

Prevention of Complications in Dermatosurgery

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SUMMARY Dermatosurgery has become ever more popular and important in recent years, mostly due to the increasing prevalence of skin malignancies. It also encompasses a wide variety of methods to remove or modify skin tissue for numerous cosmetic reasons. Nowadays, many dermatologists provide complete dermatologic care for their patients, including surgery. Therefore, it is important to be aware of the possible complications and to be able to manage them properly. Complications in cutaneous surgery are not very often, but they can be serious and worrisome including bleeding, infections, allergic reactions, syncope, wound dehiscence, necrosis, and others. In this article special attention is given to bleeding, which is the most common complication in this field. The best way to reduce the number of possible complications is to recognize patients at risk. Thus, complete history and physical examination are required before performing any dermatosurgical operation.

KEY WORDS: dermatosurgery, cutaneous surgery, surgical complications, bleeding

INTRODUCTION

Over the last decades, surgical procedures in dermatology have been gaining in importance and evolved enormously within dermatologic practice and the range of conditions being surgically treated has also been broadened. Continuous rise in the skin cancer and melanoma prevalence leads to considerable growth in demand for dermatologic surgery. Dermatosurgery also encompasses a wide variety of methods to remove or modify skin tissue for other health or cosmetic reasons. Many dermatologists nowadays believe that they should

offer complete dermatologic care for their patients, including surgery (1). However, one should be aware of the possible complications. Complications in operative dermatology may arise not only through problems during the surgery but also because of inadequate preoperative evaluation and planning or because of less than ideal postoperative care. In addition, underlying diseases such as diabetes mellitus or collagen vascular disorder may contribute to inadequate healing, bleeding or wound infections (2).

COMPLICATIONS IN DERMATOSURGERY

During the operation, complications can arise because of the physician's inexperience and lack of skill, inattention, frank sloppiness, or simple bad luck. The last of these is the most common cause of complications, such as postoperative bleeding, hypertrophic scar formation, keloids, and wound infections (2,3). A prospective study of the incidence of complications associated with dermatologic surgery was conducted by Amici *et al.*, showing an incidence of 6%. Most frequent were hemorrhagic complications (3%), which occurred significantly more frequently in males, when anticoagulant, antiplatelet or immunosuppressant agents were used and, in cases of prolonged procedures, skin flaps or full skin grafts. Infectious complications occurred in 2% and vasovagal syncope in 1% of patients. Anesthetic complications occurred more frequently when the patient's age was less than 50 years (4).

Bleeding

Generally, bleeding represents one of the most common complications in surgery. Control of bleeding process is crucial for achieving an optimal surgical outcome. Bleeding from the smaller caliber vessels encountered in cutaneous operations is unlikely to result in a life-threatening immediate risk; however, it is alarming to the patient and may also disturb the healing process. Excessive bleeding, either intraoperative or postoperative, is often associated with unfavorable outcomes. For example, increased postoperative bleeding under the suture can result in edema or hematoma formation presenting with sudden pain and a tender, often bluish area of the swelling at the wound site (Fig. 1). There are certain anatomic sites where



Figure 1. Hematoma in the axillary region that developed after sentinel lymph node excision in a melanoma patient.



Figure 2. Patient with periocular hematoma after surgical removal of lentigo maligna melanoma on the forehead.

the formation of postoperative hematoma is almost inevitable, such as periorbital region (Fig. 2). Hematoma can in some cases have severe consequences due to the pressure it exerts on the wound edges. This can cause necrosis, leading to wound dehiscence and formation of cosmetically unacceptable scar. In most cases, bleeding caused by cutaneous surgical procedure can be controlled with electrocautery, electrocoagulation, or electrodesiccation. On the other hand, electro-surgical operations (such as electrodissection of the excessive hypertrophic tissue in patients with rhinophyma) may sometimes be complicated with bleeding when a larger blood vessel is injured. In such cases, an additional suture may be the solution to stop the bleeding (5). Even with careful hemostasis, postoperative bleeding does occur in a small number of patients. Pressure dressings are recommended for the first 24 hours postoperatively in most cases. Also, patients should be given instructions about postoperative care and limited activity after the surgery (6).

