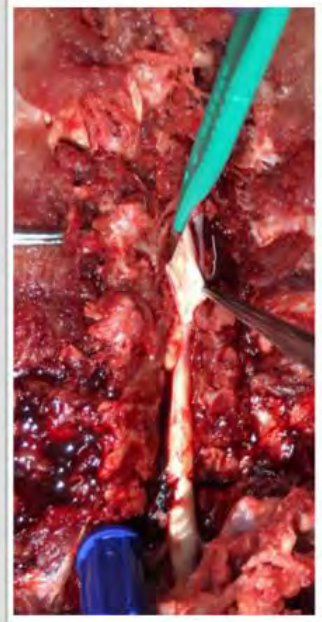
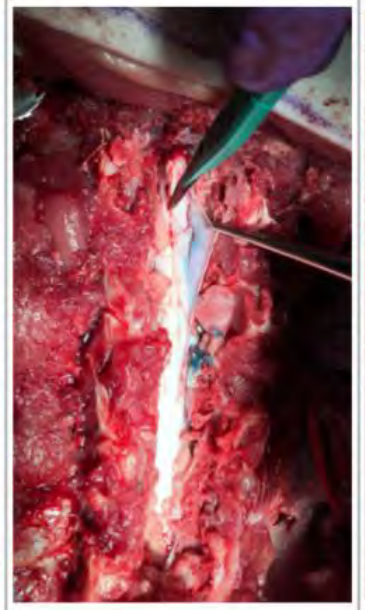
	EPL	DPE	CSE	Inadvertent Dural Puncture
Necropsy				
Dye Epidural	+	+	+	+
Dye Intrathecal	-	+	++	++

Table 1. Necropsy dye distribution, spread, and magnitude for epidural (EPL), dural puncture epidural (DPE), combined spinal epidural (CSE), and inadvertent dural puncture epidural techniques.

Richey, Christopher. 2020. Mechanistic Evaluation of the Dural Puncture Epidural in a Porcine Model. Doctoral dissertation, Harvard Medical School.

Tested Catheter

- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg.* 2008.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg.* 2017
- Eappen, *IJOA.* 1998
- Norris, *IJOA.* 2000
- Van de Velde, *Anaesth Intens Care.* 2001.
- Thomas JA, Pan PH, Harris LC, Owen MD, D'Angelo R. *Anesthesiology.* 2005.
- Bauer, Tsen, *IJOA.* 2012.
- Groden et al. *IJOA.* 2016.
- Booth et al. *Anesth.* 2016.

CHARACTERISTIC	CSE	DPE	EPL
Location Confirmation	X	X	
Faster Onset	X	X	
Sacral Coverage	X	X	
Bilateral Spread	X	X	
Tested Catheter		X	X

Failure Rate of CSEs

FAILED BLOCKS	NEEDLE	CSE	EPL
Eappen N = 4240	25G	7.2%	13.1%
Thomas N = 248	27G	8%	9.3%
Booth N = 955/1440	27G	6.6%	11.6%
Groden N = 1507/3980	27G	2.1%	3.9%

Eappen, IJOA 1998; Thomas, Anesth 2005; Booth, Anesth 2016, Groden et al. *IJOA*. 2016

Quality of Anesthesia for Repeat C/S

- Wang SY, He Y, Zhu HJ, Han B. *World J Clin Cases.* 2022.
- Sharawi N, Williams M, Athar W, et al. *JAMA Netw Open.* 2023.

CHARACTERISTIC	CSE	DPE	EPL
Location Confirmation	X	X	
Faster Onset	X	X	
Sacral Coverage	X	X	
Bilateral Spread	X	X	
Tested Catheter		X	X
Superior Anesthesia with C/S	?	X	

Randomized Controlled Trial

Dural puncture epidural technique provides better anesthesia quality in repeat cesarean delivery than epidural technique: Randomized controlled study

Sheng-You Wang, Yan He, Hai-Juan Zhu, Bo Han

CONCLUSION

The DPE technique provided higher-quality anesthesia than the EA technique, with a rapid onset of surgical anesthesia, better cranial and sacral sensory block spread and a higher motor block degree, without increasing the incidence of maternal or fetal side effects in patients undergoing repeat cesarean delivery.

Wang SY, He Y, Zhu HJ, Han B. Dural puncture epidural technique provides better anesthesia quality in repeat cesarean delivery than epidural technique: Randomized controlled study. *World J Clin Cases*. 2022 Jul 16;10(20):6890-6899.

