Supplementary Appendix A

Table A1 Lameness scoring system[7]

Grade	Definition
0	Normal limb function; no lameness at all
1	Normal weight bearing at rest but favouring of limb when walking
2	Toe-touching weight bearing at rest and when walking
3	Toe-touching weight bearing at rest and non-weight bearing when walking
4	Non-weight bearing at rest and when walking

Table A2 Perioperative management of animals treated

Type and route	Medication
Premedication IV or IM	Morphine[a] 0.4mg/kg, hydromorphone[b] 0.1–0.3mg/kg, fentanyl[c] 4 µg/kg
	Midazolam[d] 0.2–0.4mg/kg, dexmedetomidine[e] 3 µg/kg or acepromazine[f] 0.02–0.05mg/kg ± atropine[g] 0.02–0.04mg/kg or glycopyrrolate[h] 0.01mg/kg
Induction IV	Propofol[i] to effect (2–6mg/kg)
	Cefazolin[j] 22mg/kg, then q90min
Maintenance	Isoflurane[k] or sevoflurane[l] ± intraoperative CRI of morphine[a] 0.18mg/kg/hr, hydromorphone [b] 0.03mg/kg/hr, fentanyl[c] 4–15 µg/kg/hr
	Crystalloids[m] 3–22 mL/kg/hr
Femoral and sciatic nerve block	Bupivacaine[n] 2–4 mL total
Postoperative PO	Tramadol[o] 2–5mg/kg POq6–12h ± gabapentin[p] 10mg/kg POq8h and meloxicam[q] 0.1mg/kg POq24h or carprofen[r] 2.2mg/kg POq12h if not contraindicated

Abbreviations: IM, intramuscular; IV, intravenous; PO, by mouth.
Footnotes for medications listed in ►**Table A2**:
[a]Morphine Sulfate Inj, USP 0.5%: Hospira Inc, Lake Forest, Illinois, United States.
[b]Hydromorphone: West-Ward Pharmaceuticals Corp, Eatontown, New Jersey, United States.
[c]Fentanyl: West-Ward Pharmaceuticals Corp, Eatontown, New Jersey, United States.
[d]Midazolam: Akorn, Inc, Lake Forest, Illinois, 60045, United States.
[e]Dexmedetomidine: Zoetis, Florham Park, New Jersey, United States.
[f]Acepromazine Maleate Inj, USP 1%: Fort Dodge Animal Health, Fort Dodge, Iowa, United States.
[g]Atropine Sulfate Inj, USP 0.5%: Hospira Inc, Lake Forest, Illinois, United States.
[h]Glycopyrrolate: West-Ward Pharmaceuticals Corp, Eatontown, New Jersey, United States.
[i]Propofol Inj, USP 1%: Baxter Healthcare Corp, Deerfield, Illinois, United States.
[j]Cefazolin: Sandoz, Inc, Princeton, New Jersey, United States.
[k]Isoflurane: Minrad, Inc, Bethlehem, Pennsylvania, United States.
[l]Sevoflurane, USP, Volatile Liquid for Inhalation: Baxter Healthcare Corp, Deerfield, Illinois, United States.
[m]Normosol-R: Hospira Inc, Lake Forest, Illinois, United States.
[n]Bupivacaine HCl Inj, USP 0.75%: Hospira Inc, Lake Forest, Illinois, United States.
[o]Tramadol: Janssen Pharmaceuticals, Titusville, New Jersey, United States.
[p]Gabapentin: Amneal Pharmaceuticals, Bridgewater, New Jersey, United States.
[q]Metacam: Boehringer Ingelheim, Ridgefield, Connecticut, United States.
[r]Rimadyl: Pfizer Animal Health, New York, New Jersey, United States.

Table A3 Definitions of complications[7]

Major complications
Complications needing medical treatment (administration of antibiotic medications, NSAIDs, analgesics) for more than 4 weeks, revision surgery to treat a failed repair or poor clinical outcome
Minor complications
Seroma, patellar desmitis, pin movement, pin removal due to signs of clinically relevant soft tissue irritation
No complications
Planned pin removal (when significant growth potential of a patient was anticipated) was not considered a complication

Abbreviation: NSAIDs, non-steroidal anti-inflammatory drugs.

Table A4 Summarized signalment and presurgical data

Signalment/findings upon presentation	Numeric data
Sex distribution	16 entire or castrated males and 9 entire or spayed females
Breed size distribution	15 small and 10 large breed dogs
Overrepresented breeds	8 bulldogs and 7 terriers
Mean $\pm$ SD age[a]	6.2 ± 1.8 months
Mean $\pm$ SD weight[a]	9.6 ± 4.5 kg
Mean $\pm$ SD lameness grade[a]	3.6 ± 0.8
Mean $\pm$ SD time elapse from injury to surgery	3.1 ± 2.8 days
Examination findings	All dogs had some degree of swelling at and were painful with direct pressure to the TT. No ligamentous instability or other stifle- abnormalities were detected.