A normal hemostatic response to vascular injury involves the initial formation of a platelet plug followed by a fibrin-platelet clot, and it depends on the adequate quantity and function of coagulation factors and platelets. A medication or a certain disease that affects the coagulation cascade may potentially cause prolonged bleeding. Inadequate hemostasis and mechanical factors such as hypertension and trauma can cause bleeding complications too. Taking careful history preoperatively will identify patients at risk of bleeding. Information on previous surgeries, dental proce-

dures, cuts and menstruation can be very helpful in identifying patients at a higher risk. Also, a list of medications (warfarin, aspirin, other nonsteroidal anti-inflammatory drugs (NSAIDs), heparin, thiazide diuretics, oral contraceptives) should be taken into account (7). Aspirin and warfarin increase intraoperative bleeding, but have not been clearly demonstrated to increase postoperative bleeding (8). There are also various over-the-counter (OTC) preparations that may be important for the recognition of high-risk patients. Garlic, for example, inhibits platelet aggregation in a dose-dependent manner. Garlic contains adenosine, allicin, and paraffinic polysulfides, which exhibit antiplatelet effects believed to be irreversible in nature, lasting for platelet lifetime. Ginkgo biloba has been implicated in cases of postoperative and intracranial bleeding. The half-life of 3 to 10 hours determines the level of antiplatelet activity. Many patients do not consider OTC supplements when reporting medication use, and they should be specifically asked about them (9).

Vitamin E is an antioxidant which can also exhibit anticoagulant activity through the inhibition of the vitamin K-dependent coagulation cascade (10). Alcohol is a known potent vasodilator and it is strongly recommended to avoid its use in the perioperative period. Information on diseases like systemic lupus erythematosus, leukemia, viral infections, anemia, alcohol abuse, etc. are very important, and so is the family history of a bleeding abnormality (von Willebrand's disease, hemophilia, other inherited coagulation disorders). Physical examination should reveal other physical signs of increased bleeding (ecchymoses, petechiae). When necessary, the best way to identify bleeding abnormalities is with laboratory studies (platelet count, bleeding time, prothrombin time, partial thromboplastin time) (6).



Figure 3. Herpes zoster manifestation triggered by dermatosurgical procedure.

Infections

Infections are relatively rare in uncomplicated dermatologic surgery. Skin preparation before the operation plays an important role in the prevention of wound infection. For minor procedures such as biopsy and electrodesiccation, skin cleansing with isopropyl alcohol and barrier protection with nonsterile gloves are sufficient. In excisional surgical procedures with skin closure, skin should be prepared with povidone-iodine (Betadine) or chlorhexidine scrub followed by draping the surgical field with sterile towels. Hair in the surgical field should be removed (shaved or clipped with scissors) since it is well known that preoperative hair removal decreases the frequency of wound infections. Prevention and early recognition and treatment of wound infection is important to minimize the possible wound dehiscence and increased scarring, as well as more serious complications such as toxic shock, sepsis and osteomyelitis. The most common cause of cutaneous wound infections are bacterial organisms (*Staphylococcus (S.) aureus*, *S. epidermidis* and β -hemolytic streptococci) (6). Sometimes, the trauma caused by dermatosurgery can activate latent herpes virus infections (Fig. 3). Also, patients with other skin disorders (such as atopic dermatitis) are at a higher risk of cutaneous wound infections, and so are immunocompromised patients and patients with diabetes mellitus.

There is still no consensus regarding recommendations for antibiotic prophylaxis in dermatologic surgery both to prevent wound infections and to treat patients at risk of endocarditis or those with prosthetic devices (11,12). In the majority of dermatologic surgery procedures, prophylaxis is not needed because the overall incidence of infection is low (4). However, specific factors including the type of procedure or the general patient's health status may increase the risk of wound infection, so a possible benefit might be achieved by the administration of preoperative antibiotics (13,14).

