Scratching objects is an inherited normal behavior in cats that is used as a visual and olfactory territorial mark and as a stretching exercise for the forelimbs.1-3 Cats may injure themselves and damage household materials. Avoidance of injury to humans or animals was chosen as the primary reason for cats undergoing tendonectomy or onychectomy.1-8

Tendonectomy of the deep digital flexor muscle of the forelimbs is commonly performed by veterinarians either pre- or postoperatively to prevent use of the claws and the associated property damage and personal injury.10-12 Pain, lameness, bleeding, swelling, and dehiscence of the skin incision are the most common complications in cats that undergo these surgeries.13-16 Tendonectomy has been suggested as an alternative to onychectomy, because it involves fewer signs of pain and fewer complications following surgery. However, tendonectomy makes claws rough, grow excessively, and requires that the owner trim the claws regularly.10,16

Recently, the merits of the 2 surgical techniques have been debated.10,15,16 Jankowski et al10 found that cats that underwent tendonectomy recovered more quickly according to the owner, and owner satisfaction was similar after onychectomy and tendonectomy. However, to our knowledge, a clinical behavioral study has not been performed to compare owners’ attitudes regarding tendonectomy and onychectomy. The purposes of the study reported here were to compare owners’ reasons for surgery and changes in the cats’ behavior after tendonectomy and onychectomy. The procedures were not detected regarding behavior problems after surgery.

Conclusions and Clinical Relevance—Although tendonectomy and onychectomy involved some medical complications and behavior changes following surgery, owners had positive attitudes regarding both surgeries after the immediate postoperative period. Tendonectomy may be a humane alternative to onychectomy, although owners need to be advised that nail trimming is still necessary in cats after surgery. (J Am Vet Med Assoc 2001;218: 43–47)
formed, was completed before surgeries on the paws. Surgeries at the VMTH were performed by senior veterinary students under the guidance of surgical staff or faculty.

For cats undergoing forelimb tendonectomy, hair on the ventral surface of the digits was shaved on both forepaws. Toenails on all 4 feet were trimmed, and the forepaws were cleaned with 2% chlorhexidine surgical scrub solution and water for 5 minutes. A tourniquet was placed around the proximal aspect of the antebrachium, and a fenestrated drape was used to isolate the surgical area. A 0.75-cm vertical skin incision was made on the ventral surface of the first toe just proximal to the digital pad. Iris scissors were used to bluntly dissect around the deep digital flexor tendon. The tendon was isolated and transected proximally. The distal portion was grasped with Adson forceps, and the tendon was transected as far distally as possible, removing a portion of tendon approximately 0.5 cm in length. The area was blotted dry, and a drop of tissue glue was applied to appose the skin. This procedure was repeated on all 10 toes of the forepaws. Shredded paper was provided in the litter box for the next few days.

All cats that underwent forelimb onychectomy had their digits and claws cleaned with 2% chlorhexidine surgical scrub solution and water. A tourniquet was applied to the proximal aspect of the antebrachium, and a fenestrated drape was used to isolate the surgical area. Amputation of the distal phalanx of each digit by a disarticulation technique was performed by use of a sterile guillotine-type nail trimmer. When necessary, this was followed by removal of the flexor process by use of a scalpel blade (No. 10 or 12). A curved Halsted mosquito forceps was placed on the claw to allow the surgeon to extend the claw and the third phalanx. Sharp dissection was continued proximally over the ungual crest and toward the dorsal surface of the flexor process. Skin incisions were apposed with tissue glue. A light pressure bandage was also placed on the foot and distal portion of the limb; shredded paper was provided in the litter box for the next few days.

