Outcome of full-thickness skin grafts used to close skin defects involving the distal aspects of the limbs in cats and dogs: 52 cases (2005–2012)

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Objective—To describe the outcome of full-thickness skin grafts used to close skin defects involving the distal aspects of the limbs in cats and dogs and identify factors associated with outcome.

Design—Retrospective case series.

Animals—20 cats and 32 dogs with a skin defect involving the distal aspect of a limb that received 58 full-thickness skin grafts between 2005 and 2012.

Procedures—Data regarding patient signalment, location and cause of the skin defect, surgical and anesthetic duration, and postoperative bandaging protocol were obtained from the medical records. Graft outcome was assessed by interpreting descriptions in the records; skin viability over ≥ 75% of the graft area between 7 and 14 days after surgery was considered a successful outcome.

Results—For 4 of the 58 grafts, graft outcome could not be determined from the medical record. For the remaining grafts, success rate was significantly higher for grafts placed in cats (17/22 [77%]) than in dogs (12/32 [38%]). The overall complication rate was 50%; complications included skin graft failure, donor site dehiscence, and bandage-induced sloughing of skin adjacent to the graft recipient site. In addition to species, anatomic location of the skin defect was identified as a prognostic indicator of graft outcome.

Conclusions and Clinical Relevance—Full-thickness skin grafting had a higher success rate in cats than in dogs. Skin grafts applied to the antebrachium, compared with other locations on the distal aspects of the limbs, were associated with a poorer prognosis. (*J Am Vet Med Assoc* 2015;247:1042–1047)

Skin grafting is the transfer of an excised segment of epidermis and dermis from one anatomic location to another. In dogs and cats with skin defects involving the distal aspects of the limbs, the paucity of adjacent skin often prevents primary wound closure or local flap mobilization, but second-intention healing is advocated only if the wound represents < 30% of the limb circumference at that location.[1,2] Thus, these sites are common recipient sites for skin grafts. Although the use of direct or indirect pedicle flaps may be a viable alternative to skin grafting or second-intention healing, these techniques require careful patient selection to ensure a successful outcome.[1]

Skin grafts are classified as full thickness or split thickness depending on whether the entire dermis or only a portion is incorporated. Compared with split-thickness grafts, full-thickness grafts are easier to harvest, have a more favorable cosmetic outcome, are more resilient to trauma following grafting, and undergo less secondary contraction during healing.[1,3–6] To maximize the likelihood of a successful outcome, most full-thickness skin grafts are meshed following harvesting,[7] and the advantages of meshed, full-thickness grafts are well described.[3,7–10]

The principles and techniques for skin grafting in dogs and cats have been described.[1,3,5,11–14] Full-thickness and split-thickness grafts reportedly have comparable viability, despite earlier reports[3,6,15] of a better outcome associated with split-thickness grafts. Early experimental studies of full-thickness skin grafting in dogs have reported mean graft viabilities of 59.1%,[12] 81%,[15] and 90%[16] when examined 10 days after surgery. The only clinical study[17] to document full-thickness skin graft outcome in dogs had a small study population and focused on tumor resection as the sole indication for graft surgery, evaluating grafts placed on fresh wound beds following tumor resection. There was complete graft viability in 3 of 7 dogs in that study,[17] with 0% to 75% graft viability in the remaining 4 dogs. In a clinical study[14] of thick split-thickness skin grafts in cats, 14 of 17 grafts were reportedly completely viable, but to the authors' knowledge, there are no published reports on the outcome of full-thickness skin grafting in cats. The lack of continuity in study design, surgical

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technique, and reported outcome measures, along with the small case numbers, in published reports may be responsible for the marked disparity in reported success rates for skin grafting in cats and dogs. In addition, no studies have examined the potential impact of postoperative management protocols on skin graft outcome. As such, we currently lack the ability to reliably predict the outcome of skin grafting performed in cats and dogs in a clinical setting.

