

Title : PROLONGED POST THORACOTOMY ANALGESIA BY CRYOPROBE NERVE BLOCK

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**Introduction.** In order to provide post-thoracotomy patients with profound and prolonged analgesia a method of nerve block using a freezing technique, called cryo-analgesia, was investigated.

**Methods.** Twenty-four patients about to undergo thoracotomy and from whom informed consent had been previously obtained were divided into two groups for postoperative pain relief. Group I, the cryoanalgesia group, had the tip of a specially designed cryoprobe applied to intercostal nerves at the level of the incision plus two above and two below from within the chest by piercing the parietal pleura just prior to closure. Two 30 second freeze cycles were separated by a 5 second thaw for each nerve blocked. The principle of the instrumentation is the instantaneous formation of an "iceball" caused by the rapid expansion of pressurized gas ( $N_2O$ ) through a small orifice. The temperature at the core of the "iceball" is approximately  $-60^{\circ}C$ . The formation of the "iceball" is allowed to occur only after direct contact of cryoprobe with nerve. The control group, numbering 9, consisted of patients who either had intercostal blocks at the end of surgery or received no nerve block therapy at all. Observations concerning pain state, using a scale of from 0 to 10 (0 = no pain, 10 = excruciating pain), forced vital capacity (FVC), and narcotic usage were tallied throughout the hospital course. In addition, long-term follow-up, to six months, was carried out to note any adverse sequelae.

**Results.** Results indicated that cryo-analgesia is an effective tool in eliminating postoperative pain (see Figure 1). There was over a 50% reduction in pain scores in the cryoanalgesia group compared to control group. This was also noted when narcotic medication dosages are compared with about double the amount of morphine required in the first 24 hours postoperatively in the controls versus the cryo-group (see Table I). It should be mentioned that in the cryo-group patients did not experience incisional pain. Almost all of the morphine needs were for subscapular, shoulder and arm pain secondary to the pleura irritation of the chest tubes. Once chest tubes were removed, on the second day in most cases, patient were almost totally pain free in the cryo-group. Disappointingly, forced vital capacity, presented as percent of preoperative values in Table II, did not show differences between groups throughout the first 5 days of the postoperative course. It should be noted that control FVC's were about 15-20% higher than had previously been reported in the literature. The cryo-group also had about a 10% increase. For the most

part, the cryo-group began to wear off within 1 to 2 weeks and in all patients was gone by the 30 day follow-up period. One patient reported a small band of hypoesthesia several months after surgery. It could not be determined if this was secondary to the cryoanalgesia or the trauma of surgery.

**Discussion.** Aside from cryoanalgesia, there are several other methods by which postoperative thoracotomy pain can be handled, the most common being the use of narcotics. In addition to providing less than optimal analgesia, the side effects of narcotics, especially in older patients with respiratory diseases, limits their use. Thoracic epidural block is an effective method for pain relief. In addition to the technical problems of doing the block, hypotension and urinary retention are significant complications. Tachyphylaxis also has been reported to occur. Intercostal blocks provide a moderate degree of anesthesia which is self-limited with reports varying from 2 hours regardless of the agent used to up to 12 hours in some studies with longer acting local anesthetics. Repeating intercostal blocks pose the problem of removing sterile dressings as well as technical difficulties in high thoracotomies. Cryo-techniques on the other hand provide a profound level of analgesia during the entire postoperative anesthetic period with no complications having been noted so far.

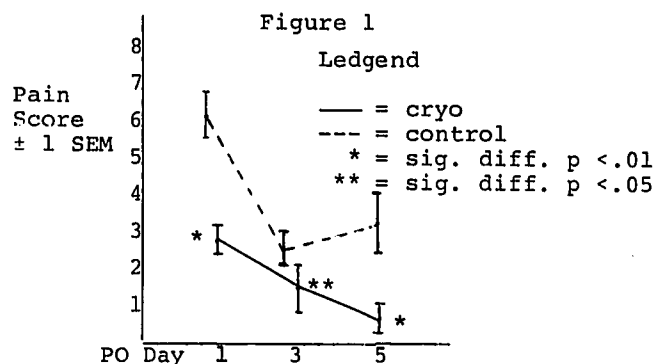


Table I: Narcotic Requirements (Mean ± 1 SEM)

Control	29 mg ±4.5	Difference
Cryo	15 mg ±2.3	Significant
		$p < .01$

Table II: FVC in % of Preoperative Values mean (range)

	Cryo	Control
PO Day 1	50% (19-92)	53% (29-77)
PO Day 3	68% (44-94)	67% (48-85)
PO Day 5	68% (29-100)	71% (34-90)