Behavioral follow-up—Each owner was contacted by telephone between 2 months and 5.4 years after surgery (median time to follow-up: onychectomy, 11.5 months; tendonectomy, 18 months) to inquire as to why they wanted their cats’ claws removed or modified, what benefits either of these procedures provided, what problems they anticipated, what problems the cat actually had following surgery, and recovery times. When asked why they considered having their cat’s claws modified, the following choices were offered: the cat was scratching household materials, prevention of injury to humans, prevention of injury to other household pets, desire to keep cat indoors, and recommendation of veterinarian or others. When owners were asked what they believed were the benefits of each procedure, they could choose one or more of the following: decreased damage to household materials, decreased injury to humans, improved relationship with owner, improved relationship with other animals, or the cat required less discipline. Owners were asked whether their cat continued to make scratching movements on furniture or carpet and whether their cat would tread (kneading movement usually when the cat is standing on a soft surface and purring). Owners were also asked about undesirable behaviors that developed after surgery (eg, biting, house soiling, not covering feces in litter) and their own attitudes regarding the surgery before and after the procedure was performed. One individual (SA) surveyed all owners to assess their attitudes regarding the surgery before and after the procedure.

Statistical analyses—Differences in distribution of categorical variables between cats having tendonectomy versus onychectomy were evaluated by use of the $\chi^2$ test of independence. For variables where expected values were < 5 in any cell, the Fisher exact test was performed.

Differences between normally distributed variables (eg, surgical times) were analyzed by use of the Student t-test. Because of the many comparisons within different sections of the questionnaire, $P$ values were adjusted by use of the Bonferonni correction. Values of $P \leq 0.05$ for individual variables were considered significant.

Results

Of the 98 owners, 57 were reached for follow-up information (median, 29 months; range, 4 to 60 months after surgery). However, 41 were not reached because their telephones had been disconnected, or they did not respond to messages left on their answering machines. Fifty-one domestic shorthair cats, 4 Siamese, and 2 Persians were included in the study. Eighteen cats underwent tendonectomy; median age of these cats was 22 months (range, 3 months to 121 months); median weight was 4.9 kg (10.8 lb; range, 2.4 to 9.9 kg [5.3 to 21.8 lb]). Thirty-nine cats underwent onychectomy; median age of these cats was 7 months (range, 4 months to 55 months); median weight was 3.5 kg (7.7 lb; range, 2 to 8 kg [4.4 to 18 lb]).

Behavioral differences were not detected between tendonectomy and onychectomy regarding duration of surgery (mean ± SD, 33 ± 9 vs 39 ± 11 minutes, respectively; $P = 0.9$). Four (22%) cats received an additional dose of oxymorphone after tendonectomy. Sixteen (41%) cats received an additional dose of oxymorphone and 3 (8%) cats received butorphanol after onychectomy.

Reasons for procedure—Most owners had several reasons why they elected onychectomy or tendonectomy for their cats (Table 1). A significantly ($P = 0.02$) higher proportion of owners of cats that underwent onychectomy (49%) were concerned with injuries to humans than owners of cats that underwent tendonectomy (17%). Similarly, owners of cats that had onychectomies were more likely to express an interest in keeping their cats indoors (90%), compared with those whose cats had tendonectomies (67%; $P = 0.03$). In contrast, a significantly ($P < 0.001$) higher proportion of owners of cats that had tendonectomies (78%) had the procedure recommended to them by someone (ie, veterinarian or other), compared with owners of cats that had onychectomies (13%).

Behaviors after surgery—Significant differences were not detected in the proportion of cats that continued to make scratching movements (78% [tendonectomy] vs 59% [onychectomy]), beginning to tread (6% [tendonectomy] vs 13% [onychectomy]), or ceasing to tread (28% [tendonectomy] vs 28% [onychectomy]) following surgery.

Three cats that underwent tendonectomy and 13 cats that underwent onychectomy had at least 1 behavior problem that began sometime after surgery; however, this difference was not significant. Two cats that underwent tendonectomy would not use the litterbox (house soiling), and 1 cat had an increase in biting habits. Six cats that underwent onychectomy would not use the litterbox (house soiling), 2 cats did not cover their feces, and 7 cats had an increase in biting habits or intensity of biting following onychectomy.
Significant differences were not detected between the 2 surgical groups with regard to any of these behavioral problems following surgery.

