



European Society of
Regional Anaesthesia
& Pain Therapy
ESRA ITALIA

ESRA Italian Chapter

XXVIII CONGRESSO NAZIONALE

PRESIDENTE
DEL CONGRESSO
Luciano Calderone





PALERMO 5-7 Ottobre
XXVIII CONGRESSO
NAZIONALE



Safe management of neuro-axial analgesia in labor

(Management dell'analgesia neuro-assiale in sicurezza nel travaglio di Parto)

L. Calderone



PALERMO 5-7 Ottobre
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Safe management of neuro-axial analgesia in labor

The procedure of neuro-axial analgesia in labor

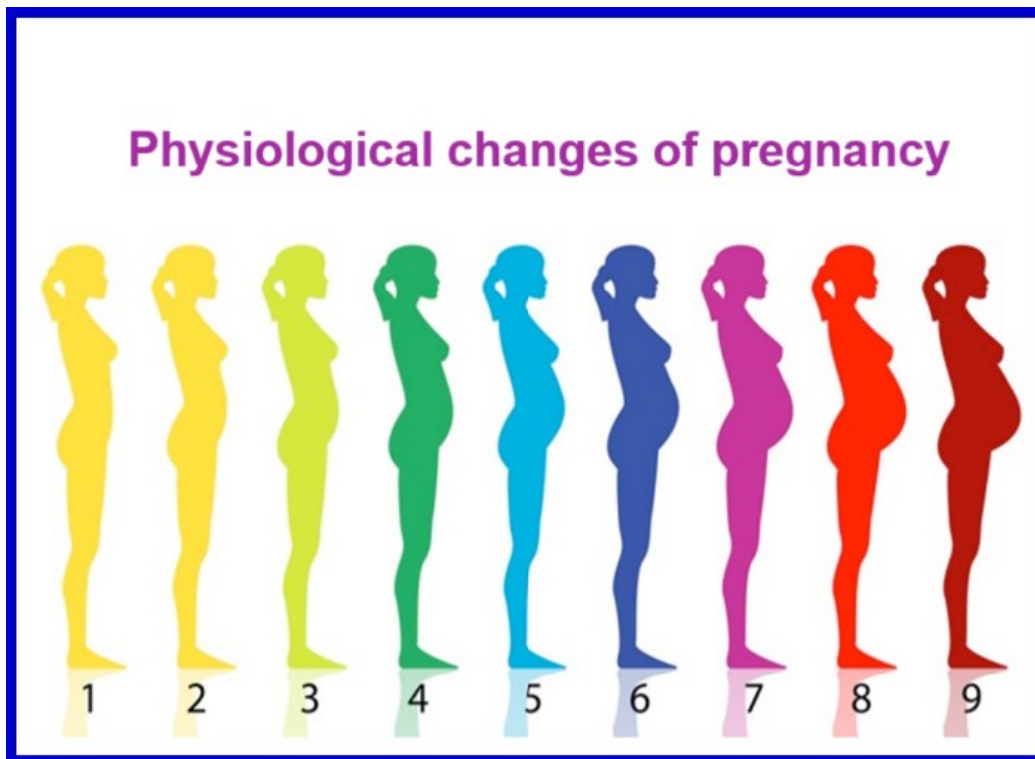
- ✓ They must be known and shared by the multidisciplinary team that is present daily in the delivery room.
- ✓ They increase safety in a complex environment where several professionals alternate and therefore it is necessary to have sharing and planning of anesthesiological activity.
- ✓ The ultimate goal is the best and safe analgesia for the woman in labor.





Safe management of neuro-axial analgesia in labor

✓ PHYSIOLOGICAL CHANGES OF PREGNANCY



1. Weight gain
2. Blood volume and composition
3. Hemocoagulative structure
4. Cardiovascular system
5. Respiratory system
6. Digestive system
7. Endocrine system
8. Urinary tract
9. Nervous system
10. Musculoskeletal system



Safe management of neuro-axial analgesia in labor



- *Anesthesiological evaluation:*
 - features that will influence anesthesiology technique
 - indicators of possible difficulty to the airways or venous access
 - contraindications to loco-regional anesthesia
 - co-morbidity
 - maternal cardiovascular diseases
 - gestational hypertensive disorders
 - coagulation disorders
 - previous uterine surgeries
 - increased risk of caesarean section
 - increased bleeding risk
 - acquisition of informed consent





Safe manager

bor

Considerations for Anesthesia Consultation During Labor

Consideration	Examples
Anticipated anesthetic complications or difficulty	Anatomic anomaly of the head, neck, or spine History of malignant hyperthermia Known allergy or adverse response to anesthesia Obesity (body mass index of at least 40 to 50 kg per m ² , depending on facility) Patient refusal of blood products
Cardiac conditions	Congenital cardiac anomalies (e.g., tetralogy of Fallot, transposition of the great vessels) Congenital or acquired obstructive heart disease Presence of a cardiac pacemaker or defibrillator Pulmonary hypertension
Hematologic conditions	Coagulation disorders Current anticoagulation Thrombocytopenia
Hepatic conditions	Cirrhosis or hepatitis with abnormal liver function or coagulopathy
Neuromuscular conditions	Multiple sclerosis Muscular dystrophy
Renal conditions	Chronic kidney disease
Spinal conditions	History of spinal surgery Known arteriovenous malformation, Chiari malformation, ventriculoperitoneal shunt Structural vertebral anomalies

Obstetric Analgesia and Anesthesia. American College of Obstetricians and Gynecologists' Committee. Obstetrics & Gynecology vol. 133, NO. 3, march 2019





Safe management of neuro-axial analgesia in labor

Tuohy needle 16->18G



Needle for combined spinal-epidural block 18G/27G



Ultrasound

Closed-tip epidural catheter ending with three helical side holes



Epidural filter



- fewer false negative tests
- wider diffusion of the local anesthetic

Infusion pumps



LOR, loss-of-resistance



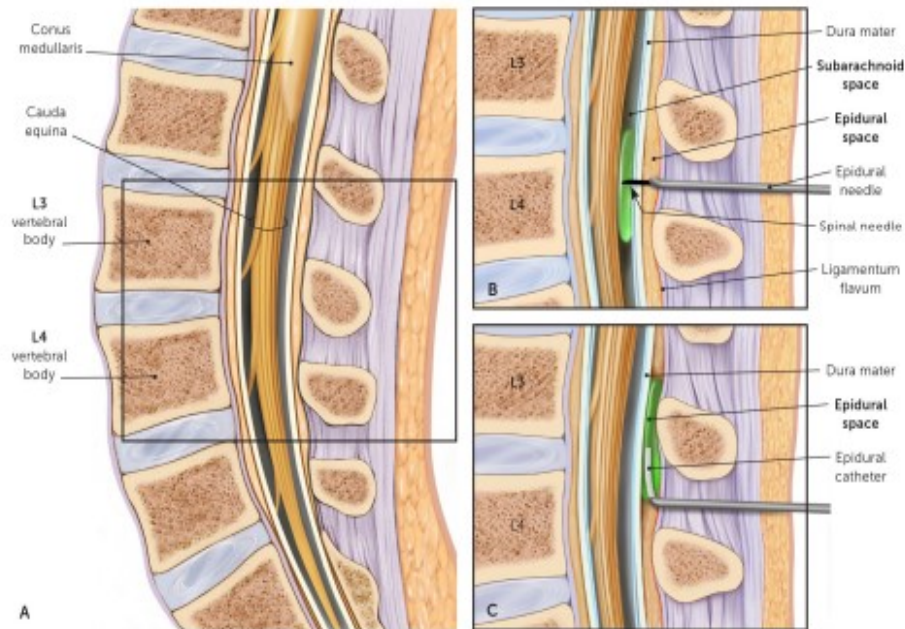
Syringe from 5 to 20 ml





Safe management of neuro-axial analgesia in labor

Neuraxial Regional Anesthesia Options for Pain Management During Labor



Neuraxial Regional Anesthesia Options for Pain Management During Labor

Type	Stage of labor	Challenges/limitations*	Evidence
Epidural^{15,28}	First; second if delivery not imminent Give on request at any point once committed to delivery	Time to pain relief is about 15 minutes Decreased mobility Hypotension (with possible fetal heart rate deceleration and maternal nausea) Risk of maternal respiratory depression, fever, and urinary retention Risk of postdural puncture headache (< 1%)	Better pain relief than opioids More sensory than motor blockade No effect on rate of cesarean delivery or assisted vaginal delivery May lead to slightly longer second stage
Combined spinal-epidural²⁹⁻³¹	First; second if delivery not imminent	Risks associated with epidural (see above) Increased risk of pruritus compared with traditional epidural ³⁰ Catheter placement cannot be confirmed until the spinal component has worn off	Rapid onset of pain relief (5 minutes) Better pain relief than opioids More sensory than motor blockade No effect on rate of cesarean delivery or assisted vaginal delivery Slightly longer second stage
Dural puncture epidural^{29,30,32}	First; second if delivery not imminent	Risks associated with epidural (see above) Increased risk of pruritus compared with traditional epidural ³⁰	Mixed results from small studies Faster onset of pain relief than traditional epidural Lower rates of asymmetric block than with traditional epidural or combined spinal-epidural Lower rates of need for rescue anesthesia than with combined spinal-epidural Less maternal hypotension than with combined spinal-epidural Significant sensory and motor blockade

Note: Local anesthetic is often combined with an opioid, which typically leads to faster onset of pain relief.³³ Commonly used local anesthetics and opioids are summarized in Table 5.

