

The level of patient satisfaction with various methods of relieving labor pain

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SUMMARY

Introduction. Improved availability and efficacy of epidural anesthesia changes the expectations of many women concerning labor pain control. The attending physician should provide the pregnant woman with exhaustive and objective information about the benefits and risks associated with this form of anesthesia. Irrespective of the gynecologist's attitude, the preferences of the woman in labor must be taken into account in each case. The aim of this research was to evaluate patient satisfaction with epidural anesthesia compared with patients giving birth without the use of this form of analgesia.

Material and methods. A voluntary and anonymous survey study was conducted in a group of 219 women giving natural vaginal birth to a single live fetus from January 2016 to December 2017. The study group (n=103) were patients who decided to use epidural anesthesia, and the control group (n=116) were patients who did not use this form of analgesia. The inclusion criteria were: single pregnancy, cephalic presentation and gestational age ≥ 37 weeks. Pain intensity before and after administration of anesthesia was measured on a 10-grade visual analogue scale (VAS).

Results. The study group contained significantly more patients who did not work compared with the control group. Patients performing intellectual work more rarely decided to use anesthesia (p=0.0001). Women whose partners were present during their previous labor more frequently used epidural anesthesia (p=0.003). A doctor and midwife were the main sources of knowledge for the study group, while the controls more often chose the media and friends (p=0.00001). Women who participated in antenatal classes more often chose epidural anesthesia (p=0.002). The study group patients were more satisfied with labor (p=0.001) and expressed greater willingness to use epidural anesthesia during their next childbirth (p=0.0001).

Conclusions. Epidural anesthesia is an effective and safe form of labor pain relief. It does not substantially affect the frequency of obstetric complications. The place of residence, type of work, manner of obtaining information about epidural anesthesia and, in multiparous women, the presence of their partner during the previous childbirth as well as experience with various methods of labor pain relief were factors that influenced the choice of epidural anesthesia during labor.

Key words: labor; epidural anesthesia; pain; patient satisfaction

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INTRODUCTION

Labor is a physiological process that is always associated with pain and stress. Labor pain is acute, nociceptive and viscerosomatic of considerable intensity. It is referred to as “unbearable” by 70% of women in labor. Unfavorable hemodynamic changes may be the consequences of pain as a result of intensive secretion of catecholamines, cortisol and other endo- and paracrine substances [1].

Labor pain management is one of the medical services guaranteed by the Minister of Health and encompasses all methods scientifically proven to be effective. The patient admitted for childbirth should be informed about the course of labor, pain relief methods and their availability in the manner understandable for her [2]. There are two forms of labor pain relief: non-pharmacological and pharmacological. The former group includes methods with efficacy confirmed in studies on large patient groups: support of a close person, being physically active during labor and assuming poses that reduce pain sensation, breathing and relaxation techniques, relaxation massage, warm or cold compresses to the painful areas, physiotherapeutic methods, water immersion, acupuncture, and acupressure, as well as methods of unsure efficacy, such as: transcutaneous electrical nerve stimulation (TENS), hypnosis, biofeedback, injections and aroma therapy [3–6]. The latter group includes: inhaled analgesia, intravenous or intramuscular opioids, regional anesthesia: either epidural or combined spinal and epidural, local infiltrative anesthesia, paracervical or pudendal nerve block [1,2,7].

The selection of a labor pain relief method is discussed with the woman in labor, who should consciously participate in the analgesic process. The selection of the method is mainly dictated by the preferences of the mother, but depends on her general condition, obstetric situation and organizational possibilities [6,8].

The implementation of non-pharmacological methods first is a rule as they are the safest for both the mother and the child. When these methods occur ineffective or when there are indications, pharmacological agents are administered. Non-pharmacological methods can be combined with invasive techniques as pain intensifies. The patient must be informed about the impact of pharmacological pain relief on the course of labor and fetal well-being as well as on possible complications and adverse effects. During the use of these methods, intensified surveillance of an obstetrician and midwife as well as additional maternal and fetal monitoring become necessary. The patient must express written concern to the use of a given method [1,2,6].

Epidural analgesia (EA) is undoubtedly the most effective form of relieving labor pain, which constitutes an additional source of stress for the mother and child [1,9,10]. EA has a number of beneficial somatic effects and exerts a positive influence on the patient's mental state. By contrast with many other pharmacological methods, it does not sedate or block motor functions. Due to catecholamine and cortisol secretion modulation, it has positive effects on hemodynamic changes in the body. This makes epidural anesthesia a method that supports treatment and enables vaginal delivery in patients with ocular diseases as well as cardiological and respiratory conditions, including patients with pregnancy-induced hypertension. It can be used in patients with concomitant endocrine, neurological and hematologic diseases [1,9]. There are also reports on beneficial and protective effects of EA on pelvic floor muscles during labor, which may reduce the risk of pelvic organ prolapse in later life [11]. EA helps to tighten the bond between the mother and the child through conscious and joyful experience of labor. It lowers the risk of posttraumatic stress disorder and postpartum depression [12]. It may be supplemented during prolonged labor and dosed by the patient herself. If labor concludes with a cesarean section, this form of analgesia is comparable to subarachnoid block [1].

The only contraindications to EA are purulent changes in the region of the lumbar puncture and coagulation disorders, including heparin use. A proper withdrawal period must be observed, usually 4 hours after infusion of unfractionated heparin, 12 hours after injection of a prophylactic dose of low-molecular-weight heparin and 24 hours after administration of a therapeutic dose [1,13].

