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Original Scientific Paper

CONVERSION RATE OF EPIDURAL ANALGESIA TO CAESAREAN SECTION REGIONAL OR GENERAL ANESTHESIA

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ABSTRACT – Introduction: Epidural analgesia is acknowledged as the most common method of analgesia during labor. If emergent Caesarean section (CS) is indicated in parturient with existing labor epidural, the need for conversion from epidural analgesia to regional (RA) or general anesthesia (GA) increases accordingly. Recent guidelines suggest the rate of conversion to general anesthesia shows the quality of obstetric anesthesia care and should be under 5%.

The aim: The aim of this study is to determine the conversion rate from epidural analgesia to Caesarean section anesthesia in "Sveti Duh" University Hospital Zagreb in order to enhance the quality of anesthetic care for obstetric patients.

Methods: We retrospectively included in the study all parturients who received epidural labor analgesia but needed subsequent regional or general anesthesia for Caesarean section in our institution for the period of 1st January 2021 to 31st December 2021. After the data analysis on the conversion rate from epidural analgesia to Caesarean section anesthesia had been performed, we compared our data to current standards and relevant literature findings.

Results: Altogether 1202 epidural catheters were placed for labor analgesia in the study period, and in 199 of these cases, the emergent Caesarean section was indicated. Epidural analgesia was converted to epidural anesthesia (EA) in 153 (76,9%) parturients, to general anesthesia in 40 (20,1%), and to spinal anesthesia (SA) in six (3%) parturients. After comparison with recommended quality standards and with the results of similar studies by other authors, our findings show a significantly higher rate of conversion from epidural analgesia to general anesthesia than has been desirable since then.

Conclusion: In order to reach the required quality standards regarding the conversion rate from epidural analgesia to Caesarean section anesthesia, it is necessary to improve the organization of the work of the obstetric anesthesiology team according to the principle of subspecialization. It is imperative to implement the best clinical practice protocols for obstetric anesthesiologists, but also to enhance the communication and coordination with the obstetric team.

Keywords: *epidural analgesia, Caesarean section anesthesia, conversion from epidural analgesia to anesthesia, quality standards of obstetric anesthesia.*

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Introduction

Epidural analgesia is considered the most effective technique for pain relief during labor today; therefore, there is an increasing number of parturients giving birth with epidural analgesia worldwide. Despite a severe shortage of anesthesiologists in Croatia, this type of analgesia has become more available in most maternity hospitals, and tertiary level obstetric care in Croatia is reaching the standards of the developed countries regarding the percentage of women giving birth with epidural analgesia. The incidence of epidural analgesia has been increasing since it was first implemented as a practice in the obstetric ward of "Sveti Duh" University Hospital in 1975 and is still used in about 40% of all deliveries (1). Even though vaginal delivery is the preferred outcome after the placement of the epidural catheter, a significant number of parturients will need Caesarean section (CS) due to complications during the first stage of labor, most often non-progress of labor, fetal distress, cephalopelvic disproportion and pre-eclampsia (2). In addition, the recent guidelines suggest placing the epidural catheter in all parturients with an increased risk for the need of CS, but with no clear indications yet (3). Once the indication for CS is established, the obstetric team is faced with the dilemma of which form of anesthesia to perform. The pre-existing epidural catheter can be topping-up to epidural anesthesia (EA) or labor epidural analgesia can be converted to spinal anesthesia (SA), combined spinal-epidural (CSA) or general anesthesia (GA) (3, 4). For the conversion of labor epidural analgesia to epidural anesthesia to be successful, both proper position and function of the epidural catheter need to be tested during epidural analgesia and the time for adequate epidural anesthesia must be sufficient (5). Nevertheless, regardless of the proper functioning of the pre-existing epidural catheter, GA remains the method of choice for most emergent intrapartum CS, mainly due to the shorter time from induction to delivery compared to regional anesthesia. (6, 7). Specifically, if labor epidural analgesia is converted to epidural anesthesia using lidocaine with epinephrine and sodium bicarbonate, it takes approximately 10 minutes, and 15 minutes in case of using bupivacaine, levobupivacaine or ropivacaine for the onset of adequate anesthesia which is double the time needed for CS general anesthesia (4, 8). However, in accordance with both Royal College of Anesthetists and The National Institute for health and clinical excellence (NICE) guidelines, it is recommended for the 1st degree emergency CS to be performed within 30 minutes, and 75 minutes for the 2nd degree emergencyCS (9,10). Therefore, enough time remains for the regional anesthesia in most cases of urgent CS and the recommendations for the rate of conversion to GA below 3-5% seems to be attainable (2, 6). Considering the clinically proven increased risk of general anesthesia during emergency Caesarean section, it is justified to take measures to detect conditions indicating the need for CS as early as possible in order to obtain time to perform regional anesthesia (11,12). For this, an uninterrupted communication between the obstetrician and the anesthesiology team is crucial.