Wong C. Epidural and spinal anesthesia. Anesthesia for labor and delivery. In: Chestnut DH, ed. *Chestnut's Obstetric Anesthesia: Principles and Practice*. 6th ed. Elsevier; 2020.

Pain Management in Labor AAFP 2021;103(6):355-364

Methods of neuraxial anesthesia. (A) Sagittal cross section through lumbar spine. (B) In a combined spinal-epidural block, an epidural needle is first inserted into the epidural space. A spinal needle is inserted through the epidural needle to inject medication into the subarachnoid space and is then removed, leaving an epidural catheter in the epidural space. (C) With the epidural catheter left in place, intermittent or continuous medication may be administered.

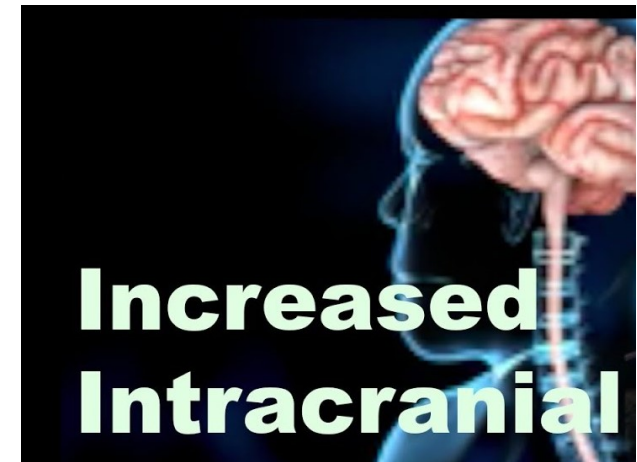
Illustration by Christy Krames



Safe management of neuro-axial analgesia in labor

Contraindications to Neuraxial Regional Anesthesia in Labor

Contraindications	Comments
Absolute	
Increased intracranial pressure	Intracranial mass, hydrocephalus
Infection overlying area of necessary skin puncture	Risk of meningitis
Lack of patient consent for anesthesia	—
Relative	
Coagulopathy	Inherited bleeding disorders increase the risk of intracranial hematoma (one per 168,000 patients). Patients with von Willebrand disease have an increased risk because von Willebrand factor concentrations increase up to 300% during pregnancy. Hemophilia carriers should undergo normal factor concentrations before anesthesia and for three to five days after delivery to avoid bleeding.
Hemodynamic instability	Severe dehydration, sepsis, cardiomyopathy, pulmonary embolism, anaphylaxis
Inability to maintain appropriate positioning for the procedure	Advanced dilation or anxiety may inhibit the ability to safely achieve the necessary positioning.
Some obstructive cardiomyopathies	Includes severe mitral or aortic stenosis and left ventricular outflow obstruction as seen with hypertrophic obstructive cardiomyopathy.
Thrombocytopenia	No specific platelet count at which completion is contraindicated. Generally considered acceptable with platelet counts > 50,000.





PARAMETERS USED FOR THE EVALUATION OF COAGULATION

History of bleeding, thrombocytopenia or a coagulation dysfunction

An INR of 1.4, in the absence of easy bruisability and normal liver function, is acceptable before neuraxial injection in patients planned for neuraxial nerve blocks.

Honorio T. Benzon, Rasha S. Jabri e Tom C. Van Zundert, Nysora 2023

Thrombocytopenia in Pregnancy and Neuraxial Anesthesia

Platelet count >75000 to 80000/mm³

Obstetric neuroaxial anesthesia at low platelet counts in the context of immune thrombocytopenia - Syst review meta-analysis - Liane J. Bailey, Nadine Shehata, Bryon De France, Jose C. A. Carvalho, Ann Kinga Malinowski, J Can Anesth (2019)

Update on Thrombocytopenia in Pregnancy and Neuraxial Anesthesia. Daniel J. Forest & Scott Segal. Curr Anesthesiol Rep (2017) 7 111–118

Regional anaesthesia in patients on antithrombotic drugs

Management in high bleeding risk blocks (neuraxial and deep nerve blocks)

Drug and dose	Time from last drug intake to intervention ^c	Target laboratory value at intervention	Time from intervention to next drug dose
VKA	Until target lab value: (about 3 days acenocoumarol; 5 days warfarin, fluindione; 7 days phenprocoumon)	INR normal	
DXA low ^b	24 h rivaroxaban, edoxaban (30 h if CrCl <30 ml min ⁻¹), 36 h apixaban	No testing	
DXA high	72 h or until target laboratory value (until target laboratory value if CrCl <30 ml min ⁻¹)	DXA level <30 ng ml ⁻¹ (alternative: anti-Xa ≤ 0.1 IU ml ⁻¹)	Low doses: according to guidelines on postOP VTE prophylaxis ³ (about 8 h – t _{max} = 6 h postop). Consider prolonged time interval after bloody tap ⁶
Dabigatran low ^b	48 h	No testing	
Dabigatran high	72 h or until target laboratory value (until target laboratory value if CrCl <50 ml min ⁻¹)	DTI level < 30 ng ml ⁻¹ (alternative: thrombin time in normal range of local laboratory)	High doses: according to guidelines on therapeutic anticoagulation ¹ (about 24 h postop)
LMWH low ≤50 IU anti-Xa kg ⁻¹ day ⁻¹ enoxaparin ≤40 mg day ⁻¹	12 h (24 h if CrCl <30 ml min ⁻¹)	No testing	
LMWH high	24 h (48 h if CrCl <30 ml min ⁻¹) or until target lab value (especially if CrCl <30 ml min ⁻¹)	anti-Xa ≤ 0.1 IU ml ⁻¹	VKA, DOAC, LMWH high, UFH high; should not be administered with a catheter in situ
UFH low ≤200 IU kg ⁻¹ day ⁻¹ SC ≤100 IU kg ⁻¹ day ⁻¹ i.v.	4 h	No testing	UFH low: 1 h for i.v. in cardiovascular surgery
UFH high	Until target lab value (about 6 h if i.v., 12 h if SC)	aPTT or anti-Xa or ACT in normal range of local laboratory	
Fondaparinux low ≤2.5 mg day ⁻¹	36 h (72 h if CrCl <50 ml min ⁻¹)	No testing	
Fondaparinux high	until target lab value (about 4 days)	Calibrated anti-Xa ≤ 0.1 IU ml ⁻¹	
Aspirin low ≤ 200 mg day ⁻¹	0	No testing	Routinely prescribed next time point
Aspirin high	3 days (in normal platelet counts) to 7 days	(consider specific platelet function tests in normal range of local laboratory)	6 h
P2Y ₁₂ inhibitor	5 days ticagrelor 5 to 7 days clopidogrel 7 days prasugrel or until target laboratory value		0-h clopidogrel 75 mg 24 h prasugrel, ticagrelor 2 days clopidogrel 300 mg
Aspirin low + anticoagulant	Aspirin: 0 + time interval of specific anticoagulant	specific laboratory test for combined anticoagulant	Aspirin low: routinely prescribed next time point Combined anticoagulant, antiplatelet drug: according to guidelines on therapeutic anticoagulation, platelet inhibition ¹ (about 24 h postOP)
Aspirin low and antiplatelet drug	Aspirin: 0 and time interval of specific antiplatelet drug	(consider specific laboratory test for combined antiplatelet drug)	

ACT, activated clotting time; aPTT, activated partial thromboplastin time; CrCl, creatinine clearance; DTI, direct thrombin inhibitor; DXA, direct Xa antagonist; i.v., intravenous; INR, International Normalised Ratio; LMWH, low molecular weight heparin; SC, subcutaneous; UFH, unfractionated heparin; VKA, Vitamin K antagonist. ^a Definition and examples of high bleeding risk blocks are summarised in Table 2. ^b Definitions of low and high DOAC doses are summarised in Table 1. ^c Times are given in hours (h) up to 72 h and days if longer. ^d For example, ESAIC guidelines on VTE prophylaxis. ^{1,12} ^e Blood in the needle/catheter. ^f For example, EHRA guidelines. ¹³



Safe neuro-axial analgesia in labor management

CHOICE OF SUBARACHNOID OR EPIDURAL PUNCTURE SITE:

Landmarks

gaps between L3 and L4 or between L2 and L3

Tuffier's line intersects the intersomatic spaces from L5-S1 to L3-L4 in a highly variable manner

In the presence of an accentuated lumbar lordosis, the approach is easier if the highest part of the lumbar spine is punctured.



