

Rad je saopšten na Međunarodnom simpozijumu "Peti anglo srpski dani anestezije", održanom 4-6 oktobra 2012, u Beogradu.

COMBINED SPINAL-EPIDURAL FOR LABOR ANALGESIA

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KOMBINOVANA SPINALNO-EPIDURALNA ANALGEZIJA U POROĐAJU

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Summary. Pain management is an essential part of good obstetrical care. Epidural as labor pain relief is spreading as an every day obstetrical practice. Continuous epidural in labor pain relief helped achieving better pain control during labor. Epidural (ED) in labor involves injection of local anesthetic agent and an opioid analgetic into the lumbar epidural space. Inadequate epidural analgesia may be prevented with subarachnoid injection of small amount of low concentration of local anesthetic/opioid combination.

Increasingly popular combined spinal epidural (CSE) in labor analgesia some consider as the method of choice, while others reserve it for certain conditions.

This study addressed some of the most important questions regarding labor analgesia, such as its initiation and maintaining. Results showed that epidural analgesia was not associated with increase of the incidence of vacuum or forceps use nor with the caesarean section rate. Regarding CSE, it appeared that the use of instrumentation in delivery is higher in CSE, as the time of action of subarachnoid local anesthetic is relatively short comparing to the time of whole delivery. This conclusion resulted due to the small data sample. What we can say for certain is that combined analgesia does not consume more time than traditional epidural insertion and that onset of analgesia and maternal relief are miraculously fast, so task that awaits is popularisation of neuraxial analgesia and anesthesia in obstetric practice.

Sažetak. Terapija bola je ključna u ginekologiji i akušerstvu. Epiduralna analgezija postaje sve zastupljenija u svakodnevnoj akušerskoj praksi. Kontinuiranom epiduralnom anestezijom postižu se bolji rezultati u smanjenju bola tokom porođaja. Neadekvatna epiduralna analgezija može se sprečiti subarahnoidalnom primenom male koncentracije kombinacije lokalnog anestetika i opioida.

Kombinovanu spinalno-epiduralnu analgeziju (CSE) u toku porođaja neki autori smatraju metodom izbora, a drugi autori su mišljenja da je ipak treba primenjivati samo u određenim uslovima.

Tema ovog rada bila su neka od najvažnijih pitanja koja se tiču anestezije u porođaju, kao što su uvod u anesteziju i njeno vođenje. Rezultati istraživanja pokazali su da epiduralna analgezija nije povezana sa povećanjem incidence upotebe vakuum forcepsa, niti sa povećanjem incidence carskog reza. Kada je predmet posmatranja bila CSE analgezija, stiče se utisak da je incidenca porođaja uz pomoć instrumentata bila povećana i da je dužina trajanja ovakvog tipa anestezije bila kraća u odnosu na ukupnu dužinu trajanja porođaja. Ovakvi rezultati posledica su činjenice da je ispitivanje vršeno na malom uzorku. Ono što sa sigurnošću možemo da konstatujemo, je da kombinovana analgezija ne oduzima više vremena za primenu u odnosu na uobičajene načine izvođenja analgezije, kao i da početak delovanja i smanjenje nivoa bola jako brzo nastupaju. Iz tih razloga potrebna je popularizacija neuroaksijalne anestezije i analgezije u ginekološko-akušerskoj praksi.

Key words: combined, spinal, epidural, labour, analgesia

Ključne reči: kombinovana, spinalna, epiduralna, porođaj, analgezija

Introduction

Pain management is an essential part of good obstetrical care, and obstetrical provider should discuss the options with the patient, and encourage patients to address anesthesiologists. On our behalf, every department of anesthesia should have resources to organize quality time with patients in preanesthetic evaluation. Dealing with pain in labor is a routine job for anesthesiologists in large specialized hospitals, but can be quite challenging in smaller obstetric wards. Never the less, epidural as labor pain relief is spreading as an every day practice, and becomes the important issue to address, in means of comparing and exchange of different experiences. Nowadays, in absence of medical contraindication, maternal request is a sufficient medical indication for pain relief in labor. So, how do we cope with increasing number of epidurals and all the variety of individual pain tolerance. Introducing the continuous epidural in labor pain relief helped mainly to reduce anesthesiologists work overload, together with decrease of overall consumption of local anesthetics and better pain control. Technical development brings progress in to our work, but so does good clinical practice and use of our skills. And example of that statement is use of combined spinal and epidural analgesia in labour.

