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# How can epidural anesthesia affect the delivery stages and a newborn infant? The prospective analysis of 90 cases

# Epidural anestezinin doğumun evrelerini ve yenidoğan bebeği nasıl etkiler? 90 vakanın prospektif analizi.

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## ÖZ

**Amaç:** Epidural anestezi (EA), ağrının azaltılmasında ve doğum sırasında tamamen ortadan kaldırılmasında en etkili yöntemdir. Bu çalışmanın amacı, EA'nın doğum sürecinin birinci ve ikinci kısmı üzerindeki etkisini ve EA'nın yenidoğan ve anne üzerindeki etkisini belirlemektir.

**Gereç ve Yöntemler:** Hastanemizde toplam 153 primipar gebe seçildi. Epidural doğum aneljesini kabul edip etmemesine göre çalışma grubu 90 primipar gebe, kontrol grubu 61 primipar gebe olmak üzere iki ayrı gruptan oluşturuldu. Her iki grup da vajinal doğum yaptı. Anestezik olarak 18 G kateterlerle Bupivakain (%0,25 veya %0,125) +2µg/ml fentanil kullanıldı. Uygulama seviyesi omurganın L2-L3 seviyesi idi. Dilatasyon ve efesman düzeyi, doğumun birinci, ikinci ve üçüncü evrelerinin süresi, primiparların anormal durumu ve komplikasyonları değerlendirildi.

**Bulgular:** Analiz sonucunda çalışma grubundaki gebelerin bebeklerinin doğum ağırlıkları kontrol grubuna göre anlamlı olarak yüksek bulundu (p<0.05). Analjezi-den 30 dakika sonra çalışma grubunun NRS skoru kontrol grubundan daha düşüktü (P<0.001). Çalışma grubundaki bebek Apgar skorları kontrol grubuna göre anlamlı derecede yüksekti (p<0,001). Çalışma grubunda evre I için ortalama süre 2.27 ± 1.26 saatti ve kontrol grubuna göre anlamlı derecede düşüktü (p <0.001). Tam dilatasyondan doğuma kadar geçen süre (evre II) çalışma grubunda kontrol grubuna göre anlamlı olarak daha uzun bulundu (p<0,001).
Doğum sonu kanama, baş dönmesi ve kusma gibi komplikasyonlar açısından, çalışma grubu ve kontrol grubu arasında anlamlı fark yoktu.

**Sonuç:** Bu çalışmada epidural anestezi uygulamasının doğum süresini kısalttığı, güvenli olduğu, hastayı rahat ettirdiği ve yenidoğan üzerinde herhangi bir olumsuz etkisi olmadığı görülmektedir.

**Anahtar kelimeler:** Epidural anestezi, vajinal doğum, neonatal sonuçlar

## ABSTRACT

**Aim:** Epidural anaesthesia (EA) is the most efficient method of pain reduction and its total elimination during delivery. The aim of this study was to establish an influence of EA on the first and the second part of delivery process and the effect of EA on the newborn and mother.

**Materials and Methods:** A total of 153 primiparas in our hospital were selected and divided into two groups according to whether they accepted epidural labor analgesia, including 90 cases in the study group and 63 cases in the control group. Both groups had vaginal delivery. As anaesthetic, Bupivacain (0,25% or 0, 125%) +2µg/ml fentanyl was used by the 18 G catheters. Level of application was L2-L3 part of spine. Dilatation and efesman level, duration of the first, second and third stages of labor, the abnormal situation and complications of primiparas were evaluated.

**Results:** As a result of the analysis the birth weight of the babies of the pregnant women in the the study group was significantly higher than the control group (p <0.05). The study group's NRS score was lower than that of the control group at 30 min after analgesia (P<0.001). The Apgar scores of the babies in the study group was significantly higher than the control group (p <0.001). The mean time for stage I in the study group was 2.27 ± 1.26 hours and was significantly lower than the control group (p <0.001). The time from full dilatation to delivery (stage II) was found to be significantly longer in the study group than in the control group (p<0.001). In terms of complications, there was no significant difference in the amount of postpartum haemorrhage, dizziness and vomiting in the study group and control group. The incidence of urinary retention in the study group is higher than that in the control group (p <0,05).

