veterinary technology for life

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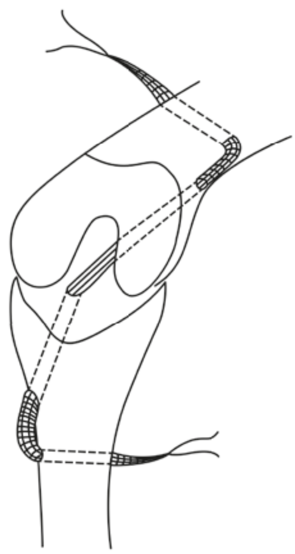
Zlig

Intra-Articular Cruciate Ligament Replacement Technique (CrCL)

With new screw & instrument set „Zlig 2“



The history
The tear of the cranial cruciate ligament is still one of the most common orthopaedic diseases in dogs. The path of the many surgical methods developed for this vary between intracapsular and extracapsular techniques to modern corrective osteotomies that alter the geometry of the affected knee joint. With the development of new materials in medical technology, it is now possible to replace the cranial cruciate ligament in an anatomically correct manner, instead of changing the forces acting on the joint. After a long period of preparatory work by the French Dr Jacques-Phillipe Laboureau, a suitable synthetic ligament is now available for the intra-articular cruciate ligament replacement in small animals. Together with the instrumentation developed by EICKEMEYER®, this new technique for cruciate ligament replacement can now be performed.

The implant
The Zlig consists of ultra-high-molecular polyethylene with the special feature that the woven structure of the implant is interrupted intra-articularly be “free fibres”. Free parallel fibres reduce fatigue and encourage the ingrowth of fibroblasts and collagen. Each implant is delivered in a sterile packed sleeve, making it easier to handle the implant before it is inserted into the joint. A selection of sizes with different resistances and fibre lengths are available to fit different patient sizes.

16 fibres / 10 mm
- 5–8 kg
- 2,000 N

191501

24 fibres / 15 mm
- 8–12 kg
- 3,000 N

191502

32 fibres / 17 mm
- 12–25 kg
- 4,000 N

191503

48 fibres / 19 mm
- 25–45 kg
- 6,000 N

191504

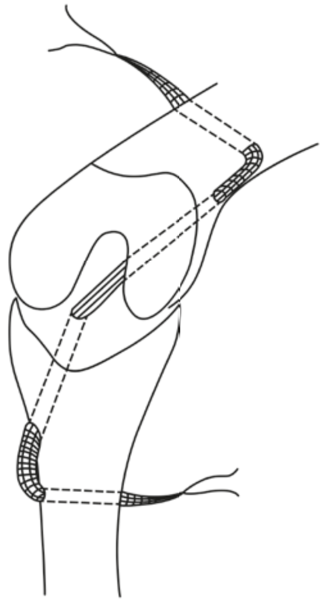
48 fibres / 22 mm
- 25–45 kg
- 6,000 N

191505

48 fibres / 25 mm
- 25–45 kg
- 6,000 N

191506

191506

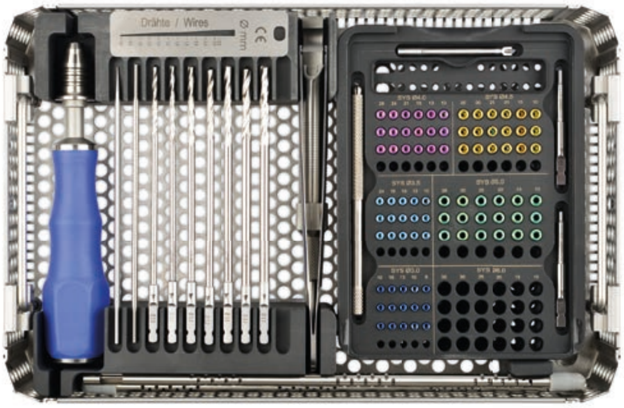


Example

The technology
In this technique, an artificial ligament is used as a total replacement for the cranial cruciate ligament using tunnel-tunnel-technique. The ligament is fixed in the tibia and Os femoris using specially developed cannulated interference screws in drill channels. The screws are guided parallel to the ligament using a guiding wire to avoid deviations. The technology does not cause irreversible damage and the results are reproducible thanks to a quick learning curve. Another great advantage of the technique is the fact that patients can put weight on the hind leg immediately after the operation without any risks.

Zlig 2 – the instrumentation

A small and inexpensive set of instruments is required to perform this innovative cruciate ligament surgery method. The threads of the specially developed titanium interference screws are round so they do not cause any damage to the fibres of the Zlig.



197500

Titanium Interference Screws

- Cannulated
- 15 Titanium Interference Screws Ø 3.0 mm, blue (from 8 – 19 mm)
- 15 Titanium Interference Screws Ø 3.5 mm, light blue (from 10 – 24 mm)
- 18 Titanium Interference Screws Ø 4.0 mm, magenta (from 10 – 28 mm)
- 18 Titanium Interference Screws Ø 4.5 mm, gold (from 10 – 35 mm)
- 18 Titanium Interference Screws Ø 5.0 mm, green (from 10 – 35 mm)

191533, 191535, 191536, 191537, 191541, 191542, 191544 – 191548, 191564, 191566, 191568, 191572 – 191579, 191580 – 191585

191535

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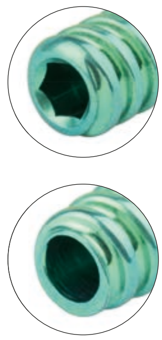
191541



191545

191544

ZLIG 2 INTRA-ARTICULAR CRUCIATE LIGAMENT REPLACEMENT – ITEM LIST

Zlig 2 Screw and Instrument Set		
Item No.	**Description**	**Quantity**
197500	Complete set, consisting of:	1
197501	Zlig 2 Instrument Tray, without instruments	1
197502	Zlig 2 Interference Screw Container, with lid, without screws	1
197503	Twist Drill, Ø 2.5 mm, cannulated, Ø cannulation 1.2 mm, AO Quick Coupling, L 120 mm	1
197504	Twist Drill, Ø 3.0 mm, cannulated, Ø cannulation 1.2 mm, AO Quick Coupling, L 120 mm	1
197505	Twist Drill, Ø 3.6 mm, cannulated, Ø cannulation 2.2 mm, AO Quick Coupling, L 120 mm	1
197506	Twist Drill, Ø 4.2 mm, cannulated, Ø cannulation 2.2 mm, AO Quick Coupling, L 120 mm	1
197507	Twist Drill, Ø 2.5 mm, not cannulated, AO Quick Coupling, L 120 mm	1
197508	Twist Drill, Ø 3.2 mm, not cannulated, AO Quick Coupling, L 120 mm	1
197509	Twist Drill, Ø 4.0 mm, not cannulated, AO Quick Coupling, L 120 mm	1
197510	Hexagon KIRSCHNER Wire, SW 2.5, L 120 mm	1
191518	Attachment for hexagon KIRSCHNER Wire, Hex 2.5, AO Quick Coupling	1
191958	Silicone Screwdriver Handle, cannulated, AO Quick Coupling, L 140 mm	1
197511	Screwdriver Blade, cannulated, HEX 2.0, AO Quick Coupling, L 50 mm	1
197512	Screwdriver Blade, cannulated, HEX 2.5, AO Quick Coupling, L 50 mm	1
191926	Wire Loop, Ø 0.5 x L 420 mm	2
197513	Tube for Wire Loop, Ø 2.5 x L 120 mm, cannulated, Ø cannulation 2.0 mm	1
101710	Handle for Micro Scalpel Blades, L 100 mm	1
185779	Plates / Screw Holding Forceps, L 150 mm	1
185119	KIRSCHNER-Wire Cylinder up to 200 mm length	2
187737	Depth Gauge, 50 mm, probe 1 mm	1
180500	V-slot Template for Pins Ø 0.6 – 2.5 mm and screws length 3 – 45 mm	1
191520	KIRSCHNER Wire, Ø 1.0 x L 190 mm, blunt / blunt	4
191521	KIRSCHNER Wire, Ø 2.0 x L 190 mm, trocar / trocar	4
191535	Titanium Interference Screw, Ø 3.0 x L 8 mm, cannulated, Ø cannulation 1.1 mm, blue, Hex 2.0	3
191533	Titanium Interference Screw, Ø 3.0 x L 10 mm, cannulated, Ø cannulation 1.1 mm, blue, Hex 2.0	3
191576	Titanium Interference Screw, Ø 3.0 x L 13 mm, cannulated, Ø cannulation 1.1 mm, blue, Hex 2.0	3
191577	Titanium Interference Screw, Ø 3.0 x L 16 mm, cannulated, Ø cannulation 1.1 mm, blue, Hex 2.0	3
191583	Titanium Interference Screw, Ø 3.0 x L 19 mm, cannulated, Ø cannulation 1.1 mm, blue, Hex 2.0	3
191536	Titanium Interference Screw, Ø 3.5 x L 10 mm, cannulated, Ø cannulation 1.1 mm, light blue, Hex 2.0	3
191537	Titanium Interference Screw, Ø 3.5 x L 13 mm, cannulated, Ø cannulation 1.1 mm, light blue, Hex 2.0	3
191578	Titanium Interference Screw, Ø 3.5 x L 16 mm, cannulated, Ø cannulation 1.1 mm, light blue, Hex 2.0	3
191579	Titanium Interference Screw, Ø 3.5 x L 19 mm, cannulated, Ø cannulation 1.1 mm, light blue, Hex 2.0	3
191584	Titanium Interference Screw, Ø 3.5 x L 24 mm, cannulated, Ø cannulation 1.1 mm, light blue, Hex 2.0	3
191541	Titanium Interference Screw, Ø 4.0 x L 10 mm, cannulated, Ø cannulation 1.1 mm, magenta Hex 2.0	3
191542	Titanium Interference Screw, Ø 4.0 x L 13 mm, cannulated, Ø cannulation 1.1 mm, magenta Hex 2.0	3
191572	Titanium Interference Screw, Ø 4.0 x L 18 mm, cannulated, Ø cannulation 1.1 mm, magenta, Hex 2.0	3
191580	Titanium Interference Screw, Ø 4.0 x L 21 mm, cannulated, Ø cannulation 1.1 mm, magenta, Hex 2.0	3
191581	Titanium Interference Screw, Ø 4.0 x L 24 mm, cannulated, Ø cannulation 1.1, mm magenta, Hex 2.0	3
191582	Titanium Interference Screw, Ø 4.0 x L 28 mm, cannulated, Ø cannulation 1.1 mm, magenta, Hex 2.0	3
191545	Titanium Interference Screw, Ø 4.5 x L 10 mm, cannulated, Ø cannulation 1.1 mm, gold Hex 2.5	3
191546	Titanium Interference Screw, Ø 4.5 x L 15 mm, cannulated, Ø cannulation 1.1 mm, gold Hex 2.5	3
191547	Titanium Interference Screw, Ø 4.5 x L 20 mm, cannulated, Ø cannulation 1.1 mm, gold Hex 2.5	3
191548	Titanium Interference Screw, Ø 4.5 x L 25 mm, cannulated, Ø cannulation 1.1 mm, gold Hex 2.5	3
191573	Titanium Interference Screw, Ø 4.5 x L 30 mm, cannulated, Ø cannulation 1.1 mm, gold Hex 2.5	3
191585	Titanium Interference Screw, Ø 4.5 x L 35 mm, cannulated, Ø cannulation 1.1 mm, gold Hex 2.5	3
191544	Titanium Interference Screw, Ø 5.0 x L 10 mm, cannulated, Ø cannulation 2.9 mm, green Hex 2.5	3
191566	Titanium Interference Screw, Ø 5.0 x L 15 mm, cannulated, Ø cannulation 2.9 mm, green Hex 2.5	3
191568	Titanium Interference Screw, Ø 5.0 x L 20 mm, cannulated, Ø cannulation 2.9 mm, green Hex 2.5	3
191564	Titanium Interference Screw, Ø 5.0 x L 25 mm, cannulated, Ø cannulation 2.9 mm, green Hex 2.5	3
191574	Titanium Interference Screw, Ø 5.0 x L 30 mm, cannulated, Ø cannulation 2.9 mm, green Hex 2.5	3
191575	Titanium Interference Screw, Ø 5.0 x L 35 mm, cannulated, Ø cannulation 2.9 mm, green Hex 2.5	3

