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Bovine testicular hyaluronidase injection for lower limb spasticity in a spinal cord injury patient

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Abstract: This case report describes the use of bovine testicular hyaluronidase (BTH) for managing lower limb spasticity in a 40-year-old spinal cord injury (SCI) patient in Peru. The patient, who sustained an ASIA B T7 traumatic SCI, developed severe spastic paraplegia. Traditional interventions and phenol chemodenervation failed to sustain prolonged improvement. Evidence supports the efficacy of human recombinant hyaluronidase for spasticity management, though not for BTH; with it unavailable, BTH was chosen as a more accessible and cost-effective option. About 1500 units were injected into 14 lower limb muscles under ultrasound guidance. The intervention improved the patient's passive range of motion and muscle tone over a 3-week period, with no adverse effects observed. However, further follow-up was limited due to patient transfer. This case suggests that BTH could be a promising, affordable option for post-SCI spasticity management in resource-limited settings. Future studies should evaluate BTH efficacy compared with other interventions.

Keywords: case report, injections, muscle spasticity, physical medicine and rehabilitation, spinal cord injuries

1. Introduction

Spasticity is a frequent outcome of spinal cord injury (SCI), estimated to impact about 65% of SCI patients after discharge from acute rehabilitation and as many as 93% of those living within the community.[1] Disabling spasticity, perceived by individuals or caregivers as limiting function, daily activities, or social participation, affects approximately 35% of people with chronic SCI.[2] According to systematic reviews, overall treatment options for post-SCI spasticity are suboptimal.[1] Physiotherapy (PT) and medications lack strong evidence: chemodenervation reduces spasticity but not function, intrathecal baclofen improves both but has risks, and robotic gait training has not shown meaningful spasticity reduction in SCI according to a meta-analysis.[1]

Since 1952, there have been publications on the use of hyaluronidase for spasticity management,[3] but it is not a routinely used intervention for this purpose. Recent studies have reported favorable outcomes in spasticity management with recombinant human hyaluronidase injections.[4,5] Some countries, such as Peru, only have bovine testicular hyaluronidase (BTH), which is typically used for aesthetic purposes. No publications on the use of BTH for spasticity management were found. There are uncertainties regarding its differences; however, a 2022 systematic review reported no differences for oocyte denudation before intracytoplasmic sperm injection.[6] This case report is about the use of BTH for managing lower limb spasticity in a patient with SCI at a referral hospital in Peru.

2. Case report

A 40-year-old male from Peru sustained a T7 ASIA B SCI after falling 2 m in December 2021 (Fig. 1A). He developed spastic paraplegia posthospitalization in early 2022. In July 2024, he was admitted to a referral hospital in Lima for management of grade IV pressure ulcers. He underwent surgical debridement and negative pressure therapy. To enable prone positioning and promote healing, posture correction with baclofen and PT was attempted, without success. An adductor tenotomy improved passive hip abduction range of motion (ROM) but not tone or posture. As the next step, phenol chemodenervation was chosen, since botulinum toxin injection was not possible due to insurance limitations.

Phenol chemodenervation at 6% was performed in September 2024 under ultrasound (US) guidance,

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Spine Research (2025) 1:2;110–113

Received: 06 June 2025 / Accepted: 29 June 2025

http://dx.doi.org/10.1097/br9.0000000000000008

Figure 1. (A) Traumatic vertebral fracture on the patient's computed tomography scan. (B) Patient's posture in lower limb adduction and flexion.

in both femoral (3 mL), obturator (3 mL), and sciatic nerves (4 mL). Postprocedure, passive ROM and muscle tone (Table 1) showed significant improvement. The patient continued PT and used a hip abduction orthosis and bilateral knee braces. However, within weeks, posture returned to adduction and flexion, passive ROM decreased, and tone increased—though not to baseline levels.

Given prior reports[4,5] and the low cost of BTH in Peru (USD 12 per 1500-unit vial), the decision to use it was made with informed consent, following approval by a medical board, as it was a non-standard and off-label treatment, and in accordance with hospital regulations. The intervention was scheduled for October 2024. Evaluation was planned at 5 time points: preinjection and at 1, 2, 3 weeks, 4 to 6 weeks, and 3 to 5 months postinjection, like a previous study.[4] A total of 1500 units of BTH was used for 14 lower limb muscles, following a protocol from a case report using recombinant hyaluronidase.[7]

Preprocedure, the patient was supine with hip flexion, adduction, and knee flexion (Fig. 1B). He had grade IV ischial and trochanteric pressure ulcers. He reported hypoesthesia in the lower limbs and mild pain (visual

Table 1

Changes in passive range of motion and muscle tone in the hip and knee.

