Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/21518
DOI URL: http://dx.doi.org/10.21474/IJAR01/21518

RESEARCH ARTICLE

LONG-TERM FUNCTIONAL RECOVERY FOLLOWING BOTULINUM TOXIN TYPE A FOR GASTROCNEMIUS HYPERTONIA AFTER LUMBAR LAMINECTOMY: A CASE REPORT

Nourah A. Almarzooq[1], Jaffar S. Abdrabalrasol[2], Ahmed A. Almusabbeh[3] and Amin A. Algafly[4]

1.Physical Medicine and Rehabilitation Consultant, Ministry of Health, Qatif Central Hospital, Eastern Region, KSA.
2. MSc, Physical Therapist, Sports Medicine Rehabilitation, Ministry of Health, Qatif Central Hospital, Eastern Region, KSA.
3. MSc, Physical Therapist, Ministry of Health; Head, Physical Therapy Department, Qatif Health Network, Eastern Region, KSA.
4.MSc, Physical Therapist, Sports Medicine Rehabilitation, Ministry of Health; Head, Rehabilitation Center, Qatif Health Network, Eastern Region, KSA.

Manuscript Info

Manuscript History
Received: 07 June 2025
Final Accepted: 9 July 2025
Published: August 2025

Abstract

Background: Focal muscle hypertonia/spasticity can complicate recov ery after spinal surgery,limiting mobility and function. Botulinum toxin type A (BoNT-A) reduces acetylcholine release at the neuromuscular ju nction and is an established, targeted therapy for focal spasticity when c ombined with rehabilitation.

Case: A 23-year-old man developed painful spasms and focal hyperton ia of the right gastrocnemius after L2 L3 laminectomy. Ultrasound-guid ed BoNT-A was administered to the medial (25U) and lateral (12.5 U) heads, followed by a structured rehabilitation program.

Outcomes: The patient showed rapid improvements in pain, modified Ashworth scale (MAS), ankle dorsiflexion, and gait within two weeks; he resumed light jogging by three months. At two years, he reported full return to running and gym activities without reinjection and no adverse effects.

Conclusion: In this postoperative context of focal gastrocnemius hyper tonia, BoNT-A plus rehabilitation was associated with sustained pain relief and functional recovery over two years,supporting individualized, multidisciplinary spasticity management.

Introduction:-

Postoperative hypertonia and spasticity can hinder gait restoration after spinal procedures when neural elements are irritated or recovery is prolonged. BoNT-A acts by reversibly inhibiting acetylcholine release through cleavage of SNARE proteins at cholinergic terminals, producing a focal chemodenervation that peaks over 1–2 weeks and typically lasts 3–4 months. Across neurologic etiologies, randomized and real-world evidence supports BoNT-A for

Corresponding Author:- Nourah A. Almarzooq
Address:- Physical Medicine & Rehabilitation Consultant, Ministry of Health, Qatif Central Hospital, Eastern Region, KSA.

lower-limb spasticity, including plantarflexor overactivity affecting gait. Guidance statements emphasize goal-directed dosing and muscle selection alongside rehabilitation to optimize function. Ultrasound or electrical stimulation guidance enhances injection precision compared with landmark methods for triceps surae.

CASE PRESENTATION

Patient Information

A 23-year-old previously healthy male (history notable only for irritable bowel syndrome) presented with acute low back pain and right-sided radiculopathy that progressed over one week to the point of limited ambulation. No trauma, constitutional symptoms, or sphincter dysfunction were reported.

Clinical Findings

Neurological examination demonstrated a right L4 sensory deficit, reduced strength in right hip/knee muscle groups, positive straight-leg raise at 40° on the right, and painful spasm with hypertrophy of the right gastrocnemius. There were no signs of wound infection or myelopathy.

Timeline

Date	Event
Apr 21	ER presentation with back pain and radiculopathy
Apr 24	L2–L3 laminectomy
May 1	Discharged after initial rehab assessment
Jul 9	Outpatient review: right gastrocnemius focal hypertonia observed
Jul 15	BoNT-A injection: medial head 25 U; lateral head 12.5 U (ultrasound-guided)
Jul 30	Marked symptom relief; improved gait and ankle ROM
3 months	Functional stretching; light jogging
1 year	Moderate physical tasks tolerated; minimal stiffness only
2 years	Full return to running/gym; no recurrence; no reinjection

Diagnostic Assessment

Ultrasound revealed right medial gastrocnemius hypertrophy (≈1.3 cm vs 0.8 cm contralaterally). Spasticity measured MAS 1+ at the ankle plantarflexors. Pain was VAS 6/10 pre-injection. Passive ankle ROM was full with end-range pain; active dorsiflexion was limited by overactivity. Post-injection manual muscle testing showed at least a two-grade improvement in dorsiflexors and plantarflexors.

Therapeutic Intervention

Under ultrasound guidance, BoNT-A was infiltrated into the medial (25 U) and lateral (12.5 U) heads of the gastrocnemius. Post-injection rehabilitation comprised daily gastrocnemius–soleus stretching, progressive neuromuscular re-education (ankle strategy and closed-chain control), and gait retraining emphasizing controlled tibial progression and terminal stance.

Follow-Up and Outcomes

Short-term (1 month): Pain decreased to VAS 1–2/10; MAS improved; dorsiflexion strength and spatiotemporal gait parameters improved; standing calf stretching became pain-free.

