

# Image-guided Intrathecal Baclofen Pump Implantation for Patients with Scoliosis and Spinal Fusion: A Technical Note and Case Series

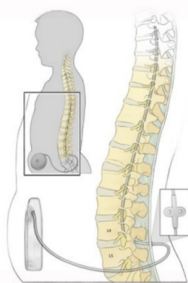
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## Introduction

Medically refractory spasticity may be mitigated with intrathecal baclofen (ITB) administration through an indwelling catheter inserted in the lumbar spine. In patients with cerebral palsy, however, there is a high incidence of concomitant neuromuscular scoliosis and ITB placement may be technically challenging in those with severe spinal deformity or who have undergone prior thoracolumbar instrumented fusion.



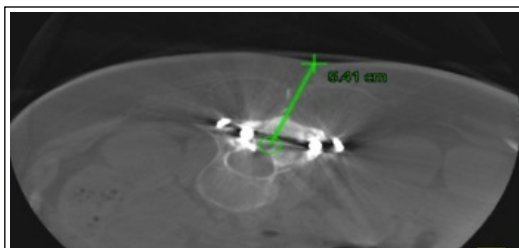
Typical ITB pump lumbar placement  
Illustration: Boston Children's Hospital

**Cone beam computed tomography (CBCT)** is an imaging modality that may facilitate intrathecal catheterization in patients with complex anatomy. CBCT uses three-dimensional rotational fluoroscopy to create "CT-like" images, which provide real-time two-dimensional (2D) projections for fast visual feedback and three-dimensional (3D) reconstructions for detailed volumetric imaging.

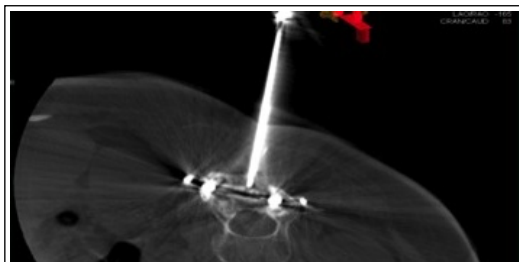
This is the first report of ITB placement using CBCT image-guidance to facilitate percutaneous intrathecal catheterization.

## Methods

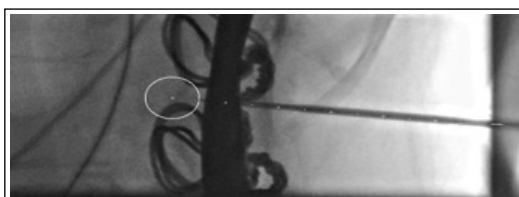
Data were prospectively collected on patients treated November 2012-June 2014. In the interventional radiology suite, general anesthesia was induced. With the patient prone, subcutaneous puncture with a sheathed needle was performed under CBCT-guidance.



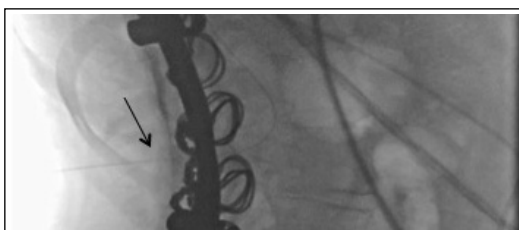
Axial CBCT image at L3-4 of user-defined needle trajectory using iGuide software (Siemens AG).



Bonopty penetration sheath in posterior bony fusion correlating with iGuide trajectory.

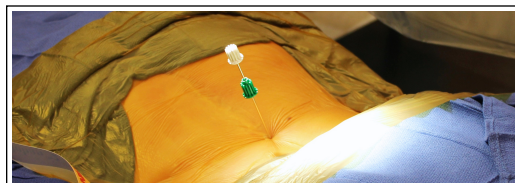


Fluoroscopic lateral view of lumbar spine: iGuide track overlay correlating with user-defined trajectory

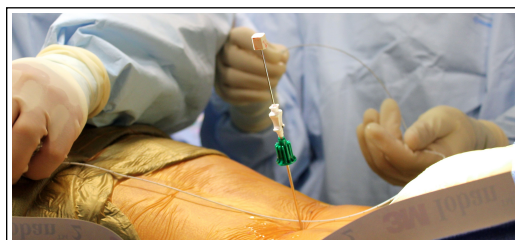


The intrathecal catheter in position (arrow).

## Methods



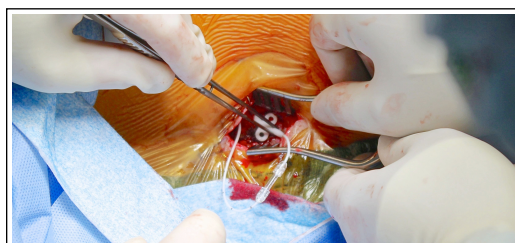
Following stereotactic placement of a sheathed needle, a bone biopsy needle is used to canal through fusion mass.



Tuohy needle advanced into thecal sac.



The catheter is threaded cephalad under fluoroscopy. CSF flow is confirmed, the stylet is replaced, external catheter tubing is sterily wrapped, and patients are transported to the operating room.



The external portion of the spinal catheter was removed, and a connector was used to connect the pump to the abdominal catheter.

## Results

Of 15 patients with Gross Motor Function Classification System level IV and V cerebral palsy and instrumented thoracolumbar fusion, 13 had spasticity and 7 had dystonia. With a mean age of 20.1 (range 13-27) years, nine patients underwent initial pump placement, while 6 were revisions due to index catheter failure.

## Outcomes

Proximal catheter placement

- Accurate placement in all patients

Hospital length of stay (mean):

- 7.1 (median 4) days

Length of stay if initial catheter (mean):

- 3.5 (median 3) days

Follow-up (mean):

- 16.8 (range 9-28) months

Surgical complications:

- No CSF leaks, catheter dislodgements, disconnections

Perioperative problems:

- 1 late infection requiring explantation. *Pseudomonas aeruginosa* at 4 months (UTI, cystitis)

## Conclusions

Cone beam computed tomography provided real-time 2D projections and 3D reconstructions for detailed volumetric imaging and allowed for navigation of the intrathecal space in the setting of patients with spasticity and prior thoracolumbar instrumented fusion. The multi-modality approach resulted in accurate implantation of an ITB catheter and pump, with low patient morbidity. In the future, studies that directly compare CBCT guided ITB catheterization to previous procedural methods may be useful. Overall, this image-guided technique is safe and effective and should be considered when treating patients with complex lumbar spine anatomy.