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Optional Accessories		
Item No.	**Description**	**Quantity**
191531	Titanium Interference Screw, Ø 3.0 x L 5 mm, cannulated, Ø cannulation 1.1 mm, blue, Hex 2.0	1
191538	Titanium Interference Screw, Ø 3.5 x L 8 mm, cannulated, Ø cannulation 1.1 mm, light blue, Hex 2.0	1
191540	Titanium Interference Screw, Ø 4.0 x L 8 mm, cannulated, Ø cannulation 1.1 mm, magenta, Hex 2.0	1
191563	Titanium Interference Screw, Ø 6.0 x L 10 mm, cannulated, Ø cannulation 2.9 mm, silver Hex 2.5	1
191565	Titanium Interference Screw, Ø 6.0 x L 15 mm, cannulated, Ø cannulation 2.9 mm, silver Hex 2.5	1
191567	Titanium Interference Screw, Ø 6.0 x L 20 mm, cannulated, Ø cannulation 2.9 mm, silver Hex 2.5	1
191569	Titanium Interference Screw, Ø 6.0 x L 25 mm, cannulated, Ø cannulation 2.9 mm, silver Hex 2.5	1
191570	Titanium Interference Screw, Ø 6.0 x L 30 mm, cannulated, Ø cannulation 2.9 mm, silver Hex 2.5	1
191571	Titanium Interference Screw, Ø 6.0 x L 35 mm, cannulated, Ø cannulation 2.9 mm, silver Hex 2.5	1

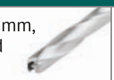
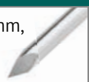
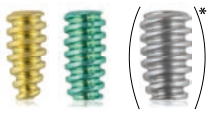
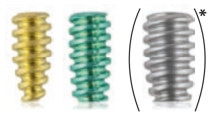
ZLIG INTRA-ARTICULAR CRUCIATE LIGAMENT REPLACEMENT – REFERENCE CHART

Advice:
Use the contents of this chart as a general guideline only:

- The drill hole always depends on in situ bone stock; choose drill size accordingly.
- Use K-Wire (trocar) to perform the initial bone hole.
- After the hole in the bone has been made, open up the cortex with the recommended drill, based on the size of the ligament.

Attention:
The blunt K-Wire for screws is a guide for the screw, to be placed parallel to the ligament.

- The blunt K-Wire is a guide for the screws (in order not to damage ligament fibres)
- How deep the guide wire is introduced into the hole should not exceed the length of the screw
- Care should be taken when introducing the screw over the guide wire (to avoid the pin being pushed into the joint, or it sticking out at the edge of the bone)
- If this were to occur due to a long guide wire, the wire will twist and be difficult to remove once the screw is in place
- The guide wire size for screws 3.0 to 4.5 is 1.0 mm only

Ligament Ref.	Drill Size	K-Wire Size for Drill	Screw Size	K-Wire Size for Screws	Screwdriver Tip Size	Dog Size
CCL16/10 10 mm fibre length	Drill Ø 2.5 mm, cannulated 	K-Wire Ø 2.0 mm, double trocar to be replaced by K-Wire Ø 1.0 mm double blunt 	Screw Ø 3.0 (blue) Length: 8/10/13/16/ 19 mm 	K-Wire Ø 1.0 mm, double blunt 	Hex 2.0 	5 – 8 kg
CCL24/15 15 mm fibre length	Drill Ø 3.0 mm, cannulated	K-Wire Ø 2.0 mm, double trocar to be replaced by K-Wire Ø 1.0 mm, double blunt	Screw Ø 3.0 (blue) Length: 8/10/13/16/ 19 mm Screw Ø 3.5 (light blue) Length: 10/13/16/19/ 24 mm 	K-Wire Ø 1.0 mm, double blunt	Hex 2.0	8 – 12 kg
CCL32/17 17 mm fibre length	Drill Ø 3.6 mm, cannulated	For light blue Screw: K-Wire Ø 2.0 mm, double trocar to be replaced by K-Wire Ø 1.0 mm, double blunt For magenta Screw: K-Wire Ø 2.0 mm, double trocar	Screw Ø 3.5 (light blue) Length: 10/13/16/19/ 24 mm Screw Ø 4.0 (magenta) Length: 8/10/13/18/ 21/24/28 mm 	K-Wire Ø 1.0 mm, double blunt	Hex 2.0	12 – 25 kg
CCL48/19 19 mm fibre length or	Drill Ø 4.2 mm, cannulated	K-Wire Ø 2.0 mm, double trocar	Screw Ø 4.0 (magenta) Length: 8/10/13/18/ 21/24/28 mm Screw Ø 4.5 (gold) Length: 10/15/20/ 25/30/35 mm 	K-Wire Ø 1.0 mm, double blunt	Hex 2.0	25 – 45 kg
CCL48/22 22 mm fibre length or	Drill Ø 4.2 mm, cannulated	K-Wire Ø 2.0 mm, double trocar	Screw Ø 4.5 (gold) Length 10/15/20/25/30/35 mm Screw Ø 5.0 (green) Length: 10/15/20/25/30/35 mm Screw Ø 6.0 (silver) Length: 10/15/20/25/30/35 mm  *	K-Wire Ø 1.0 mm, double blunt	Hex 2.0 Hex 2.5 or use Hex K-Wire Hex 2.5 or use Hex K-Wire	25 – 45 kg
CCL48/25 25 mm fibre length	Drill Ø 4.2 mm, cannulated	K-Wire Ø 2.0 mm, double trocar	Screw Ø 4.5 (gold) Length 10/15/20/25/30/35 mm Screw Ø 5.0 (green) Length 10/15/20/25/30/35 mm Screw Ø 6.0 (silver) Length 10/15/20/25/30/35 mm  *	K-Wire Ø 1.0 mm, double blunt	Hex 2.0 Hex 2.5 or use Hex K-Wire Hex 2.5 or use Hex K-Wire	25 – 45 kg
	Drill Ø 3.2 or 4.0 mm, non-cannulated for tunnels which do not need to be guided (transversal tunnel)		* Screw Ø 6.0 (silver) optional with Drill Ø 4.2 mm, cannulated			

Use of the new Zlig intra-articular ligament replacement in the cat – A case report

Zlig, the new intra-articular ligament replacement technique was recently introduced into veterinary orthopaedics as a treatment for rupture of the anterior cruciate ligament. It was initially designed for dogs, however it turns out that the Zlig can be successfully applied in cats with just a few adjustments. The cat described in the report made a quick recovery and is walking lameness-free 8 months after surgery.

