Percutaneous tibial physeal fracture repair study – Follow-up Questionnaire

Name and last name of pet:

Date of contact(s):

Questionnaire:

Please answer the following questions by responding with a score of 0 to 10. Please answer for how your pet is doing NOW. If 0 or 10 cannot be chosen, use a number between 0 and 10 that seems to be most appropriate.

Example:
How well can your pet eat breakfast?
0 = Poorly,
10 = Very well

Actual questions:

1. How has your pet’s general quality of life been over the past month?
   0 = Has limited quality of life
   10 = Couldn’t be better

2. What has your pet’s attitude been like over the past month?
   0 = Depressed, hard to engage
   10 = Happy, agreeable

3. Frequency of postures of a happy pet (ie. for a dog: tail wagging, soliciting attention)?
   0 = Never
   10 = Many times a day

4. Willingness to play voluntarily?
   0 = Never
   10 = Always

5. How often does your pet get exercise?
   0 = Never
   10 = Multiple times a day

6. What is your pet’s exercise tolerance (For cats: ability to play and run in the house, for dogs: ability to go for walks without stopping or tiring)?
   Cats:
   0 = Struggles and gets weak with mild activity
   10 = Plays without signs of weakness or pain or discomfort
   Dogs:
   0 = Struggles on short walks
   10 = Copes well with long walks
7. How often does your pet indicate lameness when walking?
   0 = Always
   10 = Never

8. Stiffness when arising for the day?
   0 = Very stiff
   10 = Not stiff

9. Stiffness at the end of the day?
   0 = Very stiff
   10 = Not stiff

10. How often does your pet experience pain when turning suddenly while walking?
    0 = Every time
    10 = Never

11. How well can your pet walk without pain?
    0 = Painful
    10 = Not painful

12. How well can your pet run without pain?
    0 = Painful
    10 = Not painful

13. How lame do you perceive your pet to be?
    0 = Could not be more lame
    10 = Not lame

14. How well can your pet climb up stairs?
    0 = Poorly
    10 = Very well

15. How well can your pet climb down stairs?
    0 = Poorly
    10 = Very well

16. How well can your pet jump up?
    0 = Poorly
    10 = Very well

17. How well can your pet jump down?
    0 = Poorly
    10 = Very well

18. How would you grade the success of the operation on the leg?
    0 = Poor
    10 = Excellent

19. Would you have this operation done again in the same circumstances?
    0 = Never
    10 = Definitely

20. Did you seek veterinary care from any other facility regarding any complications associated with surgery on your pet, after our institution had cleared your pet to return to normal function?
    Yes
    No

21. Did you pursue physical therapy at a physical therapy facility after surgery to help recovery from this surgery?
    Yes
    No
Supplementary Video

Videos of several patients from this study are available as separate file. Seven owners sent videos of their pets, all showing normal function at the long-term follow-up (Supplementary Video available online with article information at https://doi.org/10.3415/VCOT-16-07-0102)."