The aim of this study is to analyze the current practice of converting epidural analgesia to Caesarean section anesthesia in "Sveti Duh" University Hospital for the year of 2021 in order to enhance the quality of anesthetic care for obstetric patients.

Methods

We retrospectively analyzed the conversion rate of epidural labor analgesia into regional or general anesthesia for the period between 1st January 2021 and 31st December 2021. The analysis was carried out in the Clinic for Gynecology and Obstetrics "Sveti Duh" at the Zagreb University Hospital. It covered 1202 anesthesiology lists including epidural analgesia, marking the cases with an indication for an emergency CS. Further analysis of the parturients by the CS sorted them by the type of converting anesthesia, creating groups for epidural, general and spinal anesthesia. Absolute and relative relation of these three groups has been displayed in the form of tables and graphs through descriptive statistical analysis. The obtained data were correlated with the total number of live births in the examined period, the total number of births in epidural analgesia and the total number of births by CS.

Results

During our study period, from 1st January 2021 to 31st December 2021, in the obstetric ward of the Clinic for Gynecology and Obstetrics "Sveti Duh" University Hospital, a total of 3321 births were recorded, of which 723 births by Caesarean section and 2598 vaginally. Elective Caesarean sections were performed in 332 cases and emergency Caesarean sections in 391 cases. Caesarean section was performed under

spinal anesthesia in 422 (58.3%) cases, epidural anesthesia in 153 (21.2%) cases and general anesthesia in 148 (20.5%) cases (Table 1). A total of 1202 epidural catheters were placed. Of those, 1003 parturients gave birth vaginally (39 %), and in 199 mothers, CS was performed with varying degrees of urgency (Table 2). Of those 199 parturients in whom the CS was preceded by the attempt of vaginal delivery in epidural analgesia, epidural analgesia was converted to epidural anesthesia in 153 (76,9%) parturients, to general anesthesia in 40 (20,1%), and to spinal anesthesia in 6 (3%) parturients (Figure 1). The indication for conversion to

Table 1 General statistic of births in 2021

	N	%
Total number of births in 2021 according to the gynecological protocol	3321	100,0
Total number of Caesarean sections	723	21,8
Elective Caesarean sections	332	45,9
Urgent Caesarean sections	391	54,1
CSSA	422	58,3
CS GA	148	20,5
CS APA	153	21,2
Total number of vaginal deliveries	2598	78,2
Total number of vaginal deliveries in epidural analgesia	1003	38,6

Table 2 Number of epidurals and conversion rate in regional or general anaesthesia for Caesarean section

	N	%
Total number of epidural analgesia	1202	100
Total number of vaginal deliveries in epidural analgesia	1003	83,4
Total number of Caesarean sections after preceding vaginal delivery attempt in epidural analgesia	199	16,6
Conversions of CS from epidural analgesia to GA	40	20,1
Conversions of CS from epidural analgesia to SA	6	3,0
SC in epidural anaesthesia	153	76,9

