TPLOS AND OSTEO SARCOMA

Laura Selmic BVetMed (Hons) MRCVS
Animal Cancer Center, Colorado State University, Fort Collins, Colorado

Keypoints:

- Osteosarcoma of the proximal tibia osteosarcoma accounts for 5-6% of all appendicular osteosarcoma cases.1
- Prevalence of osteosarcoma following TPLO surgery is unknown but is suspected to be <1% of all appendicular osteosarcoma cases 2.

Spontaneous osteosarcoma (OSA) is the most common primary bone tumor in dogs 1,3-6. It occurs in middle aged to older large and giant breed dogs.1 Appen dicular OSA commonly arises in the metaphyseal region of the bone. Proximal tibial spontaneous OSA only accounts for ~5% of all appendicular OSA cases 1. The tibial plateau leveling osteotomy (TPLO) procedure was developed by Slocum 7 in 1992 and has become one of the most common methods for surgical treatment of cranial cruciate disease in dogs.

There are several case reports and series describing implant or fracture-associated osteosarcoma 8-17. The anatomic location of these tumors was predominantly diaphyseal corresponding with common fracture location. The reported mean latent period between osteotomy or fracture fixation and development of sarcoma is 6 years (range: 1-15 years) 18. As the TPLO procedure creates an osteotomy in the metaphyseal region of the proximal tibia, when an OSA develops in this region we do not know if the tumor developed secondary to the TPLO implant, the osteotomy and resultant bone activity or is a spontaneous de novo tumor. Only two case reports have described the occurrence of sarcomas at a previous TPLO surgery site 19,20. The only information that describes the incidence of OSA at TPLO surgery sites is an abstract presented by Slocum that was based on a questionnaire to veterinarians 2. The reported incidence was 0.075%.

We have several ongoing projects investigating OSA at site of previous TPLO surgery. One retrospective study is evaluating all appendicular osteosarcoma cases seen by the CSU oncology service between 1997 and 2010. This study evaluated 1135 cases of appendicular OSA of which 69 cases (6%) were proximal tibial OSA. Twelve out of these 69 cases (17%) were at sites of previous TPLO surgeries. At our institution, TPLO site OSA represents 1% of the entire appendicular OSA population. Another retrospective study currently underway is evaluating the all OSA cases affecting the proximal tibia. This study is a collaboration with members of the Veterinary Society of Surgical Oncology (VSSO) which will increase case numbers to address this question in the form of a case control study to allow description and comparison of signalment, stage and oncologic outcome of spontaneous and TPLO site cases of proximal tibial OSA. In addition, we wished to evaluate any increased risk to developing OSA following TPLO. In the 12 cases that had a prior TPLO the surgery was performed a mean of 5.4 years prior to diagnosis of osteosarcoma (range: 2.3-8.9 years). A 3.5mm Slocum plate was used in 8 cases and the TPLO plate type was unknown in 4 cases. Post-operative infection or inflammation was documented in 3 cases; however in only one case was infection confirmed by culture. The TPLO plate was removed in two cases; one immediately prior to diagnosis and one 4 years prior to diagnosis following treatment of an infection. The most common treatment performed was amputation (46 dogs prox. tibial, 8 dogs previous TPLO). One dog in proximal tibial group underwent a surgical limbspare performed with intraoperative radiation. Five dogs received palliative radiation treatment from the proximal tibial group (3 dogs previous TPLO).
One dog received curative intent radiation treatment (one dog with previous TPLO). One dog from the previous TPLO group had palliative medications only administered. Chemotherapy was administered to 37 dogs in proximal tibial group (7 dogs with previous TPLO).

During follow-up, metastases were documented in 31 dogs. Median survival of dogs regardless of treatment was 234 days in the proximal tibial group and 227 days in the previous TPLO group. At the time of writing 1 dog from proximal tibial group was still alive with survival time of 811 days. Four dogs from the previous TPLO group were alive at the time of writing and their survival ranged from 214-988 days. Two dogs with lymph node metastases from the previous TPLO group had a survival of 405 days and > 988 days.

There have been tens of thousands of TPLO surgeries performed in the USA between 1995 and 2005. Anecdotally, we have not observed a significant increase in the incidence of OSA in the proximal tibia relative to other anatomic sites, which suggests that the risk of developing OSA after TPLO surgery is low. The case control study design evaluating all cases of proximal tibial OSA is one way to evaluate these clinical questions. Veterinarian interested in participating in the study can contact Dr. Laura Selmic by email at laura.selmic@colostate.edu.

**Figure 1:** Lateral left tibial radiograph showing osteosarcoma at a TPLO site in a dog
References:
2. Slocum TD: Incidence of Neoplasia with TPLO surgery and Slocum implant, Proceedings, Veterinary Orthopedic Society, Snowmass, Colorado, 3/5-12/05, 2005 (available from