



GROUPEMENT  
HOSPITALIER  
DE L'OUEST  
LÉMANIQUE

# How should I top up epidural for emergent C-section?

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1.04.2023

Médecin Cheffe co-responsable du Service  
d'anesthésie

Hôpital de Nyon, Vaud  
Switzerland



A close-up photograph of Harry Styles, shirtless, smiling broadly with his arms raised. He has a gold cross necklace and a butterfly tattoo on his chest. The background is a bright, slightly blurred outdoor setting.

# Rolling Stone

CLIMATE CRISIS  
**Can We  
Survive  
Extreme  
Heat?**

BY JEFF DOODLE

**Trump  
2020:  
Be Very  
Afraid**

BY MATT FARLEY

**Sex,  
Psychedelics,  
and the  
Secrets  
of Stardom**

# Harry Styles

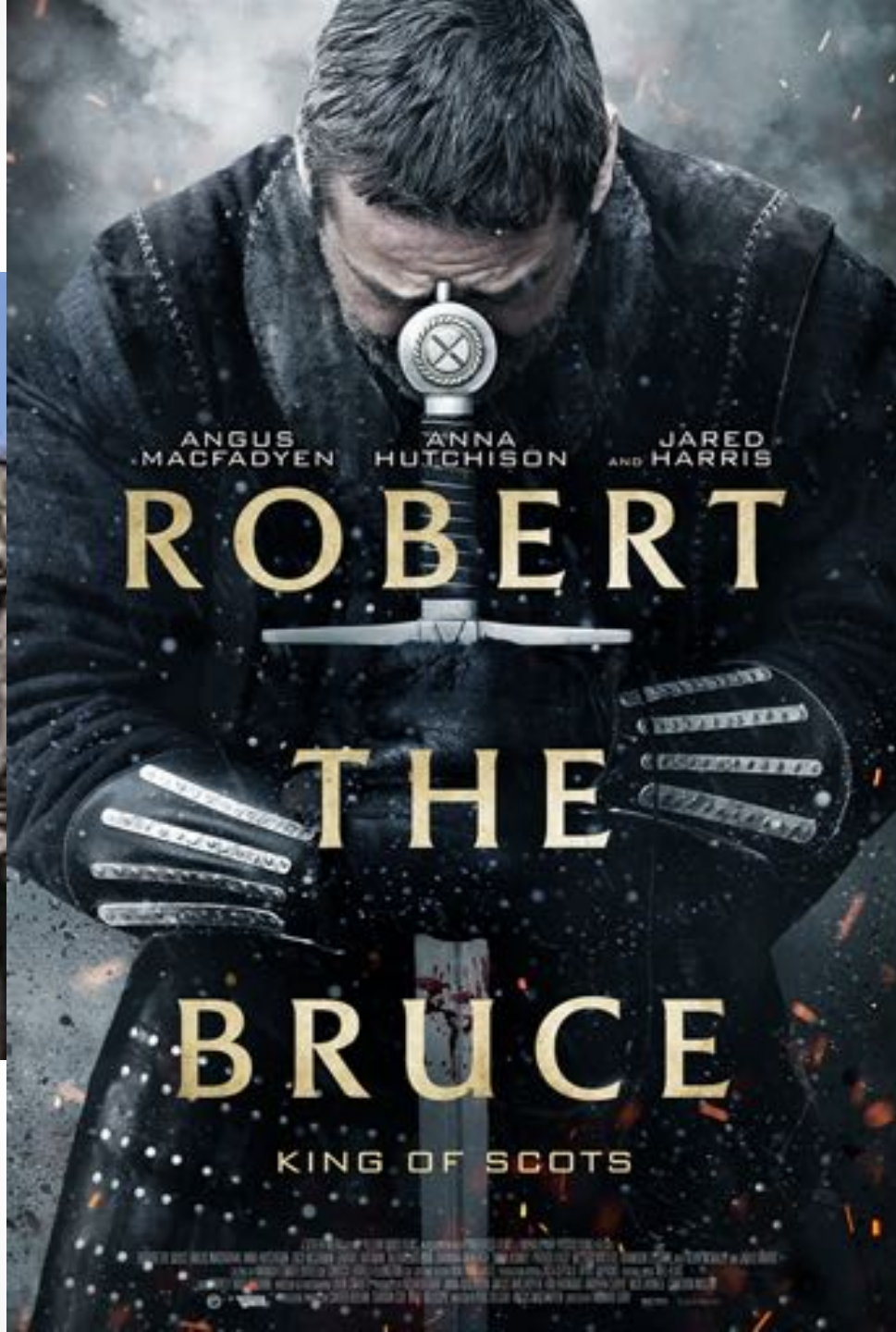














**I Examine And Act!**




# I Examine And Act!

- I: Indication of CS



# CS Category

**Figure 1. A classification relating the degree of urgency to the presence or absence of maternal or fetal compromise**



Urgency	Definition	Category
Maternal or fetal compromise	Immediate threat to life of woman or fetus	1
	No immediate threat to life of woman or fetus	2
No maternal or fetal compromise	Requires early delivery	3
	At a time to suit the woman and maternity services	4

Categories	Indications
Category 1 Decision to delivery interval: <30 min	Fetal distress/ persistent fetal bradycardia
	Cord prolapse
	Severe placental abruption
	Antepartum hemorrhage (APH) with maternal hypovolemia
	Uterine rupture and scar dehiscence
Category 2 Decision to delivery interval: 30 - 45 min	Failed instrumental delivery with fetal distress
	APH without maternal hypovolemia
	Failed induction of labor
	Abnormal Doppler
Category 3 Decision to delivery interval: 45 - 75min	Non reassuring CTG
	Previous LSCS in labor
	CPD (Cephalo- pelvic disproportion)
Category 4 Decision to delivery interval- no specific time (> 75 min)	Breech in early labor
	Elective LSCS
	Mal presentations
	Multiple pregnancy with first twin non cephalic
	LSCS on demand



# Category 1

Categories	Indications
Category 1 Decision to delivery interval: <30 min	Fetal distress/ persistent fetal bradycardia
	Cord prolapse
	Severe placental abruption
	Antepartum hemorrhage (APH) with maternal hypovolemia
	Uterine rupture and scar dehiscence
	Failed instrumental delivery with fetal distress

Immediate threat to life of woman or fetus

# I Examine And Act!

- I: Indication of CS: Category I
- Examine the Epidural







# Conversion of labour epidural analgesia to surgical anaesthesia for emergency intrapartum Caesarean section

N. Desai<sup>1,3,\*</sup> and B. Carvalho<sup>2</sup>

<sup>1</sup>Guy's and St Thomas' NHS Foundation Trust, London, UK, <sup>2</sup>Stanford University School of Medicine, Stanford, CA, USA and <sup>3</sup>King's College London, London, UK

**Table 1** Risk factors associated with the failure of conversion of epidural analgesia for labour to surgical anaesthesia for Caesarean section. <sup>†</sup> CSE, combined spinal–epidural; OR, odds ratio

## Consistent factors

- Greater number of unscheduled epidural top-ups needed to maintain effective analgesia in labour (OR 3.2)
- Increased parturient reported pain in the 2 h before Caesarean section
- Management by a non-obstetric anaesthetist (OR 4.6)
- Urgency of the Caesarean section (OR 40.4)

## Inconsistent factors

- Increased BMI or weight
- Cervical dilatation at the commencement of labour epidural analgesia
- Epidural rather than CSE for analgesia in labour
- Increasing duration of epidural analgesia

**Table 2** Recommendations to decrease the risk of failure of converting epidural analgesia for labour to surgical anaesthesia for Caesarean section<sup>3</sup>

**In the delivery room before any decision to proceed to Caesarean section**

- Early recognition of poorly functioning epidural analgesia, providing the anaesthetist with an opportunity to manipulate or replace the epidural catheter
- If the obstetrician expresses concern about a parturient's slow progress in labour or the fetal heart rate tracing, the anaesthetist must re-evaluate how well the epidural is functioning in anticipation of the need to convert to surgical anaesthesia

**In the operating theatre after the decision to proceed to Caesarean section**

- Inspection of the epidural catheter to check that it has not migrated since placement in labour
- If sufficient time is available, the function of the epidural can be tested by administering one-quarter to one-third of the full LA dose, examining initially and subsequently every 3–5 min for the bilaterally, level and density of sensory blockade
- In the absence of definite evidence of bilateral and progressively cephalad sensory blockade of adequate density, more than half of the full LA dose should not be administered

# Algorithm for the anesthetic management of cesarean delivery in patients with unsatisfactory labor epidural analgesia [v1; ref status: indexed, <http://f1000r.es/5a3>]

Sonia Vaida<sup>1</sup>, Davide Cattano<sup>2</sup>, Debra Hurwitz<sup>1</sup>, Berend Mets<sup>1</sup>

