Epidural morphine for analgesia after Caesarean section: a report of 4880 patients

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This retrospective study was undertaken to assess the efficacy and safety of epidural morphine in providing analgesia following Caesarean section under epidural anaesthesia. The morphine was administered as a single bolus, following delivery, in doses ranging from 2 to 5 mg. The charts of 4880 Caesarean sections, performed on 4500 patients, were reviewed. The duration of analgesia and the occurrence of any symptoms which might be side-effects of the epidural morphine were recorded. The duration of analgesia was 22.9 ± 10.1 hr and was not correlated with the dose of epidural morphine. Eleven per cent of the patients required no supplemental analgesia during the first 48 hr. Twelve patients (0.25 per cent) had respiratory rates <10 breaths per minute, on at least one occasion. No serious sequelae resulted from these periods of bradypnoea. Pruritus occurred in 58 per cent of patients, nausea and vomiting in 39.9 per cent and dizziness in ten per cent. Herpes simplex labialis was recorded in 3.5 per cent of patients. Epidural morphine is thus confirmed as an effective analgesic technique post-Caesarean section with 3 mg being the optimal dose. Even in this young healthy patient population, clinically detectable respiratory depression occurs so clinical respiratory monitoring is indicated.

Afin d'en évaluer l'efficacité et la sûreté en post-op de césarienne sous anesthésie épidurale, nous avons revu au sein de 4500 dossiers, 4880 cas d'analgésie à la morphine par voie épidurale où on avait injecté de 2 à 5 mg de morphine en bolus après la naissance. D'abord, la durée de l'analgésie (22,9 ± 10,1 hre) semblait indépendante de la dose utilisée et 11 pour cent des patientes n'avaient requis aucun autre analgésique pendant les 48 premières heures. Ensuite, de la bradypnée (fréquence respiratoire <10/min) était survenue chez 12 patientes à au moins une occasion, n'entraînant cependant aucune séquelle ; 58 pour cent des patientes s'étaient plaintes de prurit, 39,9 pour cent de nausée ou de vomissement et dix pour cent d'étourdissement. Enfin, on avait observé la présence d'une lésion herpétique labiale dans 3,5 pour cent des cas. Il semble donc que la morphine par voie épidurale constitue un mode d'analgésie efficace après une césarienne et qu'une dose de 3 mg soit idéale. Pourtant, même chez ces patientes jeunes et en bonne santé, une dépression respiratoire peut survenir et justifie un monitorage clinique de la respiration.

Key words
ANAESTHESIA: obstetric, epidural;
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ANALGESICS: morphine;
PAIN: postoperative.

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The value of epidural morphine in the control of postoperative pain is well recognized.[1–4] However, there is controversy in the literature regarding the use of the technique, because of the incidence of undesirable side-effects, particularly the risk of delayed respiratory depression.[5–6] Other side-effects include pruritus, nausea, vomiting, herpes simplex labialis and urinary retention, as well as dizziness. Epidural morphine has proved to be particularly effective after Caesarean section with a lower incidence of respiratory depression than that reported in studies of non-obstetric patients.[7–9]

This review was undertaken in order to document the efficacy and side-effects of epidural morphine when used for the control of pain after Caesarean section as experienced at the Grace Hospital, Vancouver, which is a tertiary care obstetric hospital. This analgesic technique is commonly employed at this institution when the Caesarean section has been performed under epidural anaesthesia. It is not used in cases of patient refusal, known or suspected dural puncture, morphine allergy, or following general anaesthesia.

Methods

Epidural anaesthesia for Caesarean section, in the Grace

Hospital, is usually induced by divided doses of carbonated lidocaine with 1:400,000 epinephrine, administered through an indwelling epidural catheter. Morphine is administered as a single dose after the delivery of the infant. The epidural catheter is removed at the end of the surgery and the patient is kept in the Post-Anaesthesia Recovery Room (PAR) until she has good motor function in her legs (~two hours). Vital signs are recorded every 15 min.

After discharge from the PAR vital signs are monitored by the postpartum unit nurses, hourly, for the remainder of the first 12 hr period and then the respiratory rate is monitored for a further 12 hr. No other special monitoring techniques are employed. Standing orders for supplemental analgesics allow acetaminophen (plain or with codeine) orally every three hours, if needed. If a parenteral narcotic is required the anaesthetist on duty is notified, prior to injection, and the vital signs are monitored every 30 min for three hours, after which the original protocol is resumed. The anaesthetist is immediately informed if the respiratory rate decreases below ten breaths per minute.