Benefits and concerns after surgery—When asked what they perceived to be the benefits of the 2 surgeries, there were significant differences in the perceptions of owners regarding risk of injury to humans and the relationship between the cat and other animals. A higher proportion of owners of cats that had an onychectomy (77%) perceived a decreased risk of injury to humans than owners of cats that had a tendonectomy (28%; P = 0.01). Similarly, more owners of cats that had an onychectomy (46%) perceived a better relationship between the cat and other animals after surgery than owners of cats that had a tendonectomy (11%; P = 0.01). Significant differences were not detected in owner perceptions between the 2 surgical groups regarding the benefits of decreased damage to household materials, better relationships between owner and pet, or the need for less discipline of the cat following either procedure.

The primary concern of owners prior to their cats' undergoing tendonectomy or onychectomy was postoperative pain (61% vs 72%, respectively), and the second most common concern was about the cats’ inability to defend themselves (17% vs 31%). Owners reported that cats that underwent tendonectomy (44%) and onychectomy (67%) had signs of some pain after surgery. The only concern that was significantly different between the 2 groups related to activity level immediately after surgery. Owners perceived that cats that underwent onychectomy (69.2%) had a greater decrease in activity than those that underwent tendonectomy (33.3%; P = 0.01). Eleven (61%) cats that had a tendonectomy and 31 (80%) cats that had an onychectomy had > 1 immediate medical complication following surgery, but this difference was not significant.

Recovery time—Twelve (67%) cats that underwent tendonectomy recovered fully (normal activity as determined by the owner) within the first 3 days after surgery, and all 18 (100%) cats recovered within 2 weeks. Seventeen (44%) cats that underwent onychectomy recovered within the first 3 days after surgery, and 35 (90%) cats recovered within 2 weeks. Four (10%) cats that underwent onychectomy needed > 2 weeks to completely recover. Significant differences were not detected in recovery times between the 2 groups.

Seven owners of cats that underwent tendonectomy had owned other cats that had an onychectomy. All owners perceived that recovery time of tendonectomy was faster than that of onychectomy.

Overall attitudes—Seventeen (94%) owners of cats that underwent tendonectomy and 34 (87%) owners of cats that underwent onychectomy had a positive attitude regarding the surgery at the time of telephone contact (Table 2); however, this difference was not significant. Only 1 owner (40 months after surgery) of a cat that underwent tendonectomy had a negative attitude, and 2 owners (8 and 9 months after surgery) of cats that underwent onychectomy had a negative attitude toward the procedure.

Discussion
Declawing is a controversial procedure about which many owners have concerns. In addition, many complications after surgery have been reported. Some owners believe that onychectomy causes physical and behavioral changes in their cats after surgery; however, results of 1 study indicated that declawing did not lead to serious behavior sequelae, and the only behavior problem that declawed cats had considerably more often than intact cats was jumping on counters or tables. Complication rates following onychectomy

Table 1—Reasons why owners elected onychectomy or tendonectomy for their cats*

<table>
<thead>
<tr>
<th>Reason</th>
<th>Tendonectomy (n = 18)</th>
<th>Onychectomy (n = 39)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scratching household materials (eg, carpet, furniture)</td>
<td>14 (78)</td>
<td>27 (69)</td>
<td>N/S</td>
</tr>
<tr>
<td>Injury to human or to prevent injury</td>
<td>3 (17)</td>
<td>19 (49)</td>
<td>0.02</td>
</tr>
<tr>
<td>Injury to other household pets</td>
<td>1 (6)</td>
<td>10 (26)</td>
<td>0.07</td>
</tr>
<tr>
<td>Wanted to keep cat indoors</td>
<td>12 (67)</td>
<td>35 (90)</td>
<td>0.03</td>
</tr>
<tr>
<td>Recommendation of a veterinarian or other person</td>
<td>14 (78)</td>
<td>6 (15%)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

*Owners could select one or more answers to this question. N/S = Not significant.
Tendonectomy has been used as an alternative method to decrease destructive scratching; it is recommended to owners that have humane concerns or those who are worried about problems that may develop after onychectomy.10 Results of 1 study revealed tendonectomy was associated with fewer signs of pain than onychectomy, but nail trimming must be performed at regular intervals after surgery.9 Results of another study revealed that although there was no significant difference, more owners of cats that underwent onychectomy were satisfied with the procedure, compared with owners of cats that underwent tendonectomy; the prevalence of lameness between cats undergoing onychectomy and those undergoing tendonectomy was similar following surgery.10 Although nail trimming of thick claws may be a problem, 17 of 18 (95%) owners of cats that underwent tendonectomy in our study had a positive attitude toward the surgery, compared with 34 of 39 (87%) owners whose cats underwent onychectomy. In our study, 1 cat that underwent tendonectomy had prolonged lameness, which was the same number as that described after onychectomy.

