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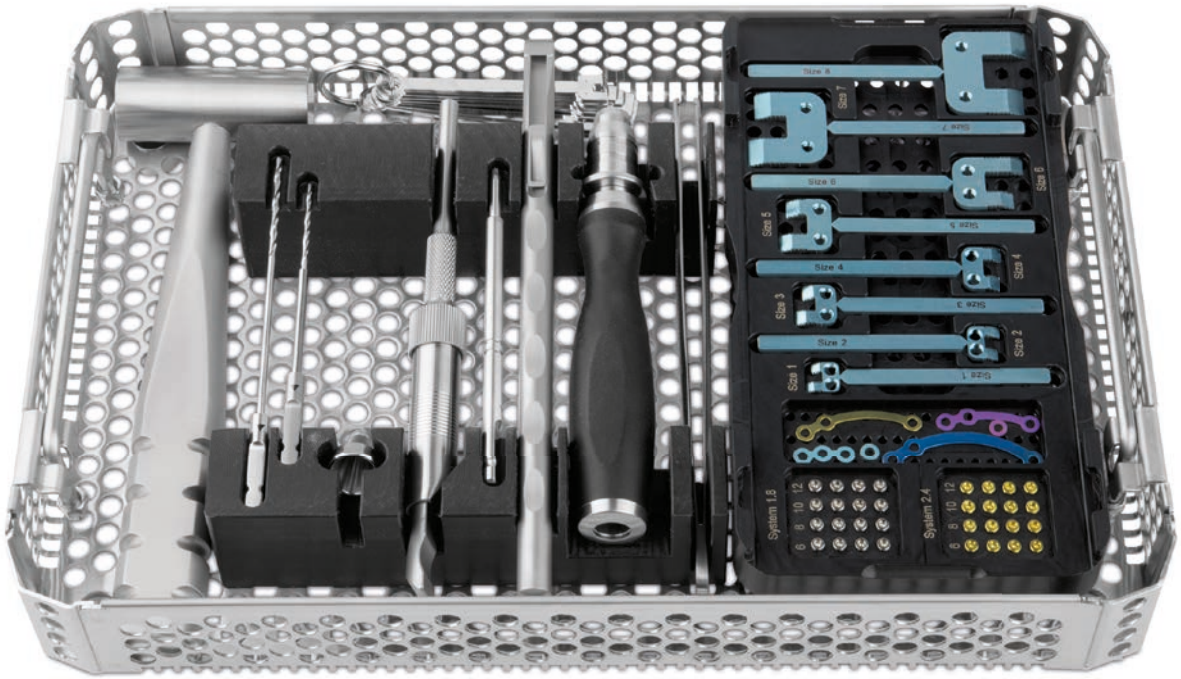
EickLoxx SPP®

Innovative Patellar Luxation System



EICKLOXX SPP® PATELLAR LUXATION SYSTEM – CHARACTERISTICS

The EickLoxx SPP® (Swiss Patella Plate®) system is a new technique in the treatment of medial patellar dislocation in dogs and cats.

In the surgical treatment of patellar luxation in small animals, a tension band is usually inserted to fix the osteotomised tibial tuberosity. When a band is fitted, the ends of the KIRSCHNER wires can irritate the skin, or the implants might migrate, requiring them to be removed. The new EickLoxx SPP® impact plate is intended to avoid revision surgeries.

The EickLoxx SPP® system consists of 8 different plate sizes, 4 locking plates, 2 washers and multiaxial Ø 1.7 mm and Ø 2.3 mm locking screws which, depending on the bone size, can be screwed into the plate. This enables a good anatomical fit and stable fixation.

Titanium Locking Screw

- Self-cutting / self-drilling
- 16 titanium locking screws Ø 1.7 mm, silver (from 6 – 12 mm)
- 28 titanium locking screws Ø 2.3 mm, gold (from 6 – 12 mm)

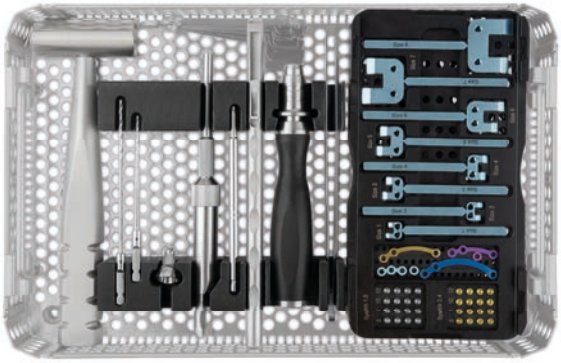
185521 – 185523 / 185528 – 185530 / 185557 / 185559

Properties

- Surgical correction of the patellar dislocation using an impact plate
- Stable fixation enables faster postoperative recovery
- Biocompatible titanium (no removal of the plate is necessary)

The technology

Due to the stable fixation of the SPP® plate using two multi-directional locking screws, and the use of implants on the medial side, the rate of revision surgeries is greatly reduced. The impact plate reliably prevents the medial displacement of the tibial tuberosity.