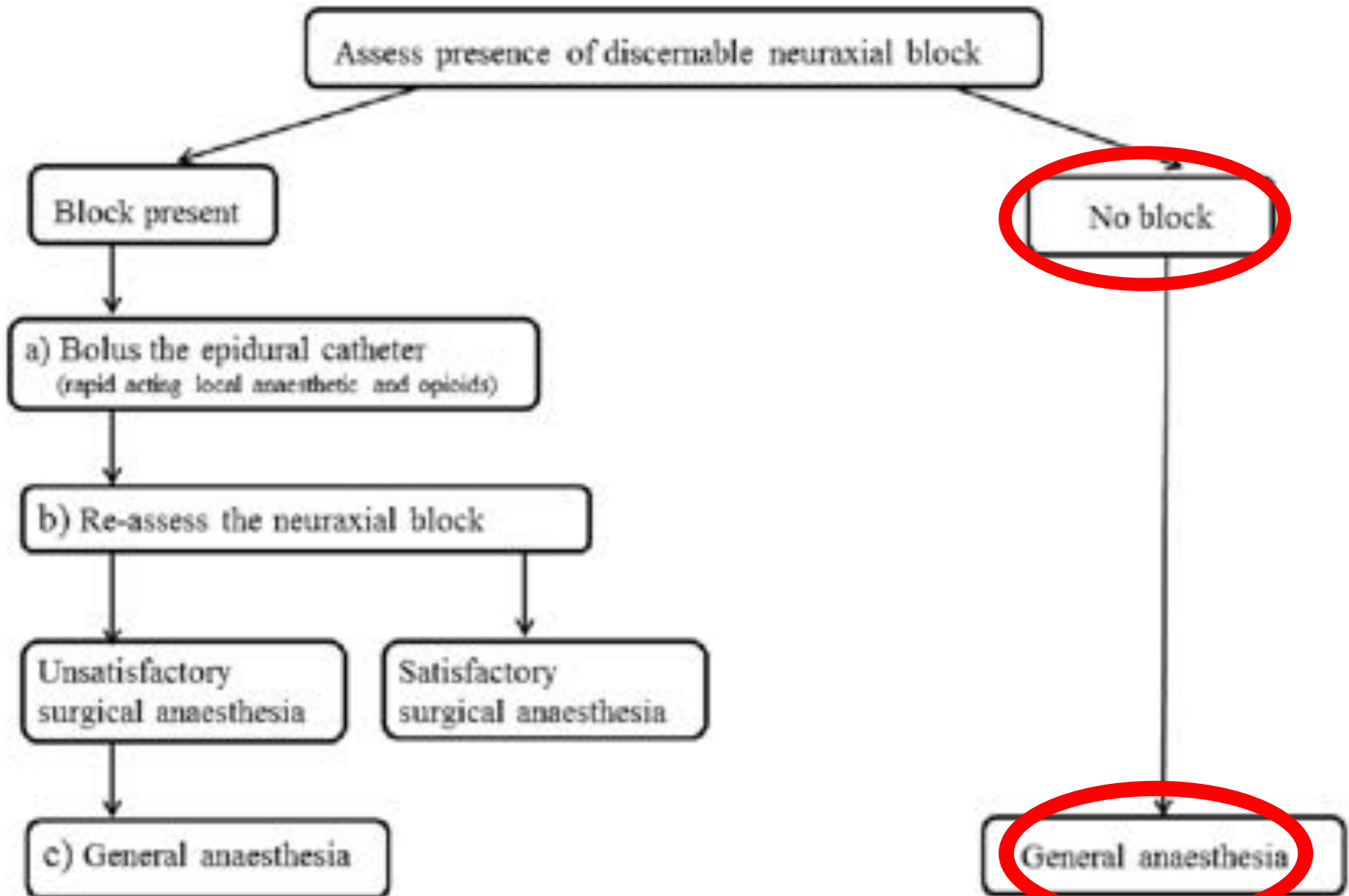
<sup>1</sup>Department of Anesthesiology, Penn State Milton S. Hershey Medical Center, Hershey, Pennsylvania, 17033, USA

<sup>2</sup>Preoperative clinic, Department of Anesthesiology, The University of Texas Medical School at Houston, Houston, Texas, 77030, USA

F1000Research 2015, 4:98 Last updated: 18 JUN 2015



## Category 1 Cesarean Delivery



# Failed tracheal intubation in obstetric anaesthesia: 2 yr national case–control study in the UK

A. C. Quinn<sup>1\*</sup>, D. Milne<sup>2</sup>, M. Columb<sup>3</sup>, H. Gorton<sup>1</sup> and M. Knight<sup>4</sup>

<sup>1</sup> The General Infirmary at Leeds, Great George Street, Leeds LS13EX, UK

<sup>2</sup> Pinderfields General Hospital, Aberford Road, Wakefield WF1 4DG, UK

<sup>3</sup> Department of Anaesthesia and Intensive Care Medicine, University Hospital of South Manchester, Wythenshawe, Manchester M23 9LT, UK

<sup>4</sup> National Perinatal Epidemiology Unit (NPEU), University of Oxford, Old Road Campus, Oxford OX3 7LF, UK

\* Corresponding author. E-mail: a.c.quinn@leeds.ac.uk

GA denominator rate at nearer 6400 per year. After consideration of these issues, we considered the rate of one in 224 appears to be a more reliable estimate for failed tracheal intubation in UK obstetric anaesthetic practice.









# Raising the Standard:

a compendium of audit recipes  
*for continuous quality improvement in anaesthesia*

3rd edition  
**2012**

Editors  
**Dr John R Colvin**  
**Dr Carol J Peden**

## Urgency classification<sup>10</sup>

Category 1	Maternal or fetal compromise, immediate threat to life of woman or fetus
Category 2	Maternal or fetal compromise, no immediate threat to life of woman or fetus
Category 3	No maternal or fetal compromise, requires early delivery
Category 4	Delivery at a time to suit the woman and maternity services

*Elective = Category 4. Emergency = Category 1–3.*

	Cat 4	Cat 1–3	Cat 1
CS carried out with RA	> 95%	> 85%	> 50%
Pain during CS	< 5%	< 15%	< 20%
RA to GA conversion	< 1%	< 5%	< 15%

