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Review

Combined spinal-epidural analgesia for labour pain relief: a narrative review

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Abstract

Ensuring analgesia during labour is particularly important and often demanding. The goal of neuraxial labour pain management is to ensure high-quality analgesia, covering sensory loss from T10-S4 dermatomes and minimize motor blockade. Epidural techniques provide relief to the parturients and, with the administration of appropriate doses, allowed for mobilization and unimpeded extrusion of the fetus. However, there are various complications associated with the method. We are now faced with increased rates of epidural failure in the management of labour pain. Often, the block is inadequate or unilateral and a repositioning or even replacement of the catheter is required. Therefore, it seems necessary to develop techniques aimed at reducing the failure rates of epidural analgesia. The initiation of labour with combined spinal epidural analgesia presents multiple potential benefits. It can be used in parturients requiring stronger pain relief, has a faster onset of action, better drug diffusion and achieves better sacral block. In addition, it is possible to confirm the position of the epidural space through the spinal pencil point needle (needle-through-needle technique), resulting in lower rates of epidural failure and postdural puncture headache. By administering an opioid intrathecally, minimal sympathetic block is achieved. Therefore, under certain circumstances combined spinal epidural analgesia could be superior to epidural analgesia. Further studies are needed to search for the ideal analgesia technique for the relief of parturient pain during labour.

Key words: **Combined spinal-epidural, analgesia, labour, epidural.**

Introduction

Labour is divided into three stages. The first stage includes the dilation of the cervix up to 10 cm. Pain from the first stage is carried by C fibres, which are thin and accompany the sympathetic fibres of the superior and inferior hypogastric plexus and the pudendal nerve. They enter the spinal cord at the T10-L1 level. The pain is visceral and not well localised. The second stage of labour involves the distension of the pelvic floor and perineum and the delivery of the baby. Pain is described as somatic and is transmitted through sacral roots S2-S4, which are in a caudal position. Therefore, labour involves many dermatomes and different types of pain. Also, as labour progresses, the severity of the pain increases. The technique used for pain relief should be effective in blocking all necessary dermatomes in all stages of labour[1].

The goal of labour pain management is to ensure high-quality analgesia, covering sensory loss from T10-S4 dermatomes and reduced motor blockade. Initiation of neuraxial labour analgesia is either achieved by conventional epidural analgesia or by combined spinal epidural analgesia (CSEA). Epidural analgesia is considered to be the gold standard for pain management in labour. However, studies have shown that the rate of complete or moderate failure of epidural analgesia is as high as 23%. This raises reasonable questions regarding the effectiveness of epidural analgesia[1].

Methods

In this narrative review the search engines and scientific databases of Cochrane Library, Essential evidence plus, Google Scholar, Trip Database, PubMed, Heal link, SCOPUS, EMBASE, Web of Science were reviewed between 15.01.2023 -

15.09.2023. The search was limited to articles in the English language, which mainly referred to the methods of analgesia available in normal labour. More specifically, the keywords used, selected through the MeSH tools, were the following: analgesia, epidural anesthesia, spinal anesthesia, parturition. Also, articles to which access is given through the National and Kapodistrian University of Athens were used, otherwise articles whose full text was not available were excluded. In addition, articles published before 1990 were also excluded. The selection of the final articles used was based on practical and methodological criteria.

Initiation of epidural analgesia for labour

The level of epidural catheter insertion influences dermatomal blockade during labour. Studies have shown that when the catheter is inserted at the L1-L2 interspace, the pain is greater during extrusion in the second stage of labour, compared to when it is inserted at the L4-L5 interspace and the same epidural solution is administered[2-3]. Bromagehistorically employed both lumbar and caudal epidural catheters in combination. Although that technique overcomes the above difficulties, it is complicated because it adds the difficulties and uncertainties of caudal block to relatively easy lumbar block[4]. In addition, the solution in the epidural space follows an unpredictable diffusion pattern. A greater cephalic than caudal diffusion of epidural solution is observed when injected in the lumbar region[5]. Hence, this leads to reduced anaesthetic blockade at the sacral dermatomes. The above increases the failure rates of epidural analgesia in labour. Low or no block, patchy block, inadequate sacral block, or unilateral block may be observed. In 1/10 cases, manipulation of the catheter, such as retraction of the catheter for centimetres, is needed. Also, in 1/20 cases there is a need to reset the catheter[6].

