Phenol Neurolysis for Spasticity

Mark Gormley, Jr., MD
Pediatric PM&R
Gillette Children’s Specialty Healthcare
St. Paul, MN
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Phenol

Carbolic Acid / phenyl alcohol
C₆H₅OH
Crystalline white solid, Commercial liquid
Keep away from light

- Initially isolated from coal tar in 1834
- Primarily man-made
- Used in adhesives, construction, automotive and appliance industries
- Nylon fibers
- Disinfectant
- Medical
  - Local anesthetic
  - Neurolytic
  - Chemical face peel
History of Phenol in Medicine

- Antiseptic
  - Sir Joseph Lister – used phenol for antiseptic surgery - 1867, Lancet

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
<th>Recovered</th>
<th>Died</th>
<th>Dth Rate</th>
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<tbody>
<tr>
<td>1864-66</td>
<td>35</td>
<td>19</td>
<td>16</td>
<td>45.7%</td>
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<tr>
<td>1867-70</td>
<td>40</td>
<td>34</td>
<td>6</td>
<td>15%</td>
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www.historylearningsite.co.uk/joseph_lister.htm
History - continued

- Auschwitz – World War II
  - Most medical of all Auschwitz killing methods - intracardiac phenol inj - death within 15 sec
Phenol in spasticity-history

- Earliest use of phenol for spasticity - by intrathecal route
  - Nathan, 1959 and Kelly, Gautier-Smith, also 1959 simultaneously reported intrathecal injections for relief of spasticity.
- Nerve Blocks with aqueous phenol - Khalili and colleagues in 1960’s
- Phenol motor point blocks – Halpern and Meelhuysen in 1965
Distribution of axonal destruction after dripping phenol onto a peripheral nerve.

(Glenn, 1990)
Wolf, et al 2000

- Phenol decreases muscle spindle activity for several months
- Sensory innervation recovers quicker than gamma motor neurons
See attached Figure #2

Set-up for nerve block.
Phenol Blocks

- Focal spasticity
- Effect lasting 9-12 months
- Technically difficult procedure
- 15% dysesthesias
Wong, et al 2004 Phenol vs BTX in Ambulatory CP

- Phenol or BTX used in Amb. CP
- Gait analysis before and after treatment
- Increase in velocity and cadence, BTX > Phenol
Ofluoglu, et al, 2003
Retrospective review of phenol to obturatory

- Phenol decreases tone
- Increases base of support (less scissoring) while walking
Summary of Phenol Block

- **Administration:** Injected into motor points of involved muscle
- **Duration of effectiveness:** 4-12 months
- **Advantages**
  - Use is widely approved
  - Lasts longer than botulinum toxin
  - Cumulative effect often occur
Summary of phenol block (cont’d)

• Can be used with botulinum toxin to allow more injection sites and larger doses per site
• A good phenol block can reduce tone better than botulinum toxin, but technically more difficult
• Most often use phenol for easy to find nerves, i.e. obturator and musculocutaneous; then use botulinum toxin elsewhere
• Effective for plantarflexion and shoulder adduction
Summary of Phenol Block (cont’d)

- Drawbacks
  - Can be painful
  - May require general anesthesia during administration
  - Takes more skill to administer
Summary of Phenol Block (cont’d)

- Complications
  - Transient dysesthesias and numbness
  - Hematomas possible, negating effects of treatment
  - With large intravascular injection, systemic effects such as muscle tremors and convulsions, also depressed cardiac activity, blood pressure and respiration possible
Phenol Dosing

- 30 mg/kg—Matthew, et.al.
- 7% = 70 mg/ml
- 5% = 50 mg/ml
- 0.5 ml/kg considered safe
Common Injection Sites

• **Most common / easiest to inject**
  - obturator nerves (to hip adductors)
  - musculocutaneous nerve (to biceps)

• **Moderately difficult to inject**
  - nerves to gastrocnemius, pectoralis, latissimus dorsi

• **Most difficult to inject**
  - nerves to hamstring, forearm muscles
Hip Adductors

- Anterior approach - lat. to add. longus tendon near inguinal crease
- Superficial - ant. branch of obturator
- Deeper - post. branch of obturator
Hip Adductor

- Medial approach - posterior medial to add. longus tendon
- Post. branch 45° angle posterior
- Ant. branch towards ASIS
Hip Adductors

- Groove btw gracilis and add. magnus
- Branch of obturator runs along ant. portion of muscle
Phenol to obturator
Gastrocnemius

- Distal to popliteal crease
- Lateral and medial to midline
- Avoid posterior tibialis nerve
- Several motor points
Biceps

- Medial border
- 1/3 from axillary
- Avoid median nerve and brachial nerve
Patient Selection

- Patients refractory to more conservative treatment
- Multifocal spasticity not addressed by botulinum toxin alone
- Patients resistant to botulinum toxin
Alcohol (ethanol) Washes

- Similar to phenol in technique
- Slightly shorter activity
- Diffuses slightly better
- Dysesthesias possible
- Less used than phenol
- Used to 50% - 100% concentrations