Dept. Vet. Surgery,
Faculty Vet. Med., Assiut University,
Head of Dept. Prof. Dr. M.T. Nassef.

IMMEDIATE SPLIT-THICKNESS AUTOGENOUS SKIN GRAFTS IN THE DONKEY

(With One Table & 9 Fig.)

By

F.M. MAKADY

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تطعيم الجلد ذاتيا بفلقة من سمكة في الحمير

فتحي مكـــاوي

طعمت ستة جروح مخلقة جراحيا في ستة حمير في منطقة السنع أو المشط تطعيم فوري ذاتـــي بفلقات من الجلد مأخوزة من جانب الرقبة · وكان سمك الفلقة مساويا ثلثي سمك الجلد تقريبـــا في كل حمار · وبعد ١٤ يوم كانت نسبة القبول للطعم تزيد عن ٨٠٪ في خمسة جروح وكانـــت ٢٥٪ في جرح واحد وتعزي هذه النسبة المنخفضة الي حدوث عدوي بهذا الجرح · وتم علاج السار كويـــد في ثلاثة حمير بالاستئصال الجراحي لها والتطعيم الفوري الذاتي للجروح الناتجة بفلقات من الجلـــد وعند ١٤ يوم كانت نسبة قبول الطعم تتراوح بين ٥٠ ٪ الي ١٠٠٪ ولم يحدث تكرار للسار كويد فـــي أي حالة من تلك الحـــالات ·

SUMMARY

Six immediate split thickness meshed skin grafts were applied to fresh surgically created wounds on the metacarpal or metatarsal regions of six donkeys. The skin transplants were approximately two-thirds the thickness of the skin of each donkey. Donar skin was harvested from the lateral aspect of the neck. At 14 days, acceptance of the grafts was generally excellent (5 out of 6 grafts). Five wounds had 80% or greater "take" and one wound had 25% take. Poor acceptance in this wound was attributed to infection.

Three donkeys with equine sarcoid were treated with radical surgical excision and immediate split-thickness skin grafts. At 14 days graft take ranged from 50 to 100%, and the epithelial coverage attained resulted in an early functional repair. In no instance was there a recurrence of the sarcoid.

F.M. MAKADY

INTRODUCTION

Skin lacerations in the horse and donkey are common and often involve the distal extremities. Lacerations of the lower limb are often complicated by severe local trauma, tissue loss and infection (BOYD and BRITTON, 1972). Wound repair in this region is compromised by the lack of soft tissue covering, poor circulation, joint movement and an increased opportunity for contamination and subsequent infection (BEEMAN, 1972). These factors may eliminate first intention healing, resulting in, at best, second intention wound management (BRITTON, 1970; ADAMS, 1979 and GREENOUGH and JOHNSON, 1974). Secondary wound healing is frequently complicated by the presence of exuberant granulation tissue (BOYD and BRITTON, 1972; CHVAPIL, et al. 1979 and BERTONE, et al. 1985). This excess tissue must be chemically suppressed or surgically removed and followed by pressure bandages or external coaptation, allowing wound contraction and epithelialization to occur at a normal rate (BRITTON, 1970 and GREENOUGH and JOHNSON, 1974). This results in a longer healing time, loss of function of the horse and more expenses to the horse owner.

Equine Sarcoids have been successfully treated by surgical excision (BROWN, 1983 and GENETZKY, et al. 1983), cryosurgery (LANE, 1977 and FRETZ and BARBER, 1980), intralesional administration of Bacillus Calmette-Guerin (BCG) (WYMAN, et al. 1977 and MURPHY, et al. 1979), radiation (ADAMS, 1979 and FRAUENFELDER, et al. 1982), Chemotherapy (TIZZARD, 1982) and radiofrequency current - induced hyperthermia (HOFFMAN, 1983), though recurrence is common (GENETZKY, et al. 1983). Surgical excision, while affording the most precise removal of neoplastic tissue, frequently results in the creation of a full-thickness skin defect, which must heal by second intention. Delayed, incomplete healing with production of exuberant granulation tissue, and unacceptable cosmetic blemishes are common complications of second intention healing in the horse (GENETZKY, et al. 1983).