197200

197225

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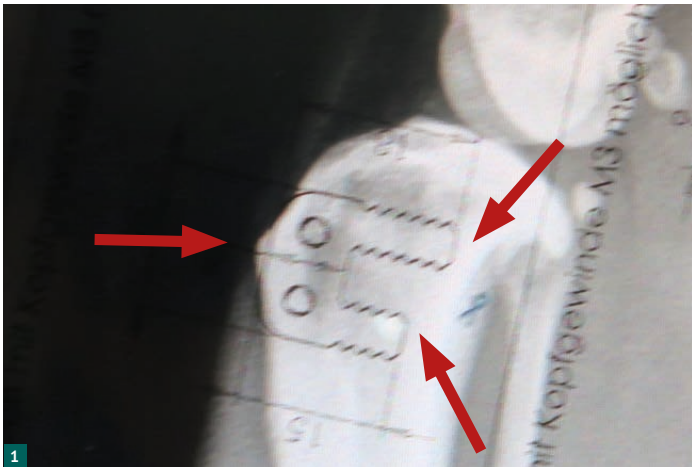
Eickemeyer®

Surgical technique with the Swiss Patella Plate® (SPP®)

Step 1: Preparatory measures

To determine the plate size, a template is placed on the lateral X-Ray of the proximal tibia (Fig. 1). The optimal impact plate has foot lengths that do not touch the caudal cortex after impact. The middle of the cranial edge should be roughly level with the proximal end of the cranial margin and allow for two screws to be safely inserted into the osteotomised segment.

The choice of the correct Swiss Patella Plate® (SPP®) can be determined using the chart below (Fig. 3). It may be possible to choose between several plate sizes depending on the body shape and size of the patient. Therefore the implant should be chosen as described above, and why the correct size should be checked on the X-Ray before and during the operation. For this reason, a set of test plates is also available (Fig. 2).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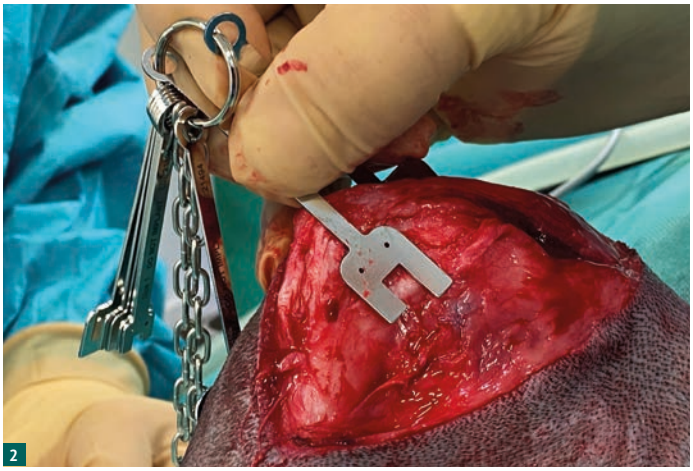
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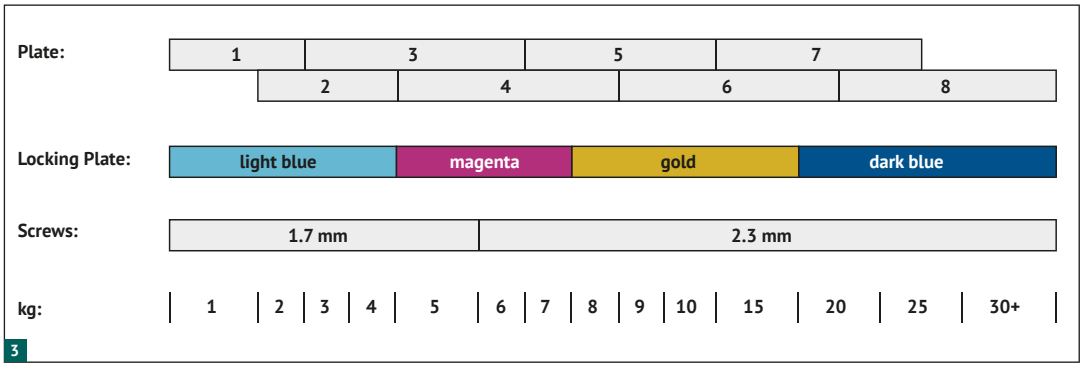

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Fig. 1: Planning the plate size on the X-Ray image
Fig. 2: Planning the plate size with the test plates
Fig. 3: Guidelines for choosing the Swiss Patella Plate® (SPP®) implants

Step 2: Access

A medial approach to the knee joint is recommended when using the Swiss Patella Plate® (SPP®). Sulcoplasty is often recommended, especially in cases which have higher degrees of patellar luxation. This can be done as a wedge or block technique in dogs. The SPP® technique requires approximately one third of the medial tibia to be exposed. To do this, the medial fascia over the middle of the tibial shaft is incised and the muscles that are medial to it are retracted in a caudal direction.

