Evaluation of short-term limb function following unilateral carbon dioxide laser or scalpel onychectomy in cats

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Objective—To evaluate short-term postoperative forelimb function after scalpel and laser onychectomy in cats.

Design—Randomized, prospective study.

Animals—20 healthy adult cats.

Procedures—Cats were randomly assigned to the laser (n = 10) or scalpel (10) onychectomy group. Unilateral left forelimb onychectomy was performed. In the scalpel group, a tourniquet was used during surgery and a bandage was applied after surgery. Pressure platform gait analysis was performed prior to and 1, 2, 3, and 12 days after onychectomy. Peak vertical force (PVF), vertical impulse, and the ratio of the PVF of the left forelimb to the sum of the remaining limbs (PVF ratio) were used as outcome measures.

Results—The laser onychectomy group had significantly higher ground reaction forces on days 1 and 2 and significantly higher PVF ratio on day 12, compared with the scalpel group. Similarly, significant differences were found in change in ground reaction forces on days 1 and 2 and the PVF ratio on day 12, compared with day –1. No cats required rescue analgesia during the course of the study. One cat in the laser group had signs of depression and was reluctant to walk on day 2 after surgery, had physical examination findings consistent with cardiac insufficiency, and was euthanized.

Conclusions and Clinical Relevance—Cats had improved limb function immediately after unilateral laser onychectomy, compared with onychectomy with a scalpel, tourniquet, and bandage. This improved limb function may result from decreased pain during the 48 hours following unilateral laser onychectomy. (J Am Vet Med Assoc 2007;230:353–358)

It is accepted that onychectomy in cats is a controversial and painful procedure. Attempts have been made to address these concerns not only with pharmacologic remedies but also in developing different surgical techniques (ie, laser onychectomy and tenonec- tomy). In fact, recent evidence suggests that in the early postoperative period, cats that have unilateral onychectomy are more reluctant to use their operated limb because of pain than are dogs recovering from surgery for a torn cranial cruciate ligament and medial meniscus because dogs had a smaller decrease in PVF 24 hours after surgery than did cats after onychectomy. It has also been determined that 12 days after unilateral onychectomy in cats, GRFs have not returned to preoperative values. However, in the long term, this lameness does resolve.

An important component of evaluating a pharmaceutical or surgical technique with regards to quality of analgesia in veterinary medicine is patient assessment. The use of pain scales is widely accepted in human medicine and has been used for the evaluation of pain in cats. Some of the pitfalls of using pain scales in veterinary medicine are that the patient cannot verbally communicate, an observer is required to estimate the level of pain, and the evaluation process is subjective and dependent on observer experience. Several studies have attempted to use weight bearing, behavioral responses (ie, vocalization or posture), lameness, or response to palpation of the feet as an indication of pain. Nonetheless, with the exception of studies in which a palpometer was used to squeeze the paw in which a thermal threshold device was used to assess antinociception, these assessments have some degree of subjectivity. In addition, the use of physiologic values (ie, heart rate, respiratory rate,
temperature, and appetite), β-endorphin concentrations, and serum cortisol concentrations, although objective, have yielded inconsistent results in cats3,10,17,18 and correlate poorly with behavioral measures of pain in dogs14,19. Pressure platform gait analysis, similar to force platform gait analysis, is an objective, accurate means of assessing normal and pathologic changes in gait and has recently been used in assessing limb function and pain in dogs and cats1,4,5,20-22.

Three major surgical techniques have been described for feline onychectomy: scalpel excision, guillotine-style shearing, and CO2 laser excision.9,25,26,b One of the major incentives toward development of laser onychectomy is the suggestion that it decreases the amount of postoperative pain and is associated with a lower rate of complications.9,25,27,30,b Although there are numerous claims in the veterinary literature of the ability of the CO2 laser to reduce postoperative pain, compared with other forms of onychectomy, such reports23,27 appear largely anecdotal.

The objective of this prospective study was to compare limb function as determined by use of pressure platform gait analysis, as an indication of discomfort, in cats after scalpel and laser onychectomy. Our null hypothesis was that there would be no significant difference in limb function between cats undergoing scalpel versus laser onychectomy.

Materials and Methods

Cats—Healthy, adult cats (n = 20) that were scheduled for elective onychectomy were recruited on the basis of the following inclusion criteria: from 6 to 24 months of age, no analgesic or sedative medications within 24 hours of evaluation, no orthopedic or neurologic disease detected via preoperative physical examination, and informed owner consent for participation. The institutional committee on animal care approved the experimental protocol for this study.

