



IN-DEPTH TOPIC

**Complications
in
Traumatology**

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CRANIAL CRUCIATE LIGAMENT INJURIES IN DOGS AND CATS - INTRA ARTICULAR RECONSTRUCTION WITH UHMWPE MEDICAL GRADE FREE FIBERS SYNTHETIC IMPLANT - RESULTS

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Purpose of the work

Most of surgical treatments for the cranial cruciate ligament (CrCL) deficiency in dogs are compensatory, modifying the biomechanics of the stifle. The dynamic stabilizations (TPLO, TTA) are quite invasive (tibial osteotomies) and complications can potentially be dramatic. Based on thousands of cases treated in humans with intra-articular reconstruction with the LARS ligament since 1992(1) (2), the same technology has been adapted for animals. This technology allows the reconstruction of the ruptured ligament itself to treat the pathological laxity and restore the physiological biomechanics of the stifle with a quick recovery and no irreversible damages. Mechanical tests have demonstrated that the free fibers in the structure of the implant (Z-lig STIF - Vetlig Global) resists much better to torsion which is the main stress applied on ligaments during flexion/extension. The ligaments had to be adapted for animals: smaller bones, so smaller tunnels and smaller ligaments. Due to mathematics ($E=1/2 mv^2$), a 35 kg dog running at a speed of 60km/h requires a ligament 2 times more resistant than a 70 kg human being running at 30 km/h (4800J vs 2400J). This adaptation has been permitted by the use of UHMWPE fibers of medical grade.

Materials and used methods

A preliminary anatomical study has been carried out in addition to the data of the literature(3) (4) (5) about the femoral isometric placement for the intra articular reconstruction which is the center of an arc of circle of 140° formed by the posterior lateral condyle. A preliminary clinical study with the Z-lig has been conducted from 2012 to Sept.2022 on 101 dogs (107 ligaments) with a follow-up from 1 to 7 years available for post-op. evaluation . A medial arthrotomy is made by a para patellar antero medial approach of the stifle. The patella is laterally dislocated, and the resection of the infra patellar fat pad allows a complete intra-articular exploration. The hyper flexion of the stifle enables to properly see the bottom of the inter condylar notch and then to insert a 2mm guide K-wire into the lateral femoral condyle from the isometric point, towards the external lateral cortex. An adapted cannulated drill bit is used to create a femoral tunnel outside-in. The same K-wire is then inserted into the tibial insertion of the CrCL attachment to come out distally on the medial face of the tibial metaphysis and then the tibial tunnel is drilled. The ligament is passed through the tunnels. The intra articular part of the implant which is only made of longitudinal fibers, so called "free fibers" is adjusted in the joint. The Z-lig is fixed in the femoral tunnel by a specific interference screw. After reduction of the patella, the isometry during complete range of motion is verified. The implant must control the anterior drawer, but must not be tighten under any position. The implant is then fixed in the tibial tunnel. Two perpendicular transversal tunnels to the femoral and tibial axis are drilled, proximally and distally to the previous ones. The ligament is passed through the tunnels and fixed by two other interference screws. The post operative cares are immediate full weight bearing and free activity when healing process is obtained. An orthopedic control at 1, 3 and 6 months post-surgery and a questionnaire for survey is sent later if the animal cannot be seen at clinic.

Outcomes

The results are based on the cases with a follow up from 1 to 7 years, 101 dogs and 107 ligaments.

The anterior drawer was absent in 94 cases (87,8%), evaluated "+" (< 5 mm) in 8 cases (7,4%) and "++" (5mm > ++ < 10 mm) in 2 cases (1,8%),). The dogs do not show any signs of limping.

Globally the anterior drawer has been improved in 97 % of the cases.

There are 3 failures (2,8%). In 2 cases, the anterior drawer was >10 mm and the implant slipped during the 2 first months after surgery. 1 case is due to implant removal for severe staphylococcus infection.

3 dogs were examined on a force plate 15 and 60 days post operatively. At D+15, 2 dogs presented 95% weight bearing, 1 dog 85%. At D+60, 1 dog presented 100%, 2 dogs 95%.

The survey was completed by a questionnaire sent to the owners. 70/101 have responded, representing 74 reconstructions, average of 18 months post op. :

Weight bearing was back on the 1st day for all dogs over 20 kg. The dogs of 8-13 kg recovered weight bearing around day 4.

For 70/74 cases, the owners found excellent the simplicity of the post-op. period. The dog recovers immediately its autonomy and doesn't need any special attention once the wound healing is completed.