A reduction of the patient's effort during labor though the use of EA for labor pain relief is a difficult task for an anesthesiologist. Analgesia, i.e. labor pain reduction, is preferred over anesthesia, i.e. loss of any sensations, which is an unfavorable phenomenon in this cases [14]. EA may prolong the second phase of labor. Reports on the use of EA in the first phase of labor are conflicting. Some studies claim that it is shorter in women who use EA, which may be explained with smooth muscle relaxation and greater cervical compliance. Other authors argue that the phase is longer due to less abrupt contractive action in patients with EA [1,3,15–23]. EA labor is associated with a risk of vacuum extraction or forceps-assisted delivery. Most studies have observed no increased percentage of cesarean sections (between 9 and 24%) [3,17,21,23,24]. However, the prevailing indications include emergencies or urgencies due to a threat of fetal asphyxia or failure to progress [18–20,25–28]. Taking into account indications associated with expected difficulties with natural delivery (e.g. hypertensive patients attempting natural labor), it can be concluded that EA may even lower the rate of cesarean sections due to obstetric and extraobstetric indications, e.g. in tocophobia where fear of pain is the cause of 85% of anxiety cases [29]. For the desired effect, various forms of drugs are used in appropriate dilutions in combination with adjuvant agents, and a number of various techniques of administering the drug to the epidural space are employed [1,5,20,24,30]. One form is not superior over others. A beneficial course of labor with EA and the manner of its conclusion have been confirmed in reliable evidence-based clinical studies [9].

Rare adverse effects and complications in the mother include: insufficient analgesia, blood pressure drop and headache after accidental dural puncture, fever of unknown etiology, motor block, urinary retention, high epidural or subarachnoid block, and subdural hematoma. Rarer effects are drug poisoning after accidental intravenous administration or administration of a greater than maximal dose [1]. Severe and permanent neurological complications are extremely rare (0.05 ‰) [10,12].

EA has no negative effect on the well-being of the neonate in Apgar scale at 5 minutes after birth [14,19,22,23,31]. Transient fetal arrhythmia may cause transitory blood pressure decline after administration of subsequent doses. EA lowers the risk of acidosis (pH <7.2) and reduces the need to use naloxone; it does not

affect breast-feeding parameters [19,27,30]. Improved EA availability and efficacy changes the expectations of women concerning labor pain control. The attending physician should, at the right time, provide the pregnant woman with exhaustive and objective information about the benefits and risks associated with this form of anesthesia [1,10]. However, irrespective of the physician's attitude, the preferences of the woman in labor, for whom birth of a child is a particularly exceptional event, must be taken into account [1,6,14].

AIM

The aim of this research was to evaluate patient satisfaction with EA compared with patients giving birth without the use of this form of analgesia. Additionally, preferences concerning labor pain relief were also analyzed in terms of the patient's marital status, education, socioeconomic status, parity, place of residence, nature of professional work and prenatal ailments. Attention was paid to possible additional adverse effects of anesthesia and to their influence on recovery and satisfaction after labor.

MATERIAL AND METHODS

A voluntary and anonymous survey study was conducted in women giving natural vaginal birth to a single live fetus from January 2016 to December 2017 in the Department of Gynecology and Obstetrics of the Silesian Institute of the Mother and Neonate in Chorzów and the Department of Gynecology and Obstetrics of the Health Center in Mikołów, Poland. The survey was divided into four parts: the first addressed general characteristics of the patient, the second concerned obstetric history, excluding the current pregnancy and labor, the third contained questions only about the current pregnancy, and the fourth included questions only about the current labor.

The study group were patients who decided to use EA during natural vaginal birth, and the control group were patients who did not use this form of analgesia. The inclusion criteria were: single pregnancy, cephalic presentation and gestational age ≥ 37 weeks. Systemic diseases that could determine the duration and manner of concluding pregnancy were exclusion criteria. Pain intensity before and after administration of anesthesia was measured on a 10-grade visual analogue scale (VAS).

In total, 219 completed surveys were returned. The study group consisted of 103 women, and there were 116 controls. The methods of EA administration varied between the departments. In Mikołów, EA was offered to willing patients in the active phase of labor, i.e. with regular uterine contractions and cervical dilation of at least 3 cm. Anesthesia was routinely performed with 0.125–0.25% solution of bupivacaine with adrenaline and additionally fentanyl (0.1 mg). The subsequent doses of approximately 3–6 mL were re-administered in 2–3-hour intervals, depending on the duration of labor, pain intensity and patient's preferences. In Chorzów, both continuous epidural anesthesia and combined spinal and epidural anesthesia (CSE) are used. EA involved 0.1–0.2% of ropivacaine, whereas CSE involved 0.5% of ropivacaine. Depending on the patient's height, 8–15 mL of solutions with 0.05 mg of fentanyl was used at a single occasion. Additional doses were administered at the patient's request. For the purposes of this study, the nomenclature was made uniform, and both types of anesthesia are referred to as epidural anesthesia (EA).

Statistical analysis

The statistical analysis was conducted in Statistica 12.0PL (STAT Soft Krakow). The normality of distribution and variance homogeneity were tested using the Lilliefors-corrected Kolmogorov-Smirnov test and Levene's test. For group comparison, the Mann-Whitney test was applied for quantitative variables and chi square test for qualitative variables. The level of statistical significance was $p < 0.05$.

RESULTS

The mean age of the patients and controls was 29 years; there were no significant differences between the groups. Parity differed significantly between the groups: there were more primiparous women in the study group. The women residing in the urban areas more frequently used EA during labor ($p = 0.03$). The study group contained significantly more patients who did not work. The patients performing intellectual work more rarely decided to use anesthesia ($p = 0.0001$). There were no statistically significant differences between the groups in the following parameters: marital status, informal relationship, body mass, education, and smoking (Tab. 1 and 2).