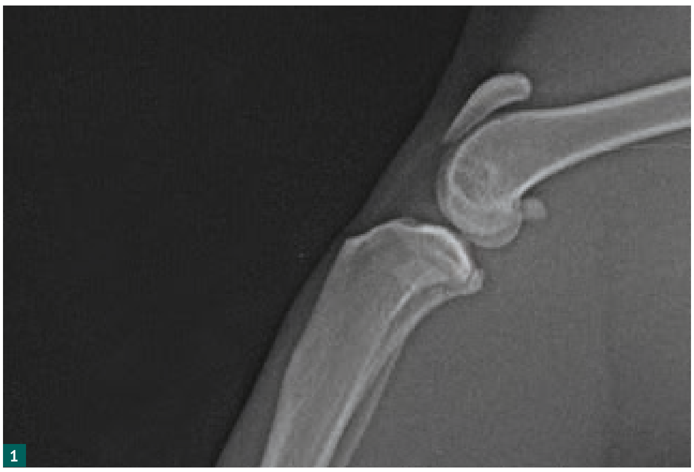
Introduction

When treating anterior cruciate ligament tears in pets, the veterinarian usually opts for a ligament replacement technique or a biomechanical change, this has been done in the last 25 years with the TPLO and TTA techniques, which were successfully introduced for large dogs (Kowaleski et al., 2012). Ligament replacement is an option for cats with a cruciate ligament tear for a number of reasons: they are lightweight, usually have a history of trauma, and the implants designed for dogs are often too large. So restoring the anatomy is the reasonable conclusion. Indications for a surgical procedure are overweight cats, lameness that has lasted for weeks and the presence of meniscus damage (Voss, 2019). The extracapsular methods (de Angelis and Lau, 1970; Flo, 1975) and their modern variants have proven particularly effective as ligament replacement techniques. They can also be used successfully by inexperienced operators. However, the disadvantages are: 1. no original origin and attachment points for the replacement material, 2. unsafe anchor points when the prosthetic material is placed around the sesamoid bones at the origin of the gastrocnemic muscles (fabellae), 3. tears in the ligament replacement, 4. loosening of the thread at the knot, 5. risk of infection.

In France, a very durable polyethylene (UHMPE) ligament replacement was invented a few years ago (Laboureau, 2017) and introduced into veterinary medicine as Zlig. The material is resistant to bending and torsional forces, is porous and facilitates colonization by fibrous endogenous tissue. In dogs, it is successfully looped intra-articularly and fixed with 4 cannulated screws (Arndt, 2022). The implementation of this technique in the cat is described and critiqued in this case report.

Case report

The patient was a 6-year-old male Maine Coon mix named "Buddy". He weighed 6.2 kg, was healthy but came home lame one morning. He was presented to the Welden Veterinary Practice, where a positive drawer test and joint effusion (Fig. 1) were noted. After 5 weeks of conservative therapy with painkillers and immobilization, the decision was made by the owner, in view of the unchanged poor gait, to proceed with an operative procedure using Zlig.



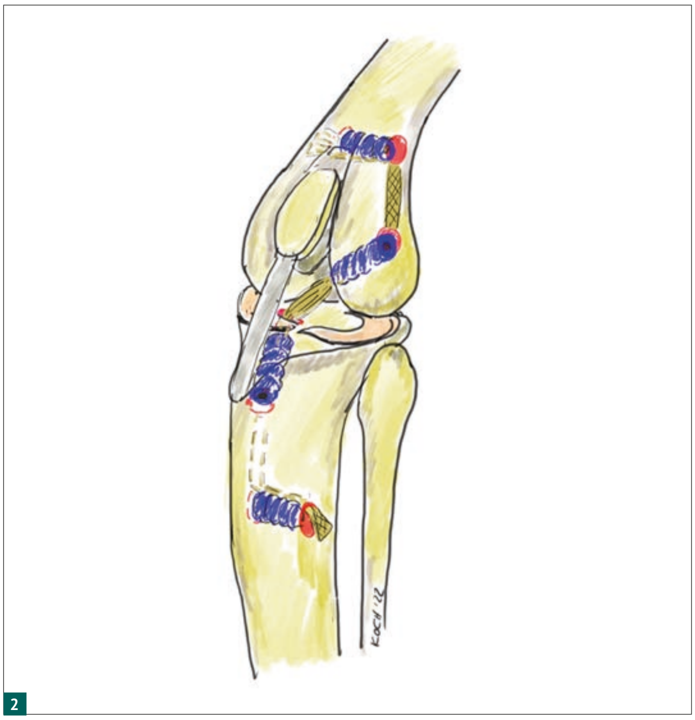
1

Fig. 1: X-Ray of the knee joint in the mediolateral view of a 6.2 kg cat with a cranial cruciate ligament tear, lateral meniscus damage and partial tear of the lateral collateral ligament

After induction with medetomidine, propofol and butorphanol, the cat was intubated and the anesthesia maintained with isoflurane and oxygen. "Buddy" received perioperative doses of amoxicillin-clavulanic acid, Marbocyl and meloxicam. The left knee joint was extensively prepared aseptically, the cat was then fixed in the supine position on the operating table and draped. The operation area was covered with an additional antimicrobial incision film.

The knee joint was exposed via a lateral parapatellar approach, the patella was dislocated medially. The knee joint was inspected. There were no visible signs of arthrosis or osteophytes, 80 % of the cranial cruciate ligament was torn, and the lateral meniscus was divided into several fragments. The lateral collateral ligament was torn. After partial removal of the lateral meniscus and suturing of the collateral ligament, the infrapatellar fat pad was partially removed for a better overview and the remains of the anterior cruciate ligament were resected with a scalpel.

The drill holes were then planned and set, through which the intra-articular replacement ligament was then passed (Fig. 2). The surgical steps were described for the dog (Arndt, 2022) and were generally adopted for the cat, adapting the drill and implant diameters. For the first drill hole, a 1.0 mm diameter KIRSCHNER wire was drilled laterally through the lateral femoral condyle from the insertion site of the cranial cruciate ligament on the lateral side of the intercondylar fossa (the remains of the ligament were still visible there). It was important that the drill wire lay on the proximal tibial edge when the knee was fully flexed, so that the exit point was lateral to the ridge. The KIRSCHNER wire served as a guide for a cannulated drill with a diameter of 3.0 mm, which then widened the canal from lateral to medial without injuring the tibial plateau at the end. In the same way, the second drill hole was drilled approx. 15 mm further proximally from lateral to medial through the distal femur.



2

Fig. 2: Schematic representation of the Zlig method in the cat using an artificial band and 4 interference screws

[1]Eickemeyer – Medizintechnik für Tierärzte KG, Eltastraße 8, D-78532 Tuttlingen

The third drill hole, again predrilled with a 1.0 mm KIRSCHNER wire, led from the insertion point of the cranial cruciate ligament under the caudal border of the cranial horn of the medial meniscus to the medial side of the tibia. Reaming with a 3.0 mm cannulated drill over the guide wire was performed from the knee joint in a distal direction, since in this way there is no risk of inadvertently injuring the intra-articular structures. The fourth hole was similarly drilled 15 mm distal to the third through the tibia from medial to lateral.

The four bore channels were flushed and their depth measured (11 to 13 mm). The matching interference screws with an outer diameter of 3.0 mm were prepared, as were the instruments for looping the band and the smallest available Zlig band (Fig. 3). The gloves were then changed to minimize contamination of the Ligament.

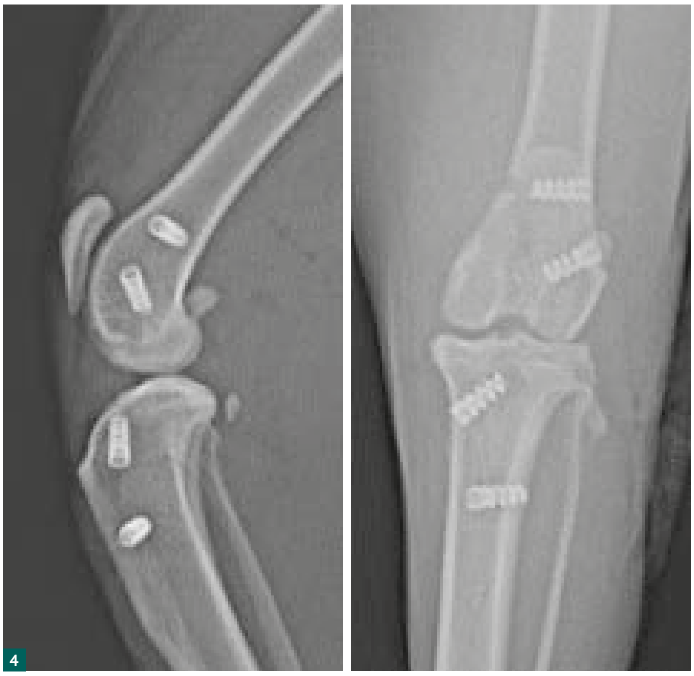
3

Fig. 3: Special instruments and implants for the Zlig technique. The smallest, blue interference screw was used for the cat

A 1.0 mm KIRSCHNER wire was guided into the proximal oblique drill channel, a 2.0 mm metal tube was pushed over it, the KIRSCHNER wire then removed and a special wire loop inserted into the tube. This was then used to guide the artificial ligament into the joint from distal to proximal. The procedure was repeated at the oblique femoral tunnel and then at the transverse holes, and the synthetic ligament with its parallel fibers was aligned in the center of the knee joint. A 1.0 mm blunt KIRSCHNER wire was then passed into the oblique femoral tunnel and the appropriate cannulated screw inserted using a cannulated screwdriver. The KIRSCHNER wire has been removed. The free end of the synthetic ligament on the medial side of the tibia was then held under tension with the aid of a clamp, the patella was repositioned and flexed and extended examining the disappearance of the drawer phenomenon. Only then was the most proximal interference screw placed in the same way as above. The third screw was inserted into the oblique tibial tunnel while the artificial ligament was stretched at the lateral end of the transverse canal in the tibia from proximal to distal, after which the last screw was inserted into the tibia from medial to lateral. The loose ends of the ligament were removed.

