



Effects of Intrathecal Baclofen Pump Therapy in Adult Patients with Severe Spasticity : A Comprehensive Evaluation of Spasticity Reduction and Functional Outcomes

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Introduction

Spasticity is one component of upper motor neuron syndrome, caused by lesions in the upper motor neurons, such as those resulting from cerebral palsy (CP), stroke, and spinal cord injury (SCI). While the Modified Ashworth Scale (MAS) is widely used for evaluating spasticity, its validity is controversial. Instead, the $H_{\max}/M_{\max}$ ratio can be used as a quantitative neurophysiological measure of spasticity.

In recent years, intrathecal baclofen treatment (ITB) has proven effective in managing severe spasticity. Previous studies have shown that ITB can reduce spasticity and spasms, improve motor function, quality of life, and ease of care in children with severe spastic CP. However, there is limited knowledge about the effects of ITB in adults with CP.

The aim of this study is to assess the efficacy of intrathecal baclofen pump (ITBP) treatment in adult patients with severe spasticity by measuring the $H_{\max}/M_{\max}$ ratio and MAS.

Keywords: *Intrathecal baclofen pump, Spasticity, MAS grade, $H_{\max}/M_{\max}$ ratio, Functional outcome*

Results

ITBP significantly reduced the MAS grades, with a reduction of -0.81 from 2.45 ± 1.74 to 1.64 ± 1.23 ($p<.001$) in upper extremity, and -1.58 from 3.59 ± 0.88 to 2.01 ± 1.17 ($p<.001$) in lower extremity. The $H_{\max}/M_{\max}$ ratio significantly decreased by 79.37 from 107.06 ± 56.05 to 27.70 ± 21.91 ($p<.001$) after ITBP implantation.

Although MMT scores did not decrease in upper extremity, MMT scores in lower extremity decreased from 2.51 ± 1.11 to 2.27 ± 1.04 ($p=0.04$). However, there was no significant changes in MBI scores. Post-ITBP satisfaction was reported at 7.8 ± 1.42 .

Five patients were able to reduce their oral anti-spastic medication, four patients maintained their medication, and three patients required an increase in oral medication dosage.

There were two cases of CSF leakage, one of which required ITBP revision, while the other was managed with a blood patch. Three patients reported weakness, one reported dizziness, one reported headache, one reported voiding difficulty, and one experienced hypotension.

