Major complication rate after 214 tibial tuberosity advancements as a therapy for cranial cruciate ligament rupture

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Introduction

Tibial tuberosity advancement (TTA) (Montavon and Damur, 2002) is used to treat cranial cruciate ligament disease in dogs. Its purpose is to alter the biomechanics of the stifle joint by corrective osteotomy, so that the shear forces are neutralized and reconstruction of the cranial ligament is no longer necessary. Compared to intra or extracapsular prosthesis techniques, the TTA is a rather invasive intervention, This raises the question of complications.

Material and methods

We have investigated the so called major complication rate according to the definition of Lafaver (2007) in 214 consecutive TTAs between 2004 and 2008. The major complication rate relates to the number of revision surgeries. This allows a clear separation from minor complications (e.g. bandage problems) and those not related to the surgery itself (e.g. diarrhea).

The 214 TTAs were performed in 185 dogs, 29 dogs had bilateral interventions on different occasions. The average age at the time of surgery was 6 years, the average body weight was 35 kg. The TTAs were performed as described by a tape from the university of Zurich (Guerrero, 2003). The size of the implants (Kyon Veterinary Products, Zurich, Switzerland) were estimated from the preoperative radiographs according to the method by Lafaver (2007) and crossed checked with an alternative method derived from another study (Inauen et al., 2009). The joints were assessed visually, and the menisci either released or the medial and caudal horns removed. After the surgery, radiographs were made in both dimensions, and the extremity immobilized in a bandage for 3 to 10 days. During the first 5 to 10 days, non-steroidal anti-inflammatory drugs were administered by the owner. The pet owners received a plan for controlled locomotion and were encouraged to visit a physiotherapist. The stitches were removed after 10 days and control radiographs were taken after 4 to 6 weeks. The major revision rate was retrieved from a telephone questionnaire with the pet owner. The observation period was 6 to 53 months (average 25.5 months). The main interest was assessing the need for revision surgery and the indication for it.

Results

A total of 15 revision surgeries (7%) were performed in 14 dogs (table 1). All except one were conducted in our clinic. The most common reason for a revision surgery was damage to the meniscus, which was considered unaffected in the first surgery (8 cases). In 4 of these cases, a meniscal release (Slocum and Devine, 1998) was initially made. In all 8 revision surgeries, the caudal horn of the medial meniscus was removed. One dog developed a bacterial gonitis after the revision surgery. During a second revision surgery, a drainage was installed and the stifle joint was flushed for 48 hours with saline solution. The infection then resolved.

The second most frequent complication was infection (5 cases). Two dogs developed fistulas over the plate screws. They were removed. One dog was bitten directly over the implants and developed an abcess. It was split and healed uneventfully. In another dog, a dehiscence led to a wound debridement and irrigation. The fifth dog underwent two

revision surgeries due to meniscal problems and gonitis (see above).

Medial patellar luxation was observed in 2 dogs. They were corrected 6 and 12 weeks after the first surgery by removal of all TTA implants except the cage and lateral transposition and tension band fixation of the tibial tuberosity.

The observation time after revision surgery was 3 to 48 months. Thirteen out of 14 dogs were without lameness. One pet owner was not satisfied, because the dog was still lame after partial meniscectomy.

Table 1: Signalment, initial surgery and revision surgery of 14 dogs with 15 major complications after 214 TTA

Signalment				Initial surgery					Revision surgery			
Case No	**Breed**	**Age (years)**	**Body weight (kg)**	**Cranial cruciate ligament injury**	**Meniscal injury**	**Meniscal therapy**	**Cage width (mm)**	**Plate size (forks/ holes)**	**Time to revision surgery (months)**	**Major complication**	**Therapy**	**Follow up after revision surgery (months)**
1	Rottweiler	5.25	40	Complete rupture	Folded meniscus	Partial meniscectomy	12	5	19	Infection	Implant removal, antibiotics	35
4	St. Bernard	3.75	65	Complete rupture	No	No	12	7	4	Folded meniscus	Partial meniscectomy	48
9	American Staffordshire Terrier	5.25	34	Complete rupture	No	Release	9	5	1	Folded meniscus	Partial meniscectomy	46
21	Mongrel	6	31	Partial rupture	No	No	9	5	0.5	Infection	Wound lavage and debridement	43
32	Mongrel	7.75	30	Complete rupture	Folded meniscus	Partial meniscectomy	9	5	1.5	Patellar luxation	Transposition of tibial tuberosity	38
38	Labrador Retriever	12	30	Complete rupture	Folded meniscus	Partial meniscectomy	9	5	24	Infection	Drainage of abcess, antibiotics	16
51	German Shepherd	4.25	35	Partial rupture	No	No	9	6	3	Patellar luxation	Transposition of tibial tuberosity	32
56	Mongrel	3.25	30	Partial rupture	No	No	12	6	20	Folded meniscus	Partial meniscectomy	12
131	Bordeaux Mastiff	4.75	58	Complete rupture	No	Release	9	6	7	Folded meniscus	Partial meniscectomy	12
132	Boxer	5	36	Partial rupture	No	No	9	6	11	Folded meniscus	Partial meniscectomy	8
147	German Shepherd	3	41	Partial rupture	No	No	9	6	14	Infection	Implant removal, antibiotics	3
152	Mongrel	9.25	13	Partial rupture	No	No	6	4	6	Folded meniscus	Partial meniscectomy	11
157	Serra de Estrella	5.25	39	Complete rupture	No	Release	9	6	3	Folded meniscus	Partial meniscectomy	13
159	Leonberger	4.5	58	Complete rupture	No	Release	12	8	2 / 5	Folded meniscus / infection	Partial meniscectomy / Irrigation, Drainage	10 / 3