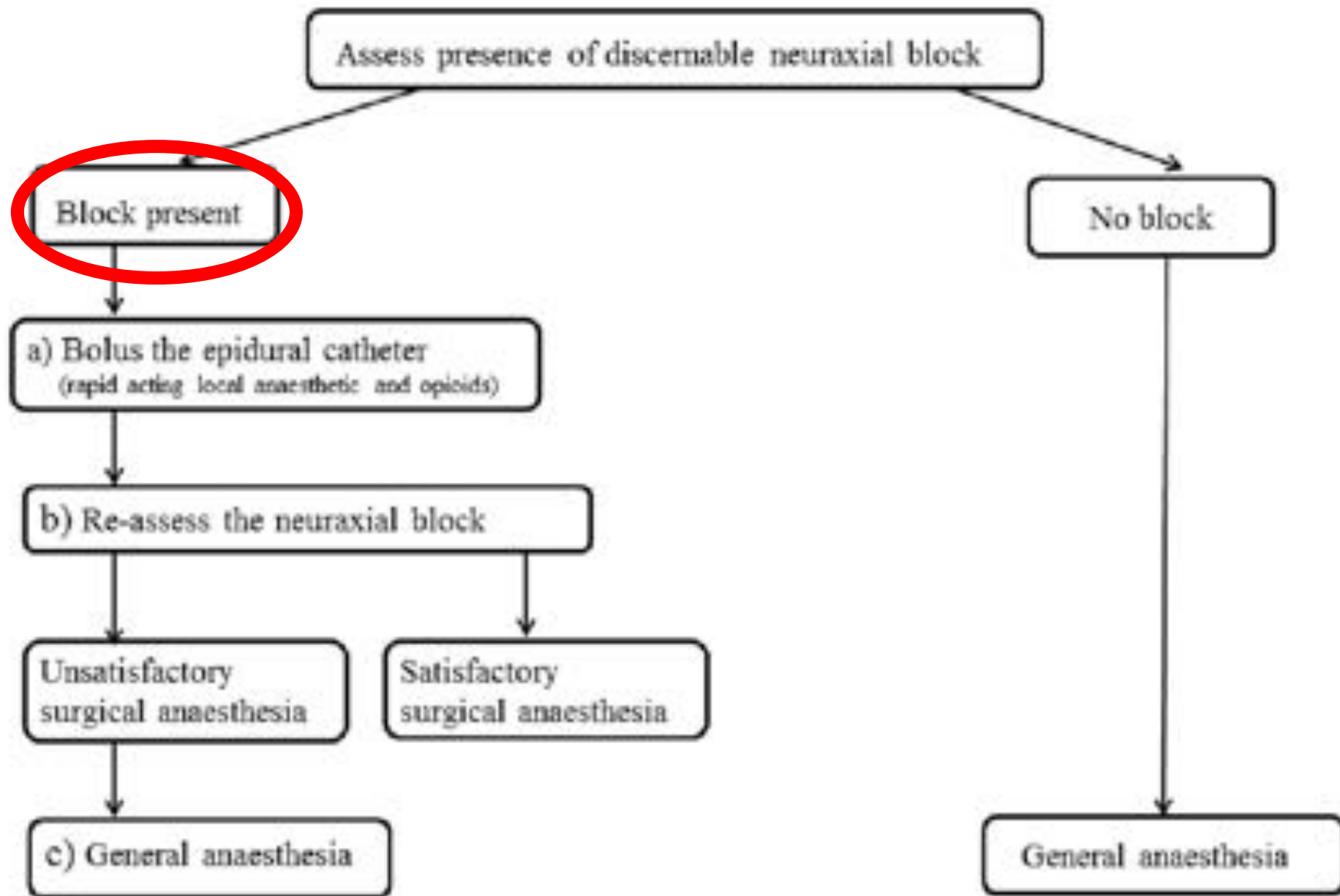


# I Examine And Act

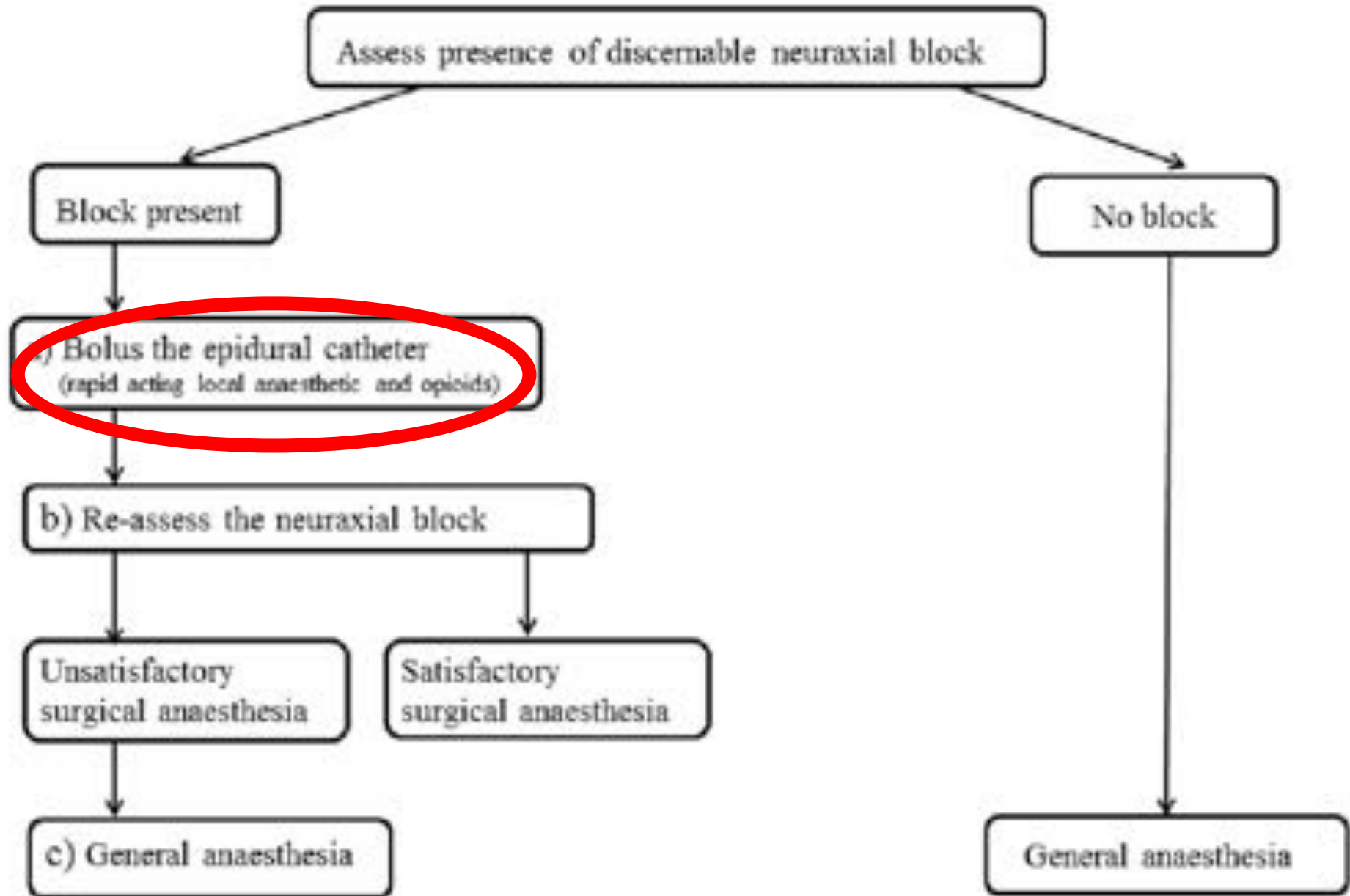
- I: Indication of CS: Category I
- Examine the Epidural



## Category 1 Cesarean Delivery



## Category 1 Cesarean Delivery





# What do anesthesiologists do?

**Table 1** Location of extension of epidural blockade.

Location	<i>n</i> (%)
Delivery room	136 (68)
Delivery room and theatre	25 (12.5)
Theatre	30 (15)
No answer	9 (4.5)

Anaesthesia, 2008, **63**, pages 136–142

# Which LA ?

**Table 2** Choice of local anaesthetic agents and adjuncts.

Drug combination	<i>n</i> (%)
Bupivacaine	83 (41.5)
Levobupivacaine	25 (12.5)
Bupivacaine / lidocaine	23 (11.5)
Lidocaine / adrenaline	19 (9.5)
Lidocaine / adrenaline / bicarbonate	13 (6.5)
Lidocaine	11 (5.5)
Bupivacaine / lidocaine / adrenaline / bicarbonate	10 (5)
Ropivacaine	7 (3.5)
Bupivacaine / adrenaline	3 (1.5)
Levobupivacaine / lidocaine / adrenaline / bicarbonate	1 (0.5)
Levobupivacaine / lidocaine	1 (0.5)
Levobupivacaine / lidocaine / adrenaline	1 (0.5)
Lidocaine / ropivacaine	1 (0.5)
Not answered	2 (1)

# What surveillance is necessary?

**Table 3** The use of monitoring during transfer between delivery room and operating theatre by anaesthetists who establish anaesthesia in the delivery room ( $n = 161$ ).

	<i>n</i>
None	114
Non-invasive blood pressure	39
$S_pO_2$	21
ECG	3
Not answered	6

**71 % no monitoring**



# What complications ?

**Table 4** Adverse incidents associated with extension of epidural blockade.

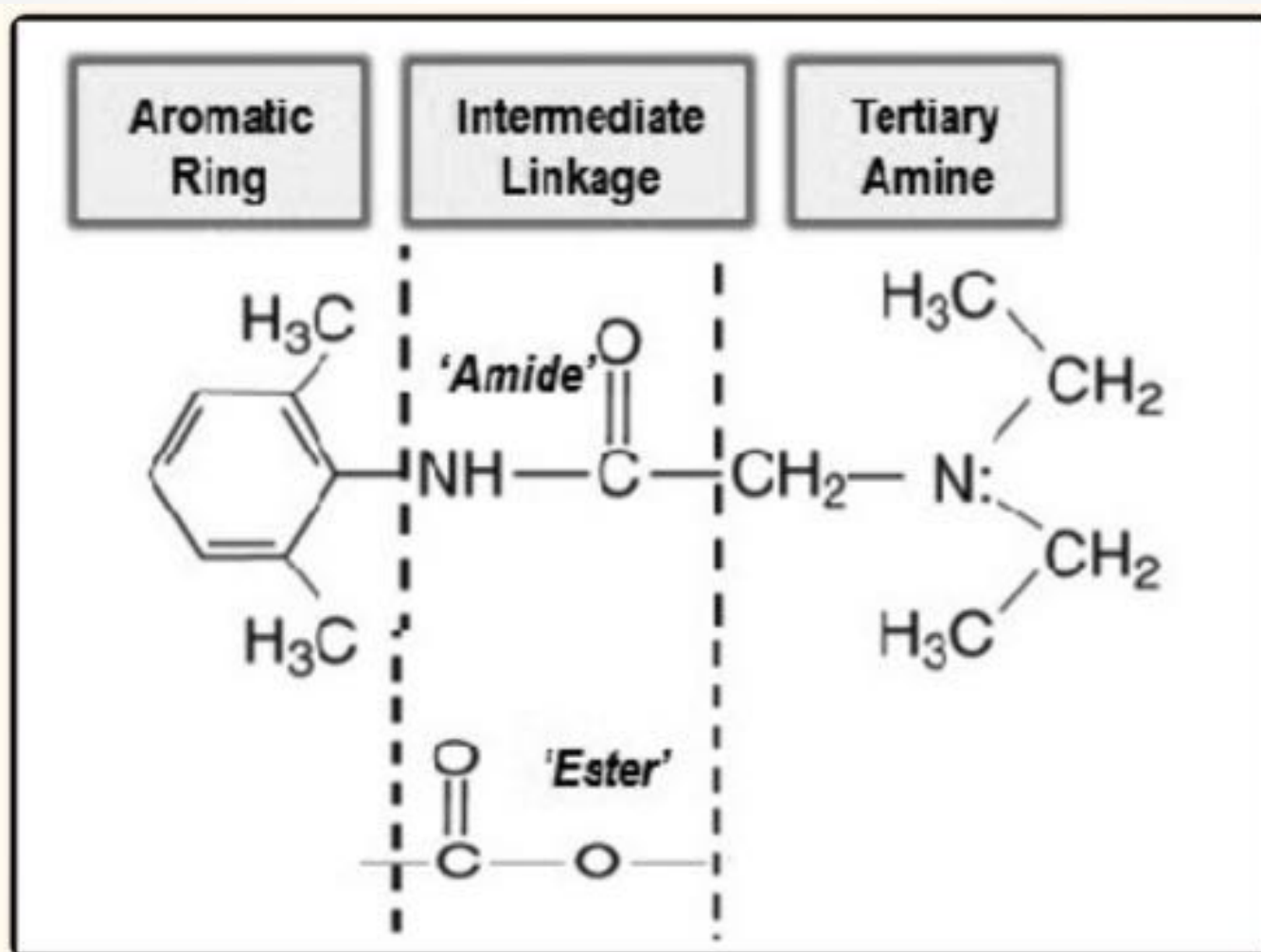
Adverse incident	Frequency
Inadequate block	8
High block not requiring intubation	14
High block requiring intubation	12
Possible intravascular position of catheter	6
Seizures	2
Cardiac arrest	1
Total no. of adverse events	43

# I Examine And Act

- **I**: Indication of CS: Category I
- **E**xamine the **E**pidural
- **A**ct:
  - Which local anaesthetic do I use?



