



# Low-dose spinal versus epidural anaesthesia for delivery and expected caesarean section

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**Abbreviation:**

CSE – Combined Spinal Epidural analgesia

## Abstract

*Regional anaesthesia is associated with significantly lower mortality among obstetric patients, but the optimal technique for delivery and caesarean section remains to be determined. Conventional epidural analgesia has disadvantages of slow onset and higher rate of instrumental delivery while spinal anaesthesia in standard doses causes hypotension and bradycardia which might further compromise critical foetal condition. Combined spinal-epidural (CSE) analgesia with low dose of intrathecal local anaesthetic or/and opioid offers theoretical advantages of faster onset and lower incidence of side effect associated with standard spinal anaesthesia. The optimal intrathecal dose which balances effective analgesia and haemodynamic stability varies in literature. CSE anaesthesia seems to be particularly suitable for caesarean section in parturients with significant cardiac comorbidities like aortic stenosis or Eisenmenger syndrome due to less haemodynamic compromise. Therefore, although in the latest Cochrane database research of clinical trials, CSE technique was not found superior to standard epidural analgesia, it might have advantages in some subgroups of obstetric patients. The definitive role of low-spinal anaesthesia as a part of CSE in clinical practice remains to be clarified.*

## LOW-DOSE SPINAL VERSUS EPIDURAL ANAESTHESIA FOR DELIVERY AND EXPECTED CAESAREAN SECTION

Regional anaesthesia is nowadays considered the optimal technique for obstetric patients. Maternal mortality under regional anaesthesia is 16 times smaller than under general anaesthesia, mainly due to reduced the risk of gastric aspiration which is the major cause of direct maternal death (1). Nevertheless, the optimal method of regional anaesthesia for delivery and caesarean section remains to be determined.

### Low-dose spinal anaesthesia

Spinal anaesthesia is the most frequently used method for caesarean section. The conventional technique might be accompanied by side effects like hypotension, nausea and vomiting. Prolonged hypotension causes fetal bradycardia and acidaemia, which can further compromise critical fetal status. Therefore, extensive clinical investigation is dedicated to issues of optimal dose and combination of drugs which would balance haemodynamic stability and effective analgesia.

Low-dose spinal anaesthesia as a part of combined spinal-epidural anaesthesia (CSE) in labor was first reported in 1993, by Collis (2). He used a single space needle – through needle technique with the initial

dose of bupivacaine 2,5 mg and fentanyl 25 µg intrathecally. Intrathecal analgesia lasted for 90 minutes and labor analgesia was maintained through epidural boluses of 10–15 mL 0.1 % bupivacaine and fentanyl 2 mcg/mL.

Since then clinical research has been focused on two aspects of low-dose spinal anaesthesia: the minimal effective dose of local anaesthetic and the optimal choice and the dose of opioid or other intrathecal supplements like clonidine or neostigmine. The minimal effective intrathecal dose of local anaesthetic in low-dose spinal technique for caesarean section varies from 2,25 mg of bupivacaine with 2,5 mg and fentanyl 25 µg (2), 3,75 mg (3), 5 mg with fentanyl 25 µg (4) to 7,5 and 13,0 mg of isobaric bupivacaine (5). In the latest study the dose range was 5-, 6-, 8-, 9, 10, 11-, or 12 mg of isobaric bupivacaine with 10 µg fentanyl and 200 µg morphine. No clinical advantages regarding hypotension, nausea and vomiting could be detected in doses lower than 7,5 mg of isobaric bupivacaine. The minimal intrathecal dose in this study is higher probably due to the stricter criteria to define »successful« anaesthesia and adequate patient comfort. Lipophilic opioids like sufentanyl 5 µg (6), fentanyl at various doses and morphine increase duration and analgesic effect of intrathecal local anaesthetics. Adjuvants to low dose spinal anaesthesia like clonidine can improve intrathecal labor and caesarean section analgesia, but hypotension and bradycardia are potential side effects (7) and maternal satisfaction is not better. In the other study combined clonidine and neostigmine administered epidurally as a component of CSE anaesthesia prolonged duration of intrathecal analgesia by ropivacaine and sufentanyl (8).