Original Investigation | Anesthesiology

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

Nadir Sharawi, MBBS, MSc; Matthew Williams, MD; Waseem Athar, MD; Caroline Martinello, MD; Kyle Stoner, MD; Cameron Taylor, MD; Nan Guo, PhD; Pervez Sultan, MBChB, MD (Res); Jill M. Mhyre, MD

*simulated an emergent cesarean section

CONCLUSIONS AND RELEVANCE Anesthesia initiated following a DPE technique resulted in faster onset and improved block quality during epidural extension compared with initiation with a standard epidural technique. Further studies are needed to confirm these findings in the setting of intrapartum cesarean delivery.

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).

Quality of Analgesia with a Programmed Intermittent Epidural Bolus (PIEB)

- Song Y, Du W, Zhou S, Zhou Y, Yu Y, Xu Z, et al. *Anesthesia and Analgesia*. 2021.
- Wang J, Zhang L, Zheng L, Xiao P, Wang Y, Zhang L, et al. *Annals of Palliative Medicine*. 2021.
- Lin, W., Yang, Y., Lin, J., Chen, J., & Lin, Q. *Journal of Pain Research*. 2023.

CHARACTERISTIC	CSE	DPE	EPL
Location Confirmation	X	X	
Faster Onset	X	X	
Sacral Coverage	X	X	
Bilateral Spread	X	X	
Tested Catheter		X	X
Superior Anesthesia with C/S	?	X	
Superior Analgesia with PIEB	?	X	

CONCLUSIONS WITH DPE + PIEB

Song et al. (2021): The use of DPE technique for neuraxial analgesia was associated with faster onset than the use of the EP technique. DPE technique with PIEB mode achieved the greatest drug-sparing effect (fewer PCEA boluses and lowest hourly ropivacaine consumption) without increasing maternal or neonatal side effects.

Wang et al. (2021): The percentage of parturients with adequate analgesia at 10 minutes was higher with DPE + PIEB compared to EPL + PIEB. Furthermore, the DPE + PIEB mode was associated with a faster time to a VAS score ≤30 mm.

Lin et al. (2023): The combination of the use of DPE technique with 25G spinal needle and PIEB technique for labor analgesia enhances the quality of labor analgesia by accelerating onset and improving sacral blockade, without increasing adverse effects.

DOES THE SIZE OF THE SPINAL NEEDLE MATTER?

Anesthesiology 2005; 103:1046–51

Dural Puncture with a 27-Gauge Whitacre Needle as Part of a Combined Spinal–Epidural Technique Does Not Improve Labor Epidural Catheter Function

John A. Thomas, M.D., Peter H. Pan, M.D.,† Lynne C. Harris, B.S.N.,‡ Medge D. Owen, M.D.,† Robert D'Angelo, M.D.†*

Conclusions: **Dural puncture with a 27-gauge Whitacre needle without subarachnoid drug administration during combined spinal–epidural labor analgesia did not improve epidural labor analgesia quality or reduce catheter manipulation or replacement rate when compared with a traditional epidural technique.**

Limitations:

- The study was conducted at an institution with a residency training program
- Residents are trained to have a low threshold of manipulating or replacing the epidural catheters when analgesia was less than optimal. This might be responsible for higher manipulation, replacement, or top-ups.

Key Takeaway:

- However, in a small subgroup, when no CSF returned from the spinal needle after an attempted DPE, intravenous epidural catheter placement, and catheter replacement were higher
- Authors cautioned not to extrapolate the results of this study to dural punctures made by larger-diameter needles. This warrants further investigation.

The Efficacy of Dural Puncture Epidural Performed by 27-gauge Whitacre Needle in Labour Epidural Analgesia: Randomized Single-Blinded Controlled Study

Iva Pažur[1], Ognjen Ožegić[1], Lada Lijović[2], Katarina Kličan Jaić[1], Maja Pešić[1]

Conclusion: Dural puncture epidural technique appears to be effective in providing faster onset of epidural analgesia. However, the need for additional boluses remains unchanged. It can be safely used in obstetrics, without deleterious effect on the course of labour.