Step 3: Surgical steps for the insertion and fixation of the Swiss Patella Plate® (SPP®)

a. Planning the osteotomy: The selected impact plate is placed on the medial proximal tibia as planned on the X-Ray (Fig. 4). The plate should be perpendicular to the longitudinal axis of the tibia. The centre of the plate should be roughly level with the proximal edge of the cranial margin. If between sizes, and where feasible, the larger plate should be chosen.

b. Marking the osteotomy: The osteotomy follows a line cranially to the menisci, along the base of the plate, and resembles a curve to cranial on the distal side of the plate (Fig. 5). In the case of very small dogs, it should be ensured that the osteotomy is sufficiently caudal; if not, too little endosteal width will be available for the implant. The osteotomy line can then be marked (scalpel blade, electrocautery) (Fig. 6).

c. Osteotomy: It is recommended that the osteotomy be performed with an oscillating saw and a short narrow blade (Fig. 7). Cool with a sterile water wash proximally to distally.

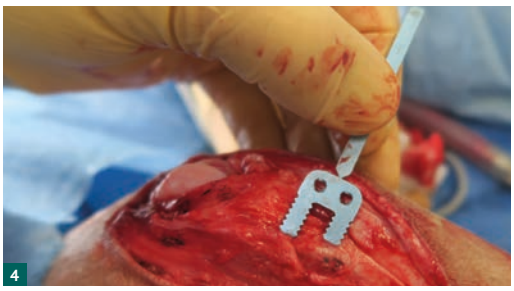
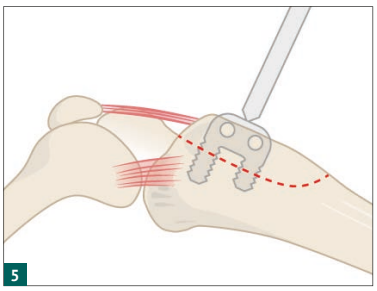



Fig. 4: Planning the osteotomy
Fig. 5: Planning the osteotomy, incision (red)
Fig. 6: Marking of the osteotomy line
Fig. 7: Use of the oscillating saw, incision from proximal to distal

d. Driving in the Swiss Patella Plate®: The plate (with the bar attached) is inserted, using the driving aid, in such a way that the protrusion of the aid does not cause pressure on the osteotomised segment. The plate is inserted with a hammer, perpendicular to the longitudinal axis, through the cancellous bone of the proximal tibia (Fig. 8), ensuring that the proximal foot penetrates before the distal one (Figs. 9 and 10).

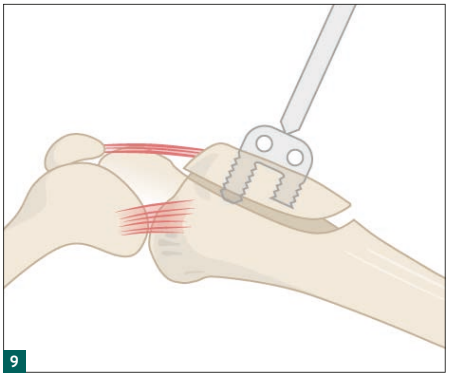
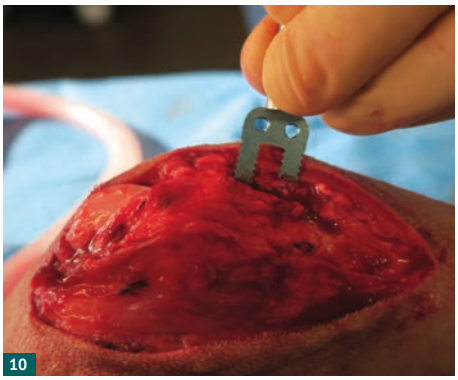




Fig. 8: Driving in the Swiss Patella Plate® (SPP®) with a hammer
Fig. 9: The proximal foot must grasp first
Fig. 10: The first foot has taken hold, the direction of the plate is left unchanged

e. Depending on the lateralisation of the impact plane and the angle of the plate, more or less lateralisation of the tibial tuberosity can be achieved (Fig. 11).

f. The bar is broken off by kinking (Fig. 12).