Appendix Table 1: Perioperative management of animals treated in this report

<table>
<thead>
<tr>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Premedication IV or IM</strong></td>
</tr>
<tr>
<td>- Morphine&lt;sup&gt;a&lt;/sup&gt; 0.4 mg/kg, Hydromorphone&lt;sup&gt;b&lt;/sup&gt; 0.1-0.3 mg/kg, Fentanyl&lt;sup&gt;c&lt;/sup&gt; 4 mcg/kg</td>
</tr>
<tr>
<td>- Midazolam&lt;sup&gt;d&lt;/sup&gt; 0.2-0.4 mg/kg, Dexmedetomidine&lt;sup*e&lt;/sup&gt; 3 mcg/kg or Acepromazine&lt;sup&gt;f&lt;/sup&gt; 0.02-0.05 mg/kg ± Atropine&lt;sup&gt;g&lt;/sup&gt; 0.02-0.04 mg/kg or Glycopyrrolate&lt;sup&gt;h&lt;/sup&gt; 0.01 mg/kg</td>
</tr>
<tr>
<td><strong>Induction IV</strong></td>
</tr>
<tr>
<td>- Propofol&lt;sup&gt;i&lt;/sup&gt; to effect (2-6 mg/kg)</td>
</tr>
<tr>
<td>- Cefazolin&lt;sup&gt;j&lt;/sup&gt; 22 mg/kg, then q90min</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
</tr>
<tr>
<td>- Isoflurane&lt;sup&gt;k&lt;/sup&gt; or Sevoflurane&lt;sup&gt;l&lt;/sup&gt; ± intraoperative CRI of Morphine&lt;sup&gt;a&lt;/sup&gt; 0.18 mg/kg/hr, Hydromorphone&lt;sup&gt;b&lt;/sup&gt; 0.03 mg/kg/hr, Fentanyl&lt;sup&gt;c&lt;/sup&gt; 4-15 mcg/kg/hr</td>
</tr>
<tr>
<td>- Crystalloids&lt;sup&gt;m&lt;/sup&gt; 3-22 ml/kg/hr</td>
</tr>
<tr>
<td><strong>Femoral and sciatic nerve block</strong></td>
</tr>
<tr>
<td>- Bupivacaine&lt;sup&gt;n&lt;/sup&gt; 2-4 ml total</td>
</tr>
<tr>
<td><strong>Postoperative</strong></td>
</tr>
<tr>
<td>- Dogs only: Tramadol&lt;sup&gt;o&lt;/sup&gt; 2-5 mg/kg PO q6-12h ± Gabapentin&lt;sup&gt;p&lt;/sup&gt; 10 mg/kg PO q8h, and Meloxicam&lt;sup&gt;q&lt;/sup&gt; 0.1 mg/kg PO q24h or Carprofen&lt;sup&gt;r&lt;/sup&gt; 2.2 mg/kg PO q12h if not contraindicated</td>
</tr>
<tr>
<td>- Cats: Buprenorphine&lt;sup&gt;s&lt;/sup&gt; 0.005-0.01 mg/kg IM, IV, SQ, PO ± Gabapentin&lt;sup&gt;p&lt;/sup&gt; 10 mg/kg PO q8h</td>
</tr>
<tr>
<td>- Dogs: Cefpodoxime&lt;sup&gt;t&lt;/sup&gt; (7.5 mg/kg PO q24 hours x 14 days)</td>
</tr>
<tr>
<td>- Cats: Amoxicillin and Clavulanic acid&lt;sup&gt;u&lt;/sup&gt; 13.75 mg/kg PO q12h x 14 days*</td>
</tr>
</tbody>
</table>

*Although this MIO surgery may not require its administration, antibiotics were generally prescribed based on author’s preference.

<sup>a</sup> Morphine Sulfate Inj, USP 0.5%: Hospira Inc, Lake Forest, IL, USA;
<sup>b</sup> Hydromorphone: West-Ward Pharmaceuticals Corp, Eatontown, NJ, USA;
<sup>c</sup> Fentanyl: West-Ward Pharmaceuticals Corp, Eatontown, NJ, USA;
<sup>d</sup> Midazolam: Akorn, Inc, Lake Forest, IL, USA;
<sup*e</sup> Dexmedetomidine: Zoetis, Florham Park, NJ, USA;
<sup>f</sup> Acepromazine Maleate Inj, USP 1%: Fort Dodge Animal Health, Fort Dodge, IA, USA;
<sup>g</sup> Atropine Sulfate Inj, USP 0.5%: Hospira Inc, Lake Forest, IL, USA;
<sup>h</sup> Glycopyrrolate: West-Ward Pharmaceuticals Corp, Eatontown, NJ, USA;
<sup>i</sup> Propofol Inj, USP 1%: Baxter Healthcare Corp, Deerfield, IL, USA;
<sup>j</sup> Cefazolin: Sandoz, Inc, Princeton, NJ, USA;
<sup>k</sup> Isoflurane: Minrad, Inc, Bethlehem, PA, USA;
<sup>l</sup> Sevoflurane, USP, Volatile Liquid for Inhalation: Baxter Healthcare Corp, Deerfield, IL, USA;
<sup>m</sup> Normosol-R: Hospira Inc, Lake Forest, IL, USA;
<sup>n</sup> Bupivacaine HCl Inj, USP 0.75%: Hospira Inc, Lake Forest, IL, USA;
<sup>o</sup> Tramadol: Janssen Pharmaceuticals, Titusville, NJ, USA;
<sup>p</sup> Buprenorphine: Hospira Inc, Lake Forest, IL, USA;
<sup>q</sup> Gabapentin: Amneal Pharmaceuticals, Bridgewater, NJ, USA;
<sup>r</sup> Metacam: Boehringer Ingelheim, Ridgefield, CT, USA;
<sup>s</sup> Rimadyr: Pfizer Animal Health, New York, NY, USA;
<sup>t</sup> Cefpodoxime Proxetil: Pharmacia & Upjohn Company LLC, Peapack, NJ, USA;
<sup>u</sup> Clavamox: Zoetis, Florham Park, NJ, USA
## Appendix Table 2: Clinical data of all cases in this case series