Main Points

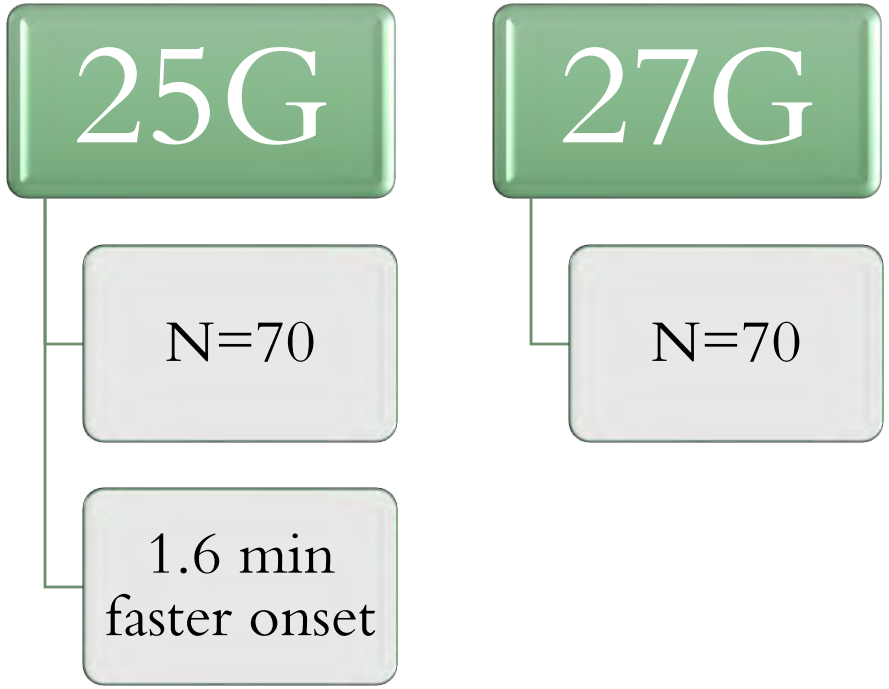
- Dural puncture epidural technique enables faster onset of epidural labour analgesia.
- The clinical significance of dural puncture epidural technique in obstetrics remains equivocal.
- Dural puncture epidural technique could be helpful in conformation of epidural space.
- It is a safe technique for mother and child.

Pažur I, Ožegić O, Lijović L, Jaić KK, Pešić M. *Turk J Anaesthesiol Reanim*. 2023.

2019

Dural puncture epidural analgesia for labor: a randomized comparison between 25-gauge and 27-gauge pencil point spinal needles

Felipe Contreras [1], Juan Morales [2], Daniela Bravo [1], Sebastián Layera [1], Álvaro Jara [1], Carlos Riaño [1], Rodrigo Pizarro [1], Natalia De La Fuente [2], Julián Aliste [1], Roderick J Finlayson [3] and De Q Tran [4]



- A bolus of 20 mL of bupivacaine 0.125% and fentanyl 2 μg/mL was administered
- Thereafter, patients received boluses of 12 mL of bupivacaine 0.125% every 2 hours PRN

Findings:

- 25G had faster onset
- No intergroup differences in terms of S2 block, sensory block height, motor block, # of top-up doses, and *incidence of PDPH*

NIH National Library of Medicine
National Center for Biotechnology Information

ClinicalTrials.gov

ACTIVE, NOT RECRUITING

NCT06287047

The Impact of Using Different Spinal Needle Sizes on the Efficacy of the **Dural Puncture Epidural** Block

Conditions

Dural Puncture Epidural Technique

Locations

Cairo, Egypt

EPL vs. 25G DPE vs. 27G DPE

Until then, we consider what we *do* know……

- DPE results in faster onset, and better quality of analgesia than EPL
- DPE with a 25G or 27G spinal needle is not associated with an ↑ PDPH risk
- No greater risk of PDPH with a 25G spinal needle over a 27G
- Leach et al. (1998) animal studies concluded that mechanistically, the translocation of medication from the epidural space to the subarachnoid space through a dural hole is *directly proportional* to the size of the spinal needle used to create the hole

Until then, we consider what we *do* know……

- 2020 pig studies demonstrated that a 25G dural hole will remain patent for at least 6 hours. Duration of patency for 27G is unknown.