At first, concentrated solutions such as bupivacaine 0.25% were administered, but this led to motor blockade. Subsequently, more dilute solutions were administered epidurally, such as 10-20 ml of bupivacaine 0.0625-0.125% and ropivacaine 0.08-0.1%. This way, the problem of motor blockade was greatly reduced, but problems such as diffusion, slow onset of action and increased catheter failure continued to persist. Therefore, the need to find a solution aimed at ensuring high-quality analgesia and reduced motor blockade is considered crucial[7].

Combined spinal-epidural analgesia in labour

The most commonly used technique in CSEA is the single-interspace technique, where the epidural and the spinal punctures are performed in the same interspace, usually with a single needle (needle-through-needle). After the epidural space is identified using an epidural needle, a 25, 27 or 29-gauge pencil point spinal needle is advanced through the epidural needle until it punctures the dura. A minimum of 13-15 mm length of the spinal needle protrusion beyond the epidural needle tip is recommended for the CSE sets for a reasonably high success rate. Local anesthetic is injected in the subarachnoid space and then the epidural catheter is inserted. It can also be performed at different times or separate intervertebral spaces. This technique combines rapid onset analgesia, potent local anaesthetic action, a better diffusion of local anaesthetic into the subarachnoid space and the flexibility of epidural analgesia.

The MLAD and the ED95 vary depending on the stage of labour and the parturient. A local anesthetic is usually combined with a lipophilic opioid such as sufentanil or fentanyl. 3- 4,7 mg ropivacaine(0,2%), 2,5-4 mg bupivacaine (0,25%) or 2,5-4 mg levobupivacaine, with fentanyl 20-35μg or sufentanil 5-10 μg may be administered[8]. Specifically, at the early phase of labour (< 4 cm), analgesia may be achieved with fentanyl 25 mcg or bupivacaine 1.5 mg with fentanyl 6 mcg. At any stage of labour, bupivacaine 2.5-5mg with fentanyl 6-25mcg, ropivacaine 2.5mg with fentanyl 6-25mg or levobupivacaine 2.5mg with fentanyl 6-25mcg may be administered intrathecally. Towards the end of labour, bupivacaine 2,5-5mg with fentanyl 25mcg or bupivacaine 5mg alone may be administered[9]. Hyperbaric bupivacaine in the latter stages of labour may provide a more predictable block. However, it might risk greater motor block[10]. Moreover, the epidural solution may be administered before the sensory intrathecal block has resolved. This preserves mobility with rapid reduction of pain. The advantages of administering opioids into the subarachnoid space are: reduced analgesia onset time, increased analgesia duration, reduced incidence of inadequate analgesia, decreased consumption of local anaesthetics, use of dilute solutions and reduced incidence of motor blockade[11].

Advantages of CSEA in labour

Rapid onset of action

Studies have shown that CSEA has a significantly faster onset of action, 3-5 minutes after drug administration, compared to the epidural technique. In contrast, the onset of epidural analgesia can take up to 20 mins (often 30 mins)[12–15]. Moreover, there is little patient variability with CSE and much more with epidurals.

In one study, 197 parturients were randomized to receive either 1 ml of 0.25% bupivacaine and fentanyl 25 μg intrathecally (CSEA group) or 10 ml of 0.25% bupivacaine epidurally (EA group). The CSEA group showed significantly faster onset of action and reduced motor blockade compared to the EA group[16].