Experimental protocol—Before surgery, cats were randomly assigned to 1 of 2 groups: scalpel onychectomy (n = 10) or CO2 laser onychectomy (10). A mixture of ketamine hydrochloride (10 mg/kg [4.5 mg/lb], IM), acepromazine maleate (0.1 mg/kg [0.045 mg/lb], IM), and atropine sulfate (0.4 mg/kg [0.18 mg/lb], IM) was injected 15 minutes before induction of anesthesia. Anesthesia was induced and maintained with isoflurane in oxygen delivered via a mask. A tourniquet wrap was used only in cats designated for scalpel onychectomy. Elastic bandage material was applied to the left forelimb, starting at the paw and extending proximally to just below the elbow joint. The wrap was then cut distally and rolled proximally to provide a surgical field that exposed only the phalanges.

Cats were placed in right lateral recumbency, and the left forepaw was prepared for surgery by use of traditional aseptic technique, except that the hair was not clipped. For scalpel and CO2 laser methods, the claw was grasped with a hemostat and the third phalanx of each digit on the left forepaw was amputated by incising over the ungular crest followed by dissection between the second and third phalanx, disarticulation of the distal interphalangeal joint, and incision of the deep digital flexor tendon. An experienced surgeon (MGC) performed the scalpel onychectomy. Each digital incision was closed with a single, simple interrupted suture of 4-0 chromic gut, and a bandage was placed on the operated limb. The bandage was removed 12 to 15 hours after surgery and at least 1 hour before gait analysis. Another surgeon (WJGE) experienced in laser onychectomy with a CO2 laser4 performed the onychectomy with a 0.3-mm steel laser tip on a 6-W continuous power setting. A new 0.3-mm tip was used after every 2 paws to avoid excessive charring of the tissue. Simple interrupted sutures of 4-0 chromic gut were placed, but a bandage was not applied in the laser onychectomy group. Cats were then placed in individual cages for recovery. All cats were treated with butorphanol tartrate (0.4 mg/kg, IM) prior to discontinuation of anesthesia and every 4 hours for the first 24 hours following surgery.5-7,15,18

A subjective pain assessment system4,7,31 was used solely to determine whether rescue analgesia and removal from the study were necessary. Similarly, cats were subjectively monitored during and after surgery for the amount of hemorrhage. The surgeon and anesthetist visually monitored for hemorrhage during surgery. After surgery, bandages from the scalpel group were monitored for blood staining on the exterior, and the kennels of the laser group cats were checked for blood on blankets or sides. The cats were also subjectively observed for evidence of neurapraxia, tissue ischemia, muscle damage, and other potential complications. Because the observer was aware of which procedure had been performed, these subjective observations were not included as part of the comparison between groups.

Gait analysis—Pressure platform gait analysis was performed 1 day before (referred to as day –1) and 1, 2, 3, and 12 days after surgery. A 2 × 0.75-m pressure measurement walkway1 was placed in the center of and level with a 4-m runway. The walkway was linked to a dedicated computer3 with specific software3 designed for collection of gait analysis data. Prior to data acquisition, the walkway sensors were equilibrated and calibrated in accordance with manufacturer specifications. Preceding data collection, each cat was weighed on an electronic scale1 and allowed to acclimate to the runway area and the pressure platform. Any cat that would not consistently walk across the pressure platform, was aggressive, or was afraid was excluded from the study population.

Cats were allowed to walk across the pressure platform at a comfortable velocity. The first 5 valid trials were recorded and saved for data evaluation. A valid trial consisted of the cat walking at a comfortable velocity with each of the 4 feet fully contacting the walkway at least 2 consecutive times during the pass. Pressure distribution data (PVF and VI) were then determined from each footfall for each of the 5 valid trials. The PVF ratio, which was defined as the ratio of PVF of the left forelimb to the sum of the 3 remaining limbs, was also calculated. Ground reaction forces were expressed as a percentage of body weight.