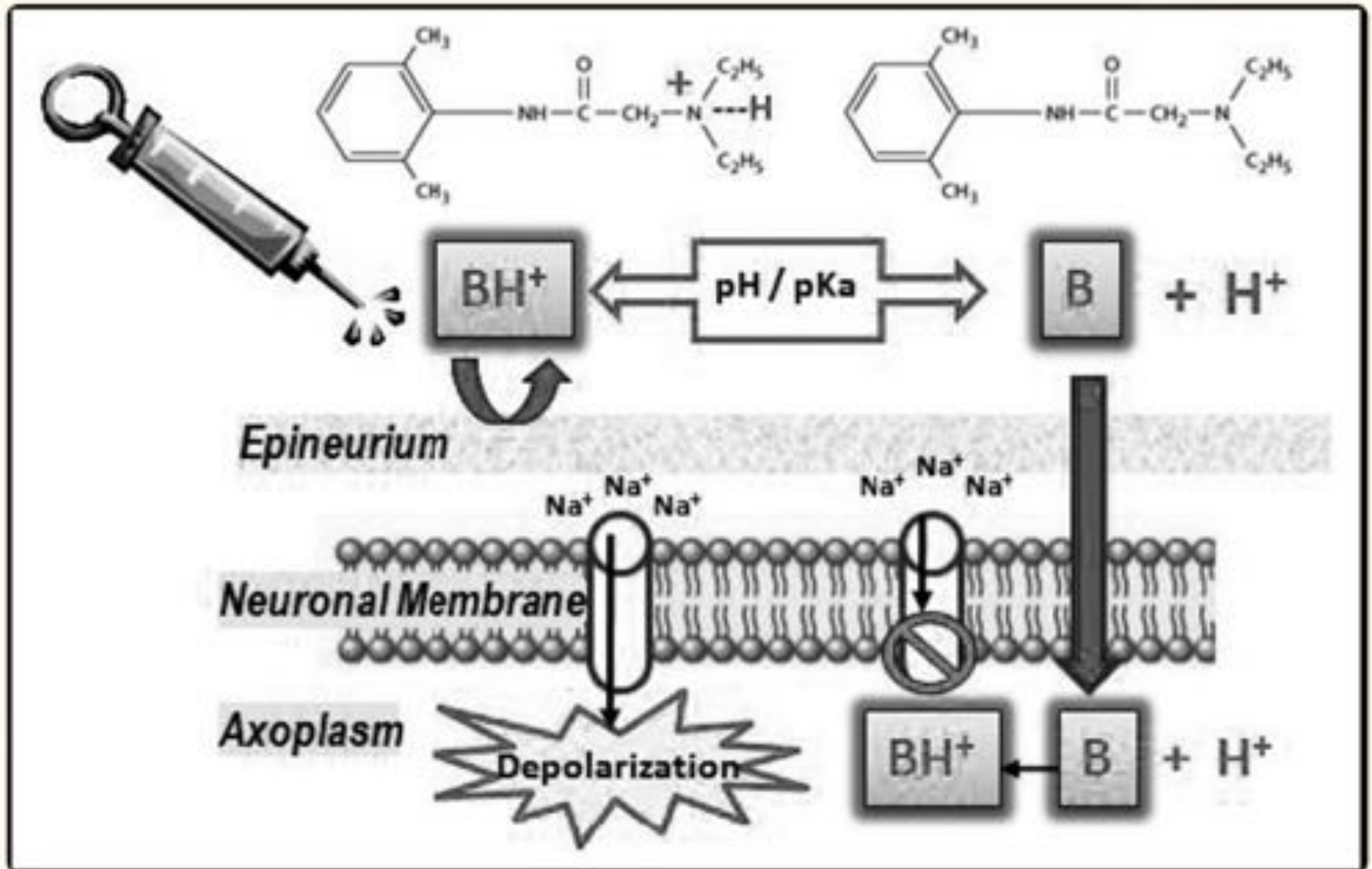




[Anesth Prog.](#) 2012 Summer; 59(2): 90–102.

doi: [10.2344/0003-3006-59.2.90](https://doi.org/10.2344/0003-3006-59.2.90)





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**Bupivacaine**

**VS**

**Lidocaine**

# **Low-dose epidural top up for emergency caesarean delivery: a randomised comparison of levobupivacaine versus lidocaine/ epinephrine/fentanyl**

P. Balaji, P. Dhillon, I.F. Russell

*Department of Anaesthesia, Hull Royal Infirmary, Hull, UK*

- Prospective study
- CS grade II and III, Epidural
- 100 patients
- 20 ml: LEF vs 0.5% levo bupivacaine
- Primary outcome: time from the end of the top up until block of the T7

**Table 2** Times for drug preparation and time to block of touch at T7, duration of caesarean section, intraoperative analgesic supplements used, and neonatal Apgar scores

	LEF group (n = 50)	Levo group (n = 50)	<i>P</i>
Preparation time (s)	145 [120, 200]	60 [44, 60]	<0.001
Start of drug preparation to T7 (min)	15 [ 15, 19]	18 [13.8, 22.4]	0.05
Start of top-up to T7 (min)	13 [10.8, 16.0]	16.6 [12.6, 21.4]	
End of top-up to T7 (min)	10 [8.0, 13.0]	15 [10, 20]	<0.001
T7 blocked until skin incision (min)	2 [ 0, 8]	4 [1.0, 10.5]	0.36
Duration of caesarean section (min)	40 [33, 47]	40 [32, 50]	0.97
T7 blocked to end of surgery (min)	44 [35, 54]	46 [36, 55]	0.70
Additional LA to achieve T7 block	0 / 50 (0%)	5*/50 (10%)	0.02
Intraoperative supplementation rates	4 / 44 (9%)	9 / 45 (20%)	0.15
Intraoperative supplementation drugs used:			
LA top up	0	2	
Nitrous oxide/oxygen	1	0	
alfentanil	0	4	
combinations of the above	3	3	
Apgar scores: 5 min	9 [ 8, 9]	9 [8, 9]	0.60
10 min	9 [ 9,10]	9 [9,10]	0.64

Values are number (%), median [lower quartile, upper quartile]; LEVO: levobupivacaine; LEF: lidocaine/epinephrine/fentanyl; LA: local anaesthetic.

\* Includes one spinal anaesthetic.

