

DOES EPIDURAL INCREASE THE INCIDENCE OF CESAREAN DELIVERY OR INSTRUMENTAL LABOR IN SAUDI POPULATIONS?

HASSAN BAKHAMEES* AND ESMAT HEGAZY**

Abstract

Background: This is a retrospective review of the medical records of 861 patients admitted for vaginal delivery. Patients were randomized to either epidural analgesia or other analgesic methods of pain relief for labor pains. The primary purpose of this study was to evaluate the effect of epidural analgesia on the rate of cesarean section delivery.

Methods: 861 patients were admitted to Saad Specialist Hospital for vaginal delivery between May 1, to September 30, 2006. Patients were divided into Nulliparous (334 patients) and Multiparous (527 patients) populations. Each population was then divided into two groups, epidural and non-epidural group. Epidural analgesia was initiated by a bolus of bupivacaine 0.25% (6 to 10 ml) plus fentanyl (50 to 100 µg), followed by bupivacaine 0.125% plus fentanyl (1 to 2 µg/ml) at the rate of (6 to 12 ml/h). Non-epidural analgesia was initiated by one or mixture of I.M meperidine 50 to 100 mg I.M, promethazine hydrochloride 25 mg, or Ontonox inhalers.

Results: In the Nulliparous population a total of 57 patients requested epidural (the epidural gp), while 277 patients received other analgesic methods (the non-epidural gp). There was no difference in the rate of cesarean section deliveries between the two analgesia groups (12 patients

From Anesthesia Dept., SAAD Specialist Hosp., El Khobar, KSA.

* M.B.B.S., D.A., K.S.U.F.F.A., A.B.M.A., F.F.A.R.C.S.I., Anesth. Consultant, Head of Anesth. Dept.

** M.D., Anesth. Consultant.

Correspondence: Dr. Esmat Hegazy, Anesth. Dept., SAAD Specialist Hosp. El Khobar, KSA. E-mail: esmatsgh@yahoo.com.

of 57 in the epidural group (21.1%), versus 61 patients of 277 (22%) in the non-epidural gp).

In the Multiparous population, a total of 49 patients requested epidural analgesia (epidural gp), while 478 patients received other analgesic methods (the non-epidural gp). There was no difference in the rate of cesarean section deliveries between the two analgesia groups (5 of 49 patients (10.2%) in the epidural group compared to 39 of 478 patients (8.2%) in the non-epidural gp).

Significantly, more patients in the epidural group had forceps or vacuum assisted deliveries compared to the other analgesia group (the non-epidural gp). This was evident in both the Nulliparous population (7 of 57 patients in the epidural gp (12.3%) compared to 13 of 277 patients (4.7%) in the non-epidural gp, $p < 0.05$), and in the Multiparous population (4 of 49 patients (8.2%) in the epidural gp versus only 6 of 478 patients (1.3%) in the non-epidural gp, $p < 0.005$).

Patients in the epidural gp had significantly lower pain scores compared to the other analgesia gp. Nulliparous reported lower pain scores during the first stage (epidural 2 ± 2 vs non-epidural 5 ± 4 , $p < 0.0001$) and second stage of labor (epidural 3 ± 3 vs non-epidural 6 ± 3 , $p < 0.0001$). Multiparous scores were (epidural 2 ± 2 vs non-epidural 4 ± 3 , $p < 0.0001$) in the first stage and (epidural 3 ± 3 vs non-epidural 5 ± 4 , $p = 0.0007$) in the second stage.

Higher satisfaction rates were reported in epidural groups versus the non-epidural groups. 80% of Nulliparous women who received epidural rated their satisfaction as excellent or good versus 45% in the non-epidural group $p < 0.001$. In the Multiparous population 77% in the epidural versus 43% in the non-epidural groups $p < 0.001$ reported excellent to good satisfaction rates.

Conclusion: Epidural analgesia is an effective method of pain relief during labor compared to the other analgesic methods of labor pain relief, and it does not increase the incidence of cesarean section deliveries.

Introduction

Epidural analgesia for vaginal delivery has been considered by both

parturients and obstetricians as the most appropriate way of relieving labor pains¹. Although the use of epidural analgesia for labor has been widely increased², yet its impact on the method of delivery is still controversial³.

The aim of this study was to compare both the rate of cesarean deliveries as well as the rate of forceps or vacuum assisted deliveries, in patients who received epidural compared to patients who did not received epidural for their vaginal deliveries.