MEAGHER and ADAMS, 1970, 1971 stated that freshly created wounds can be grafted immediately with full thickness or split thickness grafts.

Split thickness skin grafts are composed of epidermis and various thicknesses of dermal tissue (MEAGHER and ADAMS, 1970; 1971; SWAIM, 1980). These grafts may be thin split thickness, intermediate split thickness or thick split thickness, depending on the thickness of dermal tissue included. The indication for this type of graft include reconstruction of skin defects below the carpus and tarsus in the horse (SWAIM, 1980).

The aim of this study is to determine the feasibility of coverage of freshly created skin wounds with immediate splite-thickness autogenous skin grafts in the metacarpal and metatarsal region of donkey. It is also aimed to study the use of immediate split-thickness skin grafts in the treatment of equine sarcoids in donkeys.

MATERIAL and METHODS

Experimental model:

Six donkeys 2 to 8 years old of either sex weighing 90 to 120 kg were used. Each donkey was positioned in lateral recumbency. The metacarpal or metatarsal and the lateral aspect of the neck (donar site) were clipped, shaved and prepared for aseptic surgery. Under strict asepsis and under the effect of chloral hydrate deep narcosis in combination with local infiltration anaesthesia, a 4 x 6 cm. full thickness skin flap was removed from the lateral aspect of the metacarpus or metatarsus and discarded.Hemorrhage was controlled by applying gauze sponges that had been soaked in a 1:200,000 dilution of epinephrine. Intermediate split thickness skin graft sufficient in size to cover the wound was harvested from the lateral aspect of the neck with skin graft knife. The skin transplants were aproximately two-thirds the thickness of the skin of each donkey. The graft was meshed before being placed on the recipient site by making staggered 1 cm incisions in parallel rows about 5 mm apart. The harvested skin was placed over the defect, trimmed to size, and sutured in place with simple interrupted sutures using 4/0 silk. The suture tails were left long to facilitate the placement of a tie over bolus dressing, Fig. 1. The transplant was covered with one layer of Sofra-tulle* and even pressure was applied to the surface of the transplant by means of a tie-over pack, Fig. 1. A bolus dressing of sterile gauze and cotton was tied in place using the tail of the previously placed silk sutures, Fig. 1. The tie-over pack was covered with a sterilized gauze bandage wrapped firmly in place.

Graft acceptance was estimated by visual observation as a percentage of wound area covered by the meshed graft at 14 days. Graft acceptance was categorized as either poor (0 - 50%), fair (50 - 80%), good (80 - 90%) and excellent (90 - 100%).

Clinical cases:

Case 1

An 6-year-old male donkey was presented with a 4 cm diameter circumscribed granulating mass on the lateral aspect of the right ear, Fig. 2. The lesions had been present for 3 months and were becoming progressively larger. A clinical diagnosis of equine sarcoid was made.

The mass on the ear was carefully removed. split-thickness meshed skin graft was applied. Dressing ointment (Bykocillin**) was placed over the graft, a bolus dressing of sterile gauze and cotton was tied in place in the manner described previously.

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* Roussel Laboratories Ltd., London, England.

** Bykocillin Byk Gulden Konstanz West Germany.

Case 2

A 8-year-old female donkey was presented with warty like appearance cutaneous 3 cm diameter mass immediately below the left and right eye, Fig. 3. The lesion had been present for 3 weeks and were growing rapidly. Only the skin appeared to be involved and the mass was freely movable over the underlying tissue. A clinical diagnosis of equine sarcoid was made.

The mass was excised to the level of grossly normal subcutaneous tissue. A split thickness skin graft was applied to the wound and the grafted wound was covered in the manner described previously.

Case 3

A 12-year-old female donkey was pressented with two 3 cm diameter circumscribed masses on the lateral aspest of the left metatarsus, Fig. 4. The masses were extended 2 to 3 cm above the surface of the surrounding skin. The lesion was first seen 6 months earlier and had been surgically excised 4 weeks before presentation. Regrowth after excision was rapid.

A clinical diagnosis of equine sarcoid was made. The two masses were excised to the level of grossly normal subcutaneous tissue. A split thickness skin graft was placed over the defect trimmed to size and sutured in place. The grafted wound was covered in the manner described previously.