The evaluation of the reproductive history of the multiparous women showed that most of them had previously had natural births. It was also observed that the women previously using

EA during labor also used it in the current childbirth ($p=0.03$). The women who previously used intravenous analgesics, more often agreed to EA during the current labor ($p=0.002$). The wom-

Tab. 1. Characteristics of the study group: qualitative parameters

Variable	EA		No EA		P*
	n	%	n	%	
Place of residence					
Urban areas	96	94,1	99	85,3	0,03
Rural areas	6	5,9	17	14,7	
Marital status					
Single	20	19,4	14	12,1	NS
Married	83	80,6	102	87,9	
Education					
Primary	18	17,5	21	18,4	NS
Secondary	34	33,0	50	43,9	
Higher	51	49,5	43	37,7	
Work					
Does not work	37	35,9	4	3,4	0,0001
Physical work	17	16,5	25	21,6	
Intellectual work	49	47,6	87	75,0	
Smoking – YES	5	4,9	12	10,3	NS
Permanent relationship	101	98,1	115	99,1	NS
NVD	9	25,0	17	18,5	NS
Previous NVD with episiotomy	29	85,3	66	71,7	NS
Previous labor with VE	1	1,0	1	1,0	NS
EA during previous labor	6	17,6	2	2,2	0,002
Induction of previous labor	14	40,0	24	26,4	NS
Partner present during previous labor	28	80,0	45	49,4	0,002
Analgesics during previous labor	11	31,4	6	7,4	0,002
Was pregnancy planned?	81	78,6	89	77,4	NS
Hospitalization during current pregnancy	25	24,5	27	23,5	NS
Ante-natal classes	51	49,5	32	27,8	0,002
Labor plan discussed with doctor	88	85,4	87	75,6	NS
Current labor					
Nitrous oxide	-	-	14	17,2	-
IV analgesics	-	-	6	7,41	-
NVD	25	24,2	28	24,1	NS
NVD with episiotomy	41	39,8	43	37,1	NS
VE	2	2,0	1	0,8	NS
CC	35	33,9	44	37,9	NS
Complications	13	12,6	11	9,8	NS
Lactation problems	26	25,7	22	19,6	NS
Urinary retention	19	18,4	9	7,9	0,03
Nausea	18	17,4	9	8,0	0,03
Satisfaction from pain control	92	89,3	75	66,9	0,0001
Wish to use EA during next labor	100	97,1	51	45,5	0,0001

EA – epidural anesthesia; NVD – natural vaginal delivery; VE – vacuum extraction CC – cesarean section; IV – intravenous, NS – nonsignificant; * Chi square test

Tab. 2. General characteristics of the study group: quantitative parameters

Parameter	EA				No EA				P#
	Mean	Median	Range	SD	Mean	Median	Range	SD	
Age	29,2	29,0	18,0-47,0	5,1	29,5	29,0	19,0-44,0	4,8	
Economic status: 5-point Likert scale	3,6	4,0	2,0-5,0	0,6	3,6	4,0	0,0-5,0	0,9	
BMI	24,6	23,0	17,3-44,6	5,5	24,7	23,7	15,4-36,5	4,8	
Duration of the relationship (years)	5,4	5,0	1,0-15,0	3,5	6,9	6,0	1,0-20,0	4,3	0,01
Pregnancies	0,6	0,0	0,0-4,0	0,9	1,1	1,0	0,0-4,0	1,0	0,00001
Miscarriages	0,1	0,0	0,0-1,0	0,3	0,2	0,0	0,0-2,0	0,5	
Labors	0,5	0,0	0,0-4,0	0,8	0,9	1,0	0,0-4,0	0,9	0,0001
Pain intensity in VAS for previous labor	7,7	9,0	0,0-10,0	2,7	7,9	8,0	0,0-10,0	2,0	
Level of knowledge about childbirth	3,9	4,0	0,0-5,0	0,9	4,0	4,0	1,0-5,0	0,8	
Pain intensity in VAS for first phase of labor before EA	7,5	8,0	0,0-10,0	2,1	6,6	7,0	0,0-10,0	2,1	0,001
Pain intensity in VAS for first phase of labor after EA*	3,3	2,0	0,0-10,0	2,6	6,6	7,0	0,0-10,0	2,1	0,001
Pain intensity in VAS for second phase of labor	7,2	8,0	0,0-10,0	3,0	8,5	9,0	3,0-10,0	1,5	0,01
Spinal pain intensity in VAS	2,2	2,0	0,0-8,0	2,3	1,8	0,0	0,0-10,0	2,5	
Duration of sacralgia (hours)	6,8	2,5	0,0-30,0	8,2	4,9	3,0	0,0-24,0	5,2	
Intensity of headache in VAS	0,5	0,0	0,0-10,0	1,5	0,6	0,0	0,0-8,0	1,5	
Duration of headache (hours)	4,4	2,0	1,0-24,0	6,7	8,3	3,0	0,5-72,0	16,3	

* in patients without EA, pain intensity in the first phase of labor was the same; in EA group, the values differ due to the administration of anesthesia; # – Mann-Whitney U test BMI – body mass index; VAS – visual analogue scale, EA – epidural anesthesia

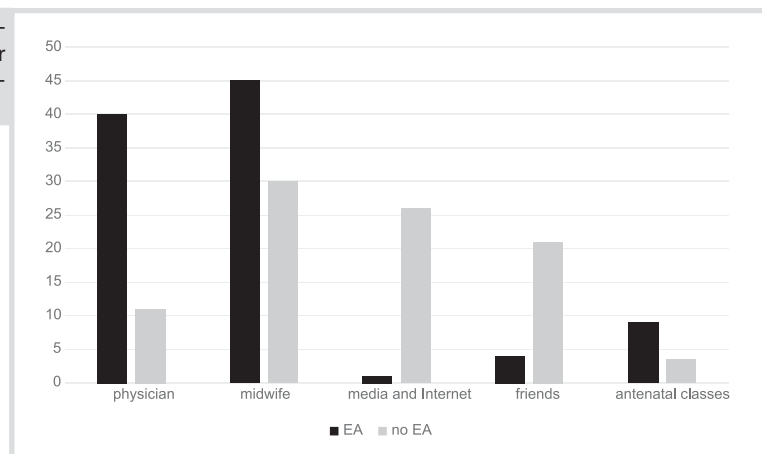
en whose partners were present during their previous labor more frequently used EA ($p=0.003$). There were no statistically significant differences between the study and control groups in terms of the need for vacuum extraction or labor stimulation (Tab. 2).