The patella was then reduced. The joint capsule, the fascia and the subcutaneous tissue were sutured with absorbable sutures and the skin is closed with non-absorbable suture material. The knee joint was X-Rayed in 2 directions (Fig. 4).

The cat was discharged one day after the operation without a bandage and given painkillers (meloxicam) and antibiotics (amoxicillin-clavulanic acid) for 7 days. According to the owner, the cat put approximately 30 % of its weight on the operated leg the following day. After 10 days, the stitches were removed, a small seroma was suctioned out from under the scar, and mild lameness was noted. The cat was ordered to be housed for 4 weeks. After 4 weeks, "Buddy" was walking without lameness and, according to the owners, jumped on the window sill. A control X-Ray was taken, which showed stable implants. The cat was then released from the controls.



4

Fig. 4: Postoperative X-Ray control according to Zlig, mediolateral and cranio-caudal view.

Discussion

The adaptation of the method described for the dog to the cat was very successful, no special precautions had to be taken. The smallest available implants and artificial bands were used throughout. In cats and small dogs, stress fractures originating from the drill holes should be avoided. For this reason, it is of utmost importance that the drill holes through the tibia and femur are placed in the centre of the shaft. As has been shown in the dog, there is a tendency to place the oblique femoral tunnel too far cranially. Maximum flexion of the knee joint when drilling the guide wire serves not only to ensure good direction, but also to optimally expose the intercondylar fossa. The cat, which was quite large at 6.2 kg, allowed the operation to be carried out smoothly. It remains to be seen to what extent smaller cats can also be treated with it.

In the case of "Buddy", the cruciate ligament tear was accompanied by other injuries to the meniscus and lateral collateral ligament. He is therefore amazed at how well the cat has recovered and was able to walk without lameness after only a few weeks. We attribute this to the stability of the Zlig because, unlike the extracapsular technique, it has the same functional length in flexion and extension and should therefore contribute to faster recovery and near-physiological conditions.

Physiotherapy follow-up care was not necessary for "Buddy". In this context, we would like to point out that the Zlig method leads to rapid loading of the limbs, which counteracts the breakdown of muscle mass. Nevertheless, physiotherapy aftercare makes sense in order to promote coordination, loosen adhesions, increase the mobility of the limbs and thus achieve rapid normalization of the gait pattern. As case reports from France have shown, a small animal with a Zlig cruciate ligament replacement can be loaded very early. The overly long immobilisation that is often practiced mainly in Germany can be regarded as outdated and contraindicated.

Literature:

1. Arndt S. (2022). Kreuzband-OP mit der Zlig-Methode für schwere Hunde. EICKEMEYER® Seminarmagazin plus, Ausgabe 1/2022: 7-14.

2. de Angelis M., Lau R. E. (1970). A lateral retinacular imbrication technique for the surgical correction of anterior cruciate ligament rupture in the dog. J Am Vet Med Assoc 157.

3. Flo G. L. (1975). Modification of the lateral retinacular imbrication technique for stabilizing cruciate ligament injuries. J Am Anim Hosp Assoc 11.

4. Kowaleski M. P., Boudrieau R. J., Pozzi A. (2012). Stifle Joint. Veterinary Surgery Small Animal. Tobias K. M. und Johnstone S. A. St. Louis, Elsevier Saunders: 906-998.

5. Laboureau J.-P. (2017). VetLig Global - Cranial Cruciate Ligament Reconstruction - Operative Technique. STIF SAS.

6. Voss K. (2019). Krankheiten des Bewegungsapparates. Krankheiten der Katze. Lutz H., Kohn B. und Forterre F. Stuttgart, Thieme: 957-1020.

Dr. Stefan Dommer

Studies at the Ludwig-Maximilians-University in Munich. Further training in small animal medicine at improve international 2012 – 2013. In own practice since 1998. main interest: orthopaedics of small animals.

Dr. Daniel Koch

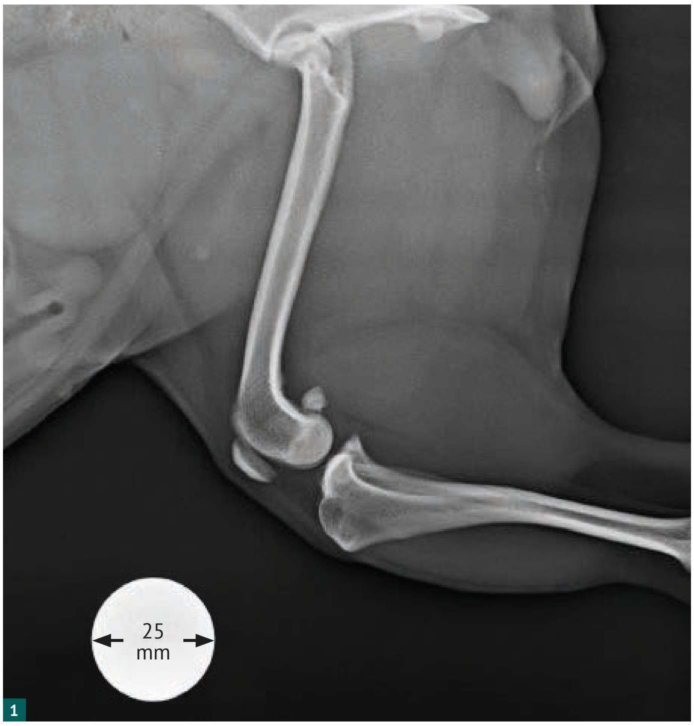
Specialist in small animal surgery; DECVS

Specialist in small animal surgery; DECVS; Specialisations: joint surgery, osteosynthesis, airway obstruction and dental treatment; Research areas: brachycephalic syndrome, knee joint of the dog.

Case Report

Dr. Christoph Werner, Freilassing, Germany, February 19th, 2020
Shih Tzu cross "Pauline", female, 6.6 kg, 8 years, right knee

Zlig synthetic ligament used: CCL16/10 10 mm fibre length, Drill Ø 3.6 mm cannulated, screws: diagonal femur Ø 3.5 x 13 mm, transversal Ø 3.5 x 10 mm, diagonal tibia Ø 3.5 x 10 mm, transversal Ø 3.5 x 8 mm.



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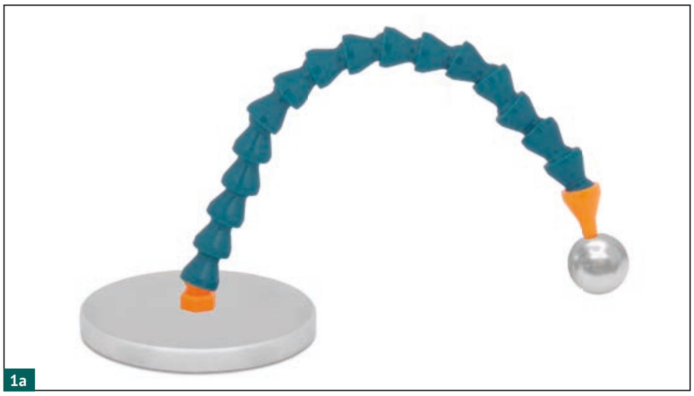
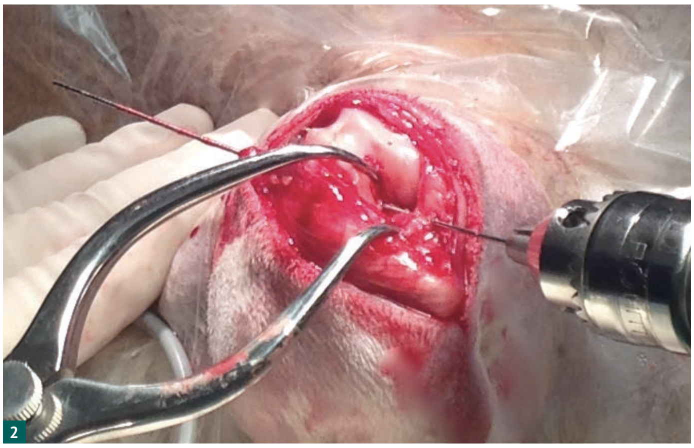


1a

X-Ray Reference Ball Holder, Ø 25 mm (Item No. 191990), stainless steel, for implants or examining structures, using digital or analog systems (Fig. 1 and 1a).