In each clinical case skin transplantation was done under the effect of chloral hydrate deep narcosis in combination with local infiltration anaesthesia using aseptic technique. The area surrounding the lesion was scrupped and prepared for surgery. The lesion was washed using sterilized sponges and sterilized physiologic saline solution. The donor area on the lateral aspect of the neck was clipped shaved, and prepared for asepic surgery.

In each donkey and in each clinical case the donor site was protected with a sterile gauze applied after graft removal.

Tetanus antitoxine was given at the time of surgery. Procaine penicillin (20,000 U/kg,im) was administered preoperatively and twiced daily for 5 days.

RESULTS

Experimental model:

In two instances the dressing was removed 4 days after surgery and in 4 instances it was removed 6 days after surgery. The graft appeared viable in all but donkey 6, in which the proximal edge of the graft failed to adhere to the recipient bed. The

grafted wounds were rebandaged. Ten days after surgery the bandage and sutures were removed. Bacterial culture of the recipient bed of donkey 6 yielded Staphlococcus sp. Graft acceptance at the end of 14 days in each donkey is given in table 1. The number of days required for complete healing of the wounds is also given, Table 1. These values were calculated from the day the transplants were placed.

Three lesions had 90% or greater take, Fig. 5 and completely healed in an average of 17 days. Two lesions had 80 to 90% takes and required 23 days to heal. One lesion had a 25% take and required 40 days to heal.

The lesion that had 80% or greater take healed with very little scar formation and had sufficient hair growth to cover the area, Fig. 6.

Clinical cases:

Case 1

The dressing was removed 6 days after surgery. The graft appeared viable and the ear was rebandage. Ten days after surgery the bandage and sutures were removed. At 14 days there was a 80% take of the graft. Result of the histopathologic examination of the excised tissue confirmed our clinical diagnosis of equine sarcoid. One year after surgery there had been no recurence of the sarcoid. The area was devoid of hair, but comseticalhy acceptable to the owner, Fig. 7.

Case 2

The dressings were removed 3 days after surgery and the graft area was cleaned with sterile gauze and normal saline. The bandage was replaced and the surgical site was cleaned daily for the next 6 days. The donkey was discharged 14 days after surgery at which time approximately 50% of the graft had taken, Fig. 8. Results of the histopathologic examination of the excised tissue confirmed our clinical diagnosis of equine sarcoid. Eight months postoperatively, the owner reported no recurrence ofthe sarcoid and normal lid function. The appearance was described as normal with the exception of a 2 cm diameter hairless area immediately adjacent to the medial canthus.

Case 3

The bandage was removed 6 days after surgery and the graft site was cleaned with sterile saline; at 14 days approximately 100% of the graft was viable, Fig. 9. Results of the histopathologic examination of the excised tissue conifirmed our diagnosis of equine sarcoid. Ten months after surgery, there had been no recurrence of the sarcoid. The wounds were covered with dark pigmented epithelium, and the result was cosmetically acceptable to the owner.

DISCUSSION

Attaining coverage of skin defects is one of the most difficult problems facing the equine surgeon. Injuries most frequently involve the limbs, and rates of epithelialization are slower in the limbs than on the body (WALTON and NEAL, 1972). The use of skin grafts in horse has enhanced our ability to deal with full-thickness skin defects in donkey. Split-thickness skin grafts (MEAGHER and ADAMS, 1971), mesh grafts (BOOTH, 1982), pinch grafts (BOYD and HANSELKA, 1971) and tunnel grafts (BJORCK and TWISSELMAN, 1971) have been used in the treatment of skin defects in the horse. In the horse, skin grafts are used primarily to facilitate epithelial coverage of wounds in which granulation tissue is present in contrast to the present study where split-thickness skin grafts were used immediately after skin excision or radical excision of tumors.

Immediate split-thickness skin grafting is used extensively in humans and to a lesser extent in the horse (PROBST and PEYTON, 1983). Revascularizton is more rapid from nongranulating wounds than from granulation tissue (PROBST and PEYTON, 1983). Granulation tissue is highly vascular and often heamorrhage beneath the graft is a significant complication. Subcutaneous tissue tends to be less vascular and therefore bleeding under the graft may occur less frequently. The granulating wound usually contains some bacteria, whereas the surgical wound created by excision should be sterile.