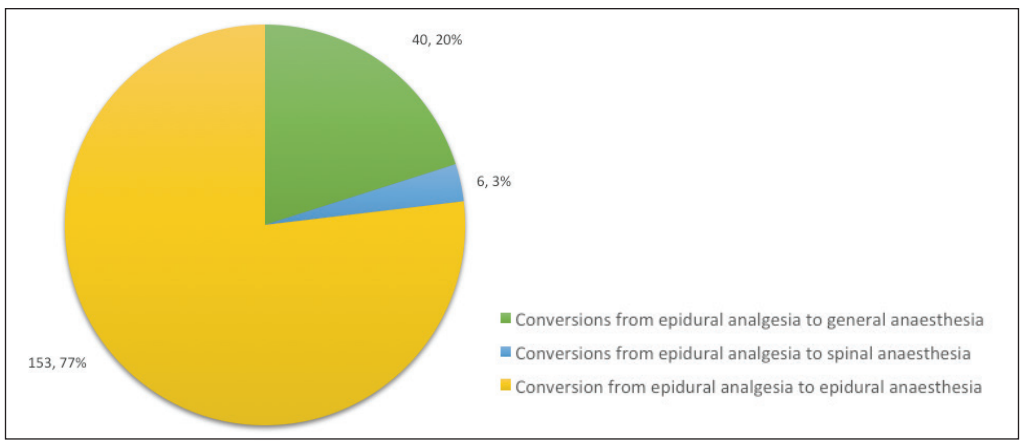

Figure 1 Conversion rate from epidural analgesia to epidural, spinal or general anaesthesia.

GA is most often a high degree of urgency declared by an obstetrician, and less often, insufficient functionality of the epidural catheter before or during CS. In situations when the catheter was not reliable enough and the degree of urgency was lower, the conversion was performed by introducing spinal anesthesia with prior removal of the epidural catheter (6 cases of 199 or 3%). The most common indications for emergency CS were fetal bradycardia, non-progression of labor and cephalopelvic disproportion. Two % lidocaine solution with the addition of epinephrine and bicarbonate were most often used for the conversion from epidural to spinal anesthesia, followed by 7.5% ropivacaine and 0.5% levobupivacaine or bupivacaine solution.

Discussion

The analysis of our one-year practice of converting of epidural analgesia to EA shows similar trends described by other authors regarding the increasing percentage of epidural anesthesia for cesarean section after previously established epidural analgesia (2, 5, 8). This is partly due to unexpected complications during childbirth, and partly to pregnancies in which there was no definite indication for a Caesarean delivery, but it was very likely. Such an approach, which includes a parturient with a difficult airway or challenging anatomy for RA, is used to increase the safety of obstetric and anesthesiology practices and is based on modern guidelines (9,10). The idea to enhance safety of obstetric practice with a previously placed epidural catheter is based on the assumption that in the case of the need for an emergency Caesarean section, epidural analgesia can be converted to epidural anesthesia in a very high percentage and thus avoid general anesthesia as a method of increased risk for both mother and fetus (12). With this idea, back in 2006 the desired standard of no more than 3% conversion of epidural analgesia to general anesthesia was defined, thus introducing a kind of indicator of the quality of obstetric anesthesia (13). Analyzing their own practice in 2008, a group of Canadian authors were among the first to check whether this standard was achievable and realistic and they found that in 4.1% of cases in a sample of 501 conversions they did it under general anesthesia, which is a relatively close to the goal of 3%. (6) Meanwhile, the standard has been revised to an average of up to 5% for the first three categories of emergency CS and 15% for category 1 emergency section according to The Royal College of Anesthetists 2012 (9). In our 199-conversion sample, epidural analgesia was converted to general anesthesia in 40 cases, accounting for 20.1%, which is a significant deviation from the mentioned standards. There are probably several reasons for such a practice. One reason can probably be addressed to the defensiveness of obstetricians who often require general anesthesia for emergency CS despite a functional epidural catheter for fear that conversion to EA will take too much time. The relative reluctance of obstetricians toward RA is also seen through the still high rate of GA for elective CS, which is why the total rate of general anesthesia for caesarean section in our institution for the study period was 20.5%. This is more than double compared to the economically developed countries we want to compare with (12, 14). For example, in the United Kingdom, general anesthesia for caesarean section was reduced to 8% in the period 2004 - 2008, and conversion from epidural to general anesthesia was reduced to 4.9% of cases (2). Today, developed western countries have a rate of GA for CS that does not exceed 5% (4,15). Here we can certainly talk about a kind of defensiveness of anesthesiology staff that is insufficiently engaged in creating a climate in which all actors support regional anesthesia for CS. It can be said that in our institution there is definitely a need for better communication between obstetricians and anesthesiologists.