Major limitation of low-dose spinal-anaesthesia is significantly reduced duration of analgesia and motor block. Another potential problem is inadequate analgesia, particularly during some moments during caesarean delivery like exteriorisation of uterus. In the study by Leo *et al* (9) 15–40 % of patients receiving low dose spinal as part of CSE technique for caesarean section required epidural bolus. The demands for additional analgesia were most common in the group B. with the lowest intrathecal bupivacaine dose of 7 mg, and the least frequent when the bupivacaine dose was 9 mg. Therefore, the indwelling epidural catheter is a must when low-dose spinal is performed for labor analgesia or caesarean section.

## Epidural analgesia

Traditional epidural analgesia is the most common technique for labor analgesia. It is also administered for caesarean section when indwelling epidural catheter is present and when epidural anaesthesia offers advantages over spinal or general anaesthesia for example in morbidly obese or respiratory compromised parturients. The major disadvantage of traditional epidural analgesia is slow onset of action, prolonged labor, use of oxytocin augmentations and increased incidence of instrumental vaginal delivery. Haemodynamic instability, although less pronounced than in conventional spinal anaesthesia, might be of clinical relevance, as well. Another problem

is reduced mobility due to motor effects of local anaesthetics which can cause discomfort and reduce maternal satisfaction. Both epidural and spinal anaesthesia for caesarean section result only in moderate patient satisfaction (10) and there are constant efforts to overcome disadvantages of traditional obstetric epidural analgesia. One option is low dose and »walking epidural« (11). Another is low-dose spinal anaesthesia used as a component of a CSE analgesia.

## Combined low dose – spinal/epidural (CSE) versus epidural analgesia

The combined »needle through needle« technique which includes low-dose spinal and epidural analgesia offers several theoretical advantages. The onset of block is faster and block is potentially »denser« in comparison to conventional epidural analgesia (12). Another advantage associated with CSE analgesia is adequate analgesia provided by small doses of local anaesthetics and opioids which cause less haemodynamic compromise than conventional epidural anaesthesia (13). Effective analgesia and cardiovascular stability make CSE anaesthesia suitable technique for high risk obstetric patients with significant cardiac disease. In four case reports Hamylin *et al* (14) described patients with aortic stenosis, mitral stenosis, pulmonary hypertension and obstructive cardiomyopathy undergoing caesarean section with invasive haemodynamic monitoring under CSE anaesthesia. Bupivacaine in doses of 4 and 5 mg with fentanyl 25 µg were used intrathecally followed by small increments of 3 ml 0,5 bupivacaine and 25 µg fentanyl. Clinical course of anaesthesia was remarkably stable. Successful anaesthesia for caesarean section under CSE anaesthesia was described in a patient with Eisenmenger (15) and Holt-Oram syndrome with implantable cardioverter-defibrillator (16). As cardiac disease in pregnancy is a leading cause of indirect maternal death, CSE analgesia might be of substantial clinical relevance in future.

Although CSE analgesia offers advantages in some clinical situations, overall benefit of CSA over conventional epidural anaesthesia could not be established in the latest Cochrane Database of Systemic Reviews (17). CSE analgesia was associated with less rescue medication and urinary retention, but more pruritus. In comparison with low-dose epidural CSE had faster onset of effective analgesia, but more pruritus. CSE is also associated with clinically non significant lower umbilical arterial pH. There was no difference in mother satisfaction, mobility, mode of delivery, maternal hypotension post-dural puncture headache and neonatal outcome. The conclusion was that at the moment there is not enough evidence to offer CSE over epidural. On the other hand, there is a clear advantage of low-dose epidural to conventional epidural analgesia because of lower incidence of urinary retention and need for rescue medication. Therefore definitive clinical relevance of CSE analgesia remains to be established.

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