- If the migration of medication is largely dependent on dural hole size, a 25G should maximize translocation of medication without imposing greater risk than a 27G spinal needle

- DPE with a 25G spinal needle can be justified as a safe (and possibly superior) alternative to a 27G DPE

TECHNIQUE *DIS*ADVANTAGES

Fetal Bradycardia

- Collis RE, Davies DW, Aveling W. *Lancet.*1995.
- Robert D'Angelo, James C. Eisenach. *Anesthesiology* 1997.
- Mardirosoff, Chahé, et al. *BJOG: an international journal of obstetrics and gynaecology*. 2002.
- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg.* 2008.
- Simmons SW, Taghizadeh N, Dennis AT, Hughes D, Cyna AM. *Cochrane Database of Systematic Reviews.* 2012.
- Chung YH, Kim WH, Lee EK, Hahm TS. *Korean J Anesthesiol.* 2013.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg.* 2017.
- Yang L, Wan L, Huang H, Qi X. *Medicine (Baltimore).* 2019.

CHARACTERISTIC	CSE	DPE	EPL
Fetal Bradycardia	X		
Uterine Hypertonus	X		

Fetal Bradycardia

Chau et al. 2017 N =120	CSE	DPE	EPL
FHR decelerations	21 (52.5%)	18 (14.5%)	17 (42.5%)
Category I to Cat II tracing	13 (32.5%)	5 (12.5%)	5 (12.5%)

Chau A, Bibbo C, Huang CC, et al. Dural puncture epidural technique improves labor analgesia quality with fewer side effects compared with epidural and combined spinal epidural techniques: a randomized clinical trial. Anesth Analg. 2017;124(2):560-569.

Uterine Hypertonus

- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg*. 2008
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg*. 2017
  - specifically looked at uterine tachysystole (UT) and uterine hypertonus (UH)
  - CSEs: 45% developed UT/UH
  - 5% requiring tocolysis

CHARACTERISTIC	CSE	DPE	EPL
Fetal Bradycardia	X		
Uterine Hypertonus	X		

Workload

Top ups, catheter manipulation, catheter replacement

- P.H. Pan, T.D. Bogard, M.D. Owen. *International Journal of Obstetric Anesthesia*,. 2004.
- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg* 2008.
- Lydia S. Grondin, Kenneth Nelson, Vernon Ross, Orlando Aponte, Sherman Lee, Peter H. Pan. *Anesthesiology.* 2009.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg.* 2017
- Pan PH, Bogard TD, Owen MD. Int J *Obstet Anesth.* 2004.
- Thomas JA, Pan PH, Harris LC, Owen MD, D'Angelo R. *Anesthesiology.* 2005.
- Gupta D, Srirajakalidindi A, Soskin V. *M.E.J Anesth.* 2013.

CHARACTERISTIC	CSE	DPE	EPL
Fetal Bradycardia	X		
Uterine Hypertonus	X		
Workload	X		X

Workload

Chau et al. 2017 N =120	CSE	DPE	EPL
None	20 (50%)	31 (77.5%)	20 (50%)
One or More	20 (50%)	9 (22.5%)	20 (50%)
Time to Top-Up	132 ± 85	250 ± 163	207 ± 133
Catheter Manipulation	3 (7.5%)	2 (5%)	4 (10%)
Catheter Replacement	0 (0%)	0 (0%)	0 (0%)

Chau A, Bibbo C, Huang CC, et al. Dural puncture epidural technique improves labor analgesia quality with fewer side effects compared with epidural and combined spinal epidural techniques: a randomized clinical trial. Anesth Analg. 2017;124(2):560-569.

Maternal Adverse Events

- Collis RE, Davies DW, Aveling W. *Lancet.*1995.
- Robert D'Angelo, James C. Eisenach. *Anesthesiology.* 1997.
- Simmons SW, Taghizadeh N, Dennis AT, Hughes D, Cyna AM. *Cochrane Database of Systematic Reviews.* 2012.
- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg.* 2008.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg.* 2017
- Pažur I, Ožegić O, Lijović L, Jaić KK, Pešić. *Turk J Anaesthesiol Reanim.* 2023.
- Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. *J Obstet Anaesth Crit Care.* 2024.