<table>
<thead>
<tr>
<th>Case Nr.</th>
<th>Breed</th>
<th>Age (mo.)</th>
<th>Sex</th>
<th>Weight (kg)</th>
<th>Lame at presentation *</th>
<th>Diagnosis</th>
<th>Ante-/retroversion</th>
<th>Concurrent injuries</th>
<th>Time to surgery (days)</th>
<th>Percutaneous treatment description, additional manipulation</th>
<th>Intra-surgical imaging</th>
<th>Implant specifics</th>
<th>Surgery time - all cases (min)</th>
<th>Time until injury use (weeks)</th>
<th>Time to resection removal (weeks)</th>
<th>PA at last radiographs (°)</th>
<th>Time of last direct follow-up (weeks)</th>
<th>Time of last telephone follow-up (months)</th>
<th>Questionnaire completed?</th>
<th>Long-term outcome?</th>
<th>Complications</th>
<th>Functional grade at final follow-up *</th>
<th>Reasons for removal or failure</th>
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<tbody>
<tr>
<td>1</td>
<td>Husky</td>
<td>3</td>
<td>M</td>
<td>3.2</td>
<td>None</td>
<td>Left type-III TTAF</td>
<td>Acute onset after unknown trauma</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoroscopy</td>
<td>Two 4.5 mm negatively threaded 6-wires distal and one 2.3 mm negatively threaded K-wire proximal</td>
<td>57</td>
<td>3</td>
<td>N/A</td>
<td>17</td>
<td>13</td>
<td>58</td>
<td>108</td>
<td>No</td>
<td>No</td>
<td>None</td>
<td>Excellent</td>
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<tr>
<td>5</td>
<td>Husky-Mix</td>
<td>3</td>
<td>F/S</td>
<td>29.5</td>
<td>K</td>
<td>Left type-III TTAF</td>
<td>Acute onset after chasing a rabbit</td>
<td>None</td>
<td>2</td>
<td>Transapophyseal pin placement</td>
<td>Fluoroscopy</td>
<td>Two 4.0 mm negatively threaded 6-wires and 1.1 mm K-wire proximal</td>
<td>42</td>
<td>2</td>
<td>N/A</td>
<td>22</td>
<td>22</td>
<td>52</td>
<td>22</td>
<td>No</td>
<td>Yes</td>
<td>None</td>
<td>Excellent</td>
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<tr>
<td>7</td>
<td>Bulldog</td>
<td>6</td>
<td>M</td>
<td>49.9</td>
<td>Right type-III TTAF</td>
<td>Unknown</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoroscopy</td>
<td>One 1.9 mm and one 1.5 mm negatively threaded K-wires proximal</td>
<td>11</td>
<td>2</td>
<td>N/A</td>
<td>32</td>
<td>32</td>
<td>45</td>
<td>35</td>
<td>Yes</td>
<td>No</td>
<td>None</td>
<td>Good</td>
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<tr>
<td>9</td>
<td>Husky-Mix</td>
<td>6</td>
<td>F/S</td>
<td>19.9</td>
<td>Right type-III TTAF</td>
<td>Unknown acute trauma</td>
<td>None</td>
<td>3</td>
<td>Transapophyseal pin placement</td>
<td>Fluoroscopy</td>
<td>Two 2.0 mm negatively threaded 6-wires</td>
<td>8</td>
<td>2</td>
<td>N/A</td>
<td>16</td>
<td>16</td>
<td>20</td>
<td>16</td>
<td>No</td>
<td>Yes</td>
<td>None</td>
<td>Excellent</td>
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<td>11</td>
<td>British Terrier</td>
<td>3</td>
<td>F</td>
<td>6.3</td>
<td>Left type-II TTAF</td>
<td>Jumping off a tree stump</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoro-oparative digital radiography, still images</td>
<td>Two 1.1 mm K-wires</td>
<td>22</td>
<td>3</td>
<td>N/A</td>
<td>20</td>
<td>20</td>
<td>37</td>
<td>37</td>
<td>Yes</td>
<td>No</td>
<td>None</td>
<td>Excellent</td>
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<tr>
<td>12</td>
<td>Jack Russell Terrier</td>
<td>7</td>
<td>F</td>
<td>6.5</td>
<td>Right type-III TTAF</td>
<td>Playing with other dogs while boarding</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoro-oparative digital radiography, still images</td>
<td>Two 1.1 mm K-wires</td>
<td>40</td>
<td>2</td>
<td>N/A</td>
<td>20</td>
<td>20</td>
<td>50</td>
<td>50</td>
<td>Yes</td>
<td>No</td>
<td>None</td>
<td>Excellent</td>
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<tr>
<td>13</td>
<td>Shepherd-Lab / M</td>
<td>4</td>
<td>M</td>
<td>12.8</td>
<td>Right type-III TTAF</td>
<td>Jumped from owner's arms</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoro-oparative digital radiography, still images</td>
<td>Two 1.6 mm K-wires</td>
<td>20</td>
<td>1</td>
<td>N/A</td>
<td>13</td>
<td>13</td>
<td>48</td>
<td>16.5</td>
<td>Yes</td>
<td>No</td>
<td>None</td>
<td>Excellent</td>
<td></td>
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<tr>
<td>14</td>
<td>French Bulldog</td>
<td>5</td>
<td>F</td>
<td>7.5</td>
<td>Right type-III TTAF</td>
<td>Jumped off a wall</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoro-oparative digital radiography, still images</td>
<td>One 1.6 mm K-wire</td>
<td>25</td>
<td>2</td>
<td>N/A</td>
<td>33</td>
<td>33</td>
<td>57</td>
<td>37</td>
<td>No</td>
<td>No</td>
<td>None</td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Maltese</td>
<td>5</td>
<td>M</td>
<td>2.77</td>
<td>Left type-III TTAF</td>
<td>Hit off bed while playing with housemate</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoro-oparative digital radiography, still images</td>
<td>One 1.1 mm K-wire and one 0.88 mm K-wire proximal</td>
<td>20</td>
<td>1</td>
<td>N/A</td>
<td>16</td>
<td>16</td>
<td>4</td>
<td>4</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Pitt Bull Terrier</td>
<td>6</td>
<td>NV</td>
<td>13.3</td>
<td>Left type-III TTAF</td>
<td>Unknown</td>
<td>None</td>
<td>1</td>
<td>Transapophyseal pin placement</td>
<td>Fluoro-oparative digital radiography, still images</td>
<td>Two 1.6 mm K-wires, two 1.1 mm K-wires</td>
<td>20</td>
<td>3</td>
<td>N/A</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
<td>2.5 years bilateral MPS repair, no implants were removed. Medial trochlear ridge wear</td>
<td>Good</td>
</tr>
</tbody>
</table>
### Distal Tibial Physeal Fractures