The purpose of the study reported here, therefore, was to describe the outcome of full-thickness skin grafting used to close skin defects involving the distal aspects of the limbs in cats and dogs and to identify factors associated with outcome.

Materials and Methods

Case selection—Medical records of 5 veterinary specialist referral centers were searched to identify cats and dogs that underwent full-thickness skin grafting between 2005 and 2012 for treatment of skin defects involving the distal aspects of the limbs. Animals were included in the study if the medical record was complete with sufficient descriptions of graft appearance for a minimum period of 2 weeks after surgery to allow outcome to be reliably assessed; animals were excluded if partial graft take was recorded but no quantitative descriptions of percentage necrosis were available.

Medical records review—Medical records were reviewed for information on patient signalment, location of the skin defect, cause of the skin defect, time between injury and skin grafting, type of skin graft, surgery and anesthesia times, perioperative and postoperative antimicrobial administration, time from grafting to first bandage change, total number of bandage changes, primary layer used when bandaging, and final outcome of the graft. Graft outcome was assessed by interpreting descriptions of graft appearance recorded in the medical records, such as percentage of viable tissue and similar descriptions relating to areas of viability or necrosis. For the purpose of the present study, graft outcome was classified as successful if there was full-thickness graft viability over ≥ 75% of the original graft area 1 to 2 weeks after surgery and as unsuccessful otherwise.

Statistical analysis—To test the hypothesis that one or more of the parameters recorded were associated with successful engraftment, binary logistic regression analysis was performed to create a statistical model to predict the binary outcome measure "graft outcome" (success or failure), with species, age, sex, location, cause, time from injury to grafting, and time from grafting to first postoperative dressing change as predictor variables in the equation. This model enabled the simultaneous examination of all the potential predictors of the outcome measure in a single analysis and allowed for multiple testing without further adjustment of the significance threshold. The analysis was performed with commercial software.[a] Values of $P \leq 0.05$ were considered significant.

Results

Twenty cats and 32 dogs met the criteria for inclusion in the study. Two cats received 2 skin grafts each, 1 cat received 3 skin grafts, and 2 dogs received 2 skin grafts each. Therefore, a total of 58 grafts were placed. Of the 5 patients undergoing multiple skin grafts, 1 cat had grafts placed at 2 different sites under 1 anesthetic episode, 1 cat had grafts placed at 2 different sites 4 days apart, and 2 dogs and 1 cat had grafts placed at the same site on separate occasions because of graft failure. For the 3 patients undergoing repeated skin grafting at 1 site, mean ± SD time between procedures was 29.2 ± 9.1 days (range, 21 to 42 days; n = 4 grafts). Of the 20 cats, 14 were domestic shorthairs, 3 were Burmese, 2 were domestic longhairs, and 1 was a British Shorthair. Six of the 32 dogs were of mixed breeding; the remaining 26 dogs represented a variety of breeds. Seven of the 20 cats and 15 of the 32 dogs were female. Median age at the time skin grafts were placed was 4.0 years (range, 0.7 to 11.5 years) for the cats and 4.4 years (range, 0.4 to 12.1 years) for the dogs.

For the 58 grafts, the most common cause of the original skin defect was a degloving injury (8/34 canine grafts and 11/24 feline grafts), followed by a shearing injury (8 canine and 8 feline grafts), cellulitis or fascitis (5 canine and 1 feline graft), resection of a tumor (6 canine grafts), previous skin graft failure (2 canine and 2 feline grafts), iatrogenic bandage-induced skin sloughing (2 canine and 1 feline graft), snake bite (2 canine grafts), and wounds of unknown origin (1 canine and 1 feline graft). Results of histologic examination were available for 3 of the tumors that were removed and included fibroadnexal hamartoma (n = 1), squamous cell carcinoma (1), and soft tissue sarcoma (1).