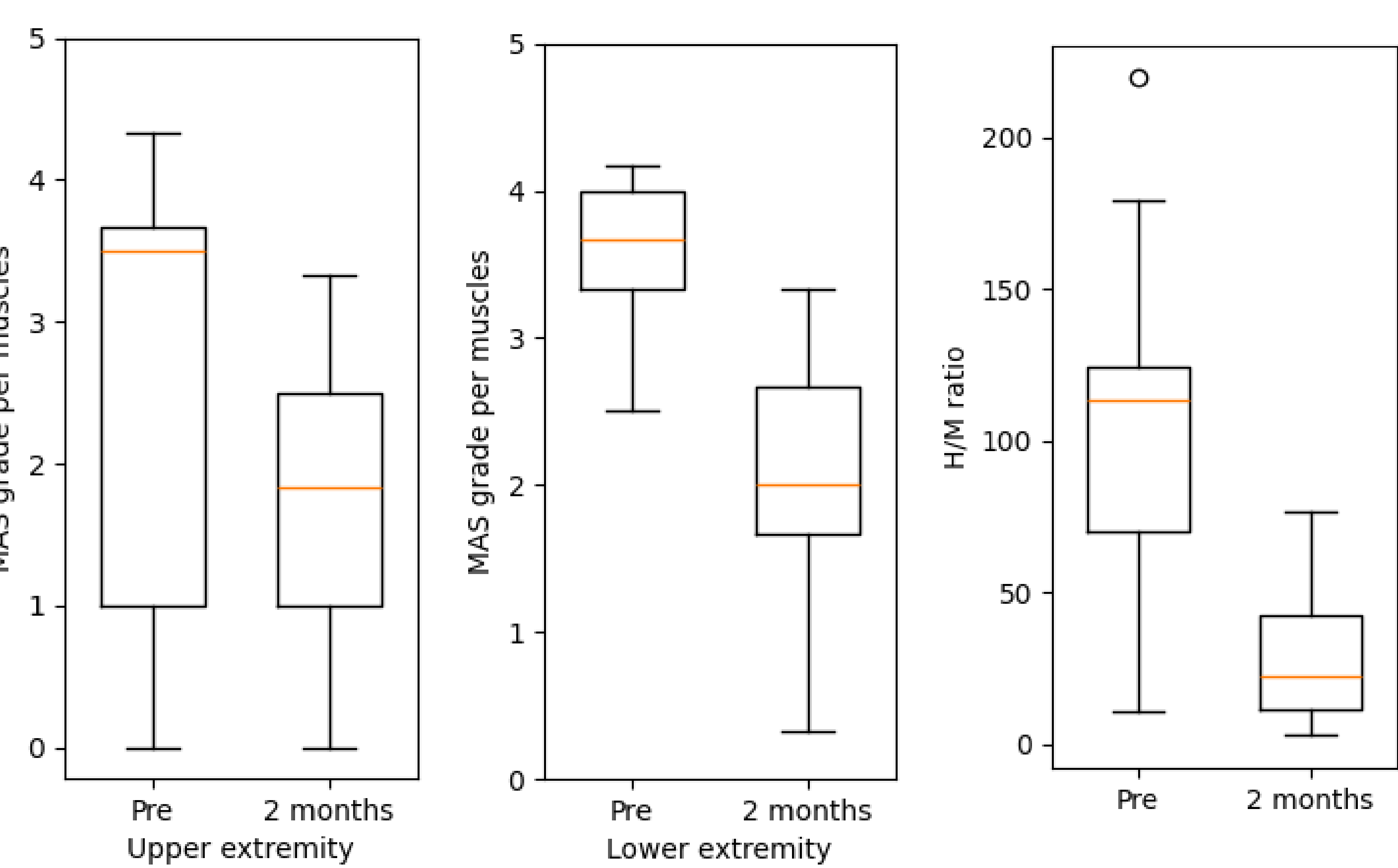


Figure 1. Short-term effects of intrathecal baclofen pump implantation

Conclusion

ITBP treatment for patients reduces spasticity measured by MAS and $H_{\max}/M_{\max}$ ratio. Patients and caregivers expressed satisfaction with ITBP treatment, although its impact on function may be limited.

Method

Thirteen patients (9 males, 4 females) with severe spasticity treated with ITBP were included in the study. Seven patients had CP, two had hereditary spastic paraplegia, three had intracerebral hemorrhage, and one had SCI. The mean age was 38.08 ± 17.58 , height was 158.68 ± 18.51 cm, weight was 62.66 ± 26.73 kg, and body mass index was 23.59 ± 6.63 .

The outcomes of spasticity were measured by MAS and $H_{\max}/M_{\max}$ ratio. The MAS grade was quantified on a 6-point scale to facilitate statistical analysis, ranging from 0 to 5. Secondary outcome measures included patients' mean manual muscle test (MMT) scores of adductors or flexor muscles in shoulder, elbow, wrist, hip, knee, and ankle joints, modified Barthel index (MBI), post-ITBP satisfaction, and adverse events after ITBP implantation.

Table 1. Baseline characteristics in patients with severe spasticity treated with ITBP implantation

Baseline characteristics (N = 13)	
Sex, M:F	9:4
Age, years	38.08 ± 17.58
Height (cm)	158.68 ± 18.51
Weight (kg)	62.66 ± 26.73
BMI	23.59 ± 6.63
Diagnosis	
Cerebral palsy	7
Intracranial hemorrhage	3
Hereditary spastic paraplegia	2
Spinal cord injury	1

BMI=body mass index, Values are presented as mean±SD

Table 2. Effects of intrathecal baclofen pump implantation

Outcome	Pre-ITBP	Post-ITBP	<i>p</i> Value
MAS			
Upper extremity	2.45 ± 1.74	1.64 ± 1.23	< .001*
Lower extremity	3.59 ± 0.88	2.01 ± 1.17	< .001*
$H_{\max}/M_{\max}$	107.06 ± 56.05	27.70 ± 21.91	< .001*
MMT			
Upper extremity	3.23 ± 1.25	2.85 ± 1.34	.08
Lower extremity	2.51 ± 1.11	2.27 ± 1.04	.04*
MBI	42.2 ± 35.65	46.4 ± 37.02	.09