Use of ultrasound



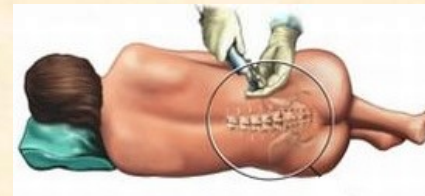
POSITION DURING THE EXECUTION OF THE LOCOREGIONAL PROCEDURE:

1. Sitting position

- shoulders lowered
- head bent on chest
- pelvis and shoulders on the same line on the horizontal plane
- arms placed in front of abdomen with forearms on knees



2. Lateral position



- shoulders lowered
- head bent on chest
- pelvis and shoulders on the same line on the horizontal plane
- arms placed in front of abdomen with forearms on knees

❖It may be simpler, thanks to the possibility of maintaining the symmetry of the spine with respect to the sagittal plane

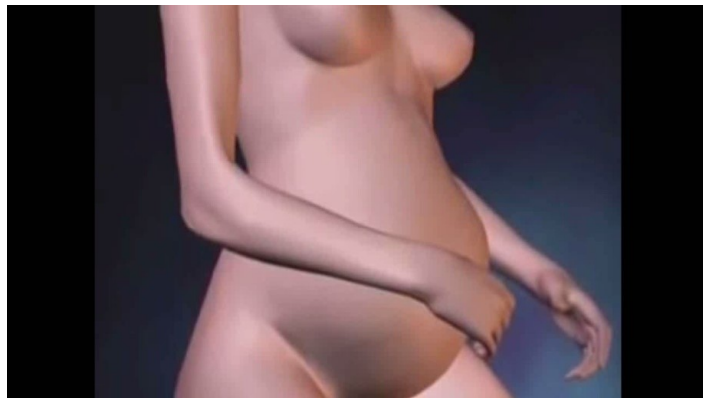
1. Higher incidence of vagal reflex, with hypotension and syncope.
2. Higher incidence of vascular puncture, especially during the execution of the epidural technique, due to the pressure exerted by the pregnant uterus on the inferior vena cava and the consequent congestion of the epidural venous plexus

1. Lower incidence of vagal reflex.
2. Possibility of maintaining fetal heartbeat monitoring during the procedure.
3. Obligatory choice in some situations, such as umbilical cord prolapse

The technical execution of the neuraxial procedure can be more complex.

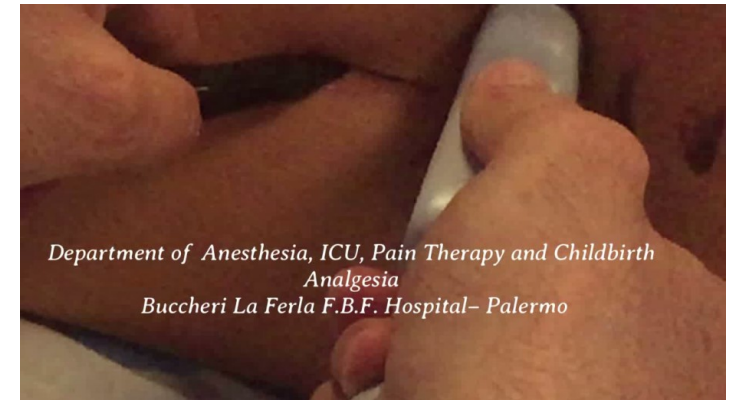


Safe management of neuro-axial analgesia in labor



The catheter is gently advanced approximately 3-4 cm cranially

Epidural analgesia



*Department of Anesthesia, ICU, Pain Therapy and Childbirth
Analgesia
Buccheri La Ferla F.B.F. Hospital- Palermo*

If introduced more than 5 cm, the catheter tends to roll up, cannulate a vessel more frequently or otherwise become malpositioned.

Methods for correct identification of catheter placement:

- ❖ aspiration
- ❖ administration of a test dose



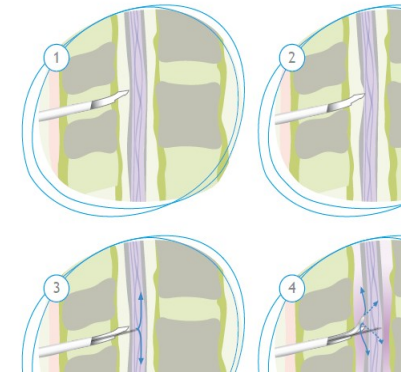
Combined spinal–epidural (CSE) analgesia

Benefits:

1. Is an ideal analgesic technique to use during labor.
2. It combines a quick start with excellent and reliable analgesia from spinal injection combined with the flexibility and longer duration of epidural techniques.
 - ❖ In a meta-analysis, the onset of analgesia for CSE was significantly faster than with an epidural technique (2–5 minutes vs. 10–15 minutes).
3. Confirmation of the midline position of the Tuohy needle in the epidural space, through the use of the spinal needle and visualization of the CSF leakage.

Drawback:

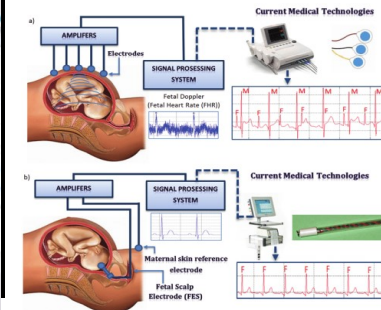
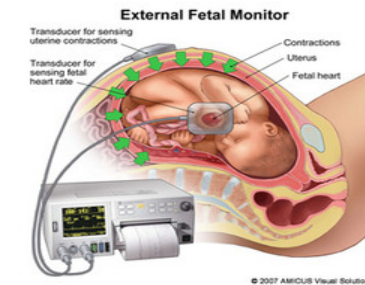
1. Before ambulation, women should be observed for 30 minutes after intrathecal or epidural drug administration to assess maternal and fetal well-being.
2. A possible disadvantage of combined spino-periural anesthesia is represented by the impossibility of immediately verifying the functionality of the epidural catheter.
3. The technical execution, however, can be more difficult and require more time than subarachnoid anesthesia.





Safe management of neuro-axial analgesia in labor

1. Neuraxial analgesia or anesthesia should be initiated and maintained only in locations in which appropriate resuscitation equipment and drugs are immediately available to manage procedurally related problems.
2. Vital signs should be obtained prior to and during placement of neuraxial analgesia.
 1. Rapid changes in patient hemodynamic and neurologic status can occur from an unintended complication (e.g. unintended intrathecal injection, local anesthetic systemic toxicity).
 2. the patient should remain under continuous direct observation by an anesthesia provider, labor nurse, or midwife for at least 20 minutes following initial administration of neuraxial medication. During this 20-minute period, the patient should have continuous heart rate and pulse oximetry monitoring with blood pressure measured at least every 5 minutes.
 3. For additional provider administered neuraxial doses sufficient to induce significant hemodynamic alteration, monitoring consistent with initiation of the block is recommended.



The prelabor maternal cardiovascular assessment could be useful for assessing the risk of intrapartum fetal compromise necessitating operative delivery.



Safe management of neuro-axial analgesia in labor

Anesthetic complications: Maternal hypotension

SBP <100 mmHg or <20-30% of systolic blood pressure and average.

Every reduction in PAO above these values must be treated with:

- a) Uterine displacement: Place the mother on her left side or with a pillow under her right buttock
- b) Oxygen in mask
- c) Trendelenburg
- d) Co-load with crystalloids (250-500 ml)
- e) Pre-load and co-load with colloids (250-500 ml)
 - a) since October 2017 the European Medicines Agency (EMA) has limited its use only to the control of hypovolemia caused by acute bleeding, when treatment with crystalloids in monotherapy is not sufficient
- f) Vasoconstrictors: increase the mother's systolic blood pressure without decreasing uterine flow:
 - a) Ephedrine (α - β -stimulants): boluses of 5 mg/ml
 - b) Phenylephrine (α -stimulants): (possibly associated with a lower incidence of fetal acidosis)
- g) Cardiotocographic monitoring.