**Conclusion:** In this study, the application of epidural anaesthesia seems to shorten the duration of delivery, be safe, make the patient comfortable, and has no any adverse effects on newborns.

**Keywords:** Epidural anestesia, vaginal delivery, neonatal outcomes

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## INTRODUCTION

Birth pain is a versatile pain with its own characteristics, the most severe and difficult to control. Uterine contraction pain and childbirth, especially in primiparous, are the most severe pain experience encountered and it is difficult to tolerate (1, 2). The desire to give the mother a comfortable and painless delivery should never compromise the safety of the baby and mother (3). The ideal approach to relieve birth pain is to be able to choose a reliable method that will ensure that the patient is conscious and will not cause side effects and toxicity in the mother and fetus (4). No anaesthetic agent is ideal for all pregnant women. The choice of analgesia depends on the wish of the pregnant woman, the obstetric necessity and the choice of the anaesthetist. Today, informing mothers about the tram and wanting to contact their babies as soon as they are born increases the painless delivery practices (5). The most effective way to relieve birth pain is in central regional blocks. The most popular technique used in birth analgesia today is epidural analgesia (4). Epidural analgesia is suitable for most women who give birth, and allows her baby to enjoy this moment fully and without pain during the birth. However, there are side effects such as birth delay and motor blockage. Epidural analgesia minimizes physiological responses during labour and provides the most favourable conditions for pregnant women. The aim of birth analgesia is to control the pain that will be reflected on the lower thoracic and sacral segments throughout the entire tram. For this purpose, a catheter is placed in the epidural space through the L3-L4 or L4-L5 range. Epidural anatomy and physiology should be known well in central block application (6,7).

In the first stage of delivery, adequate epidural analgesia is provided with lumbar epidural analgesia, while the extension of the epidural analgesia to include the pudental nerve may prevent pain in the vagina and perineum in the second stage of birth (8,9). The hypoventilation cycle between hyperventilation and contractions is broken by epidural analgesia method. The aim of epidural analgesia is to try to eliminate pain in the period from early period of trauma to delivery. Epidural analgesia does not prolong or interrupt the normal course of delivery. In fact, with the effective analgesia, the 1st stage of the trauma may be shortened due to the improvement of the frequency and severity of uterine contractions. Plasma catecholamine concentration decreases in mother. As a result of reduced alpha and beta adrenergic receptor stimulation, uteroplacental perfusion and uterine activity are further improved. The risk of aspiration is eliminated because the mother is conscious and maintains airway reflexes. Since the mother is cooperative, she is effective in the advancement of the fetus in the birth canal by using intercostal, diaphragmatic and abdominal motor functions in the second phase of the trauma. When the labor takes place, the mother is awake and can immediately relate to the newborn (8,9). These procedures can be easily performed if the pregnant woman is asked to strain or if a baby is given birth at the exit of the fetus with vacuum forceps. Postpartum examination and episiotomy repair is also easy and painless. If caesarean indication develops in a patient with epidural analgesia, the level of analgesia can be rapidly brought to the desired anaesthesia level. Tubal ligation after delivery helps the same procedure if necessary (8,9).

Epidural anaesthesia has absolute and relative contraindications. Absolute contraindications include cases where the pregnant does not adopt the method, infection in the systemic or intervention site, coagulation disorder, sepsis, increased intracranial pressure, and relative contraindications such as vertebral colon anatomical disorder, demyelization diseases, heart diseases, peripheral neuropathy, absence of pregnant women (10).

In studies examining the effects of epidural anaesthesia on mother and fetus at birth; it has been reported that it prevents various maternal metabolic changes such as hyperventilation, hypocapnia, metabolic acidosis and lactic acid accumulation, and does not increase stress hormones such as cortisol in the mother and baby. The use of epidural anaesthesia and narcotic agents has been shown to prolong the time of delivery, increase the need for oxygen and oxytocin, but no clinical significance of this prolongation has been established. Epidural anaesthesia does not increase the rate of caesarean section (11,12-13). Whether epidural labor analgesia has adverse effects on the delivery process and outcomes has been controversial. At present, there is no precise data about the impact of epidural analgesia on primipara delivery in Turkey. In this study, it was aimed to observe the impact of epidural anesthesia on maternal labor analgesia, abnormal situations and delivery outcomes in primiparas.