This study was performed as a retrospective review of the charts of patients who had received epidural morphine after Caesarean section at the Grace Hospital, Vancouver, between July 1, 1983 and June 30, 1986. The charts of 4880 patients were reviewed. A further eight charts could not be located. A standardized data collection form was completed for each chart reviewed and the following variables were recorded:

- supplementary drugs used during surgery
- date and time of administration of epidural morphine
- dose of epidural morphine
- time, drug and dose of all supplemental analgesics administered in the first 48 postoperative hr
- lowest recorded respiratory rate and the time that it occurred
- treatment required for the lowest respiratory rate
- date and time of occurrence of side-effects:
  - herpes simplex labialis recrudenscence
  - pruritus
  - urinary retention
  - nausea and vomiting
  - dizziness
- treatment administered for side-effects

This data base was computerized to simplify analysis. The time from the administration of epidural morphine to the first oral or parenteral postoperative analgesic was calculated for each patient. The patients were grouped for analysis by the dose of epidural morphine received and by the occurrence of various side-effects. Statistical analysis included Chi-square analysis on nonparametric data and correlation analysis of the relationship between epidural morphine dose and the duration of analgesia.

TABLE I Effectiveness of epidural morphine

Dose (mg)	*No. of patients*	*Duration of analgesia (±SD) (hr)*	*No. of patients receiving no analgesic in first 48 hr*
2	8	19.3 ± 11.2	0
2.5	7	17.4 ± 8.7	0
3	210	19.6 ± 10.3	17 (8.1%)
3.5	60	22.7 ± 11.3	9 (15%)
4.0	313	22.7 ± 10.2	25 (8.0%)
4.5	66	24.0 ± 10.5	5 (7.6)
5	4216	23.0 ± 10.0	485 (11.2%)
Total	4880	22.9 ± 10.1	545 (11.2%)

Correlation coefficient between dose and duration of analgesia = 0.066.

Results

Duration of analgesia

The duration of analgesia provided by each dose of epidural morphine is shown in Table I. The duration of analgesia varied widely from patient to patient. Notably, 11 per cent of patients required no analgesic supplements during the first 48 hr after surgery. There was no demonstrable correlation between the dose of morphine and the duration of analgesia. Correlation analysis of this data produced a coefficient of correlation of 0.066.

Respiratory effects

Twelve (0.25 per cent) patients were identified who had a respiratory rate $< 10 \cdot \text{min}^{-1}$ on at least one occasion. These are summarized in Table II. All were ASA physical status I or II. Table III compares these patients with the other 4868 patients with regard to the use of intraoperative and postoperative drugs. There were no differences in these variables between groups.

Other side-effects

The incidence of nausea, pruritus, urinary retention and herpes simplex labialis, related to the use of epidural morphine, is presented in Table IV.

Dizziness was specifically assessed only in the final year of the review and is presented in Table V. Overall nausea and vomiting affected 40 per cent of patients, pruritus was noted in 58 per cent, urinary retention in four per cent, herpes simplex in 3.5 per cent and dizziness in 9.8 per cent. The occurrence of pruritus was related to the dose of epidural morphine ($P < 0.05$), while there was no significant relationship between the dose of morphine and the incidence of the other side-effects.

Discussion

The selective spinal analgesia achieved with epidurally administered morphine has been shown, in many

TABLE II Patients with respiratory rate less than 10 per minute

	Age (yr)	Height (cm)	Weight (kg)	Epidural morphine dose (mg)	Resp. depression			Intraop supplemental medications	Postop medications
					Rate	Time after morphine (hr)	Naloxone (mg)		
1	38	162	73	5	9	1		Fentanyl 50 μg	
2	30	172	73	5	8	11		Fentanyl 50 μg	Diphenhydramine 50 mg
3	30	150	62	5	6	1		Fentanyl 150 μg	
4	32	160	70	5	7	2.5		Fentanyl 100 μg	
5	31	151	66	5	9	6			Diphenhydramine 50 mg
					9	7			
6	32	156	69	5	9	5	0.15	Droperidol 0.5 mg	
					7	8			
					8	9			
					8	12			
7	33	165	63	5	8	6	0.4		Demerol 50 mg
8	35	175	89	5	9	2			
					9	3			
9	39	165	81	5	8	6			Dimenhydrinate 50 mg
10	27	160	75	5	8	12	0.1		Dimenhydrinate 50 mg
11	32	152	55	4	9	2			
12	32	152	60	5	8	1		Fentanyl 50 μg	

studies,[1,2,8-11] to be effective. Its frequent use by obstetric anaesthetists has been well documented.[8-10,12] The efficacy and the popularity of the technique among obstetric patients is supported by the observation that 380 patients (8.4 per cent) in our review are represented twice. Our study population is a uniform group of healthy young women with the distinctive physiological changes of pregnancy. They thus differ from the older, relatively ill patients examined in most studies of the use of epidural morphine for analgesia after surgery.