The analysis of the course of the current pregnancy and labor showed that the control and study groups were not significantly different in terms of episiotomy and obstetric complications, except for urinary retention ($p=0.03$) and nausea ($p=0.03$). The previous pregnancy was complicated with hypertension in 4 respondents (1.83%), and with gestational diabetes in 7 women (3.21%). These diseases determine the perinatal management, and therefore, these cases were excluded from statistical calculations. There were no differences in the duration of hospitalization and pregnancy pathology between the groups. The doctor and midwife were the main sources of knowledge about EA for the study group, while the controls more often chose the media and friends ($p=0.00001$) (Fig. 1). The women who participated in antenatal classes more often chose EA ($p=0.002$).

Most patients decided to use this form of analgesia before childbirth (67.96%), while the remaining made the decision during labor (32.04%). Only 1 patient had medical indications for EA (pregnancy-induced hypertension), and the remaining received it on request. To sum up, 47.03% of the respondents used EA during the previous labor. EA was used in 16.44% of patients admitted for natural childbirth in Mikołów and in 82.29% of patients in Chorzów. In 2016, 52.97% of patients did not use EA. The causes for this were: very rapid childbirth ($n=30$; 25.86%), fear of complica-

tions ($n=14$; 12.07%), high pain tolerance and no need for analgesia during labor ($n=8$; 6.90%), no knowledge regarding labor pain relief methods ($n=6$; 5.17%) and, in 3 cases (2.59%), unavailability of EA. In 3 cases (1.37%), labor was concluded with vacuum extraction: 2 cases in the study group and 1 case in the control group. Additionally, 19.15% of patients who used EA in Chorzów, and 14.87% of patients in Mikołów had emergency cesarean section. For comparison, the percentages in the controls were 21.54% in Chorzów and 16.56% in Mikołów (a non-significant difference, Tab. 1). The occurrence of the individual complications during labor in groups A and B is presented in Table 1. Patients from the study group had urinary retention ($p=0.03$) and nausea (0.03) significantly more frequently, while the greater frequency of sacralgia was non-significant ($p>0.05$). (Tab. 1). Pain in the first phase of labor was assessed on a 10-grade visual analogue scale (VAS). In the first phase of labor, it was stronger in the study group before EA administration (mean 7.45 vs 6.58), and in the second phase of labor, it was stronger in the controls (mean 7.20 vs 8.54) (non-significant, Tab. 2). In the study group, satisfactory pain control was achieved (mean 7.45 before EA vs mean 3.32 after EA). One hundred and sixty-seven respondents (77.67%; 90% vs 67% in the study and control group, respectively) were satisfied with pain control during their last labor, and 151 (70.2%; 97.1% vs 45.5%) would decide to use EA again. The study group patients were more satisfied with labor ($p=0.001$) and expressed greater willingness to use EA during their next childbirth ($p=0.0001$; Tab. 2).

Fig. 1. Sources of knowledge about epidural anesthesia during labor (* – $p<0.05$; EA – epidural anesthesia)



DISCUSSION

Relieving labor pain is one of the most spectacular examples of a clash of habits and tradition with the possibilities offered by contemporary medicine. Labor pain relief methods have changed within the past 20 years. In the year 2000, parenteral pethidine dominated amongst pharmacological methods, while epidural anesthesia was available only for few women. Modern obstetrics is based on various forms of conduction anesthesia, which have evolved over the years to become maximally safe for women in labor. EA with low doses of drugs plus opioids, combined spinal and epidural anesthesia, and (although more rarely) patient-controlled epidural anesthesia are all in routine use. Moreover, the latest techniques of programmed doses or continuous administration with an infusion pump, and interactive computerized techniques of patient-controlled dosing are also being implemented [21,32]. In Polish hospitals, only 10–28% of patients used conduction anesthesia during labor in 2000. This rate doubled in 2009, reaching 55% [33]. In 2016, the availability of EA varied depending on the degree of hospitals: EA could be offered in 83% of hospitals with a tertiary obstetrics department and in only 36% of primary care hospitals [34].

The study reveals that primiparous women are particularly interested in EA. Similar observations have been made by Billert and Gaca. In their study, women who requested EA were those who experienced pain more intensively and primiparas, as well as those with an increased level of catastrophizing. As in our work, the patients described pain before the administration of analgesia as stronger compared with the control group. It seems that primiparous women may have higher anxiety levels and are therefore more willing to use analgesia. Labor is a new, unlearned experience in their case, and their situational reaction is more pronounced than that of multiparous women [35]. Interesting observations have been made by Rzepka et al. They compared subjective pain sensation in a group receiving epidural anesthesia and in a group administered pethidine. After administration of analgesia, lower pain levels were noted in the former group, which was particularly evident in the subgroup of primiparas [36].

Women who had received proper education during pregnancy were more willing to accept EA. In the past, the attitude to pain relief during labor was often shaped only by friends and

acquaintances while organized forms of antenatal education were poorly available. In 2005, Borowska et al. found that the main sources of information were books and more rarely antenatal schools and doctors, which definitively needed to change [37]. Currently, antenatal classes have become an important element of the preparation for labor. Nevertheless, an obstetrician is often the only authority for patients, and his or her personal attitude to pain relief and the level of professional awareness may affect the patient's final decision [38]. This is confirmed by our research which revealed a significant role of the attending physician, antenatal classes and hospital staff in the education of the pregnant (Fig. 1). These sources of information contribute to the spread of reliable knowledge on labor pain relief and to an increase in the percentage of patients receiving epidural anesthesia. Our study showed that women drawing knowledge from the media and Internet as well as from friends used EA less often.