Allergic reactions and reactions to local anesthetic agents

Local anesthetic agents are commonly used in cutaneous surgery and are considered to be safe when used properly. However, each surgeon should be familiar with the possible complications from local anesthesia, which include various regional and systemic allergic reactions, systemic toxicity, as well as possible nerve damage or even necrosis. Allergic reactions to local anesthesia are rare with an incidence of less than 1% (15). Almost



Figure 4. Contact dermatitis as a reaction to anti-septic agent.

any substance applied to the skin can cause irritant or allergic reactions. In dermatosurgery, reactions to topical anesthetics (most common ester anesthetics), preparation agents such as antiseptics (betadine, chlorhexidine, povidone-iodine, etc.), topical antibiotics and latex products are most commonly seen (Fig. 4). Contact dermatitis is frequently misdiagnosed as a wound infection (6). Allergic reactions to injected anesthetic agents are a medical emergency and sometimes life threatening state. They are almost always caused by ester anesthetics, sometimes by amide anesthetics. All local anesthetic agents have the potential to be toxic to the central nervous system and cardiac system if the plasma concentration is high enough. The most common cause of elevated plasma levels of an anesthetic agent is inadvertent arterial injection. Therefore, repeated aspiration during anesthetic application is extremely important.

Necrosis is a rare complication; however, it is also one of the most dangerous complications connected to local anesthesia. It is usually caused by epinephrine in the local anesthetic agent. Cutaneous necrosis develops due to prolonged vasoconstrictive effect of epinephrine. Therefore, when operating in the areas with poor collateral circulation, such as digits, epinephrine should be avoided. Patients with pre-existing peripheral vascular disease (diabetes, connective tissue diseases, atherosclerotic disease) have a higher risk of cutaneous necrosis (6).

Epinephrine should also be used with caution in patients taking beta-blocking agents, tricyclic antidepressants, thyroid hormones, and monoamine oxidase inhibitors because of the risk of severe hypertension. However, in routine dermatosurgery, where small amounts of local anesthetic

with epinephrine are used, the risk of this problem is remote (16).

Electrosurgical procedures can sometimes cause excessive tissue damage, resulting in charred tissue that can be a nidus for postoperative inflammation and delayed healing. This technique should be used with extreme caution in patients who have implanted pacemakers and defibrillators even though they are designed to resist outside electrical stimulation. To minimize this risk, multiple short bursts should be used (6). It is important to dry the operative field with gauze before using the electrosurgical device, to avoid the spread of current over a larger area.

Vasovagal syncope is one of more common complications in patients undergoing minor surgical procedures. Anxious and very nervous patients are more likely to have vasovagal syncope. It is important to make sure that the patient cannot see the operation, and after the procedure should be instructed to sit and stand slowly.



Figure 5. Urticarial rash as a result of psychological stress because of the operation.

The **psychological aspect** of the surgical procedure should not be forgotten. Some patients are worried or scared because of the operation, which can sometimes result in psychological disturbances such as anxiety. We report on a patient who manifested urticarial rash as a result of psychological stress from the surgical removal of a skin change (Fig. 5).

Dehiscence (wound separation) occurs when a wound fails to heal in apposition. It can be caused by delayed wound healing due to systemic disease or steroid medication, excessive wound tension, hematoma, wound infection or premature suture removal. The most common cause of wound separation is excessive tension (Fig. 6).



Figure 6. Wound dehiscence due to excessive wound tension.

Seroma is a collection of serous fluid under the suture line which may develop in the areas of extensive undermining or dead space. Seromas can be drained by using a large-bore needle and syringe in order to reduce pain and wound tension. In dermatosurgical procedures, seromas are most often seen as a side effect occurring after sentinel lymph node biopsy in patients with malignant melanoma.

One must also have thorough knowledge of the vascular and nerve supply of the operative field. Especially the facial nerve can be easily damaged during a procedure in the preauricular region.



Figure 7. Telangiectasias along the hypertrophic scar.

