# Acute Arterial Thrombosis of the Hand

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Continuing Medical Education

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Ghazi M. Rayan, MD, has no relevant conflicts of interest to disclose.

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All authors of this journal-based CME activity have no relevant conflicts of interest to disclose. In the printed or PDF version of this article, author affiliations can be found at the bottom of the first page.

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Ghazi M. Rayan, MD, has no relevant conflicts of interest to disclose. The editorial and education staff involved with this journal-based CME activity has no relevant conflicts of interest to disclose.

**Learning Objectives**

- Discuss the arterial anatomy of the hand.
- Elaborate on the causes of acute arterial thrombosis in the hand.
- Distinguish between clinical manifestations of acute and chronic arterial ischemia.
- Detail surgical treatment methods and outcomes of arterial thrombosis.
- List complications after treatment of arterial thrombosis in the hand.

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Arterial thrombosis of the hand occurs infrequently but may result in considerable morbidity and compromise of hand function. The hand surgeon may be called upon to direct management in cases of acute arterial thrombosis of the hand and should have an understanding of the available diagnostic tools and treatment modalities. This article discusses the vascular anatomy of the hand and clinical manifestations of arterial thrombosis. Differences between isolated thrombosis and diffuse intravascular injury are detailed, and treatment options for these conditions are described. Appropriate care often requires coordination with interventional radiologists or vascular surgeons. Outcomes after treatment of arterial thrombosis of the hand are variable, and prognosis may be related to whether isolated thrombosis or diffuse intravascular injury is present. *(J Hand Surg Am. 2015;40(10):2099–2106. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)*

**Key words** Arterial injury, botulinum toxin, hypothenar hammer syndrome.

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Received for publication March 25, 2015; accepted in revised form April 10, 2015.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

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0363-5023/15/4010-0029$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2015.04.015

Few conditions involving the hand and upper extremity require the same urgency as arterial thrombosis of the hand. Arterial insufficiency resulting from thrombosis presents a limited window for intervention in which "time is tissue" and requires prompt diagnosis and treatment. Treatment options may vary based on the etiology of thrombosis and whether there is localized thrombosis or diffuse small vessel injury. The goals of treatment include relieving vasospasm, preventing thromboemboli, and reestablishing perfusion to areas of ischemia. To accomplish these goals, the hand surgeon should be ready to coordinate care with members of the vascular surgery or interventional radiology team. The current article is a review of current concepts related to diagnosis and management of acute arterial thrombosis of the hand.

Arterial thrombosis of the hand is relatively uncommon.[1] The precise incidence of this condition is unknown. There are multiple etiologies of upper extremity arterial thrombosis. Intra-arterial injection of medications or illicit substances may cause diffuse intravascular injury and ischemia within the hand, whereas systemic conditions or the effects of repetitive trauma may result in relatively localized arterial thrombosis (Table 1).

Among the group of patients affected by intra-arterial injection, various offending agents have been described, including temazepam,[2] flunitrazepam,[3] zolpidem,[4] heroin, midazolam, and cocaine.[5,6] Dodd et al[2] performed histological examination of tissue obtained after amputation or fasciotomy in patients treated for intra-arterial injection of temazepam. The authors noted arteritis with interstitial edema, denudation of the endothelium, and necrosis. Thrombosis may result from platelet activation owing to endothelial injury[7] and the presence of particulate debris in the injected solution. In a study by Zachary et al,[8] the authors injected sodium pentothal into the central ear artery of rabbits to simulate necrosis after intra-arterial injections. The authors noted substantial increases in the amount of thromboxane present in the tissues and highlighted the central role that thromboxane has in vasoconstriction and platelet aggregation after intra-arterial injection. Ultimately, intravascular injury may be seen in any or all vessels distal to the site of injection. The diffuse vascular injury may limit the effectiveness of conservative modes of treatment and preclude bypass of the thrombosed vessels owing to the lack of uninjured distal targets.

Certain conditions or traumatic causes of arterial thrombosis, on the other hand, are not commonly associated with such diffuse intravascular injury. Atrial fibrillation, hypothenar hammer syndrome, or traumatic injury may result in the formation of an isolated thrombus within the hand. These conditions may occur in the setting of otherwise healthy vessels that may be amenable to bypass if less invasive methods of restoring flow to the hand fail.

**TABLE 1. Causes of Acute Thrombosis in the Hand**

| |
|---|
| **Systemic** |
| **Atherosclerosis** |
| **Immune-mediated/inflammatory** |
| Scleroderma |
| Rheumatoid arthritis |
| Sjögren syndrome |
| Systemic lupus erythematosus |
| Hypersensitivity angiitis |
| Henoch-Schönlein purpura |
| Buerger disease |
| **Myeloproliferative disorders** |
| Thrombocytosis |
| Leukemia |
| Polycythemia |
| **Thrombotic** |
| **Hypercoagulable states** |
| ***In situ* thrombosis** |
| **Embolism** |
| **Traumatic** |
| **Iatrogenic injury** |
| Arterial catheterization |
| Trauma |
| Arterial drug injection |
| **Cold injury** |
| **Vibration injury** |
| **Cytotoxic drugs** |
| **Other** |
| **Fibromuscular disease** |
| **Dialysis steal syndrome** |

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## ANATOMY

A thorough understanding of arterial anatomy is necessary when evaluating thrombosis. Blood supplying the hand originates from the radial and ulnar arteries. The radial artery travels between the brachioradialis and pronator teres muscles proximally and brachioradialis and flexor carpi radialis tendons distally in the forearm. The artery divides at the level of the radial styloid into dorsal and palmar branches. The dorsal portion of the radial artery forms the dorsal carpal rete and passes between the 2 heads of the first dorsal interosseous muscle to form the deep palmar arch by joining the ulnar artery. The volar portion of the radial artery supplies the thenar musculature, and in about 34.5% of cases may join with the ulnar artery to form a complete superficial palmar arch.[9]