Methods and Materials

This is a retrospective study of 861 women of mixed parity (334 Nulliparous and 527 Multiparous) who were admitted to SAAD Specialist Hospital for vaginal delivery in the period between May 1 and September 30, 2006. After obtaining the IRB (Institutional Review Board) approval in our hospital, the medical records of these patients were reviewed.

Our inclusion criteria consisted of singleton pregnancy, 36-42 weeks and birth weight less than 4000g. The exclusion criteria were: history of previous C.S, scheduled C.S, any pregnancy induced risk factors, malpresentation or placental abruption.

The study population were divided according to the parity into Nulliparous group and multiparous group. Each group was then sub-divided into epidural group and non-epidural group.

Epidural Analgesia Group

Epidural analgesia was initiated by a bolus of bupivacaine 0.25% (6 to 10 ml) plus fentanyl (50 to 100 µg), followed by bupivacaine. 0.125% plus fentanyl (1 to 2 µg/ml) on rate of (6 to 12 ml/h). Left uterine displacement was maintained to avoid aortocaval compression.

Analgesia was maintained throughout the first stage of labor. If progress during the second stage was inadequate, the infusion was decreased or even discontinued to restore maternal expulsive efforts.

Additional boluses of fentanyl and/or bupivacaine were injected to overcome inadequate analgesia. Maternal blood pressure was recorded every 5 min for 30 min, then every 30 min until delivery. Intra-venous fluids were given to treat hypotension which was defined as systolic blood pressure less than 25% of baseline or a systolic blood pressure less than 100 mmHg. Persistent hypotension was treated by increments of ephedrine 5 mg i.v. as needed.

Non-Epidural Group

In this group, labor analgesia was carried out by one or mixture of the following drugs: I.M meperidine 50 to 100 mg, I.M promethazine hydrochloride 25 mg, or Ontonox inhalers. Some patients in this group however, did not request any analgesia. Maternal blood pressure was recorded as already described.

Obstetric Management

All parturients were managed following a written protocol established by the medical staff. Routine intrapartum management of all women included intra-venous fluid administration and electronic fetal heart rate surveillance.

Outcomes of Interest

The primary outcome was the overall cesarean delivery rate. Also we analyzed the incidence of instrumental interferences (forceps and/or vacuum) assisted delivery.

Statistical Analysis

Analysis were conducted using Student-t test, Kruskal-Wallis and chi-square as required. All tests of significance were performed using two-tailed probability tests. Differences were considered significant when

P was less than 0.05.

Results

The present study included a population of 861 females: (334) nulliparous and (527) multiparous. The maternal demographic data of the epidural groups were comparable to the non-epidural groups in either the Nulliparous or the Multiparous populations. Table (1), (2).

Table 1
Maternal demographic characteristics of 334 patients
in the Nulliparous population

Characteristics	Epidural Analgesia Gr. (n = 57)	Non-Epidural Analgesia Gr. (n = 277)	P value
Age (years)	22 ± 3.0	22 ± 3.0	1.000
Height (cm)	155 ± 7	154 ± 6	0.267
Weight (kg)	79 ± 10	78 ± 12	0.557
Birth weight (gm)	3.211 ± 298	3.180 ± 301	0.479
Gestational age (wk)	39.3 ± 1.3	39.4 ± 1.5	0.639

Data presented as mean ± SD. No significant changes between the two groups.

Table 2
Maternal demographic characteristics of 527 patients
in the Multiparous population

Characteristics	Epidural Analgesia Gr. (n = 49)	Non-Epidural Analgesia Gr. (n = 478)	P value
Age (years)	28 ± 4.0	27 ± 6.0	0.255
Height (cm)	155 ± 7	156 ± 6	0.275
Weight (kg)	81 ± 10	83 ± 12	0.260
Birth weight (gm)	3.331 ± 298	3.360 ± 279	0.491
Gestational age (wk)	39.1 ± 1.2	38.9 ± 1.4	0.335

Data presented as mean ± SD. No significant changes between the two groups.

Results of the Nulliparous Group

In the Nulliparous population of 334 patients, 57 patients requested epidural (the Epidural Gr.), while 277 patients were (the Non-Epidural Gr.).