The most common graft recipient site was the metatarsal region (8/34 canine grafts and 10/24 feline grafts), followed by the tarsal region (10 canine and 5 feline grafts), metacarpal region (4 canine and 7 feline grafts), antebrachium (8 canine and 2 feline grafts), carpal region (3 canine grafts), and elbow region (1 canine graft). Donor sites were located on the flank or in the trunk region ipsilateral to the skin defect. For the 48 grafts for which information on donor site was described, the anatomic location ranged from the axilla (n = 1) to the midcaudal portion of the abdomen (3), with most grafts taken from the thoracic portion of the trunk (22).

Mean ± SD time between the skin defect occurring and graft placement was 31.5 ± 26.9 days (range, 2 to 160 days; n = 55 grafts). For the 3 patients that received multiple grafts at the same site, the date of confirmed graft failure was used as a reference point for calculating the time elapsed between the skin defect occurring and the subsequent graft procedure. All but one of the skin grafts were placed on granulation tissue in the recipient bed. The exception was a skin graft applied 2 days after excision of a skin mass (diagnosis not documented in the records), before granulation tissue had formed. Mean ± SD surgical time for the skin graft procedure was 88.9 ± 36.6 minutes (range, 25 to 180 minutes; n = 42 grafts), and mean duration of general anesthesia was 175.3 ± 57.4 minutes (range, 85 to 330 minutes; 44). Thirty-one of the 32 grafts for which information was available underwent meshing prior to transfer; the remaining graft remained unmeshed.

Antimicrobials were administered IV during 31 of the grafting procedures (21 canine and 10 feline grafts)

and included amoxicillin-clavulanate (20 mg/kg [9.1 mg/lb], IV; n = 17), cefuroxime (20 mg/kg, IV; 12), and enrofloxacin (5 mg/kg [2.3 mg/lb], IV; 2). In 13 grafting procedures (9 canine and 4 feline grafts), animals did not receive antimicrobials perioperatively. Information regarding perioperative antimicrobial administration was not available for the remaining 14 grafting procedures. Antimicrobials were administered PO after 37 procedures and included amoxicillin-clavulanate (12.5 to 25 mg/kg [5.7 to 11.4 mg/lb], PO, q 12 h; n = 23), cephalexin (10 to 25 mg/kg [4.5 to 11.4 mg/lb], PO, q 12 h; 5), and enrofloxacin (5 mg/kg, PO, q 24 h; 1) given as sole agents. For 7 procedures, a combination of antimicrobials was administered, either at the same time or sequentially; information regarding antimicrobials administered postoperatively was unavailable for the remaining procedure. Antimicrobials were not administered PO after 11 graft procedures, but in 2 of these instances, antimicrobials were subsequently prescribed because of concerns that infection might have been contributing to partial graft loss. Where recorded in the medical records, the duration of antimicrobial administration ranged from 7 to 37 days. Owing to the variety of antimicrobial protocols and the number of cases for which this information was missing from the patient files, this variable was excluded from subsequent statistical modeling.

Four materials were used for the primary layer of bandages covering the skin grafts, including paraffin-impregnated tulle gras[b] (15 canine and 12 feline grafts), a polyester film–coated cotton and acrylic fiber pad[c] (9 canine grafts), a silicone-coated polyamide mesh[d] (2 canine and 3 feline grafts), and a hydrocellular foam with nonadherent coating and polyurethane top film[e] (1 feline graft). A topical antimicrobial or other topical agent was not used between the graft and the primary layer. Information on the bandage primary layer was not available for the remaining 8 canine and 8 feline grafts.

Mean ± SD time between skin graft surgery and the first bandage change was 2.8 ± 1.2 days (range, 1 to 5 days) for canine grafts (n = 33) and 3.1 ± 1.3 days (range, 1 to 5 days) for the feline grafts (24). Subsequent bandage changes occurred at daily (n = 2), 2-day (36), 3-day (12), or 4-day (1) intervals. When stated in the medical records, bandages were maintained for 1 to 4 weeks; all bandage changes were performed with the animals sedated. After 2 grafting procedures, an external skeletal fixator was applied for postoperative immobilization of the graft site (tarsal region).

