Effects of Epidural, Spinal and Genera! Anesthesia on Umbilical Cord Acid-Base Values

EPIDURAL, SPİNAL VE GENEL ANESTEZİNİN UMBILICAL KORD ASİT BAZ DENGESİNE ETKİSİ

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SUMMARY

Effects of different types of anesthesia on umbilical cord acid-base values were studied on 70 elective cesarean sections. 60-75mg 0.5% bupivacaine was administered to the epidural space in 18 patients. 7.5-10mg 0.5% bupivacaine heavy was administered to the subarachnoid space in 25 patients. Operation was started after the level of anesthesia was controlled by a needle. For general anesthesia in 27 patients, anesthesia was induced with 5-6mg/kg sodium thiopental IV. Operation was started immediately after the intubation was achieved with 1.5mg/kg succinylcholine IV. Blood samples were taken into heparinized syringes from umbilical artery and vein separately, immediately after clamping the cord. Umbilical arterial and venous pH, p02, PC02, base excess were determined. Mean umbilical artery pH values were 7.30 - 0.3, 7.31 - 0.06, 7.32 - 0.04 for epidural, spinal and general anesthesia respectively (p<0.05). Mean Apgar scores, umbilical arterial and venous blood gases were not statistically significant between the groups. Anesthesia type for cesarean section in the nondepressed, term fetus is not superior to each other according to these results.

Key Words: **Cesarean section, General anesthesia, Regional anesthesia**

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ÖZET

Değişik anestezi tiplerinin umbilical kord asit baz dengesine etkisi 70 elektlf sezaryen olgusunda çalışıldı. Olguların 18'ine epidural, 25'ine spinal ve 27'sine genel anestezi uygulandı. Epidural anestezi için epidural aralığa %0.5 bupivakain 60-75mg, spinal anestezi için subaraknoid aralığa %0.5 bupivakain heavy 7.5-1 Omg verildi. İğne ucuyla anestezi düzeyi kontrol edildikten sonra operasyona başlandı. Genel anestezi için 5-6mg sodyum thiopental ile indüksiyondan sonra 1.5mg/kg süksinilkolinle entübasyon yapılıp operasyona geçildi. Kordon klempe edildikten hemen sonra heparan ize enjektörlere ayrı ayrı umbilical ven ve arterden kan örneği alınarak pH, p02, pC02, HC03 ve baz fazlalığı çalışıldı. Umbilical arter ortalama pH'ı epidural spinal ve genel anestezi için sırasıyla 7.30 - 0.3, 7.31 - 0.06, 7.32 - 0.04 olarak bulundu (p<0.05). Gruplar arasında apgar skoru, umbilical arter ve venöz kan gazları açısından istatistiki anlam saptanamadı. Bu bulgular sezaryende anestezi türünün önceden deprese olmayan term fetusta birbirine karşı kesin bir üstünlüğü olmadığımı göstermektedir.

Anahtar Kelimeler: Sezaryen, Genel anestezi, Rejional anestezi

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Regional anesthesia (epidural, spinal) or general anesthesia may be used for cesarean section. Although some advantages are well known, controversy still exists for which type of anesthesia is better for both the mother and fetus. General anesthesia is preferred in the emergency sections that have to be performed as quickly as possible. The anesthetic drugs can cross the placenta and depress the fetus, if the delivery is delayed. Serious hypotension induced by regional anesthesia may decrease uteroplacental blood flow. Large volumes of crystalloids are infused and certain vasoactive agents are used to prevent hypotension. Continuous epidural anesthesia, already established for labor analgesia, may also be used for cesarean section. Excellent postoperative analgesia can be obtained by the administration of narcotics via this route (1). In this study, we, prospectively, studied the effects of different types of anesthesia on acid-base status of the fetus.

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MATERIALS AND METHODS

70 women delivered by cesarean section between May 1991 and March 1992 in the Department of Obstetrics and Gynecology, Uludağ University Medicine Faculty were included in the study. Epidural anesthesia was applied to 18 patients, spinal anesthesia to 25 and general anesthesia to 27 for cesarean section at term. Patients with antenatal risk factors which could affect the cord blood acid-base values were excluded. All the cases had normal fetal heart rate patterns. Pregnancies complicated by thick meconium (greater than 2, on a scale from 0 to 4) were also excluded.

In regional anesthesia 1000mL of lactated Ringer's solutions were infused for volume preload. 60-75mg 0.5% bupivacaine was administered to the epidural space for epidural anesthesia. 7.5-1 Omg 0.5% bupivacaine heavy was injected to the subarachnoid space for spinal anesthesia. Small doses of ephedrine up to 10mg IV were used in cases of transient hypotension. The operation was started after the level of anesthesia was controlled by a needle in minimal left lateral tilt position.

In general anesthesia, patients were given 100% oxygen by face mask while the surgical preparation was in progress. Left uterine displacement was maintained with a pillow under the right hip. 5mg/kg sodium thiopental and 1.5mg/kg suocinylcholine were used before intubation. Operation was started immediately after the intubation.

