TITLE: POST-OPERATIVE ANALGESIA WITH CONTINUOUS INTRATHECAL LIDOCAINE INFUSION.

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Continuous spinal anesthesia is a well-established technique that has been revitalized with modern technology.[1] Extension of this technique into the post-operative period for the purpose of analgesia is a natural progression from its intra-operative use. The present study evaluates the safety and efficacy of a continuous intrathecal lidocaine infusion for post-operative analgesia.

Ten ASA III or IV male patients (mean age 68, range 54-86 years), scheduled for major peripheral vascular surgery were enrolled in the study following institutional review and informed patient consent. The patients had an 18 gauge, (five cases) or 28 gauge, (five cases) intrathecal (IT) catheter placed in the operating room and the procedure was conducted under continuous spinal anesthesia. Post-operatively, the catheter was left in situ and an infusion of 0.5-2.0% lidocaine was initiated. The infusion volume (2-10 cc/hour) was individualized for the patient surgery requirements. The patient was monitored in the Intensive Care Unit and allowed free access to parenteral morphine for analgesia. The patient's subjective evaluation of his pain was recorded along with the nurse's objective evaluation of the patient's pain. (both on a scale of excellent/good/fair/poor). The IT infusion was continued as long as the patient was in the Intensive Care Unit.

The mean duration of infusion was 29.1 hours (range 10.5-56 hours). All ten patients rated their analegesia as excellent. (no pain). Eight patients received no parenteral narcotics during the infusion period. Two of the patients were given two doses each of morphine for pain and/or sedation at nursing discretion. All of the nurses rated the ten patients' analgesia and their ability to cooperate with their care was excellent. There were no instances of hemodynamic instability attributed to the lidocaine infusion, nor was there any evidence of lidocaine toxicity. None of the patients demonstrated motor blockade at any time during the infusion period. Two technical problems with occlusion of the infusion pump (with 28 gauge catheters) were encountered, and there was one incidence of disconnection of the IT catheter; however, there was no evidence of adverse sequelae in these three patients. The problem with the infusion occlusion was corrected by conversion to syringe infusion pumps which were better able to provide the increased pressures needed to infuse micro-bore spinal catheters.

Regional anesthesia continued into the post-operative period provides excellent analgesia and may decrease morbidity by providing improved ablation of "surgical stress".[2] While epidural analgesia remains the most common manner in which to achieve these favorable effects, our preliminary data shows that IT analgesia can be safely employed with a high degreee of patient care and nursing acceptance. Further, IT infusions offer an additional safety factor in that markedly smaller doses of drugs (on the order of 1/10 th to 1/15th that needed in the epidural space) can be employed.

In conclusion, the intrathecal infusion of lidocaine for post-operative analgesia was extremely effective and safe in this patient population. There was a very high degree of patient and nursing satisfaction associated with this technique.

REFERENCES:

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TITLE: TITRATION OF pH AND CO_2 PARTIAL PRESSURE IN LOCAL ANESTHETIC AGENTS

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Raising the pH of local anesthetic agents has been demonstrated to decrease the time of onset of regional anesthesia as well as improve the quality and prolong the duration of the block. Addition of carbon dioxide has also been shown to be a useful technique to enhance local anesthetic activity. During clinical usage, sodium bicarbonate is frequently added to local anesthetic agents to produce these effects. We evaluated changes of both pH and carbon dioxide partial pressures in 11 local anesthetic solutions in order to develop titration curves for possible clinical applications. Local anesthetic agents tested included chloroprocaine (1%, 2%, 3%), lidocaine (0.5%, 1.5%), procaine, bupivicaine (0.25%, 0.5%). Agents with epinephrine were also evaluated. Each was divided into a 6 ml alliquot. pH and CO_2 measurements were made by a pHM64 Research pH meter (Radiometer, Copenhagen) and a Corning 168 pH/Blood gas analyzer, respectively, in the standard solution and after each addition of sodium bicarbonate (1mEq per ml). The quantity of bicarbonate added in each step was determined by preliminary pilot titrations. Three samples were tested for each measurement and the mean value taken. Titration curves for both pH and CO_2 partial pressure were determined for each agent. Precipitation occurred in most agents and PCO_2 peaked and then decreased suggesting atmospheric loss. The pH and pCO_2 measured and pH of precipitation occurring (denoted by cloudiness) varied widely between agents. (Table 1) The volume of bicarbonate resulting in precipitation was 32x greater for 1.5% lidocaine than for 0.5% bupivicaine. Titration of pH and pCO_2 of local anesthetics with bicarbonate must be individualized for each agent.

Table 1. Titration of pH and pCO_2 of local anesthetics with bicarbonate

Agent (6 ml. volume)	Base pH/pCO_2	ml. HCO^3 to pH 7.4	ml. HCO^3/ to "clouding"	pCO_2 at pH 7.4	ml. HCO^3/ max. pCO_2
Chloropro-					
caine: 1.0%	3.37/9.9	0.11	0.7	55	0.35/62.1
2.0%	3.41/6.4	0.14	0.38	60.9	0.10/60.9
3.0%	3.37/4.9	0.14	0.34	69.1	0.09/69.1
Lidocaine:					
0.5%	6.23/7.9	0.2	*	26.7	1.00/26.3
0.5% (with epi)	3.54/11.4	0.3	*	47	0.02/65.2
1.5%	6.32/13.5	0.35	0.93	23.1	0.10/24.5
2.0%	6.42/7.9	**	0.19	**	0.05/33.2
2.0% (with epi)	3.79/8.3	**	0.24	**	0.08/40.5
Bupivicaine:					
0.5%	5.39/7.8	**	0.03	**	0.03/27.6
0.5% (with epi)	3.82/4.8	**	0.16	**	0.04/108
Procaine:					
1.0%	3.37/10.7	0.2	*	102	0.19/102

* no clouding
** precipitation prior to pH 7.4