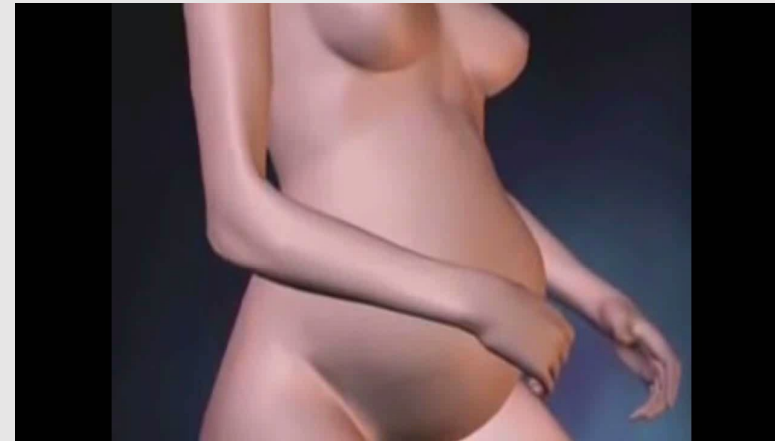
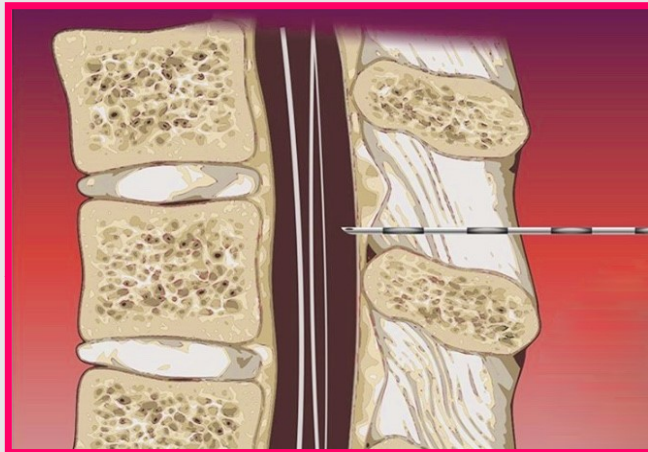


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ACCIDENTAL PUNCTURE OF THE DURA MATER IN OBSTETRIC PATIENTS

possible complication during the execution of both the peridural technique and the combined spino-peridural technique



- Incidence of accidental dura mater puncture (ADP) in obstetric patients: 0.5-1.5%
- Risk of accidental post-dural puncture headache (PDPH), following the use of peridural needles of caliber 16-18 G: > 50% (45-80%)

Major neurologic complications associated with postdural headache in obstetrics: a retrospective cohort study. J Guglielminotti, R Landau et al; Anesth Analg. 2019; 129: 1328-1336



ACCIDENTAL PUNCTURE OF THE DURA

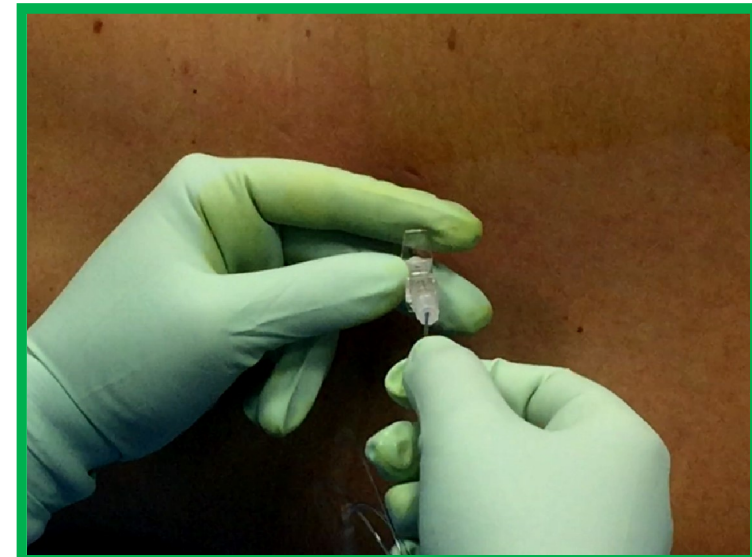
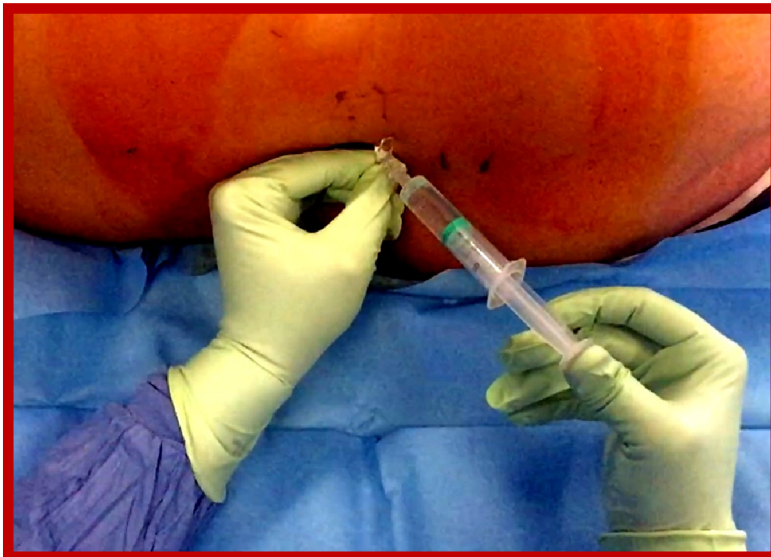
EVIDENCE OF CONTINUOUS FLOW OF LIQUOR THROUGH THE TUOHY NEEDLE



Remove the needle and repeat the epidural technique, if possible at the level of the upper intervertebral space



Insert the epidural catheter through the tuohy needle into the subarachnoid space





MANAGEMENT OF ACCIDENTAL PUNCTURE OF THE DURA MATER WITH INTRATHECAL CATHETER

Accidental puncture of the dura mater, confirmed by the leakage of liquor by your own needle from Tuohy



Reinsertion of the spindle into the needle to avoid excessive deliquoration



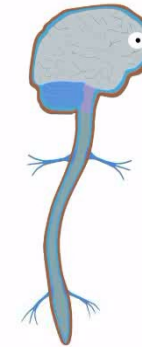
Administration of 10 ml of 0.9 % saline into the intrathecal space



Insertion of the peridural catheter into the intrathecal space



Checking the correct positioning and fixing





Management of the accidental puncture of the dura mater with intracal catheter

Top-up technique

Regional Anesthesia and Pain Medicine • Volume 41, Number 2, March-April 2016

Accidental Dural Puncture Management
10-Year Experience at an Academic Tertiary Care Center
 Norman Bolden, MD* and Ermias Gebre, MD†

Bupivacaine 1,25 mg e fentanyl 15 mcg
 total volume : 3 ml

Continuous infusion technique

LOADING-DOSE

MAINTENANCE

Acta Anaesthesiol Scand 2003; 47: 98–100
 Printed in Denmark.

Decrease in the incidence of post-dural puncture headache: maintaining CSF volume *Case Report*

K. M. KUCZKOWSKI^{1,2} and J. L. BENUMOF¹
 Departments of ¹Anesthesiology and ²Reproductive Medicine, University of California San Diego, San Diego, CA, USA

Bupivacaine 2,5 mg e fentanyl 10 mcg

Bupivacaine 0,0625% e fentanyl 2 mcg/ml; speed: 2ml/h

Regional Anesthesia and Pain Medicine, Vol 28, No 6 (November–December), 2003: pp 512–515

Subarachnoid Catheter Placement After Wet Tap for Analgesia in Labor: Influence on the Risk of Headache in Obstetric Patients

Sabry Ayad, M.D., Yousef Demian, M.D., Samer N. Narouze, M.D., and John E. Tetzlaff, M.D.

Bupivacaine 0,1% e sufentanil
 1mcg/ml
 Total Volume : 2 ml

Bupivacaine 0,1% e sufentanil 1 mcg/ml;
 speed: 1-2 ml/h

Acta Anaesthesiol Scand 2014; 58: 1233–1239
 Printed in Singapore. All rights reserved.