In the investigated group, the use epidural anesthesia or intravenous pethidine during the previous labor was positively correlated with epidural anesthesia during the next labor. It seems that this group may consist of patients with lower pain tolerance or those who received better education on labor pain relief. A Canadian publication by Liu and Wen suggests an association between the amount of EA during labor and the level of education and economic status of patients [39]. Multiparous women with a low socioeconomic status use it less often [36,37,40]. The availability of an anesthesiologist plays a substantial role in the decision about EA. In obstetric units with over 2,000 childbirths annually, there is usually a full-time anesthesiologist working only in the childbirth department, while in smaller centers, this specialist secures several hospital wards [36,41]. Women residing in rural areas use interventional procedures, including EA, less often than those from urban areas [42]. Moreover, our own study revealed significant differences in the number of anesthetized labors between the gynecology and obstetrics departments with respect to this variable. This is a consequence of worse availability of procedures, but also of different and lower expectations of women from rural areas and smaller towns. Based on own observations and reports of other authors, it seems that EA during labor is the most efficacious method to relieve labor pain, even though it is accompanied by certain controver-

sies regarding the impact of this form of analgesia on the duration and conclusion of labor and postnatal child condition. In the Cochrane review from 2012, it was demonstrated that EA does not increase the absolute number of cesarean sections. However, a threat of fetal asphyxia was a more common indication for cesarean section and vaginal procedural birth in women using spinal anesthesia. Blood pressure drop, motor block, fever, urinary retention and skin itching are more likely to occur in these patients [3]. This can be counteracted by the administration of low doses and concentrations of the currently used medications. A meta-analysis of randomized studies comparing outcomes of labors during which low-dose (i.e. solutions $\leq 0.1\%$ bupivacaine or $\leq 0.17\%$ ropivacaine) or high-dose epidural anesthesia was administered, which was conducted in 2013, supports the fact that low doses decrease the rate of complications, such as: prolonged second phase of labor, forceps-assisted delivery or vacuum extraction, motor block or urinary retention. The dose of a drug had no effect on the level of pain, nausea and vomiting, blood pressure fall and neonatal status [43]. British recommendations suggest that the administration of a single dose $\leq 0.125\%$ bupivacaine solution is so safe that it does not require surveillance over the patient. These guidelines state that the patient must be informed about the lack of consequences of anesthesia performed in this way on the duration of the first and second phases of labor, and on the number of cesarean sections and procedural vaginal deliveries [41,44]. The technique of anesthetizing with diluted medicine with an opioid is effective, and most women are satisfied with this form of analgesia [45]. It occurs that low doses of the administered drugs are equally efficacious for pain relief, evaluated on VAS, as earlier [46] and do not significantly affect the frequency of the described postpartum complications. Some of the recommendations suggested the administration of an appropriate dose of colloid or crystalloid solutions in order to lower the risk of hypotonia after EA. At present, however, this management is redundant due to the use of low doses, and is not routinely recommended by American and European societies [41,44,47].

In the Polish literature, numerous authors have not noted any influence of EA on the rate of cesarean sections and procedural deliveries [36]. Other publications suggest, however, that it is an independent factor of procedural conclusion of labor in multiparous women, but

does not affect a cesarean section rate irrespective of parity. It may increase the risk of deceleration of changeable and late low Apgar scores at 1 minute after birth and lower umbilical blood pH values, but has no effect on neonatal condition at 5 minutes after birth [48].

The impact of anesthesia on the duration of labor seems equally controversial. This EA-induced prolongation failed to be confirmed not only in the 2013 meta-analysis [43]. Rzepka and Żukowski also report that the use of patient-controlled EA has no effect on the duration of the first and second phases of labor, which may be associated with more frequent use of oxytocin in this group of patients [36]. Another publication, in turn, showed no statistically significant differences in the rate of procedural deliveries between the oxytocin-stimulated group administered EA and patients receiving placebo [49].

The duration of labor can be influenced not only by low drug doses and contraction-inducing drugs, but also by active participation in labor. In the Cochrane review from 2017, conducted by Kibuk and Thornton, a statistical analysis of 857 labors showed that vertical positions may counteract labor prolongation and lower the rate of procedural deliveries in the context of EA [50]. The number of the above-described complications does not depend on whether EA is administered at an early stage or later after the use other, mainly non-pharmacological methods of pain relief (so-called delayed EA) [8]. The Polish recommendations from 2000 state that analgesia should be administered in the active phase of labor, optimally at cervical dilatation of 4 cm. British and American societies, in turn, allow its use at an early phase of labor at patient's request [21,41,44,47]. Obese patients in particular should be offered analgesia at an early phase of labor, as recommended by international guidelines, due to higher risk of obstetric complications and the possibility of using conduction anesthesia instead of general anesthesia in the case of the need for surgical intervention [51].

Support of a close person and midwife's care from the early phase of labor do not have a clear impact of the frequency of cesarean sections and procedural deliveries. It is suspected that these actions may affect a reduction in the use of EA and labor stimulation, and result in greater satisfaction of the mother from the birth of her child. Further studies in this area are required [52].

Moreover, there are no sufficient data to support a hypothesis about a reduction of procedural deliveries by stopping analgesia in the second phase of birth. This practice is widespread, and a reduction of procedural deliveries may be clinically significant. That is why further investigation is needed to find out whether this effect is real or was observed only accidentally. Stronger evidence for the safety of this practice is also needed. It is known that it is undoubtedly associated with insufficient pain control in the second phase of labor and with perineal pain, which may lower the evaluation of labor pain relief [52]. Furthermore, the results of studies on the influence of EA on problems with lactation, urinary retention, spinal pain, post-puncture headache, nausea and other symptoms in the puerperium are conflicting [16,18,31]. The British recommendations emphasize mainly the lack of influence of EA on long-term headache [47]. When analyzing the responses of the surveyed women, it was found that EA may result in urinary retention, nausea and sacralgia. The number of EA-related headache cases was not significantly increased. It is worth mentioning that modern techniques minimize the risk of this complication. Substantial protective relevance is attributed to the use of atraumatic needles and inserting a catheter in the lateral position with the legs drawn to the chest [44,47,53–55]. The need for multiple punctures and patient's movements frequently lead to accidental dural punctures and post-puncture headaches [56]. As in our study, another investigation involving a group of primiparous women after natural delivery revealed no relationship of EA with headache and lumbosacral pain [57].