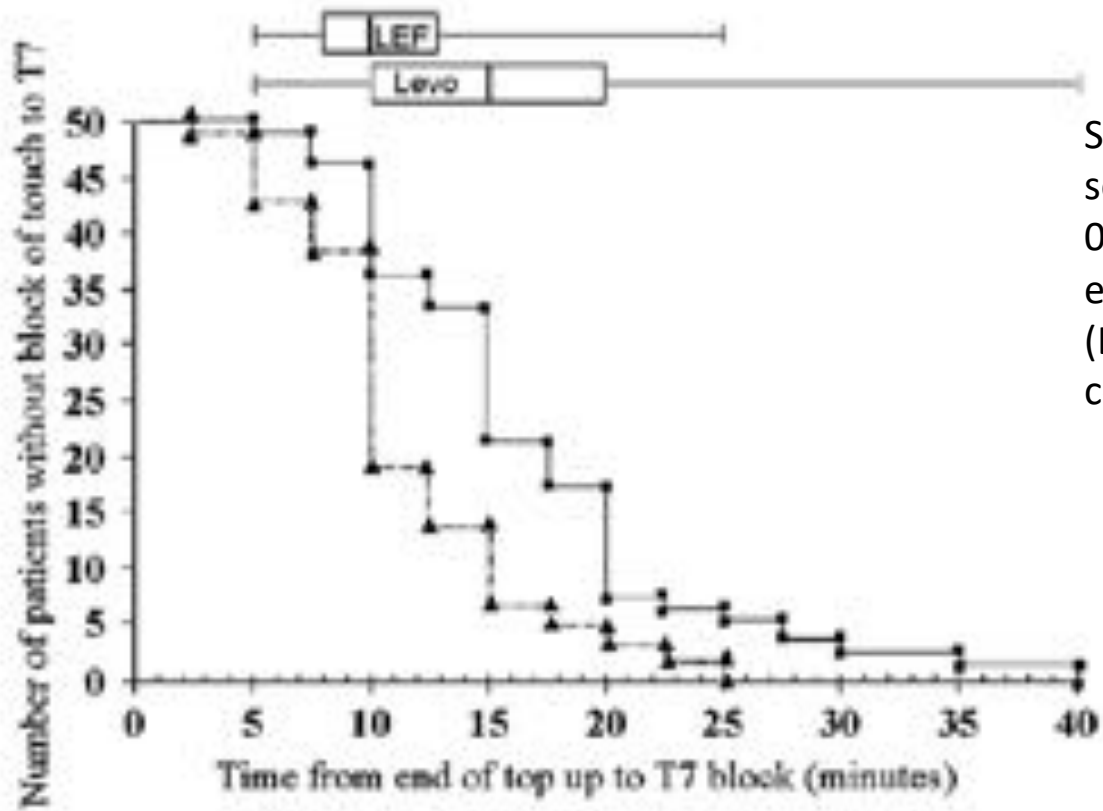


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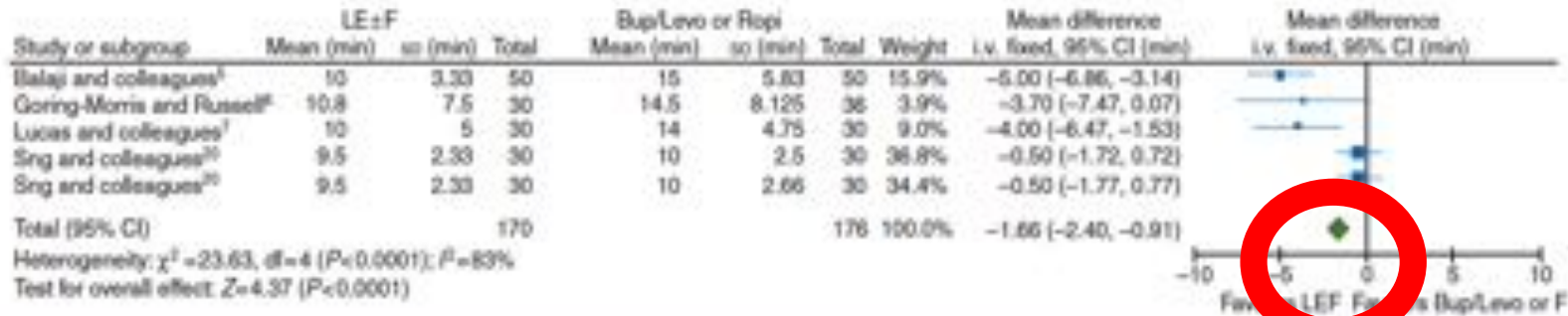
Survival curves for onset time of loss of touch sensation at T7 following epidural top up with 0.5% levobupivacaine or 2% lidocaine / epinephrine 100 µg/ fentanyl 100 µg mixture (LEF: dotted line) and levobupivacaine (Levo : continuous line).

# Extending epidural analgesia for emergency Caesarean section: a meta-analysis

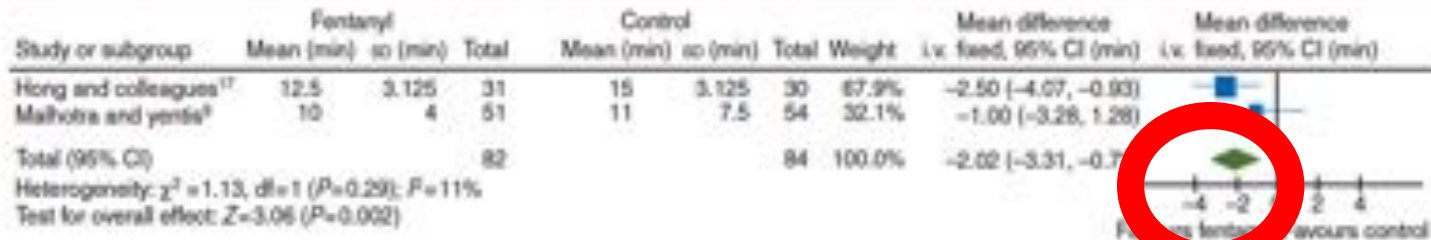
S. G. Hillyard<sup>1,2\*</sup>, T. E. Bate<sup>2</sup>, T. B. Corcoran<sup>1,3</sup>, M. J. Paech<sup>3,4</sup> and G. O'Sullivan<sup>2</sup>

- Conversion of epidural analgesia to surgical analgesia for emergency CS
- 11 RCT
- 779 parturients
- Primary outcome: time to onset adequate for surgery and need for supplementation intraoperatively
- 3 groups:
  - 0.5% bupivacaine or levobupivacaine (Bup/Levo);
  - lidocaine and epinephrine, with or without fentanyl (LE+/-F);
  - 0.75% ropivacaine (Ropi).

BJA 2011 ; 107:668-678



**Fig 3** The onset time of a block suitable to allow surgery, comparing LE ± F (2% lidocaine, epinephrine, and fentanyl) top-up solutions with either Bup/Levo (0.5% bupivacaine, 0.5% levobupivacaine), or Ropi (0.75% ropivacaine) solutions.



**Fig 4** The effect of the addition of fentanyl to a top-up solution on the onset time of a block suitable to allow surgery.



# Extending epidural analgesia for emergency Caesarean section: a meta-analysis

S. G. Hillyard<sup>1,2\*</sup>, T. E. Bate<sup>2</sup>, T. B. Corcoran<sup>1,3</sup>, M. J. Paech<sup>3,4</sup> and G. O'Sullivan<sup>2</sup>

- Fentanyl faster onset but did not affect the need for intraoperative supplementation.
- Bupivacaine or levobupivacaine 0.5% was the least effective solution.
- Speed of onset: lidocaine and epinephrine solution, with or without fentanyl, appears optimal.
- If the quality of epidural block is paramount, then 0.75% ropivacaine is suggested.

**Bupivacaine**

**VS**

**Lidocaine**

**Lidocaine**

**vs**

**2-Chloro**

# Similar onset time of 2-chloroprocaine and lidocaine + epinephrine for epidural anesthesia for elective Cesarean section

E. BJØRNESTAD<sup>1</sup>, O. L. E. E. IVERSEN<sup>2</sup> and J. RAEDER<sup>3</sup>

Departments of <sup>1</sup>Anesthesiology and Intensive Care and <sup>2</sup>Obstetrics and Gynecology, Haukeland University Hospital, Bergen and <sup>3</sup>Department of Anesthesiology, Ullevål University Hospital, Oslo, Norway

- RCT 40 patients ASA I
- 2 Groups: 20 ml
  - 2-chloroprocaine 30 mg/ml
  - lidocaine 20 mg/ml with 5 ug/ml epinephrine.
- Primary outcome: loss of sensation at T5



# Similar onset time of 2-chloroprocaine and lidocaine + epinephrine for epidural anesthesia for elective Cesarean section

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Departments of <sup>1</sup>Anesthesiology and Intensive Care and <sup>2</sup>Obstetrics and Gynecology, Haukeland University Hospital, Bergen and <sup>3</sup>Department of Anesthesiology, Ullevål University Hospital, Oslo, Norway

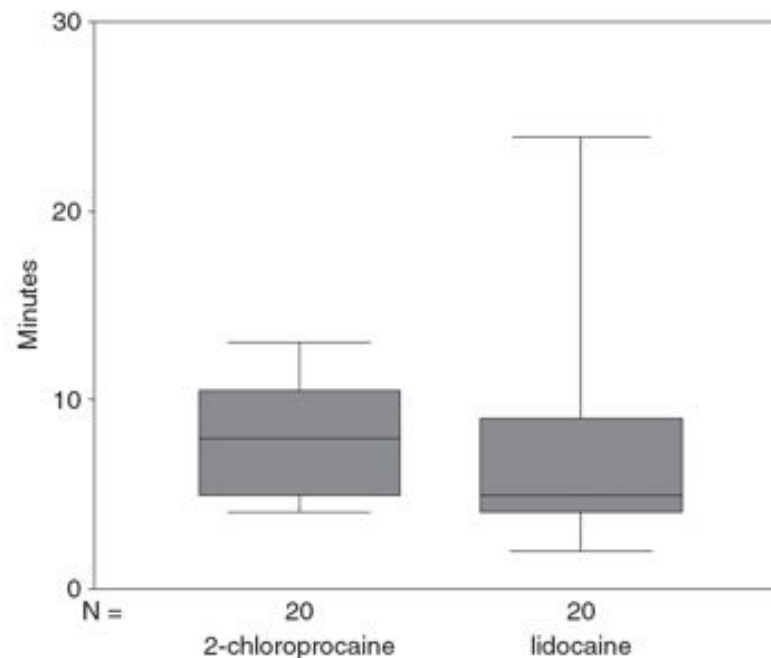


Fig. 1. Time (min) to achieve loss of cold sensation at thoracic dermatome level 5 (Th5) in women receiving two anesthetic drugs (NS) [boxplot shows median, 25–75 quartiles (boxes), minimum and maximum (whiskers)].