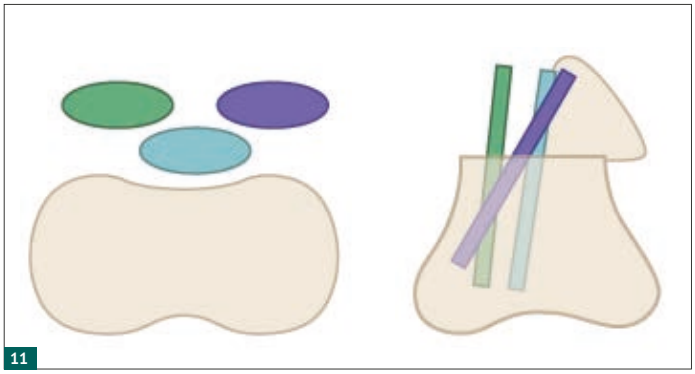
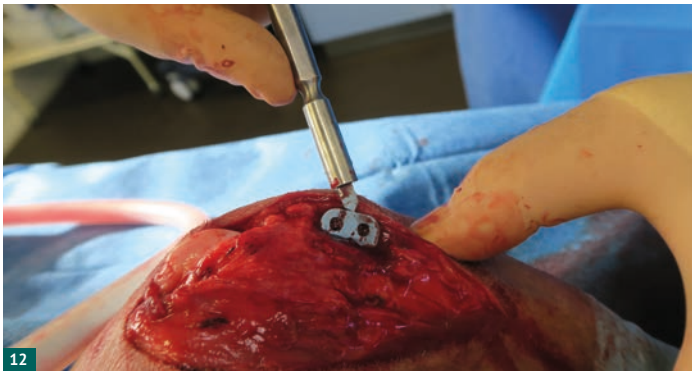



Fig. 11: Possibilities for lateralisation
Fig. 12: Kinking of the bar

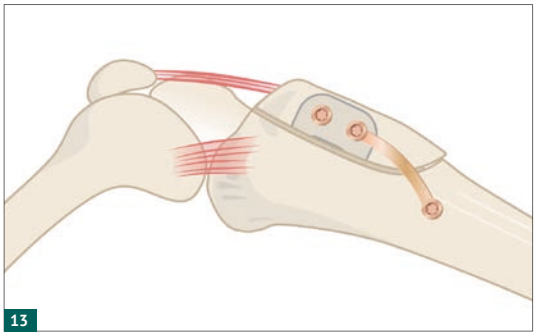
Step 4: Fixation of the plate

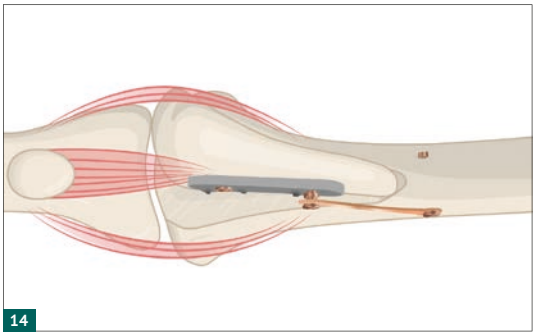
To prevent the quadriceps muscle from pulling the plate out of the tibia, the plate it is attached to the osteotomised tibial tuberosity and the tibial shaft.

a. The tibial tuberosity is placed on the plate with bone grasping forceps and fixed to the tibia. The proximal hole of the screw is drilled with a Ø 1.4 mm or Ø 1.8 mm drill bit; the screw with the corresponding length (Ø 1.7 mm or Ø 2.3 mm) is inserted and fully tightened.

b. The appropriate size locking plate is selected. The third eyelet, in the locking plate, serves to compensate for the misalignment caused by the osteotomised tuberosity. Optional: With heavier dogs it is also possible to use the securing plate fixed distally with 2 screws.

c. As described above for the proximal plate, the securing plate is attached by means of a screw through the distal plate hole. The distal end is fixed to the tibial shaft with a third screw (Figs. 13, 14 and 15).





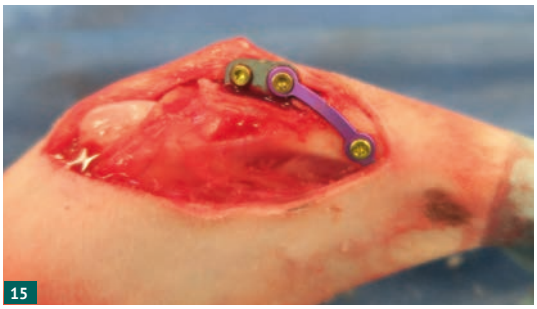


Fig. 13 and 14: Illustration of the fully assembled SPP® with safety bracket and 3 screws
Fig. 15: Fully assembled SPP® with locking plate

Step 5: Closure

After the operation, the fit of the SPP® is checked using X-Rays (Figs. 16 and 17). Bandage therapy is not indicated. Physiotherapy increases and ensures the success of the procedure.