Lower incidence of post-dural puncture headache with spinal catheterization after accidental dural puncture in obstetric patients

S. VERSTRAETE¹, M. A. WALTERS², S. DEVROZ¹, E. ROOFTHOOFF³ and M. VAN DE VELDE¹
¹Department of Anesthesiology, University Hospitals Gasthuisberg, Leuven, Belgium, ²Nuffield Department of Anaesthetics, Oxford University Hospitals, Oxford, UK and ³Department of Anesthesia ZNA Middelheim and Pata Children's Hospital, Antwerp, Belgium

Ropivacaine 0,175% e sufentanil
 0,75mcg/ml; speed: 1ml/h
 PCEA: 0,5-1 ml of the same analgical
 mixture, lock out: 30 minutes



ACCIDENTAL DURAL PUNCTURE AND INSERTION OF THE INTRATHECAL CATHETER

COMPLICATIONS

Complications of 761 short-term intrathecal macrocatheters in obstetric patients: a retrospective review of cases over a 12-year period

I. Cohn^a, D. Moaveni^a, I. Szol^b, I. Ranasinghe^a

**INTRATHECAL CATHETER IN 761 OBSTETRIC PATIENTS 653:
 accidental puncture of the dura mater 108: intentional insertion**

COMPLICATIONS

FAILURE OF THE TECHNIQUE (displacement in the epidural space)	5.7% (6.1% in case of ADP; 2.8% in case of intentional insertion)
HIGH SPINAL BLOCK (from incorrect administration of drugs)	3 cases
RESPIRATORY DEPRESSION	1 case
No severe neurological complications: meningitis, spinal/epidural abscess, spinal hematoma, arachnoiditis, cauda equina syndrome	



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Creazzola et al. *J Anesth Analg Crit Care* (2023) 3:22
<https://doi.org/10.1186/s44158-023-00107-5>



Journal of Anesthesia,
Analgesia and Critical Care

ORIGINAL ARTICLE

Open Access

Effective prevention of post-dural puncture headache with insertion of an intrathecal catheter in parturients: a retrospective study and meta-analysis

F. Creazzola , M. Aversano , F. Prencipe , R. Barelli , P. Pasqualetti , I. Simonelli and M. G. Frigo

Intrathecal catheter placement is a promising measure to prevent post-dural puncture headache, especially if followed by a pain management protocol and a continuous saline infusion.

MANAGEMENT OF ACCIDENTAL PUNCTURE OF THE DURA MATER WITH INTRATHECAL CATHETER

AT THE END OF SPONTANEOUS DELIVERY (OR CAESAREAN SECTION):

- A) Connection to an infusion pump with administration of 0.9% saline at a rate of 2 ml/h and injection of a bolus of 0.9% physiological solution 10 ml before removal**
- Or**
- B) Catheter closure, to avoid incongruous administration of drugs**
- C) Maintenance of the intrathecal catheter for 24 hours after delivery**

The peridural catheter and filter have a dead space of about 1 ml, therefore after administration of the analgesic mixture it is appropriate to inject at least 1 ml of 0.9% saline

It is advisable to clearly and unequivocally mark the intrathecal catheter, to avoid incongruous administration of drugs and to inform all members of the team attending the birth.

Antibiotic prophylaxis: CEFTRIAZONE 2 g ev/day for 2 days.



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MANAGEMENT OF ACCIDENTAL PUNCTURE OF THE DURA MATER WITH INTRATHECAL CATHETER

- ❖ Anesthesiological and neurological objective examination every 8-12 hours after childbirth and upon removal of the epidural catheter, to identify signs and symptoms of headache after accidental puncture.
- ❖ In the event of the appearance of symptoms and signs of headache after an accidental puncture, initially administer conservative therapy (maintenance in the supine position; administration of Paracetamol, Paracetamol/caffeine, NSAIDs, weak opioids; oral intake of liquids and drinks containing caffeine).
- ❖ It is essential to avoid dehydration and constipation.
- ❖ Follow-up should continue until symptoms resolve.
- ❖ Consider administration of antithromboembolic therapy in case of prolonged bed rest.



ACCIDENTAL DURAL PUNCTURE AND INTRATHECAL CATHETER INSERTION

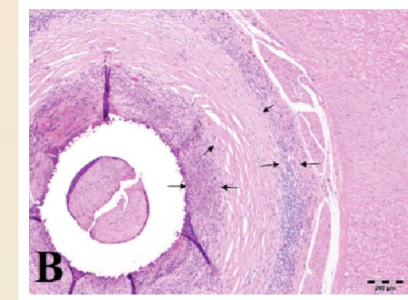
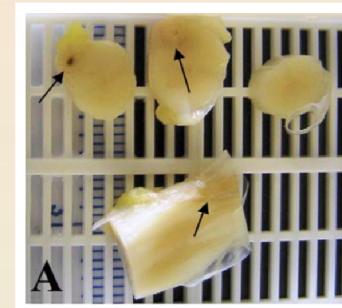
POSSIBLE MECHANISM OF ACTION:

- ❑ IMMEDIATE EFFECT: PARTIAL OCCLUSION OF THE LUMEN OF THE ORIFICE
- ❑ DELAYED EFFECT: POSSIBLE INFLAMMATORY REACTION

Morphologic Changes Associated with Intrathecal Catheters for Direct Delivery to the Central Nervous System in Preclinical Studies

MARK T. BUTT

Tox Path Specialists, LLC, Hagerstown, Maryland, USA
Toxicologic Pathology, 39: 213-219, 2011



- A.** *An inflammatory mass/pyogranuloma (arrows) is evident in three transverse sections (top) and one oblique section (lower) taken at the level of the catheter tip and prepared using conventional techniques. The inflammatory mass surrounds the catheter track (dark dot) in the upper left section, and it is present but less visible in the center upper section.*
- B.** *Higher-magnification views of the same inflammatory mass, revealing a circular, clear area (where the catheter wall was located prior to processing) surrounding a circular tissue core that had grown into the lumen of the catheter. The inflammatory mass is composed of three distinct layers: an inner core consisting predominantly of neutrophils (many are degenerate/necrotic), a middle zone of connective tissue (pink), and an outer band of lymphocytes and macrophages. The compressed spinal cord is to the right.*

Butt TB .Toxicologic Pathology. 2011; 39: 213-219

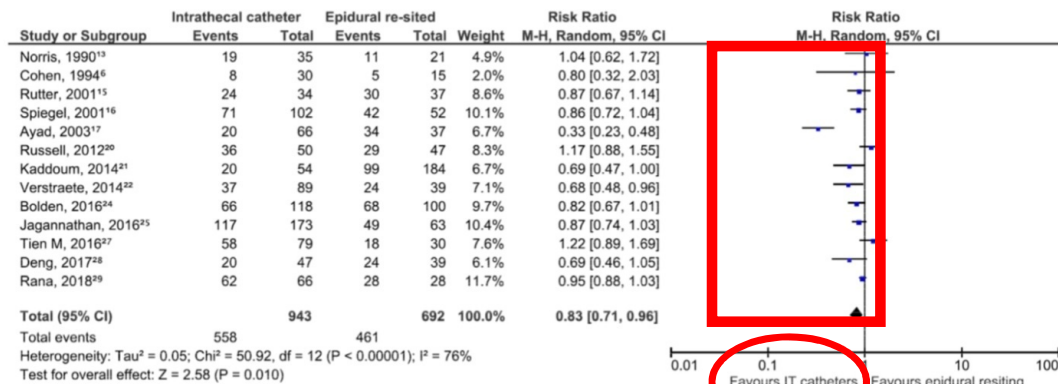


ACCIDENTAL DURAL PUNCTURE AND INTRATHECAL CATHETER INSERTION

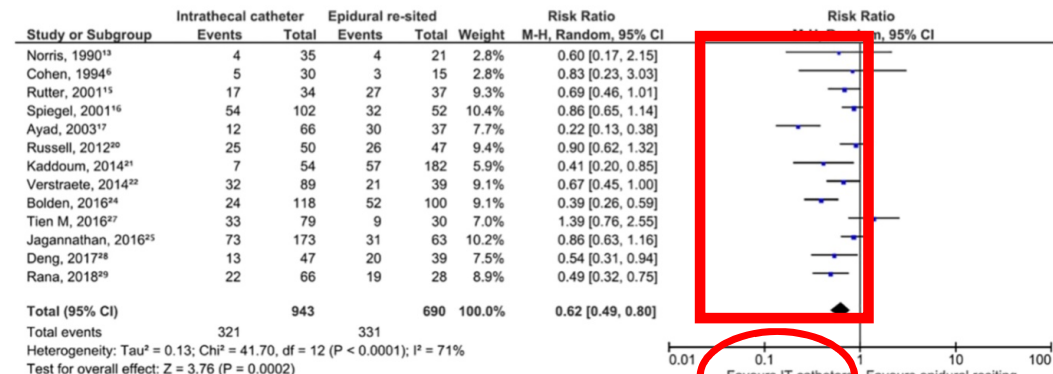
Intrathecal catheterisation after observed accidental dural puncture in labouring women: up-date of a meta-analysis and a trial-sequential analysis