# Similar onset time of 2-chloroprocaine and lidocaine + epinephrine for epidural anesthesia for elective Cesarean section

E. BJØRNESTAD<sup>1</sup>, O. L. E. E. IVERSEN<sup>2</sup> and J. RAEDER<sup>3</sup>

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Table 2

Time-dependent effects and distribution of anesthesia at different levels.

	2-Chloroprocaine (n = 20)	Lidocaine (n = 20)
Time from anesthesia to operation	27.0 ± 1.6	28.0 ± 1.2
Time to highest level	12.4 ± 1.1	13.3 ± 1.3
Highest level of anesthesia, n (%)		
Th5	3 (16)	2 (10)
Th4	7 (37)	3 (15)
Th3	6 (32)	9 (45)
Th2	0	3 (15)
Th1	3 (15)	3 (15)
Maximum motor block (Bromage scale), n (%)		
0	6 (30)	1 (5)
1	7 (35)	7 (35)
2	5 (25)	7 (35)
3	2 (10)	5 (25)

There were no significant differences in the outcome data between the groups.

Table 4

Intra-operative complications[ *n* (%)].

	2-Chloroprocaine ( <i>n</i> = 20)	Lidocaine ( <i>n</i> = 20)
None	8 (40)	4 (20)
Hypotension	11 (55)	15 (75)
Mild	4	7
Moderate	5	7
Sustained	2	1
Nausea	2 (10)	4 (20)
Bradycardia	2 (10)	0
Other	1 (5)	1 (5)

There were no significant differences in the intra-operative complications between the groups.

# Similar onset time of 2-chloroprocaine and lidocaine + epinephrine for epidural anesthesia for elective Cesarean section

E. BJØRNESTAD<sup>1</sup>, O. L. E. E. IVERSEN<sup>2</sup> and J. RAEDER<sup>3</sup>

Departments of <sup>1</sup>Anesthesiology and Intensive Care and <sup>2</sup>Obstetrics and Gynecology, Haukeland University Hospital, Bergen and <sup>3</sup>Department of Anesthesiology, Ullevål University Hospital, Oslo, Norway

In conclusion, both 2-chloroprocaine and lidocaine with epinephrine have a rapid onset of action and are suitable local anesthetic agents for elective Cesarean section. In view of the increase in preparation time and other potential problems of additives, the use of pre-prepared solutions may be recommended in emergencies. As 2-chloroprocaine without any additives has a rapid onset of action and may be more predictable, it should be the first-choice local anesthetic in emergencies, especially when the fetus is compromised.



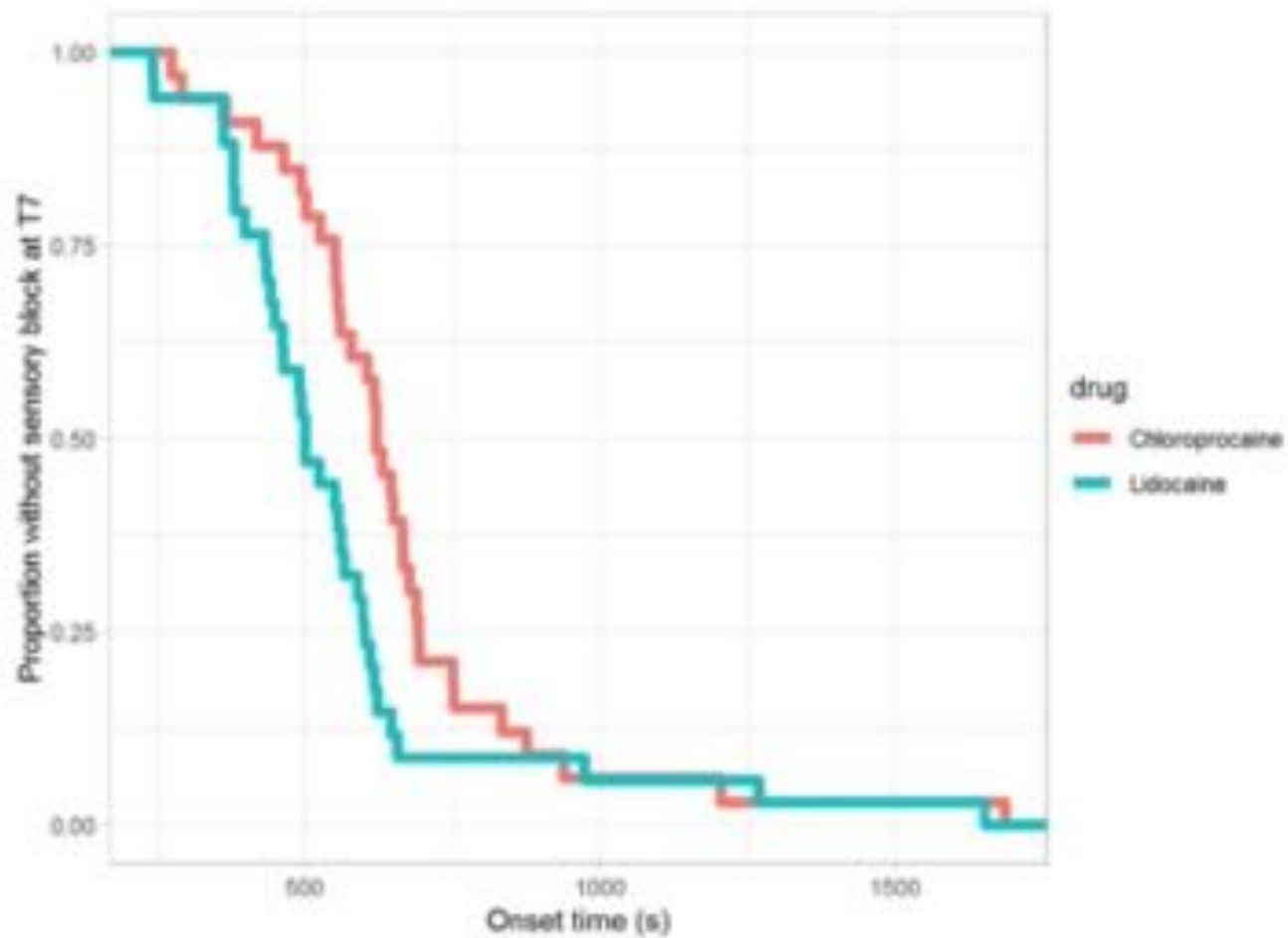
# **Comparison of Chloroprocaine Versus Lidocaine With Epinephrine, Sodium Bicarbonate, and Fentanyl for Epidural Extension Anesthesia in Elective Cesarean Delivery: A Randomized, Triple-Blind, Noninferiority Study**

Nadir Sharawi, MD, MSc, FRCA,\* Prannal Bansal, MD,\* Matthew Williams, MD,\* Horace Spencer, MS,† and Jill M. Mhyre, MD\*

[www.anesthesia-analgesia.org](http://www.anesthesia-analgesia.org)

March 2021 • Volume 132 • Number 3

- Single centre randomized non-inferiority study
- CD
- Randomized: CP or LEBF
- Primary outcome: time to loss of sensation to touch at T7
- Secondary outcome: need for intraoperative supplementation