CHARACTERISTIC	CSE	DPE	EPL
Fetal Bradycardia	X		
Uterine Hypertonus	X		
Workload	X		X
N/V, Pruritus, Hypotension	X		X

Maternal Adverse Events

Chau et al. 2017 N =120	CSE	DPE	EPL
Nausea	1 (2.5%)	1 (2.5%)	4 (10%)
Pruritus	27 (67.5%)	4 (10%)	4 (10%)
Hypotension	13 (32.5%)	5 (12.5%)	5 (12.5%)

Khetarpal et al. 2024 N =60	CSE	DPE	EPL
Nausea	4 (20%)	2 (10%)	2 (10%)
Pruritus	6 (30%)	1 (5%)	0 (0%)
Hypotension	2 (10%)	0 (0%)	0 (0%)

Chau A, Bibbo C, Huang CC, et al. Dural puncture epidural technique improves labor analgesia quality with fewer side effects compared with epidural and combined spinal epidural techniques: a randomized clinical trial. Anesth Analg. 2017;124(2):560-569.

Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. Comparison of epidural, combined spinal epidural and dural puncture epidural techniques for labor analgesia. J Obstet Anaesth Crit Care 2024;14:45-53.

Maternal Adverse Events

- Pan PH, Bogard TD, Owen MD. Int J *Obstet Anesth*. 2004.
- Cappiello E, O'Rourke N, Segal S, Tsen LC. *Anes Analg*. 2008.
- Chau A, Bibbo C, Huang CC, Elterman KG, Cappiello E, Tsen LC. *Anesth Analg*. 2017.
- Contreras F, Morales J, Bravo D, *et al*. *Regional Anesthesia & Pain Medicine*. 2019.
- Pažur I, Ožegić O, Lijović L, Jaić KK, Pešić M. *Turk J Anaesthesiol Reanim*. 2023.
- Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. *J Obstet Anaesth Crit Care*. 2024.

CHARACTERISTIC	CSE	DPE	EPL
Fetal Bradycardia	X		
Uterine Hypertonus	X		
Workload	X		X
N/V, Pruritus, HoTN	X		
High level, Motor Block	X		X
Asymmetry			X
PDPH			

Maternal Adverse Events

Chau et al. 2017 N =120	CSE	DPE	EPL
Highest Level	T4 (T2-6)	T4 (T2-T8)	T4 (T2-T8)
Motor Blockade	3 (7.5%)	6 (15%)	15 (37.5%)
PDPH	0 (0%)	0 (0%)	0 (0%)

Khetarpal et al. 2024 N =60	CSE	DPE	EPL
Asymmetry	2 (10%)	5 (25%)	9 (45%)
Motor Blockade	1 (5%)	0 (0%)	0 (0%)
PDPH	0 (0%)	0 (0%)	0 (0%)

Chau A, Bibbo C, Huang CC, et al. Dural puncture epidural technique improves labor analgesia quality with fewer side effects compared with epidural and combined spinal epidural techniques: a randomized clinical trial. Anesth Analg. 2017;124(2):560-569.

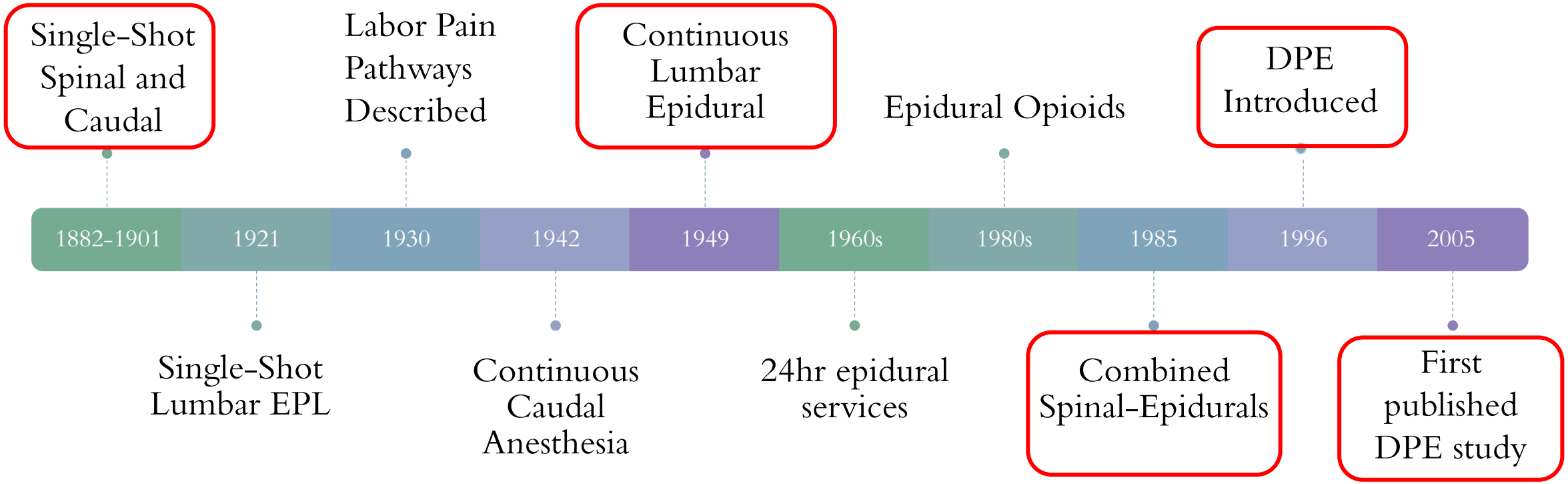
Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. Comparison of epidural, combined spinal epidural and dural puncture epidural techniques for labor analgesia. J Obstet Anaesth Crit Care 2024;14:45-53.