1. Diagonal drill, femoral channel



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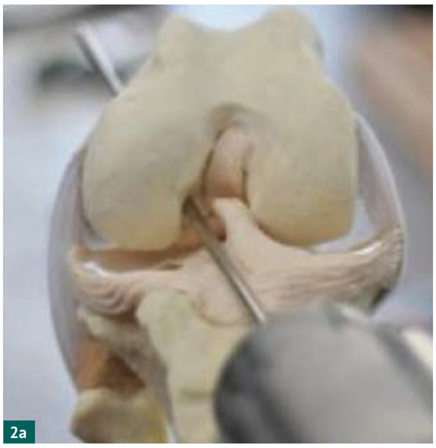
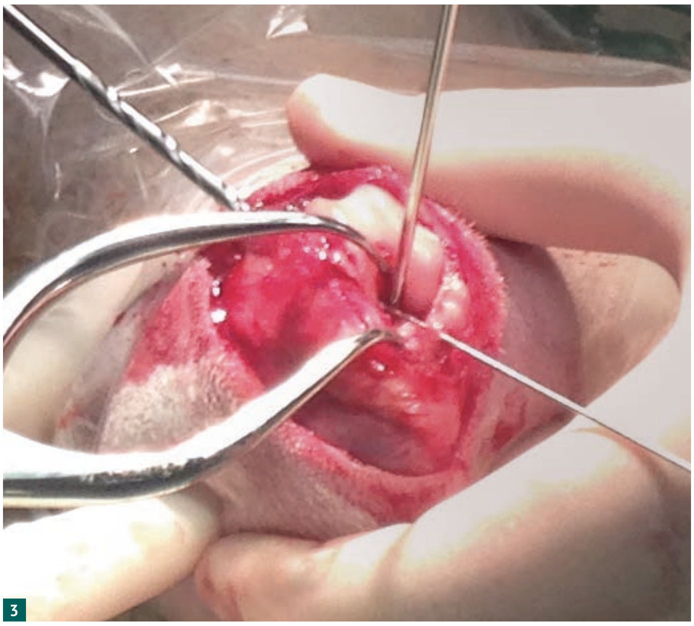


2a

Access is performed through a medial arthrotomy, in which an incision is made in the joint capsule one centimetre medial to the patellar tendon. The patella is laterally luxated and the menisci are examined and, if necessary, resected / partially resected. The fat pad is partially removed to enable a better view if necessary. In this case, as it is a small dog, a guide KIRSCHNER wire trocar / trocar with Ø 1.0 mm (Item No. 191519) is placed in the condylar notch (otherwise use Ø 1.8 mm wire), which runs over the tibial cruciate ligament attachment. This is then drilled through the condyle to emerge on its lateral side (Fig. 2 and 2a).

Practical tip:

The proximal attachment of the cruciate ligament can often still be seen in the intercondylar fossa. It serves as a landmark for the planned entry point of the trocar. It is important that the drilling wire lies directly on the proximal edge of the tibia with full knee flexion to achieve the necessary angle to emerge laterally from the proximal end of the trochlea.



3

The Ø 3.6 mm cannulated drill (Item No. 191516) is then placed at the proximal end of the KIRSCHNER wire to drill a tunnel from the lateral side of the condyle towards the intracondylar notch. The hole must end just above the tibial plateau in order not to damage it. The drill is removed. The KIRSCHNER wire is left in the drilling channel (Fig. 3).

Practical tip:

The knee should be bent as much as possible when drilling to prevent the structures of the tibial plateau from being damaged if the drill comes out too far.

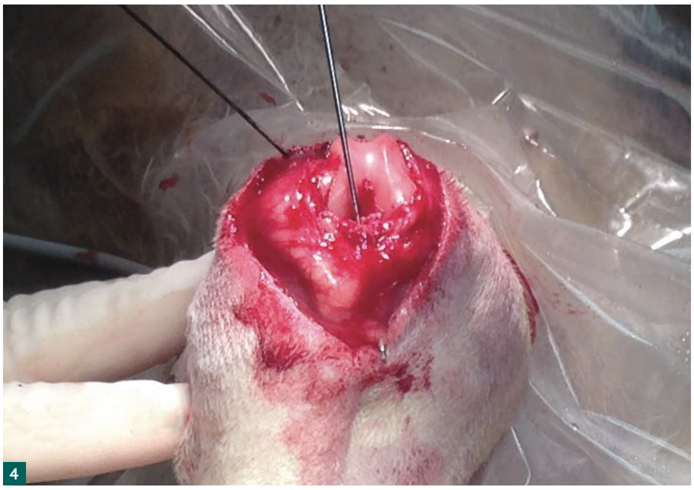
Attention:

Never insert the ligament immediately after drilling the canal through the femoral condyle, otherwise the ligament can be damaged in the second step (tibial canal).

2. Determine the screw length of the femoral canal

The length of the femoral canal is measured with the KIRSCHNER wire left in the drilling canal, which now acts as a depth gauge (Item No. 187737), to determine the screw length (Fig. 14 and 15). If the length of the drilling channel is between two screw lengths, the shorter screw should be selected, which is screwed in flush up to the cis cortex.

3. Diagonal drilling, tibial channel



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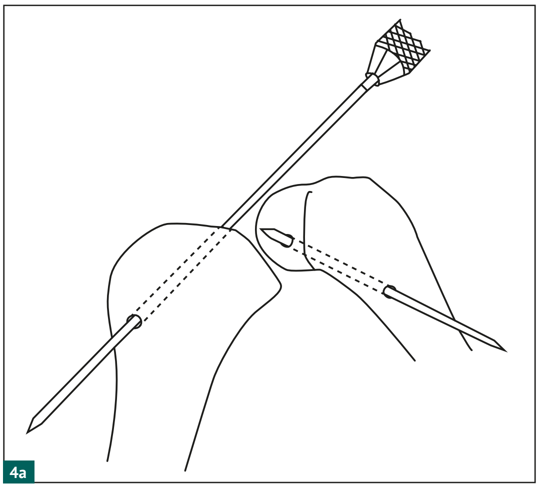
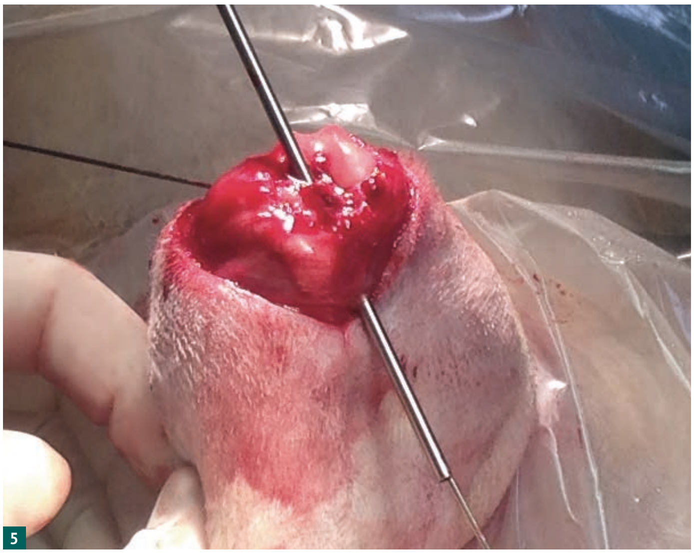


4a

In this case the two-channel drilling technique was chosen (Fig. 4 and 4a).

The two-channel drilling technique may be necessary in some circumstances – for example, if the tibial channel cannot be drilled to a sufficient length (i. e. the hole comes out of the tibia too far distally >3 cm) via the one-channel drilling technique through the femoral bone channel. With the two-channel drilling technique, the tibia drill hole is made with the knee in full flexion. First, the Ø 1.0 mm (guide wire trocar / trocar (Item No. 191519) is placed on the tibial footprint of the anterior cruciate ligament and aligned in its inclination, so that the guide wire emerges medially about 2 – 3 cm below the tibial plateau. Drilling is carried out with the Ø 3.6 mm cannulated drill from the tibial plateau. This has the advantage that the structures of the knee joint (condyles, caudal cruciate ligament, etc.) cannot be damaged due to the direction of drilling. The drill is removed, the guide wire remains in the drill channel.

