Comments on the Use of Intraspinal Phenol-Pantopaque for Relief of Pain and Spasticity

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The highly successful use of intraspinal injections of phenol dissolved in iodo-phenylundecylate* for the relief of pain and spasticity10 has been reported in the English literature. We were encouraged by these results and elected to use this agent in selected cases. Our series is small in comparison with those reported by Maher,6-8 Nathan,9 and Brown5,8 but we felt it worth while to report our observations since they differ considerably from the above authors. Brown reported 80 per cent of his patients with pain caused by neoplasm were relieved completely of their pain after phenol-glycerine injections, and only 26 of 46 patients with pain produced by non-neoplastic conditions failed to respond. Our experience with either category is much less encouraging. As a result of this clinical study, we have reproduced the procedure in the laboratory, using cats, and in a subsequent report will offer a possible explanation for the clinical phenomena observed.

Material and Methods

A total of 60 phenol-Pantopaque injections were performed in 30 patients. The injections for spastic paraplegia and for pain in the pelvis and lower limbs were made into the subarachnoid space; injections for high dorsal and cervical pain were made epidurally or subdurally. All injections were controlled radiologically and in all instances the procedure was continued until there was radiographic evidence that all roots that might be innervating painful or spastic areas were covered with dye. A minimum of four and an average of at least six roots were thus treated on one side at each session. The procedure used is that as described by Maher6 and the material was prepared by dissolving phenol crystals in Pantopaque in strengths of 1:5, 1:10, 1:15, and 1:20. Pre- and postinjection neurological examinations were performed on all patients. Results as to relief of pain were evaluated by questioning the patient, his or her family, the floor nurses, when possible the referring physicians, and especially by noting the amount of medication the patient required before and after injection. Results were considered excellent when all pain was relieved for a prolonged period, good when the patient no longer required narcotic for relief, fair when relief was partial, and poor when relief was nil or lasted but for a brief period of time. We have grouped our patients into three categories—somatic pain, pain of visceral or sympathetic origin, and spasticity.

Results with Somatic Pain

Concentrated (1:10) solutions of phenol-Pantopaque were used only in patients with malignancy in whom life expectancy was considered brief and who already were hopelessly bedridden. Exceptions to this were 3 patients with a good life expectancy in whom pain was limited entirely to the “saddle area” and who already had colostomy and “ileal conduit” urinary diversions. Nine patients were treated with the 1:10 solution. A good result was obtained twice, a fair result 3 times, and a poor result in 3 instances. One injection was considered indeterminate as the patient expired 5 days after injection.

One of the poor results with 1:10 phenol occurred in a female with carcinoma of the cervix who 2 years previously had obtained excellent relief of perineal pain with a subarachnoid injection of alcohol. As her malig-
nancy progressed, pain recurred in the perineum. She was injected with 1:10 phenol and on this occasion relief lasted only 4 hours. The following day she was re-injected with absolute alcohol and obtained excellent relief of pain which lasted until the time of her death 6 months later. It would appear, at least in this instance, that alcohol has a better penetration of roots than phenol-Pantopaque.

The possible delayed action of phenol-Pantopaque and the interim phase of reversibility of the induced lesion were well demonstrated in a patient in whom 1:10 phenol-Pantopaque was confirmed radiologically to rest in the caudal dural sac, below the lumbosacral joint. Approximately 90 min. after the injection, when the patient changed from a sitting to a supine position, weakness and numbness developed in the lower extremities. He immediately was placed erect and within a few minutes these symptoms had subsided.

Complications following injections of 1:10 phenol could not be appraised as this strength was used only in cases in which severe neurologic deficit already was present. In 1 successful injection for pain in the “saddle area”, resulting from pelvic carcinoma, no sensory loss could be demonstrated in the perineum.

A concentration of 1:15 phenol-Pantopaque was used for 10 injections in 8 patients. Six of these were patients suffering a recurrence of pain after injections of 1:20 phenol. Seven injections resulted in partial or “fair” relief. In 3 instances pain was unchanged or relief lasted only a brief period. One patient with carcinoma of the cervix had been relieved of pain in the right hip and leg with a unilateral cordotomy but did not respond to 1:15 phenol which was injected for pain in the left hip and leg which became apparent soon after her cordotomy. In this instance there is little doubt that cordotomy was the superior method of relief of pain. One individual was relieved of the constant ache of metastatic disease of the hip but continued to suffer excruciating pain whenever this member was moved. Two injections were followed by complaint of numbness in the affected limbs and each time hypalgesia and hypesthesia were demonstrable for several days after the injections.

A concentration of 1:20 phenol was employed for 19 injections in 10 patients and was of questionable or no benefit in 17 instances. Two patients had initial relief of pain, but each suffered a recurrence within 1 month. One of these is a patient with Paget’s disease who had pain and hypalgesia in the 4th lumbar dermatome bilaterally and in whom the L3-L4 intervertebral foramen was narrowed by Paget’s disease. The sleeves of the 2nd through 5th lumbar roots were shown to be filled with phenol-Pantopaque at the time of his treatment. Immediate relief without increased sensory or motor loss occurred at the time of injection, but when seen a month later pain had recurred. Another patient in this group had undergone nephrectomy for renal stones on two occasions. He suffered intractable pain in and about the incisional scar. On three separate occasions he was injected subdurally with 1:20 phenol-Pantopaque with good relief, only to have recurrence of the pain in each instance within 30 days of the injection.

There was but 1 adverse reaction in this group. This was an individual who suffered numbness of the leg and loss of ankle reflex for 4 days following a subarachnoid injection of 1:20 phenol.