For 4 of the 58 grafts, graft outcome could not be determined from the medical record, and these 4 grafts were excluded from subsequent statistical modeling. For 17 of the 22 (77%) grafts placed in cats and 12 of the 32 (38%) grafts placed in dogs, graft outcome was classified as successful (ie, full-thickness graft viability over ≥ 75% of the original graft area 1 to 2 weeks after surgery). Complications of the graft process other than graft failure itself included dehiscence of the donor site 8 days after skin graft surgery (n = 1) and a bandage-induced pressure sore over the calcaneus with subsequent skin sloughing (1). In both of these instances, the skin graft itself was successful. Postoperative infection of the graft site was suspected in 2 instances in which graft failure resulted. One of these animals had not received antimicrobials in the perioperative or postoperative period. Including graft failure, the overall complication rate was 50% (27/54). For grafts placed in cats, the complication rate was 27% (6/22); for dogs, the complication rate was 66% (21/32).

Detailed descriptions of graft appearance at various intervals after surgery were available for only 15 of the 58 grafts, and reliable assessments of skin graft viability during the first 7 days after surgery were available for only 10 of those 15 grafts. For 5 of the 15 grafts, failure of part or all of the graft was not evident until 8 (n = 1), 10 (2), or 11 (2) days after surgery, beyond the expected period of revascularization. In 2 instances, graft viability was impeded by infection 11 days after surgery; the cause of delayed loss of graft viability in the other 3 instances was unknown. None of the medical records for the grafts with delayed graft failure reported any evidence of self-trauma.

Binary logistic regression modeling indicated that the grafting success rate was significantly (P = 0.014) higher for grafts placed in cats (17/22 [77%]) than for grafts placed in dogs (12/32 [38%]; **Table 1**). Furthermore, grafts placed on the antebrachium were significantly (P = 0.039) more likely to have an unsuccessful outcome than were grafts placed in other locations. We did not identify a significant association between graft outcome and time between graft surgery and the first

Table 1—Results of binary logistic regression analysis of factors potentially associated with a successful outcome following full-thickness grafting of skin defects (n = 54) involving the distal aspects of the limbs in cats and dogs.

Variable	OR (95% CI)	*P* value
Species		
Cat	24 (1.9–310)	0.014
Dog	Referent	
Age (y)	0.91 (0.70–1.2)	0.51
Sex and neuter status		
Sexually intact male	0.72 (0.026–20)	0.85
Neutered male	0.77 (0.067–8.9)	0.83
Sexually intact female	3.6 (0.15–88)	0.43
Spayed female	Referent	
Site		
Metacarpal region	0.18 (0.005–6.8)	0.35
Carpal region	1.6 (0.004–560)	0.88
Antebrachium	0.011 (0.000–0.79)	0.039
Metatarsal region	0.20 (0.007–6.0)	0.36
Tarsal region	Referent	
Cause		
Degloving	9.9 (0.16–610)	0.28
Shearing	7.0 (0.12–420)	0.35
Bandaged-induced injury	0.00 (0.00–0.00)	1.0
Surgical tumor excision	48 (0.15–15,000)	0.19
Snake bite	0.00 (0.00–0.00)	1.0
Cellulitis	92 (0.17–51,000)	0.16
Graft revision	Referent	
Time (d)		
Trauma to graft	0.99 (0.94–1.0)	0.52
Graft to first postoperative dressing change	2.3 (1.0–5.5)	0.051

Graft outcome was classified as successful if there was full-thickness graft viability over ≥ 75% of the original graft area 1 to 2 weeks after surgery and as unsuccessful otherwise. For categorical data, the OR represents the odds of a successful outcome for animals with the factor of interest divided by the odds of a successful outcome for animals in the referent category. For continuous data, the OR represents the change in odds of a successful outcome associated with each unit increase in the factor of interest.

bandage change, but the *P* value was close to our cutoff for significance (*P* = 0.051).