| Case Nr. | Breed | Age (mo.) | Sex | Weight (kg) | Lameness grade at presentation | Diagnosis | Concomitant Injuries | Time elapse (days) | Lameness at presentation | Lameness at presentation | Lameness grade at presentation |Implant specifics | Time until pre-injury lameness | Time to fixation removal | Time of last radiographs | Time of last follow-up | Telephone follow-up | Questionnaire completed? | Long-term video? | Complications |
|----------|-------|-----------|-----|-------------|---------------------------------|-----------|----------------------|---------------------|------------------------|------------------------|-------------------------------|-----------------|--------------------------|-----------------------------|------------------------|-------------------------|----------------------|------------------|-----------------|
| 4        | Bengal Cat | 10 | MN  | 5.5        | 4                               | Right SH-I fracture of the distal tibial physeal fracture | Cat fell and hit a bed frame | None | 2                     | None                  | 2                             | Trasphyseal cross pins     | 2.0 mm smooth K-wires | 3              | 3               | 2               | Yes             | No             | None             | 0                | Excellent |
| 5        | Doberman | 10 | F   | 11.8       | 4                               | Left SH-I fracture of the distal tibial physeal fracture | Acute onset after unknown trauma | None | 1                     | None                  | 1                             | Trasphyseal cross pins     | 2.0 mm smooth K-wires | 5              | 5               | 3               | Yes             | No             | None             | 0                | Excellent |
| 6        | Shepherd- Mix | 9 | MN  | 23.4       | 4                               | Left SH-I fracture of the distal tibial physeal fracture | Run in backyard, suddenly lame | None | 2                    | None                  | 2                             | Trasphyseal cross pins, soft padded bandage | 2.0 mm smooth K-wires | 7              | 7               | 4               | Yes             | No             | None             | 0                | Excellent |
| 10       | DSH    | 11 | F   | 6.6        | 2                               | Left SH-I fracture of the distal tibial physeal fracture | Played with dog in household | None | 1                     | None                  | 1                             | Trasphyseal cross pins     | 2.0 mm smooth K-wires | 8              | 8               | 3               | Yes             | No             | None             | 0                | Excellent |
| 12       | DSH    | 7  | MN  | 4.47       | 2                               | Right SH-I of the distal tibia and fibula fracture | Unknown | Right lateral meniscal tear | 1                     | None                  | 1                             | Trasphyseal cross pins, lateral splint | Digital radiography, still images | 1.6 mm smooth K-wires | 7              | 7               | 3               | Yes             | Yes            | Meniscal tear removed, mild tarsus valgus without clinical lameness | Excellent |

