

# Complications Associated with the Maquet Procedure—Two Case Reports in Dog's

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## Abstract

Cranial cruciate ligament rupture is a very common disease in dogs and the leading cause of degenerative joint disease of the stifle. Many techniques are described for its treatment and none is without complications. The Maquet technique follows the same principles as tibial tuberosity advancement (TTA) but without the use of a bone plate on the tibial crest. The aim of this study was to report two cases where complications were observed with the Maquet technique. The first case was a male Dachshund, in which the tibial crest fractured during surgery, and was treated with use of a TTA bone plate. The second was a Fila Brasileiro in which fracture of the tibial crest was detected 21 days after surgery, and was treated with a clinical treatment. No surgical procedure is free of complications, but the veterinarian should be aware of what these are likely to be and be prepared to manage them appropriately.

**Keywords:** Complications; Stifle; Cranial Cruciate Ligament; Orthopedics; Osteotomy

## Introduction

The Maquet technique, or fast TTA, is a new technique for the treatment of CCrLR. This technique has been described for many years in human medicine to reduce the pressure of the femoral trochlea on the patella in cases of patellar chondromalacia [1-3].

The Maquet technique follows the concept of biological repair, achieving a balance between maximum preservation of soft tissue integrity and vascularization, and minimum use of implants for fracture repair [4]. This technique follows the same principles as the TTA technique, but with a cage rather than a bone plate to support the tibial crest. In this technique a hole is drilled in the distal tibial crest before the osteotomy is performed [4-6].

The results of this technique are similar to those of traditional TTA but it also offers a number of advantages, such as reduced surgical time, use of fewer implants, lower procedure cost and a lower incidence of osteomyelitis. The main disadvantages are that it is not possible to achieve large advancement of the tibial crest and fracture, especially in the distal portion, is a real possibility [6,7].

According to Brunel et al., the main complication of the technique is the risk of cracking or fracture of the tibial tuberosity. In this event the authors recommend conversion of the Maquet technique to the traditional TTA, as cerclage wires do not provide sufficient stability. Barthelemy et al. [8] reported the risk factors, complications, and owner satisfaction with the Maquet technique in 109 dogs. Complications were observed in 27% cases, 9% of which were major complications (requiring surgical revision) and 18% smaller (no need for further surgical intervention). Thinning of the tibial crest at surgery, predisposes it to fracture in the postoperative period. The owners reported excellent results in 82% of cases and good in 13.1%.

The objective of this study was to describe two cases where complications were associated with the use of the Maquet technique in dogs.

## Case Report

Two dogs with hindlimb lameness and no history of trauma were treated at the Veterinary Hospital of the Federal University of Paraná (HV-UFPR). On physical examination, a positive cranial drawer and tibial thrust test were observed, confirming the diagnosis of rupture of the cranial cruciate ligament. Animal 1 was a ten year old, female Dachshund, 11 kg body mass, with right CCrLR. Animal 2 was a two year old, male, German Dogue breed, body mass of 64 kg, with right CCrLR.

The animals were sedated and the affected stifles were angulated at 135 degrees in the mediolateral position to calculate the tibial plateau angle (TPA) for surgical planning. The TPA of animals 1 and 2 were 21 and 22 degrees, respectively. In both cases, the Maquet technique was used for surgical repair.

Medial parapatellar access was used and no significant damage was found in the menisci at medial arthrotomy. The joint capsule was sutured with polydioxanone 2.0 Sutan standard.

Subcutaneous tissues were dissected with Mayo scissors and the periosteum lifted with a periosteal elevator to expose the tibial crest. For the Maquet technique, a drill (4mm, animal 1 and 6mm in animal 2) was used to drill the distal region of the tibial crest of the tibia, allowing advancement of the crest and

a 6mm cage was placed in both animals. The advancement was performed with the use of a lever for triple tibial osteotomy. In animal 1 spongy bone was collected from the proximal region of the tibia, with the aid of a curette, and placed in the osteotomy site. Immediately postoperative a mediolateral radiograph was taken to confirm the position of the cage. In animal 1 a fissure was observed in the region of the tibial crest (Figure 1A). This animal was returned to theatre for placement of a TTA bone plate to support the crest (Figure 1B).