Cesarean section was carried out in the usual manner with Pfannenstiel incision and low transvers uterine incision. Incision to delivery intervals were less than three minutes in all cases. Blood samples were taken into heparinized syringes from umbilical artery and vein separately, immediately after clamping the cord. A rubber plug was used to avoid oxygenation from the room air. The samples were analyzed in a blood gas analyzer (Nova Stat Prophyle 5, USA) in fifteen minutes. The cases in which umbilical arterial and venous blood samples could not be drawn separately were excluded. Apgar scores at 1 and 5 minutes were determined by a pediatrician unaware of the study.

Student t test was used to compare the characteristics and umbilical arterial and venous pH, PO_2, PCO_2, $PHCO_3$ and base excess between the groups. $p<0.05$ was considered significant.

RESULTS

Mean ages, gravidities, parities, gestational ages and birth weights of the subjects in each group are seen in Table 1. There were no statistical significance between the groups ($p<0.05$). The indications for cesarean section in each group are illustrated separately, in Table 2. 34(48.6%) of them were operated for repeat section or previous myomectomy, 20(28.6%) for cephalopelvic disproportion, 13(18.5%) for malpresentation and only 3(4.3%) for placenta previa with no major vaginal bleeding. None of the cases received blood transfusion. Mean umbilical arterial and venous pH, p_{02}, PCO_2, HCO_3 and base excess, 1 and 5 minute Apgar scores of each group are shown in Table 3. Mean umbilical artery pH values were 7.30 - 0.03, 7 31 - 0.06, 7.32 - 0 04 for epidural, spinal and general anesthesia respectively ($p<0.05$). There were no significant difference in any parameter between the groups. One infant in epidural anesthesia group (9.1%) and one infant in general anesthesia group (4.5%) had 1 minute Apgar scores below 7, but 5 minute Apgar scores were 8 and 9 respectively.

Table 1. Patient characteristics in each type of anesthesia

	Epidural (n:18)	Spinal (n:25)	General (n:27)
Age (year)*	27.83-0.91	28.32-0.92	27.62-0.82
Gravida*	2.50-0.35	2.52-0.25	2.48-0,29
Para*	0.88-0.27	1.00-0.18	0.92-0.22
Birth weight (gr)*	3402-148	3548-139	3472-90
Gestational age (week)*	39 11-0.29	39.40-0.35	39.00-0.36

*p>0.05 between the groups

Table 2. Indications for cesarean section

	Epidural		Spinal		General	
Indication	n	%	n	%	n	%
Repeat-myomectomy	8	44	14	56	12	44
CPD*	6	33	6	24	8	30
Malpresentation	3	17	3	24	7	26
Placenta previa	1	6	2	8	–	–
Total	18	100	25	100	27	100

*CPD: Cephalopelvic disproportion

Table 3. Umbilical cord acid-base values

	Epidural (n:18)	Spinal (n:25)	General (n:27)	p value
Arterial				
pH	7.30-0.03	7.31-0.06	7.32-0.04	NS*
p02 (mmHg)	15.50-1.77	16.70-1.33	18.97-1.19	NS
PCO2 (mmHg)	**49**.61-1.88	44.64-1.61	46.30-1.50	NS
Bicarbonate (mmol/L)	24.73-0.78	23.02-0.87	24.06-0.58	NS
Base excess (mmol/L)	-2.04-0.86	-3.21-0.99	-2.62-0.60	NS
Venous				
pH	7.35-0.01	7.36-0.01	7.35-0.04	NS
p02 (mmHg)	25.72-1.93	24.85-1.19	27.39-1.31	NS
pC02 (mmHg)	41.07-2.24	39.73- 1.25	40.60-1.20	NS
Bicarbonate (mmol/L)	22.99-1.07	22.74- 0.80	22.84-0.55	NS
Base excess (mmol/L)	-2.84-1.07	-3.16-0.97	-3.07-O.58	NS
1 min. Apgar	8.11-0.21	8.56-0.17	8.22-0.19	NS
5 min. Apgar	9.88-0.11	9.96-0.03	9.96-0.03	NS

*NS: Statistically nonsignificant (p>0.05)

DISCUSSION

Apgar score is generally used to determine the birth asphyxia. It is considered useful to study the umbilical cord pH values in addition to Apgar scores (2). A good correlation between umbilical arterial pH and Apgar was observed in 1924 deliveries, but umbilical arterial acidemia was found in babies who have high Apgar scores in 2.1% cases (3). Controversy exists in the origin of this acidemia. Some authors believe this acidemia originates from maternal compartments (4), whereas some others have found some evidence that this acidemia reflects intrapartum asphyxia (5,6). Umbilical arterial pH values are the best indicators of fetal tissue acid-base status. In cases of umbilical cord compression and low fetal cardiac output, umbilical venous pH values may be normal while umbilical arterial acidemia is present.

