

intended to fulfil the draining function of a conventional stomach tube for reasons of safety and economy.

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The Effects of Epidural Morphine and Epidural Butorphanol on Maternal Outcomes After Cesarean Delivery

To the Editor:

Gambling et al. (1) compared postcesarean outcomes of epidural morphine 3 mg plus epidural butorphanol 3 mg versus epidural morphine 3 mg alone. Patients receiving butorphanol had less analgesia, an equivalent need for treatment of pruritus, and equivalent satisfaction compared with controls. In an earlier study (2), we had compared postcesarean outcomes of epidural morphine 4 mg plus epidural butorphanol 3 mg versus epidural morphine 4 mg alone. Patients receiving butorphanol in our study had significantly greater analgesia, a significantly lower incidence of treatment for pruritus, and significantly greater overall satisfaction compared with controls. We carefully reviewed both studies to determine why our results differed (Table 1).

With 10-cm visual analog scales (VASs), numerical pain score values imply the following: 1) VAS > 3.0 represents inadequate analgesia; 2) VAS = 1-3 represents good analgesia; and 3) VAS < 1 represents extraordinary analgesia ("pain prevention") (3). Over the expected

range of adequate-to-superb VAS analgesia scores (0-3 cm), a difference of 0.5 cm is clinically important. Specifically, postoperative pain scores < 1 cm generally require continuous epidural administration of local anesthetics (3,4). VAS sensitivity depends on administering an anchored scale in a standardized manner, evaluating patients on multiple occasions, and obtaining a uniform distribution of scores (5).

With respect to cumulative pain assessment, our study group was unique in achieving "pain prevention" (mean VAS = 0.7 cm) with an extremely narrow distribution of low scores (SD = 1.0 cm) that was both statistically and clinically significant. Statistical analysis of VAS scores involved pairwise comparisons of each study group with the control group using one-way analysis of variance. Furthermore, χ^2 analysis of 265 evaluations among the two groups demonstrated that butorphanol significantly reduced the incidence of inadequate analgesia to a level (4%) threefold less than control (11%). Our *post hoc* power analysis demonstrated that 265 evaluations among two groups produced a statistically significant difference ($P < 0.05$) in mean VAS pain scores of less than 0.5 cm.

In contrast, the study design of Gambling et al. (1) presumed that 102 evaluations among two groups produced a power of 0.8 to detect a difference ($P < 0.005$) in mean VAS scores of 2.0 cm. Nearly a third of their pain score evaluations claimed inadequate analgesia (VAS pain score > 3). The duration of analgesia after epidural morphine administration does not reliably extend to 24 h (2,6), so one third of their patient assessments occurred at a time (24 h) when epidural opioid analgesia was dissipating. Overall, the lack of statistically significant differences in the study by Gambling et al. (1) appears to be due to inadequate numbers of patient evaluations (no VAS satisfaction scores were presented), unusually high VAS pain scores (2,6), and statistical methods that were biased toward unreasonable limits of detection.

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Table 1. Epidural Morphine and Epidural Butorphanol: Comparison of Similar Studies with Contrasting Results

Patient group	Authors			
	Gambling et al.		Wittels et al.	
	Study	Control	Study	Control
No. of patients	17	23	28	25
Epidural morphine (mg)	3	3	4	4
Epidural butorphanol (mg)	3	0	3	0
Analgesic duration studied ^a	2-24 h postpartum		2-12 h postpartum	
No. of evaluations/patient	3		5	
Cumulative VAS pain score, mean \pm SD (cm) ^b	2.5 \pm 2.4	2.3 \pm 1.3	0.7 \pm 1.0*	1.1 \pm 1.4
VAS pain scores > 3 (%) ^c	29	32	4*	11
Patients treated for pruritus (%) ^d	24	22	25*	52
Satisfaction fair or poor (%)	12	13	NA	NA
VAS satisfaction < 7.5 (%)	NA	NA	4*	13
Cumulative VAS satisfaction score, mean \pm SD (cm) ^b	NA	NA	9.4 \pm 1.1*	9.0 \pm 1.8

VAS = visual analog scale; NA = not applicable.

^a Patients in the Wittels et al. study utilized intravenous patient-controlled analgesia with morphine sparingly during the first 12 postpartum hours (cumulative amounts averaged 2.75 and 3.0 mg).

^b VASs were 10 cm in length. Cumulative VAS pain scores (mean and SD) for patients in the Gambling et al. study were estimated from graphic data presented in Figure 1 of their article. Cumulative VAS pain and satisfaction scores (mean and SD) for patients in the Wittels et al. study were determined by pairwise comparison of each study group with the control group using one-way analysis of variance, $\alpha = 0.05$.

^c The fraction of VAS pain scores > 3 among patients in the Gambling et al. study was calculated from data in Table 2 of their article. Analysis of the incidences of inadequate analgesia and inadequate satisfaction among patient groups in the Wittels et al. study was achieved with the χ^2 statistic.

^d The percentage of patients treated for pruritus in the Gambling et al. study was derived from Table 3B in their article. All patients in the Wittels et al. study were interviewed with respect to the incidence and severity of pruritus. Those who confirmed pruritus upon interview were offered the option of treatment; patients elected to receive treatment for severe pruritus or for moderate pruritus that promoted strong dissatisfaction.

*Statistically significant differences ($P < 0.05$) comparing study and control groups in the Wittels et al. study.