Twelve patients of 57 in the Epidural Group (21.1%), versus 61 patients of 277 (22%) in the Non-Epidural Group, had cesarean section deliveries. This difference was not statistically significant. However, 7 of 57 patients in the Epidural Gr. (12.3%) compared to 13 of 277 patients (4.7%) in the Non-Epidural Gr., had either forceps or vacuum assisted deliveries. The difference was statistically significant $p < 0.05$. Patients delivered vaginally were also not statistically different in both groups 38 of 57 (66.7%) in the epidural gp versus 203 of 277 patients (73.3%) in the non-epidural gp. Table (3).

Table 3
Labor events in the Nulliparous population (n = 334)

Labor event	Epidural Analgesia Gr. (n = 57)	Non-Epidural Analgesia Gr. (n = 277)	P value
Spontaneous vaginal delivery	38 (66.7%)	203 (73.3%)	n.s
Vacuum or forceps delivery	7 (12.3%)	13 (4.7%)	<0.05
Cesarean delivery	12 (21.1%)	61 (22%)	n.s

Data are presented as n (%).

Results in Multiparous Group

In the Multiparous population of 527 patients, 49 patients requested epidural analgesia (Epidural Gr.), while 478 patients did not request epidural (the Non-Epidural Gr.).

Five of 49 patients (10.2%) compared to 39 of 478 patients (8.2%) had cesarean section deliveries. These differences were not statistically significant. On the other hand, 4 of 49 patients (8.2%) in the Epidural Gr. versus 6 of 478 patients (1.3%) of the Non-Epidural Gr. had either

vacuum or forceps assisted deliveries. This difference was highly significant where $p < 0.005$. Patients who had vaginal deliveries were also not significantly different in Epidural 40 of 49 (81.6%) compared to the Non-Epidural Gr. 433 of 478 (90.6%). $P = 0.05$. Table 4.

Table 4
Labor events in the Multiparous population (n = 527)

Labor event	Epidural Analgesia Gr. (n = 49)	Non-Epidural Analgesia Gr. (n = 478)	P value
Spontaneous vaginal delivery	40 (81.6%)	433 (90.6%)	= 0.05
Vacuum or forceps delivery	4 (8.2%)	6 (1.3%)	<0.005
Cesarean delivery	5 (10.2%)	39 (8.2%)	n.s

Data are presented as n (%).

Neonatal Outcome

The Apgar scores of all the neonates were not statistically different between the Epidural versus the Non-Epidural Gr. in either the Nulliparous (Table 5) or the Multiparous populations (Table 6).

Table 5
Infant outcome in the Nulliparous population (n = 334)

Infant outcome	Epidural Analgesia Gr. (n = 57)	Non-Epidural Analgesia Gr. (n = 277)	P value
Apgar score <7 at 1 min	2 (3.5%)	7 (2.5%)	$P \leq 1.00$
Apgar score <7 at 5 min	0 (0%)	0 (0%)	$P \leq 1.00$

Data are presented as n (%).

Table 6
Infant outcome in the Multiparous population (n = 527)

Infant outcome	Epidural Analgesia Gr. (n = 49)	Non-Epidural Analgesia Gr. (n = 478)	P value
----------------	---------------------------------	--------------------------------------	---------

	49)		
Apgar score <7 at 1 min	1 (2%)	11 (2.3%)	P≤1.00
Apgar score <7 at 5 min	0 (0%)	1 (0.21%)	P≤1.00

Data are presented as n (%).

Maternal Thermodynamics

The maternal blood pressure, pulse rate and arterial oxygen saturations were not different between the Epidural versus the Non-Epidural Gr. in either the Nulliparous or the Multiparous populations along the whole course of labor in first and second stages.

Maternal VAS and Satisfaction Rates

The pre-analgesic visual analogue scale scores were similar between the two analgesic groups in our study populations. (Epidural 9 ± 1.6 vs Non-Epidural 9 ± 1.5 , $p = 1.00$ in the Nulliparous population), and (Epidural 9 ± 1.2 vs Non-Epidural 9 ± 1.3 , $p = 1.00$ in the Multiparous population).

Nulliparous women who received epidural reported lower pain scores during the first stage (Epidural 2 ± 2 vs Non-Epidural 5 ± 4 , $p < 0.0001$) and second stage of labor (Epidural 3 ± 3 vs Non-Epidural 6 ± 3 , $p < 0.0001$).