Discussion

A major revision rate of 7% is lower than in all previous reports, where rates of 12 to 20% are described (Hoffmann et al., 2006; Lafaver et al., 2007; Stein and Schmoekel, 2008; Voss et al., 2008). This is explained by a higher number of surgeries, and thus, increased experience of the surgeons. Further evidence of improved results with experience is given by the fact, that the almost half of the revision surgeries (7) were required in the first 51 cases, whereas the other 8 are distributed over the following 163 surgeries.

Meniscus associated problems are also found at first in other studies about revisions after TTA (Lafaver et al., 2007; Stein and Schmoekel, 2008; Voss et al., 2008). They claim an inefficient neutralization of shear forces by the insertion of inappropriately sized cages (Apelt et al., 2007; Stein and Schmoekel, 2008) or by overlooked meniscal damage at the first operation. Even meniscal release, described to be a measure against late meniscal problems (Slocum and Devine, 1998; Lafaver et al., 2007), did not prevent secondary meniscal tears in 4 cases. Pozzi et al. (2008) postulate, that a partial removal of the meniscus would increase the risk for osteoarthrtitis. This has to be weighed against the owner observation, that no

revision surgery was indicated, when a partial meniscectomy was initially done.

The two patellar luxations probably resulted after too oblique osteotomy cuts. All infections were not directly related to the TTA technique and are therefore not further discussed.

Conclusions

The TTA is considered to be a safe surgery, resulting in only 7% of revision interventions. This number is lower than previous reports (12 to 20%). Partial meniscectomies seem to prevent the need for a second intervention due to meniscal problems. However, only limited information is present over the long term outcome of stifle joints without medial caudal horn. A meniscal release is not a guarantee for the absence of subsequent meniscus associated complications.

References

Apelt D., Kowaleski M.P.,Boudrieau R.J.: Effect of tibial tuberosity advancement on cranial tibial subluxation in canine cranial cruciate-deficient stifle joints: an in vitro experimental study. Vet Surg 2007, 36: 170-7.

Guerrero T.: Advancement of the tibial tuberosity for the treatment of the cranial cruciate-deficient canine stifle – a video film. Thesis, Vetsuisse Faculty University of Zurich, 2003.

Hoffmann D.E., Miller J.M., Ober C.P., Lanz O.I., Martin R.A.,Shires P.K.: Tibial tuberosity advancement in 65 canine stifles. Vet Comp Orthop Traumatol 2006, 19: 219-27.

Inauen R., Koch D.A., Bass M.,Haessig M.: Tibial tuberosity conformation as a risk factor for cranial cruciate ligament rupture in the dog. Vet Comp Orthop Traumatol 2009, 22: 16-20.

Lafaver S., Miller N.A., Stubbs W.P., Taylor R.A.,Boudrieau R.J.: Tibial tuberosity advancement for stabilization of the canine cranial cruciate ligament-deficient stifle joint: surgical technique, early results, and complications in 101 dogs. Vet Surg 2007, 36: 573-86.

Montavon P.,Damur D.:Advancement of the tibial tuberosity for the treatment of cranial cruciate deficient canine stifle, Proceedings 1th World Orthopaedic Veterinary Congress, Munich, 2002.

Pozzi A., Litsky A.S., Field J., Apelt D., Meadows C.,Johnson K.A.: Pressure distributions on the medial tibial plateau after medial meniscal surgery and tibial plateau levelling osteotomy in dogs. Vet Comp Orthop Traumatol 2008, 21: 8-14.

Slocum B.,Devine T.: Meniscal Release. In: Current techniques in small animal surgery. Hrsg. M. Bojrab, Verlag Williams & Wilkins, Baltimore, Philadelphia, 1998, 1197-1199.

Stein S.,Schmoekel H.: Short-term and eight to 12 months results of a tibial tuberosity advancement as treatment of canine cranial cruciate ligament damage. J Small Anim Pract 2008, 49: 398-404.

Voss K., Damur D.M., Guerrero T., Haessig M.,Montavon P.M.: Force plate gait analysis to assess limb function after tibial tuberosity advancement in dogs with cranial cruciate ligament disease. Vet Comp Orthop Traumatol 2008, 21: 243-9.

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