Intrathecal Baclofen for Spasticity

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Goals of Spasticity: Management

- Decrease spasticity
- Improve functional ability and independence
- Decrease pain associated with spasticity
- Prevent or decrease incidence of contractures
- Improve ambulation
- Facilitate hygiene
- Ease rehabilitation procedures
Spectrum of Care for Management of Spasticity

- Prevent Nociception
- Intrathecal Baclofen (ITB™) Therapy
- Oral Drugs
- Injection Therapy
- Neurosurgery
- Orthopedic Treatments
- Rehabilitation Therapy

Patient
Oral Medications

- Baclofen
- Diazepam
- Dantrolene Sodium
- Tizanidine
# Site of Action for Oral Drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Site of action</th>
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<tbody>
<tr>
<td>Baclofen</td>
<td>GABA&lt;sub&gt;b&lt;/sub&gt; receptors in spinal cord</td>
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<td>Diazepam:</td>
<td>Central nervous system</td>
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<td>Dantrolene Sodium:</td>
<td>Skeletal muscles beyond the myoneural junction</td>
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<tr>
<td>Tizanidine:</td>
<td>Central acting (spinal and supraspinal) at alpha&lt;sub&gt;2&lt;/sub&gt; – adrenergic receptor sites</td>
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Pharmacokinetics of Baclofen

**Oral**
- 60 mg dose: 0.024 mcg/mL IT lumbar concentration
- Half-life 3-4 hours

**Intrathecal**
- 600 mcg/day dose: 1.24 mcg/mL IT lumbar concentration
- Lumbar to cervical concentration is 4:1
- Half-life 4-5 hours
Pharmacodynamics of Baclofen Injection

**Bolus**
- Onset of action is one-half hour to 1 hour after intrathecal bolus
- Peak effect at 4 hours after dosing
- Effects may last from 4 to 8 hours

**Continuous**
- Effects are first seen at 6 to 8 hours after initiation of continuous infusion
- Maximum effect observed in 24 to 48 hours

*Onset, peak response, and duration of action may vary*
Why Intrathecal vs. Oral?

**Baclofen Injection**
- Baclofen injection is delivered to the CSF and thought to act at GABA\(_b\) receptor sites at the spinal cord
- Lower doses than those required orally
- Potential for fewer systemic side effects

**Oral Baclofen**
- Low blood/brain barrier penetration, with high systemic absorption and low CNS absorption
- Lack of preferential spinal cord distribution
- Some patients experience unacceptable side effects at effective doses
Reported Outcomes in Patients with Spasticity of Cerebral Origin

**Method**
- 37 patients
- Spastic quadriplegia
- ITB Therapy received over a range of 3 - 48 months

**Results**
- 6 and 12 months post implant
  - muscle tone significantly decreased in lower and upper extremities
- 25 children capable of self-care at start of study:
  - significant improvement in
    - ADL
    - upper extremity function
    - hamstring extensibility

Reported Outcomes in Patients with Spasticity of Spinal Origin

**Method**
- 20 patients
- Diagnosed with spinal cord injury or multiple sclerosis
- ITB Therapy received over a range of 10-33 months

**Results**
- Statistically significant decreases in muscle tone of hip, knee, and ankle musculature
  - based on Ashworth score
- Statistically significant decrease in frequency of spasms
- Functional status tracked in 8 patients (6 months duration):
  - improved ADL
  - improved bowel and bladder management programs


Advantages of ITB™ Therapy

• Potentially fewer systemic side effects

• Programmable
  • allows dose titration to give optimal benefit

• Effective in reducing spasticity
  • upper and lower extremities\(^1\)
  • cerebral and spinal origin
Contraindications of ITB™ Therapy

• Patient has a history of allergy (hypersensitivity) to oral baclofen

• Infection is present at time of screening or implant
Potential Risks of ITB™ Therapy

- Common side effects: hypotonia, somnolence, nausea/vomiting, headache, dizziness
- Overdose, although rare, could lead to respiratory depression, loss of consciousness, reversible coma, and in extreme cases, may be life-threatening
- Catheter and procedural complications may occur
Titration Period

*After First 24-Hour Period*
- Increase dose slowly
- Increase only once every 24 hours until desired clinical effect achieved
  - Adults with spasticity of spinal origin
    - 10-30% increments
  - Adults with spasticity of cerebral origin
    - 5-15% increments
  - Pediatrics
    - 5-15% increments
ITB Withdrawal syndrome and Management

**Symptoms**

- Tachycardia, fluctuating blood pressure,
- Hypothermia, delirium, hallucinations, agitation, disorientation
- Muscle rigidity.

**Management**

- Resume baclofen delivery to the intrathecal space as promptly as possible
- High-dose or continuous infusion benzodiazepines or propofol
- Dantrolene
- Tizanidine
LAC protocol

- July 2005 – May 2008:
- 100 intrathecal trials with baclofen
- Standard anaesthetic rules
  - clotting, sterility, fasting
- standard monitoring
- IV sedation with propofol 1% (0.5 -1.5 µg/ml)
- Returns immediately to Ward
Pump Implantation

Abdominal incision pocket for the pump no deeper than 2.5 cm or 1 inch

X-ray of implanted pump and catheter with tip of catheter at 1st lumbar vertebral body.

Programming of the pump after implantation
Complications

- 1 Patient developed Meningitis: responded well to treatment
- 1 catheter fell out

- Incidence PDPH: 4.0% = 4 patients
- Every PDPH needed a blood patch

- Blood patch with satisfactory result
- 2 spinal taps after spasm trigger
- 2 PDPH after removal of catheter
Conclusion

• Continuous ITB is very effective and safe for patients with severe cerebral palsy with whole body involvement.

• The indication is severe spasticity which does not respond to oral application of baclofen or spasticity after near drowning accidents.

• The increase in infusion rate of baclofen during test period should be slow and the blood pressure, heart rate and oxygen saturation of the patient must be monitored.

• You need good compliance of these patients because of frequent controls and fillings of the pump.