

Pulmonary Embolism after Botulinum Toxin Treatment for Leg Muscle Hypertrophy

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Summary: Leg muscle hypertrophy is a unique physical symptom in East Asian women. Compared with traditional surgical treatment for calf muscle hypertrophy, botulinum toxin is widely favored by East Asian women because of its minimal trauma and significant effects. We describe the case of a 22-year-old woman with pulmonary embolism because of deep vein thrombosis, who presented with hypertrophy of bilateral calf muscles, and was administered 300 U of botulinum toxin A injection in July 2022. On the third day after the injection, she experienced swelling and pain in her left leg, which gradually worsened and made walking difficult. She underwent an ultrasound examination of lower limbs, which revealed several deep and shallow vein thrombi in the left lower limb. Computed tomography arterial imaging indicated multiple embolisms in pulmonary arteries. This study aimed to explore and analyze the causes of pulmonary embolism after botulinum toxin treatment for calf muscle hypertrophy by reviewing and analyzing the patient's symptoms, diagnosis, and treatment process to provide management strategies for treatment and prevention of this disease. (*Plast Reconstr Surg Glob Open* 2024; 12:e5594; doi: 10.1097/GOX.0000000000005594; Published online 6 February 2024.)

Since its first application in the medical field in 1981, botulinum toxin A (BTA) injection has been widely used for cosmetic purposes, including treatment for leg muscle hypertrophy, because of its safety and effectiveness.¹ Very few complications are associated with the use of BTA for slimming treatment in East Asian women.² To the best of our knowledge, this is the first report of pulmonary embolism resulting from deep vein thrombosis after BTA treatment for calf muscle hypertrophy.

CASE

A 22-year-old woman who presented with hypertrophy of bilateral calf muscles was injected with 300 U BTA (Lanzhou Hengli, China) on both sides of her calf muscles on July 17, 2022, at a beauty salon, with each side receiving 150 U of the BTA. No imaging or laboratory tests were performed before administration of the injection. The patient had no history of illness or allergies. (See table,

Supplemental Digital Content 1, which displays basic information of the patient. <http://links.lww.com/PRSGO/D65>.) On the third day postinjection, the patient reported slight pain and swelling in the left leg (pain score: three points). The pain did not subside even after resting; on the contrary, it worsened. On the fifth day, the patient experienced severe pain in the left leg (pain score, six points) and was unable to walk, and she was brought to the hospital for examination (Fig. 1). Ultrasonography revealed thrombosis in the common femoral vein, upper segment of the superficial femoral vein, and upper segment of the great saphenous vein. On July 25, 2022, further in-patient examination with vascular ultrasound revealed deep and superficial vein thrombosis of the left lower limb, slightly thickened arterial wall of the left lower limb, and segmental thrombosis of the left common iliac vein and external iliac vein. Pulmonary artery computed tomography arterial imaging indicated multiple thrombosis in both lungs (Fig. 2). Although the cardiac ultrasound and electrocardiography showed no obvious abnormalities, the patient gradually developed difficulty in breathing with stable blood pressure and heart rate. The diagnosis was pulmonary embolism (moderate risk) and deep vein thrombosis in the lower limbs. On August 1, the inferior vena cava filter (Denali filter) was placed.

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Fig. 1. The patient's left lower limb is swollen with varying leg thickness.

One month after the operation, lower limb blood vessels were reexamined with ultrasound, which indicated that one of the left common femoral veins, superficial femoral vein, posterior tibial vein, and part of the left lower leg intermuscular vein had thrombosis. When partially reopened, the left common iliac vein and external iliac vein showed segmental thrombosis, and no obvious signs of embolism were found on the pulmonary artery CTA. On September 2, the filter was surgically removed.

The patient has been taking oral toluenesulfonic acid aldoxaban. Presently, the lower limbs feel pain and swelling after a little walk, which interferes with her regular activities of daily life.

