Intrathecal Local Anesthetic Infusion as a Treatment for Complex Regional Pain Syndrome in a Child

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Goals
1. Understand the clinical presentation and diagnostic criteria of complex regional pain syndrome (CRPS) in children.
2. Understand associated symptoms of CRPS in children.
3. Discuss likely complications of CRPS in cases where treatment is delayed.
4. Discuss therapeutic modalities for CRPS.

Case
An otherwise healthy 8-year-old, 31kgs. girl developed left foot pain of six weeks duration. Her pain began without any recalled trauma, accident, or inciting event. She awoke from sleep with bilateral foot pain which spontaneously resolved in the right foot but progressed in the ankle, sole, and dorsum of the entire left foot. The pain was described as burning in nature, moderate to severe, continuous, and exacerbated with any touch or movement. The pain awakened the child from sleep and restricted her from using her foot in any kind of activity. She used crutches or was pulled in a wagon. Associated signs and symptoms included edema, color and temperature changes. A history of intermittent “low-grade temperatures” was reported. Plain radiographs showed diffuse disuse osteopenia. Bone scan revealed decreased blood flow to the left ankle with decreased tracer in the growth plates on the blood pool, and mild tracer accumulation in the distal left tibia in the metaphyseal and adjacent diaphyseal region. MRI showed mild dorsal soft tissue edema, which was thought to be developmental. Previous six-week treatment history included use of a pneumatic walker, and pharmacologic treatment with Tylenol, ibuprofen, and Tylenol with codeine, none of which provided relief.

On initial presentation the patient was alert and cooperative. She answered all questions appropriately regarding her pain, and did not appear overtly anxious or depressed. General examination was unremarkable, and she had a fully normal neurological evaluation of the upper extremities and the right lower extremity. The left lower extremity demonstrated sympathetically mediated pain signs including loss of hair, glistening of the skin, excessive dryness of the dorsum of the foot and toes, purple discoloration, excessive sweating of the sole, as well as
edema encircling the entire left foot. She also had allodynia of the left foot and lower leg with very pronounced guarding of the extremity. Between the initial evaluation and the planned hospitalization pain developed spontaneously in the right foot, essentially immobilizing her. She had mottling, dryness and edema of both feet.

As a Pediatric Anesthesiologist specializing in Pediatric Pain Management, you are asked to diagnose and treat this child.

**Discussion**

Complex Regional Pain Syndrome (CRPS) is a debilitating neuropathic pain syndrome composed of sensory, autonomic and motor changes disproportionate to the expected response to an inciting, often minor, injury. Clinical presentation includes severe pain, allodynia, edema, regional temperature changes, and disuse atrophy. Trophic changes in skin color and texture, as well as in hair and nail growth are often observed. There is considerable variability in presentation, intensity of symptoms, and disease progression. Response to therapies is also variable, likely due to a lack of understanding of the exact etiology and pathophysiology of the syndrome.

CRPS has a progressive course, with pain and inactivity creating a vicious circle of exaggerated and inappropriate signals sent to the brain and spinal cord, resulting in increasing pain and disuse of the affected extremity. Symptoms spread contiguously in all patients, independently in the majority of patients, and in a mirror-image fashion in a smaller percentage. Early diagnosis and treatment are critical for full recovery, whereas delayed diagnosis and treatment may result in prolonged pain, functional impairments, complications, and potentially lifelong disability. Associated symptoms of psychological distress result from pain, lack of sleep, and limitations in activity. Most researchers suggest progression through distinct stages (early, dystrophic, and atrophic), implying a critical period of opportunity for full recovery. In children, delays often occur due to a lack of familiarity with the characteristics of the syndrome and infrequency of presentation.

Therapeutic modalities for CRPS are multidisciplinary, involving physiotherapeutic, pharmacotherapeutic, psychotherapeutic strategies, and interventional nerve blocks, with the goal of pain relief, recovery of function, and relief of psychological suffering. However, review of the literature demonstrates considerable variability in approach to treatment, likely due to lack of a scientifically proven cure for CRPS in either children or adults.

