THE USE OF INTRATHECAL PHENOL FOR MUSCLE SPASMS IN MULTIPLE SCLEROSIS

A description of two cases

R.A. BROWNE AND D.V. CATTON

MULTIPLE SCLEROSIS is a distressing condition usually starting in young adult life and slowly progressing to marked disability and eventual confinement to bed due to muscle spasticity. There may be severe pain associated with the spasms so that the patient's life is misery. It is the purpose of this paper to describe two cases which were referred to the Pain Clinic in Hamilton. Both of these cases were treated with intrathecal phenol.

Case 1. (J.M.) Female, age 31 years.

In 1961, at 19 years of age, she first noted dragging of her right foot while walking. This lasted for approximately three hours, then disappeared.

Four months later the patient noticed slowly progressing incoordination as well as weakness of both her lower limbs. This slowly progressed so that six years later (1967) she required two canes for walking, and seven years after the onset of symptoms (1968) she required a wheelchair.

In 1971 she first noticed increasing tiredness of the arms. In August 1972, spasms of the muscles of the lower limbs started and these gradually increased in intensity.

In January 1973 the patient received motor point blocks¹ of the gastrocnemii, adductors and hamstrings of both legs with temporary improvement in the spasticity. The improvement, however, was short-lived and over the course of the following few months the patient's general condition deteriorated markedly. She now had severe spasms of the abdominal muscles, the ileopsoas, adductors, hamstrings and gastrocnemii of both legs.

She also had urgency of the large bowel especially when sitting.

The patient was referred to the Pain Clinic and admitted to hospital on July 21, 1973. On examination the following significant signs were elicited:

1. Horizontal nystagmus.
2. Bilateral temporal pallor of both fundi.
3. Weakness of the muscles of both upper limbs with normal sensation to pain and touch.
4. Marked spasm of the adductors and flexors of both lower limbs especially when stimulated. These spasms appeared to be painful. Touch sensation was retained in the lower limbs.

Figure 1 shows the position of her limbs at that time.

AIM OF TREATMENT

The aim of treatment was to convert the spastic paralysis to a flaccid paralysis,

Department of Anaesthesia, Hamilton Civic Hospitals and McMaster University.

FIGURE 1. Patient #1. Position of the legs before intrathecal phenol.

so that her limbs could be extended and she could sit in a wheelchair. This would achieve three things:

1. Allow her to propel herself since she still had good muscular power in her arms.
2. Prevent the painful spasms that were constantly occurring and exhausting her, making life unbearable.
3. Allow access to the perineum for proper hygiene and care of bowel and bladder.

Bladder and bowel control were weak and it was realized that all control of these functions would probably be lost by the block. The patient was prepared to accept this.

METHOD

July 19, 1973. A spinal anaesthetic using 10 mg hyperbaric tetracaine was carried out at the L_{2-3} interspace, to allow the patient to appreciate the degree of muscular relaxation that would be obtained with a more permanent phenol block.

July 20, 1973. 0.5 ml 10 per cent phenol in glycerine was injected in the L_{2-3} interspace with the patient in the left semi-prone position in order to obtain a motor block of the left leg muscles.

July 21, 1973. 0.5 ml 10 per cent phenol in glycerine was injected with the patient in the right semi-prone position at the same level.

FIGURE 2. Patient #1. Legs after the intrathecal phenol blocks.

RESULTS

Results are shown in Figures 2 and 3. Both legs could now be extended well at the hips and to approximately 120° at the knees.

Physiotherapy was instituted in order to obtain full extension at the knees, and this was achieved after a few days.

The patient returned home and was able to use a wheelchair. The spasms and pain in the legs had been relieved.

A permanent Foley catheter was *in situ* in the bladder on discharge.

The patient learned to evacuate her rectum using a gloved finger each morning, since she had no rectal sensation, and managed satisfactorily at home with the aid of a home help and her husband.