Initiating labor analgesia

Epidural (ED) in labor today involves the well known injection of local anesthetic agent and an opioid analgetic into the lumbar epidural space. Injected agents gradually diffuse across the dura into the subarachnoid space, where they act primarily on the spinal nerve roots, and to a lesser degree on the spinal cord and paravertebral nerves.

The pain in labor, caused by uterine contractions and cervical dilatation, is transmitted through visceral afferent nerves entering spinal cord in level of Th10 through L1. Later in labor perineal stretching transmits painful stimuli through the pudendal nerve and sacral nerves from S2 through S4. In cases of wider cervical dilatation and accelerated perineal stretching, as well as in highly anxious woman

with poor tolerance for pain and discomfort, inadequate epidural analgesia may be prevented with subarachnoid injection of "low-dose spinal" – small amount of low concentration of local anesthetic/opioid combination. This rapid onset of analgesia results in sympathetic and sensor nerve block and in decrease of endogenous catecholamines, and moreover it results in resolving the agitation and restlessness of patient, providing conditions for safe epidural catheter insertion.

Increasingly popular combined spinal epidural (CSE) in labor analgesia some consider as the method of choice, while others reserve it for certain conditions. A prospective review of over 1500 parturients who received either CSE or ED for labor pain revealed that those receiving CSE had decreased need for supplemental analgesics and better patient satisfaction, and there was no increase in adverse maternal or fetal effects.¹ Another, retrospective study of over 6000 cases show that CSE and conventional epidural in labor are comparable in terms of safety, and have similar effect on delivery type.²

Effective labor analgesia is accomplished in 4-6 minutes after intrathecal injection, while analgesia following conventional epidural is achieved in 15-25 minutes.³ Rapid and spectacular onset of pain relief is the most obvious advantage of CSE. Especially during the late labor, analgesia following epidural injection is often delayed and successful if large doses are used. Local anesthetic consumption is significantly reduced with CSE.⁴ Duration of spinal analgesia is usually similar to the duration of initial epidural bolus, up to 90-150 minutes, depending on anesthetic concentration and drug combinations. Motor block is reduced with lowering concentration of local anesthetic, nevertheless ambulation can be advised after performing motor function testing.

Bupivacaine is still mostly used for intrathecal and epidural labor analgesia. In comparison to levobupivacaine and ropivacaine there is a motor blocking hierarchy in labor analgesia, bupivacaine being most potent, followed by levobupivacaine, and finally ropivacaine.⁵ The three pipecoloxidines were investigated in several studies regarding effectiveness in labor analgesia. In evaluation of fetal responses to epidural analgesia evidenced by

Doppler indices, although all three local anesthetics produced excellent analgesia and improved fetal blood flow, best results were in levobupivacaine group.⁶ A study of inhibitory effects of bupivacaine and levobupivacaine on isolated human pregnant myometrium contractility both decreased contractions in concentration-related manner, but in much higher concentrations than the clinically relevant plasma concentrations after epidural administration.⁷ Similar studies and evaluations were more affirmative of the safeness and effectiveness of epidural in labor, than they pointed out preference for one of local anesthetics. Choice of anesthetic is left to the experience and preference of anesthesiologists, but majority modify concentration rather than type of anesthetic solution. Practice changes towards low dose epidural regimens in labor analgesia. It provides at least as effective as traditional epidural pain relief, but significantly increases the incidence of normal delivery.⁸

Adjuvant drugs to local anesthetics are used to facilitate and prolong labor analgesia. Plain intrathecal opioids are successful in producing labor analgesia, and it was established twenty years ago that 25mcg of fentanyl is optimal intrathecal dose, and increasing the dose does not improve the duration or quality of anesthesia.⁹ Most anaesthesiologists prefer the intrathecal combination of opioid and low concentration of local anesthetic for initiation of CSE, both in intrathecal and in epidural solutions. Combination of bupivacaine and fentanyl is typical worldwide.