In the pain rating index (PRI), the pain of labour in untrained parturients scores as very severe, just below the pain of amputation. The pain of normal labour is sharp and recurs every 2 to 3 minutes. Therefore, a faster onset of action, by 20 mins, is of great importance for the woman in labour who experiences severe pain. Rapid onset of action is beneficial during the advanced first stage of labour (dilation > 6 cm) or the second stage, in cases of increased maternal discomfort, and in rapidly progressing labour or cervical dilation independently. Moreover, CSEA could be an option in the case of multiparous parturients who are rapidly progressing in labour and in cases of ruptured membranes – also, in uterine contractions without complete cervical dilation (Table I)[13–15].

Better diffusion of the drug

Subarachnoid administration of the drug leads to the maximization of its diffusion. Subarachnoid diffusion is better, both cephalic and caudally. This leads to better satisfaction in parturients. Studies have demonstrated a reduction in unilateral sensory or motor block and better responses to visual pain scales ($p = 0.04$) with CSEA, compared to standard epidural[14]. Also, CSEA offers superior analgesia, with a reduction in top-up epidural doses compared to standard epidural[17]. Moreover, during CSEA, epidural bolus injection and thecal sac compression can lead to enhanced cephalad spread of the spinal anaesthetic in the intrathecal space[18].

Better sacral spread

Another problem that arises when using the epidural technique is ineffective pain relief at the end of first and second stages of labour. The sacral roots (S2-S4) have an increased diameter and increased myelin thickness. They are also in a caudal position and have an increased distance from the tip of the epidural catheter. At the same time, the epidural solution has cephalic diffusion. Thus, it is challenging to be blocked compared to the lumbar roots.

In clinical practice, analgesia in sacral dermatomes requires many hours of a lumbar epidural solution or multiple bolus doses of local anaesthetic. All these lead to increased cephalic sensory and marked motor block and toxicity. Moreover, it removes the parturient's involuntary bearing down reflex. The above contribute to fetal malposition during descentor suboptimal expulsive efforts and therefore to instrumental delivery. On the other hand, administration of a more dilute solution fails to provide optimal analgesia for the parturient. Although motor blockade and hence weakness of pelvic floor muscle is minimal or absent, it is ineffective in covering the analgesic requirements of the 2nd stage of labour and shows a slower onset of action[15,19].

In a double-blind randomised study of 120 pregnant women, divided into two groups, one group was given 20 mL of bupivacaine 0.125%, 2μg/ml fentanyl, epidurally, while the other was given 1.7mg bupivacaine, 17mcg fentanyl intrathecally. Intrathecal administration resulted in more effective analgesia in 10 mins and a statistically faster onset of analgesia in the sacral dermatomes, compared to epidural analgesia[20].

Reduction of motor block

In another study, 1054 parturients were randomised to three groups. The first group received CSE analgesia with a loading dose of fentanyl 25mcg and bupivacaine 2.5 mg, followed by an infusion of bupivacaine 0.1%. In this group, instrumental delivery occurred at a rate of 29%. The second group received a dilute bupivacaine 0.1% solution at baseline, followed by an infusion of bupivacaine 0.1%. In this group, instrumental delivery occurred

Table I. — Indications of Combined- spinal epidural analgesia.

High risk situations	Emergency caesarean section Multiple pregnancy Vaginal birth after C-section (VBAC)
Anaesthesiologic difficulties	Scoliosis Difficult airway Failure of previous epidural & ongoing failed epidural attempts
Need for quick onset	Advanced stage 1 (dilation > 6 cm) or stage 2 labor Rapidly progressing labour Multiparous Ruptured membranes Uterine contractions without complete cervical dilation

at a rate of 28%. In the third group, a loading dose of 0.25% bupivacaine was administered, followed by an infusion of 0.25% bupivacaine, and instrumental delivery occurred at a rate of 37%. In the third group, which received the concentrated solution, a prolongation of the second stage of labour was observed. In contrast, in the CSEA group with the dilute epidural solution, muscle tone was maintained[21].