M. Heesen,^a N. Hilber,^a K. Riis,^b C. van der Marel,^b R. Rossaint,^c L. Schäffer,^d
 M. Klimek^b International Journal of Obstetric Anaesthesia (2019)

META-ANALYSIS OF THE INCIDENCE OF POST-DURAL PUNCTURE HEADACHE



META-ANALYSIS OF THE NECESSITY OF EPIDURAL BLOOD PATCH





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Safe management of neuro-axial analgesia in labor

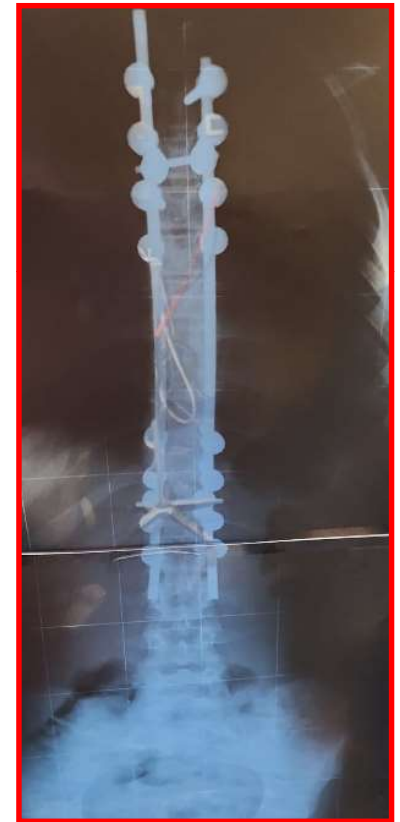
In our delivery rooms we would like the women giving birth to always be like this



and instead.....



OR





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- ❑ It is a "blind" technique: the needle is inserted after palpatory research of the anatomical landmarks (iliac crests, intercrestal line, spinous processes, interspinous spaces).
- ❑ With palpation, the anesthetist is able to correctly identify the interspace only in approximately 30% of cases.
- ❑ In 15% of cases, the Interspace used is two levels higher than the assumed one (L1???)

➤ **Ultrasound-assisted and ultrasound-guided neuraxial anesthesia** has improved clinical accuracy and patient safety through landmark identification including proper vertebral level and midline, as well as via measurements on neuraxial space. Direct needle or catheter visualization during the entire procedure has not yet been achieved consistently.





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Safe management of neuro-axial analgesia in labor

Ultrasound-facilitated neuraxial anaesthesia in obstetrics

A. Sadeghi¹, R. Patel^{2,*} and J.C.A. Carvalho^{3,4} *BJA Education*, 21(10): 369–375 (2021)

Review Article

Conventional landmark palpation vs. preprocedural ultrasound for neuraxial analgesia and anaesthesia in obstetrics – a systematic review and meta-analysis with trial sequential analyses B.Young, D.Onwochei N.Desai *Anaesthesia* 2021, 76, 818–831

Anesthesiology Clin
26 (2008) 145–158

Ultrasound-Facilitated Epidural and Spinals in Obstetrics

Jose Carlos Almeida Carvalho, MD, 1
FANZCA, FRCPC

Can J Anesth/J Can Anesth (2010) 57:1111–1126
DOI 10.1007/s12630-010-9397-y

Locating the epidural space in obstetric patients—a useful tool: Continuing Professional Development

International Journal of Obstetric Anesthesia (2010) 19, 373–378
0959-289X/S - see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.ijoa.2010.04.002

ORIGINAL ARTICLE

Ultrasound decreases the failed labor epidural rate in trainees

M.C. Vallejo, A.L. Phelps, S. Singh, S.L. Orebaugh, N. Sah



Goals:

- ✓ improve clinical practice
- ✓ improve teaching



❖ In fact, ultrasound of the spine allows you to evaluate:

- ❖ Midline of the spine.
- ❖ The level of the puncture
- ❖ The orientation to give to the needle.
- ❖ The distance between the skin and the ligamentum flavum.
- ❖ The presence of anatomical alterations.





Goals:

- ✓ improve clinical practice
- ✓ improve teaching



- Shortens the duration of the Epidural/Spinal technique
- Reduces the number of attempts and possible trauma
- Reduces patient discomfort
- Reduces the number of cases of accidental perforation of the dura mater / headache
- It facilitates the learning curve and increases the safety of the technique

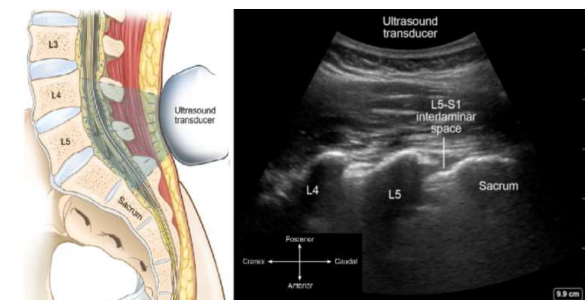
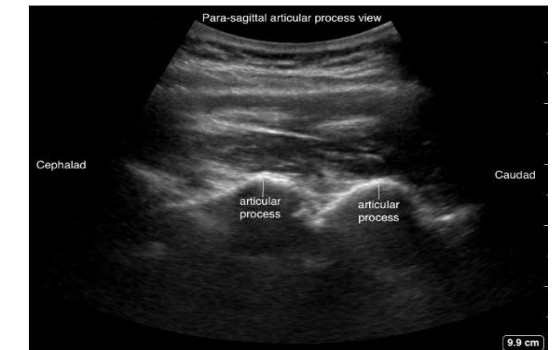
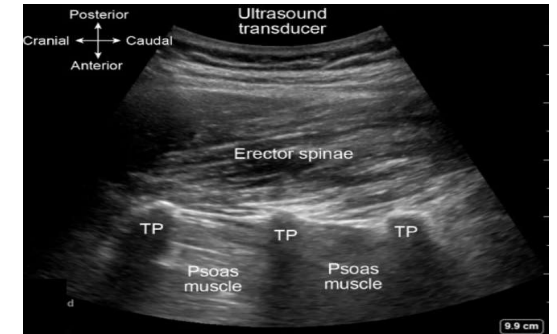




Safe management of neuro-axial analgesia in labor

Neuraxial Ultrasound

- Position the patient sitting or a lateral decubitus position.
 - Select a curvilinear low-frequency transducer (2–5 MHz) and sterile ultrasound gel as a coupling medium with a sterile probe cover.
 - Set the screen depth to 9–11 cm and adjust as needed after initial assessment.
 - Start scanning from the parasagittal transverse process view by placing the transducer few centimeters lateral
 - . The transverse processes are identified as a trident sign.
 - Slide the transducer cranially to identify the respective L5–L4, L4–L3, and L3–L2 interspaces, and mark the desired space
- Slide the transducer medially to obtain a parasagittal articular process view, identified as camel humps.
 - Tilt the transducer medially to obtain a parasagittal oblique interlaminar view. Identify the laminae appearing as a sawtooth or horsehead pattern and, subsequently, the PC, AC, and thecal sac.
 - Count the interlaminar spaces (acoustic windows) up from the sacrum in the parasagittal interlaminar view and identify the desired intervertebral level.



