

## TPLO COMPLICATIONS, HOW TO TREAT AND AVOID

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The initial complication rate was over 25% when TPLO was first attempted by the mass of veterinary surgeons. Complications following TPLO are now uncommon if good surgical technique and locking bone plates are used. Proper planning of the TPLO surgery is critical to success. Complications associated with TPLO can be categorized as intraoperative or postoperative. Many complications are minor and easy to resolve. Some complications are severe, difficult to treat and can lead to life-long functional deficits. Most complications can be avoided by better preoperative planning, meticulous surgical technique and appropriate postoperative care.

### Intraoperative

Intraoperative complications include hemorrhage, intra-articular placement of screws or jig pins, screw breakage and stripping of the screw. Hemorrhage from the popliteal vessels can be profuse. The popliteal vessels course proximal to distal through the intercondyloid fossa of the femur, along the caudal surface of the stifle joint and then the popliteal notch of the tibia. The popliteal artery can be lacerated by excessive dissection or improper passage of pins, drill bits or taps. Bleeding can initially be controlled by applying direct pressure caudal to the proximal tibia. Ligation of the popliteal artery with suture or hemoclips may be needed if bleeding is profuse. Hemorrhage can also result when elevating muscles caudal to the tibia. In most instances, this type of bleeding can usually be controlled by direct pressure. The amount of bleeding at the osteotomy site varies. The intramedullary vasculature will be disturbed during the osteotomy and drilling of screw holes. Bleeding usually quickly stops when the osteotomy is stabilized and the screw holes are filled with screws.



**The screw extraction set can be used to remove broken or stripped screws**

Intra-articular placement of screws or jig pins may damage articular cartilage, menisci, subchondral bone or the cruciate ligaments. These complications can easily be avoided with careful attention to detail. Improperly placed screws can either be redirected or replaced with shorter screws that do not penetrate the stifle joint. Anatomic landmarks (fibular head, patellar ligament, proximal edge of medial tibia, perpendicular planes to the sagittal and transverse planes of the tibial diaphysis) should be checked to ensure proper direction of drilling of jig pins and plate screws. Screws will occasionally break during tightening, especially when using cancellous screw placed at an oblique angle. The shaft of the screw may start to bend as the head of the screw engages the plate hole. The screw most commonly breaks at the intersection of the head and shaft. If the screw breaks, a decision must be made whether to remove the plate so the broken shaft of the screw can be removed and replaced; or leave the screw in place and rely on two screws for stabilization in that portion of the tibial segment. Often times, the screw shaft is left buried in the bone and cannot be easily retrieved unless a screw extraction set (Synthes) is available. If the screw cannot be retrieved, the plate can be repositioned so that new screw holes can be drilled. Screws may also strip during insertion if

the bone is of poor quality or poor technique was used during screw application. Several options can be considered to try and solve this problem; the screw may be replaced with a larger diameter screw (replace a stripped 3.5 mm screw with a 4.0 cancellous screw), the screw may be placed at a different angle, a locking screw may be used if using a Synthes LCP, the plate may be repositioned, the tibial segment may be left with only two screws for stabilization, or adjunctive stabilization may be supplied ( pin, lag screw or second plate).

## Postoperative

Acute postoperative complications include tissue swelling/edema, hematoma/seroma, dehiscence, incisional infection, and irritation from bandaging. Most of these problems can be avoided by proper asepsis, good surgical technique and prevention of self trauma by the patient. Postoperative bandaging can help eliminate these complications, but wounds secondary to the bandages may become a problem. This usually can be avoided by early removal of bandages (5-7 days) and strict confinement of the pet during this time.

Chronic postoperative complications include postliminary meniscal tears, tibial crest fracture, proximal tibial fracture, fixation failure, patellar tendon swelling, and infection.

Meniscal tears are seen following TPLO in approximately 30% of patients not undergoing prophylactic meniscal release. The type of tears seen vary, but the most common tears are bucket-handle or radial tears. Tears have been found in both the medial and lateral meniscus following TPLO surgery. Many minor meniscal tears likely are never diagnosed due to the fact that function is often deemed to be acceptable by the pet owner or veterinarian. Second look arthroscopy has confirmed the presence of postliminary meniscal tears in this group of patients. It is recommended that the patient be evaluated for meniscal tears if residual lameness, pain or a less than anticipated functional outcome is achieved in TPLO patients. Meniscal evaluation is best performed arthroscopically, using a probe to palpate the entire meniscus.

Fracture of the tibial crest is usually the result of an inappropriate osteotomy placed too close to the tibial tuberosity. In addition, placement of the temporary stabilizing K-wire distal to the insertion of the patellar tendon creates a stress riser that weakens the tibial crest. Unless marked displacement occurs, most of these fractures are treated conservatively. Displaced tibial tuberosity fractures are usually successfully treated with a pin and tension band. Fracture of the proximal tibial metaphysis can also occur and appears to occur most commonly early in the healing process. TPLO fixation failure can be the result of acute catastrophic loading of the limb (in excess of osteosynthesis yield strength) or repetitive low energy loading contributing to fatigue failure of the implants or implant loosening. Often,



**Incisional infections usually require future implant removal for complete resolution.**



**Tibial tuberosity (TT) fracture can usually be prevented if the fixation pin is placed proximal to the patellar tendon insertion and if adequate TT width is left at the time of TPLO.**

subtle nuances of surgical technique can influence the yield strength of the osteosynthesis and tolerance to repetitive loading. Should minor fixation failure (isolated screw loosening or breakage) develop without attendant symptoms such as lameness, draining tract, etc, the surgeon must determine whether the bone healing present is sufficient to withstand the loading on the remaining fixation or if revision of the fixation is indicated. In instances of catastrophic fixation failure, revision of the

surgical stabilization with attempts to restore limb alignment and tibial plateau leveling is indicated. Methods that have been used to successfully revise catastrophic fixation failure include placement of a bilateral-uniplanar (type II) external skeletal fixator using the previous jig pin tracts for positioning of the ESF pins, placement of a second bone plate and replacement of the standard 3.5mm TPLO plate with a broad 3.5mm TPLO plate. Removal and/or replacement of the bone plate and/or deep culture of



**Severe fractures can rarely occur following TPLO resulting in the need for challenging revision procedures. This patient suffered proximal tibial and tibial tuberosity fractures leading to instability, loss of tibial plateau rotation and implant loosening.**

the surgical site may be indicated at the same time. The role of supplemental fixation (tension band, load-sharing pins, lag screws, double plates, etc) at the time of TPLO surgery to prevent fixation failure is currently unknown. Patellar tendon swelling, though usually an asymptomatic radiographic finding, can indicate patellar tendonitis and may be a source of chronic lameness. Infection of the incision should be avoided at all costs due to the possible extension of the infection to the bone, resulting in osteomyelitis. Fortunately, the osteotomy site of most patients undergoing TPLO will heal in the face of an infection, but in some cases infection can result in delayed or non-union. Typically the osteotomy site will have sufficient stability 2 months postoperatively, and removal of the implants at this time will usually result in continued stability and resolution of infection. The necessity for implant removal is much likely if an incisional infection occurs. Recurrent infections have less than a 10% chance of resolution with antibiotic therapy alone. Fortunately, resolution of infections is greater than 95% if the implant is removed, even in the case of highly resistant organisms such as MRSI and MRSA.

## REFERENCES

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