There are few publications on the effects on anesthesia on breast-feeding. The Cochrane review from 2016 included 12 studies that showed a negative influence of EA on breast-feeding, 10 studies with no such influence proven and one study underlining positive effects of anesthesia on lactation [58]. Attention should be paid to the study of Henderson and Dickson based on 992 primiparous women, 690 of whom received EA during labor. It has been shown that anesthesia, type of labor (CC or natural), age, education and smoking during pregnancy had a significant effect on breast-feeding. Breast-feeding was shorter in patients who were administered epidural anesthesia [59].

Patients do appreciate effective pain relief provided by EA during labor. However, a number of women still complain about having to

wait for anesthesia in pain (too late administration) and about its adverse effects. These factors affect labor satisfaction [60]. It is important to instruct patients thoroughly about EA in the course of prenatal education so as to make their expectation about labor analgesia real. Also, the need to improve communication between midwives, obstetricians and anesthesiologists seems important in order to rapidly provide the patient with the access to analgesia on request. The cooperation and involvement of an anesthesiologist seem a significant condition for such improved communication. It then occurs that low-dose anesthesia enables safe and effective labor pain management, and such are the latest trends in anesthesiology.

Meeting the patient's expectations is very important for labor satisfaction. Patients with a planned labor with epidural anesthesia who actually have it administered are at lower risk of postpartum depression [61]. A Spanish work from 2017 on the level of anxiety during natural labor shows that it declines significantly after the administration of EA and stays at a low level for 24 hours after childbirth. Women for whom labor is concluded with a cesarean section show a higher level of anxiety after childbirth [62].

In order to obtain labor satisfaction, it is important to choose a pain control option that best suits the patient's expectations [3,21,63]. The literature contains numerous reports supporting the fact that, unless there are complications, EA is the gold standard in obstetrics. Most studies underline greater labor satisfaction among patients who had EA administered compared with patients who used other pain relief methods. It must not be forgotten, however, that patient satisfaction is affected by a range of other aspects associated with childbirth. That is why, apart from relieving pain, a holistic approach to the patient and respecting her right to dignity in the peripartum period are extremely important [31,33,34,64–69].

CONCLUSIONS

1. EA is an effective and safe form of labor pain relief. It does not substantially affect the frequency of obstetric complications.
2. The place of residence, type of work, manner of obtaining information about epidural anesthesia and, in multiparous women, the presence of their partner during the previous childbirth as well as experience with various methods of labor pain relief were factors that influenced the choice of EA during labor.