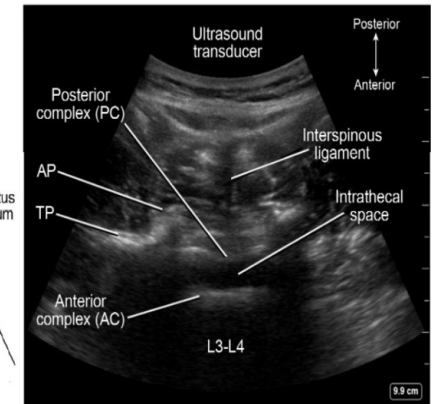
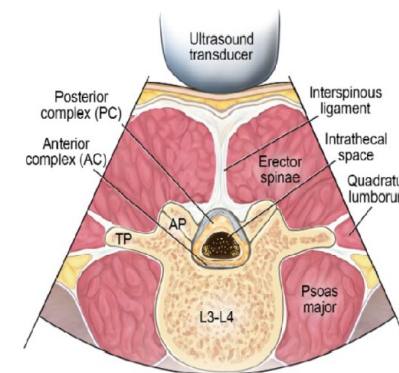
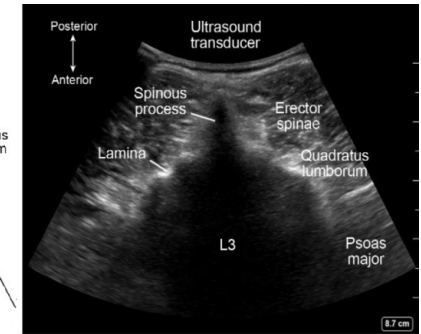
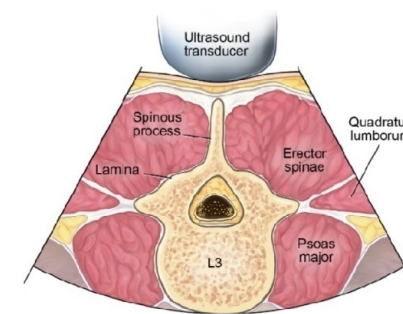


Safe management of neuro-axial analgesia in labor

Neuraxial Ultrasound

Rotate the transducer 90 degrees to obtain a transverse spinous process view at the desired vertebral level and make the midline (vertical) marking

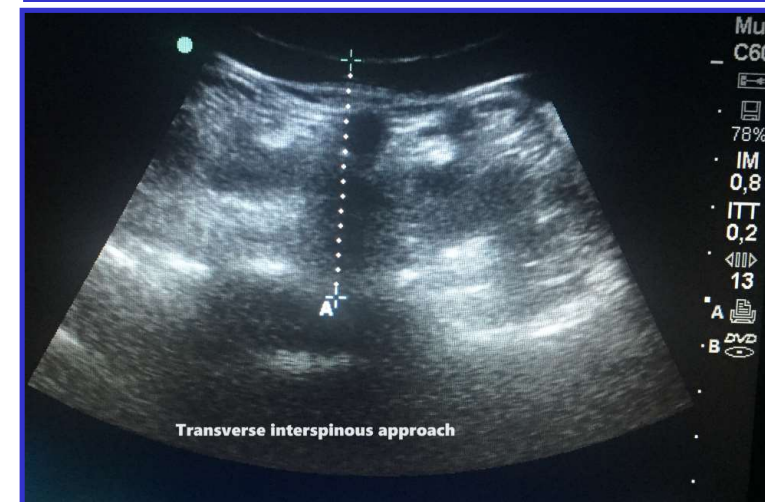
- Obtain the transverse interspinous view by sliding the probe slightly cephalad or caudad. This enables identification of the PC, AC, and thecal sac. Mark the interspaces laterally.
- The intersection of the vertical and transverse skin markings is the needle entry point for ultrasound-assisted neuraxial .





Ultrasound in the very obese parturient

- ❑ Palpation is impossible
 - ✓ it is not possible to precisely locate the midline of the lumbar spine and the iliac crests
- ❑ Image resolution is lower
 - ✓ due to the subcutaneous fat and the greater depth of the target structures
- ❑ The longitudinal scan indicates
 - ✓ the favorable level
- ❑ The transversal approach
 - ✓ helps locate the midline
- ❑ The distances to the target:
 - ✓ > 4 cm between skin surface and spinous process
 - ✓ > 7 cm between skin surface and posterior ligament/dura





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Ultrasound analysis of the spine

Department of Anesthesia, ICU, Pain Therapy and Childbirth

Analgesia - Buccheri La Ferla F.B.F. Hospital – Palermo



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Neuraxial Ultrasound

Sagittal Paramedian Oblique Approach and Transverse Approach

1. Pre-puncture evaluation



Eco-assisted procedure



2. Real-Time technique



Eco-guided procedure

Direct visualization of the progression of the needle through the tissues

Locating the epidural space in obstetric patients—ultrasound a useful tool: Continuing Professional Development

Mrinalini Balki, MD

Table 1 Efficacy of ultrasound-guided neuraxial blocks

Study	Patients	Parameters tested	Findings		
			US	Control	<i>P</i> value
Grau ¹⁵	Labouring women (<i>n</i> = 300)	Puncture attempts (<i>n</i>)	1.4 ± 0.7	2.2 ± 1.1	< 0.013
		Effective analgesia	98%	92%	< 0.03
		Side effects	20%	34%	< 0.011
Grau ¹⁶	CSE for CD (<i>n</i> = 80)	Puncture attempts (<i>n</i>)	1.3 ± 0.5	2.1 ± 0.9	< 0.001
		Success in first attempt	75%	20%	< 0.001
Grau ¹⁷	Labouring women with poor landmarks (<i>n</i> = 72)	Puncture attempts (<i>n</i>)	1.5 ± 0.9	2.6 ± 1.4	< 0.001
		Epidural failure	0%	5.5%	< 0.03
Grau ¹⁸	CSE for CD (<i>n</i> = 30)	Success at first attempt	70% *	40%	< 0.036
Arzola ⁵	Labouring women (<i>n</i> = 60)	Success at first attempt	92%	–	–
Balki ⁸	Labouring obese women (<i>n</i> = 46)	Success at first attempt	76%	–	–

US = ultrasound; CSE = combined spinal-epidural; CD = Cesarean delivery; *n* = number of patients. *Success rate was 100% for epidurals performed with real-time US

Locating the epidural space in obstetric patients—ultrasound a useful tool

1119

Table 2 Ultrasound-estimated depth to the epidural space in obstetric patients

Study	Patients	Scanning plane	Puncture Depth (cm)	Correlation Coefficient (<i>r</i> ²)	Bland-Altman Analysis Precision (cm)
Currie ¹⁹	Labour epidurals (<i>n</i> = 75)	Sagittal	4.1 ± 0.8	0.92	0.54
Wallace ²⁰	Labour epidurals in obese (<i>n</i> = 36)	Sagittal median/ Transverse	5.5 ± 2.1	0.98	0.54
Grau ²¹	Labour epidurals (<i>n</i> = 100)	Sagittal paramedian/ Transverse	5.3 ± 0.7	0.79	0.68
Grau ¹⁶	CSE for CD (<i>n</i> = 40)	Sagittal paramedian/ Transverse	5.2 ± 0.9	0.92	0.51
Grau ¹⁷	Labour epidurals in difficult cases (<i>n</i> = 36)	Sagittal paramedian/ Transverse	5.8 ± 1.1	0.87	0.77
Grau ¹⁵	Labour epidurals (<i>n</i> = 150)	Sagittal Paramedian/ Transverse	5.1 ± 0.9	0.83	0.69
Arzola ⁵	Labour epidurals (<i>n</i> = 60)	Transverse	4.7 ± 0.7	0.88	0.70
Balki ⁸	Labour epidurals in obese (<i>n</i> = 46)	Transverse	6.6 ± 1.0	0.85	1.00

CSE = combined spinal-epidural; CD = Cesarean delivery; *n* = number of patients





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Safe management of neuro-axial analgesia in labor

Management of analgesia in labor :(*Tailored analgesia for woman in labor*)

A Randomized Comparison of Programmed Intermittent Epidural Bolus with Continuous Epidural Infusion for Labor Analgesia

Cynthia A. Wong, MD, John T. Ratliff, MD, John T. Sullivan, MD, Barbara M. Scavone, MD, Paloma Toledo, MD, and Robert J. McCarthy, PharmD
Department of Anesthesiology, Northwestern University Feinberg School of Medicine, Chicago, Illinois

The Effect of Manipulation of the Programmed Intermittent Bolus Time Interval and Injection Volume on Total Drug Use for Labor Epidural Analgesia: A Randomized Controlled Trial

Cynthia A. Wong, MD, Robert J. McCarthy, PharmD, and Bradley Hewlett, MD

Scientific literature

Intermittent vs continuous administration of epidural ropivacaine with fentanyl for analgesia during labour†

P. D. W. Fettes*, C. S. Moore¹, J. B. Whiteside², G. A. Mcleod and J. A. W. Wildsmith

Programmed Intermittent Epidural Bolus Versus Continuous Epidural Infusion for Labor Analgesia: The Effects on Maternal Motor Function and Labor Outcome. A Randomized Double-Blind Study in Nulliparous Women

Giorgio Capogna, MD, Michela Camorcia, MD, Silvia Stirparo, MD, and Alessio Farcomeni, PhD

- The use of PIEB + PCEA (with the aid of computerized microinfusors) has proven to be qualitatively better than CEI + PCEA for the control of labor pain as it reduces the consumption of local anesthetic (especially after 180 minutes from initiation of analgesia) while maintaining optimal pain scores, sensory and motor block, lower incidence of instrumental birth and high degree of satisfaction of the parturient.
- Extending the programmed intermittent bolus volume from 15 minutes to 60 minutes and from 2.5 to 10 ml, respectively, reduced local anesthetic consumption without reducing the comfort or satisfaction of the parturient.
- Other authors (Halpern and Carvalho) argue that larger doses of low concentration anesthetic can provide superior analgesia and maternal satisfaction.
- The risk of instrumental birth appears reduced thanks to "low-dose" neuraxial analgesia



An effective neur-axial analgesia effective in labor:

- ❖ It does not increase the cesarean delivery rate.
- ❖ There is no single universal method for managing labor pain that fits all circumstances and needs.
- ❖ In the absence of obstetric contraindications, neuraxial analgesia should be considered as the gold standard in obtaining relief from maternal pain during labor.
- ❖ The use of PIEB instead of CEI after CSE seems to give better analgesia perhaps due to the direct passage of the local anesthetic into the intrathecal space.
- ❖ The different options that can be used in the management of labor pain analgesia as well as the potential risks and benefits should be known and evaluated both by gynecologists and obstetricians and by anesthetists in order to choose the best scheme, personalized and adapted to the needs of the parturient.
- ❖ The early administration of neuroaxial analgesia does not increase the risk of operative delivery and therefore the mother has no reason to suffer pain in the initial phase of labor while waiting for an arbitrary degree of cervical dilatation to be reached.