Again, the VAS scores were significantly lower in the epidural groups compared to the non-epidural groups in the Multiparous populations (Epidural 2 ± 2 vs Non-Epidural 4 ± 3 , $p < 0.0001$) in the first stage and (Epidural 3 ± 3 vs Non-Epidural 5 ± 4 , $p = 0.0007$) in the second stage.

Twenty-four hours after delivery, 80% of Nulliparous women who received epidural rated their satisfaction as excellent or good versus 45% in the non-epidural group $p < 0.001$. In the Multiparous population 77% in

the Epidural versus 43% in the Non-Epidural Gr. $p < 0.001$ reported excellent to good satisfaction rates.

Discussion

In this retrospective randomized study, epidural analgesia did not cause any significant increase in the incidence of cesarean section deliveries compared to patients who did not take epidural, neither in the Nulliparous nor in the Multiparous populations. However, our results indicated that administration of epidural did cause a significant increase in the incidence of vacuum and forceps assisted deliveries in both the Nulliparous and the Multiparous populations. Interestingly, in the present study, this significant increase in instrumental deliveries caused by epidural administration was much more evident in the Multiparous population (8.2% in Epidural Gr. vs 1.3% in Non-Epidural Gr. ($p < 0.005$) which is nearly 8 folds), compared to the Nulliparous population (12.3% in Epidural vs 4.7% in Non-Epidural) Gr. ($p < 0.05$) which represents less than 3 folds.

The weak abdominal muscles of the multiparous patients compared to primigravidas, with the possible resultant slower rate of fetal descent, could be a reasonable explanation for this observation.

The findings of the present study concur with the results of several retrospective and prospective studies conducted over the past decade which have attempted to evaluate the effect of epidural analgesia on cesarean delivery^{4,5,6}. In these trials there was no difference in the rate of cesarean section deliveries between their two analgesia groups (epidural versus I.V meperidine gp).

In a recent retrospective study done in 2004 over 2618 patients of mixed parity, ElKassabany et al, did not find any increase of cesarean section deliveries between epidural and non-epidural groups².

Leighton and Halpern⁷ performed a meta-analysis in 2002 of 14 studies including 2161 women who received epidural analgesia versus 2163 who received opioids for labor pain. They reported no increase in

cesarean section delivery rate attributable to epidural analgesia. Zhang et al⁸, recently reported on the effect of introduction of an on-demand labor epidural analgesia service at Tripler Army Hospital, Honolulu, Hawaii. In late 1993, a policy change within the Department of Defense required the availability of on-demand labor epidural analgesia in military medical centers. As a result, the incidence of epidural analgesia increased from 1% before the policy to 84% at one year after the policy had been implemented. The primary cesarean delivery rate was 14.4% before and 12.1% after this dramatic change in epidural use.

It is important to emphasize that there had been continual refinement of techniques used for epidural analgesia during labor. It is likely that early methods of epidural analgesia using high doses of analgesic agents had greater effect on labor than contemporary low dose techniques such as those used in our trial. Although epidural analgesia was not associated with increased cesarean section deliveries in our study, such analgesia had effects on labor. Clinically, we believe epidural related poor maternal expulsive efforts could be responsible for the increase in forceps or vacuum assisted deliveries observed in our study. This also could be a good explanation to the fact observed in the present study, that the incidence of instrumental assisted deliveries was much more evident in the Multiparous patients with weaker abdominal muscles than in the Nulliparous population.

The neonatal Apgar scores were comparable in the epidural group and the non-epidural group again in the two study populations. These results do not coincide with the results of Sharma et al⁹, who found the non-epidural group babies were having significantly lower Apgar scores at 1 and 5 minutes compared to the epidural group. This difference between our study and Sharma's results is due to the fact that analgesia in their non-epidural group was carried out using I.V meperidine, while in our study analgesia in the non-epidural group was either I.M meperidine and/or I.M promethazine or even no analgesia at all.

The administration of epidural analgesia in the present study did not cause any maternal hemodynamic changes, in the arterial blood pressure or the maternal pulse rate in the two study populations.

Patients who took epidural analgesia in either Nulliparous or Multiparous populations in the present study, had lower pain scores and they also rated higher maternal satisfaction rates compared to patients who did not take epidural analgesia. These results confirmed what is previously known about the excellent analgesic efficacy of epidural analgesia in meta- analysis done by other authors⁹.

