Practical guide to basic Skin Grafting in practice

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EQUIVET Skin Grafting Set

Pinch grafting requires a minimum of equipment, but the correct equipment helps significantly. The KRUUSE grafting kit contains the correct instruments for grafting techniques.

- Mayo-Hegar Needle Holder - 16 cm
- Standard Narrow Dressing Forceps - 13 cm
- Graefe Iris Forceps - 7 cm Straight
- Graefe Iris Forceps - 7 cm ½ Curve 45°
- Graefe Iris Forceps - 7 cm Curved 90°
- Mini-Mcghee Micro Ear Forceps – 8 cm
- Scalpel Blade Handle No.3
- Loopuyt Needle 80 mm, Regular Eye
- Instrument Case Stainless Steel

Cat. No 142000
Introduction:

Techniques for skin grafting in horses vary widely from the most basic (pinch grafts) to the most sophisticated (split thickness mesh or micro-island (Meek) grafting). The practicality of these varies markedly. Skin grafting is an underused technique in equine wound management as well as in surgical practice. Significant benefits can be gained from early use of grafting techniques so that the horse returns to a healthy and usable state much earlier. It is also an important resource in the management of non-healing wounds and in some specific surgical circumstances. This guide provides information and instruction on the technique of pinch grafting. This is an easy and practical method of supporting wound healing in particular. There are also comments on the related techniques of punch grafting and tunnel grafting.

- Pinch grafting requires the minimum of equipment but the correct equipment helps significantly. KRUUSE has developed the EQUIVET Skin Grafting Set that contains the correct instruments for grafting techniques.

- Pinch grafting can be performed in many cases with a standing sedated horse because collection of the grafts can easily be undertaken using local anaesthesia and placement of the grafts is usually pain-free and requires no significant local anaesthesia in the vast majority of cases.

- Pinch grafting is tolerant of low quality granulation tissue and superficial and minor infection as well as some local and general movement. It is however improved dramatically by ensuring good quality even and healthy granulation tissue and by careful attention to detail including the restriction of movement in the immediate post grafting period. Other forms of grafting are much less tolerant of infection, movement and poor quality granulation tissue.

- Pinch grafting is a fast and easily repeatable technique that demands very little technical skill – however there are important ways in which the benefit can be enhanced and the results improved.
Technique

1. Preparation
   a. Prior to crafting the recipient site should be prepared as well as possible – high quality granulation tissue without infection and without movement provides the best opportunity for a good outcome.
   b. Care should be taken to ensure that the granulation tissue is healthy prior to grafting. It is useful to reduce any excessive granulation tissue by surgical debridement. This serves to remove any superficial infection and reduces the amount of granulation tissue that has to be removed later on. This is best performed a day or two before pinch grafting.
      i. Please note that pinch grafting is tolerant of variations in granulation tissue quality at various areas within the wound bed. It is also more tolerant of movement and minor infection.

2. Collection of grafts
   a. Donor pinch grafts are usually harvested from the side of the neck (under the mane) or the breast;
   b. The donor site should be clipped and washed and then rinsed over with alcohol
   c. Local anaesthetic solution is laid in a line around the periphery of the donor site and left for 10 minutes
   d. A right handed operator should hold the needle driver in the left hand and grasp the half curved large, cutting suture needle about half way along its length so that the point is directed to the right!
   e. The number 15 (or 11) scalpel is held in the right hand
   f. The skin is just lifted with the point of the suture needle and the blade is used to cut a disc of skin around it. It helps to avoid excessive lifting tension and it helps to cut directly at right angles to the needle.
   g. Grafts should be harvested from the most ventral part of the donor site first to avoid blood spreading across the site and making collection problematic.
   h. Grafts are placed carefully into a sterile pot or petri dish and should be used as soon as possible. There is no known advantage to placing them on a saline soaked swab.
   i. There is no advantage in trying to close the donor sites with staples or sutures – they will look slightly bigger by 24 hours post procedure but thereafter will heal rapidly by contraction and epithelialisation. By 7 days they are usually just a small scab and by 14 days they are imperceptible in most cases.

NOTE: It may help to have one operator collecting the grafts whilst another person implants the grafts.

