

# Deep Venous Thrombosis and Pulmonary Embolism in Plastic Surgery Office Procedures

In the interests of increasing patient safety and decreasing the liability risk for physicians, The Doctors Company presents the following discussion of 12 recent medical malpractice claims involving pulmonary emboli after plastic surgery office procedures and a review of the relevant literature.

Thromboembolic phenomena, including deep venous thrombosis (DVT) and its feared sequela of pulmonary embolism (PE), are known postoperative risks of lengthy surgical procedures. Plastic surgery procedures also place patients at risk for these complications, and a number of recent articles in the literature have focused specifically on this problem.<sup>1-5</sup> Most of these articles have emphasized the importance of prevention, since statistics show that most patients suffering embolic events will die before potentially effective treatment can be initiated.<sup>1-3</sup>

Preventive techniques, including elastic stockings and intermittent leg compression devices, are routinely used today in many hospital operating rooms for the majority of cases, including aesthetic surgeries. The use of these devices in office operating rooms and surgery centers is inconsistent. The Doctors Company has noted a continuing incidence of malpractice claims involving plastic surgery patients who suffer serious injury or die from venous thrombosis after office surgeries. Often, a major issue in these claims is the failure to take preventive measures for patients who might have been considered at increased risk for thrombotic episodes.

## Claims

The 12 claims included patients aged 31–64, with a mean age of 47, comprising 11 females and one male. Eight of the 12 claims involved abdominoplasties, with six of these combined with other procedures performed at the same time. Half of the claims were performed under general anesthesia provided by an anesthesiologist or a CRNA, and half were performed under intravenous sedation. Nine of the patients died as a result of the pulmonary embolism, while three survived.

The following is a composite case incorporating details from several of the claims:

A 57-year-old woman presented for abdominoplasty and liposuction of her thighs. She was obese and on hormone replacement. The procedure was performed

under general anesthesia in the plastic surgeon's office and took five hours. The insured did not routinely use either stockings or compression devices in the office, explaining that the liposuction on the legs would have made this technically difficult. The patient phoned the insured the day following surgery complaining of shortness of breath while walking. She was told to release some of the pressure on the abdominal binder. One day later, she was found dead in bed by her husband. An autopsy listed the cause of death as "massive saddle pulmonary embolism."

## Incidence

The incidence of thromboembolic disease is difficult to estimate and varies from study to study. In 2001, the American Society of Plastic Surgeons (ASPS) extrapolated existing data to estimate that over 18,000 cases of deep venous thrombosis may occur in plastic surgery patients each year. Despite this, over half of the surgeons responding to an ASPS questionnaire indicated that they currently used no form of DVT prophylaxis.<sup>4</sup>

Pulmonary embolism is the leading cause of death following liposuction, accounting for 23 percent of the deaths in one study.<sup>6</sup> When liposuction is combined with other procedures, the mortality rate increases from one per 47,415 surgeries to one per 7,314.<sup>7</sup> A significant proportion of that increased mortality may be due to PEs.

Of all common plastic surgery procedures, abdominoplasty has the highest rate of thromboembolic complications, with estimates as high as a 1.2 percent incidence for DVT and a 0.8 percent incidence for pulmonary embolism.<sup>1</sup> Possible reasons for this include impairment of drainage of the superficial veins from the legs and pelvic area during performance of the abdominoplasty,<sup>1</sup> as well as hip flexion during surgery slowing flow through larger veins. The use of abdominal binders postoperatively increases abdominal pressure and decreases venous return.<sup>3,6</sup> Whenever abdominoplasty is combined with

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other surgical procedures, the risk of thromboembolic complications may increase.<sup>1</sup>

Facelift procedures would not be expected to mechanically impair venous return, yet they are still associated with a smaller but significant number of DVT and PE complications due to the immobilization during surgery. Estimates are that the incidence in facelift patients is 0.35 percent for DVT and 0.14 percent for PE.<sup>3</sup> With a combined incidence of 0.49 percent, the average plastic surgeon might, therefore, expect one case of either DVT or PE for every 200 facelifts performed. A major survey found that general anesthesia was used in 44 percent of facelift patients overall, but in 84 percent of the patients who developed thromboembolism—suggesting an increased relative risk from general anesthesia alone.<sup>3</sup>

One procedure is associated with an unusually high incidence of thromboembolic complications. A study of belt lipectomies (circumferential panniculectomy) reported a pulmonary embolism rate of 9.3 percent even with the use of prophylactic measures, prompting the authors to conclude that “belt lipectomy should be undertaken only in patients who are well informed about the possible risks and complications.”<sup>8</sup>