**Figure 3.** Kaplan-Meier survival curve for time to onset of sensory block to touch at T7.

# Choice of local anaesthetic for epidural caesarean section: a Bayesian network meta-analysis

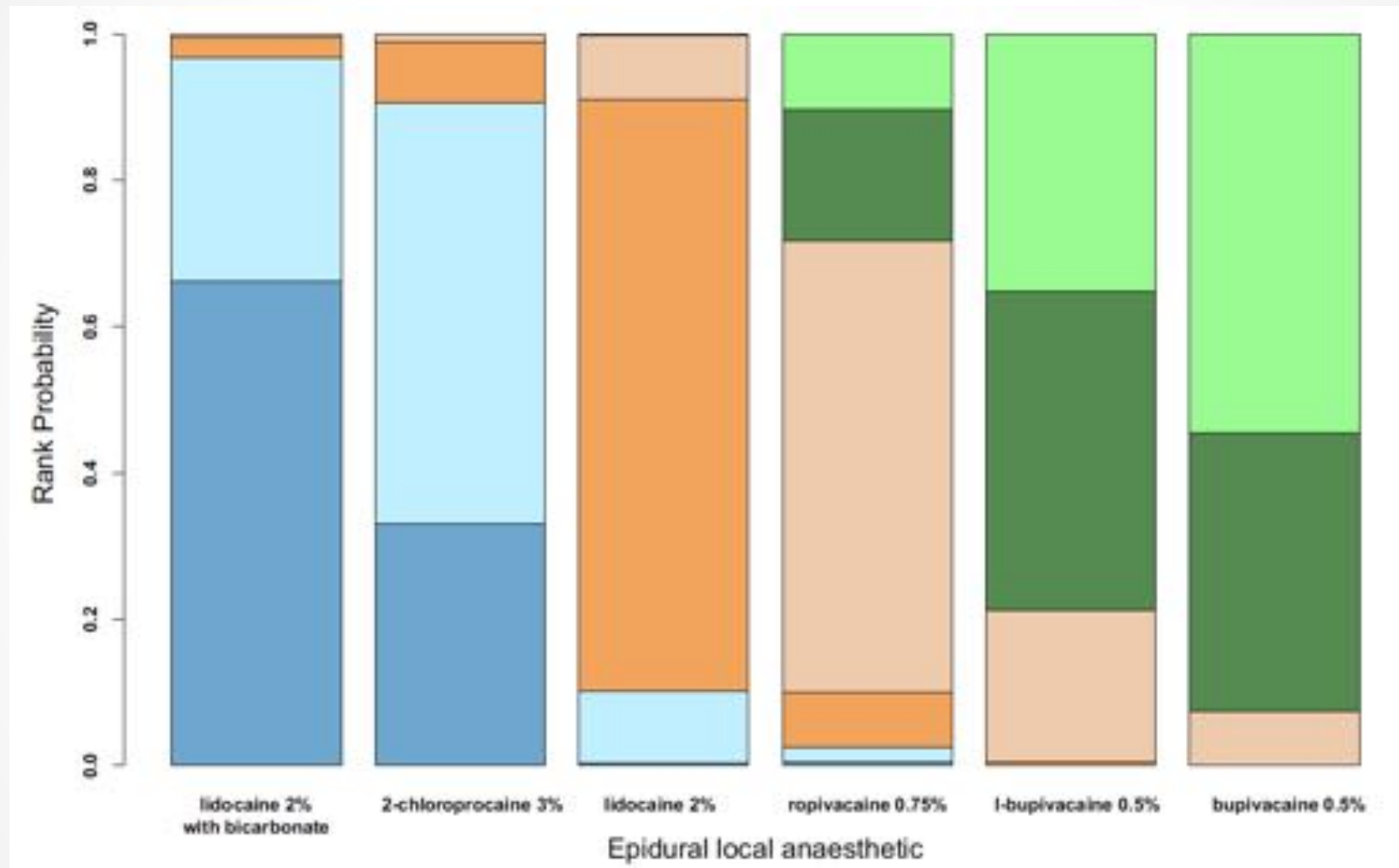
**M. M. Reschke,<sup>1</sup> D. T. Monks,<sup>2</sup> S. S. Varaday,<sup>3</sup> Y. Ginosar,<sup>4</sup> A. Palanisamy<sup>3</sup> and P. M. Singh<sup>2</sup>**

1 Assistant Professor, Division of Obstetric Anesthesia, Johns Hopkins University, Baltimore, MD, USA

2 Assistant Professor, 3 Associate Professor, 4 Professor, Division of Obstetric Anesthesia, Department of Anesthesiology, Washington University in St. Louis, MI, USA

Anaesthesia 2020, 75, 674-682

- 24 RCT
- 1280 parturients
- Bayesian meta-analysis
- Direct and indirect comparisons
- Rank speed of onset of the six most often used LA caesarean delivery





**Lidocaine**

**2-Chloro**

**Bupivacaine**

# Epidural Bupivacaine, Chloroprocaine, or Lidocaine for Cesarean Section—Maternal and Neonatal Effects

Therese K. Abboud, MD, Kyung Chul Kim, MD, Rabia Noueihed, MD,  
Betty R. Kuhnert, MD, Nooshik DerMardirossian, MD, Jean Moumdjian, MD,  
Faruk Sarkis, MD, and Shakuntala Nagappala, MD

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- RCT
- 40 patients elective CS
- Epidurals
- 4 Groups: bupivacaine 0.75% (n = 16); 3%chloroprocaine (n = 18); 2% lidocaine (n = 11); 2% lidocaine with 1:200,000 epinephrine (n = 9)
- Blood samples

	Bupivacaine (n = 16)	Chloroprocaine (n = 18)	Lidocaine (n = 11)	Lidocaine with epinephrine (n = 9)
Total initial dose before delivery (mg)	127.8 ± 4.5	645 ± 32.9	418.2 ± 26.4	420 ± 37.8
Total dose (mg)	134.9 ± 23.7	789.4 ± 64.5	472.7 ± 12.4	433.3 ± 38.3
Onset of anesthesia (min)	22.9 ± 2.1 <sup>a</sup>	17.2 ± 1.8	14.9 ± 0.3	23 ± 4.0 <sup>a</sup>
Induction-delivery interval (min)	39.0 ± 2.1	35.2 ± 16.1	42.4 ± 4.6	37.9 ± 5.6
Hypotension (no. of pts)	6	8	2	1

Values are given as mean ± SEM.

<sup>a</sup>*P* < 0.05 compared to lidocaine.

	Bupivacaine (n = 16)	Chloroprocaine (n = 18)	Lidocaine (n = 11)	Lidocaine with epinephrine (n = 9)
Apgar Scores				
1 min	1	2	1	2
5 min	0	0	0	0

<sup>a</sup>No significant difference between groups by  $\chi^2$  analysis.

T.Abboud et al. Anesth Analg 1983; 62:914-9

**Table 7. Mean Maternal and Fetal Chloroprocaine Plasma Concentrations**

	Total no. of samples	No. of samples with detectable levels	Chloroprocaine levels (ng/ml)
Maternal vein at delivery	18	12	15.73 ± 6.67
Umbilical vein	18	7	2.74 ± 0.79
Umbilical artery	18	6	7.64 ± 3.64

Values are given as mean ± SEM.

**Table 8. Plasma Concentrations of Bupivacaine and Lidocaine**

	Bupivacaine (µg/ml)	Lidocaine (µg/ml)	Lidocaine with epinephrine (µg/ml)
Maternal vein at delivery	0.78 ± 0.64	3.10 ± 0.44	1.98 ± 0.18
Umbilical vein	0.21 ± 0.04	1.43 ± 0.20	1.15 ± 0.14
Umbilical artery	0.17 ± 0.05	1.23 ± 0.20	1.10 ± 0.12
Umbilical vein/ maternal vein	0.27 ± 0.04	0.48 ± 0.04	0.58 ± 0.05

Values are given as mean ± SEM.

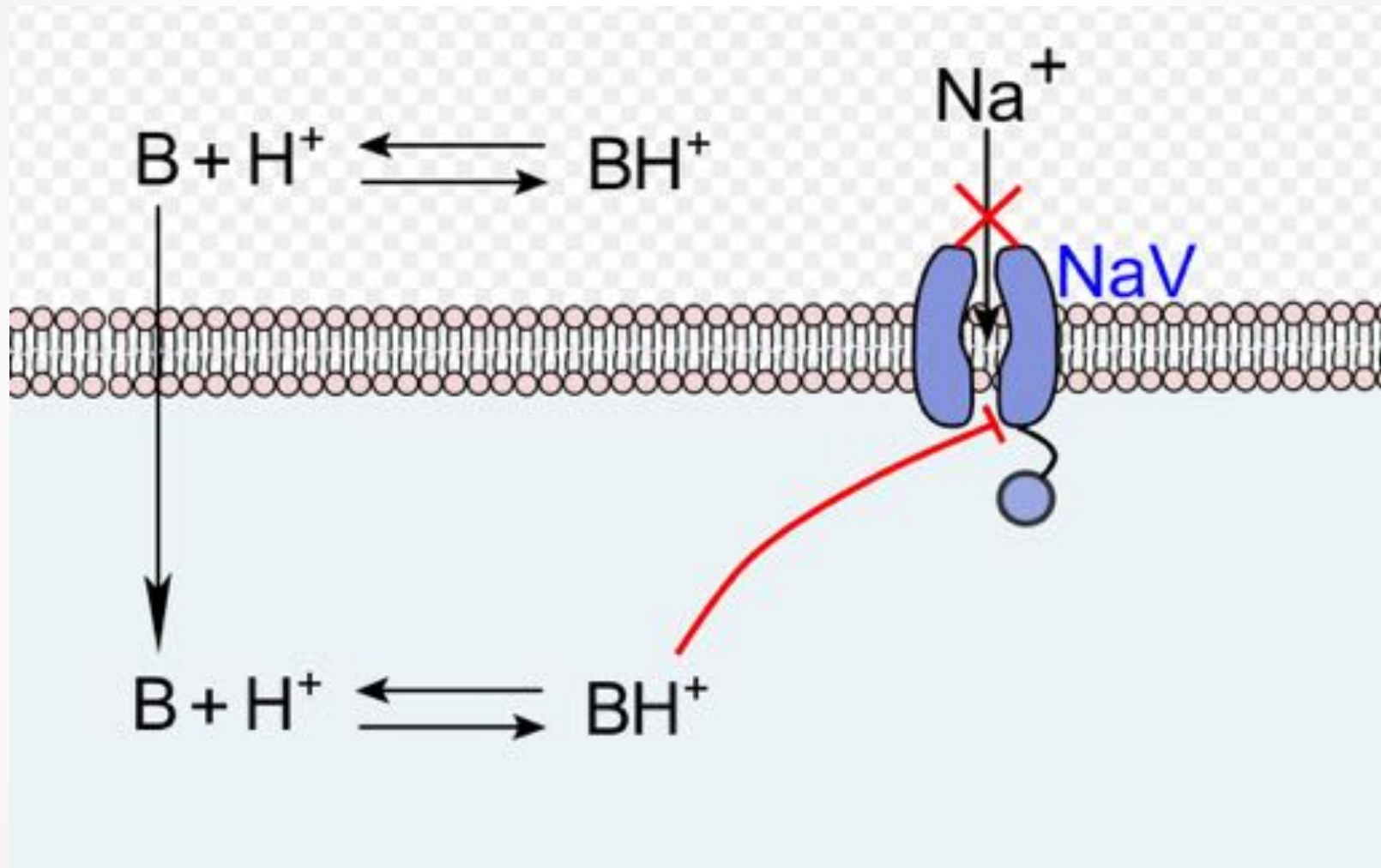


# Epidural Bupivacaine, Chloroprocaine, or Lidocaine for Cesarean Section—Maternal and Neonatal Effects

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Chloroprocaine was detected in only some of the maternal and fetal samples, undoubtedly because of the rapid hydrolysis of the drug by plasma cholinesterases (14,27,28). In vitro experiments have shown that the half-life of chloroprocaine in maternal and fetal blood is 21 and 43 sec, respectively (28). In contrast to chloroprocaine, lidocaine and bupivacaine were detected in all maternal and fetal samples. These results indicate the relatively slow elimination of lidocaine and bupivacaine from the maternal and fetal blood.