Another study involved 761 parturients, randomised to two groups. The first group received CSE analgesia with sufentanil 10 mcg, followed by an infusion of bupivacaine 0.0625% w/v and fentanyl 20mcg/mL, and instrumental delivery was required in 30% of the women. The second group received bupivacaine 0.1% epidurally, followed by an infusion of bupivacaine 0.125% w/v and fentanyl 20mcg/mL, and finally instrumental delivery was required in 40% of the women. The CSEA group had a lower rate of invasive delivery[22]. The CSEA technique results in a 25% reduction of local anaesthetics consumption when co-administered with opioids. Therefore, motor blockade is reduced compared to epidural analgesia and expulsive forces are maintained. Also, maintaining better pelvic floor muscle tone reduces the predisposition for poor position of the foetal head and the risk of invasive delivery[23].

With CSEA, ambulation may be possible for many women in labour. At the early latent phase of labour, administration of fentanyl 20mcg may provide sufficient pain relief. It produces analgesia and preserved motor function. It has an onset of 2-3 minutes and a duration of 70-100 minutes. In this way, an increase in the intensity of uterine contractions and an improvement in the position of the foetus is achieved. The above leads both to a reduction in instrumental delivery rates and in the duration of delivery. Therefore, a better satisfaction rate is achieved[16,24,25].

Other advantages

Intrathecal analgesia leads to a reduction in doses, as well as in the systemic absorption of drugs. Consequently, there is a reduction in the concentration of the drug in the mother's and foetus' circulation, a reduction in toxicity and reduced exposure of the foetus[16,26,27].

In a high-risk parturient, the abrupt reduction of preload by local anaesthetics – such as in stenotic valvulopathies – increases the risk of haemodynamic instability. Intrathecal opioid administration results in analgesia without motor blockade or with minimal sympathetic blockade with a slow onset[28].

It has been observed that epidural administration of bupivacaine in vivo reduces uterine activity and, consequently, may prolong labour duration. With the CSE technique, smaller doses of bupivacaine are administered intrathecally. The above, in combination with a decrease in adrenaline plasma concentration due to rapid reduction in pain, leads to an increase in uterine contractions. Consequently, faster cervical dilation occurs, leading to a prolongation of the first stage of labour. However, further studies are required in order to investigate the effect of the regional technique used to prolong labour[29–31].

Maintaining analgesia after the initial dose in CSEA, is done by using patient controlled epidural analgesia (PCEA) compared to continuous infusions. A more novel technique is programmed intermittent epidural bolus (PIEB), in which a large epidural bolus is given using a programmed interval. The pump will initiate every 45 min an automatic bolus and it's the large volume given over a short period of time that result in better spread of the local anaesthetic in the epidural space, less anaesthetic consumption, less motor block, less breakthrough pain and higher quality analgesia[32].

A more efficient epidural catheter

Correct placement of the epidural catheter during the standard epidural technique is essential. In the epidural technique, there is no way to confirm the location of the epidural catheter in midline. In most cases, it either escapes through the intervertebral foramen – due to dilatation of the epidural venous plexus – or is placed laterally towards the paraspinal space, which is continuous with the epidural space[33]. Moreover, insertion of the catheter, more than 5 cm in the lumbar epidural space, may be associated with a higher incidence of catheter deviation into the intervertebral foramen, causing unilateral block. Visualization of cerebrospinal fluid through the spinal needle confirms the correct placement of the tip of the epidural needle in the epidural space and ensures that the catheter is advanced to the midline. This increases the reliability of the placement of the epidural catheter and is more effective, with lower failure rates[34]. Fewer epidural catheter placement failures (7%) were observed in a retrospective study, when performing the CSE technique, compared to a standard epidural (12%). Also, with the CSE technique, a reduced need for catheter replacement and a reduction in unilateral analgesia were observed35. The literature is replete with studies demonstrating that the CSE technique for labour analgesia reduces the risk of catheter failure or replacement[1,12,34–45] (Table II).