MAS=modified Ashworth scale, MMT=Manual muscle testing, MBI=Modified Barthel index
* $P<.05$ compared within groups, Values are presented as mean±SD

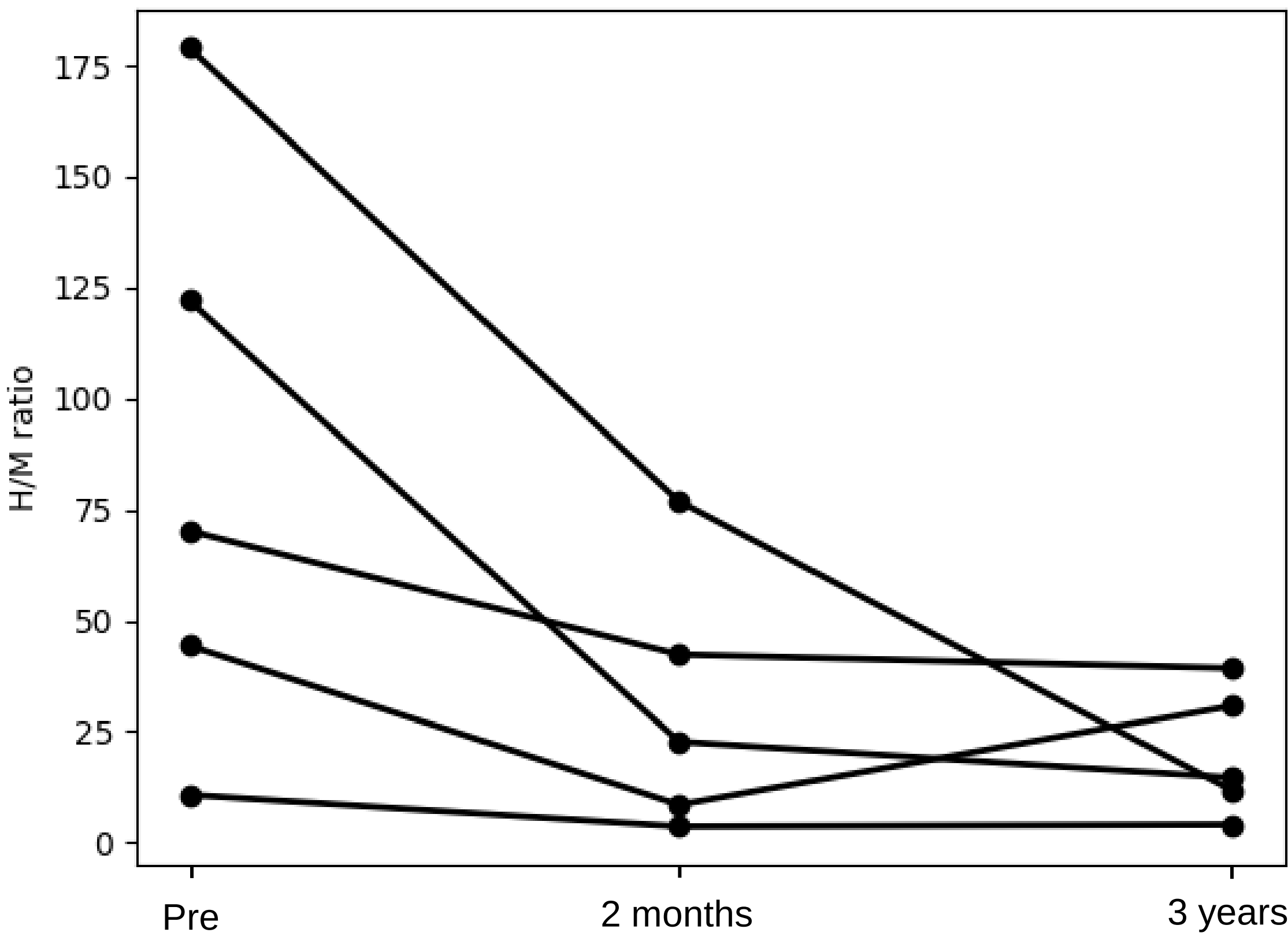


Figure 2. Long-term follow-up of $H_{\max}/M_{\max}$ ratio after intrathecal baclofen pump implantation

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