

HOW IS A SKIN GRAFT PERFORMED SUCCESSFULLY?

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Free skin grafts consist of a segment of epidermis and different layers of dermis that are completely removed from the body and transferred from the donor site to the recipient site. The difference with flaps is that the piece of skin is not attached to a blood vessel; because of this, its survival depends on the absorption of tissue fluid in the first phase and the development of a new blood supply subsequently.

Free skin grafts are mainly used for the reconstruction of wounds affecting the distal part of the extremities, as there is not enough skin in this area to immobilize and close the wound or perform a skin flap.

Grafts are used when there is a large loss of skin due to trauma or cancer surgery.

Where a graft will and will not take:

The success of a graft depends on the establishment of arterial and venous connections with the graft bed. The wound must provide adequate vascularization, ideally through granulation tissue, but it can also be used in surgical wounds (e.g., when resecting a tumor) that do not yet have granulation tissue, provided that the area is highly vascularized and the wound is free of contamination. Grafts should be placed on healthy granulation tissue that is free of infection and debris.

It is important to know where a graft will not take: epithelial surfaces, bone, cartilage, tendon, or nerves. Also, infected wounds, crushed tissue, irradiated tissue, avascular fat, and chronic granulation tissue.

Graft acceptance involves four steps:

1. **Adhesion:** the fibrin found in the tissue fluid initially forms a kind of adhesion between the granulation tissue and the graft. Over time, the fibrin is replaced by collagen, forming a fibrous tissue that becomes completely adherent after 10 days.
2. **Plasma imbibition:** This occurs during the first 2-3 days. The capillaries of the graft dilate and absorb the serum proteins and erythrocytes found in the tissue fluid. They also absorb hemoglobin, which gives them a cyanotic/purple color during these first 2-3 days.
3. **Inosculation:** This is the process by which anastomosis occurs between the existing blood vessels of the graft and the granulation bed. It begins 24 hours after grafting, and blood flow may begin after 3-4 days.
4. **Revascularization:** This is the process by which new blood vessels are created from the granulation bed to the graft.

The three most common reasons why a skin graft fails are:

- **Infection:** this is harmful because the enzymes released by bacteria (proteolytic enzymes) alter the fibrin, preventing the graft from adhering. Pseudomonas bacteria are usually the most commonly involved. Aseptic technique and proper wound management are essential.
- **Movement:** this alters the fibrin bonds that attach the graft to the bed, impairing its vascularization and nutrition. This is prevented by placing an adequate number of sutures and using an appropriate graft dressing.
- **Haematoma and seroma formation:** the accumulation of fluid under the graft mechanically separates the graft from the recipient bed, preventing the connection of the fibrin network and the connection of the vessels. The best way to prevent this is through careful wound preparation, avoiding suppuration and, especially, using a mesh graft. Drainage systems can also be used.

How a skin graft is performed:

Preparation of the recipient site:

- The recipient site must have a healthy granulation bed that is free of contamination/bacterial infection.
- If the wound has developed chronic granulation tissue, this will be surgically removed at the time of surgery using a scalpel or gauze. This should be done before obtaining the graft to allow time for the area to stop bleeding.
- The edges of the wound may or may not be removed.

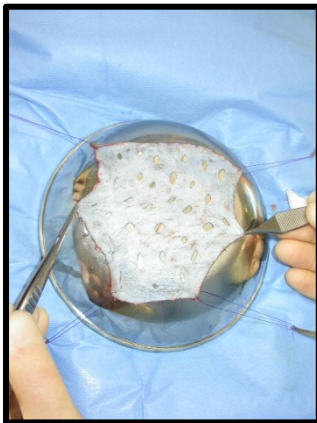
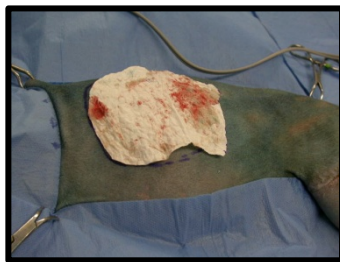
Preparation of the donor site:

- The area where the graft is obtained must be a site with excess skin in order to obtain the desired graft size and to allow for easy suturing without tension. The most suitable area for obtaining a graft is the lateral area of the chest or abdomen.
- If possible, obtain a graft from an area that matches the hair and color of the recipient area.
- A template is obtained from the recipient area, which is used to draw the dimensions of the graft needed in the donor area.
- A partial-thickness incision is made in the donor skin with a scalpel blade perpendicular to it. After this initial incision, the scalpel blade is kept almost parallel to the skin surface and cutting begins.
- Once 3-4 mm of skin has been cut, three or four traction sutures are placed in the skin to apply traction while the blade cuts the rest of the graft. Several blades may be needed.
- The donor site can be completely removed and the edges sutured, or it can be left to heal by secondary intention (not ideal).
- There are also dermatomes, which are cutting machines that obtain a graft of a specific thickness, but they are very expensive.

Preparation/placement of the graft:

- All hypodermic tissue must be removed, as any tissue between the dermal tissue and the recipient wound prevents vascular access to the dermis. This is achieved by placing the graft on a bowl or index finger with the hypodermis facing up and carefully trimming all adipose tissue with scissors or a scalpel. Once the graft has been obtained, it should be placed immediately on the wound.

- If the graft is to be meshed, a number 11 scalpel blade is used to make parallel staggered incisions in the skin, approximately 1 to 2 cm long and 0.5 to 2 cm apart.
- The graft is placed on the hair bed in the same direction as the hair growth in the surrounding area.
- It is positioned so that it overlaps the edges of the wound by 1 to 2 mm, and sufficient simple interrupted sutures or staples are used to secure it in place. The overlapping portion of the graft will die due to avascularity and can be removed at a later date. The edge of the graft can also be sutured to the edge of the wound, but if graft contraction occurs, the entire wound may not be covered.
- The graft is sutured with simple interrupted sutures in an apposition manner.



Postoperative care:

This is probably the most important part of the entire procedure.

Dressing:

The first layer should consist of a non-adherent contact layer made of perforated silicone sheets impregnated with petroleum jelly. An absorbent, adaptable cotton intermediate layer should be used to remove exudate and provide support, followed by an outer layer where a splint could be placed to reduce movement.

Frequency of dressing changes:

The first two dressings are normally changed every two days, ideally under general anesthesia, although I usually do my first dressing change around day 4-5. Since adhesion is only partial, there is a high risk of damaging the adhesion process. This process must be performed with extreme care and under sterile conditions.

After this period, dressing changes can be performed every 48-72 hours, depending on the amount of exudate, and can be performed under sedation. The graft should ideally remain bandaged for a minimum of 14 days. After removing the bandage, a collar may be necessary for a couple more weeks to prevent self-trauma caused by reinnervation.

Interpretation of graft appearance:

- During the first 1-3 days, the graft will appear engorged and edematous due to plasma imbibition. The color of the graft will darken; this does not necessarily indicate graft failure.
- After one week, the graft will become less edematous and take on a pinker color due to the onset of circulation.
- Hair may begin to grow after two or three weeks.

What not to expect:

- Signs of graft movement are concerning, as they can damage the fibrin bonds and halt angiogenesis.
- Separation of the graft from the bed due to fluid accumulation during the first 48 hours can be treated with gentle pressure or by making a small incision in the graft to drain the fluid.
- Epidermal detachment may occur; this is not necessarily a sign of graft failure, as the deeper dermal layers remain viable.
- Purulent exudate: imminent graft failure, with little chance of recovery.

Other colors:

- o White: generally indicates ischemia
- o Black: indicates necrosis; these areas should be resected

Recommended literature:

- Pavletic, M. Atlas of Small Animal Wound Management and Reconstructive Surgery.^{3rd} Ed.
- Williams, J; Moores, A. BSAVA Manual of Canine and Feline Wound Management and Reconstruction.^{2nd} Edition
- Slatter. Textbook of Small Animal Surgery.^{3rd} Ed.
- Tobias K.M. Johnston S.A. Veterinary Surgery Small Animal. Elsevier