December 11, 1973. Return of spasms in legs, but now painless. Abduction of both hips still satisfactory, but moderate spasm of flexors. 0.5 ml intrathecal 10 per cent phenol was injected on each side at the L_{2-3} interspace with good results.

May 11, 1974. Phenol block repeated as flexor spasms recurred in left leg. Good result obtained. Her right leg was still flaccid and required no further treatment.

Case 2. (B.P.) Female, age 41 years.

History of multiple sclerosis for 18 years. Over the previous year marked flexor and adductor spasticity had developed in the lower limbs.

Motor point phenol block of the hamstrings, adductors and hip flexors was con-

FIGURE 3. Patient #1. Legs after the intrathecal phenol blocks.

templated, but the idea was abandoned as being too extensive a procedure and due to uncertainty that it would achieve adequate block of so many muscles.

The patient had a neurogenic bladder and no active muscles in her lower extremities. Also, progressive bulbar involvement was present.

She was transferred to the Pain Clinic in Hamilton in an effort to convert her spastic paralysis to a flaccid paralysis. She could no longer use a wheelchair and she was very distressed by the frequent painful muscle spasms in her lower limbs. Figure 4 illustrates the position of her legs.

TREATMENT

December 13, 1972. A spinal anaesthetic was given with 8 mg hyperbaric tetracaine. This resulted in almost full extension of the legs at the hips. The knees

FIGURE 4. Patient #2. Legs before intrathecal phenol block.

could be passively extended to 90° but abduction of the thighs was limited due to continued spasm of the adductors. Thus there was very little knee separation.

December 15, 1972. Painful spasms were present in both legs. An intrathecal puncture was carried out at L_{2-3} (confirmed by X-ray). 0.75 ml 5 per cent phenol in glycerine was injected in the right semi-prone position, then 0.75 ml 5 per cent phenol in glycerine with the patient in the left semi-prone position after an interval of 40 minutes.

RESULTS

Mild muscle spasms were still present in the right leg and more marked spasms in the left leg, but they were now painless and the patient was more comfortable. Her knees could now be better separated and extension of the legs at the knee joints to 90° was achieved. It was obvious that further treatment would be required.

FIGURE 5. Patient #2. Leg after the block.

December 18, 1972. 0.75 ml 20 per cent phenol in glycerine was injected intrathecally on each side at L₂₋₃ level with the patient in the right, then left semi-prone positions. There was an interval of 40 minutes between injections and this resulted in moderate improvement on both sides.

It was now decided that the right leg was satisfactory.

December 21, 1972. On the left side 1 ml 20 per cent phenol in glycerine injected at L₂₋₃ intrathecally. No improvement.

December 23, 1972. On the left side 1 ml 20 per cent phenol in glycerine injected at L₁₋₂ intrathecally. No improvement.

RESULTS

Right leg was satisfactory without spasms. Spasms were still present on stimulation in the left leg, but these were painless.

It was now considered that further improvement in her left leg would not be obtained by injections. Tenotomy was considered for the left side to release contractures, but the patient refused to have this operation.

With physiotherapy, the right leg in a matter of days was fully extended at the knee and the muscles were flaccid. The left leg still had slight spasms of the adductors and flexors but could be extended to 90° at the knee. The patient was now satisfied since she could sit in a wheelchair for 1-2 hours daily and could propel herself.

Figure 5 shows the patient's legs following the phenol blocks.

December 26, 1972. Patient discharged to a chronic hospital where she died in June 1973 due to bulbar paralysis.

DISCUSSION

In multiple sclerosis the stretch reflex which is responsible for muscle tone is altered. This becomes exaggerated and increased out of all proportion. Muscles that are normally inactive at rest are now in a continual state of increased tone. Involuntary movements of the limbs occur and these may become violent and be accompanied by continuous pain which is increased during flexor, adductor or extensor spasms. Paraplegia-in-extension develops, and eventually this progresses to paraplegia-in-flexion when the limbs become fixed in flexion and adduction. This indicates a more complete interruption of conduction of the descending impulses in the cord and an approach to total separation of the cord below the level of the lesion from higher levels of the nervous system.

