LOCKING PLATE TECHNOLOGY REDUCES THE SHORT TERM COMPLICATION RATE IN THE TRIPLE PELVIC OSTEOTOMY (TPO) PROCEDURE

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INTRODUCTION

The triple pelvic osteotomy (TPO) procedure is generally accepted as an effective method to reduce subluxation of the coxofemoral joint and slow the progression of degenerative changes associated with canine hip dysplasia when performed early in disease progression. While the procedure produces a favorable clinical outcome, the published complication rate is 35-70%.[1] The most common reported complication of the procedure when using conventional 6 hole TPO plates is loosening of screws cranial to the ilial osteotomy site.

There are several proposed theories as to the cause of implant loosening in the TPO procedure. Although inadequate sacral purchase has been implicated in implant screw loosening, a more recent study found cancellous screws in positions 1 through 3, not engaging the sacrum, were associated with the lowest frequency of loosening (6%).[1,2] Prevention or treatment of screw loosening has included the use of interfragmentary ischial wire, cerclage wire placed through the caudal segment of the plate, an 8 hole TPO plate, additional ventral ilial plates, and fluoroscopic-guided minimally-invasive screw tightening.

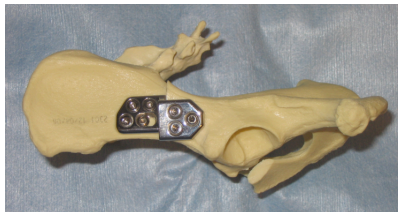

Figure 1: Pelvis model utilizing locking TPO plate; ischial osteotomy visible

Locking compression plates (LCP) have improved the efficacy of bone plates in situations where a bridge plate is required.[3] Once the screws are placed in the bone and locked into the fracture plate, the bone fragments become locked into a relative position. This reduces the necessity for precise plate contouring because the locking screws do not rely on friction between the plate and bone fragments. These techniques have already been applied to tibial plateau leveling osteotomy (TPLO) plates and distal femoral ostectomy plates (DFO) with success.[4,5]

Figure 2: Locking TPO plates; right (top) and left (bottom)

ACKNOWLEDGEMENTS: The locking triple pelvic osteotomy plates (LTPO) were manufactured and provided by New Generation Devices, Inc ®.

OBJECTIVE

This pilot study evaluates the short-term complication rate of the TPO procedure using a newly designed locking TPO plate (**Figure 1**). We performed 15 TPO procedures in patients with clinical, radiographic, and arthroscopic evidence of hip dysplasia and arthritis using locking TPO (LTPO) plates made by New Generation Devices, Inc ® (**Figure 2**).

MATERIALS AND METHODS

Patients were diagnosed with hip dysplasia based on clinical signs, orthopedic examination, and diagnostic imaging (computed tomography [CT], plain film radiography, or both). Coxofemoral joint arthritis was evaluated with arthroscopy before the TPO. Patients were followed for a minimum of 12 weeks with orthopedic exams, visual gait analysis, and plain film radiographs. Eleven dogs had TPOs (15) utilizing pre-angled 20° LTPO plates. Six patients had bilateral TPO performed bilaterally with 2 LTPO plates and 2 patients had bilateral TPO with one locking and one conventional plate. The plates were secured with conventional 3.5 mm compression screws and 3.5 mm locking screws at positions that varied according to surgeon preference. The patients were followed for 19-88 days after surgery. Radiographs were performed at 3, 6, and 12 weeks after surgery or if clinical evidence of complications (**Figure 3 and 4**). Complications were treated with additional surgery when required. Healing of the TPO was determined by clinical appearance, physical examination, and radiographic evidence.

Figure 3: Ventro-dorsal projection of bilateral TPO

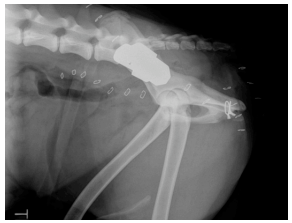

Figure 4: Right lateral projection of bilateral TPO

RESULTS

In 15 TPOs performed with locking plates, 1 hip (7%) developed post-operative complications. No patients in this study developed loosening of screws from the plate (0/105 screws). In the only case with complications, radiographs performed 13 days after surgery revealed pullout of the LTPO plate-screw construct from the caudal ilial fragment, but no loosening of the screws from the plate (**Fig 5 and 6**). This complication was corrected by removal of the three 3.5 mm locking screws and replacing them with 4.5 mm cortical screws and cerclage wire and surgical button around the plate and ilium at the #7 screw. The ilium was further stabilized by placement of a 5 hole 2.7 mm plate applied to the ventral aspect of the ilium (**Figure 7a and 7b**). Recovery was uneventful and subsequent radiographs showed no further complications.

DISCUSSION/CONCLUSION

LTPO plates reduced the incidence of post-operative complications to 7% and eliminated the screw loosening complication. The only complication with use of locking TPO plates was a separation of the plate-screw construct from the ilial fragment caudal to the osteotomy site, with no visible loosening of screws from the plate. The pullout was attributed to inadequate bicortical purchase of the caudal screws, increasing the strain on the osteotomy site and resulting in catastrophic failure. Complete bicortical screw purchase is recommended. Loosening of locking or conventional screws was not seen in any of the TPOs performed in this study. Locking plate technology is an effective technique to reduce complications of the TPO procedure.

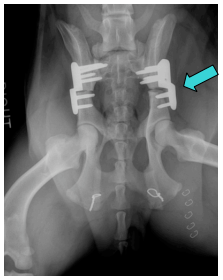

Figure 5: Pull-out of plate-screw construct from caudal ilial segment (arrow)

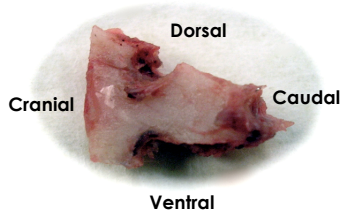

Figure 6: Bone fragment (lateral aspect of the caudal ilial segment) from a slab fracture due to a stress riser of the screw holes of the lateral cortex

Figure 7a: Revision surgery utilizing ventral plate, 4.5 mm caudal screws, cerclage wire and a surgical button

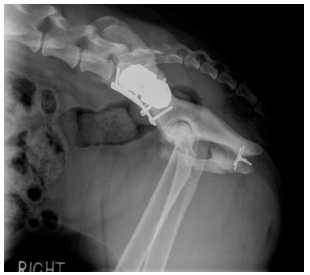

Figure 7b: Revision surgery (right lateral projection).

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