

Title: OXYGEN SATURATION IN PATIENTS THE NIGHT PRIOR TO AND THE NIGHT AFTER CESAREAN SECTION DURING EPIDURAL MORPHINE ANALGESIA

Authors: L.P. Östman, M.D., C.L. Owen, M.D., J.N. Bates, M.D., F.L. Scamman, M.D., K. Davis, M.S.

Affiliations: Department of Anesthesia and Critical Care, The University of Chicago, Chicago, Illinois and Department of Anesthesia, University of Iowa College of Medicine, Iowa City, Iowa.

Introduction. Epidural morphine (EM) administration is a common modality of postoperative pain therapy in cesarean section (CS) patients. Delayed respiratory depression can occur after the administration of epidural narcotics. Currently there is controversy over how to monitor these patients. Recent studies have attempted to evaluate CS patients, who received EM, patient controlled analgesia or intramuscular narcotics for postoperative pain relief, with pulse oximetry to determine if significant hypoxemia occurred.¹ However, it is not known if these patients have similar desaturation events during late pregnancy prior to surgery and pain therapy. We are not aware of any studies reporting oxygen saturations (SaO₂) prior to and following cesarean section and EM analgesia using patients as their own controls. The current study was designed to compare the incidence and severity of desaturation episodes in patients during the night prior to elective CS and during the night following the surgery when analgesia was provided with EM.

Methods. The study population consisted of healthy, nonobese, term parturients who presented for elective repeat CS. Following approval from The Institutional Human Subjects Review Committee, informed consent was obtained from six patients. The night prior to their surgery, the patients were monitored continuously with a Nellcor N-100 pulse oximeter. The alarm was inactivated and the sensor was attached to the patient's finger when she was ready to go to bed. SaO₂ and heart rate data were measured continuously and stored every minute on a computer. SaO₂ measurement was performed continuously throughout the night except when the patient was ambulant. The following morning the patients underwent a CS under epidural anesthesia with 2% lidocaine. Following delivery the patients received intravenous fentanyl (50-100µg) for sedation. For postoperative analgesia, the patients received 4 mg of EM (Duramorph®) 15-30 minutes prior to completion of surgery. The night after the operation, the patient's SaO₂ was monitored in the same fashion as prior to the operation. In addition, the patients completed a visual analog pain scale at 6 and 24 hours after receiving EM. Also, the respiratory rate was monitored intermittently according to hospital protocol, by a nurse instructed not to disturb the patient. Side effects such as pruritus, nausea and vomiting, and additional narcotic/sedative therapy were recorded. For the purpose of SaO₂ analysis, the data was divided into four categories: 96-100%, 91-95%, 86-90% and < 85%. The total monitoring time, the cumulative time in each category, and the minimum oxygen saturation and the duration of it were recorded for each patient. Data was analyzed using student's t-test and Wilcoxon signed-rank test.

Results. The patients' mean age, height and weight were 24±2.1 years, 167±4.5 cm and 82±14.3 kg respectively (mean±SD). The total time spent monitoring prior to and after surgery was 451±145 and 465±121 minutes respectively (mean±SD). SaO₂ was above 96% during the majority of the monitored time for all patients, both the night prior to and the night

after the operation, except for patient #4 (table 1). Patient #4 spent the majority of her time with SaO₂ between 91-95% both the night prior to and the night after surgery. However, three patients spent considerable portions of both nights with SaO₂ at 91-95% (table 1). One patient had SaO₂ of 89% measured for one minute (table 2). There were no differences in the SaO₂ measured when the two nights were compared. No respiratory rate less than 12/min was recorded. All patients reported good to excellent analgesia during the 24 hours after the surgery. Three patients had mild pruritus and one patient had moderate pruritus with nausea. They were treated with nalbuphine and/or antihistamine.

Table 1. Patient Data. Percent of time spent in each saturation category.

Ptn #	Preoperative		Postoperative	
	96-100	91-95	96-100	91-95
1	98.2	1.8	97.9	2.1
2	99.4	0.6	95.8	4.2
3	67.9	32.1	89.7	10.3
4	47.9	52.1	30.8	69.2
5	94.6	5.4	99.8	0.2
6	51.6	48.4	76.1	23.9

Table 2. Minimum oxygen saturation and duration for each patient (%/min)

Ptn#	1	2	3	4	5	6
Preop.	94/1	95/4	94/3	93/2	92/1	93/1
Postop	93/3	91/1	95/33	94/60	95/1	89/1

Discussion. This data suggests that patients in late pregnancy may spend considerable time with SaO₂ at 91-95% while sleeping. However, the time spent at this saturation level may not differ from the time and SaO₂ measured the night after cesarean section when analgesia is provided with EM. In studies which attempt to assess patient's respiratory depression the night after CS when analgesia is provided with EM, it appears warranted to also record SaO₂ the night prior to their surgery in order to evaluate the true desaturation events caused by surgery or pain therapy.

References.

1. Brose WB, Powar M, Cohen SE: Oxygen saturation in post-cesarean patients using epidural morphine, PCA, or IM narcotic analgesia. *Anest Analg* 67:S1-266,1988