Both of these patients presented with this extreme disability and were confined to bed. An attempt was made to convert the spastic paralysis into a flaccid paralysis. The needles were introduced intrathecally as far forward as possible in an attempt to block the anterior nerve roots. The reasons for this were threefold:

1. To relieve the spasms and so allow the use of a wheelchair.
2. To relieve the pain which was constant.
3. To allow access to the perineum for the care of bladder and bowel.

It was realized that any residual degree of control of bladder and bowel function would be abolished. At any rate, these were already grossly deficient.

In the management of lesser degrees of spasticity the following forms of treatment have been advocated (Figure 6):

1. Drugs
2. Nerve blocks – (a) sensory
(b) motor
3. Surgery – (a) partial posterior rhizotomy
(b) selective tenotomy
4. Physiotherapy

Drugs

Drugs should be tried initially during the earlier stages of spasms, since the relief of pain and spasms should not be achieved at the expense of considerably limiting the patient's freedom and activity. The assessment of treatment for the ambulant spastic requires a great deal of experience and clinical acumen.³

Relief of pain in the early stages can be achieved by drugs such as acetylsalicylic acid or codeine.

Drugs which reduce muscle tone may also be helpful, notably mephanesin, diazepam and chlorpromazine. A recently introduced drug baclofen, which affects polysynaptic transmission in the spinal cord may be helpful. It acts on the gamma fibre system by presynaptic inhibition.⁴ This results in reduced spasm of voluntary muscles, leading to a subsequent increase in motor power.⁵

Nerve Blocks

(a) Sensory-Specific measures are directed at abolishing muscle spasm and pain by reducing afferent sensory stimulation. Individual nerve blocks of the sciatic or

FIGURE 6. Possible methods of treatment for spasticity of the lower limbs.

obturator for adductor spasms which limit walking and perineal for rectal and bladder complications are useful in isolated cases.³

Extensive sensory block by intrathecal phenol or alcohol may be carried out to reduce the sensory input, without weakening important muscles. Five to ten per cent phenol in glycerine is recommended by Mehta.³ Repeated injections may be required to achieve the desired result and volumes of 0.5 ml or less are administered on each occasion. Adductor spasms are improved by injection of the upper four lumbar roots, whereas paraplegia-in-flexion requires blocks of several segments over a wide area. Paraplegia-in-extension requires block of L₄₋₅ and S₁.³

Many patients are incapacitated by the increase in tone rather than by weakness and in some a surprising amount of voluntary power has been unmasked by its reduction.⁶

In cases of severe disability with paraplegia-in-flexion and frequent painful muscle spasm, permanent destruction of the anterior nerve roots with phenol in glycerine is advocated using concentrations as high as 20 per cent. One ml affects seven to eight roots, 0.75 ml affects four to six roots and 0.5 ml affects two to three roots.⁷ To prevent flexion of the lower limb on the pelvis it is necessary to denervate the psoas muscle by destroying L₁₋₂₋₃ anterior roots. To prevent adduction requires the destruction of L₃ and L₄ roots. The roots of L₅, S₁ and S₂ are blocked to

paralyze the hamstrings and this may result in sphincter paralysis. Both of our patients suffered this complication.

Ball, Pearce and Davies⁸ found that using phenol and glycerine for spasticity their results were: a remission rate of 50 per cent, considerable improvement in 37.5 per cent and moderate benefit in 12.5 per cent.

Halpern and Meelhuysen¹ have described a method for accurate location of sensitive areas in affected muscles, these trigger zones being treated with aqueous phenol. Small volumes of 0.1 to 0.2 ml of a 3 per cent to 7 per cent solution are injected into these focal points until the muscle no longer responds to electric stimulation.