The effectiveness of epidural morphine in the control of pain after Caesarean section is well documented in this review. Eleven per cent of patients required no other analgesia for 48 hr after surgery. The 22.9 hr mean

TABLE III Perioperative medications and respiratory depression

	No. of patients	No. of patients receiving:			
		Intraop fentanyl	Postop parenteral narcotic	Postop gravol	Postop benadryl
RR <10	12	5 (41.7%)	1 (8.3%)	2 (16.7)	2 (16.7)
RR ≥10	4868	2143 (43.9%)	627 (12.8%)	923 (18.9)	926 (19.0)

TABLE IV Common side-effects of epidural morphine vs dose

Dose (mg)	No. of patients	Nausea & vomiting	Pruritus	Herpes simplex	Urinary retention
2	8	3	2		1
2.5	7	2	2		
3	210	80	101	6	10
3.5	60	17	31	3	2
4	313	108	170	6	15
4.5	66	30	39	3	4
5	4216	1707	2500	153	170
Total	4880	1947 (39.9%)	2845 (58.3%)	171 (3.5%)	202 (4.1%)
P-	NS	<0.05	NS	NS	

TABLE V Dizziness vs dose of epidural morphine

Dose	No. of patients	No. with dizziness (%)
3	192	23 (12)
3.5	19	2 (11)
4	91	10 (11)
4.5	8	0 (0)
5	926	86 (9)
Total	1236	121 (9.8%)

duration of analgesia is similar to other reports of the use of epidural morphine in obstetric analgesia,[2,8,9,12] and is longer than reported for postoperative analgesia in non-obstetric groups.[2,3] While there was little change in the mean duration of action at various dose levels (Table I), there was a large standard deviation from the mean noted with each dose. This may be related to the sixfold variation in CSF concentration of morphine after epidural administration, which was reported by Sjostrom *et al.*[13] They also noted a wide variation in CSF morphine concentration at the time of request for additional analgesia.

Respiratory depression, defined as a respiratory rate of less than ten breaths per minute, occurred in 0.25 per cent of the cases in this review. This is in the low end of the range (0–2 per cent) documented in other reports of the use of epidural morphine for postoperative analgesia,[1,2,8,9,12] in which clinical observation was the method used to assess respiratory function. More sophisticated evaluation has shown that epidural morphine depresses respiratory responses to some degree in all subjects.[4,5] In our study and others, hourly nursing observation detected the documented episodes of respiratory depression and no other respiratory sequelae occurred. Most patients responded promptly to verbal stimulation, while only three patients required naloxone injection to increase their respiratory rates above ten breaths per minute. Thus, we believe that clinical monitoring is sufficient to detect clinically important respiratory depression after epidural morphine in the obstetric population.

The potentially life-threatening side-effect of delayed respiratory depression does not appear to have the same incidence, nor severity, as has been reported in studies of other surgical patients. Obstetrical patients are relatively young and generally healthy, while many of the reported cases of severe respiratory depression have occurred in older people, often with concurrent respiratory disease. Obstetrical patients, too, are generally anxious to care for their neonates and are active, rather than lying passively in bed, in contrast to many other surgical patients. Additionally, progesterone has been shown to lead to improved ventilation by increasing the sensitivity of the respiratory centre to CO_2.[18]

The patients with respiratory rates below ten breaths per minute are summarized in Table II. Four of these episodes were seen early, in the post-anaesthetic recovery room, while the remainder were observed between three and 12 hours postoperatively. Ten of the 12 patients had received intra- or postoperative narcotic or sedative drugs. Cohen *et al.*[7] reported the combination of epidural morphine and intravenous droperidol as a possible cause of increased respiratory depression. There were no other identifiable characteristics or risk factors in our patients with low respiratory rates.

Nausea and vomiting are well documented side-effects of epidural morphine.[2,4,14] The 40 per cent incidence in this review is in the middle of the range of 8–75 per cent reported in other studies.[2,8,9] As shown in Table IV, no relationship was demonstrated between the dose of epidural morphine and the incidence of nausea and vomiting.

Pruritus occurred in 58 per cent of our study population which is similar to other reports.[2,8,9] Our study reveals a direct relationship between the dose of epidural morphine and the incidence of pruritus.

Herpes simplex labialis recrudescence has been shown to be associated with the use of epidural morphine after Caesarean section.[15–17] The incidence of 3.5 per cent reported was lower than that noted in reports which specifically studied this side-effect. This may represent a lack of awareness of the possible relationship in the early part of the review with consequent failure to record the problem consistently. If recrudescent labial herpetic lesions are secondary to pruritus, the relationship between this incidence of pruritus and the dose of epidural morphine (noted in this review) would indicate that the lowest effective dose of morphine should be used. This review did not note any significant increase in the duration of analgesia nor in the number of patients who did not require any supplemental analgesia when the dose of morphine exceeded 3 mg. We suggest that 3 mg is an adequate dose for most post-Caesarean section patients.

Urinary retention is a recognized side-effect of intraspinal narcotics. It was not possible to assess its incidence in our patient population, all of whom had lower abdominal surgery and had indwelling bladder catheters for up to 24 hr after surgery.

Dizziness was not initially recognized as being related to the use of epidural morphine and, consequently, was only specifically assessed in the last 1236 charts reviewed in this study. On direct questioning of our postpartum nurses, they gave the opinion that dizziness was more frequent and more profound than in patients who had not received epidural morphine. The dizziness was often experienced even while the patient was lying quietly supine and was frequently recorded in the nursing notes

because of its inhibition of patient mobility. Because of the ten per cent incidence in our patients, dizziness may be an important side-effect of epidural morphine, at least in women who have had Caesarean sections. Further study of the mechanism of this phenomenon and measures to prevent or treat it are indicated.

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