A study conducted in Japan that retrospectively looked at the effect of forming an obstetric anesthesiologist team, instead of an earlier practice when all their anesthesiologists occasionally performed obstetric anesthesia, indicates that the incidence of general anesthesia for SCs dropped from 10 to 5% after forming an obstetric team (16). There has been a long tradition of the obstetric team of anesthesiologists in our institution, but it has been disbanded in recent years, which obviously has more negative than positive effects on the quality and safety of obstetric anesthesiology practice. Analyzing the actual time needed for conversion from epidural analgesia to general or regional anesthesia, Palmer and authors found differences of 5 minutes in favor of general, taking 6 minutes to converse to general and 11 minutes to epidural anesthesia, measured by "operating room to incision interval" (17). Although those 5 minutes can make a big difference in extremely urgent cases, like umbilical cord prolapse or placental abruption, it was shown that in most of the cases there has been no difference in Abgar scores or umbilical cord blood gases (11,12,17). One of the

ways of shortening the conversion time from epidural analgesia to epidural anesthesia is to apply a local anesthetic in the delivery room, before the transfer to the operating room, with constant supervision by a trained anesthesiologist (5). Today, several local anesthetics are used to top-up epidurals, most commonly 2% lidocaine, bupivacaine, levobupivacaine, ropivacaine and in some countries 3% chloroprocaine (8). With addition of epinephrine and bicarbonate, with or without fentanyl, lidocaine can achieve epidural anesthesia within 10 minutes making it, according to most reports, the fastest method of conversion from epidural analgesia to epidural anesthesia (8, 16). Other local anesthetics, except chloroprocaine, need around five more minutes to achieve surgical anesthesia, with ropivacaine being least associated with failed epidural block (8, 18). To date, the finest randomized research in the US, which compares the time needed for conversion using the 3% chloroprocaine with that of a mixture of lidocaine, epinephrine, bicarbonate and fentanyl has shown a very small difference in the time needed for the anesthesia to take effect, with the lidocaine mixture being faster (558 vs 655second) (19). If we take into account the time needed to prepare the mixture of the four mentioned drugs, then the use of pure chlorprocaine may be the fastest option. The addition of bicarbonate further accelerates the action of chlorprocaine and thus becomes comparable to the time required for conversion to general anesthesia, and therefore it is a pity that this anesthetic is not available in our country (18,19).

There are several other points of discussion about the process of converting epidural analgesia to CS anesthesia. One question is what to do when the epidural catheter did not provide satisfactory analgesia before the Caesarean section indication was set, and another is what to do when pain occurs during surgery after conversion to regional anesthesia. Most authors suggest an early re-insertion of the malfunctioning catheter, and when time is limited, conversion to CSA or spinal anesthesia is recommended (20).