### Risk Factors

Numerous patient characteristics that increase the risk of postoperative thrombosis have been identified. These include smoking, obesity, advanced age, use of hormone replacement or oral contraceptives, congestive heart failure, immobilization (bed rests, casts), malignancy, history of previous thromboembolism, and inherited hypercoagulable states.<sup>1,2</sup> It has been suggested that these factors may act synergistically so that patients who have more than one of these risks may develop DVTs at an incidence higher than would be predicted by the sum of the individual risks.<sup>2</sup>

General anesthesia is likely an independent risk factor because of the immobility associated with it. After the first hour of general anesthesia, there appears to be a linear relationship between the procedure time and the incidence of postoperative DVTs.<sup>3</sup>

### Preventive Measures

Several clinical steps, devices, and medications are available that have proven effective for the prevention of DVTs. One simple measure is flexing the patient's knees to approximately five degrees by placing a

pillow underneath them, which increases popliteal venous return.<sup>1,2</sup> This can be accomplished easily in almost all cases.

Graded elastic compression stockings that increase venous return by applying constant pressure to the legs have been shown to reduce the incidence of DVTs.<sup>2</sup> One study focusing on facelift patients, however, found no evidence that these hose provided protection when used alone.<sup>3</sup> Other evidence indicates that thromboembolism hose may be most effective when used together with the intermittent compression devices discussed below.<sup>2</sup>

Intermittent pneumatic compression devices (IPCs), which apply variable and intermittent positive pressure to the legs, enhance venous return and are widely used in operating rooms for the prevention of lower extremity thrombosis. The relative risk of DVTs with the use of these devices is approximately 0.28 percent, or about one fourth of the risk of procedures performed without them.<sup>1</sup> These pressure devices have also been shown to induce fibrinolysis and cause the release of antiplatelet aggregation factors—additional mechanisms of clot prevention. It is recommended that, ideally, they be placed and operational before the induction of anesthesia.<sup>1,3</sup>

Anticoagulants are useful for patients at high risk of developing venous thrombosis. These include heparin, warfarin, and the low-molecular-weight heparins (LMWH) such as enoxaparin. Several authors feel that there are advantages of LMWH over heparin, including a lower incidence of thrombocytopenia,<sup>1,2</sup> a lower rate of bleeding complications when used in lower doses, and the ease of once-a-day subcutaneous dosing.<sup>2</sup> If the first dose of LMWH is given two hours before surgery, it has been shown to protect throughout the perioperative period.<sup>2</sup> Bleeding can present unique problems for cosmetic surgery patients, and the risks of DVT must always be weighed against the risk of increased bleeding in any given patient.

### Prophylaxis Algorithm

In 1999, the American Society of Plastic and Reconstructive Surgeons issued a practice guideline regarding thromboprophylaxis.<sup>5</sup> It suggested that patients be stratified into three levels of risk. Low-risk patients are those under age 40 having minor procedures. Moderate-risk patients are aged 40 and above, undergoing procedures longer than 30 minutes. Patients on oral contraceptives or using post-

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menopausal hormone replacement are also considered to be at moderate risk in the absence of other factors. High-risk patients are over 40, having procedures longer than 30 minutes under general anesthesia or possessing additional risk factors.

A 2002 advisory suggested that even low-risk patients should have their knees slightly flexed on the operating room table.<sup>9</sup> For procedures on moderate-risk patients, in addition to the knee flexion, it is recommended that intermittent pneumatic compression devices be placed before beginning anesthesia and remain operational until the patient is awake and moving. With high-risk patients, in addition to both of the above measures, it is suggested that a hematology consultation be obtained and antithrombotic medical therapy be considered.<sup>9</sup> The importance of early ambulation for all three risk groups has been stressed.<sup>2</sup>

A 2004 article on thromboembolism prevention<sup>2</sup> further refined the risk stratification of patients to a scoring system, giving points for each risk factor that the patient exhibits, such as age, obesity, hormones, or malignancy. The number of points accumulated then determines the risk rating. This information is then attached to an order sheet so that appropriate measures can be taken. This article recommends the use of elastic compression stockings in addition to intermittent pneumatic compression stockings for all but the lowest risk patients.

While specialty society advisories and guidelines do not technically constitute the standard of care for medical-legal cases, it can be hard for a jury to understand why a physician would fail to adhere to their published recommendations. Of the 12 cases reviewed by The Doctors Company, only four exhibited care that would be consistent with the society's current guidelines described above. The most common deviation was the failure to use intermittent pneumatic compression devices in moderate- and high-risk patients.

