

# The Role of Botulinum Toxin in Vasospastic Disorders of the Hand



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## KEYWORDS

• Vasospasm • Raynaud • Botox • Botulinum toxin • Vasodilation • Pain • Ischemia

## KEY POINTS

- At present, botulinum injections offer a low-risk method for the treatment of symptomatic Raynaud phenomenon.
- Although the mechanism has not been fully elucidated, this finding provides patients with another means of medical management before moving to sympathectomy.
- Repeated injections may be required.

## INTRODUCTION

The hand is a true end organ with an arborization of vasculature that continues from the palms to the fingertips and nail beds. A multitude of intrinsic and extrinsic factors can affect the normal anatomy and physiology of the blood vessels to the hand. Blood vessels may be affected by trauma, inflammation, infection, autoimmune disorders, pharmacologic agents, neoplasms, and endocrine abnormalities, as well as other factors that may affect the central nervous system, the peripheral nervous system, and the neuropeptides that control vascular tone. Vasospasm, which is defined as inappropriate tone of the arteries or veins in the hand, can result in impaired vasodilatation, cold intolerance, and digital ischemia. It is estimated that more than 9 million people have vasospasm of the digits annually.<sup>1-4</sup> Women are more susceptible than men at a ratio of 9:1 and young adults experience more vasospastic episodes that those more than 40 years of age.<sup>1-4</sup> Although advances have been made in the last decade, understanding of digital vasospasm, also known as Raynaud phenomenon, is still limited. This article focuses on vasospasm of the hand and the use

of botulinum toxin for the treatment of patients with Raynaud phenomenon.

## VASCULAR INSUFFICIENCY FROM VASOSPASM OF THE DIGITAL VESSELS

Vasospastic disorders of the hand are a common phenomenon and are manifest by remitting and relapsing clinical symptoms. Recurring episodes of vasospasm become problematic as the frequency and duration of the episodes increase. One of the earliest descriptions of vasospasm of digital arteries was by Maurice Raynaud in 1862, who described the process as “A local asphyxia of the extremities as the result of increased irritability of the central parts of the cord presiding over vascular innervation.”<sup>5,6</sup> The vasospastic disorder characterized by Maurice Raynaud was called Raynaud disease for decades until John Hutchinson in 1901 correctly articulated that there were many causes for vasospasm of the digital vessels and that the term “disease” was probably not appropriate for this condition. Sir Thomas Louis was the first to describe the physiologic features to distinguish primary Raynaud phenomenon from secondary Raynaud conditions.<sup>5</sup> Primary

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**Box 1****Conditions associated with secondary Raynaud**

## Rheumatologic disease

Systemic sclerosis  
 Systemic lupus erythematosus  
 Mixed connective tissue disease  
 Dermatomyositis  
 Rheumatoid arthritis  
 Sjögren syndrome  
 Vasculitis

## Vascular occlusive disease

Buerger disease  
 Arteriosclerosis  
 Thromboembolic disease

## Drug induced

Amphetamines  
 Beta-adrenergic blockers  
 Bleomycin  
 Cisplatin  
 Cyclosporin  
 Ergots  
 Interferon alfa  
 Vinblastine

## Hematologic syndromes

Polycythemia  
 Paraproteinemia  
 Cryoglobulinemia  
 Cryofibrinogenemia  
 Cold agglutinin disease  
 Homocysteinemia  
 Protein C, protein S, antithrombin III deficiency  
 Factor V Leiden

## Environmental associations

Vibration injury  
 Frostbite

## Anatomic syndromes

Scalenus anticus syndrome  
 Cervical rib

## Infectious causes

Hepatitis B and C (associated with cryoglobulinemia)  
 Mycoplasma infections (cold agglutinins)  
 Parvovirus B19

Many medical conditions or illnesses may have one of their manifestations present as Raynaud. The many potential causes or related entities that are associated with secondary Raynaud phenomenon are indicated here.

*Adapted from Bakst R, Merola JF, Franks AG Jr, et al. Raynaud's phenomenon: pathogenesis and management. J Am Acad Dermatol 2008;59(4):635; with permission.*

Raynaud phenomenon does not have any other associated medical condition linked to the vasospastic disorder. In secondary Raynaud phenomenon, the vasospastic disorder is linked to other systemic disorders (**Box 1, Table 1**).<sup>1,6</sup>

The term Raynaud phenomenon is used here to describe the clinical picture of pallor, cyanosis, and rubor. The disorder is the result of vascular embarrassment to the hand from dysfunction of the homeostatic neural control of blood vessels. The resultant paroxysmal vasoconstriction combined with episodes of vasodilation manifest in the color changes noted earlier, pain, and ultimately ulceration of the fingertips. The histories obtained from patients often describe their fingers as being blanched and cool, which is especially brought on by cold exposure or stress (**Fig. 1**). There are episodes of secondary vasodilation in which the digit becomes more swollen and fusiform with characteristic dysesthesias. The longer and more severe the vasospasm, the more likely the patient is to experience fingertip pain and possible ulceration. Persistent ischemia may lead to deep ulceration, bone exposure, and amputation.<sup>7,8</sup>

The physical examination findings on patients with Raynaud disease or phenomenon may appear normal when a vasospastic episode has not occurred recently. The surgeon should look for signs of ulceration, inflammation, dry gangrene, discoloration, nail bed petechiae, poor turgor, or dystrophic nails or fingertips. The capillary refill may be normal or sluggish but the Allen test is usually normal.

Tests used to evaluate the vascularity of the hand are included in **Box 2**. The management of Raynaud phenomenon is variable depending on the cause and the severity of the condition. Essential conservative measures include smoking cessation, maintaining a warm environment, and reducing stress. These early measures are often enough for those patients who have mild or very infrequent bouts of vasoconstriction. When vasospastic disorders result in prolonged symptomatic problems for patients, drug therapy is indicated. An extensive array of medications has been used

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