Title: INTRATHECAL MORPHINE FOR THE TREATMENT OF SPASTICITY

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Introduction. Intrathecal and epidural administration of morphine for the treatment of acute and chronic pain is well established. Preliminary work by Koll[1] investigated morphine's ability to block the nociceptive reflex arc in spinal cats. Subsequent limited clinical investigations by Struppler (1983), Erickson and Lo (1985), and Loubser (1986) studied the effect morphine has on reflex arcs responsible for spasticity in chronic spinal cord injuries. This report on forty patients is a continuation of Erickson and Lo's original study.

Methods. After approval of the study by the Human Research Committee and with informed consent, 40 patients with spasticity due to spinal cord injury were given bolus intrathecal injections of preservative-free morphine in doses ranging between 0.5 mg to 2.0 mg. The patients were then questioned and examined by nursing staff and an independent observer during the 24 hour postinjection period. Changes in spasticity and side effects were recorded. Patients who experienced a favorable response underwent surgical placement of a subcutaneous pump or reservoir to allow continuous intrathecal administration of morphine.

Results. The results are summarized in Table 1. Of the 40 patients who received intrathecal morphine bolus injections, 33 patients (82.5%) experienced some relief of spasticity; 5 had no relief while 2 experienced a paradoxical increase in spasticity. The degree of relief ranged from a mild improvement to complete ablation of spasms. Duration of relief varied from 12 hrs to 36 hrs. There was no apparent correlation between the success rate and the type of spinal cord injury. Incidence of side effects was significant; however, in several patients who received multiple injections side effects often decreased in severity without reducing the dose. No episodes of respiratory depression occurred after the bolus injections. Among the 13 patients who underwent pump placement, one developed tolerance; the remainder (12) have experienced good control of spasticity to date. Typical continuous doses ranged from 1.6 mg/d to 6.2 mg/d. The incidence of major side effects in the pump group decreased gradually with time. All 4 patients who had subcutaneous reservoirs placed experienced satisfactory relief with minimal side effects.

Discussion. The etiology of spasticity following spinal cord injury is not fully understood. Spasticity may result from: 1) interruption of descending inhibitory impulses from supraspinal centers, 2) disruption of influential descending tracts resulting in abnormal connections via sprouting interneurons within the spinal cord, 3) an increased sensitivity of spinal interneurons and motor neurons to transmitter substances.

Animal studies by Koll[1] demonstrated that morphine can inhibit nociceptive post δ and C reflexes while sparing the non-nociceptive Group II and δ reflexes. Struppler[2] showed that in humans morphine inhibits polysynaptic flexor reflex spasms and muscle tone without inhibiting oligosynaptic motor responses or voluntary movements. Baclofen also has been shown to be a potent local inhibitor of spinal reflexes and has been used intrathecally to treat spasticity with much success[5]. Baclofen's inhibitory mechanism is not yet fully understood but studies suggest the drug may hyperpolarize primary afferents and may have the ability to release GABA.

The present study confirms that intrathecal morphine does decrease the severity of spasticity associated with spinal cord injury as previously reported.[3,4] The high success rate (83%) marks the intrathecal morphine technique as a promising new approach in the treatment of chronic refractive spasticity secondary to a variety of spinal cord abnormalities.

Good control of spasms was achieved at low dose levels (<6 mg/d) and tachyphylaxis was infrequent (1 of 17) in the patients who received pumps or reservoirs.

References.

1. Koll W, Et al: The predilictive action of small doses of morphine on nociceptive spinal reflexes in low spinal cats. Int. J. Neuro. Pharmacol. 2:57-65, 1963.
2. Struppler A, et al: The effect of epidural application of opioids on spasticity of spinal origin. Life Sciences 33, Sup. 1:607-610, 1983.
3. Erickson DL, Lo JN et al: Control of spasticity by implantable continuous flow morphine pump. Neurosurg. 16:215-217, 1985.
4. Loubser PG, et al: Control of spasticity with intrathecal morphine. Anesthesiol. 65:A202, 1986.
5. Penn RD, Kroin: Continuous intrathecal baclofen for severe spasticity. 2(8447):125-127, 1985.

Table 1

| Event | Patients n=40 | Injections n=60 | Pump n=13 | Reservoir n=4 |
|---|---|---|---|---|
| Success | 82.5% | 83.3% | 92.3% | 100% |
| Nausea & Emesis | 45.0% | 36.7% | 61.5% | 25.0%* |
| Pruritis | 67.5% | 55.0% | 15.4%* | 0 |
| Urinary Retention | 47.5% | 40.0% | 23.1% | 0 |
| Resp. Depression | 0 | 0 | 0 | 0 |
| Headache | 15.0% | 10.0% | 23.1% | 0 |

All values statistically significant ($p < .05$) except where noted (*).