In a few cases a few white hairs may develop at the donor site so it is worthwhile warning the owner first.
3. **Graft placement**
   a. The grafts are grasped with a small plain, 90° forceps (Graefe iris forceps - 7 cm are ideal), avoiding any excessive pressure.
   b. Starting along the most ventral part of the recipient site, the grafts are placed at 1 cm intervals with interlocking rows.
   c. Placement needs to be done carefully! Grafts need to be placed in a downward facing pocket 3 – 4 mm behind the surface of the granulation tissue bed.
   d. The handle of the forceps is held parallel to the wound bed so that the initial penetration of the forceps (carrying the graft) is at right angles to the surface of the granulation tissue.
   e. The forceps is driven directly into the granulation tissue to a depth of around 2- 4 mm (the small forceps included in the KRUUSE kit are ideal because that is the depth of the point of the instrument).
   f. The forceps are now lifted until they are right angles to the surface – the graft is now in a downward facing pocket 2- 4 mm deep and 2-4 mm below the entry point.
   g. The forceps are released and then removed following a reverse pathway.

**DO NOT JUST PULL the forceps out – they must follow the same exit pathway as the entry pathway so that the graft does not have any freedom to fall out of the site. Any bleeding occurs in the pathway of the insertion and not below the graft so there is little or no danger that bleeding will cause graft expulsion and loss.**

Different angles of forceps including 90°, 45° and straight can be useful in different sites but the graft placement should always be downwards to minimise graft loss. Suitable forceps are included in the EQUIVET Skin Grafting Set.

Some bleeding is of course inevitable but since the bleeding is predominately "outside" the graft, this is not an issue of any importance.

4. **Post grafting management**
   a. Following graft placement through the selected recipient area, the site should be dressed with a hydrogel and a hydrocellular foam dressing and a soft bandage. Restriction of movement is helpful and this can be done using a splinted padded bandage or a bandage cast where the site allows that to be done safely.
   b. The dressing should be left in situ for 5 days if at all possible to allow the process of revascularisation of the grafts.

**The graft sites should not be interfered with at all during this time. Upon first dressing change a light flush with saline is the best cleanser. Chemicals should be avoided.**

   c. After 4- 5 days the dressing should be changed and then left for up to 7 days if possible.
   d. Where only part of the site is grafted suitable variations in the dressings and intervals to dressing change may be altered.
   e. Limited movement can be permitted after 5- 10 days.
5. Outcome
a. Positive outcomes are reflected in a distinct blanching of the granulation tissue bed which is usually noticeable at around 10 days post grafting.
b. Islands of epithelial cells will usually be visible by 21 days post grafting and by 35 days hairs will be obvious.
c. Wound site contraction is a cardinal feature of grafted sites – the site will show significant and obvious contraction from around 21 days and this will continue until the site has completely healed.
d. Trimming back of granulation tissue is seldom required but if it is done, then the operator needs to be very careful to stay just outside the graft level.
e. Failed graft take seldom occurs except where there are specific inhibitors of healing such as excessive movement, poor blood supply, infection and tumour transformation in the wound bed.
f. Sequential grafting of bigger or partially problematic wound sites is feasible at around 10 – 21 days interval.

Remember:
- Grafted sites may look a bit exudative in the early stages following graft placement.
- Examine the first dressing carefully on removal to see if any grafts have been lost – it is common that about 10% of them either do not take or are displaced.
- Grafts do not survive well in very fibrous tissue or where there are significant inhibiting factors present such as serious pathogen infection and tumour.

Note on tunnel grafting:
- Tunnel grafting involves the collection of a thin (2 mm) strips of skin from the donor site.
- These are drawn through granulation tissue of a suitable configuration with the help of "alligator forceps.

- This technique is of limited applicability but it can be very helpful in some areas such as the dorsal proximal metatarsus and dorsal carpus where granulation tissue is deep; great care must be taken to ensure that no significant anatomic structures are harmed during grafting in this way – tendon sheaths, joints and neurovascular bundles may be injured.
- The pre- and post-procedural management is the same for this technique as for pinch grafting apart from the fact that the granulation tissue often requires some debridement after 10 days.
  - Debridement of the granulation tissue after 10 – 14 days should be carried out very carefully so that the graft is not damaged but so that the graft is as near the surface of the wound bed as possible – it is usually visible!
Note on punch grafting