Statistical analysis—All analyses were performed with standard software.6 χ2 Analysis was used to compare the sex distribution between the laser and
scalpel groups. A linear regression analysis was used to evaluate the relationship between the overall mean PVF of the left forelimb and age of the cats. The Student t test was used to compare duration of surgery, age, velocity, and acceleration on each study day and weight on days –1 and 12 between the laser and scalpel groups. The PVF and VI for the left forelimb and the ratio of the left forelimb PVF to the remaining 3 limbs' PVF were compared by use of matched-pairs t tests. For these analyses, group effect was determined by use of day –1 as a baseline for all outcome measures.

Data were further evaluated by calculating the mean percentage change in PVF, VI, and PVF ratio on days 1, 2, 3, and 12 from day –1 for each cat by use of the following formula:

\[
\text{mean GRF day } X \text{ } - \text{mean GRF day } -1 / \text{mean GRF day } -1 \times 100\%
\]

where the GRF is the PVF, VI, or PVF ratio and day X is day 1, 2, 3, or 12. The result for each cat was then used to calculate the mean values for each of the laser and scalpel groups. By use of this formula, a negative value represented a GRF that was less than the day –1 value and likewise a positive value represented a GRF that was greater than the day –1 value. The Student t test was used to compare the percentage change in PVF, VI, and PVF ratio between the laser and scalpel groups on days 1, 2, 3, and 12. Overall significance for all comparisons was set at \( P < 0.05 \). Values are given as mean ± SE.

Results

No cats were excluded for inconsistently walking across the platform or for being aggressive or afraid. One cat in the laser group developed signs of depression and was reluctant to walk on day 2. Physical examination revealed signs consistent with pulmonary edema and cardiac insufficiency. The cat was euthanized, and necropsy confirmed the presence of pulmonary edema with left ventricular dilation. Data from this cat were not used in the final analyses. No cats required rescue analgesia during the course of the study. No additional complications were detected during the study period.

There were 10 males and 9 females (laser group, 3 males and 6 females; scalpel group, 7 males and 3 females). There was no significant difference in sex distribution between groups. Duration of surgery was 17.3 ± 1.14 minutes for cats in the laser group and 12.5 ± 1.82 minutes for cats in the scalpel group. Duration of surgery for cats in the laser group was significantly (\( P = 0.04 \)) longer than in the scalpel group. Age of cats in the laser and scalpel groups was 20.0 ± 2.83 months and 15.2 ± 3.44 months, respectively. Age was not significantly different between groups and was not significantly associated with the PVF or VI. Velocity for cats in the laser and scalpel groups was 0.74 ± 0.06 m/s and 0.76 ± 0.08 m/s, respectively. Acceleration for cats in the laser and scalpel groups was 0.08 ± 0.06 m/s² and 0.06 ± 0.06 m/s², respectively. There were no significant differences in velocity or acceleration between groups.

Body weight for cats in the laser and scalpel groups was 2.55 ± 1.14 lb (1.14 minutes for cats in the scalpel group and 12.5 minutes for cats in the laser group), respectively, and 3.54 ± 0.56 lb (7.19 ± 0.48 lb) on day –1, respectively, and 3.54 ± 0.22 kg (7.79 ± 0.48 kg) and 3.33 ± 0.18 kg (7.52 ± 0.40 kg) on day 12, respectively. There were no significant differences in body weight between groups and the change over time was not significant.

On days 1 and 2, the cats that had undergone laser onychectomy had a significantly higher PVF (day 1, \( P = 0.004 \); day 2, \( P = 0.04 \)), VI (day 1, \( P = 0.01 \); day 2, \( P = 0.01 \)), and PVF ratio (day 1, \( P < 0.001 \); day 2, \( P < 0.001 \)) than cats in the scalpel group (Table 1). No significant differences were found between groups for day 3 GRFs (PVF, \( P = 0.36 \); VI, \( P = 0.21 \); PVF ratio, \( P = 0.36 \)). On day 12, cats in the laser group had a significantly higher PVF ratio (\( P = 0.04 \)), but other GRFs were not different between groups (PVF, \( P = 0.18 \); VI, \( P = 0.14 \)).