Step and date	Initial (August 2024)		Post phenol chemodenervation (September 2024)		T0 (preinjection of BTH) (October 25, 2024)		T1 (within 1 week postinjection) (October 29, 2024)		T2 (within 2 weeks postinjection) (November 4, 2024)		T3 (within 3 weeks postinjection) (November 11, 2024)	
Side	R	L	R	L	R	L	R	L	R	L	R	L
Passive range of motion												
Hip flexion	105	85	110	110	112	110	115	110	115	110	115	110
Hip extension	–30	–20	0	0	–10	–10	–8	–5	0	10	0	10
Hip abduction	20	5	30	20	20	12	30	20	40	30	40	35
Hip adduction	30	30	30	30	30	30	30	30	30	30	30	30
Hip external rotation	20	10	25	15	15	10	20	10	25	15	25	15
Hip internal rotation	20	40	20	40	25	25	25	40	40	40	40	40
Knee flexion	135	135	135	135	135	135	135	135	135	135	135	135
Knee extension	–25	–25	0	–10	–10	–15	–10	–10	0	–10	0	–10
Muscle tone (Modified ashworth scale)												
Hip flexors	3	3	3	3	3	3	3	3	3	2	3	2
Hip extensors	2	2	2	2	2	2	2	2	2	2	2	2
Hip abductors	1+	1+	1	1	1+	1+	1	1	1	1	1	1
Hip adductors	3	3	3	3	3	3	3	3	3	2	2	2
Hip external rotators	2	2	2	2	2	2	2	2	1+	1+	1+	1+
Hip internal rotators	3	3	3	3	3	3	3	3	2	2	2	2
Knee flexors	3	3	2	2	3	3	2	2	2	2	2	2
Knee extensors	2	2	1+	1+	2	2	2	2	1+	1+	1+	1+

BTH = bovine testicular hyaluronidase.

analogue scale 3/10) near the ulcers. Bilateral patellar hyperreflexia was present. Cognitive function and systemic exams were normal. He had a severe level of dependency: a functional independence measure motor score of 26 (total: 61).

Passive ROM and Modified Ashworth Scale (MAS) scores for hips and knees are detailed in Table 1. MAS was 0/4 in the upper limbs and 1/4 in the ankle groups. Muscle strength (Medical Research Council Scale for Muscle Strength) was 5/5 in upper limbs and 0/5 in lower limbs. Muscle changes were assessed via US using the Modified Heckmatt Scale: score 4 for iliopsoas, rectus femoris, adductor longus, and brevis; score 3 for adductor magnus, semitendinosus, semimembranosus, and biceps femoris.

BTH (1500 units) was diluted in 15 mL saline. A 0.03 mL intradermal test dose (3 units) showed no erythema, itching, or swelling at 5 minutes or 20 minutes. No contraindications have been reported as long as precautions are taken to avoid intravascular injections.[3] Under US guidance, ~100 units were injected into each of the following muscles bilaterally, targeting areas with greater Modified Heckmatt Scale score: iliopsoas, rectus femoris, long and major adductors, semimembranosus, semitendinosus, and biceps femoris. The intervention proceeded without pain or any adverse effects and was well tolerated by the patient. PT and orthotic use continued.

The patient was reevaluated at each planned time point by the same provider. No major changes were noted in the first week, but by weeks 2 and 3, improvements in ROM, tone, and posture were observed. No adverse effects were reported. Unfortunately, in the fourth week postinjection, the patient was referred to another hospital for specialized care, preventing continued follow-up at the 4- to 6-week and 3- to 5-month time points.

This study complies with the case reports guidelines and includes all required elements.

3. Discussion

In this case report, spasticity improved with BTH combined with PT and orthotics. MAS score changes were smaller than passive ROM improvements, possibly because BTH better addresses stiffness.[4] Therefore, MAS was used over the Modified Tardieu Scale (MTS) for its simpler assessment of spasticity-related stiffness. Pressure ulcers status may have also affected spasticity. The effectiveness of BTH for post-SCI spasticity management, as well as the most suitable intervention for this condition, remains uncertain.[1]

A PubMed search (2014–2024) was conducted and found limited data. A 2016 case series of 20 patients with upper limb spasticity reported improved passive and active ROM and MAS after recombinant human hyaluronidase, with effects lasting 3 minutes to 5 months and no significant adverse effects.[4] A 2022 cohort study of 103 poststroke patients found MAS and passive ROM improved 1 month postinjection; hyaluronidase showed greater MAS improvement than phenol.[5] Additionally, a 2022 case report of a woman with spastic hemiparesis showed improved gait and joint kinematics 2 months after lower limb hyaluronidase injection.[7]

Hyaluronan buildup may contribute to muscle stiffness after neurological injury, making intramuscular hyaluronidase a potential treatment. Although its action is brief, with tissue recovery occurring within 24 minutes to 48 hours, studies suggest lasting benefits. Effectiveness may depend on initial stiffness, fibrosis, and active ROM.[4]

Limitations and strengths

Improvement in passive ROM and MAS was observed without adverse effects, consistent with the literature found. However, as a single-patient report with a short follow-up, results are not generalizable and should be interpreted cautiously. This is the first case report on BTH use for spasticity. Future well-designed randomized trials are needed to compare BTH's efficacy with other post-SCI spasticity treatments.

4. Conclusion

BTH injection for lower limb spasticity in an SCI patient was performed, showing improvement in passive ROM and MAS of both hips and knees up to 3 weeks postinjection, in combination with PT and the use of orthotics. Further studies are required to understand the efficacy of this treatment, which, due to its accessibility and low cost, could be an important intervention, especially in developing countries.

Acknowledgments

I am grateful to Drs. Anyeli Dueñas, Paula Arnillas, Nando Espinoza, and Maria Hurtado, as well as to the other colleagues from the Physical Medicine and Rehabilitation Service at Hospital Nacional Arzobispo Loayza in Lima, Peru, for their valuable support with this case report.

Ethical statement

This case report was conducted in accordance with the CARE (CAse REport) guidelines. Ethical approval was not required, as this is a descriptive report of a single clinical case. Written informed consent was obtained from the patient for the publication of this case and any accompanying images.

Conflicts of interest

The author has no conflicts of interest to disclose.

Funding source

Not applicable.

Data availability statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Author contributions

RDL: conceptualization, resources, writing - original draft preparation, writing - review and editing, visualization, supervision, project administration.

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