# Avoiding Abdominal Wall Necrosis in Abdominoplasty

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## 17.1 Introduction

One of the most devastating complications in abdominoplasty is the occurrence of abdominal wall necrosis. This may involve only the inferior portion of the skin flap or a large section of the lower and upper abdominal wall. The causative factors vary but necrosis can usually, but not always, be avoided. The author has analyzed the causative factors involved in an attempt to aid other surgeons in avoiding this complication.

## 17.2 Arterial Supply of the Abdominal Wall

Huger [1] divided the abdominal wall vascularity into three zones. Zone I is the area from xyphoid to pubis bounded laterally by the lateral margin of the rectus muscles. Zone II is the area of the lower abdomen from the pubis and inguinal creases to a line at the level of the anterior superior iliac spines. Zone III comprises the area on each side lateral to Zone I superior to a line between the anterior superior iliac spines.

The arterial supply to Zone I superiorly is from the superior epigastric artery originating from the internal mammary artery that is derived from the first portion of the subclavian artery. Inferiorly the supply is from the inferior epigastric artery originating from the external iliac artery. Secondary vessels are from Zone III crossing the midline.

The arterial supply to Zone II is from the superficial epigastric artery and the superficial external pudendal artery both of which are branches of the femoral artery that originates from the external iliac artery and from the superficial circumflex iliac artery that also originates from the femoral artery.

Zone II arterial supply is derived from the intercostal, subcostal, and lumbar arteries that are branches from the aorta.

### 17.2.1 Smoking

Cigarette smoking is associated with atherosclerotic cardiovascular disease, cancer, and chronic obstructive pulmonary disease. Smoking is a risk factor for arteriosclerosis obliterans and thromboangiitis obliterans. Nicotine activates chemoreceptors of the aortic and carotid bodies resulting in vasoconstriction, tachycardia, and elevated blood pressure. The ultimate response of any one system is the summation of stimulatory and inhibitory effects of nicotine. Small doses of nicotine cause the discharge of catecholamines from the adrenal medulla, but larger doses prevent their release in response to splanchnic nerve stimulation.

The average cigarette contains 8–9 mg of nicotine and delivers about 1 mg of nicotine systemically to the smoker [2]. The intensity of puffing and technique of the smoker can increase the bioavailability of the nicotine [3]. The half-life of nicotine in the smoker is 2 h [2] with 80–90% metabolized in the liver, kidney, and lungs. Even though there appears to be complete metabolization by 24 h, patients who do not begin to stop smoking at least 2 weeks before surgery are likely to continue right up to the time of surgery and after surgery.

The patient who is a smoker is set up for necrosis if smoking is not completely stopped prior to and following surgery. Chronic smokers have difficulty withdrawing and attempts at withdrawal are associated with significant symptoms (Table 17.1). Smoking cigarettes, using oral snuff, chewing tobacco, and chewing nicotine gum result in a peak of nicotine within 30 min

**Table 17.1.** Symptoms of nicotine withdrawal

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| 1. Irritability |
| 2. Impatience |
| 3. Hostility |
| 4. Anxiety |
| 5. Restlessness |
| 6. Dysphoric or depressed mood |
| 7. Difficulties concentrating |
| 8. Increased appetite or weight gain |


**Fig. 17.1. a** Necrosis of periumbilical area and central lower abdominal wall in a patient who would not stop smoking before and after full abdominoplasty. **b** Following complete healing by secondary intention in 10 months. *Arrows* show areas of scar that are slightly indented and required revision

while the use of the nicotine patch results in a peak in 8 h. Patients who refuse to stop smoking should not have a complete abdominoplasty (Fig. 17.1) and may not be candidates for any cosmetic surgical procedure [4].

Necrosis in smokers may involve the lower and upper skin flap including the new periumbilical area. Destruction of the stalk may also occur.

### 17.2.2 Liposuction Combined with Abdominoplasty

The combination of liposuction with a full abdominoplasty can have devastating consequences if care is not taken to limit the amount and areas of liposuction and/or the extent of the abdominoplasty. Matarasso [5] describes four types of abdominal wall laxity and presents information on the critical areas of the abdominal wall to liposuction at the time of abdominoplasty. Abdominoplasty may be combined with liposuction if the central upper abdominal area has cautious liposuction and the areas lateral to this central area have limited liposuction. Patients should be screened as to risk factors. Low risk includes young age, low volume of liposuction, and no concomitant intra-abdominal surgical procedures. Moderate risk includes larger extent and multiple sites of liposuction, obesity, and "T" closures. High risk includes prior history of thromboembolism, smoking exposure, and coexistent morbid medical conditions.