Mean percentage change in PVF, VI, and PVF ratio for days 1, 2, 3, and 12, compared with day –1, were determined (Table 1). With the exception of VI on day 12, PVF, VI, and PVF ratio were all less than day –1 values on days 1, 2, 3, and 12 for both groups. On days

<table>
<thead>
<tr>
<th>Day</th>
<th>Variable</th>
<th>Laser GRF</th>
<th>Laser Change (%)</th>
<th>Scaspel GRF</th>
<th>Scaspel Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>–1</td>
<td>PVF</td>
<td>52.00 ± 4.08</td>
<td>NA</td>
<td>60.75 ± 2.51</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>VI</td>
<td>12.71 ± 0.57</td>
<td>NA</td>
<td>13.30 ± 1.10</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>PVF ratio</td>
<td>0.38 ± 0.01</td>
<td>NA</td>
<td>0.39 ± 0.01</td>
<td>NA</td>
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<tr>
<td>1</td>
<td>PVF*</td>
<td>45.76 ± 2.56</td>
<td>–8.47 ± 0.08</td>
<td>34.81 ± 2.35</td>
<td>–41.89 ± 0.05</td>
</tr>
<tr>
<td></td>
<td>VI*</td>
<td>9.74 ± 0.42</td>
<td>–21.80 ± 0.06</td>
<td>6.31 ± 0.75</td>
<td>–61.02 ± 0.06</td>
</tr>
<tr>
<td></td>
<td>PVF ratio*</td>
<td>0.34 ± 0.01</td>
<td>–9.29 ± 0.06</td>
<td>0.21 ± 0.01</td>
<td>–45.58 ± 0.06</td>
</tr>
<tr>
<td>2</td>
<td>PVF*</td>
<td>46.87 ± 2.03</td>
<td>–7.84 ± 0.04</td>
<td>45.26 ± 2.39</td>
<td>–24.47 ± 0.05</td>
</tr>
<tr>
<td></td>
<td>VI*</td>
<td>11.96 ± 0.61</td>
<td>–5.21 ± 0.04</td>
<td>8.98 ± 0.84</td>
<td>–30.17 ± 0.07</td>
</tr>
<tr>
<td></td>
<td>PVF ratio*</td>
<td>0.37 ± 0.01</td>
<td>–3.16 ± 0.04</td>
<td>0.27 ± 0.001</td>
<td>–29.32 ± 0.02</td>
</tr>
<tr>
<td>3</td>
<td>PVF</td>
<td>40.65 ± 1.38</td>
<td>–18.94 ± 0.05</td>
<td>44.49 ± 1.44</td>
<td>–25.53 ± 0.04</td>
</tr>
<tr>
<td></td>
<td>VI</td>
<td>10.90 ± 0.56</td>
<td>–13.01 ± 0.06</td>
<td>10.04 ± 0.52</td>
<td>–21.58 ± 0.05</td>
</tr>
<tr>
<td></td>
<td>PVF ratio</td>
<td>2.03 ± 0.01</td>
<td>–15.49 ± 0.06</td>
<td>0.29 ± 0.01</td>
<td>–23.43 ± 0.05</td>
</tr>
<tr>
<td>12</td>
<td>PVF</td>
<td>45.83 ± 1.33</td>
<td>–9.13 ± 0.05</td>
<td>48.71 ± 1.52</td>
<td>–19.01 ± 0.03</td>
</tr>
<tr>
<td></td>
<td>VI</td>
<td>13.98 ± 0.69</td>
<td>12.13 ± 0.08</td>
<td>12.18 ± 0.87</td>
<td>–4.27 ± 0.08</td>
</tr>
<tr>
<td></td>
<td>PVF ratio*</td>
<td>0.35 ± 0.008</td>
<td>–7.64 ± 0.04</td>
<td>0.31 ± 0.008</td>
<td>–19.66 ± 0.03</td>
</tr>
</tbody>
</table>

*Significant (\( P < 0.05 \)) difference from value on day –1.
NA = Not applicable.
1 and 2, cats in the scalpel onychectomy group had a significantly greater decrease in PVF (day 1, \( P = 0.003 \); day 2, \( P = 0.02 \)), VI (day 1, \( P = 0.002 \); day 2, \( P = 0.01 \)), and PVF ratio (day 1, \( P < 0.001 \); day 2, \( P < 0.001 \)) than cats in the laser group. There were no significant differences in the change in PVF (\( P = 0.34 \)), VI (\( P = 0.29 \)), or PVF ratio (\( P = 0.31 \)) on day 3 between groups. On day 12, a significant difference was found between groups with respect to the change in PVF ratio (\( P = 0.02 \)) but not in PVF (\( P = 0.11 \)) or VI (\( P = 0.16 \)).