Other adjuvant drugs did not find place in attempt to improve initial analgesia in labor. Clonidine maybe improves duration of initial spinal analgesia, but produces significant and prolonged hypotension. Epinephrine induces an increased incidence of maternal motor deficit, and may prolong labor duration when higher doses are injected in epidural space. Neostigmine when investigated as part of multi-drug combination gave high incidence of severe nausea and vomiting.⁶

Maintaining labour analgesia – mode of epidural drug delivery

Effective pain relief through labor means parturients with low pain scores, without need for supplemental analgesics, and the absence of recurrent “break-through” pain. The mode of delivering epi-

dural drugs progressed with advances of medical equipment. The variations of drugs administered, patient population characteristics and obstetric practice make the ideal recommendations impossible. Epidural boluses are effective, but labor intense. Nevertheless, some centres lack human or technical resources, and increase anesthesiologists workload in order to provide epidural analgesia in labor. The rationale is use of automated pumps and delivering continuous or bolused epidural infusion, with trend toward patient controlled epidural analgesia (PCEA).

In comparison of continuous epidural infusion (CEI) with PCEA, meta-analysis show that patients who receive PCEA are less likely to require anesthetic interventions, required lower doses of local anesthetic and had less motor block than dose receiving CEI.¹⁰ None of the studies demonstrated advantages of CEI over PCEA. The use of basal infusion in conjunction of PCEA seems preferable, as PCEA without background infusion demonstrates increased incidence of breakthrough pain, resulting in higher intrapartum pain scores and decreased maternal satisfaction.¹¹ However, background infusion during labor may lead to increased consumption of anesthetic solution and prolonged second stage of labor,¹² in spite of decreased demand of PCEA dosing.¹³

Spread of an infusate from the multiorificed catheter is more extensive if regular boluses are used instead of continuous infusion. Availability of reliable automated intermittent bolus pumps that can deliver fix bolus of epidural solution at regular intervals under high pressure can lead to decrease of breakthrough pain and improving maternal satisfaction without increasing side effects. In busy obstetric wards this alternative to CEI currently used by many, may serve to decrease workload. The future in maintaining labor epidural is computer integrated PCEA, which is responsive to the parturients needs, but either regimen used, individualization of treatment according to a woman's pain level and stage of labor can improve obstetrical outcome and maternal satisfaction.

Inadequate pain relief in labor epidurals ranges from 0,9% to 24%. Statistically significant associated factors are multiparity, previous failed epidural, and cervical dilatation over 7 cm¹⁴, but relevant factors are as well opioid tolerance, obesity of parturient, use of air for loss of resistance technique, and

less experienced anesthetist. Patient characteristics are seldom evaluated regarding the maternal satisfaction with labor pain relief. Interestingly parturients with labor onset and epidural request in the evening and night experience higher pain scores¹⁵, indicating that patient anxiety influences quality of analgesia. Socio-economic characteristics of patient population influence medical knowledge, and therefore pain relief in labor often does not match expectations of parturients with lack of information regarding analgesia in labor and delivery. Availability of patient information in obstetric units, whether through flyer information or direct communication with anesthetists is as important as availability of human and technical resources for initiating and maintaining adequate epidural analgesia in labor.