In the present study the grafts were meshed because we believed there would be some motion at these sites. Mesh grafts tolerate limited motion better than sheet grafts (McMILLAN, 1970 and RUDOLPH, et al. 1979). In addition, the holes in the graft allow some drainage thereby decreasing seroma formation (SWAIM, 1982).

The dressings were used in this study because they allow excellent apposition of graft to recipient bed and can be used in areas where wrap around bandages cannot be applied as in case 1 and 2. The question of when to remove or change dressings remains an enigma. Early removal of dressings may disrupt the vascular supply to the graft (PROBST and BINGHAM, 1983). Contamination of the graft site could occur during dressing changes. The possible disruption of vascular supply and the potential for contamination outweight the benefits of early detection of graft infection. Therefore,we suggest elaying the first dressing change for a minimum of 4 to 6 days.

Estimation of the percentage of area of graft acceptance is difficult because epithelial migration and wound contrture continuously change the ratio of skin to uncovered recipient bed. Although visual observation was considered a resonable method of assessing percentage graft acceptance, a more objective measurement can be obtained with an orthoplex digital coordinate sensor coupled to a microcomputer (POPE and SWAIM, 1986).

It was assumed that there was no difference in acceptance of grafts on metacarpal and metatarsal wounds. Randomized limb grafting of many more donkeys than were used in this study would be necessary to determine if such a difference existed.

In the treatment of equine sarcoid, the treatment chosen is dependent on the tumor location, availability of equipment and the surgeons preference. Surgical excision, while an accepted technique, results in a full-thickness skin defect which often cannot be closed.

Equine sarcoids are tumors of dermal origin (GENETZKY, et al. 1983) and surgical excision, if carefully performed, can often leave underlying tissues intact. In case 1 thorough debridement and precise control were required to avoid damage to the auricular cartilage. Preservation of eyelid function as well as attainment of a cosmetic appearance required exacting removal of abnormal tissue in donkey 2. Surgical excision afforded us the opportunity to place immediate split- thickness skin grafts thereby reducing the healing time as compared to healing by second intention. The application of split-thickness skin grafts to nongranulating tissue especially in donkey 2 probably reduced the amount of fibrous scar tissue and wound contraction allowing maintenance of normal eyelid function. The partial failure in case 2 can probably be attributed to the constant contamination of the graft site by tears.

Skin grafting offers several advantages over healing by second intention. The quality of the scar epithelium is often better, in that the epithelium will be thicker thus offering more mechanical protection. The healing time with skin grafting is shorter. This technique offers an alternative to healing by second intention. Results can be cosmetic and functional as well as economical.

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LIST OF FIGURES

Fig. 1: Tie-over pack in place. The suture tails (ends) tied over cotton and gauze pack.

Fig. 2: Preoperative apearance of the sarcoid on the right ear of donkey 1.

Fig. 3: Preoperative appearance of the sarcoid below the eye of donkey 2.

Fig. 4: Preoperative appearance of the sarcoid on the lateral aspect of the left metatarsus of donkey 3.

Fig. 5: Skin graft on the lateral surface of the A. metacarpus and B. metatarsus (experimental model) 14 days after surgery. 90% or greater take.

Fig. 6: The left metatarsus of donkey 5,8 months postoperatively. Hair growth cover the area.

Fig. 7: The right ear of donkey 1, 12 months postoperatively.

Fig. 8: Partial failure of the graft in donkey 2, due to the constant contamination of the graft site by tears. 14 days after surgery.

Fig. 9: Case 3: At 14 days approximately 100% of the graft was viaple.

Table (1): Acceptance of grafts after 14 days.

Donkey No.	Location of wound	Graft acceptance	total healing time
1	Lateral aspect of the metacarpus	Good	23
2	Lateral aspect of the metacarpus	Excellent	16
3	Lateral aspect of the metatarsus	Good	22
4	lateral aspect of the metatarsus	Excellent	18
5	lateral aspect of the metatarsus	Excellent	17
6	lateral aspect of the metatarsus	Poor	40