



# Dermatologic surgery emergencies

## Complications caused by occlusion and blood pressure

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### Learning objectives

After completing this learning activity, participants should be able to describe the potential emergencies that can result from dermatologic surgery, lasers, and cosmetic surgery and describe methods of diagnosis of each specific type of emergency.

### Disclosures

#### Editors

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While the overall incidence of emergencies in dermatologic surgery is low, emergent situations can occasionally pose a risk to patients undergoing such procedures. The clinical importance of several types of emergencies related to vascular occlusion, hypertension, and hypotension are reviewed, and relevant epidemiology, clinical manifestations, diagnosis, work-up, management, and prevention are discussed. Early detection of these emergencies can mitigate or forestall associated adverse outcomes, thereby allowing the outstanding record of safety of dermatologic surgery to continue. (*J Am Acad Dermatol* 2016;75:243-62.)

**Key words:** complication; dermatologic emergency; embolism; hypertension; hypotension; myocardial infarction; stroke; surgery.

Despite the high level of safety and low adverse event rates associated with office-based dermatologic surgery, emergencies can arise, and it is helpful for dermatologists to be able to identify the onset of these. Timely recognition and appropriate management can minimize detrimental patient outcomes and ensure that dermatologic surgery maintains its privileged position as an unusually safe surgical specialty.

In this review we describe several potentially reversible but serious adverse events that may be

### Abbreviations used:

ABC:	airway breathing and circulation
DBP:	diastolic blood pressure
DVT:	deep vein thrombosis
EMS:	emergency medical services
LMWH:	low molecular weight heparin
MMS:	Mohs micrographic surgery
OD:	organ damage
PE:	pulmonary embolism
PFO:	patent foramen ovale
SBP:	systolic blood pressure
VTE:	venous thromboembolism

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encountered during the practice of dermatologic surgery. For each, we provide an explanation of its clinical significance; incidence data, when available; a description of clinical presentation, including signs and symptoms; other specific characteristics or tests that can aid in establishing a diagnosis; treatment and management options, including preventive strategies; and long-term outcomes. The scope of the potential emergencies spans procedures performed commonly by the general dermatology clinician and those performed by more specialized oncologic or cosmetic dermatologic surgeons.

Many of the adverse events and emergencies considered in this review are uncommon or rare. Nonetheless, we include these for completeness. In addition, many of these uncommon problems are by nature unpredictable and idiosyncratic, often associated with few if any steps that a dermatologist can reasonably preemptively implement to avoid their occurrence. Finally, while we generally include a detailed methodology for addressing and managing each adverse event, the portion of such management that is performed by the dermatologist is limited. In many and likely most situations, the dermatologist's role is merely to identify that something is wrong, and then to make a referral to another specialist. A simplified description of what may be done by nondermatologists is included to help the dermatologist refer to the correct service and communicate with the doctor receiving the referral, and not because the dermatologist is responsible for further management.

The first part of this review will address complications that may be seen after a range of dermatologic interventions, specifically those related to vascular occlusion and changes in blood pressure. The second article in this series will consider complications more likely to occur as a result of systemic reactions, trauma, and high-energy sources.

## AIR EMBOLISM

### Key points

- **Air embolism can present as a complication of foam sclerotherapy, but rarely results in significant permanent deficits**
- **Two reports of air emboli as a complication of Mohs micrographic surgery have also been described, both involving extirpation of large scalp tumors with calvarial invasion**
- **Factors that may create an increased risk for a symptomatic event include patent foramen ovale and sclerotherapy foam characteristics**
- **Cerebral vessel spasm has been suggested as an alternative mechanism of transient neurologic deficits after sclerotherapy**

- **Air emboli may be asymptomatic or may present with a range of symptoms, depending on where the blockage occurs**
- **The management of clinically significant air emboli relies on restoring flow to the cardiopulmonary circulation and promoting the reabsorption of intravascular air**

### General/incidence

Air embolism can occur as a complication of foam sclerotherapy and presents with clinical manifestations ranging from asymptomatic to pulmonary or neurologic events.<sup>1,2</sup> The median incidence of symptomatic neurologic events after foam sclerotherapy (including scotoma and migraine) is estimated to be between 0.3% and 6% for visual disturbances and between 0% and 23% for headaches.<sup>3</sup> Reports also have described uncommon but significant neurologic events, including cerebrovascular accident, seizures, and transient ischemic attacks.<sup>4,5</sup> Air emboli as a complication of oncologic surgery have also been described in 2 case reports.<sup>6</sup> Both cases involved large and complicated tumors on the scalp and required extension of Mohs micrographic surgery (MMS) to the level of the calvarium.

### Risk factors

Factors that may create an increased risk for symptomatic air emboli have been well described. These include patent foramen ovale (PFO), and when foam sclerotherapy is used, specific foam characteristics, such as the type and amount.<sup>7-9</sup> Although only 2 case reports of air emboli resulting from MMS have been described, both patients had tumors that extended to the bony calvarium (Fig 1) and were treated in a seated position, potentially contributing to the introduction of air into the circulation.<sup>6</sup>

A PFO—an anomalous connection between the venous and arterial blood supplies—is present in 10% to 27% of the population. PFOs permit the air introduced into circulation (spontaneously or from foam used during sclerotherapy) to rise as far as the right atrium, with the potential for subsequent cerebrovascular gas embolization.<sup>10,11</sup> An analysis of 3259 patients who underwent ultrasonography-guided foam sclerotherapy for the treatment of varicose veins (ie, the great saphenous vein, small saphenous vein, and small veins) revealed an association between PFO and adverse events that included visual disturbances, migraines, and chest discomfort.<sup>8</sup> The adverse event rate was low, however, with only 7 patients (0.21%) reporting such events, all of which were temporary, lasting

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