Such a practice is also present in our institution, which is evident from a number of conversions of epidural analgesia to spinal anesthesia (6 out of 199 or 3%).The occurrence of pain or discomfort during surgery is resolved in very different ways and is not standardized depending on the pregnant woman's condition, stage of surgery, available drugs, experience and preferences of anesthesiologists, etc. In the wide spectrum of interventions, a conversion to spinal or general anesthesia is described, as well as top-upping the existing EA with the addition of local anesthetic and opioid bolus, or administration of an intravenous opioid, intravenous anesthetics such as propofol or ketamine and midazolam (21, 22, 23). Other options include the inhalation of nitrous oxide as well as a local infiltration of fascia by the surgeon (21). Risk factors for an inadequate regional anesthesia (failed RA) are a high degree of emergency, the height of the mother, the number of clinician top-ups in labor, and the performance of obstetric anesthesia by a non-obstetric anesthesiologist (24). Our research did not include an analysis of the approach to incomplete epidural anesthesia, but according to the author's experience, conversion to general anesthesia or the use of ketamine are the most common options used in such a case.

Conclusion

While observing the practice of anesthesiology regarding the conversion from epidural analgesia to Caesarean section anesthesia during the previous year, our findings show a significantly higher conversion rate from epidural to general anesthesia than recommended by the world's largest associations of obstetric anesthesiologists. Starting from the experience of others, as well as from our own experience, to approach world standards of obstetric anesthesia, it is necessary to improve the organization of obstetric anesthesia on the principle of subspecialization with a permanent team of obstetric anesthesiologists in 24-hour service. It is also necessary to introduce clear common protocols for the work of obstetric anesthesiologists and obstetricians and to monitor their implementation. For complete success in improving quality and safety, it is necessary to improve communication and coordination between anesthesiologists and obstetricians.

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Sažetak

UČESTALOST KONVERZIJE EPIDURALNE ANALGEZIJE U REGIONALNU ILI OPĆU ANESTEZIJU KOD CARSKOG REZA

I. Šklebar, M. Vrljičak, D. Habek, T. Šklebar i L. Šakić

Uvod: Epiduralna analgezija za porođaj danas je najčešća metoda analgezije tijekom porođaja. Zahvaljujući tome sve češće se javlja potreba za konverzijom iz epiduralne analgezije u regionalnu ili opću anesteziju u slučaju indikacije za hitni carski rez.

Prema standardima kvalitete konverzija u opću anesteziju ne bi trebala prelaziti 5%.

Cilj: Na vlastitom uzorku provesti analizu prakse konverzije epiduralne analgezije u anesteziju za carski rez retrospektivnom analizom jednogodišnjeg razdoblja kako bi se utvrdila područja za poboljšanjem u dnevnoj praksi.

Ispitanici i metode: Analizirana je učestalost i konverzije epiduralne analgezije u regionalnu ili opću anesteziju u razdoblju od 01. 01. 2021. do 31. 12. 2021. Dobiveni podaci o učestalosti konverzije u pojedinu vrstu anestezije za carski rez uspoređeni su sa standardom kao i podacima sličnih istraživanja.

Rezultati: Tijekom ispitivanog razdoblja stavljena su 1202 epiduralna katetera za analgeziju porođaja od čega je u 199 slučajeva nastupila indikacija za hitni carski rez te je epiduralna analgezija u 153 (76,9%) slučaja konvertirana u epiduralnu anesteziju, u 40 (20,1%) slučajeva u opću anesteziju i u 6 (3%) slučajeva u spinalnu anesteziju. Usporedba dobivenih rezultata s rezultatima drugih autora kao i zadanim standardima kvalitete ukazuje na značajno višu učestalost konverzije epiduralne analgezije u opću anesteziju u odnosu na poželjno.

Zaključak: Za približavanje svjetskim standardima kvalitete opstetričke anestezije u segmentu konverzije epiduralne analgezije u anesteziju za carski nužno je unaprijediti organizaciju rada opstetričkog anesteziološkog tima prema principu subspecijalizacije. Potrebno je uvesti jasne zajedničke protokole za rad opstetričkih anesteziologa te unaprijediti komunikaciju i koordinaciju s opstetričkim timom.

Ključne riječi: *epiduralna analgezija, anestezija za carski rez, konverzija epiduralne analgezije u anesteziju, standard i kvalitete opstetričke anestezije.*