Fig. 16 and 17: Postoperative X-Rays after the use of an SPP®

EICKLOXX SPP® PATELLAR LUXATION SYSTEM – ITEM LIST

EickLoxx SPP®		
Item No.	**Description**	**Quantity**
197200	Complete set, consisting of:	
197250	EickLoxx SPP® Mesh Tray, without instruments and without implants	1
197230	EickLoxx SPP® Implant Tray, without implants	1
185507	Twist Drill, Ø 1.4 mm, AO Quick Coupling	1
185508	Twist Drill, Ø 1.8 mm, AO Quick Coupling	1
185510	Screwdriver Blade, Torx 6, AO Quick Coupling	1
185515	Silicone Screwdriver Handle, cannulated, AO Quick Coupling, L 120 mm	1
185512	Drill Guide Funnel System, 1.7 / 2.3	1
185779	Plate and Screw Holding Forceps, stainless steel, angled, L 150 mm	1
197201	Depth Gauge, measuring range 30 mm, sample 1.0 mm	1
197204	EickLoxx SPP® Panel Impactor	1
197202	EickLoxx SPP® Hammer, small, L 165 mm	1
197203	EickLoxx SPP® Metal Templates, for determining the size of the patellar dislocation plates	1
197205	EickLoxx SPP® Foil Template, for determining the size of the implants, not sterilizable	1
197220	EickLoxx SPP® Patellar Dislocation Plate, size 1	1
197221	EickLoxx SPP® Patellar Dislocation Plate, size 2	1
197222	EickLoxx SPP® Patellar Dislocation Plate, size 3	1
197223	EickLoxx SPP® Patellar Dislocation Plate, size 4	1
197224	EickLoxx SPP® Patellar Dislocation Plate, size 5	1
197225	EickLoxx SPP® Patellar Dislocation Plate, size 6	1
197226	EickLoxx SPP® Patellar Dislocation Plate, size 7	1
197227	EickLoxx SPP® Patellar Dislocation Plate, size 8	1
197216	EickLoxx SPP® Locking Plate, size S, light blue	1
197217	EickLoxx SPP® Locking Plate, size M, magenta	1
197218	EickLoxx SPP® Locking Plate, size L, gold	1
197219	EickLoxx SPP® Locking Plate, size XL, dark blue	1
197210	EickLoxx SPP® Washer, Ø 0.6 mm, magenta	2
197211	EickLoxx SPP® Washer, Ø 1.6 mm, light blue	2
185557	Titanium Locking Screw, Ø 1.7 x L 6 mm, multidirectional, silver, Torx 6, self-drilling, self-tapping	4
185521	Titanium Locking Screw, Ø 1.7 x L 8 mm, multidirectional, silver, Torx 6, self-drilling, self-tapping	4
185522	Titanium Locking Screw, Ø 1.7 x L 10 mm, multidirectional, silver, Torx 6, self-drilling, self-tapping	4
185523	Titanium Locking Screw, Ø 1.7 x L 12 mm, multidirectional, silver, Torx 6, self-drilling, self-tapping	4
185559	Titanium Locking Screw, Ø 2.3 x L 6 mm, multidirectional, gold, Torx 6, self-drilling, self-tapping	4
185528	Titanium Locking Screw, Ø 2.3 x L 8 mm, multidirectional, gold, Torx 6, self-drilling, self-tapping	4
185529	Titanium Locking Screw, Ø 2.3 x L 10 mm, multidirectional, gold, Torx 6, self-drilling, self-tapping	4
185530	Titanium Locking Screw, Ø 2.3 x L 12 mm, multidirectional, gold, Torx 6, self-drilling, self-tapping	4
185554	Container, unperforated tub, including perforated lid, dimensions (in mm): L 312 x W 183 x H 65	1

Swiss Patella Plate® (SPP®) – a new technology for the treatment of Medial Patellar Luxation using an impact plate

In the current surgical treatment of patellar dislocation in small animals, a tension band is inserted, fixing the osteotomised tibial tuberosity. When a band is fitted, the ends of the KIRSCHNER wires can irritate the skin, damage the implant, or even make the implant migrate, requiring them to be removed. With the new impact plate (Swiss Patella Plate®) revision surgeries are avoided. The technology, and the experience over a year, is presented below.▸

Introduction

Patellar luxation (PL) is a widespread skeletal disease in dogs and cats. It occurs mainly in pre-disposed breeds (OFA, 2020). These include, among others: Chihuahua, Pug, French Bulldog, Miniature Pinscher, Poodle, Shih Tzu, Pekingese, Yorkshire Terrier, Maltese. There has been also an increase in large dogs, these include Appenzell Mountain Dogs, Flat Coated Retrievers and Newfoundlands. The patella usually dislocates medially; very few dogs have a lateral patellar dislocation (Vidoni et al., 2005).

Dogs with PL are usually young and present with intermittent lameness in one or both hindlimbs. The diagnosis of PL is possible via palpation. It has been divided into 4 degrees (Putnam, 1968; Singleton, 1969; Koch et al., 1998). The graduation does not necessarily correlate with the clinical picture. There is no clarity about the pathogenesis of PL.