### Patient Safety Suggestions

Surgeons should routinely question all preoperative patients about the risk factors for thrombosis listed in the algorithm above. The patient's history and physical should include pertinent information about risks, including malignancy history or hormone usage and documentation of any suspicious findings such as pre-existing leg edema. Patients may be advised to

discontinue supplemental hormones one week prior to the procedure.<sup>1</sup>

For procedures with higher risks of thromboembolic complications, such as abdominoplasty, belt lipectomy, and large volume liposuction, the risk of DVT and PE should be explained to patients as part of the informed-consent process. The proposed prophylactic measures can then be discussed, as well as the possibility of performing the procedure in a more acute care environment if deemed appropriate. Informed-consent deficiencies and the fact that the patient was never apprised that the procedure could be done somewhere other than in the office were not infrequent allegations in the malpractice claims reviewed.

Intermittent compression devices have been described as being of low cost and low morbidity, leading to the suggestion that they be used in any lengthy plastic surgery procedure or in any procedure performed under general anesthesia.<sup>3</sup> Despite this advice, many malpractice claims continue to be seen involving patients who developed pulmonary emboli after long procedures in which the IPC device was not employed. Often the surgeons in these claims argue that pneumatic compression systems were not standard for offices at the time or that it was difficult to apply them because of the nature of the surgery.

Suggestions for using the compression device when surgery is being performed on the legs include sterilizing the plastic leg wraps and applying them after the patient is prepped<sup>1</sup> or placing them only on the lower leg when procedures are performed above the knee. Surgeons should be aware that many offices now have intermittent compression machines, having purchased them new or used, leased them, or rented them on a case-by-case basis.

The use of general anesthesia for long plastic procedures is a subject of current debate. While some authors laud its advantages,<sup>10</sup> others caution that the immobility associated with general anesthesia is a significant risk factor for thromboembolism. Newer techniques for intravenous sedation that include the use of propofol drips, often in combination with other drugs, have made it possible to perform lengthy or extensive surgeries without general anesthesia and without the loss of the patient's airway protective reflexes.<sup>11</sup>

This has led the plastic surgery society task force to conclude: "When possible, procedures longer than

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three or four hours should be performed with local anesthesia and intravenous sedation because general anesthesia is associated with deep vein thrombosis at much higher rates under prolonged operative conditions.”<sup>5</sup> Surgeons should consider taking an active role in the planning of the type of anesthesia used rather than simply deferring this decision to the anesthesia provider, who may not always consider the risk of thrombotic disease. Because the length of the procedure itself increases the risk for many complications, the American Society of Plastic Surgeons has recommended that, ideally, office procedures should be completed within six hours.<sup>9</sup> Sometimes this might involve staging multiple procedures into more than one case.

### Diagnosis and Treatment

Untreated proximal leg DVTs will progress to pulmonary embolism at a rate estimated to be near 50 percent. The rate of PE in treated patients is less than 5 percent.<sup>1</sup> Early and aggressive treatment is, therefore, the goal. The symptoms of both DVT and PE are nonspecific and may be absent in any given patient.<sup>2</sup> Physicians must have a high suspicion for patients complaining of possible symptoms who have recently had any surgery, including, of course, cosmetic procedures.

The symptoms and signs of DVT include calf pain and tenderness, leg edema, and venous engorgement.<sup>1,10</sup> Presenting complaints with PE may include chest pain, dyspnea, hemoptysis, tachycardia, and tachypnea.<sup>1,10</sup> Preliminary screening tests include a chest x-ray (insensitive) and a serum D-dimer test, which is a marker for thrombosis.<sup>1</sup> However, if PE is a differential diagnostic consideration, consultation should be obtained regarding definitive testing (helical CT scan, ventilation-perfusion lung scan) and treatment.

Interestingly, in seven out of the 12 cases reviewed by The Doctors Company, the patients phoned the insured plastic surgeons complaining of symptoms later thought to be related to pulmonary embolism. These included shortness of breath (five claims), lightheadedness, tachypnea, and fainting. In only two of the claims, the surgeons instructed the patients to go to the emergency room immediately; both of those patients survived. The remaining five claims included the allegations that the surgeons failed to have a sufficiently high suspicion about thromboembolic

disease, had misdiagnosed or minimized their patients' complaints, and failed to act immediately and aggressively—thereby depriving them of an increased chance for survival.

Plastic surgery procedures are by definition elective, and a death from postoperative pulmonary embolism is an unexpected tragedy. With vigilant prevention and early diagnosis and treatment, we are hopeful that more patients can be spared this devastating consequence.

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*The guidelines suggested in this article are not rules, and they do not ensure a successful outcome. They attempt to define principles of practice for providing appropriate care. The principles are not inclusive of all proper methods of care nor exclusive of other methods reasonably directed at obtaining the same results. The ultimate decision regarding the appropriateness of any treatment must be made by each health care provider in light of all circumstances prevailing in the individual situation and in accordance with the laws of the jurisdiction in which the care is rendered.*

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