In summary, every mode of maintaining epidural analgesia, whether after epidural or subarachnoid initiation have its advantages or disadvantages, and to increase effectiveness of labor analgesia we should be able to customize a suitable analgesic regimen for each parturient. Based on collected data from meta-analyses in recent literature benefits of different epidural analgesia maintaining techniques are summed in table 1.^{3, 13-16, 16}

Our experience in CSE

As national data base is in progress, clinical data from few tertiary centres are only available. At the Gynaecology and Obstetrics Clinic "Narodni Front" in Belgrade epidural analgesia in labour was introduced into the practice in late nineties, and has increased tenfold in ten years, from 2,9% in 1998 (159 epidurals in 5335 deliveries) to 29,9% in 2008 (2221 epidural in 7420 deliveries). The similar

rate of labor epidural was persisting in few recent years, till today, when it increased further (45,8% in the first half of 2012 – 1433 epidural analgesia for 3123 deliveries). Our retrospective study of six year data of labor epidural analgesia indicate that even traditional epidural used until the introduction of low-dose epidural in our settings few years ago, was not associated with increase of the incidence of vacuum or forceps use nor with the caesarean section rate (Figure 1). Permanent yearly increase of use of epidural labor analgesia did not correlate with constant incidence of instrumentation in labour (2,4%-3,2%) or the incidence of caesarean section (9,2%-10,1%).

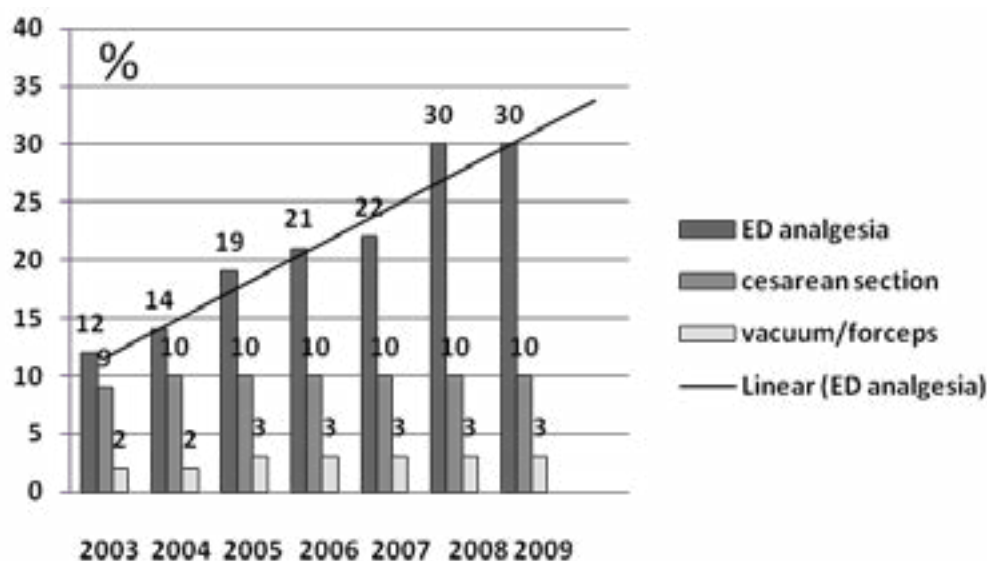
Similar conclusion was established as we compared mode of delivery with the use of sole epidural and combined spinal-epidural analgesia. In an detailed analysis of the first half of 2011, due to small sample of CSE it appeared that the use of instrumentation in delivery is higher in CSE, as the time of action of subarachnoid local anesthetic is relatively short comparing to the time of whole delivery, those numbers have to be tested in larger sample of data. (Figure 2)

Bupivacaine is local anesthetic of choice in 75%, levobupivacaine in 25%, and ropivacaine is not used. For maintaining of analgesia in majority cases it was intermittent epidural bolus technique, and for past few years CEI took over. We are not yet equipped for wide use of PCEA. Regarding LA concentrations, one third of anesthetists prefer traditional epidural dosing, and the low-dose epidural is performed with 0,125%-0,0625% bupivacaine, supplemented with fentanyl 2-2,5 mcg/ml. CSE analgesia is rather reserved for some indications, and the use of intrathecal drugs in labor is anesthetists' preference.