From studies on PL in Papillons (Weber, 1992) correlation could not be drawn from the anatomy of the hind leg and pelvis. The only connection was with the miniaturisation of dogs. The knee angle and shape of the femur could not be correlated with the occurrence of PL (Kaiser et al., 1997; Kaiser et al., 2001a; Kaiser et al., 2001b). Only the three-dimensional processing of images, by means of high-frequency radiography, allowed a working group (Lehmann et al., 2020) the rotation of the femur in the bracing phase with the foot and tibia fixed, demonstrating that the patella is affected by the medially directed pull of the M. quadriceps and can be pulled out of the sulcus femoris. This rotation is found especially in dogs with a wide gait, which can be found in many of the breeds listed above. The phylogenetically defined role of the patella as the original apophysis of the femur and, in most animals today, its role as a functioned free piece of bone in the M. quadriceps network, must remain unexplained for the time being. With regard to treatment, only the medial PL is discussed here.

There are different approaches, taking into consideration the degree of dislocation and the degree of discomfort. The simplest course of action consists of a tightening of the lateral joint capsule, enabling a balanced tension on the patella. This is achieved with anti-rotation sutures, of either slow or non absorbent properties. In many cases there is no sustainability. The classic treatment lies in the depression of the sulcus femoris with a wedge or block resection technique, a lateral displacement of the tibial tuberosity and fixation by means of tension straps. Different fixation methods include the introduction of a single screw or KIRSCHNER wire, if the tibial crest is not completely osteotomised. High grade PL, where the tibial crest and femur are incorrectly aligned, can also be treated with rotation osteotomies, giving a slight cranial shift (Kowaleski et al., 2012). Finally, there is the alternative approach for the extensor tendon apparatus displaced with the patella, where the femoral sulcus should be moved under the patella. For this purpose, the "Patella Groove" half-prosthesis is ideal (Dokic et al., 2015). The most common complication noted is migration of the implants used to fix the osteotomised and laterally relocated tibial tuberosity (Kowaleski et al., 2012; Cashmore et al., 2014; Bosio et al., 2017). In addition, the sharp KIRSCHNER wire end up rubbing the nearby skin and can cause lameness.

For this reason, we are introducing a new fixation method using an impact plate, the Swiss Patella Plate® (SPP®), which is intended to prevent the implants having to be removed in a follow-up operation. This is based on the revision surgery rate with the classic method. The new technology is only suitable for medial PL.

Surgical technique

We recommend surgical treatment of medial PL with a medial approach to the knee joint. A sulcoplasty can be carried out for a shallow femoral sulcus, via a wedge osteotomy and removing a thin deepening wedge. The osteotomy of the tibia is performed using the medial lateral X-Ray and the selected SPP® plate. The separated tibial tuberosity can accommodate 2 screws and the shaft of the tibia should be exposed sufficiently so that the plate can be fitted. The osteotomy is then completed using an oscillating saw from medial and proximal to distal. Depending on the degree of dislocation, the osteotomised tuberosity can now be shifted laterally. A lateral bend in the SPP® that is to be hammered in can increase this.

Now the plate is fixed using a special drive-in aid, hammered into the tibia from the cranial side (Fig. 1). Through a hole in the distal screw of the plate, cerclage wire is passed around the shaft of the tibia (Fig. 2 and 3). After introducing the proximal screw and the distal screw is tightened, the soft tissues can be closed, the lateral fascia near the knee is gathered and the knee is X-rayed (Fig. 4).

Postoperative bandage therapy is not necessary. 8 different plate sizes are available for treatment. The SPP® is attached with 1.7 or 2.3 mm EickLoxx locking screws. The most common cerclage wire diameters are 0.7, 0.8 and 1.0 mm.

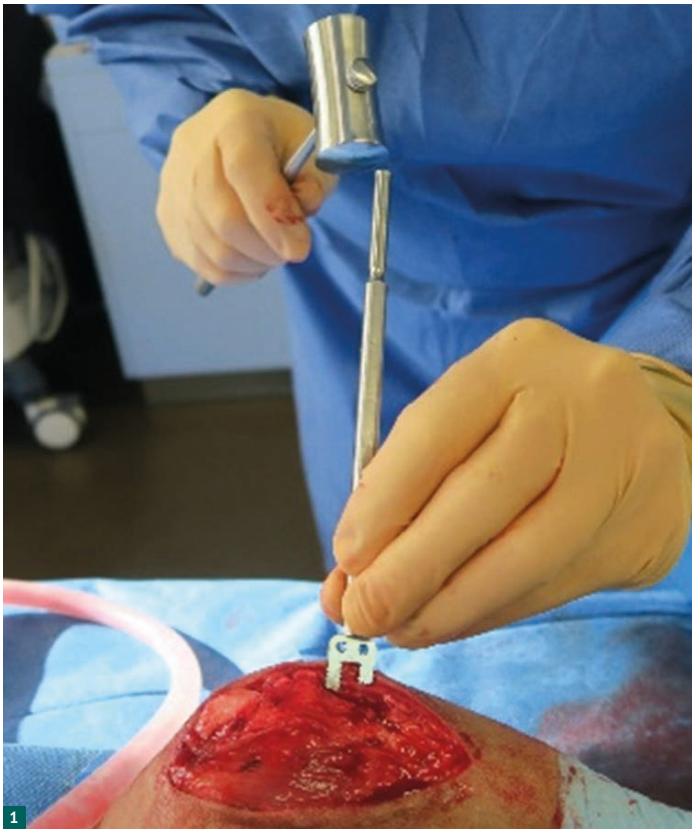


Fig. 1: Impact of the SPP® into the tibia with the aid of an impact aid.