1. **Vincent RD Jr, Chestnut DH.** Epidural analgesia during labor. *Am Fam Physician.* 1998 Nov 15;58(8):1785-92.
2. Rozporządzenie Ministra Zdrowia z dnia 9 listopada 2015 r. w sprawie standardów postępowania medycznego w łagodzeniu bólu porodowego. Dostęp on-line w dniu 31.03.2018. <http://dziennikustaw.gov.pl/du/2015/1997>.
3. **Jones L, Otmhman M, Dowswell, Alfirevic Z et al.** Pain management for women in labour: an overview of systematic reviews. *Cochrane Database Syst Rev.* 2012 Mar 14;(3) CD 009234.
4. **Madden K, Middleton P, Cyna AM et al.** Hypnosis for pain management during labour and childbirth. *Cochrane Database Syst Rev.* 2016 May 19;(5):CD009356.
5. **Jochberger S, Ortner C, Klein KU.** Pain therapy during labour. *Wien Med Wochenschr.* 2017 Jun 2. doi: 10.1007/s10354-017-0571-5.
6. Practice Bulletin No. 177: Obstetric Analgesia and Anesthesia. Committee on Practice Bulletins-Obstetrics. *Obstet Gynecol.* 2017 Apr;129(4):e73-e89.
7. **Simmons SW, Taghizadeh N, Dennis AT et al.** Combined spinal-epidural versus epidural analgesia in labour. *Cochrane Database Syst Rev.* 2012 Oct 17;10:CD003401.
8. **Sng BL, Leong WL, Zeng Y et al.** Early versus late initiation of epidural analgesia for labour. *Cochrane Database Syst Rev.* 2014 Oct 9;(10):CD007238
9. Study Group UK. Comparative Obstetric Mobile Epidural Trial (COMET). *Lancet.* 2001 Jul 7;358(9275):19-23.
10. **Lee BB, Chen PP, Ngan Kee WD.** Status of obstetric epidural analgesia services in Hong Kong public hospitals: postal questionnaire survey. *Hong Kong Med J.* 2003 Dec; 9(6):407-14.
11. **Lewis M.** The long-term effects of epidural analgesia preclude its use in uncomplicated labour. Proposer. *Int J Obstet Anesth.* 1995 Jan;4(1):44-6.
12. **Hoyte L, Wayman A, Hahn L.** Poród przez pochwę a dno miednicy: następstwa uszkodzenia mięśnia dźwigacza odbytu. *Ginekol po dyplomie* 2016 Mar;18(2):15-23.
13. **Heesen M, Veesser M.** Analgesia in Obstetrics. *Geburtshilfe Frauenheilkd.* 2012 Jul;72(7):596-601.
14. **Sioma-Markowska U, Żur A, Skrzypulec-Plinta V et al.** Causes and frequency of tocophobia - own experiences. *Ginekol Pol.* 2017;88(5):239-243.
15. **Bilić N, Djaković I, Klišan-Jaić K et al.** Epidural analgesia in labor - controversies. *Acta Clin Croat.* 2015 Sep; 54(3):330-6.
16. **Beilin Y.** Advanced In Labour Analgesia. *Mt Sinai Jmed.* 2002 Jan-Mar; 69 (1-2).
17. **Leeman L, Fontaine P, King V et al.** The nature and management of labor pain: part II. Pharmacologic pain relief. *Am Fam Physician.* 2003 Sep 15;68(6):1115-20.
18. **Weigl W, Szymusik I, Borowska-Solonynko A et al.** The influence of epidural analgesia on the course of labor *Ginekol Pol.* 2010 Jan;81(1):41-5.
19. **Wang TT, Sun S, Huang SQ.** Effects of Epidural Labor Analgesia With Low Concentrations of Local Anesthetics on Obstetric Outcomes: A Systematic Review and Meta-analysis of Randomised Controlled Trials. *Anesth Analg.* 2017 May;124(5):1571-1580.
20. **Sienko J, Czajkowski K, Swiatek-Zdzienicka M, Krawczyńska-Wichrzycka R.** Epidural analgesia and the course of delivery in term primiparas *Ginekol Pol.* 2005 Oct; 76(10):806-11.
21. **Świątek-Zdzienicka M, Krawczyńska-Wichrzycka R.** Epidural analgesia and the course of delivery in term primiparas *Ginekol Pol.* 2005 Oct;76(10):806-11.
22. **Gizzo S, Noventa M et al.** Update on best available options in obstetrics anaesthesia: perinatal outcomes, side effects and maternal satisfaction. Fifteen years systematic literature review. *Arch Gynecol Obstet.* 2014 Jul; 290(1):21-34.
23. **Cooper GM, MacArthur C, Wilson MJ et al.** COMET Study Group UK. Satisfaction, control and pain relief: short- and long-term assessments in a randomised controlled trial of low-dose and traditional epidurals and a non-epidural comparison group. *Int J Obstet Anesth.* 2010 Jan;19(1):31-7.
24. **Rimaitis K et al.** Labor epidural analgesia and the incidence of instrumental assisted delivery. *Medicina Volume 51, Issue 2, 2015:76-80.*
25. **Capogna G, Camorcía M.** Epidural analgesia for childbirth: effects of newer techniques on neonatal outcome. *Paediatr Drugs.* 2004;6(6):375-86.
26. **Herrera-Gómez A, De Luna-Bertos E, Ramos-Torrecillas J et al.** The Effect of Epidural Analgesia Alone and in Association With Other Variables on the Risk of Cesarean Section. *Biol Res Nurs.* 2017 Jul;19(4):393-398.
27. **Mousa WF, Al-Metwalli R, Mostafa M.** Epidural analgesia during labor vs no analgesia: A comparative study Saudi J Anaesth. 2012 Jan-Mar, 6 (1): 36-40.
28. **French CA, Cong X, Chung KS.** Labor Epidural Analgesia and Breastfeeding: A Systematic Review. *J Hum Lact.* 2016 Aug;32(3):507-20.
29. **Sohaib M, Ismail S.** Does labour epidural slow the progress of labour and lead to complications? Obstetricians' perception working in private and public sector teaching hospitals in a developing country. *Indian J Anaesth.* 2015 Dec;59(12):779-84.
30. **Fraser WD.** Multicenter Randomised Controlled Trial of Delayed Pushing for nulliparous women in the second stage of labor with continuous epidural analgesia. The PEOPLE (Pushing Early or Pushing Late with Epidural) Study Group. *Am J Obstet Gynecol.* 2000 May; 182(5): 1165-72.
31. **Anim-Somuah M, Smyth RM, Jones L.** Epidural versus non-epidural or no analgesia in labour. *Cochrane Database Syst Rev.* 2011 Dec 7;(12):CD000331.
32. **Sng BL, Sia ATH.** Maintenance of epidural labour analgesia: The old, the new and the future. *Best Pract Res Clin Anaesthesiol.* 2017 Mar;31(1):15-22.
33. **Furmanik J.** Labour epidural analgesia in Poland in 2009 - a survey. *Anaesthesiol Intensive Ther.* 2013 Jul-Sep; 45(3):149-52.
34. **Doroszewska A.** Raport z monitoringu oddziałów położniczych Fundacji Rodzić po Ludzku. Fundacja Rodzić po Ludzku. Warszawa 2017.
35. **Billert H, Gaca M, Miluska J, Bręborowicz G.** Ocena lęku u rodzących zdecydowanych na analgezję zewnątrzpoponową. *Ginekol Pol.* 2007;78,532-538.
36. **Rzepka R, Żukowski M, Michalczyk M et al.** Wpływ analgezji zewnątrzpoponowej sterowanej przez pacjentkę na przebieg porodu oraz stan urodzeniowy noworodków. *Ginekol Pol.* 2012;83,92-98.
37. **Borowska A, Szymusik I, Wielgoś M, Krzemień-Wilczyńska S.** Retrospective assessment of epidural analgesia during labor according to parturients. *Ginekol Pol.* 2005 Apr;76(4):277-83.
38. **Maciejewski D, Mazij M.** Postępy anestezji regionalnej w położnictwie-polskie doświadczenia. *Ból* 2003;4;35-39.
39. **Liu N, Wen SW, Munual DG et al.** Social disparity and the use of intrapartum epidural analgesia in a publicly funded health care system. *Am J Obstet Gynecol.* 2010; 202(3):273.e1-8.
40. **Kpea L, Bonnet MP, Le Ray C et al.** Initial preference for labor without neuraxial analgesia and actual use: results from a national survey in France. *Anesth Analg.* 2015 Sep; 121(3):759-66.
41. **Furmanik J.** Labour epidural analgesia in Poland in 2009 - a survey. *Anaesthesiol Intensive Ther.* 2013 Jul-Sep; 45(3): 149-52.
42. **Powers JR, Loxton DJ, O'Mara AT et al.** Regardless of where they give birth, women living in non-metropolitan areas are less likely to have an epidural than their metropolitan counterparts. *Women Birth.* 2013 Jun;26(2):e77-81.
43. **Sultan P, Murphy C, Halpern S, Carvalho B.** The effect of low concentrations versus high concentrations of local anesthetics for labour analgesia on obstetric and anesthetic outcomes: a meta-analysis. *Can J Anaesth.* 2013 Sep;60(9):840-54.