The group treated for somatic pain consisted of 15 patients with malignancy and 6 with benign conditions. Only 1 of the latter group was relieved of his pain for longer than 30 days. This occurred in a rodeo rider who suffered pain in the dorsal region secondary to traumatic osteoarthritis of the spine. The relief of pain following an extradural injection of 1:20 phenol has now lasted 9 months. Only 3 patients with malignancy are alive at the time of this writing. One received no benefit with 1:10 phenol and was relieved subsequently with an alcohol injection, the second patient has remained comfortable 12 months following subarachnoid injection of 1:10 phenol, and the third patient obtained only temporary partial relief of pain with 1:15 phenol. This latter patient was relieved
subsequently of his pain by a high cervical cordotomy.

**Results with Pain of Visceral or Sympathetic Origin**

There were 3 patients in this category. One individual suffered reflex sympathetic dystrophy following trauma to the arm. She was injected twice with 1:20 phenol in the cervical and upper dorsal spine and obtained partial relief of pain. Another suffered a causalgic-like syndrome as a sequela of a frozen hand. Pain had recurred approximately 18 months after a preganglionic sympathectomy of the 2nd and 3rd thoracic roots. Neither his pain nor tolerance to the tests with cold was altered by a subdural injection of 1:20 phenol covering the lower cervical and upper dorsal spine. This individual suffered numbness of the left side of the face and a diminished gag reflex for 24 hours following accidental entrance of approximately ½ cc. of the injectate into the posterior fossa. Relief following a stellate ganglionectomy has persisted for 8 months at the time of this writing.

One individual with visceral pain caused by metastases to the liver was not helped with a subdural injection of 1:20 phenol covering almost the entire thoracic cord.

Table 1 summarizes our results in the treatment of pain with phenol-Pantopaque injections.

**Results with the Treatment of Spasticity**

This group can be divided into those with total and permanent spastic paraplegia, and those in whom a partial lesion is present. We have treated 3 individuals in each group. A total of 22 graded injections have been made into the subarachnoid space. The 3 patients with total paraplegia responded well to concentrated (1:5) phenol. In the group with partial lesions spasticity and flexor spasms were interfering seriously with attempts at rehabilitation. We had hoped to relieve the spasticity by affecting the gamma- efferent fibers without destroying whatever residual function was still present. An attempt was made to accomplish this by starting with dilute (1:20) injections and gradually increasing the strength of the injectate as spasticity recurred. Sixteen injections were given to this group of 3 patients: 1:20 phenol gave very brief relaxation; 1:15 phenol gave dramatic relief without increasing neurologic deficit but within 24–48 hours the full degree of spasticity had recurred; 1:10 phenol gave relaxation which lasted several months, but only at the cost of increasing the pre-existing neurologic deficit. It would appear from these observations that permanent relief of spasticity can be accomplished only by total and permanent destruction of the entire involved roots, and 1:10 phenol does not appear capable of this. A 1:5 concentration likely would give a total chemical rhizotomy but we have not used this strength in the treatment of partial lesions.

**Discussion**

Alcohol has long been employed as an agent for achieving chemical rhizotomy. The undesirable aspects of alcohol are (a) a non-discriminate destruction of the roots, (b) the effect often is not long lasting, (c) it is somewhat unsafe to use except in the caudal dural sac, and (d) on occasion the alcohol itself has been incriminated as the cause of a painful
neuritis or arachnoiditis. It had been hoped that phenol-Pantopaque might circumvent these disadvantages, but in our experience it has been only partially successful.

The advantages of phenol-Pantopaque are that its site and extent of injection can be controlled easily and verified roentgenologically, there have been no systemic or meningitic reactions as employed here, and no instances of a painful chemical neuritis have occurred. We have employed as much as 9 ml of a 1:5 concentration in the extradural space without noting meningitic or systemic reactions. Another advantage of this method is that the injection can be repeated as necessary when symptoms recur, it being necessary only to remove the residual Pantopaque from the prior injection. The chief disadvantages to the agent are the relative nonspecificity of its action on various fiber-size groups and function, and the temporary effect it has in alleviating pain and spasticity. We have not found it possible to relieve spasticity permanently without destroying whatever residual function is present in partial spinal-cord lesions, and only occasionally to achieve long-lasting relief of pain without inducing neurologic deficit. In spite of these disadvantages, we feel phenol-Pantopaque has been a useful adjunct to the neurosurgeon’s armamentarium. In selected cases of complete paraplegia with spasticity and in ill patients suffering the severe pain of terminal malignancy, this agent may serve a useful role.

Summary

1. Experience has been gained in the use of phenol-Pantopaque by observing the results of 60 injections administered in 30 patients.
2. Our observations indicate that 1:5 phenol-Pantopaque will give prolonged relief of the spasticity of paraplegia, but only at the cost of destroying any residual function. Lesser concentrations give only temporary relief for it would appear that gamma-efferent fibers cannot be destroyed completely without also destroying some large fibers in the same roots.
3. A concentration of 1:15 phenol-Pantopaque is relatively safe for controlled subarachnoid injection for relief of pain. A partial (but never complete) relief of pain occurred with 7 of 10 injections, but unfortunately the period of relief was often short-lived. The exact duration of partial relief is difficult to estimate as some of the patients expired within 2 to 3 months of injection and in others recurrence of pain occurred gradually to its pre-treatment severity.
4. Further search for a more effective agent is indicated. As yet selective chemical rhizotomy is not as reliable as cordotomy for relief of pain in those patients with at least 6-months life expectancy.

Addendum

Since submission of this manuscript, Mark et al. have reported their experience with this agent in the New England Journal of Medicine, 1962, 267: 589–593. Their results for relief of pain are similar but somewhat better than those reported above.

References