Common pharmacotherapeutic and interventional modalities include:

1. Antidepressants
2. Anticonvulsants
3. Adjuvants
4. Epidural infusion of local anesthetic
5. Sympathetic nerve blockade

In this case, standard treatment modalities were unsuccessful, and the disease was progressing rapidly. The child was immobile and unable to sleep, perform daily activities, or attend school.
The decision was made to initiate a more aggressive therapy while she was being treated with gabapentin and amitriptyline. Physiotherapeutic strategies were ongoing though limited greatly due to pain. Psychotherapy was ongoing.

The child was brought to the Pain Center and an epidural catheter was placed at the L5-S1 space using loss of resistance technique under procedural sedation. An infusion of .2% Ropivicaine with fentanyl 2mcg/ml was infused at .4 mg/kg/hr. She continued to complain of severe pain in bilateral feet, though “numb” from thigh to knee on the right side. Intravenous morphine, and 5cc epidural bolus of .5% Ropivacaine, did not provide any relief, and physical therapy was unable to touch her feet. The epidural catheter was replaced, providing complete pain relief to the right foot, but the left foot remained unchanged. A decision was made to place an indwelling intrathecal catheter at the L4-5 spinal space. A dense block to T10 was achieved with .5% Ropivacaine, which receded to provide complete analgesia to bilateral feet with intact motor function and strength. Infusion of .2% Ropivacaine at .03 mg/kg/hr was continued without complication for a total of seven days. She received twice daily physical therapy in the gym, massotherapy daily, and ambulated about the hospital with the aid of a walker. She was cared for on the general nursing care unit with strict monitoring guidelines and protocols for care of the intrathecal infusion. She had no complications from the procedure or the ongoing infusion, and was discharged home following removal of the catheter. Her pain at discharge was rated 0-3/10, primarily with ambulation, though she was weight-bearing with a walker.

Following discharge, the patient continued to receive physical therapy three times per week. Over the next two month period, she regained full range of motion, strength and sensation. She finished school, and is back to her usual level of active play. Pain scores are 1/10 per patient report. Physical therapy exercises have been continued at home; psychotherapy has been discontinued. Amitriptyline and gabapentin were weaned completely after approximately a six-month course.

In conclusion, this case study offers an alternative approach to the treatment of Complex Regional Pain Syndrome in a child for whom the standard treatment was not successful. Due to the severity and rapid progression of her presenting symptoms, it was deemed imperative to use an interventional technique immediately. Epidural infusion, though normally successful in providing analgesia for physical therapy, was not effective in this case. Recognizing the debilitating nature of CRPS, the severity of the pain and resulting immobility, mandated that a previously untried technique be attempted. Fortunately for this child, the intrathecal infusion was successful and her CRPS has essentially completely resolved.

This team was not able to identify any previous reports of intrathecal local anesthetic management of CRPS in children. It is our hope that use of this modality, in conjunction with physical therapy, psychotherapy, and adjuvant pharmacologic agents may benefit other patients with CRPS who are resistant to standard treatment. Clearly, this technique must be done in a setting with pain management specialists and specifically trained nursing staff to ensure patient safety. Early, comprehensive, and individualized multidisciplinary treatment offers children with CRPS the best opportunity for complete recovery.
References


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Figure Captions

Figure 1. K.S, 8-year old child with diagnosis of CRPS on presentation to pediatric pain center (3/30/2006). Sympathetically mediated signs of CRPS include hair loss, glistening of the skin, excessive dryness, purple discoloration and edema, some of which may be seen in the above photo.

Figure 2. K.S. at first outpatient follow-up appointment two weeks after intrathecal infusion of local anesthetic (5/3/2006). Note the lack of sympathetically mediated signs of CRPS.
Figure 1
Figure 2