British Journal of Anaesthesia 105 (51): 150-160 (2010)
doi:10.1093/bja/aeq311

BJA

OBSTETRICS

Labour analgesia and obstetric outcomes

C. R. Cambic and C. A. Wong*

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* Corresponding author. E-mail: c-wong2@northwestern.edu

Automated intermittent epidural boluses improve analgesia induced by intrathecal fentanyl during labour

[L'administration automatisée de bolus intermittents améliore l'analgesie induite par du fentanyl intrathécal pendant le travail]

Sebastian M.H. Choa MMed,* Alex T.H. Sia MMed†



Ruth Landau, MD, and Christopher Ciliberto, MD
Department of Anesthesiology & Pain Medicine
University of Washington - Seattle, August 2011

Modern Labor Analgesia

Scientific
literature

Early Compared With Late Neuraxial Analgesia in Nulliparous Labor Induction A Randomized Controlled Trial

Cynthia A. Wong, MD, Robert J. McCarthy, PharmD, John T. Sullivan, MD, Barbara M. Scavone, MD, Susan E. Gerber, MD, MPH, and Edward A. Yaghmour, MD

Arch Gynecol Obstet. 2014 Jul;290(1):21-34.

Update on best available options in obstetrics anaesthesia: perinatal outcomes, side effects and maternal satisfaction. Fifteen years systematic literature review.

Gizzo S, Noventa M, Fagherazzi S, Lamparelli L, Ancona E, Di Gangi S, Saccardi C, D'Antona D, Nardelli GB.

1. Department of Woman and Child Health University of Padua Padua Italy
2. Dipartimento della Salute della Donna e del Bambino U.O.C di Clinica Ginecologica e Ostetrica Padua Italy

Neuraxial analgesia in labour – induction and maintenance

Brynmor A Summers Graeme G Flett
Obstetric Anaesthesia volume 20, ISSUE p371-375 july 2019

PROJECT TAWILA - Tailored analgesia for women in labor - Analgesia neurassiale in travaglio di parto
 Department of Anesthesia, ICU, Pain Therapy and Childbirth Analgesia - Buccheri La Ferla F.B.F. Hospital – Palermo Chief : Dr. L. Calderone

1st STAGE OF LABOR: DILATING PERIOD

FIRST PROCEDURE:

PRIMIPARAOUS / PLURIPARAOUS AT THE BEGINNING OF PHYSIOLOGICAL LABOR with VAS >3 or posterior cephalic presentation

Initial bolus in L3-L4 or L2-L3 epidural space over 4-5 minutes

Ropivacaine 0.1%: 10-14 ml according to BMI with Sufentanyl 10 mcg or Sufentanyl 10 mcg diluted with 10ml of NaCl 0.9%

Dopo 30 min

If pain is controlled

If pain is NOT controlled

Programmed intermittent boluses (PIEB): Ropivacaine 0.1% 10-12 ml/70 min + PCEA (Lock Out 20min) Ropivacaine 0,1% 6-8ml

Ropivacaine 0,2%: 4-6 ml with Sufentanyl 5 mcg

If pain is NOT controlled REPEAT EPIDURAL PROCEDURE

SECOND PROCEDURE:

PRIMIPARAOUS / PLURIPARAOUS >7CM DILATION with high VAS: 7-10 with expected delivery >2h

Initial bolus the L3-L4 or L2-L3 epidural space over 4-5 minutes

Ropivacaine 0.2%: 10-14 ml according to BMI

Dopo 30 min

Programmed intermittent boluses (PIEB): Ropivacaine 0.1% 10-12 ml/70 min + PCEA (20 minutes lock out): Ropivacaine 0.1% 6-8ml

THIRD PROCEDURE:

PRIMIPARAOUS/PLURIPARAOUS:>7CM DILATION with expected delivery <2h

Spinal-epidural combination in L3-4 or L2-3 subarachnoid bolus:

-Sufentanyl 2,5 mcg or Fentanyl 10 mcg
 -Levobupivacaine 0,25% 0,8 ml
 -Dilute with 0.9% NaCl to a total volume of 2 ml

After 60-90 <-minutes

continue as the SECOND PROCEDURE

FOURTH PROCEDURE:

PRIMIPARAOUS/PLURIPARAOUS: in the very painful prodromal phase NON-PHYSIOLOGICAL LABOR gestational hypertension, pre-eclampsia, IUGR, induced or labor with dyskinesia or probable Cesarean section

Spinal-epidural combination in L3-4 or L2-3 subarachnoid bolus:

-Sufentanyl 2,5 mcg or Fentanyl 25 mcg
 -Dilute with 0.9% NaCl to a total volume of 2 ml

When the pain resumes

continue as the FIRST PROCEDURE

1st STAGE OF LABOR: EXPULSIVE PERIOD

Check for the presence of perineal analgesia and possibly before giving birth inject:
Ropivacaine 0,2 % 6-8 ml DURING THE EXPULSIVE PERIOD

and/or
 •Lidocaine 2% 6-8 ml AFTER EXPULSION OF THE FETUS placing the parturient in a semi-sitting position for 10 minutes

In case of ACCIDENTAL PUNCTURE OF THE DURA MATERAL:

Insert the epidural catheter into the subarachnoid site, confirm correct positioning and fix it; perform antibiotic prophylaxis, then administer::

during LABOR (1st stage)

- Levobupivacaine 0,25% 0,8-1 ml (2-2,5 mg)
 - Sufentanyl 2,5 mcg
 - Dilute with 0.9% NaCl to a total volume of 4 ml

volume tot. 5 ml

in case of PAIN

- Levobupivacaine 0,25% 0,8-1 ml (2-2,5 mg)
 - NaCl 0,9% 4 ml

volume tot. 5 ml

in case of Cesarean section

-Bupivacaine 0.5% hyperbaric 9-10mg(1,8 - 2 ml) (volume according to BMI and phase of analgesia)

At the end of delivery/Cesarean section:

Connect the intrathecal catheter to an infuser filled with 0.9% NaCl solution at a rate of 2.5 ml/h for 24 hours or administer a bolus of 10 ml of 0.9% NaCl solution every 4 hours for 24 hours; Administer 0.9% NaCl solution 10 ml upon removal of the intrathecal catheter.

Dr. Luciano Calderone



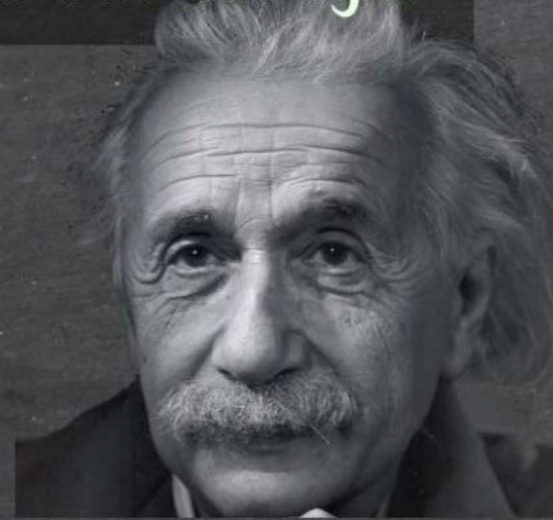


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If you can't explain it **simply**, you
don't understand it well enough.

-Albert Einstein



QuotesEverlasting.com

Se non puoi spiegarlo in modo **semplice**, non lo hai capito abbastanza



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