Necrosis occurs secondary to tissue ischemia when the blood supply of the healing wound is inadequate. Wounds that are under tension and the conditions like hematoma in the postoperative wound, infection, contact dermatitis or peripheral vascular disease imply a higher risk of necrosis. Smoking is also a risk factor for the development of necrosis since it causes vasoconstriction,

increased blood viscosity, hypoxia, and increased platelet aggregation, which promotes microvascular thrombosis.

Telangiectasias can sometimes develop within the postoperative healed wound, especially in cases of hypertrophic scars, keloids, and widened scars (Fig. 7). The risk of telangiectasias is higher in wounds that are under tension.

Hypertrophic scars and keloids are formed when excessive collagen proliferation occurs after



Figure 8. Keloid developing after a minor surgical excision.

trauma (6). Keloids are benign fibrous growths that appear after surgery, trauma or 'spontaneously' as a consequence of microtrauma in predisposed patients (Figs. 7 and 8). Keloids are distinguished from hypertrophic scars because keloids extend beyond the margins of the original wound and do not tend to regress spontaneously. Moreover, hypertrophic scars arise early (4 weeks postoperatively), they often regress spontaneously, and they do not recur. Keloids may arise months after surgery, they do not regress spontaneously, and they frequently recur. Keloids are often associated with



Figure 9. A wide postoperative scar on the back.

pruritus and pain, and can lead to functional and cosmetic deformities. Some patients have a family tendency or personal history of hypertrophic scar or keloid formation. Wound infection, hematoma, wound under tension and dehiscence increase the risk of forming a hypertrophic scar or keloid. Keloids represent a therapeutic challenge and, although multiple treatment options are available, a reliably effective approach with few side effects remains elusive (17). However, radiotherapy for keloids represents a safe and most effective option for postoperative keloid therapy, especially for patients with bulky or recurrent disease (18). Recent studies have shown that silicone elastomer sheeting might be effective in the prevention of the development or in the improvement of the appearance and feel of hypertrophic and keloid scars. These products are an attractive treatment option because of their ease of use and low risk of adverse effects compared to other treatments such as surgical excision, intralesional corticosteroid injections, pressure therapy, radiation, laser treatment, and cryotherapy (19). In our experience, the best results in the treatment of large keloids have been achieved with a combination of the above mentioned modalities.

Granulation tissue can develop in the presence of a certain barrier to complete wound healing. Trapdoor deformities occur when a part of a flap or a graft becomes elevated by thickened tissue (6).

Wide scars after surgical excision are usually the result of tension on the area that exceeds the wound strength (Fig. 9). Areas such as back, chest and shoulders are more often affected by the formation of wide scars because the wounds are here usually closed under tension. Failure to consider the skin tension lines can lead to wider scar or to a distortion of normal structures (2). When planning operations that are entirely cosmetic, patients should be thoroughly informed on all possible complications, scarring in particular. Sometimes the operative scar may be more disturbing than the preoperative problem, especially if a hypertrophic scar or keloid develops, which can happen despite excellent technical efforts. Certain areas such as pectoral, deltoid and dorsal areas are particularly prone to keloid formation.

Hypopigmentation and hyperpigmentation can appear as a result of inflammation caused by any surgical procedure. Cryosurgery, electrodesiccation and dermabrasion are dermatosurgical methods that are relatively more often followed by change in the local skin pigmentation. Hyper-

pigmentation and hypopigmentation are frequent complications of Er:YAG laser resurfacing. Long pulse duration-induced thermal damage seems to be the most important factor in terms of the induction of pigmentary disorders (20).

CONCLUSION

Surgical complications are not frequent but can be both worrisome and disturbing. In order to prevent or reduce complications it is necessary to take complete history and physical examination before performing dermatosurgical operations. Since the importance of dermatosurgery can be expected to increase continuously in the future, dermatologists should prepare themselves for the present and future challenges within the surgery of the skin, including the awareness and management of its possible and sometimes inevitable complications.

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