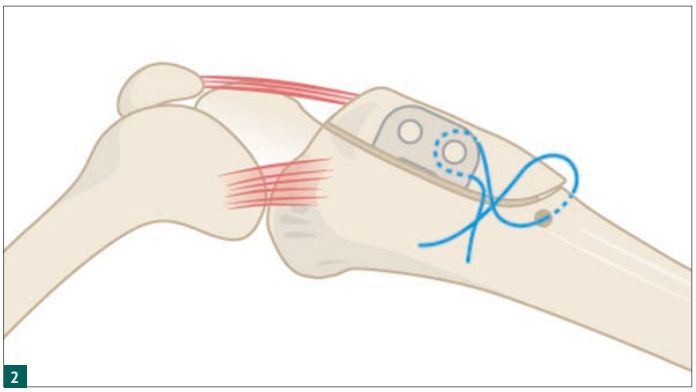


Fig. 2: Schematic view of the surgical technique with SPP®. The plate is hammered into the tibia, the cerclage wire to be applied prevents the rotation of the osteotomised and laterally displaced tibial tuberosity. The osteotomy is performed caudally and sufficiently, especially at the distal end.

Fig. 3: Intraoperative view from the cranial side: the tibial tuberosity moves laterally offset, the implanted SPP® prevents it from sliding back.

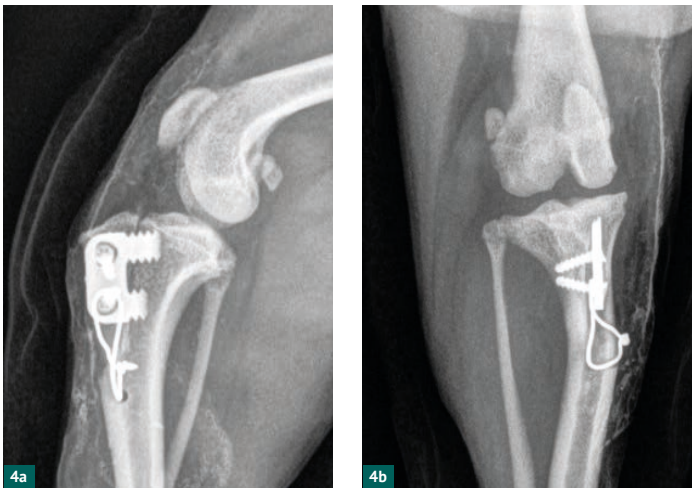


Fig. 4a and 4b: Postoperative X-Rays with a SPP® (size no.3). The cerclage wire goes around the distal screw and a hole in the tibial shaft.

First experience with the technology

In comparison to fixation with a tension belt, where the surgeon can adjust if needed, the plate size must be preoperatively determined, facilitated with the help of a template. Because the tibial tuberosity has to accept two screws the segment should be deep enough. In dogs weighing less than 3 kg, the tibial shaft may not be osteotomised sufficiently enough to be able to accommodate the impact plate.

In the first case of an eight-month-old dog treated with the SPP® no cerclage wire was used because it was assumed that the feet of the plate could resist the tensile forces of the quadriceps. Like the control X-Ray six weeks after showed, the tibial tuberosity rotated slightly proximally, before it grew. We also observed the same phenomenon with three dogs in which the cerclage wire was not fully drawn. Owners reported one clinical relapse with lameness a few days after the operation and a quite lengthy healing process.

Revision surgery rate after 60 cases

The first 60 cases with an SPP® and the above technique with two fixation screws and cerclage wire were evaluated. The observation time after the operation was a minimum of three months. Four dogs had to be operated on again. In three of the dogs the wire had come loose and led to irritation of the skin and consequent lameness. There was also a dog with a reaction to the metal. The revision operation rate was therefore 6.5 %.

In contrast, the long-term rate of implant removal with our previous technique, using the tension band, was 32%, with 87 revisions out of 271 PL cases.

In another three cases with the SPP®, the wire did come loose, but the tibial tuberosity shifted minimally in the proximal direction, which is why revision surgery was not indicated. The bone healed in time and with the formation of callus.

