Title: THE EFFECT OF pH ADJUSTING 3% 2-CHLOROPROCAINE ON THE QUALITY OF POST-CESAREAN SECTION ANALGESIA WITH EPIDURAL MORPHINE

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Introduction: It has been previously reported that the use of 3% 2-chloroprocaine(2-CP) for epidural anesthesia adversely effects the efficacy of epidural morphine and fentanyl in providing post-cesarean section analgesia although this is controversial.[1,2,3] It has been postulated that the low pH of 2-CP (pH approximately 3.5-4.0) might decrease the effectiveness of subsequently administered epidural narcotics. Epidural morphine must cross the dura and enter the dorsal horn to be effective. Since morphine is an organic base which exists in a charged ionic form in an acid environment, the low pH of 2-CP may hinder the dural penetration of morphine. We chose to study this hypothesis, by raising the pH of commercially prepared 2-CP. We have therefore examined the duration and the quality of post-cesarean section epidural morphine analgesia when either the commercially available, unbuffered 2-CP(pH<4.0) or sodium bicarbonate-buffered 2-CP(pH=6.7), both with 1:200,000 epinephrine were used for cesarean section anesthesia.

Methods: After approval by our institution's Committee on Human Research and with informed consent, we studied 39 consecutive healthy ASA I or II status patients who had requested epidural anesthesia for cesarean section. No patients had received epidural analgesia prior to the anesthetic for cesarean section. Patients were randomized to receive either the unbuffered commercially prepared 2-CP (N=19) or pH-adjusted(N=20) 2-CP with 1:200,000 epinephrine. Buffering was achieved by adding 1mEq of sodium bicarbonate to each 30ml of local anesthetic and briefly shaking the solution. Prior to completion of the study metabisulfite was eliminated from the commercially available 2-CP and we studied 9 patients in the unbuffered 2-CP group and 7 patients in the buffered 2-CP group who received the new 2-CP preparation. One-half of the initial 2-CP dose was repeated between 30 to 45 minutes after the initial injection as clinically indicated. Five milligrams (10cc Duramorph®) of preservative-free morphine were administered after delivery of the infant and clamping of the umbilical cord. The time to the patient's first request for additional analgesia was noted, as was the total narcotic requirement for the first 24 and 48 hours. On the first postoperative day, pain relief was assessed by the patient using a 4-point scoring system: 0=no relief, 1=poor-to-fair relief, 2=good relief, and 3=excellent relief. The individual evaluating the quality of postoperative analgesia was blinded to the epidural drug used. Because there were minimal differences between the "old" and "new" 2-chloroprocaine preparations regarding the variables we measured, we have pooled the data obtained from using the two preparations. Data were compared using the analysis of variance and the Student's T-Test.

Results: There were no significant differences between the unbuffered (pH=4.4+0.2) and buffered (pH6.7±0.2) 3% 2-CP groups with regard to quality of analgesia or narcotics administered (Table 1). The majority of patients, 84.2% in the unbuffered 2-CP group and 90.0% in the buffered 2-CP group, rated their postoperative analgesia as good or excellent and the total amounts of supplemental narcotics administered postoperatively in the 24 and 48 hour time periods were not significantly different. One third of the patients in both groups required small doses of narcotics within 6 hours of epidural morphine administration but there was no difference between the 2 groups, 36.8% versus 35,0% in this regard. The patients then went on to experience excellent analgesia. While the incidence of pruritus and nausea was higher in the pH-adjusted group (Table 2), there was no difference in the number requiring treatment. There was no respiratory depression as judged by a respiratory rate of less than ten or routine clinical signs.

Discussion: We found that pH adjustment of 3% 2-CP prior to the application of epidural morphine for cesarean section pain had no effect on the quality or duration of analgesia as had been postulated. Surprisingly, we found good to excellent analgesia in both group of patients. The higher degree of patient satisfaction, and low dose of narcotics administered in the first 24 hours suggests conflict with previous studies. The time to the first supplemental medication in this study is somewhat shorter than that previously reported, (20-22 hrs.), but not nearly as brief a time period as had been claimed. It appears from our data that the failure to promptly treat pain as the 2-CP block recedes, prior to the onset of epidural morphine analgesia, leads to the reported failures of epidural morphine after 2-CP. Th onset of pain relief with epidural morphine may be 45 min. or more with improvement in quality of analgesia occurring up to ninety minutes later. This allows for a "window effect", when postoperative pain is appreciated. If this pain break through is properly treated with small doses of intravenous narcotics than satisfactory postoperative pain relief with epidural morphine can be achieved after 2-CP as the local anesthetic for cesarean section. An alternative technique to "close" this window might be to administer a small dose of epidural fentanyl or sufentanil with the epidural morphine when 2-CP is used for cesarean section or other surgical procedures. The rapid onset of the lipid soluble agent would provide analgesia until the onset of morphine. However, this remains to be investigated.

TABLE 1
QUALITY OF ANALGESIA-POSTOPERATIVE MEDICATION

	POSTOPERATIVE ANALGESIA GOOD TO EXCELLENT	TIME TO FIRST SUPPLEMENTAL MEDICATION (HRS.)	TOTAL SUPPLEMENTAL NARCOTICS IN MORPHINE EQUIVALENT 0-24HRS.	0-48HRS.
UNBUFFERED 3% 2-CP(N=19)	84.2%	16.6±3.1	5.0±1.6	18.6±3.6
BUFFERED(N=20) 3% 2-CP	90.0%	17.5±3.2	5.3±1.5	16.1±2.6

TABLE 2
COMPLICATIONS OF EPIDURAL MORPHINE

	PRURITUS-TREATED		NAUSEA-VOMITING TREATED	
UNBUFFERED 3% 2-CP	29.4%	21.5%	16.7%	10.5%
BUFFERED 3% 2-CP	50%	25%	25%	10%

References:
1) Kotelko DM, Thigpen JW, Shnider SM, Foutz SE, Rosen MA, Hughes SC: Postoperative epidural morphine analgesia after various local anesthetics. Anesthesiology 59:A413, 1983.
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