Bozola and Psillakis [6] devised a classification of abdominal wall deformities and their treatment. There are a variety of treatments advised for the different deformities. However, the author disagrees with the treatment of type 4 by transecting the umbilical stalk from its attachment to the aponeurosis. There is very little reason to lower the umbilicus except in a minimal fashion to prevent a vertical midline scar. Type 5 deformity is treated with the full abdominoplasty that may be combined with liposuction. There is no mention of the

risks of extensive liposuction done concomitantly with full abdominoplasty.

### 17.2.3 Liposuction Prior to or Following Abdominoplasty

The question frequently comes up as to which is better, doing liposuction before, during, or after abdominoplasty. Doing liposuction before abdominoplasty allows the fat to be removed from the abdomen and surrounding areas without having to be concerned about injuring the blood supply. However, a recent study has shown that a full abdominoplasty after extensive liposuction may result in severe complications including necrosis. The author's experience has also shown that liposuction first may still result in necrosis (Fig. 17.2) unless the liposuction and/or the abdominoplasty is limited in extent. Also, the liposuction results in intense scarring and makes the abdominoplasty more difficult, trying to separate the fat and subcutaneous tissues from the underlying fascia.

Performing liposuction after abdominoplasty allows the surgeon to be more discriminating in selecting the areas to be treated and any touch up, as for dog-ears, can be done at the same time. Tissue planes are more distinct during abdominoplasty and vessels are more easily visualized for ligation.

## 17.3 Tight Closure

There is a tendency for surgeons to excise as much lower abdominal skin flap, as well as extending into the upper abdomen (above the umbilicus), in order to obtain as flat an abdominal wall as possible. This can be overdone by stretching the skin as tightly as possible with the patient in a flexed position and then keeping the patient flexed for weeks into the postoperative period. There are very few patients who can tolerate the flexed position for any length of time while attempting to ambulate especially if the patient has a chronic back problem. The author closes the subcutaneous tissues as tightly as possible while the patient is in a flat supine position and then may flex the patient in order to close the skin more easily.

If the skin flap is stretched too tightly, the vessels of the flap may become stretched, spasm, and then clot causing flap necrosis. The necrosis is usually in the central mid-portion of the flap.

## 17.4 Concomitant Upper Abdominal Wall Scars

The subcostal scar from cholecystectomy or gastric surgery disrupts the vascular supply to the skin flap medial to the scar. When the flap is pulled tightly, the vascular stretching and spasm are complicated by the disrupted blood supply and may result in flap necrosis. The necrosis appears in the triangle between the scar and the midline. This may be prevented by minimizing the amount of flap resected and leaving at least a 4–6 cm space between the inferior point of the scar and the cut edge of the skin flap or by resecting the central portion of the abdominal flap leaving a midline scar [7].

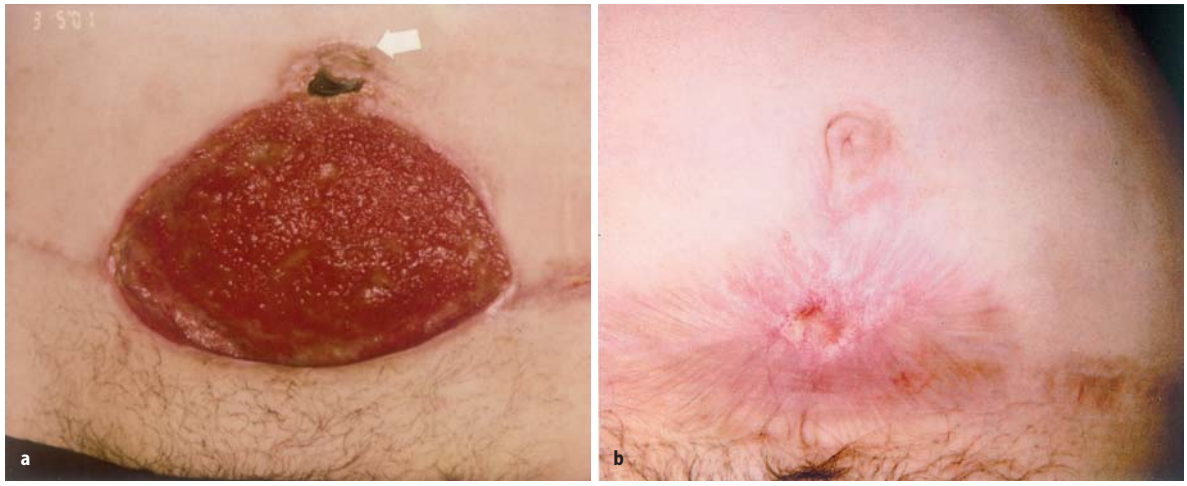


**Fig. 17.2. a** Extensive lower abdominal wall necrosis in a patient who had extensive liposuction 4 months before having a full abdominoplasty (*arrow* at umbilicus). Cyanotic changes did not respond to the use of Nitro-Bid. The wound 2 months after abdominoplasty shows good granulations. The umbilical stalk is still intact (*arrow*). **b** Wound completely healed by secondary intention after 10 months. Revision of scars will be necessary after maturation of scar in 6–10 months