## MATERIALS AND METHODS

We examined all patients who underwent vaginal delivery with epidural from July 2021 to December 2021 at Dicle Memorial Hospital, Tatvan Can Hospital and Healt Science University İzmir Tepecik Training and Research Hospital. The patients were divided into 2 groups as the study group (n:90) and the cont-

rol group (n:63). Epidural anesthesia was applied to the study group. Patients in the study and control groups were compared in terms of age, height, weight, gestational week, birth Weight (gram), dilatation (cm), efasman (%), amount of bleeding, APGAR scores of the newborn infant, NRS (Numeric Rating Scale) pain scale and birth stages.

Epidural anesthesia was applied in the study group when the cervical opening was more than 3 cm. Noninvasive arterial pressures, heart peaks, oxygen saturations were monitored before the epidural catheter was inserted. Before applying epidural analgesia, a 20 G iv cannula was opened from the back of the hand and a 7 ml/kg lactated ringer solution was given within 30 minutes. After cleaning with an antiseptic solution suitable for epidural intervention, infiltration anaesthesia was applied to the skin at the level of L2-L3 / L3-L4 intervals, by giving 2% lidocaine under the skin. Peridural distance was reached with 18 G toughy needle using median approach and loss of resistance method. It was detected that there was no blood or CSF from the catheter by aspiration, so that the epidural distance was 3-4 cm. Patient controlled analgesia device was connected to the epidural catheter. Pregnant women were hospitalized at 30 degrees upside and left lateral position.

0.125% bupivacaine +2µg/ml fentanyl: Bolus dose adjusted according to the patient's height was given from the solution prepared in 100 cc SF. Patients whose effective birth pains increased and cervical dilatation progressed (4-5 cm) were administered to the patients with 1.5 ml of local anaesthetic (lidocaine) SF to 3 ml as a test dose and administered through the catheter to rule out subarachnoid placement. After the intrathecal placement was excluded, the loading dose from the catheter was given from the patient-controlled analgesia device.

The loading dose was adjusted according to the height of the patient as follows:

10 ml if patient's height <160 cm

If the patient's height is between 160-170 cm, 15 ml

20 ml if patient's height is> 170 cm

The device was set to 6 ml bolus, 15 min lock time, one hour limit 24 ml. After epidural analgesia started, maternal heart peak (KTA), systolic artery pressure (SAB), diastolic artery pressure (DAB), respiratory rate, fetal heart peak, NRS (Numeric Rating Scale) were recorded. A 20% drop in blood pressure or systolic arterial pressure of 90 mm/Hg was considered as hypotension. When deemed necessary, it was decided to make ephedrine 5 mg/ml IV.

NRS score before and after the analgesia: Labor pain was evaluated by the NRS score. Time: before analgesia and 30 min after analgesia. The scale adopted 10 points. 0 points was painless; 1-3 points were mild pain ,4-6 points were moderate pain, 7-10 points were severe pain. The higher the NRS score is, the more severe the pain is (14).

Before starting the study, approval was obtained from the S. B.Ü Tepecik Training and Research Hospital Ethics Committee where the study was conducted (2021/7-17).

Statistical Analyses: Univariate analysis was performed using the chi-squared test, and the ManneWhitney U test and paired t-test were used for the statistical analysis. P-values <0.05 were considered significant.

## RESULTS

The comparison of various clinical and demographic characteristics of the pregnant women included in the study by groups is presented in Table 1.