In CSE labour analgesia, we may use an untested epidural catheter in order to extend the block for an unplanned caesarean section. By performing the CSE

Table II. — Studies summarizing epidural catheter function as part of CSEA and epidural technique in neuraxiallabour analgesia.

STUDIES	N	CSEA	EPIDURAL	BETTER FUNCTIONAL EPIDURAL CATHETER
Panet al.[1] IJOA 2004	12,590	3.2%	7.1%	CSEA
Norriset al.[34] IJOA 2000	2,065	0.2%	1.3%	CSEA
Boothet al.[35] Anesthesiology 2016	2,395	6.6%	11.6%	CSEA
Lee et al.[37] AnesthAnalg 2009	1,025	1.1%	5.8%	CSEA
Eappen[41] IJOA1998	4,240	7.2%	13.1%	CSEA
Van de Velde et al.[42] AnaesthIntensiveCare 2001	2,736	1.5%	3.2%	CSEA
Goodman et al.[43] AnesthAnalg 2009	84	0%	7.3%	CSEA
Gambling et al.[44] AnesthAnalg 2013	800	1.2%	2%	CSEA
Grodenet al.[45] IJOA2016	5,487	2.1%	3.9%	CSEA

technique, there is doubt about the position of the epidural catheter, as it has not been checked. When subarachnoid block is established before placing an epidural catheter, a conventional epidural test dose cannot be directly interpreted and may be potentially dangerous by extending subarachnoid block. However, studies show that an epidural catheter inserted with the CSE technique has lower failure rates when converting from analgesia to neuraxial anaesthesia for a caesarean section, if required. In addition, the epidural catheter inserted with the simple epidural technique is often ineffective over time and fails to achieve neuraxial anaesthesia for a caesarean section, if required[36–38]. Extension of epidural block is based on an untested catheter in CSE technique. Therefore, the test dose may lead to a greater reliance on negative aspiration tests to confirm epidural catheter placement. Extension is better done by dividing epidural dose in different smaller doses.

CSEA is not only associated with reduced failure rates, but is also recommended in higher risk situations such as emergency caesarean section (e.g. vaginal birth after caesarean section), multiple pregnancy, scoliosis, difficult airway, failure of previous epidural and ongoing failed epidural attempts[38].

The risk of emergency caesarean section in obese parturients is increased. In one study, 233 parturients with BMI ≥ 50 kg/m2 and with neuraxial analgesia for labour were randomized to 3 groups. One group underwent the epidural analgesia technique and CSEA without return of cerebrospinal fluid; the second group underwent CSEA, and the third group followed the spinal technique. In the group without CSF visualization, catheter failure at the onset of normal delivery was observed at a rate of 28.6% and at 9.5% for caesarean section. Also, a catheter replacement was required in normal delivery, in 20% of the parturients. In contrast, when CSEA was performed and CSF return was obtained, then failure at the onset of normal delivery was at 9.2% and for caesarean section at 4.9%, and no catheter replacement was required. Finally, when the technique was spinal, there was 0% catheter failure for normal delivery and 0% catheter failure for caesarean section[39]. In the above study, epidural catheters placed either without attempting dural puncture or without obtaining CSF after attempted dural puncture, failed at a higher rate than catheters placed using a dural puncture technique in which CSF was obtained. The theoretical advantage of CSF visualization, is the identification of midline. Therefore, the catheter will be advanced in the midline and there is a higher chance of it being more effective and reliable.

Dural puncture epidural (DPE) is an alternative technique for labouring parturients. An intentional dural puncture with spinal needle is performed, but without administering intrathecal drugs. When there is a puncture in the dura, the anaesthetic can flow from the epidural space into the intrathecal space. DPE technique might provide benefits compared to CSEA, such as less maternal and fetal side effects. However, further studies are warranted to determine the benefits of DPE technique[46].

Studies have shown that when simple epidural was compared with the CSE technique, no difference was found in terms of labour progression, conversion to caesarean section and foetal outcomes (Table III)[1,15,40,47].