After exclusion of the 4 grafts for which graft outcome could not be determined, information regarding the primary bandage layer was available for only 38 grafts. Therefore, this variable was excluded from logistic regression modeling. However, all 8 grafts for which a polyester film–coated cotton and acrylic fiber pad was used as the primary layer had an unsuccessful outcome. Conversely, of the 26 grafts for which paraffin-impregnated tulle gras was used as the primary layer, 15 had a successful outcome and 11 had an unsuccessful outcome, and of the 3 grafts for which a silicone-coated polyamide mesh was used as the primary layer, 2 had a successful outcome and 1 had an unsuccessful outcome. The 1 graft for which a hydrocellular foam dressing was used as a primary layer had a successful outcome. Preliminary univariate analysis suggested that the polyester film–coated cotton and acrylic fiber pad was associated with a significantly (*P* = 0.001) poorer outcome than the other 2 dressings; however, this finding was not confirmed by subsequent multivariate analysis.

Statistical analyses (including preliminary univariate analyses) failed to reveal any significant associations between graft outcome and cause of the skin defect, time between the defect occurring and graft placement, anesthetic time, surgical time, institution, or sex, age, or breed of the patient.

Discussion

Results of the present study suggested that full-thickness skin grafting may be associated with a higher success rate in cats than in dogs. In addition, in this cohort, skin grafts applied to the antebrachium, compared with other locations on the distal aspects of the limbs, were associated with a poorer prognosis.

In the present study, 17 of the 22 (77%) full-thickness skin grafts placed in cats but only 12 of the 32 (38%) full-thickness skin grafts placed in dogs were classified as successful. For this study, we classified graft outcome as successful if there was full-thickness graft viability over ≥ 75% of the original graft area between 1 and 2 weeks after surgery. We elected to use this definition because, in our experience, loss of full-thickness graft viability over > 25% of the graft area following surgery typically necessitates additional therapeutic interventions, resulting in clinical and financial implications for the patient and client, respectively. However, this cutoff was based on empirical data, and some grafts with > 25% loss of viability may still have a successful outcome if the area involved is relatively small. Conversely, even with ≥ 75% graft viability, further surgery may still be required for large defects. In the present study, none of the grafts that were categorized as successful required further intervention, so it is more likely we underestimated rather than overestimated the success rates in our study by having a minimum threshold of 75% viability. Importantly, it is possible that some of the grafts classified as unsuccessful actually had partial-thickness graft viability,[18] and if so, this would also have tended to underestimate the success rate.

The success rate in the present study for full-thickness skin grafts placed in cats (77%) was comparable to the 82% success rate previously reported for split-thickness grafts used to treat traumatic injuries to the distal aspect of the limbs in cats.[14] Because feline skin is relatively thin, it is possible that full-thickness grafts are able to undergo revascularization as effectively as split-thickness grafts. Our findings, therefore, may argue for the use of full-thickness grafts in preference to split-thickness grafts in this species, owing to the improved durability and cosmetic outcome of full-thickness grafts.[1,3–6] In contrast, the success rate in the present study for full-thickness grafts placed in dogs (38%) was lower than success rates previously reported, which, by extrapolation and application of our definition of success, range from 50% to 71%.[12,15–17] This discrepancy may be explained by the fact that much of the existing literature reports graft outcome following experimental, aseptic creation of skin defects with immediate grafting from the donor site. For all but one of the grafts reviewed in this study, the grafts were placed on granulation tissue in the recipient bed that had formed as a result of careful wound management prior to surgery. Considering that studies[15,19] have shown that grafting onto a granulation bed results in poorer revascularization and outcome, compared with grafting onto a fresh excisional bed, this may provide an explanation for the lower success rate of grafts in dogs in the present study. Grafting onto a fresh excisional bed is not always possible in the clinical setting because many skin defects result from a traumatic event and are contaminated or infected, requiring open wound management before definitive correction. The exact mechanisms by which granulation tissue might impede revascularization of a skin graft are, to the authors' knowledge, unknown and worthy of future investigation.