**Table 1.** Clinical characteristics of the study and control groups.

| | Study Group n:90 | Control Group n:63 | P |
|---|---|---|---|
| Age (year) | 28,51 ± 3,86 | 27,65 ± 2,94 | 0,128 |
| Height (cm) | 164,81 ± 5,08 | 165,96 ± 4,61 | 0,152 |
| Weight (kg) | 71,15 ± 10.13 | 72,31 ± 7,04 | 0,433 |
| Gestational Week | 39,25 ±0,97 | 39,39 ± 0.75 | 0,337 |
| Birth weight of newborn infant (gr) | 3356,55 ± 309,61 | 3203,17 ± 348,58 | 0,005 |
| Dilatation (cm) | 4,12 ± 1,06 | 4,24 ± 1,19 | 0,876 |
| Efesman (%) | 63,11 ± 8,56 | 59,68 ± 6,46 | 0,08 |
| NRS (Before EA) | 9,15±0,44 | 9,10±0,47 | 0,275 |
| NRS (After EA 30 min) | 3,57±1,52 | 9,45±0,341 | 0,001 |
| Amount of Bleeding (ml) | 247,00 ± 57,16 | 224,60 ± 41,02 | 0,441 |
| Dizziness ( yes/no) | 10 | 6 | 0,744 |
| Uriner retention during delivery (yes/no) | 42 | 17 | 0,019 |
| Vomiting (yes /no) | 12 | 6 | 0,745 |
| APGAR ( 5 min) | 9,58 ± 0,53 | 8,60 ± 0,49 | 0,001 |

The birth weight of the babies of the pregnant women in the study group was significantly higher than the control group (p <0.05). There was no significant difference in the NRS score between the study group and the control group before analgesia (P>0.05). The study group's NRS score was lower than that of the control group at 30 min after analgesia (all P<0.001).

When the APGAR scores were examined, it was seen that the Apgar score of the pregnant women in the study group was significantly higher than the control group (p <0.001). In terms of complications, there was no significant difference in the amount of postpartum haemorrhage, dizziness and vomiting in the study group and control group. This study shows that the incidence of urinary retention in the study group is higher than that in the control group (p <0,05).

As a result of the study, after epidural anesthesia, the mean duration of stage I in the study group was 2.27 ± 1.26 hours, and it was found to be significantly lower than the control group (p<0.001). The time from Stage II was found to be significantly longer in the study group than in the control group. (p<0.001) (Table 2).

**Table 2.** Comparison of birth stages in vaginal delivery

| | Study Group n:90 | Control Group n:63 | P |
|---|---|---|---|
| Stage I (hour) | 2,27 ± 1,26 | 3,21 ± 1,30 | 0,001 |
| Stage II (minutes) | 61,55 ± 17,90 | 42,53 ± 9,99 | 0,001 |
| Stage III (minutes) | 15,50 ± 8,35 | 14,36 ± 5,51 | 0,433 |

## DISCUSSION

The natural delivery process takes a long time. During the delivery of the fetus from the uterus through the birth canal, the parturient will feel severe pain, accompanied by a certain degree of anxiety, panic and other negative emotions, which further stimulate the sympathetic nerve, reduce prolactin secretion, and can have a negative impact on the parturient and the newborn (15). Labor analgesia is to use a variety of methods to reduce or even eliminate the pain during delivery. Epidural labor analgesia is a commonly used method for maternal labor analgesia. Generally, experimental drugs are injected when the uterine orifice is opened to 3 cm-4 cm. Continuous analgesia or patient-controlled analgesia are mostly used to improve maternal labor pain (16). In our study, epidural anesthesia was applied when the dilatation level was after 3 cm in study group. The aim of taking analgesia during labor is to acquire adequate analgesia in association with the least maternal and fetal complications (17). Epidural analgesia has turned out to be a popular and widely accepted analgesia technique considering its several advantages, including demanded analgesia during primary stages of the labor (18). Although the use of epidural analgesia is well-established in clinical practice and its benefits are well described, similar to any other inter-vention, it can lead to some complications after the intervention (19). Severe complications, such as hematoma and infections, are infrequent, but they result in permanent disability in most of the cases (19). No complications were observed in our study. Thus, after the intervention, patients should be observed meticulously to evaluate potential sources of the complications (20). Besides, any alteration during neurologic examinations should be taken into consideration promptly to determine the underlying reasons for the deficits.