Complications

It is worth considering whether the dura is vulnerable to puncturing by the non-cutting pencil point needle during initiation of CSEA for labour. Studies have shown that there is no difference as to the incidence of Postdural Puncture Headache (PDPH) and the need for blood patch treatment between the two techniques42. In standard epidural analgesia, PDPH rate was 0.21%-1.6%, whereas in CSEA it was 0.20%-1.7%. Regardless of whether a 27-gauge or a 29-gauge spinal pencil point needle was used, the PDPH rate remained the same. This is probably explained by the fact that administration of a local anaesthetic epidurally leads to an increase in epidural space pressure, which reduces CSF outflow. Moreover, CSEA may be a safer technique to follow compared to standard epidural. The return of CSF in the CSEA technique, results in fewer attempts to successfully perform the technique, which leads to an overall reduction of Tuohy needle dural puncturing[40,42,47-50].

Puncturing the dura mater deliberately during the CSE technique, theoretically increases the risk of meningitis. Moreover, during normal delivery, bacteraemia occurs in up to 10% of cases. Therefore, the risk of infection is increased. However, the literature contains only reports of cases of meningitis and only after many attempts[49]. Thus, there is no difference in the incidence of neuraxial infection between the two techniques. However, the need to provide parturients with comprehensive information about the potential risks and complications of the CSE technique remains undeniable.

Regarding the unintentional intrathecal catheter placement through the dural puncture with a 27-gauge pencil point needle, it is extremely rare. Only after five dural punctures with a 25-gauge spinal needle, may the epidural catheter penetrate the perforated dura in 5% of cases. Studies have shown that there is no greater risk with CSE than with the epidural technique[7,36]. Moreover, specifically designed Tuohy needles, which have a hole at the back end make it easy to insert the spinal needle and reduce the chance of perforation the dura. As the spinal needle is advanced through the Tuohy needle its centering sleeve aligns the spinal needle with the back eye lumen to help prevent an over the curve placement. Therefore, the epidural catheter is directed through the Tuohy curve away from the dura puncture site.

The question arises as to whether it is feasible for the epidurally administered drug for top-up in case of an emergency caesarean section, to leak intrathecally through the dural puncture. However, studies in which 1,200 top-ups were performed at caesarean section did not show a high blockage. Moreover, the CSE technique was completely safe when top-up was attempted, 30 minutes after CSE was performed[51].

Studies have shown that there was no statistically significant difference between the two techniques, regarding hypotension. Moreover, the CSE technique, with opioid administration alone, resulted in hypotension at a rate of only 14%[16]. In one study, intrathecal administration of bupivacaine 2.5 mg with fentanyl 25 mcg resulted in SBP<100 mmHg in only 5% of parturients, which was clinically insignificant[52].

Regarding neurological complications, there was no difference between CSEA and epidural analgesia. Identification of the correct intervertebral space is required, and the technique should be performed below the L2-L3 interspace[48,53,54]. If a CSE is inserted at a level higher than L2-L3 interspace, direct trauma to the conus medullaris is possible by the spinal needle[55].

Side effects of intrathecal opioids are dose dependant. Doses greater than >15μg fentanyl are associated with an increase in side effects. The most common side effect is pruritus, which is caused by stimulation of m opioid receptors.

Table III. — Advantages and disadvantages of CSEA.

Advantages	Disadvantages
Superior analgesia	Epidural test dose cannot be interpreted
Rapid onset of action	Incidence of fetal heart rhythm (FHR) abnormalities
Better diffusion of the drug	Requires monitoring
Better sacral block	Side effects of intrathecal opioids e.g. pruritus
Reduction of motor block	
Lower epidural failure rates	
Lower epidural catheter replacement rates	
Minimal sympathetic blockade	

The frequency and severity of pruritus depend on the dose of opioid administered intrathecally. They are lower when local anaesthetics are co-administrated with opioids and especially when the fentanyl dose is less than 10-15 μg. Pruritus usually resolves in 45-60 mins and is treated with naloxone and nalbuphine. Other side effects of intrathecal opioids include nausea and vomiting, hypotension, respiratory depression, urinary retention and foetal heart rate (FHR) abnormalities[56].