4. Pull the ligament into the joint through the tibial drilling channel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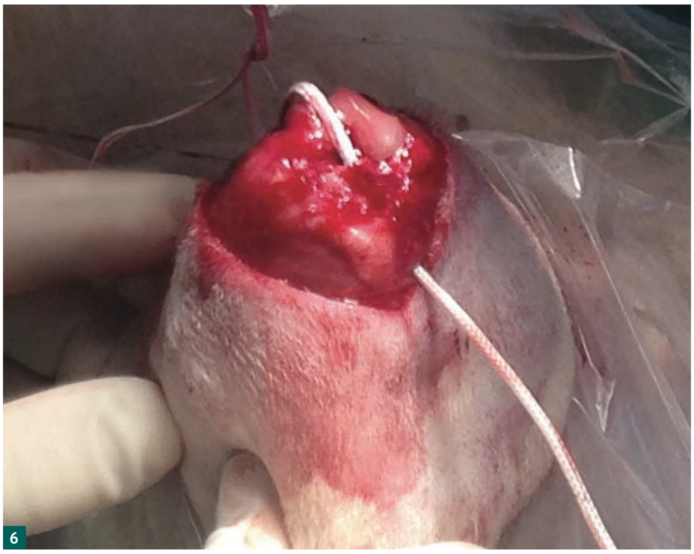
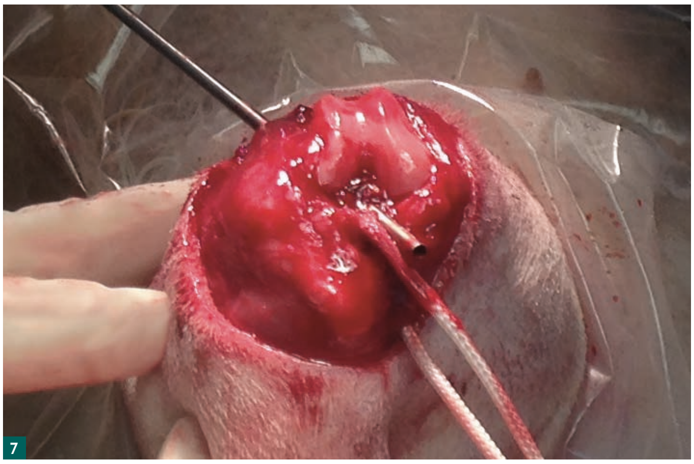
Pull the ligament into the joint through the tibial drilling channel Starting from the tibial plateau, the Ø 2.0 mm tube is now pushed over the KIRSCHNER wire to guide the wire loop (Item No. 191524). The KIRSCHNER wire is removed. The wire loop is inserted from the tibial plateau as shown here … (Fig. 5)


6

… to pull the sterile artificial ligament (Item No. 191501) into the joint from the distal end through the drill channel (Fig. 6).

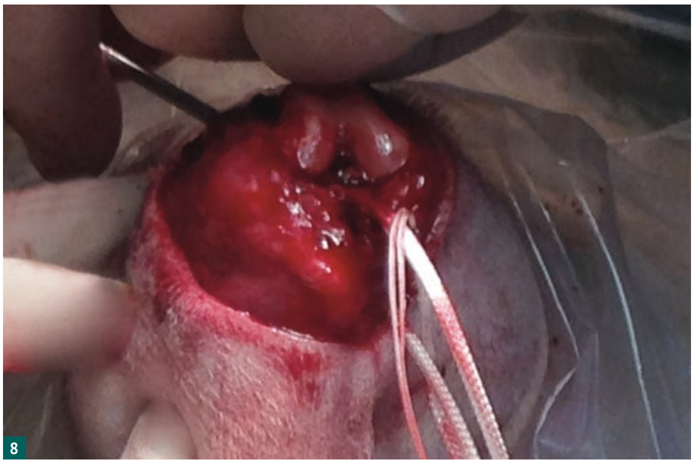
5. Pull the ligament out of the joint through the femoral drilling channel


7

As before on the tibia, the Ø 2.0 mm tube (Item No. 191524) is now placed from proximal to distal in the femoral tunnel and the wire loop (Item No. 191926) is then inserted (Fig. 7).

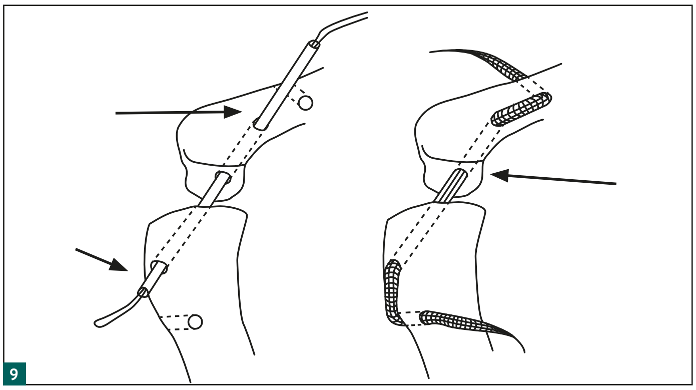
Practical tip:

If there are problems with the insertion of the tube: simply use the drill wire again for guidance!



8

The loose end of the artificial ligament is threaded into the wire loop and then pulled proximally through the femoral drilling channel (Fig. 8).



9

The artificial ligament is aligned (image). The loose free fibres of the ligament are placed intra-articularly (Fig. 9).

6. Determine the screw length of the femoral canal

The length of the femoral canal was previously measured with a depth gauge (Item No. 187737) to determine the screw length (Fig. 14 and 15). If the length of the drilling channel is between two screw lengths, the shorter screw should be selected, which is screwed in flush up to the cis cortex.

7. Place the guide wire for the screw

Here you see the KIRSCHNER wire blunt / blunt Ø 1.0 mm (Item No. 191520). The guide wire should only be inserted according to the measured screw length so that it does not drive into the joint when the screw is screwed in. The screw is carefully screwed in over this guide wire.

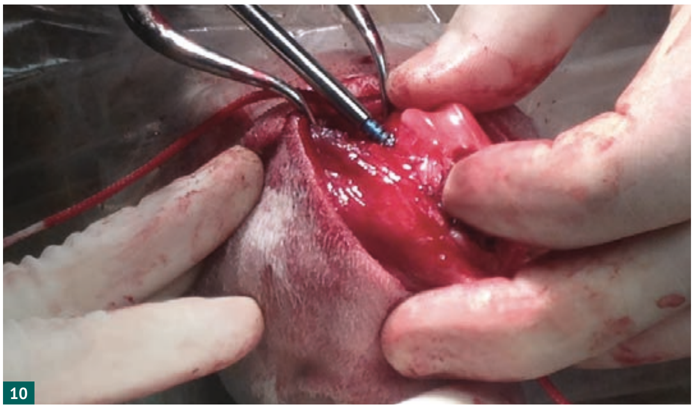
Important:

The blunt KIRSCHNER wire is positioned laterally from and parallel to the synthetic band in the drill channel. It is therefore located laterally to the replacement ligament. This prevents the ligament from running over the screw head later, which could lead to fraying.

Practical tip:

The start and end of the free fibres on the ligament can be marked with an operating marker. This makes it easier to identify them when in the knee joint!

8. Screw in the femoral canal screw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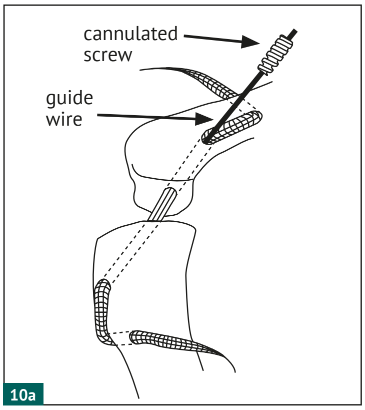
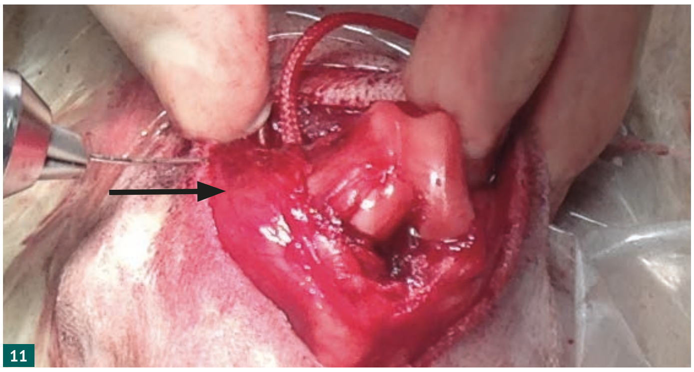


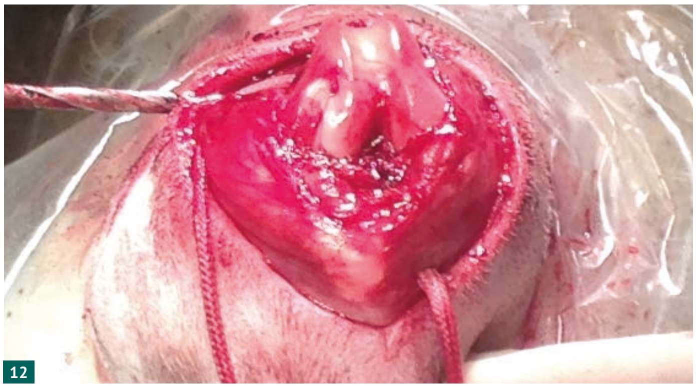
10a

The length of the drill channel determines the screw length. The thickness is determined by the drill used. The Ø 3.5 x 13 mm cannulated interference screw is screwed over the blunt guide wire with the cannulated screwdriver onto the lateral condyle until it lies flush with the bone (Fig. 10 and 10a).

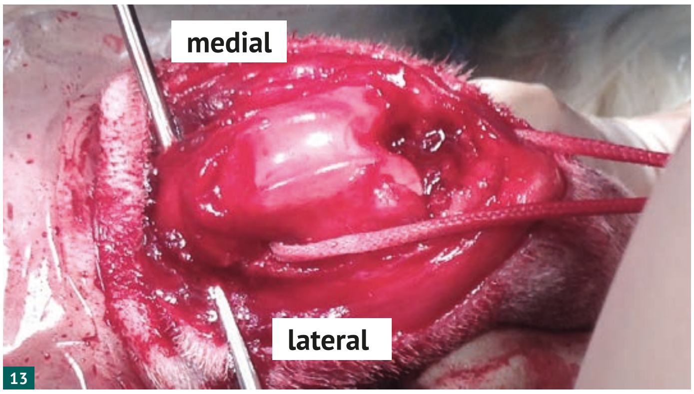
9. Transverse drilling, femoral channel


11

The transverse drill channel in the femur is prepared. Here the Ø 1.0 mm KIRSCHNER trocar / trocar wire is drilled into the femoral metaphysis one or two centimetres above the tunnel from lateral to medial (Fig. 11) …


12

… and then drilled with the Ø 3.6 mm cannulated drill (Fig. 12).