**TTAF and/or only proximal tibial physeal fracture cases**

| Case Nr. | Breed | Age (mo.) | Sex | Height (cm) | Lameness grade at presentation | Diagnosis | Concomitant Injuries | Time elapse (days) | Lameness at presentation | Lameness grade at presentation | Implant specifics | Time until pre-injury lameness | Time to fixation removal | Time of last radiographs | Time of last follow-up | Telephone follow-up | Questionnaire completed? | Long-term video? | Complications |
|----------|-------|-----------|-----|-------------|---------------------------------|-----------|----------------------|---------------------|------------------------|-------------------------------|-----------------|--------------------------|-----------------------------|------------------------|-------------------------|----------------------|------------------|-----------------|
| 2        | Irish Water Spaniel | 9 | F    | 21.2       | 2                               | Left type-II TTAF and left SH-I fracture of the proximal tibial physeal fracture | Dog crashed into wall after sliding on ice when running on the deck | None | 1                     | None                  | 1                             | Trasphyseal cross pins, transcortical screws | Two 2.0 mm smooth K-wires for the distal tibia physeal, one 2.0 mm negatively threaded K-wire for the type II TTAF | 24   | 3               | 3               | 17              | 7               | Yes             | No             | None             | 0                | Excellent |
| 3        | Labrador- Mix | 4 | F    | 8.8        | 6                               | Left SH-II fracture of the proximal tibial physeal fracture | Owner ran dog over while sledding | None | 1                     | None                  | 1                             | Trasphyseal cross pins     | 2.0 mm smooth K-wires | 5              | 5               | 2               | Yes             | No             | None             | 0                | Excellent |

**TTAF = tibial tuberosity avulsion fracture;**

- DSH = Domestic Shorthair cat; F = female entire; FS = female spayed; kg = kilograms; M = male entire; min = minutes; mm = millimeters; MN = male neutered; Mo. = months; N/A = not-available; Nr. = number; TTAF = tibial tuberosity avulsion fracture; ° = degrees; **see Table 1;** **see Table 2