

# REVIEW ARTICLE

## Phenol block for spasticity management

## Bloqueios com fenol para tratamento de espasticidade

*Paulo Cesar Trevisol-Bittencourt<sup>1</sup>, Marcelo B. Tournier<sup>2</sup>*

### ABSTRACT

Peripheral blocks with botulinum toxin (BoTN) and phenol are the treatment of first choice in the management of focal spasticity. This review will focus on phenol blocks, presenting some historical aspects, principles of action, main indications and the clinical applicability of this substance. The purpose of this review is to remind that, when its indications are respected, phenol has shown a good balance between efficacy and safety. Since it is an extremely low-cost drug, phenol should be considered as the ideal agent for large-scale use in resource-poor rehabilitation centres.

### KEYWORDS

phenol, muscle spasticity, nerve block

### RESUMO

No tratamento da espasticidade focal, os bloqueios periféricos com toxina botulínica (TB) e com fenol são os preferidos. Os bloqueios com fenol são os assuntos de interesse desta revisão, que mostra alguns aspectos históricos, princípios de ação, principais indicações e a aplicabilidade clínica desta substância. Ela tem o propósito de relembrar que o fenol, quando respeitada suas indicações, tem mostrado boa relação entre eficácia e segurança. Desde que é uma droga de baixíssimo custo, deveria ser considerada como agente ideal para uso em larga escala nos serviços de reabilitação carentes de recursos econômicos.

### PALAVRAS-CHAVE

fenol, espasticidade muscular, bloqueio nervoso

1 Neurologist, President of the Study Centre of University Hospital, Federal University of Santa Catarina and Associate Professor of Neurology, Department of Clinical Medicine, Discipline of Medicine, Federal University of Santa Catarina

2 Physiatrist, Institute of Physical and Rehabilitation Medicine – Umarizal Rehabilitation Centre / HCFMUSP

### CORRESPONDING AUTHOR:

Rua Guaramembé 589  
Jardim Umarizal – São Paulo / SP  
Cep 05756-350  
E-mail: dr.tournier@gmail.com

## INTRODUCTION

Spasticity is defined as a motor alteration characterized by muscle hypertonia and hyperreflexia – both depending on the speed of muscle stretching movement – associated to other clinical conditions decurring from upper motor neuron injury. Such injuries may be caused, among other factors, by rachimedullary/encephalic traumas, brain infarction/haemorrhage, neurodegenerative disorders and cerebral palsy.<sup>1</sup>

When the patient presents a pattern of spasticity that implies on functional or postural loss, management of spasticity must be considered within a progressive approach – from the most conservative to the most invasive therapy.

The most primary approach consists on improving the patient's posture and positioning, as well as removing or treating any harmful factor (such as pressure sores, obstipation, infections etc.). After that, physical therapy is employed as prophylaxis to deformities caused by chronic contractures as well as to promote tonus relaxation. The use of physical agents for management of spasticity have shown some positive results, but studies have neither quantified this improvement nor determined its efficacy so far.<sup>1,2,3,4</sup>

The use of muscle relaxant drugs (such as baclofen, diazepam, tizanidine, dantrolene) is usually considered for spasticity with severe impairment in global motor function.<sup>1,3</sup> Intrathecal drug administration or surgical (orthopaedic and/or neurosurgical) approach is reserved to select and refractory cases.

The use of peripheral blocks to treat focal spasticity can be done by injecting phenol, alcohol, anaesthetics or botulinum toxin to nerve branches or motor points.<sup>3</sup> Despite its growing popularization, botulinum toxin continues to be the object of several studies in order to delimit its efficacy and safety.<sup>5</sup> However, phenol usage as neurolytic agent still has several indications and unequivocal virtues.

## HISTORY

Although phenol has been used as a neurolytic agent for more than 50 years, it was firstly used as a sympatholytic agent, when its clinical applicability was discovered in 1926. Later on, intrathecal and epidural phenol injections began to be used for intractable oncologic pain.

Initially phenol for spasticity was administrated via intrathecal, presenting high morbidity and complication rates. However, in 1966, a study describing motor point blocks in 39 subjects showed lessening of spasticity for an average period of six months. And, by the same time, reports on infiltration of peripheral nerves evidenced reduction of spasticity for a similar period.<sup>3,4</sup>

Botulinum toxin began to be used for management of spasticity by the end of the 20th century. Its easier usage, the smaller rates of painful complications and the strong commercial appeal from pharmaceutical companies resulted on a strong restriction to indications of phenol for management of spasticity nowadays.<sup>1</sup>

## PRINCIPLES OF ACTION

Injection of phenol to a nerve trunk produces chemical axonotmesis on nerve tissues for its dissolving properties directly to axonal membranes and to myelin without affecting endoneural

tubes.<sup>3,6</sup> The immediate effect after injection is anaesthesia of gamma fibres that, according to Granit, are hyperactive on spastic subjects (due to loss of inhibition of pyramidal cells on these neurons). According to some authors, phenol would act selectively on gamma fibres only, causing deactivation of muscle fuses and inhibition of muscle stretching reflex. However, histological studies in animals demonstrated the occurrence of neurolysis not only in gamma, but also in I-a and alpha fibres as well.<sup>1,6,7</sup>

These other fibres are responsible, according to Delwaide, for the disharmony in contraction and relaxation control of agonist and antagonist muscles, as they lose control of spinal inhibiting circuits which, in turn, are controlled by upper motor neuron usually injured in subjects with spasticity.