44. Task Force on Obstetric Anesthesia: Practice Guidelines for Obstetric Anesthesia An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology. *Anesthesiology* 2016;124:12-13.
45. Clivatti J, Siddiqui N, Gael A et al. Quality of labour neuraxial analgesia and maternal satisfaction at a tertiary care teaching hospital: a prospective observational study. *Can J Anaesth*. 2013 Aug; 60 (8): 787-95.
46. Sikdar I, Singh S, Setlur R et al. A prospective review of the labour analgesia programme in a teaching hospital. *Med J Armed Forces India*. 2013 Oct;69(4):361-5.
47. NICE guidelines: Intrapartum care. Care of healthy women and their babies during childbirth. Dostęp on-line w dniu 31.03.2018 <https://www.nice.org.uk/guidance/cg190>.
48. Hincz P, Podciechowski L, Grzesiak M et al. Wpływ znieczulenia zewnątrzoponowego na przebieg i rodzaj porodu oraz stan urodzeniowy noworodków- badanie retrospektywne. *Ginekol Pol*. 2014, 85,923-928.
49. Costley PL, East CE. Oxytocin augmentation of labour in women with epidural analgesia for reducing operative deliveries. *Cochrane database Syst Rev*. 2013 Jul 11;(7): CD009241.
50. Kibuka M, Thornton JG. Position in the second stage of labour for women with epidural anaesthesia. *Cochrane Database Syst Rev*. 2017 Feb 24;2: CD008070.
51. Eley VA, van Zundert AA, Lipman J, Callaway LK. Anesthetic management of obese parturients: what is the evidence supporting practice guidelines? *Anaesth Intensive Care*. 2016 Sep;44(5):552-9.
52. Kobayashi S, Hanada N, Matsuzaki M et al. Assessment and support during early labour for improving birth outcomes. *Cochrane Database Syst Rev*. 2017 Apr 20;4: CD011516.
53. Torvaldsen S, Roberts CL, Bell JC, Raynes-Greenow CH. Discontinuation of epidural analgesia late in labour for reducing the adverse delivery outcomes associated with epidural analgesia. *Cochrane Database Syst Rev*. 2004 Oct 18;(4):CD004457.
54. Arevalo-Rodriguez I, Munoz L, Godoy-Casasbuenas N et al. Needle gauge and tip designs for preventing post-dural puncture headache (PDPH). *Cochrane Database Syst Rev*. 2017 Apr 7;4:CD010807.
55. Zorrilla-Vaca A, Makkar JK. Effectiveness of Lateral Decubitus Position for Preventing Post-Dural Puncture Headache: A Meta-Analysis. *Pain Physician*. 2017 May; 20(4): E521-E529.
56. Michaan N, Lotan M, Galiner M et al. Risk factors for accidental dural puncture during epidural anesthesia for laboring women. *J Matern Fetal Neonatal Med*. 2016 Sep; 29(17):2845-7.
57. Orlikowski CE, Dickson JE, Paech MJ et al. Intrapartum analgesia and its association with post-partum back pain and headache in nulliparous women. *Aust N Z J Obstet Gynaecol*. 2006; 46 (5): 395-401.
58. French CA, Cong X, Chung KS. Labour epidural analgesia and breastfeeding. A systematic review. *J Hum Lact*. 2016 Aug;32(3):507-20.
59. Henderson JJ, Dickson JE, Evans SF et al. Impact of intrapartum epidural analgesia on breast-feeding duration. *Aust N J obstet Gynaecol*. 2003 Oct; 43(5):372-7.
60. Attanasio L, Kozhimannil KB, Jou J et al. Women's experiences with neuraxial labor analgesia in the listening to mothers II survey: a content analysis of open-ended responses. *Anest Analg*. 2015 Oct; 121 (4):974-980.
61. Orbach-Zinger S, Landau R, Harousch AB et al. The relationship between women's intention to request a labour epidural analgesia, actually delivering with labour epidural analgesia and postpartum depression at 6 weeks. A prospective observational study. *Anest Analg*. 2017 Sep 19. doi:10/1213/ANE.
62. Fernandez-Campos FJ, Escriva D, Palanca JM et al. Women's acute anxiety variations before and after epidural anesthesia for childbirth. *J Psychosom Obstet Gynaecol*. 2017 Jun; 38(2): 152-158.
63. Jochberger S, Ortner C, Klein KU. Pain therapy during labour. *Wien Med Wochenschr*. 2017 Nov;167(15-16):368-373.
64. Dickson JE, Paech MJ, McDonald SJ, Evans SF. Maternal satisfaction with childbirth and intrapartum analgesia in nulliparous labour. *Aust N Z J Obstet Gynaecol*. 2003 Dec; 43(6): 463-8.
65. Richardson MG, Lopez BM, Baysinger CL et al. Nitrous oxide during labour: maternal satisfaction does not depend exclusively on analgesic effectiveness. *Anest Analg*. 2017 Feb; 124(2):548-553.
66. Hildingsson I. Women's birth expectations, are they fulfilled? Findings from a longitudinal Swedish cohort study. *Women Birth*. 2015 Jun;28(2):e7-13.
67. Ishibashi C, Horiguchi I, Sumikura et al. Satisfaction with delivery and maternal identity with epidural labour analgesia among Japanese women with children younger than 3 years of age: a web-based survey. *Masui*. 2014 Dec; 63(12):1306-13.
68. Bhatt H, Pandya S, Kolar G, Nirmalan PK. The impact of labour epidural analgesia on the childbirth expectation and experience and a tertiary care center in southern India. *J Clin Diagn Res*. 2014 Mar;8(3):73-6.
69. Marengo-Arellano V, Ferreira L, Ramalle-Gómara E et al. Assessment of maternal satisfaction with epidural analgesia for pain control during labour. *Rev Calid Asist*. 2017 May - Jun;32(3):166-171.