Botulinum Toxin as a Tool to Reduce Hyperhidrosis in Amputees

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Botulinum toxin (BTX) is an effective treatment for improving prosthetic discomfort and reducing limb pain in amputees, particularly those experiencing hyperhidrosis of the residual limb. We describe a technique for administering BTX injections by dividing the residual limb into targeted areas and delivering the treatment in stages. This approach demonstrated an excellent outcome in our patient, enhancing comfort and managing hyperhidrosis. Our case underscores the importance of personalized treatment plans that are tailored to each patient's needs while also addressing factors that may affect their access to effective therapies.

Practice Gap

Hyperhidrosis poses a considerable challenge for many amputees who use prosthetic devices, particularly at the interface between the residual limb and the prosthetic socket. The enclosed environment of the socket often leads to excessive sweating, which can compromise suction fit and increase the risk for skin chafing, irritation, and slippage. Persistent moisture also promotes bacterial and fungal growth, raising the likelihood of infections and foul odors within the socket. Research has shown that skin complications are highly prevalent among amputees, affecting up to 73.9% of this population in the United States.[1] Commonly reported complications include wounds, abscesses, and blisters, many of which can be triggered or worsened by hyperhidrosis.[2] Current treatment options for residual limb sweating include topical antiperspirants, botulinum toxin (BTX) injections, iontophoresis, and liner-liner socks.

While BTX commonly is used to treat hyperhidrosis in areas such as the palms and axillae, it typically is not considered as a first-line therapy for residual limb sweating; however, both BTX type A and type B have shown safety and effectiveness in managing hyperhidrosis in amputees, enhancing prosthetic use, and improving overall quality of life.[3] Despite these benefits, BTX remains relatively underutilized for residual limb sweating, particularly among dermatologists who may not routinely treat individuals with acquired limb loss. This presents an opportunity for dermatologists to expand their scope and address the unique needs of amputees. We propose a technique for administering BTX injections to treat residual limb hyperhidrosis.

Tools and Techniques

A 64-year-old man initially presented to our dermatology clinic after undergoing an above-the-knee amputation of the left leg 1 year prior. The amputation had been performed due to chronic prosthetic joint infections with *Escherichia coli*. He reported persistent sweating of the residual limb, which severely limited his use of a prosthesis and led to frequent falls.

During the initial visit, treatment options for primary hyperhidrosis including topical and injectable therapies were discussed. Due to a fear of needles, the patient chose topical treatment, with the option to pursue BTX injections later if better control was needed. An aluminum chloride hexahydrate prosthetic antiperspirant was prescribed for nightly application on the anterior and posterior residual limb along with an over-the-counter prosthetic antiperspirant simultaneously. Although the over-the-counter prosthetic antiperspirant provided partial relief, the symptoms persisted, preventing the patient from returning to work. Unfortunately, the prescription antiperspirant was prohibitively expensive and not covered by the patient's insurance. As a result, BTX injections were initiated at 1-month follow-up.

Botulinum toxin injections were administered in a grid-like pattern across the surface area where the residual limb made contact with the prosthetic. Using a surgical marker, the patient assisted the medical team in identifying the areas where sweating occurred most frequently. The area was divided into 4 equal sections, with each section treated per weekly interval sequentially over 4 weeks. The targeted areas included the left anterior (extending from the anterior tensor fasciae latae band to the lateral thigh) and left posterior residual limb (Figure 1 and eFigure 1, respectively).

The treated section was cleaned with an alcohol wipe prior to each injection, and 50 units of BTX (diluted to

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2.5 units per 0.1 mL in bacteriostatic saline) were injected intradermally into each section (Figure 2 and eFigure 2). The injections were administered in rows, with the needle inserted at evenly spaced intervals approximately 1 inch apart. A total of 100 units were administered per section at each weekly appointment. The patient tolerated the procedure well, and no complications were observed.