Although reported to be a reliable technique in the literature,[17] none of the skin defects resulting from tumor resection in the present study underwent immediate skin grafting at the time of tumor excision. Of the 6 skin grafts performed following tumor resection (exclusively in dogs), 3 were successful. In a previous report[17] describing skin grafting immediately after tumor resection in dogs, 5 of 7 grafts met our definition of a successful graft outcome (including 3 with 100% graft viability) and 2 had just 15% epidermal necrosis. Provided there is no contamination of the recipient bed during tumor excision, immediate grafting, rather than waiting for granulation tissue to form, may improve the graft success rate.

The higher success rate for grafts placed in cats than in dogs in the present study was unexpected, given that previous studies[20,21] suggest that the rate of wound healing is significantly slower in cats than it is in dogs. Specifically, cats produce granulation tissue at a slower rate than dogs and the granulation tissue that is produced is overall less abundant than it is in dogs.[20,21] Furthermore, the granulation tissue is initially distributed at the wound periphery in cats, in contrast to the center of the wound in dogs.[21] Rates of epithelialization and wound contraction rate are also faster in dogs than in cats, when examined over a 3-week period.[21] Mean time between the skin defect occurring and graft place-

ment in the present study was 31.5 days (31.1 days in dogs and 32.1 days in cats), which was longer than the follow-up period (21 days) in the previous study, but unlikely to be long enough for appreciable changes in these conclusions to be apparent. One plausible explanation for the more favorable outcome of skin grafts in cats versus dogs is a species difference in the thickness of the donor skin prepared for grafting. It is possible that with thinner feline skin, there is a shorter distance over which nutrients from the serum exuded by recipient bed venules must diffuse during the plasmatic imbibition phase so that nutrients are more likely to reach all of the graft tissue.[1,3,11] In addition, revascularization across the graft dermis by vessel ingrowth from the donor bed is likely to be faster where there is a shorter distance over which endothelial cell deposition must take place, as is the case with thinner feline skin.[1,3,11]

An additional reason that may explain the better outcome in feline patients in the present study was a reduced incidence of factors contributing to graft failure in these patients. Skin graft viability is most commonly complicated by separation of the graft from the recipient bed, infection at the graft site, or movement at the graft site.[18] These factors cause disruption to the fibrin framework responsible for graft adherence, which impairs revascularization by damaging fragile new blood vessels growing from the recipient bed. Furthermore, the presence of a seroma or hematoma between the graft and recipient bed results in failure of inosculation, and it is this process that has been shown to inhibit the development of vascular buds in the graft bed.[22] Thus, to maximize skin graft outcome, it is imperative that tissue separation, infection, and movement at the graft site are minimized. It is possible that more effective methods of confinement (cage rest) and the ability to reduce limb motion in cats, compared with dogs, may contribute to the disparate success rate noted.

In addition to species, anatomic location of the skin defect was identified as a prognostic indicator of graft outcome in the present study. Specifically, skin grafts placed on the antebrachium were significantly (P = 0.039) more likely to have an unsuccessful outcome than were grafts placed in other locations. A possible explanation for this finding is that this site is more difficult to effectively immobilize with bandaging following graft surgery, resulting in more movement at the site and disruption of the fibrin framework required for graft adherence. Compounding this is the fact that cats and dogs tend to rely on their forelimbs for ambulation, interaction, and grooming and thus are more likely to try to use these limbs even when bandaged, risking graft site movement.[23–25] Therefore, particular attention must be paid to ensuring adequate immobilization of the antebrachium following graft surgery in this location. Careful consideration must be made in each case to assess both the benefits and the possible morbidities associated with any immobilization technique.