# Conclusions

- I Examine and ACT
- Indication : fetal or maternal compromise
- Examine: does the Epidural work
- Top up in OB ward
- Monitoring maybe not necessary
- Bupivacaine < Lidocaine/chloroprocaine
- Chloroprocaine: esterase, least toxic fetus, less preparation time
- Adjuncts: Bicarbonate, similar action and time.
- Ropivacaine 0.75% perioperatively











GROUPEMENT  
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DE L'OUEST  
LÉMANIQUE

# How should I top up epidural for emergent C-section?

Dr Moira Robertson

1.04.2023

Médecin Cheffe co-responsable du Service  
d'anesthésie

Hôpital de Nyon, Vaud  
Switzerland

# What about adding adjuvants to lidocaine?



# Epidural lidocaine-bicarbonate-adrenaline vs levobupivacaine for emergency Caesarean section: a randomised controlled trial\*

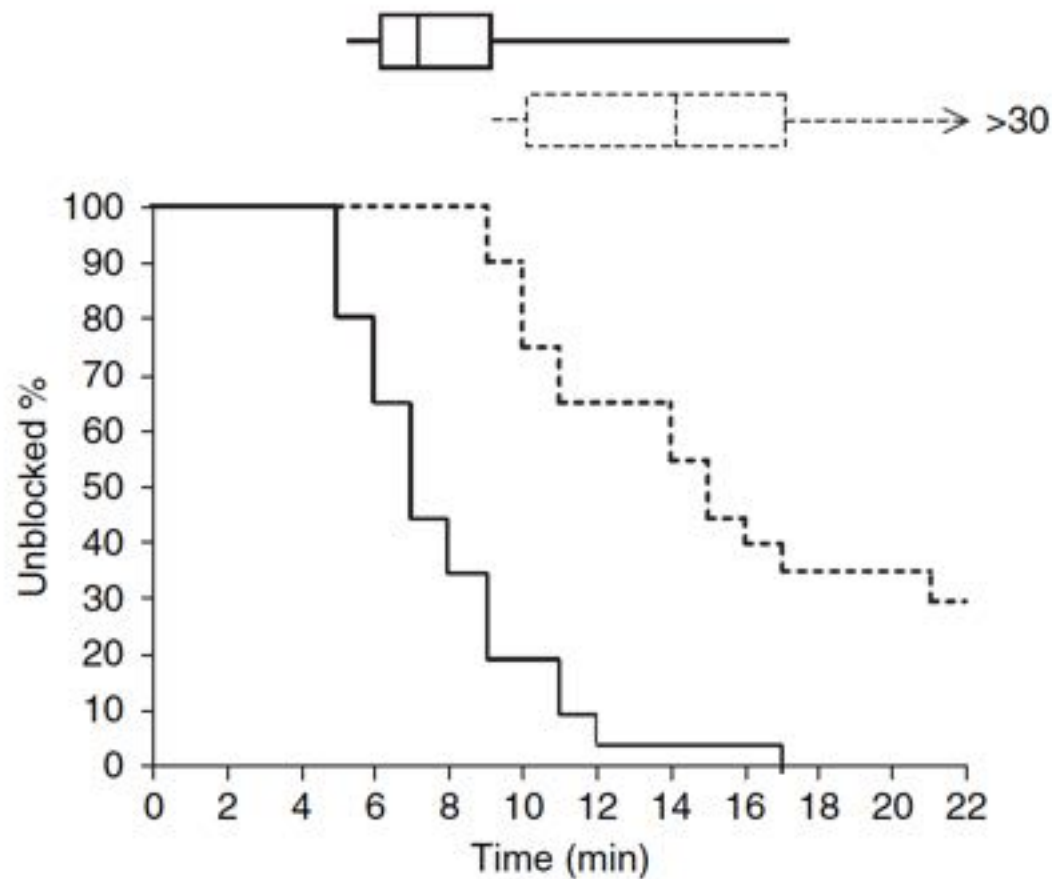
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- Prospective double blinded study
- 40 parturients ASA I or II, epidural
- Emergency CS
- 1 group :lidocaine-bicarbonate-adrenaline mixture (final concentrations 1.8%, 0.76% and 1 : 200,000, respectively
- 2 group: levobupivacaine 0.5%
- Primary outcome: time to reach T4/T5



**Figure 1** Survival plots for time to reach a block to touch to T5, in women receiving epidural top-ups with lidocaine-adrenaline-bicarbonate (—) or levobupivacaine (---). The box-whisker diagrams show the median (vertical centre line), IQR (box) and range (whiskers). In the levobupivacaine group, one patient failed to achieve a block to T5 within 30 min.

# Epidural lidocaine-bicarbonate-adrenaline vs levobupivacaine for emergency Caesarean section: a randomised controlled trial\*

J. Allam,<sup>1</sup> S. Malhotra,<sup>1,†</sup> C. Hemingway<sup>2</sup> and S. M. Yentis<sup>3</sup>

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preparation [34]. Any decision to use a lidocaine-bicarbonate-adrenaline top-up for achieving epidural anaesthesia for emergency Caesarean section must include consideration of these practical aspects of preparation. In our unit, we have recently adopted a protocol for use of the mixture as the advantages in terms of speed are felt to outweigh its potential disadvantages; the protocol specifies fresh preparation of solution immediately before use, according to a strict recipe, by which we hope to minimise the time taken and the risk of errors.

## FORUM

# Extension of epidural blockade in labour for emergency Caesarean section using 2% lidocaine with epinephrine and fentanyl, with or without alkalinisation\*

D. T. C. Lam,<sup>1</sup> W. D. Ngan Kee<sup>2</sup> and K. S. Khaw<sup>2</sup>

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- RCT
- 40 parturients ASA I / II emergency CS
- Lidocaine 2% with epinephrine 1:200000 epinephrine and 75 ug fentanyl
- 2 groups: 1.2 ml sodium bicarbonate 8.4% vs without
- Primary outcome: time to loss of pinprick sensation T6



**Table 2** Details of epidural analgesia and anaesthesia in mothers receiving alkalinised (bicarbonate group) or non-alkalinised (saline group) epidural lidocaine 2% with epinephrine 1 : 200 000 for emergency Caesarean section. Values are mean (SD [range]) or median (interquartile range [range]).

	Bicarbonate group <i>n</i> = 20	Saline group <i>n</i> = 20	<i>p</i> -value
Duration of epidural infusion; h	5.3 (3.9)	7.5 (5.5)	0.1
Block level (pinprick) before top-up for Caesarean section	T <sub>11</sub> (T <sub>10</sub> -T <sub>12</sub> [T <sub>9</sub> -T <sub>12</sub> ])	T <sub>11</sub> (T <sub>10</sub> -T <sub>12</sub> [T <sub>9</sub> -T <sub>12</sub> ])	0.9
Maximum block level (pinprick)	T <sub>4</sub> (T <sub>4</sub> -T <sub>4</sub> [T <sub>4</sub> -T <sub>6</sub> ])	T <sub>4</sub> (T <sub>4</sub> -T <sub>6</sub> [T <sub>4</sub> -T <sub>6</sub> ])	0.3
Bromage score before top-up for Caesarean section*	1 (1-1 [1-2])	1 (1-1 [1-2])	0.2
Bromage score at end of surgery	4 (3-4 [3-4])	4 (3-4 [3-4])	0.8
Time from end of top-up to surgical anaesthesia†	5.2 (1.5 [2-8])	9.7 (1.6 [6-12])	< 0.001
Duration of surgery; min	45 (40-60 [30-115])	45 (35-45 [30-90])	0.6

\*0 = no motor block; 1 = unable to raise the extended leg but able to move the knee and foot; 2 = unable to raise the extended leg and to move the knee, but able to move the foot; 3 = complete motor block of the lower limb. †Loss of discrimination to pinprick at the T<sub>6</sub> dermatome.



## FORUM

# Extension of epidural blockade in labour for emergency Caesarean section using 2% lidocaine with epinephrine and fentanyl, with or without alkalinisation\*

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- Concluded:
- pH-adjusted lidocaine 2% with epinephrine and
- fentanyl is effective for rapidly establishing surgical anaesthesia
- No maternal and no neonatal side effects