Satisfaction Scores

Khetarpal et al. 2024 N =60	CSE	DPE	EPL
Patient (Rating: Excellent)	15 (75%)	11 (55%)	4 (20%)
Surgeon (completely satisfied)	17 (85%)	13 (65%)	9 (45%)

Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. Comparison of epidural, combined spinal epidural and dural puncture epidural techniques for labor analgesia. J Obstet Anaesth Crit Care 2024;14:45-53.

Neuraxial Anesthesia Timeline



So, now what??

Ask yourself:

- What conclusions can you draw *now* with the existing research?
- Of the three neuraxial techniques, which one harnesses the MOST advantages? The LEAST advantages?
- Which one has the most favorable maternal & fetal safety profile?

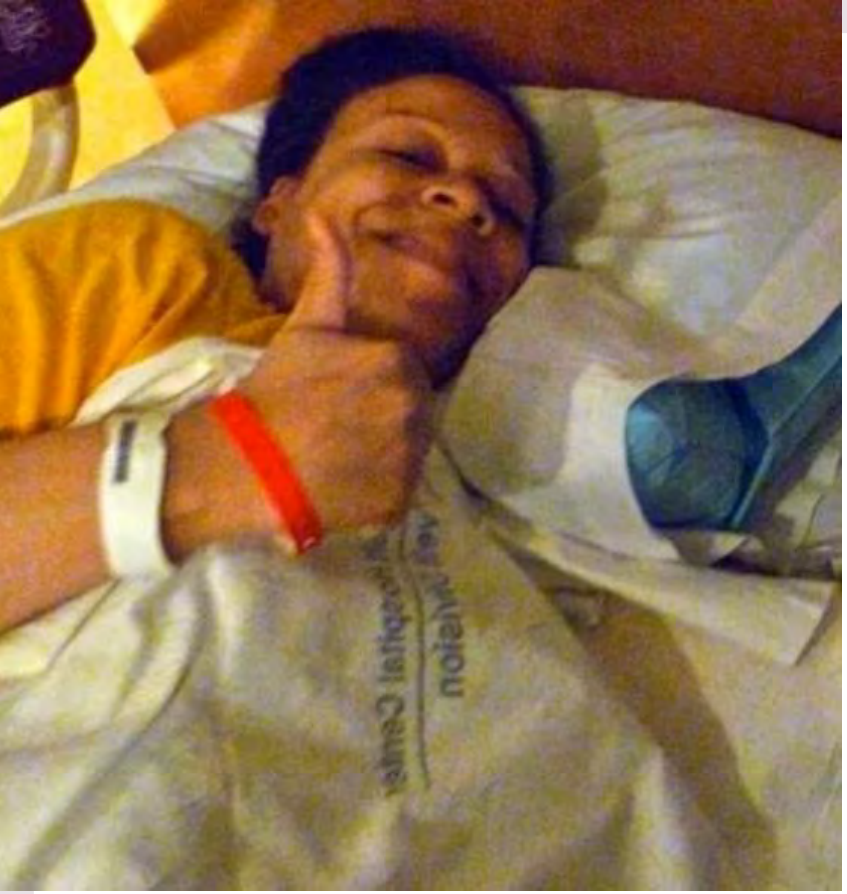
TECHNIQUE ADVANTAGES

Characteristic	CSE	DPE	EPL
Location Confirmation	X	X	
Faster Onset	X	X	
Sacral Coverage	X	X	
Bilaterality	X	X	
Tested Catheter		X	X
Superior Analgesia with PIEB	?	X	
Superior Anesthesia for C/S	?	X	

TECHNIQUE DISADVANTAGES

Characteristic	CSE	DPE	EPL
Fetal Bradycardia	X		
Uterine Hypertonus	X		
Workload	X		X
N/V, Pruritus, Hypotension	X		
High Level, Motor Block			X
PDPH			

SUMMARY OF FINDINGS



Signs of <u>any</u> Successful Block

thank you!