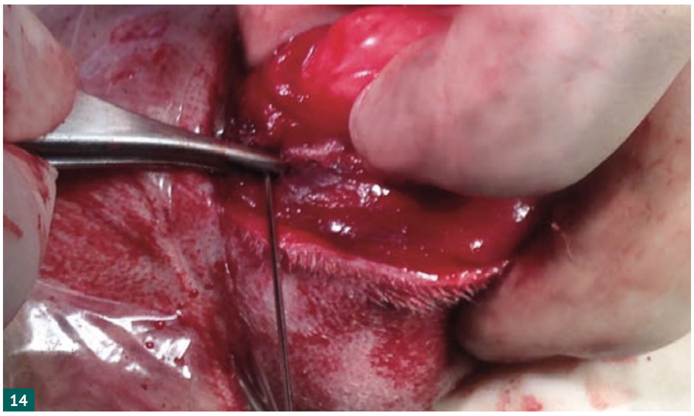


13

The drill is removed while the Ø 1.0 mm guide wire remains in the drill channel. The Ø 2.0 mm tube for guiding the wire loop is pushed over it from the medial side. The wire loop (Item No. 191926) is inserted from the medial side, the free end of the band is inserted into the end of the loop and then pulled medially through the tube. The tube is removed (Fig. 13).

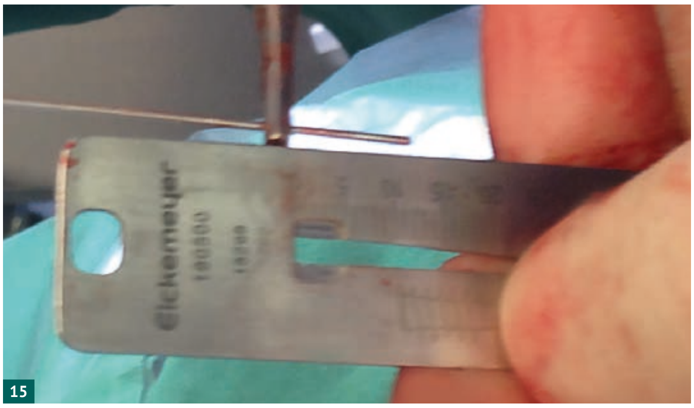
Practical tip:

Make sure that the ligament does not “twist”. For safety, a longitudinal mark can be made on one side of the band with an operating marker pen before starting the operation!



14

The Ø 1.0 mm blunt / blunt KIRSCHNER wire is inserted into the transverse drill hole to measure its length. Check at the exit point with the finger whether the KIRSCHNER wire appears in the drill hole: the entry point of the wire is fixed with a forceps (Fig. 14).

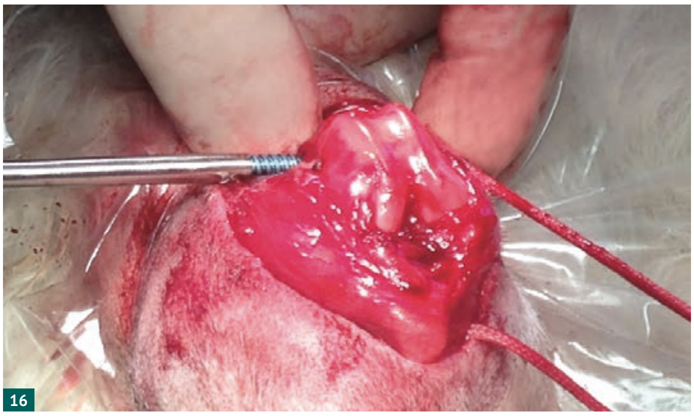


15

The length of the bone canal can thus be easily determined (here using the V-slot template, Item No. 180500). It determines the length of the interference screw (Fig. 15).

Practical tip:

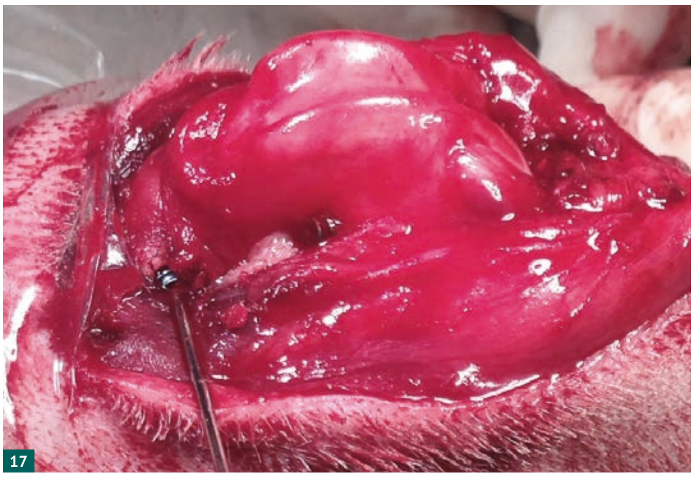
It is advisable to determine the lengths of all drill channels and have them noted!



16

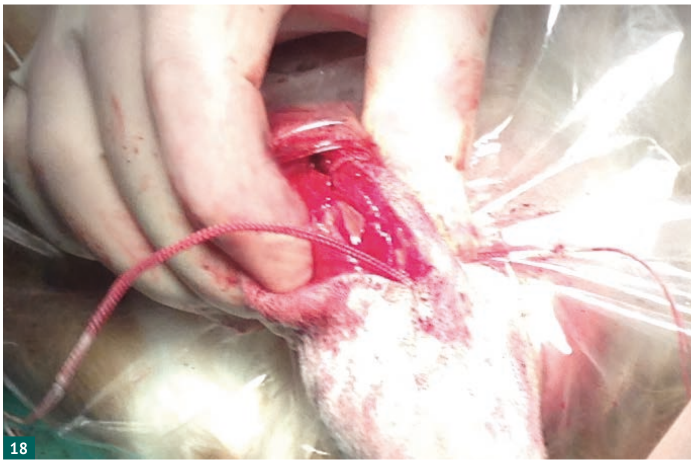
Next the Ø 3.5 x 10 mm screw is screwed in laterally with the cannulated screwdriver (Item No. 191958) and the cannulated screwdriver blade (Item No. 191957) over the guide KIRSCHNER wire. Please note that this time the screw is inserted proximally from the band (see Fig. 9)! The ligament is kept under tension on the opposite side (Fig. 16).

10. Screw in the transverse femoral screw



17

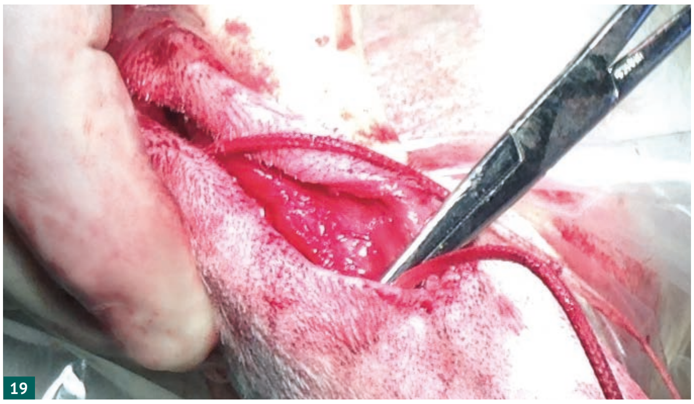
The interference screw is screwed into the transverse femoral tunnel until it is flush with the bone. The free end of the replacement ligament is then cut off medially near the bone surface (Fig. 17).



18

The knee joint is then rinsed with plenty of sterile saline solution. The patella is placed in the trochlea (Fig. 18).

11. Checking the anterior drawer ...



19

The knee joint is positioned in a 130° flexion. The free, loose ligament end at the tibia exit is held under tension with a clamp while the knee joint is extended and flexed to check whether the tension of the ligament allows the joint to move freely. The removal of the anterior drawer is checked (Fig. 19).

12. ... and isometry

The clamp is released, and the ligament is held under tension with the thumb and index finger directly at the exit. The previous step is repeated. The ligament must not tighten or loosen under flexion and extension – this is the only way to ensure that the isometric nature of the ligament has been reached!

13. Screw in the tibial canal screw

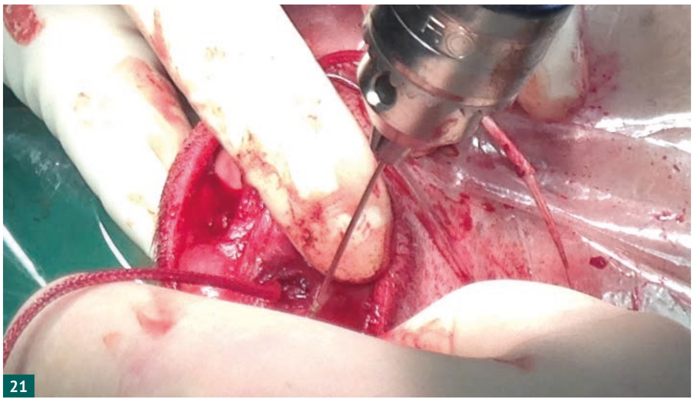
20

The clamp is removed, the knee remains in the 130° position and the ligament is held distally under tension. This facilitates insertion of the blunt guide wire proximal to the ligament. The cannulated interference screw, whose length is measured as before can now be screwed into the drill channel via this guide wire to secure the band (Fig. 20).