- Punch grafting involves the embedding of skin punch blocks into cavities made in the granulation tissue bed.
- Usually the grafts are harvested from the donor site (as above) using an 8 mm punch biopsy instrument.
  - The subcutaneous and deep dermal tissue should be excised from the under surface of each graft.
- Using a 4 mm biopsy punch, small well defined cavities are made in the granulation tissue bed at 1 cm intervals.
  - Since these bleed a lot, small cotton swabs (Cotton buds / CuTips) are placed in each of the recipient holes to try to control bleeding.
- After 5 – 10 minutes, the swabs are removed from the recipient sites and the grafts placed into the cavities.
  - After collection primary contraction will quickly reduce the diameter of the donor grafts to 6 mm and primary centrifugal contraction of the recipient site will expand the cavity to 6 mm – this allows a good firm fit.
  - NOTE: It is unwise to place the grafts too quickly for several reasons:
    i. Bleeding behind the graft can push it out of the recipient site very easily
    ii. Failure to allow the size of the donor graft and the recipient size to equate results in difficult placement
- Graft take may be low as result of poor placement technique, poor quality of donor graft preparation and excessive subcutaneous tissue. Additionally of course, the continuing centripetal and centrifugal contraction of the donor graft and the recipient site respectively can loosen the grafts significantly.
  i. Dressings and possibly even tissue adhesive can be used to minimise this.
  ii. Collagen powder and collagen dressings can be helpful as a tissue adhesive to try to improve the immediate adhesion of the grafts.
- Punch grafting is more sensitive to the quality of granulation tissue and to technical skill but the cosmetic effects are possibly superior in most cases.

Further reading:
Stashak TS, Theoret CM (eds) 2008 Equine Wound Management, Willie-Blackwell, USA
KRUUSE HydroGel

A clear amorphous hydrogel containing a Carboxymethyl cellulose polymer, propylene glycol and water. 0.04% Polyhexanide added.

Key Functions:
- As part of the wound preparation
- Provides a moist wound healing environment
- Promotes natural debridement through autolysis
- Loosens and absorbs slough and exudate
- Not runny
- Contains 0.04% Polyhexanide (PHMB) as a preservative

Cat. No  Description
165020  KRUUSE HydroGel, 15 g, 10/pk, sterile

KRUUSE Foam Dressing

A 4.5 mm non-adhesive PU (polyurethane) foam dressing with one side covered with a thin PU film which provides a bacterial barrier.

Key Functions:
- Highly absorbent wound dressing
- Non-adherent
- Makes moist wound healing possible
- Conforms to the wound bed

Cat. No  Description
165030  KRUUSE Foam Dressing 5 x 5 cm, 10/pk, sterile
165031  KRUUSE Foam Dressing 10 x 10 cm, 10/pk, sterile
165032  KRUUSE Foam Dressing 15 x 15 cm, 5/pk, sterile
165033  KRUUSE Foam Dressing 10 x 20 cm, 10/pk, sterile

KRUUSE Vet-Flex

High quality flexible cohesive bandage. Strong, comfortable and user-friendly. Easy to tear. The Vet-Flex bandage has minimal shrinkage. Each roll is wrapped individually. Dispenser box of 4 and 10 rolls.

Cat. No  Description
160728  KRUUSE Vet-Flex 2.5 cm x 4.5 m, red, 10/pk
160729  KRUUSE Vet-Flex 5 cm x 4.5 m, white, 10/pk
160730  KRUUSE Vet-Flex 5 cm x 4.5 m, red, 10/pk
160731  KRUUSE Vet-Flex 7.5 cm x 4.5 m, green, 10/pk
160732  KRUUSE Vet-Flex 7.5 cm x 4.5 m, white, 10/pk
160733  KRUUSE Vet-Flex 10 cm x 4.5 m, white, 10/pk
160734  KRUUSE Vet-Flex 10 cm x 4.5 m, red, 10/pk
160735  KRUUSE Vet-Flex 10 cm x 4.5 m, blue, 10/pk
160736  KRUUSE Vet-Flex 10 cm x 4.5 m, green, 10/pk
160737  KRUUSE Vet-Flex 10 cm x 4.5 m, yellow, 10/pk
160738  KRUUSE Vet-Flex 10 cm x 4.5 m, black, 10/pk
160739  KRUUSE Vet-Flex 10 cm x 4.5 m, ass. of neon colours, 10/pk
160742  KRUUSE Vet-Flex 15 cm x 15 m, red, 4/pk
160743  KRUUSE Vet-Flex 15 cm x 15 m, blue, 4/pk