Time intervals ranging from 1 to 14 days have been recommended in the existing literature as optimal times for the first bandage change following graft surgery.[1,5,11,13,18] The main argument for assessing the graft 24 to 48 hours after surgery is that drainage of a seroma or hematoma at this stage ensures contact between the graft and recipient bed is maintained and graft viability is not impeded.[1,18] However, other authors advocate allowing a longer interval between surgery and the first bandage change to prevent disruption of the fibrin network established between the graft and the recipient bed.[5,11] In the present study, the time between graft surgery and the first bandage change was not significantly (P = 0.051) associated with graft outcome. Of the 17 successful grafts placed in cats, 9 had the first bandage change ≥ 4 days after surgery; of the 5 failed grafts placed in cats, 2 had the first bandage change ≥ 4 days after surgery. It is the authors' clinical impression that leaving the first bandage undisturbed for a longer time than stated in most texts results in better chances of graft viability.[1,11,13,18] For dogs, 3 of 11 grafts that had the first bandage change ≥ 4 days after surgery were successful, whereas 5 of 20 grafts that had the first bandage change ≥ 4 days after surgery failed. The effect of the time interval between graft surgery and the first bandage change on graft outcome remains ambiguous and warrants further clinical study.

Although not confirmed by means of binary logistic regression modeling in the present study, the primary bandage layer is still thought to be an important determinant of graft outcome. In the present study, all 8 grafts for which a polyester film–coated fiber pad dressing was used as the primary layer failed. In contrast, numbers of successful and failed grafts were relatively similar when paraffin-impregnated tulle gras or silicone-coated polyamide mesh was used as the primary bandage layer. Hydrocellular foam was used with only 1 graft in the present study, and that graft was successful. Although all 4 of these dressings are purportedly nonadherent, in our experience, the polyester film–coated cotton and acrylic fiber pad dressing had greater adherent properties than the other dressings and was more likely to cause separation of the graft from the recipient bed at the time of bandage changes.

Owing to the discrepancy in graft outcome for canine versus feline skin grafts in the present study, it is possible that combining all patient data for statistical analyses to identify prognostic factors may have biased our results. Although the sample size for this study was greater than that included in previous studies of veterinary skin grafts, it was still small and would not have supported independent statistical analysis of canine versus feline data to identify species-specific prognostic indicators. It was necessary to include data from 5 referral institutions to acquire a sufficient number of cases for the study. This was beneficial, in that it allowed alternative postoperative graft management practices to be compared, but also likely introduced institutional bias to the data related to surgeon experience and technique. The multi-institutional design of the study also meant that we were unable to analyze factors such as cost, specific bandaging methods, hospitalization time, and further treatment or management to determine whether these factors were associated with success of the procedure. Unfortunately, none of the cases reviewed included serial photographs of the grafts during the healing process after surgery, which would have allowed for objective assessment of percentage graft viability and enabled us to categorize success and failure more ac-

curately. Graft outcome was classified on the basis of written descriptions in the medical records, and many of these descriptions were likely to have been subjective. Although a limitation of the study, grafts with inadequate quantitative descriptive information available were excluded from the statistical analyses irrespective of the described outcome to improve the reliability of the results. The recognized limitations of this retrospective, multicenter study highlight the requirement for a prospective clinical study in which predefined protocols for skin graft harvesting, preparation, and postoperative management, along with outcome measures, are used to allow for a more accurate comparison of graft success in small animals.

a. SPSS, version 20.0, IBM Inc, New York, NY.
b. Jelonet, Smith & Nephew Healthcare Ltd, Kingston upon Hull, East Riding of Yorkshire, England.
c. Melolin, Smith & Nephew Healthcare Ltd, Kingston upon Hull, East Riding of Yorkshire, England.
d. Mepitel, Mölnlycke Health Care, Gothenburg, Sweden.
e. Allevyn, Smith & Nephew Healthcare Ltd, Kingston upon Hull, East Riding of Yorkshire, England.

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