

Botulinum Toxin A Injection for Hemihypertrophy-related Unilateral Gastrocnemius Hypertrophy

Ziming Zhang, MM*
 Qingqian Wei, MM*
 Yingzi Li, MM*
 Jun Zhuang, MM*
 Xueshang Su, MM*
 Tun Liu, MD†
 Jintian Hu, MD*

Summary: Hemihypertrophy is a rare congenital disorder that causes unequal growth of the extremities, trunk, face, or half of the body. We report a case of a 32-year-old woman with hemihypertrophy-related gastrocnemius hypertrophy treated with botulinum toxin A injection. The patient has received two botulinum toxin A injections, and we measured the thickness of the gastrocnemius muscle using ultrasound and measured the maximum circumference around the calf with the patient in the prone position. The patient's maximum calf circumference was reduced by 1 cm. The thickness of the medial head of the gastrocnemius was reduced by 0.3 cm, and the thickness of the lateral head of the gastrocnemius was reduced by 0.6 cm. Botulinum toxin A injection therapy was effective in treating hemihypertrophy-related gastrocnemius hypertrophy. (*Plast Reconstr Surg Glob Open* 2023; 11:e5356; doi: 10.1097/GOX.0000000000005356; Published online 30 October 2023.)

Hemihypertrophy is a cellular proliferation abnormality that results in asymmetric overgrowth of one or more body regions and can occur as an isolated abnormality or as part of an overgrowth syndrome.¹ Hemihypertrophy may result in unilateral gastrocnemius hypertrophy, which thickens the patient's calf muscles and has an impact on both their everyday living and mental health. A noninvasive botulinum toxin type A injection for gastrocnemius hypertrophy is gaining attention.²

CASE REPORT

On September 16, 2022, a 32-year-old woman presented to our hospital. The patient had a normal medical history, no history of chronic or infectious disease, no personal or family medical history abnormalities, and no factors affecting botulinum toxin type A injection therapy. The patient's right leg circumference was

3.0 cm bigger than the left leg's (Fig. 1). The ultrasonography indicated right gastrocnemius muscle hypertrophy. The patient's other examination results were all normal, and hemihypertrophy was suspected. The patient has received two botulinum toxin A injections, the first in September 2022 at a dose of 400 U and the second in May 2023 at a dose of 400 U. We used a 25G needle and injected to a depth of 1 inch below the skin. The muscle groups injected included the anterior tibialis, gastrocnemius, and soleus. The patient received two treatments in September and December 2022, and the results of the review in May 2023 revealed that the right leg's circumference was 2.0 cm bigger than the left leg's. The ultrasound results are shown in Figure 2. The patient's calves began to thin after our first injection of 400 units and continued to thin after the second injection of 400 units. Therefore, we believe that this dose is sufficient. In addition, we followed up the patient 1, 3, 6, and 9 months after the injections. Follow-up results show a stable effect of injection therapy. (See table, **Supplemental Digital Content 1**, which displays the calf measurement results. <http://links.lww.com/PRSGO/C830>.) After the injection treatment, we conducted a functional assessment by checking the patient's joint range of motion and sensory examination. We also observed the patient's gait at each follow-up visit to comprehensively evaluate the impact on the patient's quality of life, and there was a significant improvement

From the *Department of Cicatrix Minimally Invasive Treatment Center, Plastic Surgery Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China; and †Department of Ear Reconstruction, Plastic Surgery Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China.

Received for publication June 22, 2023; accepted September 8, 2023.

Drs. Zhang and Wei contribute equally to this work.

Copyright © 2023 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/GOX.0000000000005356

Disclosure statements are at the end of this article, following the correspondence information.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