Umbilical venous pH and p02 obtained by cordocentesis were significantly decreased when compared with mixed cord blood values after elective cesarean delivery under epidural anesthesia (7). It is concluded that epidural anesthesia and cesarean section cause some acidemia in nonlaborous women and acid-base values obtained at delivery do not reflect the real antenatal status. Although it is difficult to obtain umbilical arterial blood sample at cordosentesis, it is not realistic to compare the umbilical venous blood gas values with mixed cord blood values since cord compression can affect the results.

Apgar was the first to report that babies delivered by cesarean section under spinal anesthesia were more vigorous than whose mothers had general anesthesia (8). Since then, several studies demonstrated that neonates whose mothers received regional anesthesia for cesarean section were in better clinical condition (9,10,11). Some other studies showed no significant difference in Apgar scores between regional and general anesthesia (12,13). In a recent study with a relatively larger series, a significant decrease in the percentage of depressed and acidotic babies in epidural anesthesia for cesarean section (14). However, SHYKEN et al (15) reported no significant difference in Apgar scores and umbilical cord acid-base values between the general and epidural anesthesia. The results of our study which compare epidural, spinal and general anesthesia support the conclusions of the last authors.

In the pregnancies complicated with meconium staining, umbilical cord acid-base values were studied. Although one minute Apgar scores were low in thick meconium cases, a poor correlation between umbilical arterial acidemia and the presence of meconium has been found (16). For this reason, we have excluded the cases complicated with thick meconium.

Maternal hypotension induced in regional anesthesia need not adversely affect the fetus (17). SHYKEN et al (15) have reported that transient symptomatic hypotension for short duration did not cause any significant alteration in umbilical arterial acid-base values. We, too, have observed no umbilical arterial acidemia due to this mild transient hypotension in spinal and epudarl anesthesia groups.

In conclusion, anesthesia type for elective cesarean section in the nondepressed, term fetus is not superior to each other according to umbilical cord acid-base values. Further prospective studies should be done to see the effect of anesthesia on the premature and depressed fetuses.

REFERENCES

1. Rawal N, Sjostrand UH, Dahlstorm B. Postoperative pain relief by epidural morphine. Anesth Analg 1981; 60:726-31.

2. Johson JWR, Richards DS, Wagaman RA. The case for routine umbilical blood acid-base studies at delivery. Am J Obstet Gynecol 1990; 162:621-5.

3. Thorp JA, Sampson JE, Parisi VM, Creasy RK. Routine umbilical cord blood gas determinations. Am J Obstet Gynecol 1989; 161:600-5.

4. Seeds AE. Maternal-fetal acid-base relationships and fetal scalp-blood analysis. Clin Obstet Gynecol 1978; 21:579-91.

5. Low JA, Galbriath RS, Muir DW, Kitten HL, Pater EA, Karchmar EJ. Intrapartum fetal hypoxia: a study of longterm morbidity. Am J Obstet Gynecol 1983; 145:129-34.

6. Gordon A, Johnson JWC. Value of umbilical blood-acid base studies in fetal assessment. J Reprod Med 1985; 30:329-36.

7. Khoury AD, Moretti ML, Barton JR, Shaver DC, Sibai BM. Fetal blood sampling in patients undergoing elective cesarean section. Am J Obstet Gynecol 1991; 165:1026-29.

8. Apgar V, Holaday DA, James LS, Prince CE, Weisbrot IM. Comparison of regional and general anesthesia in obstetrics. JAMA 1957; 165:2155-61.

9. Datta S, Ostheimer GW, Weiss JB, Brown WU, Alper MH. Neonatal effects of prolonged anesthetic induction for cesarean section. Obstet Gynecol 1981; 58:331-5.

10. Gale R, Slater DE, Zalkinder-Luboshitz I. Neonatal advantage of epidural anesthesia in elective and emergency cesarean sections. Eur J Obstet Gynecol Reprod Biol 1986; 23:369-77.

11. Ong BY, Cohen MM, Palahniuk RJ. Anesthesia for cesarean section. Effects on neonates. Anesth Analg 1989; 68:270-5.

12. Fox GS, Smith JB, Namba Y, Johson RC. Anesthesia for cesarean section: further studies. Am J Obstet Gynecol 1979; 133:15-9.

13. Zagorzycki MT, Brinkman CR. The effect of general and epidural anesthesia upon neonatal Apgar scores in repeat cesarean section. Surg Gynecol Obstet 1982; 155:641-5.

14. Evans CM, Murphy JF, Gray OP, Rosen M. Epidural versus general anesthesia for elective cesarean section.

15. Shyken JM, Smeltzer JS, Baxi LV, Blakemore KJ, Ambrose SE, Pétrie RH. A comparison of the effect of epidural, general and no anesthesia on funic acid-base values by stage of labor and type of delivery. Am J Obstet Gynecol 1990; 163:802-7.

16. Yoemans ER, Gilstrap LG III, Leveno KJ, Burris JS. Meconium in the amniotic fluid and fetal acid-base status. Obstet Gynecol 1989;73:175-8.

17. Brizgys RV, Dailey PA; Shnider SM, Kotelko DM, Levinson G, The incidence of neonatal effects of maternal hypotension during epidural anesthesia for cesarean section. Anesthesiology 1987; 67:782-6..