Abbreviations SD, standard deviation; TT, tibial tuberosity.
[a]At presentation.

Table A5 *p*-Values from the statistical comparison between pin angles to minor complications and questionnaire summary scores

	Seroma	Patellar desmitis	Pin movement	Pin bending	Pin removal	QSS	QSS R^2
KWIA	0.37	0.30	0.63	0.13	0.36	0.03	0.19
VPCA	0.74	0.97	0.21	0.75	0.77	0.59	0.02
PrPTPA	0.98	0.72	0.20	0.37	0.10	0.68	0.01
DiPTPA	0.14	0.41	0.56	0.16	0.08	0.97	0.00
HPCA	0.62	0.05	0.93	0.26	0.40	0.08	0.16
Angle lateral	0.16	0.99	0.9	0.55	0.6	0.37	–
Angle AP	0.34	0.25	0.18	0.43	0.16	0.52	–

Abbreviations: AP, anterior–posterior; DiPTPA, distal pin tibial plateau angle; HPCA, horizontal pin cross angle; KWIA, Kirschner-wire insertion angle; PrPTPA, proximal pin tibial plateau angle; QSS, final questionnaire summary score; R^2, coefficient of determination; VPCAA, vertical pin cross angle.
Note: As R^2 was practically '0' for final questionnaire summary score, there was virtually no association between this score and the evaluated variables. This indicated no association.

Table A6 *p*-Values from the statistical comparison between age, type of tibial tuberosity avulsion fracture, and breed on minor complications, tibial plateau angle on last radiographs and questionnaire scores

	Seroma	Patellar desmitis	Pin movement	Pin bending	TPA on last radiographs	QSS
Age	0.69	0.07	0.16	0.48	0.23	0.05
TTAF–type	1.00	1.00	1.00	1.00	0.5	0.5
Weight of breed[a]	0.06	0.41	1.00	1.00	0.31	0.18

Abbreviations: QSS, questionnaire summary score; TPA, tibial plateau angle; TTAF, tibial tuberosity avulsion fractures.
[a]Based on anticipated adult weight $\leq$ or $\geq$25 kg.

Supplementary Appendix B

Tibial apophyseal percutaneous pinning (TAPP)

Long-term follow-up questionnaire

Name and last name of pet:

Date of contact(s):

Questionnaire:

How long did it take your dog to use the limb at the same level as before surgery?

_____ weeks

———————

Please answer the following for how your pet is doing *NOW*.

Please answer the following questions by responding with a score of 0 (poor) to 10 (very well).

Example:

How well can your pet eat breakfast?

0 = Poorly

10 = Very well

If 0 or 10 cannot be chosen, use a number between 0 and 10 that seems to be most appropriate.

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

___ Final number

2. What has your pet's attitude been like over the past month?

0 = Depressed, hard to engage

10 = Happy, agreeable

___ Final number

3. Frequency of postures of a happy pet (i.e. for a dog: tail wagging, soliciting attention)?

0 = Never

10 = Many times a day

___ Final number

4. Willingness to play voluntarily?

0 = Never

10 = Always

___ Final number

5. How often does your pet get exercise?

0 = Never

10 = Multiple times a day

___ Final number

6. What is your pet's exercise tolerance

0 = Struggles on short walks

10 = Copes well with long walks

___ Final number

7. How often does your pet indicate lameness when walking?

0 = Always

10 = Never

___ Final number

8. Is there stiffness when arising for the day?

0 = Very stiff

10 = Not stiff

___ Final number

9. Is there stiffness at the end of the day?

0 = Very Stiff

10 = Not stiff

___ Final number

10. How often does your pet experience pain when turning suddenly while walking?
0 = Every time
10 = Never
___ Final number
11. How well can your pet walk without pain?
0 = Painful
10 = Not painful
___ Final number
12. How well can your pet run without pain?
0 = Painful
10 = Not painful
___ Final number
13. How lame do you perceive your pet to be?
0 = Couldn't be more lame
10 = Not lame
___ Final number
14. How well can your pet climb up stairs?
0 = Poorly
10 = Very well
___ Final number
15. How well can your pet climb down stairs?
0 = Poorly
10 = Very well
___ Final number
16. How well can your pet jump up?
0 = Poorly
10 = Very well
___ Final number
17. How well can your pet jump down?
0 = Poorly
10 = Very well
___ Final number
18. How would you grade the success of the operation on the limb?
0 = Poor
10 = Excellent
___ Final number
19. Would you have this operation done again in the same circumstances?
0 = Never
10 = Definitely
___ Final number
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 Appendix C

Detailed description of the statistical methods used in this study:

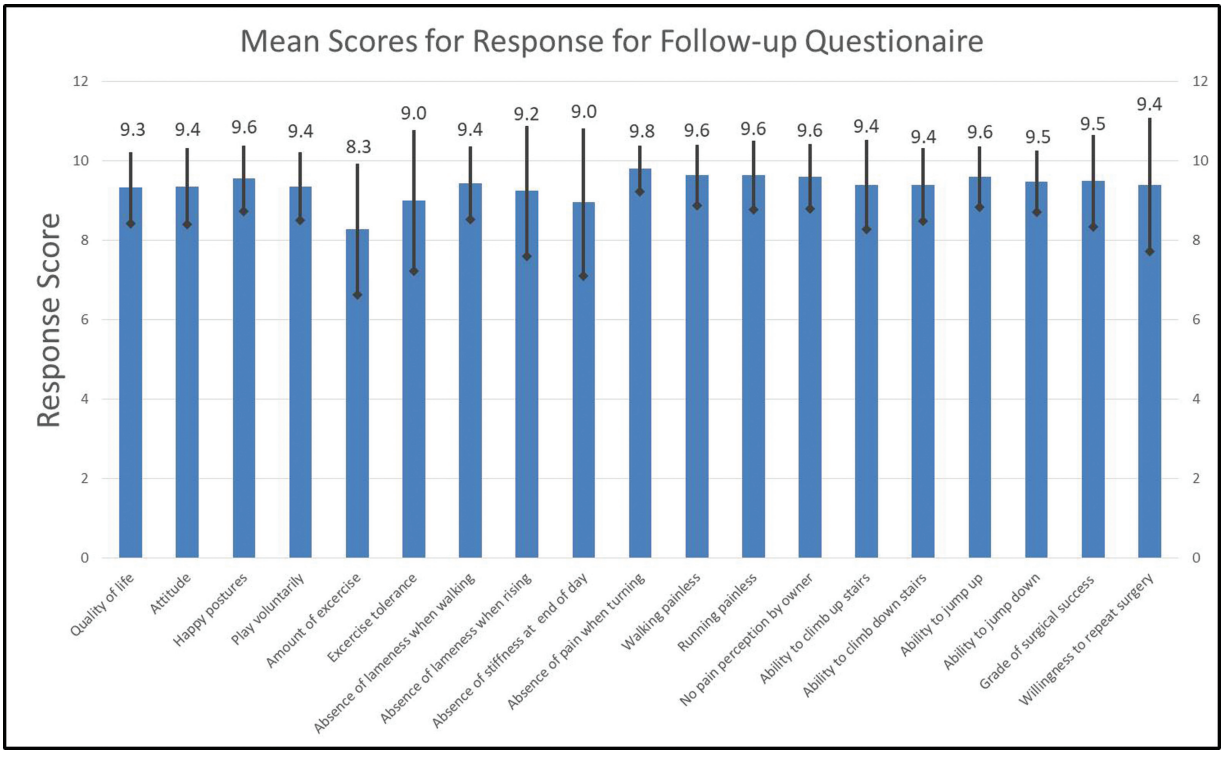
Data were assessed for normality by using the Shapiro–Wilk test. For further analysis, if data were normal, then unpaired *t*-test was used. If data were not normally distributed, then Wilcoxon rank sum test, Kruskal–Wallis one-way analysis of variance, or Pearson's chi-squared test or Fisher's exact test for categorical or binary data were used as determined most appropriate. Linear regression analysis was used if data were continuous.

Analysis was used to determine significant differences between implant design (smooth pins [SP] versus negatively threaded pins [NTP]), implant specifics (combined pin diameter, combined pin diameter/proximal tibial physeal length),

implantation specifics (pin insertion angles and direction of pin tips], age at time of injury [SP vs. NTP], age [< or ≥6months], tibial tuberosity avulsion fractures (TTAF) type (II or III) and breed [small or large; based on anticipated adult weight ≤ or ≥25 kg]) on performance variables (surgery time, seroma formation [yes/no], pin removal [yes/no], owner questionnaire final score, and on radiographs: patellar desmitis [yes/no], pin migration [yes/no], pin bending [yes/no], tibial plateau angle (TPA) difference between first and last radiographs, apophyseal fusion status on last available radiographs).

Orthogonal radiographic views (named 'angle lateral' and 'angle AP', herein) were assessed to evaluate any significant differences for having pins placed in crossed fashion (Cr), pin tips angled toward (At) or away (Aa) from each other or in a parallel (P) trajectory.

In regard to statistical evaluation of specific pin insertion angles, only cases that had two pins placed were included. Only cases with two pins were included for this specific analysis. All other analyses included all cases with any number of pins. For all tests, $p \leq 0.05$ was considered significant.



Supplementary Appendix Fig. 1 Line chart showing mean and standard deviation bars, based on long-term follow-up questionnaire results (0 = worst,10 = best).