After a few weeks or months axons are regenerated, and there is subsequent reinnervation of myoneural junction and fibrotic alterations on the site of injection.<sup>1,7</sup>

## APPLICABILITY

### Indication

The use of phenol for spasticity is recommended, mainly, for cases of motor nerve neurolysis (table I). Although cutaneous-muscle nerve presents some relevant sensitive functioning, the occurrence of dysesthesias is rare, probably due to the fact that C-fibres are amyelinic and have thick calibre (and, therefore, would hardly ever be dissolved by phenol). Application in nerves with relevant sensitive representation (median nerve, for instance) is only recommended for patients with no sensibility in that site (for instance, SCI patients).<sup>1,2,3,6,7</sup>

Chart 1  
Main motor nerve branches for application of phenol.

NERVE OR NERVE BRANCH	AFFECTED MUSCLE GROUP
Muscle-cutaneous nerve	Elbow flexors
Anterior branch of obturator nerve	Thigh abductors
Motor branch of sciatic nerve	Knee flexors
Femoral Nerve	Knee extensors

Phenol injection to muscle motor points is utilized for more focal cases of spasticity, such as abductor muscle of thumb that, when affected, may cause difficulties both to manual function and to hygiene. Motor point is defined as the point where a larger concentration of myoneural junctions is located in a muscle. Many of these points coincide with the sites where electrodes are placed for electroneuromyography.

### Contraindications and adverse effects

Application of phenol is unadvisable for peripheral nerves with relevant sensitive representation, due to risk of painful dysesthesias (about 10 to 30% of these cases). Main contraindications are: poor general health condition, alterations in blood clotting, poor skin conditions on the site of injection and presence of irreducible

muscle contractures (in this case, surgical stretching would be recommended). Repeated phenol injections on the same site may cause fibrosis, therefore “encapsulating” the nerve or motor point and causing difficulties in application and decrease of efficacy in muscle relaxing.<sup>1,3,7</sup>

Most common adverse effects immediately after application are pain and hyperaemia with oedema on the injected site. Other less common adverse effects are dizziness, nausea, regurgitation and muscle weakness. Higher doses or application in sensible individuals may cause symptoms similar to alcoholic intoxication. Accidental intravenous injection may cause tremor, convulsions, necrosis of the vascular wall, cardiac and respiratory arrest. Lethal dose of phenol is about 8.5 grams, ensuring its safety since a 5% phenol solution contains 0.05 g in one millilitre; however, a dose higher than 15 ml is almost never used in patients.<sup>1</sup>

### Advantages and disadvantages

Considering its proved efficacy, the first and most remarkable advantage of phenol is its cost. The cost of its presentation as 5% phenolized solution is about one to two hundred times smaller than the cost of an application of botulinum toxin with the same objective. This fact is strongly relevant when we consider the economic frailty of public health services in Brazil, where the general rule is abundance of patients and lack of economic resources. For these reasons the indication of botulinum toxin should be reserved to those situations that really require its use. However, we should not ignore other virtues of phenol such as its prolonged effect and its immediate effect on muscular tonus relaxation. Besides, another peculiarity of phenol is that it does not induce antibody production and it does not require an interval between nerve blocks.

However, we acknowledge that its effect will be transient in some few patients; in some cases, the relaxation effect will last only two days. Such phenomenon, although not fully cleared, is apparently not related to the amount of dose used.<sup>1,2,3</sup>

### Administration

Among the presentations and concentrations of phenol available we may find solutions of 3% to 5% in water, glycerine or oil (in crescent order of local potency), with 3% - 5% phenolized water as the choicest solution.<sup>3</sup>

There are several techniques for the application of phenol. One of the original ones is to block a peripheral nerve or motor point, located with the aid of an electrostimulator attached to a needle coated with Teflon. Application to motor branches can also be done directly to the surgically-exposed nerve. In clinical practice, it has been observed difficulties with application of phenol with electrostimulator in children, since they usually do not collaborate for the procedure. In such cases, this procedure can be done with the administration of inhaled anaesthesia in a surgical centre in order to ensure its precision and efficacy.<sup>1,2,3,4,7</sup>

When using electrostimulation it is recommended that the intensity of electric current be as small as necessary (between 0

and 1 mA) to locate nerve branches, in order to avoid false positive results caused by higher stimuli to muscle motor points. It is also extremely important that the needle be isolated, in order to avoid dispersion of electric current and consequent activation of other points but, instead, delivering electric current only at its edge, ensuring precision to the local of injection.<sup>8</sup>

The amount injected per point is variable. Literature mentions doses ranging from 0,1 to 5,0ml but, in daily clinical practice, it is observed the smaller dose to produce ablation of the effect of needle. For longer-lasting or more potent effects, a dose higher than the minimal could be infiltrated.<sup>1,3</sup>

In case of doubt about the benefit of blocking a nerve branch, a previous block using lidocaine is recommended. Such action allows temporary observation of the effect of muscle tonus relaxation and increases the therapeutic safety of this procedure.<sup>3</sup>

### CONCLUSION

Neurolytic block with phenol, when adequately indicated, is a tool that presents excellent cost-benefit relation, high margin of safety and rare complications, especially when administered by well-qualified professionals.

However, we have to emphasize that many patients are “trained” to use spasticity to their benefit, as a substitute for muscle strength to stand up, to deambulate or when they want to maintain or change their posture. Therefore, a criterional functional evaluation about who this person is and what are their activities in daily life is mandatory, so that we may not identify in spasticity an “incorrigible villain”.<sup>7</sup>

### Acknowledgements / Dedication

This work is dedicated to Charles Mingus (22/04/1922 – 05/01/1979). He left a formidable legacy of songs and a sentence that inspired us by its idealization: “Making the simple complicated is commonplace; making the complicated simple, awesomely simple, that’s creativity.”

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