QUESTIONS
?

REFERENCES

Booth JM, Pan JC, Ross VH, Rusell GB, Harris LC, Pan PH. Combined Spinal Epidural Technique for Labor Analgesia Does Not Delay Recognition of Epidural Catheter Failures: A Single-center Retrospective Cohort Survival Analysis. *Anesthesiology* 2016; 125:516–524. doi: https://doi.org/10.1097/ALN.0000000000001222

Cappiello E, O'Rourke N, Segal S, Tsen LC. A randomized trial of dural puncture epidural technique compared with the standard epidural technique for labor analgesia. *Anesth Analg*. 2008 Nov;107(5):1646-51. doi: 10.1213/ane.0b013e318184ec14. PMID: 18931227

Chung YH, Kim WH, Lee EK, Hahm TS. Sudden persistent fetal bradycardia after spinal analgesia for labor pain. *Korean J Anesthesiol.* 2013 Dec;65(6 Suppl):S99-S100. doi: 10.4097/kjae.2013.65.6S.S99. PMID: 24478893; PMCID: PMC3903881

Contreras F, Morales J, Bravo D, et al. Dural puncture epidural analgesia for labor: a randomized comparison between 25-gauge and 27-gauge pencil point spinal needles. *Regional Anesthesia & Pain Medicine* 2019;44:750-753.

D'Angelo R, Eisenach JC. Severe Maternal Hypotension and Fetal Bradycardia after a Combined Spinal Epidural Anesthetic . *Anesthesiology* 1997; 87:166–168.

Eappen S, Blinn A, Segal S. Incidence of epidural catheter re-placement in parturients: a retrospective chart review. *Int J Obstet Anesth*. 1998; 7: 220–5. DOI: https://doi.org/10.1016/S0959-289X(98)80042-3

REFERENCES

Groden J, Gonzalez-Fiol A, Aaronson J, Sachs A, Smiley R. Catheter failure rates and time course with epidural versus combined spinal-epidural analgesia in labor. *International Journal of Obstetric Anesthesia*, 2016, 26: 4-7. https://doi.org/10.1016/j.ijoa.2016.01.004.

Grondin LS, Nelson K, Ross V, Aponte O, Lee S, Pan PH. Success of Spinal and Epidural Labor Analgesia: Comparison of Loss of Resistance Technique Using Air versus Saline in Combined Spinal-Epidural Labor Analgesia Technique. *Anesthesiology* 2009; 111:165–172.

Khetarpal R, Chatrath V, Grover S, Kaur P, Taneja A, Madaan A. Comparison of epidural, combined spinal epidural and dural puncture epidural techniques for labor analgesia. *J Obstet Anaesth Crit Care.* 2024;14:45-53.

Leach A, Smith, G. Subarachnoid spread of epidural local anaesthetic following dural puncture. Anaesthesia.1988;43:671-674. doi:10.1111/j.1365-2044.1988.tb04155.x.

Lin, Wenqian et al. Dural Puncture Epidural with 25-G Spinal Needles Versus Conventional Epidural Technique for Labor Analgesia: A Systematic Review of Randomized Controlled Trials'. 1 Jan. 2024 : 495 – 510.

Lin, W, Yang Y, Lin, J, Chen, J, Lin, Q. Dural Puncture Epidural with 25-G Spinal Needles versus Conventional Epidural Technique in Conjunction with PIEB for Labor Analgesia: A Randomized Trial. *Journal of Pain Research*, 2023; *16*, 3797–3805. https://doi.org/10.2147/JPR.S424082

REFERENCES

Mardirosoff, Chahé, et al. Fetal bradycardia due to intrathecal opioids for labour analgesia: a systematic review. *BJOG: an international journal of obstetrics and gynaecology* .2002;109(3): 274-281.