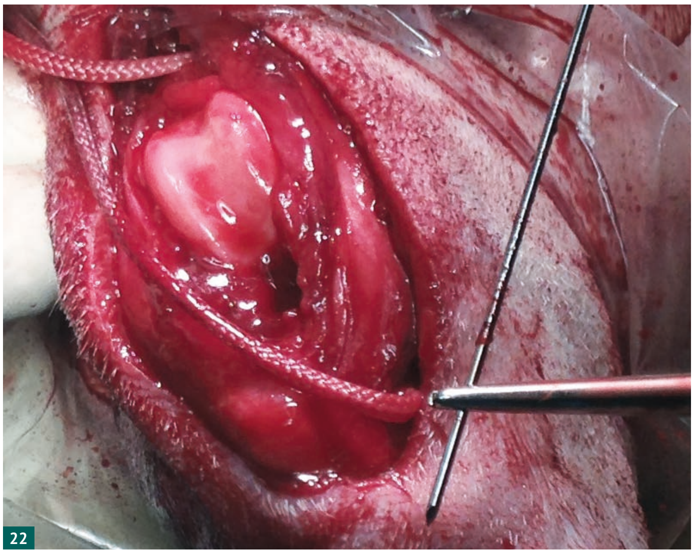
Practical tip:

The blunt guide wire can also be used to check whether the screw protrudes into the joint gap by inserting it into the drill hole from the proximal end.

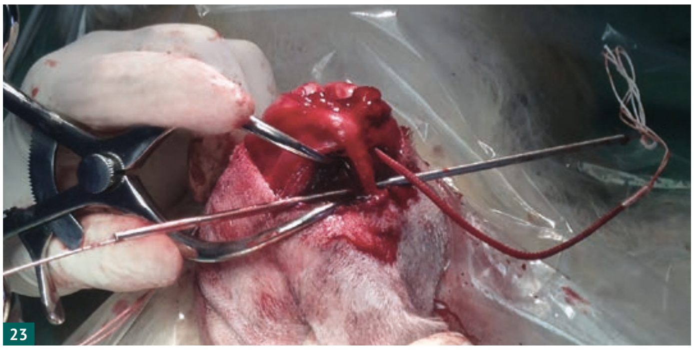
14. Transverse drilling, tibial channel


21

The transverse drill channel through the tibia is first made with the drill wire 1 cm below the exit of the ligament replacement. Then it is widened to Ø 3.6 mm with the cannulated drill (Fig. 21).

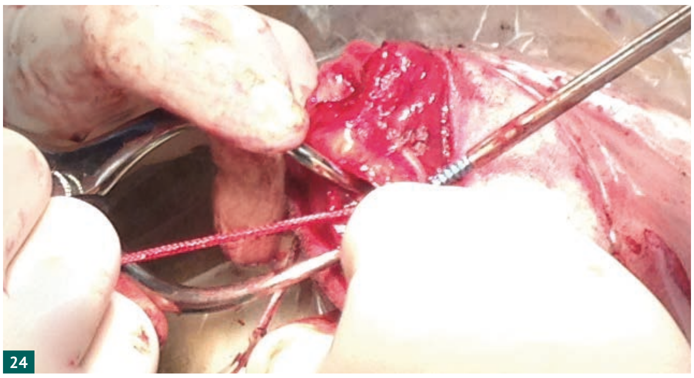

22

The interference screw length is again determined using a KIRSCHNER wire (Fig. 22).


23

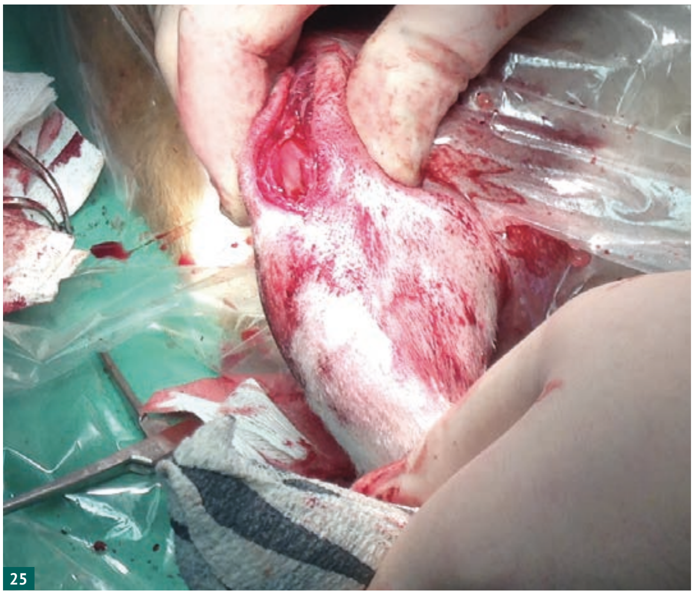
The drill is removed while the guide wire with a diameter of 1.0 mm is left in the bone canal. The Ø 2.0 mm tube is pushed over it. The wire loop (Item No. 191926) is inserted laterally, the free end of the band is placed in the end of the loop and pulled laterally through the drill hole (Fig. 23).

15. Screw in the transverse tibial screw


24

The thickness of the cannulated interference screw is determined by the bone canal, in this case a Ø 3.5 mm x 8 mm screw. The guide wire is inserted from the medial side of the tibia. It is important that this time it runs distal to the ligament replacement. The screw is screwed in until it is flush with the bone surface. Both loose ends of the ligament can now be cut close to the bone (Fig. 24).

16. Wound closure


25

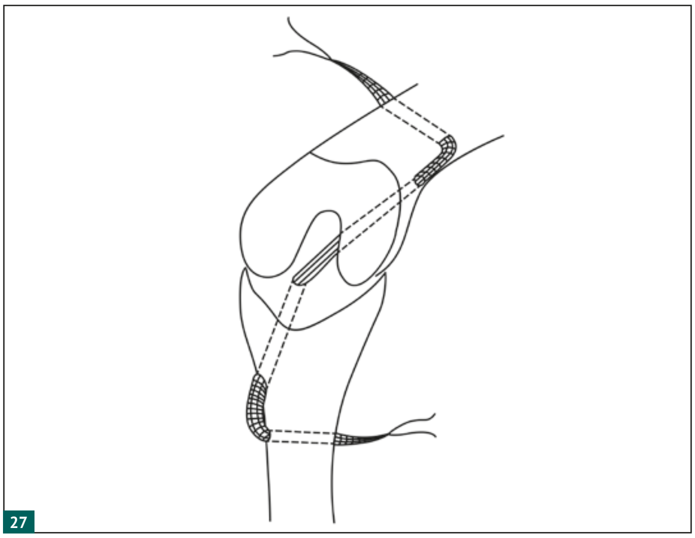
The joint capsule, the fascia and the subcutaneous tissue are sutured with absorbable suture, the skin is closed with non-absorbable suture material (Fig. 25).


26

Lateral view (Fig. 26)


26a

Enlarged section of Fig. 26 Lateral view (Fig. 26a)

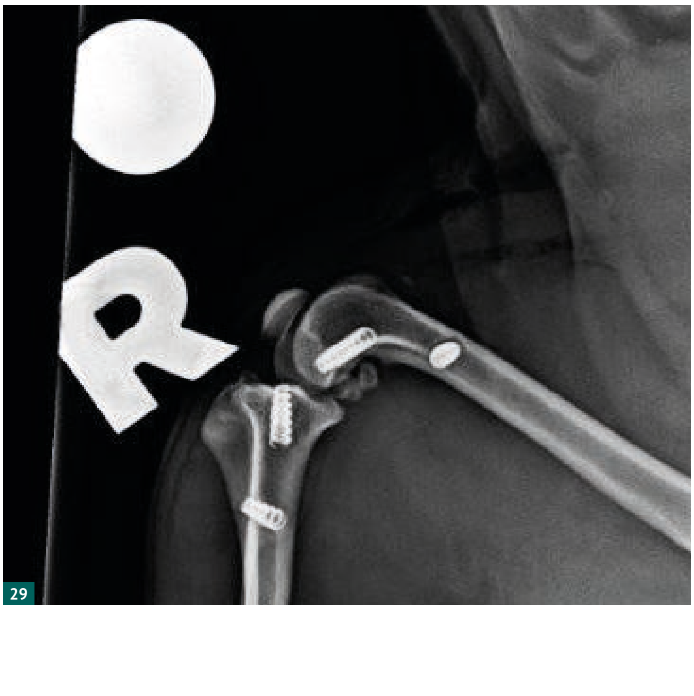


27

This Z-shaped arrangement is mechanically very strong. It enables the immediate resumption of joint activity in every dog (Fig. 27).

28

Lateral view (Fig. 28)



29

Lateral view with X-Ray reference sphere Ø 25 mm (Item No. 191990) (Fig. 29)

Frontal view (Fig. 30)

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ZLIG INTRA-ARTICULAR CRUCIATE LIGAMENT REPLACEMENT – VIDEOS

Zlig application video

Zlig post-operative videos

German Shepherd Cross
“Lieserl”

Labrador Retriever
“Bonny”

Shih Tzu
“Pauline”

Cocker Spaniel
“Indie”

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