Selective nerve block with dilute aqueous phenol has also been described.^{9,10,11}

The authors advocate the use of a specially insulated needle which could transmit a small electric current. Two to three per cent aqueous phenol is used to a total of 3.0 ml phenol. This is called motor point block and is very useful in treating spasms.

Awad¹² has described two techniques utilizing an electrical stimulator to block branches of the obturator nerve to control hip adductor spasms and also blocking with phenol the psoas major muscle to control hip flexion.

Surgery

(a) Partial posterior rhizotomy has been suggested by Dimitrijevic and Nathan¹³ to reduce the sensory input. They state that this is preferable to the total division of the nerve root because it avoids complete loss of sensibility and pseudo-paralysis which occurs when all afferent impulses are blocked.

(b) Tenotomy – after a prolonged period of spasticity, even when the spastic paralysis has been converted to a flaccid paralysis, contractures of muscles may have occurred, and selective tenotomy be required to increase the degree of extension and abduction of the lower limbs. This is carried out after physiotherapy has stretched the affected muscles to the fullest possible extent.

Physiotherapy

This is important to promote full extension and abduction of the lower limbs. In the patients described this was carried out daily after chemical neurectomy. In spite of this, in the first patient, the phenol blocks had to be repeated after a few months because of return of muscle spasms.

SUMMARY

Two cases of multiple sclerosis are described, in both of whom the disease started in young adult life. This disability gradually progressed to the stage of paraplegia-in-flexion in which the lower limbs were fixed in adduction-and-flexion. Both patients developed painful muscle spasms which made life intolerable.

These patients were treated by intrathecal phenol in glycerine in an effort to convert this spastic paralysis into a flaccid paralysis. The three advantages sought were:

1. To relieve the muscle spasms so that the patient could sit in a wheelchair and propel herself.

2. To relieve the pain of the spasms.
3. To allow access to the perineum for proper hygienic care of bladder and bowel function.

The first patient obtained an excellent result (Figures 1, 2, 3) but blocks had to be repeated after approximately five months.

The second patient after the block developed a good result in the right leg, but still had mild, but painless spasms in the muscles of the left leg (Figures 4 and 5). However, she was able to use a wheelchair and was discharged to a chronic hospital where she died of bulbar paralysis six months later.

Intrathecal phenol thus appears to be a useful method for relieving muscle spasms and pain in the lower extremities in advanced cases of multiple sclerosis.

RÉSUMÉ

Les auteurs rapportent deux cas de sclérose en plaques ayant débuté tous les deux cas chez des jeunes femmes au début de l'âge adulte. Dans les deux cas, la pathologie a évolué vers une paraplégie en flexion avec fixation des membres inférieurs en flexion et adduction. Les deux patientes présentaient de douloureux spasmes musculaires qui leur rendaient la vie intolérable.

Dans le but de transformer ces états de paralysies spastiques en paralysies flasques, on a procédé à des injections intra-rachidiennes de phénol dans la glycérine. On cherchait ainsi à:

- (1) Faire disparaître l'état de spasticité musculaire pour permettre à ces malades de s'asseoir et de se mouvoir en chaise roulante.
- (2) Faire disparaître les douleurs causées par les spasmes.
- (3) Faciliter l'accès au périnée pour raisons d'hygiène vésicale et fécale.

La première malade obtint un excellent résultat bien que l'on ait eu à répéter les blocages au bout de cinq mois.

Chez la seconde malade, le résultat fut excellent du côté droit, mais un état spasmodique léger et non douloureux persista au niveau du membre inférieur gauche. Cette patiente a quand même pu utiliser une chaise roulante et a pu être transférée à une institution pour malades chroniques où elle est décédée d'une paralysie bulbaire six mois plus tard.

L'administration intra-rachidienne de phénol semble une technique utile pour soulager les spasmes musculaires douloureux des extrémités inférieures dans les cas de sclérose en plaques.

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