Intermediate (3–12 months): Gradual resumption of sport; no recurrence of spasms; occasional tightness only after prolonged activity.

Long-term (2 years): Full return to running and resistance training; single-leg hop symmetric bilaterally; no reinjection required; no adverse events were reported.

DISCUSSION:-

This case highlights a post-laminectomy context of focal gastrocnemius hypertonia successfully addressed with targeted BoNT-A plus rehabilitation, with sustained recovery at two years. Although most BoNT-A evidence arises

from post-stroke or other upper motor neuron syndromes, its mechanism and goal-directed application are consistent across etiologies when focal overactivity limits function. Precise targeting of the gastrocnemius heads under ultrasound likely enhanced localization and response compared with landmark techniques, while pairing injections with rehabilitation is recommended to translate tone reduction into functional gains. For mild spasticity (MAS 1+), a relatively low total dose confined to the target muscle can minimize spread and adverse effects while allowing active retraining. BoNT-A effects typically last 3–4 months, but functional benefits may persist with ongoing rehabilitation or repeated cycles when indicated. In this case, durable recovery without reinjection may reflect early correction of aberrant motor patterns and improved strength, although this hypothesis requires prospective validation.

CONCLUSION:-

In a young adult with post-laminectomy focal gastrocnemius hypertonia, ultrasound-guided BoNT-A combined with structured rehabilitation was associated with rapid symptom relief and sustained, reinjection-free functional recovery at two years. This case supports individualized, multidisciplinary spasticity management and judicious BoNT-A use outside traditional post-stroke indications.

PATIENT PERSPECTIVE

"The treatment made a huge difference. I went from being unable to walk without pain to running again. I feel completely back to normal now."

INFORMED CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

REFERENCES:-

1. Esquenazi, A., Alfaro, A., Ayyoub, Z., Charles, D., Dashtipour, K., Graham, G. D., McGuire, J. R., Odderson, I. R., Patel, A. T., and Simpson, D. M. (2017). OnabotulinumtoxinA for lower limb spasticity: Guidance from a Delphi panel approach. PMandR, 9(10), 960–968. https://doi.org/10.1016/j.pmrj.2017.02.014
2. Esquenazi, A., Bavikatte, G., Sunnerhagen, K. S., Kaji, R., Mazibrada, G., and Marciniak, C. (2021). OnabotulinumtoxinA treatment for adult lower limb spasticity: Long-term observational results from the ASPIRE registry. PMandR, 13(10), 1079–1093. https://doi.org/10.1002/pmrj.12517
3. Morel, C., Hauret, I., Andant, N., Bonnin, A., and Coudeyre, E. (2023). Effectiveness of ultrasound-guided vs electrical-stimulation-guided abobotulinumtoxinA injections in triceps surae spasticity after stroke. Journal of Rehabilitation Medicine, 55, jrm00380. https://doi.org/10.2340/jrm.v55.1381
4. Paley, M., Venkatesan, M., Li, S., and Fridman, E. A. (2022). Comparison of ultrasound and electrical stimulation guidance for onabotulinumtoxinA injections. Movement Disorders Clinical Practice, 9(8), 1061–1069. https://doi.org/10.1002/mdc3.13533
5. Padda, I. S., and Tadi, P. (2023). Botulinum toxin. In StatPearls. StatPearls Publishing.
6. Picelli, A., Bonetti, P., Fontana, C., Barausse, M., Dambruoso, F., Gajofatto, F., Tamburin, S., Girardi, P., Gimigliano, R., and Smania, N. (2012). Accuracy of botulinum toxin type A injection into the gastrocnemius: Manual vs electrical stimulation guidance. Journal of Rehabilitation Medicine, 44(5), 450–452. https://doi.org/10.2340/16501977-0970
7. Picelli, A., Lobba, D., Midiri, A., Prandi, P., Melotti, C., Baldessarelli, S., and Smania, N. (2013). Forearm injections for post-stroke spasticity: Manual vs electrical vs ultrasound guidance (randomized trial). Clinical Rehabilitation, 28(3), 232–242. https://doi.org/10.1177/0269215513497735
8. Picelli, A., Tamburin, S., Cavazza, S., et al. (2014). Ultrasound, EMG, and clinical parameters in spastic equinus. Archives of Physical Medicine and Rehabilitation, 95(8), 1564–1570. https://doi.org/10.1016/j.apmr.2014.04.011
9. Santamato, A., Cinone, N., Panza, F., Letizia, S., Santoro, L., Lozupone, M., Daniele, A., Picelli, A., Baricich, A., Intiso, D., and Ranieri, M. (2019). Botulinum toxin type A for lower limb spasticity after stroke: A review. Drugs, 79(2), 143–160. https://doi.org/10.1007/s40265-018-1042-z
10. Wein, T., Esquenazi, A., Jost, W. H., Ward, A. B., Pan, G., and Dimitrova, R. (2018). OnabotulinumtoxinA for post-stroke distal lower-limb spasticity: A randomized trial. PMandR, 10(7), 693–703. https://doi.org/10.1016/j.pmrj.2017.12.006
11. Wissel, J., Bensmail, D., Ferreira, J. J., et al. (2022). A practical guide to optimizing post-stroke spasticity care. Journal of Rehabilitation Medicine, 54, jrm00363. https://doi.org/10.2340/jrm.v54.1769