Rather than skin closure with suture materials, in this study n-butyl monomers of cyanoacrylate tissue adhesive were used. Isobutylcyanoacrylate or n-butyl monomers of cyanoacrylate tissue adhesive may decrease the surgical time of onychectomy and encourage rapid healing of surgical sites; however, this product should be used sparingly, and the tissue should be clean before application.12,17-19

A common reason for considering tendonectomy or onychectomy was that owners wanted to prevent their cats from scratching household materials. When owners considered injury to humans, fewer owners of cats that underwent tendonectomy considered this problem than those whose cats underwent onychectomy. A larger proportion of owners selecting tendonectomy had the procedure recommended to them by a veterinarian or someone else. Tendonectomy was typically not performed at the time of neutering but later, when problems arose. Veterinarians or others rarely recommended onychectomy, but that is most likely because owners were already aware of that procedure. Tendonectomy is a newer procedure and as such may be recommended by veterinarians or others from whom the owner seeks advice.

Owners of cats that underwent onychectomy were more satisfied with the relationship between the cat and other animals than owners of cats that underwent tendonectomy. Owners of cats that had a tendonectomy may have believed that the intact claws still posed a threat to other animals.

Jankowski et al10 reported that 24 hours after surgery, cats that underwent onychectomy had more signs of pain than cats that underwent tendonectomy. In the present study, cats that underwent onychectomy were described as having a greater decrease in activity than those that underwent tendonectomy in the 2 weeks following surgery.

There are several possible limitations to our study. Several differences that were not significant may have been significant if the sample size had been larger. In addition, cats that underwent tendonectomy were older at the time of surgery than cats that underwent onychectomy. We believe this was because owners did not want to declaw their cats unless it was necessary and, therefore, waited longer before scheduling the surgery. Some owners of cats that had a tendonectomy were contacted much longer after the surgery was performed; one reason for this was because these owners were more likely to be veterinarians or veterinary students who were easier to locate and contact and, thus, were not lost to follow-up.

Results of previous studies have revealed that behavioral problems after onychectomy were not pronounced.18 In our study, 3 of 18 (17%) owners reported they noticed at least 1 behavioral change after their cats underwent tendonectomy, compared with 13 of 39 (33%) owners of cats that underwent onychectomy. The most common problem following surgery was house soiling; however, house soiling is also a common problem of intact cats. The prevalence of house soiling in a survey of 125 cat owners was 16%.6

Tendonectomy may be a good alternative for owners who consider onychectomy inhumane or want their cat to undergo what is perceived as a less painful surgical procedure than onychectomy. Veterinarians should suggest tendonectomy if behavioral means of decreasing destructive scratching have not been successful. Tendonectomy results in more rapid return to normal behavior, and owners are satisfied with the outcome of the procedure.

References

References


Books Received But Not Reviewed

**Anaesthetic & Sedative Technique for Aquatic Animals (2nd ed).** By Lindsay G. Ross & Barbara Ross. 174 pages; illustrated. Iowa State University, 2121 South State Avenue, Ames, Ia 50014-8300. 1999. Price $34.95.


**Cardiorespiratory System: Integration of Normal and Pathological Structure and Function.** By A.S. King. 648 pages; illustrated. Iowa State University, 2121 South State Avenue, Ames, Ia 50014-8300. 1999. Price $84.95.


**Self-assessment Color Review of Veterinary Dentistry.** By Frank J.M. Verstraete. 224 pages; illustrated. Iowa State University, 2121 South State Avenue, Ames IA 50014-8300. 1999. Price $34.95.