In animal 2 the procedure was performed as described above, but no complications were observed in the immediate postoperative period and the mediolateral radiograph showed the cage to be in the correct position (Figure 2A). In both cases, anti-inflammatory, analgesic and antimicrobial agents were prescribed postoperatively and the animals returned after 10 days for suture removal and with good support of the limb. Further radiographs were taken 21 days postoperative, and at this time a tibial crest fracture was present in animal 2 (Figure 2B). This animal had shown some lameness of the operated limb and pain on palpation, so surgical intervention was not chosen. Only de treatment clinic did in this case.

Both animals 1 and 2 had consolidation of the osteotomy at 63 and 42 days following surgery, respectively.



**Figure 1:** Mediolateral radiographic image immediately after surgery in animal 1. (A) The fracture of the tibial crest is visible. (B) after placement of the TTA plate to support the fissured crest.



**Figure 2:** Mediolateral radiographic image of animal 2. (A) immediately postoperatively following the Maquet technique and see the cage is correctly placed. (B) 21 days after the Maquet technique and a fracture of the tibial crest is present.

## Discussion

The incidence of cranial cruciate ligament rupture in dogs is reportedly higher in large breeds [9]. In this report the 2 animals were of very different sizes and weights. The Maquet technique, as performed in the two cases reported here, presents the same advantages as the traditional TTA technique, but also has a shorter surgical time, reduced implant costs and the incidence of osteomyelitis may be reduced [2].

Measurement of the tibial plateau angle is very important when selecting the osteotomy technique, and Maquet's technique is not indicated where the tibial plateau angle is very large angle, due to the high probability of fracture of the tibial crest [6]. In these two cases the animals had low TPA, thus making the use of this technique appropriate.

In these cases a steel alloy (316 L) cage was used to provide a site for placement of two screws. This same implant is used in TTA procedures. This implant differs from that used by Samoy et al. [10], in which a titanium cage that could place four or six screws, depending on the size of the implant, was used.

The ideal site for drilling (hole) into the tibial crest is still not well established [10], in the 2 cases presented here the drilling was performed just beyond the termination of the tibial crest.

In the cases in this report, the same cages and principles of TTA were used, but with the advantage of lower implant utilization, as reported by other authors [6-10]. In animal 2 the osteotomy defect was filled with spongy bone, collected from the tibia itself. Bone grafting is also performed in patients that have undergone TTA [11,12].

One of the main complications of the Maquet procedure is fracture of the tibial crest, which may occur in the immediate or prolonged postoperative period [7]. The two animals described here suffered fracture of the tibial crest at different times, in animal 1 fracture was identified immediately post-operatively and in animal 2 not until 21 days post-surgery.

In these cases, we did not elect to apply a tension band during the first procedure. The use of tension bands is controversial, and they are often not used if there is no fracture or fissure of the tibial crest [10]. But, according to Brunel and collaborators [7], a tension band should be used to reduce the rate of post-operative tibial crest fracture, due to the great tension of the quadriceps muscle.

Brunel and collaborators [7], advocate that if fracture of the tibial crest occurs when using the Maquet technique, it should be supported with the TTA plate. In animal 1 a TTA plate was placed after the observation of the cleft in the tibial crest on the post-operative radiograph.

A figure of eight cerclage wire can be used to reduce the incidence of tibial crest fracture [2]. In animal 2, cerclage placement was not chosen in the first surgical procedure. Only used clinic treatment in this case. In a study performed of the Maquet technique in 84 stifles, Ramirez et al [13]. observed fissure of the tibia crest in 26 stifles. This complication was observed in animal 1.

## Conclusion

No surgical procedure is free of complications, but the veterinarian should be aware of what these are likely to be and be prepared to manage them appropriately.

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