Practice Implications

This staged approach to administering BTX ensures even distribution of the injections, optimizes hyperhidrosis control, minimizes the risk for complications, and allows for precise targeting of the affected areas to maximize therapeutic benefit. Following the initial procedure, our patient was scheduled for follow-ups approximately every 3 to 4 months starting from the first set of injections for each area. Over 9 months, the patient successfully completed 3 treatment sessions using this method. The patient reported improved quality of life after starting the BTX injections.

After evaluating the initial treatment outcomes with 100 units per section, the dosage was increased to 200 units per section to reduce the number of visits from 4 every 3 months to cover the entire area to 2 visits every 3 months. This adjustment aimed to optimize results and better manage the patient's ongoing symptoms. At about 1 to 2 weeks after beginning treatment, the patient noticed decreased sweating and discomfort during his daily activities and reduced friction with his prosthetic leg. No adverse effects were noted with the increased dosage during a clinical visit.

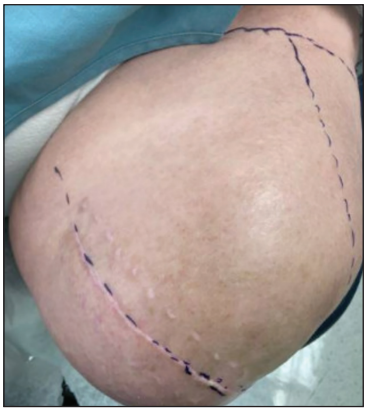

FIGURE 1. Marked outlines of the sections for botulinum toxin injections on the anterior limb.

FIGURE 2. Anterior limb after undergoing botulinum toxin injections performed in a gridlike pattern.

Our case highlights the importance of ensuring equitable access to hyperhidrosis treatment. Dermatologists should prioritize patient-centered care by factoring in financial constraints when recommending therapies. In this patient's case, offering a range of options including over-the-counter antiperspirants and prescription treatments allowed for a management plan tailored to his individual needs and circumstances.

DaxibotulinumtoxinA, known for its longer duration of action compared to other BTX formulations, presents a promising alternative for treating hyperhidrosis.[4] However, a gap in care emerged for our patient when prescription antiperspirant was not covered by his insurance, and daxibotulinumtoxinA, which could have offered a more durable solution, was not yet available at our clinic for hyperhidrosis management. Expanding insurance coverage for effective prescription treatments and improving access to newer treatment options are crucial for enhancing patient outcomes and ensuring more equitable care.

Focusing dermatologic care on amputees presents distinct challenges and opportunities for improving their care and decreasing discomfort. Amputees, particularly those with residual limb hyperhidrosis, often experience additional discomfort and difficulty while using prosthetics, as excessive sweating can interfere with fit and function.[5,6] Dermatologists should proactively address these specific needs by tailoring treatment accordingly. Incorporating targeted therapies, such as BTX injections, in addition to education on lifestyle modifications and managing treatment expectations, ensures comprehensive care that enhances both quality of life and functional outcomes. Engaging patients in discussions about all available options, including emerging therapies, is essential for improving care for this underserved population.

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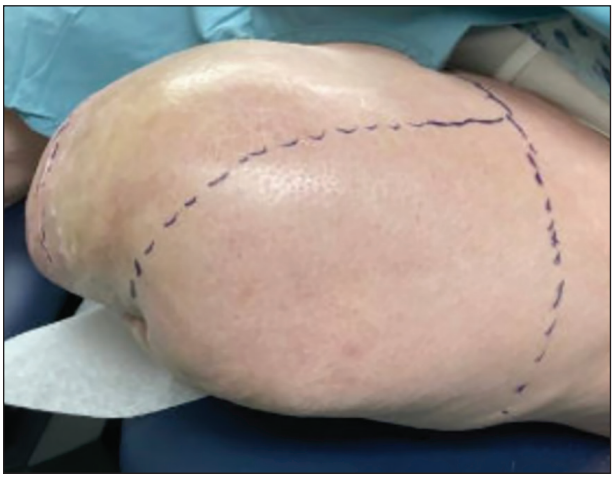
APPENDIX



eFIGURE 1. Marked outlines of the sections for botulinum toxin injections on the posterior limb.

eFIGURE 2. Posterior limb after undergoing botulinum toxin injections performed in a gridlike pattern.