The NRS score is a digital, intuitive expression of the VAS score. Compared with the VAS score, the NRS score can more directly express the body's pain intensity, and it is easier for pregnant women to understand and express. The NRS score adopts a 10-point system. The higher the score, the more severe the pain. This article confirmed that the study group's epidural analgesia could significantly reduce the NRS score, suggesting that epidural block could improve labor pain. Adequate labor analgesia can alleviate the pain of the pregnant woman and also has little effect on the motor nerves. In particular, good labor analgesia should have no inhibitory effect on the contractility of the uterine muscle, abdominal muscle, and levator anal muscle. International literature has confirmed that epidural block has little effect on motor and sensory nerves. Liang et al. stated that epidural anesthesia can regulate uterine contraction receptor, upregulate oxytocin level, stimulate PGE2 and PGE2a release, induce regular and coordinated uterine contraction, and accelerate fetal delivery (21). This article shows that the duration of uterine contraction 30 minutes after analgesia was lower in the study group than in the control group, that epidural analgesia can block the sympathetic nervous system and have a modulating effect on uterine contraction. The mechanism is that epidural anesthesia blocks the sympathetic nervous system and can voluntarily release norepinephrine to control and regulate uterine activity (22) .

First experiences did not clearly indicate a beneficial effect of EA on shortening the duration of labor (23) . This can be explained by the insufficient experience of the team of obstetricians and anesthesiologists and giving excessive doses of anesthetics that led to the blockade of not only sensitive but also motor fibers, which significantly affected the intensity of uterine contractions. Intensively guided labor in EA by obstetricians and anesthesiologists involves good

communication with the mother, so that the prescribed dose neutralizes the pain, but retains a mild feeling of contractions. This degree of analgesia is not easy to achieve, especially if the team of doctors is not experienced enough. In this study, it was aimed to compare epidural analgesia method and birth analgesia with 0.125% bupivacaine + 2µg / ml fentanyl for maternal and infant hemodynamics and birth physiology. As a result of the study the mean time for entire openness in the study group was significantly lower than the control group (p<0.001). Birth time (stage II) was found to be significantly higher in the study group compared to the control group (p<0.001). This increase at the end of labor can be partly explained by lower voltages due to the negative effect of EA on stress, and partly due to the unpreparedness of the mother for the second phase of labor. A weakening of straining during delivery due to epidural anesthesia and an increase in mechanical delivery has been reported. The present study showed the same findings, but this is a no significant problem because these do not cause any increase in cardiovascular events or blood loss during delivery, nor do they affect the neonatal outcome (24). In addition the entire openness time in study group was significantly lower compared with the control. On the other hand birth duration in study group was significantly higher than the control group. In terms of complications, there was no significant difference in the amount of postpartum haemorrhage, dizziness and vomiting in the study group and control group. This study shows that the incidence of urinary retention in the study group is higher than that in the control group (p =0,019). The reason may be that epidural block accelerated the rate of bladder relaxation. The tension of the urethral sphincter is increased when the sympathetic nerve is blocked by epidural analgesia. Besides, the incidence of urinary retention is increased when primiparas keep the supine position. This is similar to the results of Ojo et al (25). When the APGAR scores were examined, it was seen that the APGAR score of the babies born in the study group was significantly higher than the control group (p <0.001). The desired goal in obstetric analgesia is to reduce the pain caused by cervical dilatation and the feeling of uterine contractions while creating minimal motor block (26). Birth pain is an event that increases oxygen consumption by causing stress in the mother. Pain-related stress may decrease placental perfusion by increasing autonomic activity and cause fetal acidosis (27). It is reported that analgesia reduces both maternal and perinatal morbidity rates (28). Ideal analgesia for childbirth; it should be a safe method for the mother and baby, without any adverse effects on labor, preferably noninvasive. Although the ideal analgesia method with all these features has not been developed yet, the search continues. It has been shown that patient-controlled epidural analgesia, which goes into clinical use for this purpose, can be used safely and effectively during childbirth (29).

## CONCLUSION

The effect of epidural labor analgesia is better, which is conducive to shorten the time of the first stage of labor, good analgesic effect, shorter duration of the uterine contraction and higher safety. We conclude that patient-controlled epidural analgesia provided effective and safe postoperative analgesia on the hospital ward after various surgical procedures.

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