**Discussion**

One study\(^9\) found that although laser onychectomy may decrease the postoperative stress and level of pain, as determined via serial blood cortisol concentrations, behavioral changes, and urine cortisol-to-creatinine ratio, it may also increase the number of complications in the immediate postoperative period. In another study,\(^9\) subjective assessments and scoring of pain, lameness, and swelling were used to compare laser versus scalpel onychectomy. The authors’ conclusion was that although laser onychectomy resulted in less discomfort and complication scores in the immediate postoperative period, the difference did not appear to be clinically important.\(^9\) In our study, on days 1 and 2 after surgery, cats in the laser surgery group had significantly higher PVF, VI, and PVF ratio than cats in the scalpel group. These results indicated that in the immediate postoperative period, cats in the laser surgery group were less lame and arguably had less limb pain than cats in the scalpel group. On day 3, there were no significant differences between the groups, and on day 12, no differences were found with respect to PVF and VI but there was a difference between the groups with respect to PVF ratio.

When the data were evaluated by examining the change in GRFs, compared with day –1, similar results were found. Over the entire study period, the laser group had mean PVF, VI, and PVF ratio that were closer to the day –1 values than did the scalpel group. However, the difference was only significant for all 3 variables on days 1 and 2 and for PVF ratio on day 12. Also of interest was the finding that on day 12, the mean VI for the laser group was greater than the mean value on day –1. Given that significance was not achieved with respect to the day 12 change in VI, this was likely caused by normal variation. These findings led to rejection of the null hypothesis and suggested that limb function was improved when unilateral onychectomy was performed with a CO\(_2\) laser rather than a scalpel, which is in agreement with previous studies.\(^9\,^b\)

Plasma cortisol concentrations are considered by many to be a good, objective indication of pain in dogs and cats.\(^5\,^7\,^17\,^18\) However, cortisol concentration can be affected by variables other than pain, which results in inconsistencies with these measurements.\(^2\,^7\,^10\,^19\,^17\,^18\) Plasma cortisol concentration remains an impractical and invasive means of assessing pain that is often limited to use in research settings. The use of pressure platform gait analysis has been advocated for animals that are not amenable to force platform gait analysis because of size or short stride length.\(^1\,^5\,^20\,^23\,^a\) The pressure platform has been validated as an alternative to the force platform for measuring PVF and VI in dogs.\(^20\,^22\) In cats, pressure platform gait analysis has been used to determine that forelimb vertical forces 6 months or longer after onychectomy are not significantly different from those of cats that did not have that surgery.\(^1\) This system has also been used to evaluate clinically normal cats,\(^5\) the efficacy of perioperative analgesia in dogs,\(^3\) and postoperative analgesia in cats.\(^4\) This pressure platform system is appealing because it allows an objective assessment of vertical forces (PVF and VI), which together are the most commonly used kinetic variables to assess normal and pathologic changes in gait. Although the GRFs could be affected by other factors, measurement of PVF and VI is widely accepted as an assessment of limb function and discomfort. In the present study, unilateral onychectomy as well as the use of the pressure platform system provided the opportunity to obtain a more accurate assessment of limb pain. Unlike the subjective pain assessment, in which an observer assigns a pain score, each cat determined the amount of weight applied to the operated limb. With this in mind, a unilateral onychectomy was essential because it provided a normal, unoperated forelimb to which weight could be transferred. Overall, we agree with Horstman et al\(^3\) in that pressure platform gait analysis does not necessarily provide a 100% reliable measure of pain. However, we are not aware of a better method of objectively evaluating limb pain in cats in the perioperative period.

