ESVOT CONGRESS 2006

PROCEEDINGS

MUNICH, Germany
7th-10th September

“The Cutting Edge in Veterinary Orthopaedics”

European Society of Veterinary Orthopaedics and Traumatology
TPLO/TCWO: dealing with excessive tibial plateau angle

M.P. Kowaleski
The Ohio State University, Columbus, Ohio, USA

The development of proximal tibial osteotomy for the treatment of the cranial cruciate ligament deficient stifle in the dog initiated a new paradigm in stifle joint stabilization. The tibial compression test was first described by Henderson in 1978, however it was not until 1983 that the importance of cranial tibial thrust in the biomechanics of the cranial cruciate ligament deficient stifle joint in the dog, and potentially to the pathogenesis of rupture of the cranial cruciate ligament was identified by Slocum. This led to the development of the cranial tibial wedge osteotomy [also referred to as tibial closing wedge osteotomy (TCWO) or cranial closing wedge osteotomy (CCWO)] by Slocum in 1984. In this publication, Slocum attributed the failure of intra-articular grafts or extra-articular prostheses (lateral suture) to the inability of these techniques to effectively neutralize cranial tibial thrust. A later refinement of this technique, the tibial plateau leveling osteotomy (TPLO) procedure, was described by Slocum in 1993. The aim of both procedures is to diminish the tibial plateau angle to a magnitude at which cranial tibial thrust is neutralized, however the position and shape of the osteotomy in each procedure results in dramatically different effects on the proximal tibia.

The TPLO procedure allows accurate tibial plateau leveling without alteration of the tibial tuberosity or tibial crest, and consequently, the relative position of the patella at various positions of stifle joint flexion and extension remains essentially unchanged. In contrast to the TPLO, reduction of the proximal and distal tibial segments following the TCWO procedure results in cranio-caudal angulation of the tibial crest, as well as cranio-distal displacement of the tibial tuberosity. As a result, the patella is positioned more distally in the trochlear groove at any given angle of stifle flexion, than preoperatively. This may be advantageous when treating patella alta. The TCWO may also result in greater extension of the stifle and flexion of the hock in the standing patient post-operatively, as compared to pre-operatively. This may be advantageous in the patient with a hind limb conformation demonstrating excessive stifle flexion and hock extension. The TPLO can be combined with the CCWO procedure (TPLO/CCWO) in order to take advantage of the unique characteristics of each. Indications for TPLO/CCWO include patella alta, excessive tibial plateau slope, concurrent cranial cruciate ligament rupture with medial patellar luxation with medial displacement of the tibial tuberosity, severe torsional or angular malformation, and selected proximal tibial deformities.

In cases of excessive tibial plateau slope, preoperative planning can be utilized to determine if TPLO alone or TPLO/CCWO is required to achieve the desired postoperative tibial plateau slope. Since the tibial plateau segment acts as a buttress for the tibial tuberosity following tibial plateau segment rotation, I elect to perform a TPLO/CCWO in cases in which tibial plateau segment rotation following a TPLO alone would result in a tibial plateau segment which is distal to the patellar tendon insertion on the tibial tuberosity. A useful rule of thumb is that if appropriate rotation of the tibial plateau segment results in positioning the proximo-cranial margin of the tibial plateau segment below the level of the tibial tubercle, consider a TPLO/CCWO. The postoperative location of the tibial plateau segment is dependent on the position of the osteotomy, the size of the radial saw blade utilized, and the angle of rotation. Since individual variation exists in the patellar tendon insertion point, the degree of rotation that is “safe” varies as well; therefore the tibial plateau angle at which a TPLO/CCWO should be considered varies with individual patient anatomy. Using the preoperative lateral view, the osteotomy can be planned, and the final position of the tibial plateau segment can be estimated based on the distance of rotation for the appropriate radial saw blade (measurement from the TPLO chart).

Slocum described the use of double radial osteotomies to develop the cranially based wedge if the TPA is greater than 34 degrees when utilizing the 24 mm TPLO saw blade. It is difficult to accurately calculate the appropriate wedge angle when using the TPLO saw blade, therefore, I recommend using a cranially based triangular wedge (Fig. 1). The TPLO is positioned such that the center of the osteotomy lies at the proximal tibial long axis point, the point dividing the intercondylar tubercles. The

Reprinted in the IVIS website with the permission of the ESVOT
angle of the cranial closing wedge will affect the degree of rotation required in the TPLO. The “safe” degree of rotation is such that the tibial plateau segment is at the same level as the tibial tuberosity. This distance is measured, and the preoperative TPA that corresponds to this distance is read from the TPLO chart, and subtracted from the patient’s TPA to determine the CCWO angle. Alternatively, a wedge of 10 degrees can be arbitrarily chosen, and the TPLO rotation would be the patient’s TPA-10 degrees.

In cases of patella alta, the distance the patella is to be moved down the trochlear groove is determined, and substituted as “Y” in the CCWO planning (Fig. 1). The CCWO is positioned such that the apex is placed at the caudal cortical margin of the TPLO. Intraoperatively, the TPLO is scored, and the proximal limb of the CCWO is positioned based on the preoperative planning. Distance “X” is measured (the length of the proximal limb of the CCWO) and limb “Y” is calculated (Fig. 1), determining the appropriate position of the distal limb of the CCWO, which is then scored. The TPLO is completed, the tibial plateau segment is rotated, and holding k-wires are placed. The CCWO is completed, and a holding k-wire is placed from cranio-distal to caudo-proximal, avoiding the articular surface (Fig. 2). The TPLO implant(s) are placed, and tension band wire(s) are placed cranially (Fig. 2). The osteotomized CCWO wedge can be morcelized and placed as autogenous cortico-cancellous bone graft at the osteotomy sites. Torsional correction as well as lateralization of the tibial tuberosity segment can be accomplished utilizing the dual osteotomies, facilitating limb alignment corrections in complex cases, such as MPL with cranial cruciate ligament rupture.

Postoperative exercise restriction and rehabilitation are similar to that performed for the TPLO procedure. Complications particular to this procedure include those of the TPLO alone, as well as intra-articular placement of the CCWO holding k-wire, implant failure of the tension band wire(s) or holding k-wire, delayed union or nonunion of the CCWO, and most commonly implant loosening of the holding k-wire or tension band wire(s).

REFERENCES