During labour, adrenaline normally reduces uterine activity, and oxytocin and noradrenaline increase uterine activity and lead to hypertonia. Presumably, CSEA leads to rapid pain relief. Intrathecal opioid administration reduces adrenaline levels more than noradrenaline levels, resulting in an unopposed effect of oxytocin. Thus, uterine hyperstimulation occurs, due to an increase in α activity. The above lead to a decrease in uteroplacental perfusion and hypoxemia of the foetus. However, it has not been demonstrated that rapid onset of analgesia with CSEA is solely responsible for hypertonia and FHR abnormalities[23,57,58].The causes of FHR abnormalities may involve hypotension and oxytocin.

In a meta-analysis of randomised double-blind studies, intrathecal opioid administration was statistically, significantly associated with FHR abnormalities compared to analgesia without opioids[60]. Moreover, the frequency of bradycardia depends on the intrathecal dose of opioids. At doses greater than >15 mcg sulfentanil, greater bradycardia is observed[60–63].

In another study, 77 parturients were randomised into 2 groups. In one group, epidural analgesia was performed and 10 ml of 0.125% bupivacaine with 10mcg sufentanil were administered epidurally. In the second group, CSE was performed and bupivacaine 2.5 mg with sufentanil 2.5 mcg were administered. The CSEA group demonstrated a significantly higher incidence of FHR abnormalities compared to the epidural analgesia group ($p<0.01$). However, FHR was monitored only for 15 mins after neuraxial analgesia. During this time, FHR abnormalities are expected to occur more frequently in the CSEA group. In contrast to that, FHR abnormalities caused by epidural analgesia occur later, compared to CSEA. Therefore, short-term monitoring favours epidural analgesia and, thus, it seems crucial to pay attention to the FHR monitoring interval[64]. Studies have shown that both epidural analgesia and CSEA affect FHR and there is no difference in pathological FHR between the two techniques[65,66]. However – most importantly – bradycardia in the CSEA technique is not associated with an increase in caesarean section delivery rate and does not affect the Apgar score[15].

If FHR abnormalities occur after initiation of labour analgesia with the CSE technique, they occur in late labour. This is probably caused by the rapid and sudden reduction in pain[23]. The faster the pain relief with CSEA compared to epidural analgesia, the higher the probability of uterine hypertonous and FHR changes[64]. Management is easy but requires uninterrupted monitoring. It includes left lateral positioning and both fluid and vasoconstrictor administration. The administration of oxytocin and tocolytics is contraindicated. Moreover, left lateral position does not affect the intrathecal diffusion of drug. However, when FHR abnormalities are present, initiation of labour analgesia with CSEA may not be recommended[67].

Conclusion

CSE is an ideal neuraxial analgesia technique for labour. It combines an increased success rate and a rapid onset. Moreover, it ensures high quality analgesia at all stages of labour, does not cause motor block, and preserves the parturient's capacity for extrusion. Furthermore, CSE facilitates the conversion to neuraxial anaesthesia for caesarean section. In the past, labour pain was ameliorated with systemic analgesics due to concerns about the use of neuraxial blocks. Over time, epidural technique provided analgesia with many benefits in the management of labour pain. However, we are now faced with increased rates of epidural failure in the management of labour pain. Therefore, it seems necessary to develop techniques aimed at reducing the failure rates of epidural analgesia. The initiation of labour with CSEA presents multiple benefits. Dura mater is not as vulnerable to pencil point needle abrasion and therefore does not increase potential complications. However, it requires a personalised approach depending on the parturient. Further studies will need to investigate the cause of FHR disorders, how to prevent them, and define high-risk parturient's for FHR.

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