Although the results of this and other studies\(^9\,^b\) indicated that an onychectomy performed with a CO\(_2\) laser is less painful than when performed with a scalpel, the mechanism responsible for the difference remains to be elucidated. This phenomenon is not unique to veterinary medicine because the use of a CO\(_2\) laser for surgical procedures of the head and neck in humans appears to result in less postoperative pain than procedures performed with a scalpel or electrocautery.\(^32\) In 1 study, transection of the tibial branch of the sciatic nerve in rats with a CO\(_2\) laser resulted in a significant decrease in the retrograde transport of horseradish peroxidase, compared with a scalpel group.\(^32\) Although these results may support the suggestion that a decrease in postoperative pain with laser onychectomy is the result of decreased initiation of action potential at the transected nerve ending,\(^30\) similar findings in a feline onychectomy model have not been reported; thus, the clinical relevance of such findings remains unclear. In another study,\(^33\) incisions made in the dorsal surface of a rat tongue with cautery, a scalpel, and a CO\(_2\) laser in both continuous and pulsed modes were compared immunocytochemically to normal, unoperated tissue. There was no significant difference in the number of intact nerves adjacent to the incisions, and only the cautery group was significantly different from the unoperated and scalpel groups. The authors concluded that it was unlikely that the destruction of peripheral nerves was the mechanism of analgesia associated with CO\(_2\) laser surgery.\(^33\) Regardless of the pathophysiologic mechanisms, the analgesic effects of the CO\(_2\) laser remain controversial, and further investigation into the mechanism of decreased discomfort is warranted.
The tissue effects of a given laser depend on the composition of the target tissue. The amounts of hemoglobin, proteins, melanin, and most importantly, water are key in the tissue-heating process associated with lasers that emit energy in the infrared wavelengths. The CO₂ laser is ideally suited for use in small animal soft tissue surgery because the wavelength of the light emitted is in the far infrared region and is highly absorbed by water with minimal thermal damage to surrounding tissues. The precision of a CO₂ laser is attributed to the fact that approximately 98% of the laser's energy is absorbed within 0.01 mm of the target tissue. The resultant effects are vaporization of the tissue and apparent sealing of blood vessels and lymphatics. The clinical effects are decreased intra- and postoperative hemorrhage and postoperative swelling. Although it would have been ideal to measure the amount of hemorrhage objectively, several previous studies have assessed the amount of hemorrhage both objectively and subjectively and indicate that less intraoperative hemorrhage occurs with the use of a CO₂ laser. Similarly, comparison of the laser group with a scalpel group without a tourniquet would have been ideal. However, this was not possible because of concerns for excessive hemorrhage and associated complications. Other reported advantages of CO₂ laser onychectomy include the fact that neither a tourniquet nor bandage is required. Complications associated with each of these have been reported and can be important. Improper tourniquet application can result in neurapraxia of the radial nerve, tissue ischemia, and muscle damage, and bandages have been associated with tissue necrosis. Although other studies have compared laser and scalpel onychectomy used a tourniquet in both groups, we chose not to use a tourniquet or bandage in the laser group because the goal was to more accurately emulate the surgical protocol used in clinical practice. Other complications, such as claw regrowth, chronic draining tracts, persistent lameness, and incomplete healing have been reported in the long term but were not addressed in the present study. To the authors’ knowledge, there are no reports of claw regrowth, chronic draining tracts, persistent lameness, and incomplete healing. As with all studies, this study had limitations. Although it would have been ideal to have the same surgeon perform the surgery for both groups of cats, we do not believe that this adversely affected the data. Both surgeons had considerable experience with their respective procedure, and having a surgeon perform a surgery that he or she did not have experience with could have negatively influenced the outcome. Interestingly, even though cats in the laser group had improved limb function after surgery, mean duration of surgery in that group was longer. Although the difference in surgery time was significant, the approximate 5-minute difference between groups may not be clinically relevant. The inclusion of a control group that was anesthetized, had a tourniquet placed, and was bandaged without surgery would have added to the overall results. However, Lapham et al included such a group and found that when using behavioral changes, the CO₂ onychectomy group had fewer negative behavioral changes and smaller percentage increases in serum and urine cortisol values. Similarly, the use of the tourniquet in the scalpel group may have contributed to complications. However, another study in which a tourniquet was used in the scalpel and laser groups found that 1 day after surgery, the laser group had significantly lower discomfort scores. With these results in mind, we suggest that although the tourniquet has the potential to result in increased complications, with proper application, the likelihood is not clinically important. Although duration of tourniquet application was not specifically measured, it was not likely an issue in the present study because of the duration of onychectomy in the scalpel group. Several studies that have assessed pain in cats have used combinations of objective and subjective observations. In the present study, subjective evaluations were not compared for 2 reasons. First, the observer was aware of treatment groups, and second, subjective variables are unreliable. Instead, subjective variables were chosen only as a means of deciding whether rescue analgesia was required. Regardless of the underlying mechanism, cats with a unilateral onychectomy performed by use of the CO₂ laser were less lame and therefore had less pain 24 to 48 hours after surgery, compared with cats in which onychectomy was performed with a scalpel, tourniquet, and bandage.

References