In summary, epidural analgesia is an effective method of pain relief during labor, it may cause some effect on the maternal expulsive efforts, which can be improved to a good extent by prior ante-natal teaching of pregnant ladies how and when to push down during labor. However, this effect did not result in an increase of cesarean section deliveries rates. Thus, in our opinion, fear of unnecessary cesarean section delivery should not prevent women from choosing this effective and rather safe method of pain relief during labor.

References

1. OKUTOMI T, SAITO M, HOKA S, MOCHIZUKI J, AMANO K: The Effect of Timing in the Initiation of Epidural Infusion at Combined Spinal-Epidural Analgesia for Labor on the Total Dose of Local Anesthetic. *Anesthesiology*; 101:A1225, 2004.
2. ELKASSABANY NM, TETZLAFF JE, PENG X, AYAD S: Does the administration of epidural analgesia affect the incidence of Cesarean Delivery? A 2-year Retrospective Study. *Anesthesiology*; 101:A1223, 2004.
3. KEÏTA H, MERCERON S, MADELENAT P, MONTRAVERS P, DESMONTS JM: Does Early Epidural Analgesia Increase the Rate of Delivery Requiring Forceps or Cesarean Delivery? *Anesthesiology*; 103:A588, 2005.
4. SHARMA SK, SIDAWI JE, RAMIN SM, LUCAS MJ, LEVENO KJ, CUNNINGHAM FG: Cesarean delivery: A randomized trial of epidural versus patient-controlled meperidine analgesia during labor. *Anesthesiology*; 87:487-94, 1997.
5. LUCAS MJ, SHARMA SK, MCLNTIRE DD, WILEY J, SIDAWI JE, RAMIN SM, LEVENO KJ, CUNNINGHAM FG: A randomized trial of labor analgesia in women with pregnancy-induced hypertension. *Am J Obstet Gynecol*; 185:970-5, 2001.
6. SHARMA SK, ALEXANDER JM, MESSICK G, BLOOM SL, WILEY J, MCLNTIRE DD, LEVENO KJ: Cesarean delivery: A randomized trial of epidural analgesia versus intravenous meperidine analgesia during labor in nulliparous women. *Anesthesiology*; 96:546-51, 2002.
7. LEIGHTON BL, HALPERN SH: The effects of epidural analgesia on labor, maternal, and neonatal outcomes: A systemic review. *Am J Obstet Gynecol*; 186:S69-77, 2002.
8. ZHANG J, YANCEY MK, KLEBANOFF MA, SCHWARZ J, SCHWEITZER D: Does epidural analgesia prolong labor and increase risk of cesarean delivery? A natural experiment. *Am J Obstet Gynecol*; 285:128-34, 2001.
9. SHARMA SK, MCINTIRE DD, WILEY J, LEVENO KJ: Labor Analgesia and Cesarean Delivery: An Individual Patient Meta- analysis of Nulliparous Women. *Anesthesiology*; 100(1):142-148, 2004.

OBITUARY

The Editorial Board of the Middle East Journal of Anesthesiology announces with great sorrow the passing away of Dr. Salah El-Halabi and Dr. Hilmi Hijazi, Consultant Editors of the Middle East Journal of Anesthesiology.

Dr. Halabi and Dr. Hijazi have been pioneers of anesthesia in the whole Arab World for more than fifty years. They were founders of the Pan Arab Society of Anesthesia and Intensive Care as well as the Arab Board of Anesthesia. Their contributions towards establishing the Pan Arab Congress of Anesthesia is appreciated by all anesthesiologists all over the Arab World.

Deep sympathies are expressed to their families and friends.

ERRATUM

In the article titled “Hydrocortisone in post-dural puncture headache” by Noyan Ashraf MA, Sadeghi A, Azarbakht Z, Salehi S and Hamediseresht E in the June issue of the Middle East Journal Of Anesthesiology Vo. 19, (2), 2007 page 415-422.

- The title should read “Evaluation of intravenous hydrocortisone in reducing headache after spinal anesthesia: A double blind controlled clinical study”.
- In page 415 the word “is patients” should read “in patients”
- In page 417 last paragraph, the word “Thirty” should read “Sixty”.
- In page 421 conclusion, should read as follows:
“This study showed the therapeutic effects of intravenous hydrocortisone in reducing headache after spinal anesthesia in women who underwent cesarean section. Its mechanism of action is yet to be determined”.