DISCUSSION

East Asians refer to beautiful legs as being length of the calves exceeding one-fourths of their height and the circumference of the legs being three-fourths of their length. The inner boundary forms a straight line, whereas the outer and rear boundaries form arched curves. However, East Asian women generally have short stature, which visually creates the impression of short and thick calves.³ There are many traditional methods to treat calf muscle hypertrophy, such as selective neurectomy, total or partial gastrocnemius muscle resection, radiofrequency, and liposuction, but these procedures are associated with many complications, including irreversible loss of function, scarring, leg asymmetry, incision infection, and edema.⁴ Liposuction is only used for fat hypertrophy. Because calf muscles have more fat, liposuction has little effect.⁵

There are few reports of leg weakness, deformities, and sensory abnormalities after administration of BTA injection for the treatment of calf muscle hypertrophy, and no gait disorders or fatigue during walking or running, and very few cases of swelling, hematoma, edema, or infection.⁶ Very few patients may experience local ecchymosis but generally recover within 3–5 days. According to expert consensus, it is recommended that the injection depth be 2.0–3.0 cm, the injection volume at each point be 5–10 U, and the amount on both sides of the lower legs be 300 U.⁷ The target muscles for injection are generally the calf gastrocnemius and soleus muscles. Muscle fibers can be reversibly denervated by blocking presynaptic release of the neurotransmitter (acetylcholine) at the neuromuscular junction, resulting in muscle paralysis and atrophy.⁸

The intermuscular vein of the lower leg runs through the gastrocnemius and soleus and belongs to the deep venous plexus of the lower limb. The vascular lumen is thin, and the blood flow speed is slow. Under physiological conditions, it mainly relies on the muscle pumps and venous valves to promote blood return.⁹ If the calf muscle cannot contract due to long-term bed rest or similar

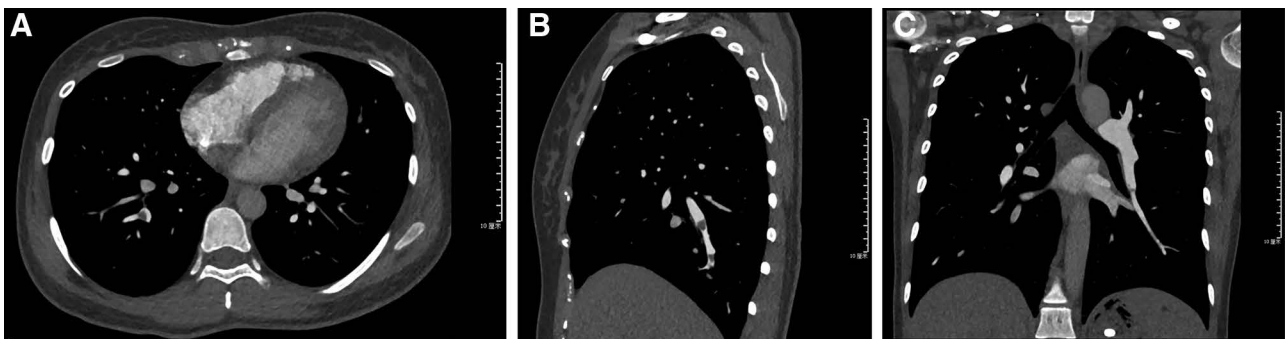


Fig. 2. Scattered filling defects can be seen in the outer basal branch of the right lower lobe of the lung, and in the lower lingual branch and anterior internal branch of the left lung. A, Transverse section for CTA. B, Median sagittal section for CTA. C, Coronal section for CTA.

conditions, intermuscular vein blood flow is insufficient and stagnant, which facilitates the formation of intermuscular vein thrombosis of the calf.¹⁰ Due to the anatomical structure characteristics of the calf muscles, when the lower limb vein is excessively congested, soleus vein perfusion is more likely to be disordered and form a thrombus. Without intervention, the thrombus may progress slowly above the popliteal vein level, eventually leading to thrombus detachment and pulmonary embolism. Thrombosis impairs venous valve function, exacerbates blood stasis, and ultimately leads to repeated thrombosis. This also explains the reason for the progression of the disease to pulmonary embolism and segmental thrombosis formation during vascular ultrasound follow-up 1 month later.

CONCLUSIONS

The usage guidelines for BTA injection have not yet clarified its potential for treating calf muscle hypertrophy. Even with expert consensus and guidelines as the basis, as well as this technology already being used on a frequent basis, the protocol should be strictly followed for clinical use according to the indications and specifications in the guidelines.

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DISCLOSURE

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

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