## 17.5 Hematoma

The pressure exerted on the abdominal wall skin flap by a hematoma can result in flap necrosis especially if there are other concomitant factors. Care should be taken to obtain hemostasis before closure of the abdominal wall. Even with good hemostasis, it is possible, because of excessive activity, coughing, trauma, or sneezing that a vascular clot may come loose, resulting in bleeding. Recognition and immediate evacuation of the hematoma may preserve the flap.

## 17.6 Infection

Infection may occur as a result of contamination of instruments or by a break in sterile technique. Statistically, infection occurs in clean, uncontaminated surgical wounds in 3% of hospital cases and 1% of cases in an outpatient office setting. Early recognition and adequate treatment of the infection may prevent flap necrosis.

Necrotizing fasciitis is a result of infection by a fulminant group A streptococcus that starts as a cellulitis, spreads to the superficial and deep fascia, and produces thrombosis of cutaneous vessels and necrosis of the underlying tissues. Other organisms, aerobic, anaerobic, or mixed, may cause the same process. Recognition of this process early in its course will allow debridement and drainage that may limit the extent of the necrosis and avoid mortality.

Diabetes mellitus increases the risk of infection when the blood sugar is not controlled preoperatively and postoperatively. If general anesthesia is utilized and the patient is not expected to eat for a period of time postoperatively, the blood sugar level should be monitored and intravenous or subcutaneous insulin used when necessary. Daily blood sugar evaluation during the time of healing is essential for patients who are on insulin or oral diabetic medications. Patients controlled by diet alone can be controlled postoperatively by resuming the diet as soon as possible. Elevated blood sugar should be treated adequately and promptly. If infection occurs in a diabetic patient, the result is usually elevation of the blood sugar that in turn increases the infectious process problem.

### 17.6.1 Smoking

Patients who smoke cigarettes just before or after abdominoplasty are highly prone to necrosis of the flap because of the disturbance of the blood supply. It is necessary to strongly advise the patient against smoking, usually for 2 weeks before and 2 weeks after surgery. Some patients are unable to stop smoking because of the symptoms of withdrawal (Table 17.1) and either refuse to stop or say they will cut down. Any smoking at all is hazardous to the skin flap and, therefore, the surgeon must decide whether or not to proceed with the surgery after a thorough warning to the patient. Some patients will say that they will stop smoking and in fact continue to smoke after surgery without telling the physician because they are afraid to be admonished about the smoking. The author does not perform cosmetic surgery with flaps if the patient refuses to stop smoking.

## 17.7 Discussion

When the tissues become cyanotic and have an increased refill time, over 6 s, the chances of saving the tissue are slight. The author has found that even with the use of Nitro-Bid ointment (Hoechst Marion Roussel, Kansas City, MO) (Fig. 17.2) or other vascular dilators, the necrosis will proceed to its inevitable end. However, the use of these ointments or medications assuages the patient's fears, gives the patient something to do that may be helping the wound, and gives the patient confidence that in time the wound will heal with the treatment. Early cutting of the tight sutures may help but leaves a large defect that will take months to fill in. Since healing of necrotic areas takes weeks to months, the patient needs something positive to do during the period of debridement rather than simply waiting and hoping that the wound will get better. Necrotic tissue should be debrided until there are fresh granulations and the wound kept clean by the patient with frequent cleansing and sterile dressings. The wound can be allowed to close on its own, which may take months, or split thickness skin graft applied. Skin grafts allow faster healing but prevent ultimate contraction of the wound. On the abdominal wall, skin grafts are not usually indicated since secondary healing can result in an acceptable scar in comparison to a skin graft that fills the space with a conspicuous scar and thin skin.

There are no guidelines as to what constitutes a less aggressive liposuction or what constitutes a limited abdominoplasty. Limited liposuction means avoiding the central upper abdomen except for the deep subcutaneous fat and generally avoiding superficial liposuction. Limited abdominoplasty means removal of less skin-subcutaneous fat flap, no tension, less lateral dissection, and less superior dissection. The flap should be limited to the central abdomen halfway across the external oblique aponeurosis from the lateral edge of the rectus muscle and below the costal margins superiorly. Even then there is no guarantee that necrosis will not occur but at least it will be less likely.

## 17.8 Conclusions

The cosmetic or plastic surgeon should be aware of the possible causes of flap necrosis, their avoidance, and the treatment of the problem.

## References


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