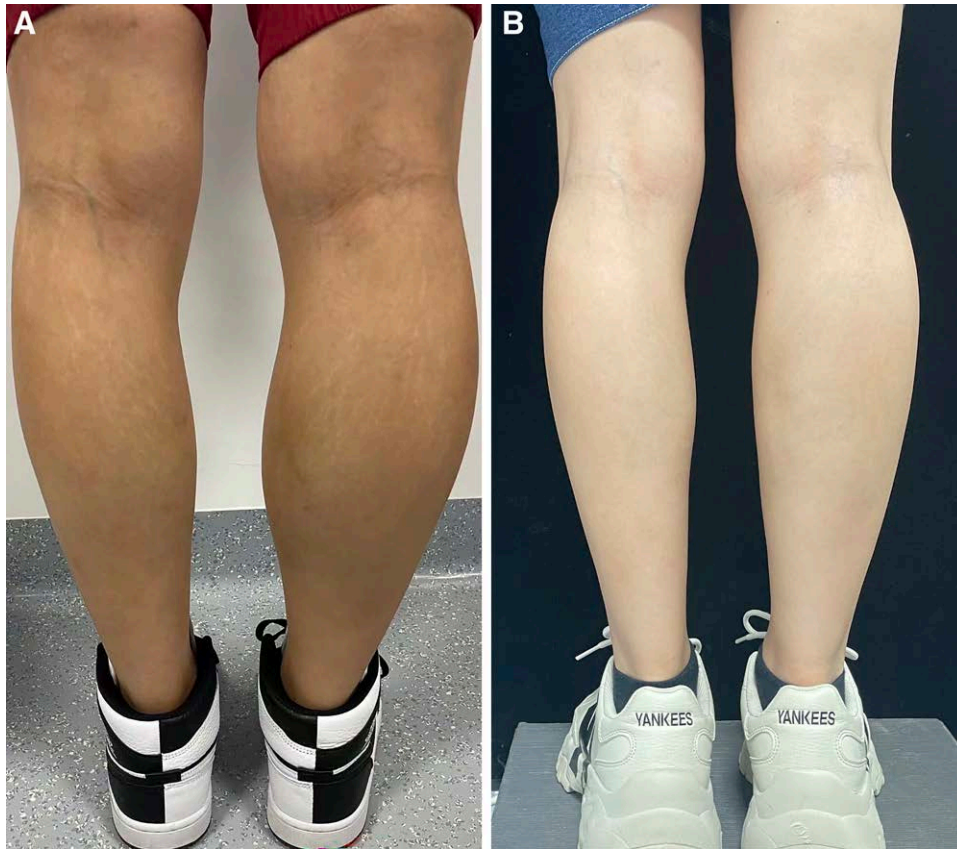


Fig. 1. Calf photography before and after injection treatment, A, Photography of legs before injection treatment. B, Photography of legs after injection treatment.

in the patient's gait compared with that before the injection.

DISCUSSION

The cause of hemihypertrophy is unknown, and there are no viable diagnostic or therapy options. The diagnosis is often confirmed based on a thorough medical history and clinical manifestations, and if necessary, further tests such as X-rays, computed tomography scans, and ultrasounds.³ Gastrocnemius hypertrophy is considered to be an obstacle to calf aesthetics. There are both invasive and noninvasive ways of reshaping the calf. Invasive procedures mainly include gastrocnemius myotomy, liposuction, and peroneal neurectomy. However, these methods are associated with surgically related diseases and serious complications, such as paralysis due to nerve damage, muscle dystrophy, proliferative scarring, and intestinal muscle healing process.⁴ Noninvasive botulinum toxin A injection therapy is gaining importance due to less invasive treatment and fewer complications. Botulinum toxin A is an extremely effective neurotoxin synthesized by *Clostridium botulinum*, which blocks the release of the neurotransmitter acetylcholine at the neuromuscular junction in the target muscle.⁵ This is the basis of the action of botulinum toxin A. By injecting botulinum toxin type A into the calf, the overly tense gastrocnemius muscle

can be relaxed, making the calf look thinner. Compared with surgery, the cost of injection treatment is less, and the result is reversible. Botulinum toxin A injection treatment usually lasts for 6 months, and if the patient is not satisfied, the pretreatment condition can be restored 6 months after stopping the injections.⁶ We summarized the case reports of calf contouring by botulinum toxin A injection and found that botulinum toxin A injections for leg slimming treatment can lead to pain, bruising, and cramping at the injection site, causing gait changes and serious complications such as deformity, which are less common.⁷⁻⁹ (See table, Supplemental Digital Content 2, which displays a review of the literature on the use of botulinum toxin type A for the treatment of gastrocnemius hypertrophy. <http://links.lww.com/PRSGO/C831>.) Contraindications to botulinum toxin A injections include pregnancy, neuromuscular disorders (eg, myasthenia gravis, Eaton-Lambert syndrome), and botulinum toxin, which should not be used concomitantly with aminoglycosides, quinine, and calcium channel blockers, which may potentiate its efficacy.¹⁰

This case report presents a patient with hemihypertrophy-related unilateral gastrocnemius hypertrophy, and after two botulinum toxin A injections, the calf was significantly thinner. In addition, we are exploring whether botulinum toxin A injections can be used to treat other areas of hypertrophy caused by hemihypertrophy, such as hemifacial