Table 1. Summary of outcomes of four regimens of maintaining epidural analgesia in labor. EDB = epidural boluses, CEI = continuous epidural infusion, PCEA = patient controlled epidural analgesia, LA = local anesthetic

	EDB	CEI	PCEA	PCEA + CEI
increased anesthetic consumption		●		●
breakthrough pain		●		
higher incidence of vacuum or forceps extractions	●			
higher incidence of caesarean section	●			
better distribution of LA	●			
less motor block	●		●	
maternal satisfaction			●	●●
decrease of anesthetists workload		●	●	●●

Figure 1. Correlation of epidural analgesia in labor with obstetric interventions for delivery and caesarean section rate at the Gyn/Obstetr Clinic "Narodni Front", Belgrade



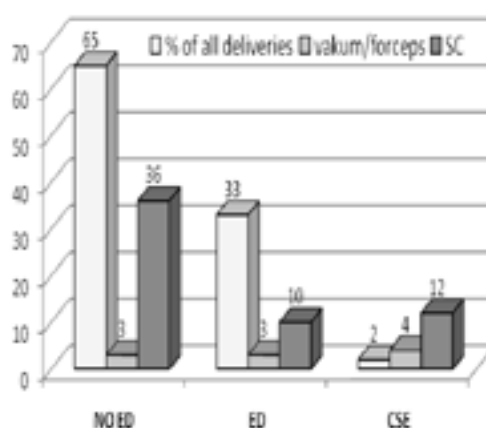
erence. In spite of the benefit of combined spinal epidural in labor, CSE is represented in our settings in approximately 3% labor epidurals. Collected data from 1500 parturients in 2009 reviewed significant maternal satisfaction with labor analgesia, with 0,6% rate of repeated catheter insertion (11/1951 parturients), 0,25% of post epidural headache (5 patients), 0,1% (2/1951 pts) reported hypotensive episode after initiation of epidural analgesia, and there were no problems in ambulation after labor. No neurologic complications or other adverse effects were reported.

As CSE is rather matter of choice of anesthesiologist, in our hospital only one anesthesiologist performs routinely combined initiation of labor analgesia, in about half of parturients. As I can speak

only for myself, I can state that combined analgesia does not consume more time than traditional epidural insertion, that onset of analgesia and maternal relief are miraculously fast, that no gynecologist opposed my choice of CSE, on contrary, as there were no complications satisfaction of our team work was mutual.

Current clinical options for labor epidural analgesia in Serbia are conventional pain relief induction with epidural or intrathecal analgetic solutions, followed by maintaining of analgesia with intermittent epidural boluses or continuous epidural infusion regimen. Tasks that await us are popularisation of neuraxial analgesia and anesthesia in obstetric practice, improving technical recourses and changing preferences toward novel techniques and drugs

Figure 2. Representation of mode of delivery according the mode of labor analgesia



in anesthesia. For providing adequate labor analgesia, decrease of anesthetists workload is important as well.

Conclusion

Every mode of maintaining analgesia during labor, whether after epidural or subarachnoid initiation, or combining these two, has its advantages or disadvantages. This paper has showed that no significant negative correlation between epidural analgesia and labour difficulties. Also, we have showed that use of instrumentation in delivery is higher in CSE, and as the time of action of subarachnoid local anesthetic is relatively short comparing to the time of whole delivery. Given the fact that in our hospital only one anesthesiologist performs routinely combined initiation of labor analgesia, in about half of parturients, we can say that preface conclusion resulted that way due to the small data sample.

Combined analgesia does not consume more time than traditional epidural insertion. Onset of analgesia and maternal relief are miraculously fast. Between CSE and rease effectiveness of labor analgesia we should be able to customize a suitable analgesic regimen for each parturient.

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