McKenzie, Alistair G., Historic timeline of obstetric anaesthesia', in Vicki Clark, Marc Van de Velde, and Roshan Fernando (eds), *Oxford Textbook of Obstetric Anaesthesia*, Oxford Textbook in Anaesthesia (Oxford, 2016; online edn, Oxford Academic, 1 Oct. 2016), https://doi.org/10.1093/med/9780198713333.003.0001, accessed 23 Sept. 2024.

Pan PH, Bogard TD, Owen MD. Incidence and characteristics of failures in obstetric neuraxial analgesia and anesthesia: a retrospective analysis of 19,259 deliveries. *Int J Obstet Anesth*. 2004 Oct;13(4):227-33. doi: 10.1016/j.ijoa.2004.04.008. PMID: 15477051

Pažur I, Ožegić O, Lijović L, Jaić KK, Pešić M. The Efficacy of Dural Puncture Epidural Performed by 27-gauge Whitacre Needle in Labour Epidural Analgesia: Randomized Single-Blinded Controlled Study. *Turk J Anaesthesiol Reanim*. 2023 Aug 18;51(4):304-310. doi: 10.4274/TJAR.2023.221085. PMID: 37587657; PMCID: PMC10440478

Scott S, Pan SH.Dural Puncture Epidural for Labor Analgesia: Is It Really an Improvement over Conventional Labor Epidural Analgesia?. *Anesthesiology* 2022; 136:667–669.

Simmons SW, Taghizadeh N, Dennis AT, Hughes D, Cyna AM. Combined spinal-epidural versus epidural analgesia in labour. *Cochrane Database of Systematic Reviews 2012*, Issue 10. Art. No.: CD003401. DOI: 10.1002/14651858.CD003401.pub3. Accessed 04 October 2024.

REFERENCES

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

Song Y, Du W, Zhou S, Zhou Y, Yu Y, Xu Z, et al. Effect of dural puncture epidural technique combined with programmed intermittent epidural bolus on labor analgesia onset and maintenance: A randomized controlled trial. *Anesthesia and Analgesia*. 2021; 132(4): 971-8.

Suzuki N, Koganemaru M, Onizuka S, Takasaki M. Dural puncture with a 26-gauge spinal needle affects spread of epidural anesthesia. *Anesth Analg*. 1996 May;82(5):1040-2. doi: 10.1097/00000539-199605000-00028. PMID: 8610864

Tan HS, Reed SE, Mehdiratta JE, Diomede OI, Landreth R, Gatta LA, et al. Quality of Labor Analgesia with Dural Puncture Epidural versus Standard Epidural Technique in Obese Parturients: A Double-blind Randomized Controlled Study. *Anesthesiology.* 2022.

Thomas JA, Pan JH, Harris JC, Owen MD, D'Angelo R. Dural Puncture with a 27-Gauge Whitacre Needle as Part of a Combined Spinal–Epidural Technique Does Not Improve Labor Epidural Catheter Function. *Anesthesiology* 2005; 103:1046–1051 doi: https://doi.org/10.1097/00000542-200511000-00019

REFERENCES

Wang J, Zhang L, Zheng L, Xiao P, Wang Y, Zhang L, et al. A randomized trial of the dural puncture epidural technique combined with programmed intermittent epidural boluses for labor analgesia. *Annals of Palliative Medicine*. 2021; 10(1): 404-14.

Wang SY, He Y, Zhu HJ, Han B. Dural puncture epidural technique provides better anesthesia quality in repeat cesarean delivery than epidural technique: Randomized controlled study. *World J Clin Cases*. 2022 Jul 16;10(20):6890-6899. doi: 10.12998/wjcc.v10.i20.6890. PMID: 36051113; PMCID: PMC9297399.

Wilson, SH, Wolf, BJ, Bingham, K, Scotland QS, FoxJM, Woltz, Hebbar EM, Latha. Labor Analgesia Onset With Dural Puncture Epidural Versus Traditional Epidural Using a 26-Gauge Whitacre Needle and 0.125% Bupivacaine Bolus: A Randomized Clinical Trial. *Anesthesia & Analgesia* 126(2):p 545-551, February 2018. | DOI: 10.1213/ANE.0000000000002129.

Yang L, Wan L, Huang H, Qi X. Uterine hypertonus and fetal bradycardia occurred after combined spinal-epidural analgesia during induction of labor with oxytocin infusion: A case report. *Medicine (Baltimore)*. 2019 Jul;98(28):e16282. doi: 10.1097/MD.0000000000016282. PMID: 31305411; PMCID: PMC6641829.