The owners estimated that their dog had fully recovered within 2 months. In total 70/74 reconstructions (94,5%) led to a total satisfaction. 2 owners were not entirely satisfied, 1 owner was not satisfied.

Complications

3/107 dogs had a superficial skin infection that were all cured with local treatment and antibiotics.

1 severe staphylococcus infection led to a removal of the implant, cleaning of the joint and tunnels, and antibiotherapy. Final good result was obtained in 3 weeks with no major disfunction. It is now mandatory to make a complete pre-op check-up (ears ,skin , etc ,) to search for an infection.

2 primary fixations have slipped in the 2 months after surgery (2012-2014), which led to a revision of the technique with the systematic double fixation in transversal tunnels.

No reaction of intolerance to the implant and no rupture of ligament was noted.

Conclusions

The CrCL intra articular reconstruction with the Z-lig implant gave good to excellent results in 97% of cases.

The method restores stability of the stifle and does not create any irreversible situation in case of complication. Only bony tunnels are drilled. The fast recovery and the easy post-operative period are the two major advantages for the owners. The opportunity of 2 post-operative biopsies showed that the porous area of the free fibers seems to favour the fibroblastic and collagenic ingrowth. Arthroscopic surgery with the help of a specific aiming device would be the best way for optimum results.

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Disclosure Statement

Dr Laboureau is one of the founders of STIF - Vetlig Global

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WE INNOVATE WITH YOU

**STAND
N°8**

THE Z-LIG AND ITS FREE FIBERS



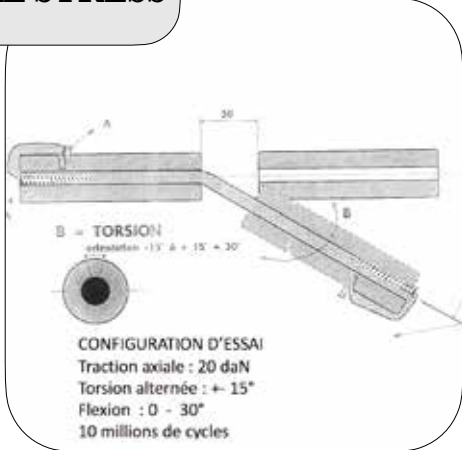
Vetlig Global, dedicated to veterinary orthopedic surgery, is the result of exceptional experience of 30 years in human surgery by the founder of the company (STIF). 7 years of scientific research, mechanical testing and clinical trials have been conducted before the first introduction of the Z-lig to the veterinary market in 2018.

Free fibers are a major advantage of our synthetic ligament, which has been used more than 3,500 times, with more than 95% of good results, lasting over time. The associated surgical technique is mini invasive, and can be performed under arthroscopy to be even less so.

RESISTANCE TO MECHANICAL STRESS

A ligament works in flexion, in tension, but above all in torsion. Several architectures have been studied and tested: free fibres are the most suitable for in-vivo movements during walking and running.

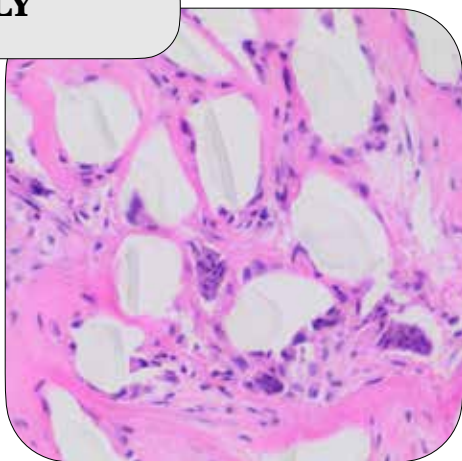
Indeed, after 6 million cycles, all woven, braided or knitted ligaments are broken, whereas the free-fibers ligament still has 90% of its initial strength after 12 million cycles, with no substantial deformation due to its elasticity properties, making it the best choice for intra-articular reconstruction with a synthetic ligament.







FIBROBLAST FRIENDLY

Our implant is 100% tolerated, but that's not all. The porosity of the free fibers is conducive to the colonisation of the active zone of the implant by fibroblasts and the growth of a new collagen.

The right hand side image is a cross-section of an histological study carried out on a dog 2 years after surgery using our technique and our implant. The Z-lig synthetic ligament is not only tolerated, but allows regeneration of the ruptured ligament itself over time.



 MINI INVASIVE	 RESTORES THE BIOMECHANICS	 ESAY POST OPERATIVE CARE	 STABLE RESULTS OVER TIME
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