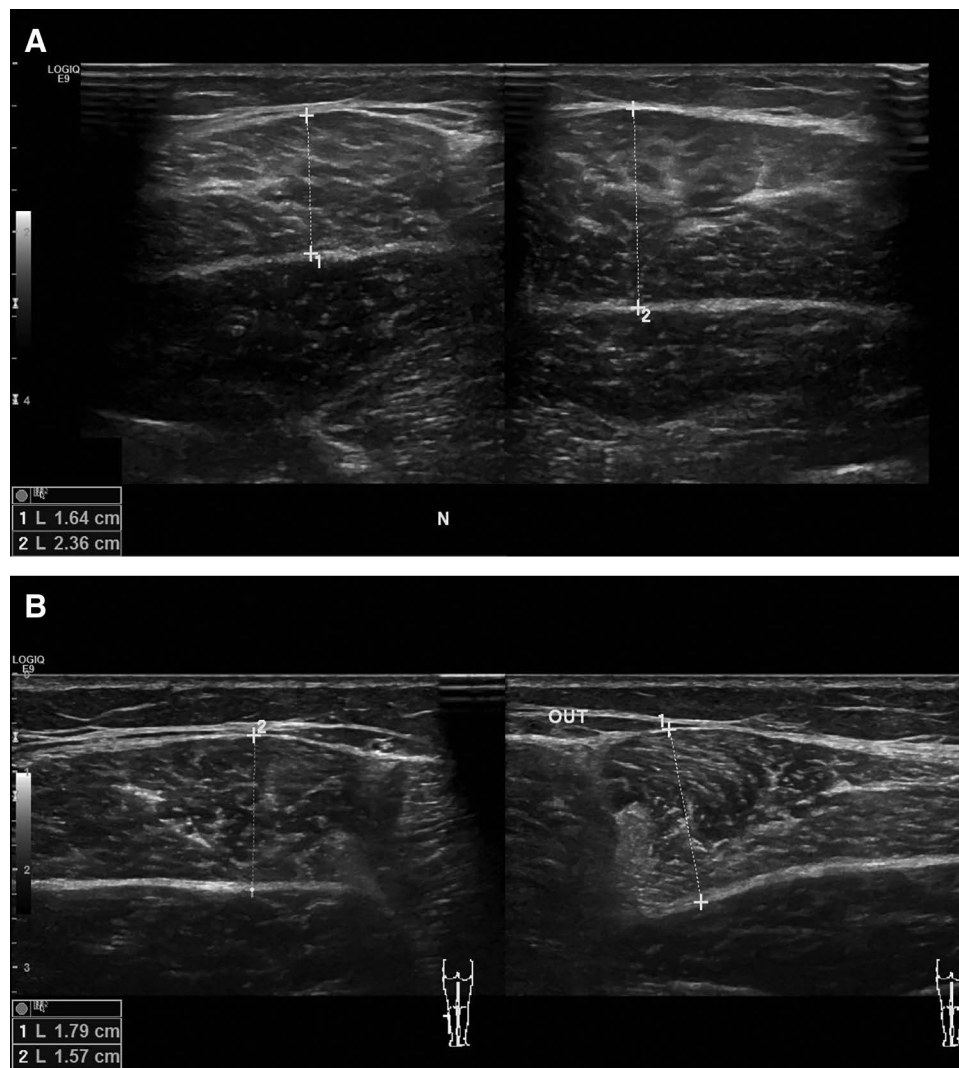


Fig. 2. Ultrasound results of the calf before and after injection treatment. Calf ultrasound results. A, Thicknesses of lateral head of gastrocnemius in September 2022. B, Thicknesses of lateral head of gastrocnemius in May 2023.

hypertrophy. We assessed patient outcomes by gastrocnemius muscle thickness without measuring muscle volume, but muscle volume is a more intuitive metric. Therefore, further studies and additional experiments are needed.

Jintian Hu, MD

Department of Cosmetic Injection Center
Plastic Surgery Hospital
Chinese Academy of Medical Sciences and
Peking Union Medical College
Beijing, 100144, China
Thirty-three Badachu Road
Shijingshan District
Beijing, P.R. China
E-mail: hujintian@vip.163.com

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

REFERENCES

1. Nyati A, Kalwaniya S, Agarwal P. Idiopathic hemihypertrophy with multiple fibroadenoma. *Indian Dermatol Online J.* 2016;7:316–317.
2. Cheng J, Chung HJ, Friedland M, et al. Botulinum toxin injections for leg contouring in East Asians. *Dermatol Surg.* 2020;46:S62–S70.
3. Leung AK, Fong JH, Leong AG. Hemihypertrophy. *J R Soc Promot Health.* 2002;122:1466–4240.
4. Bogari M, Tan A, Xin Y, et al. Treatment of gastrocnemius muscle hypertrophy with botulinum toxin injection followed by magnetic resonance imaging assessment and 3-dimensional evaluation. *Aesthet Surg J.* 2017;37:1146–1156.
5. Tomazini Martins R, Elstner KE, Skulina C, et al. Limitations of electromyography in the assessment of abdominal wall muscle contractility following botulinum toxin A injection. *Front Surg.* 2019;6:16.
6. Lee HJ, Lee DW, Park YH, et al. Botulinum toxin a for aesthetic contouring of enlarged medial gastrocnemius muscle. *Dermatol Surg.* 2004;30:867–71; discussion 871.

7. Wanitphakdeedecha R, Ungakornpairote C, Kaewkes A, et al. A pilot study comparing the efficacy of two formulations of botulinum toxin type A for muscular calves contouring. *J Cosmet Dermatol*. 2018;17:984–990.
8. Han KH, Joo YH, Moon SE, et al. Botulinum toxin A treatment for contouring of the lower leg. *J Dermatolog Treat*. 2006;17:250–254.
9. Oh WJ, Kwon TR, Oh CT, et al. Clinical application of botulinum toxin A for calf hypertrophy followed by 3-dimensional computed tomography. *Plast Reconstr Surg Glob Open*. 2018;6:e1071–e7574.
10. Klein AW. Contraindications and complications with the use of botulinum toxin. *Clin Dermatol*. 2004;22:66–75.