Discussion

In itself, surgical treatment of PL is a standard procedure (Singleton, 1969; Slocum and Devine, 1985; Harasen, 2006; Kowaleski et al., 2012). There is potential for improvement especially with a reliable estimate of the degree of lateralisation, medialisation and fixation of the implants. The classic tension band using two KIRSCHNER wires and cerclage wire carries the risk of loosening the thread free nails. One could argue that using threaded nails would get better hold. This is true, but the principle of tension banding involves one through the muscle pull and the compressive force along the KIRSCHNER wires, lightly pressing the tuberosity onto the tibia and thus promoting healing. (Schwarz, 2005). Lots of surgeons also bend the proximal ends of the KIRSCHNER wires around to minimise abrasion of the overlying fascia, subcutaneous tissue and skin. The bend cannot prevent loosening.

The alternative to the technique is that of the osteotomised tuberosity with a single screw or one individual KIRSCHNER wire. To enable this, the distal saw cut must not be fully completed – the distal end of the tuberosity should just barely touch the tibia and remain connected, thus relieving the tensile forces of the quadriceps. With such a cut, sufficient lateral displacement of the tuberosity can be limited and high levels of PL cannot be corrected as a result of this.

To address the problem of implant loosening or irritation caused implant removal and an associated second intervention, the SPP® was developed. The impact plate reliably prevents medial

backward displacement of the tuberosity. Italian surgeons had a similar idea, putting a nail in the tibia in place of the plate and attaching it to a special external fixator (Petazzoni, 2015). This fixator then had to be removed again. Thanks to the stable fixation of the SPP® using screws and the placement of all implants on the medial side, the revision rate will be greatly reduced.

The numbers from our first test series are shown. The cause of 3 revision surgeries was linked to the tensile strength and fixation of the cerclage wire. These can occasionally break during the operation and require replacement. Damage to the wire caused by asymmetrical pulling/twisting with the pliers around the screw thread can lead to such fractures. Plus, the now freer to pull M.quadriceps can rotate and add to this issue. With this in mind, choose a wire strong enough to tighten and cut, in accordance with the same principles as the working group for Osteosynthesis questions (AO) to be followed (Schwarz, 2005).

Developments introduced by the manufacturer provide alternative fixation possibilities of the wire on the plate, as well as attachment to the tibial shaft (Fig. 5).

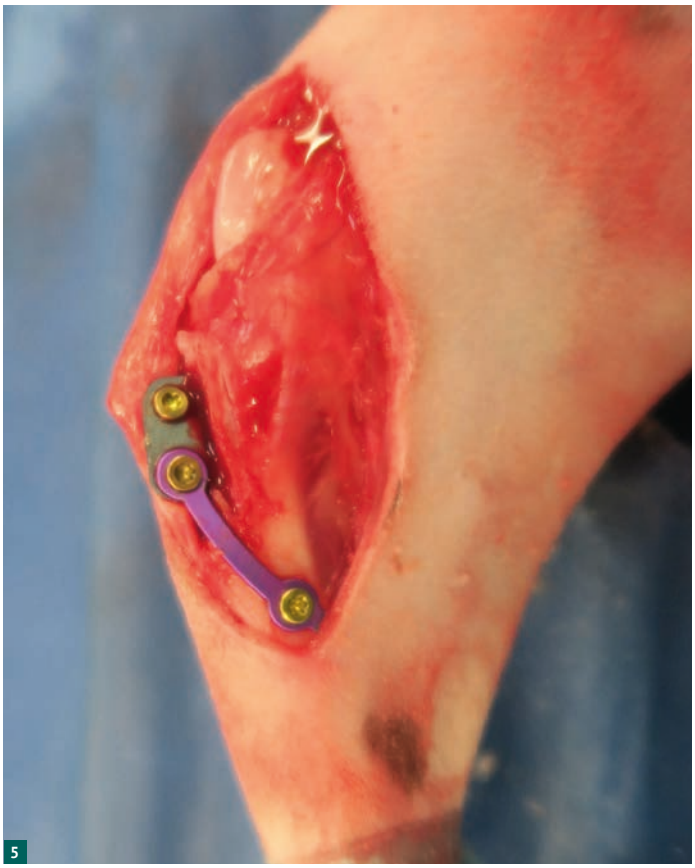


Fig. 5: The latest fixation method: the wire is secured by a titanium bracket / securing plate and screw fixation replaced

A clear limitation with the SPP® is the fact that this method is only suitable for medial PL. With a lateral PL, the tuberosity would have to be displaced medially and force surgeons to place the plate on the lateral side of the tibia. This can only be achieved through widespread deposition of the M. tibialis cranialis from the periosteum. This would mean the blood supply of the osteotomised tuberosity, especially in the important healing phase, would be severely impaired and would loosen because the tibialis cranialis muscle pulls the M. quadriceps and counteracts this.

The technique presented here with the SPP® requires a couple of precautions. A plate cannot be arbitrarily hammered into the end of the tibial shaft, otherwise the lateral stability would be impaired due to broken cancellous bone. The osteotomy needs to be carefully planned as well as performed. It begins just above the menisci and must be wide enough at its distal end to be able to take the plate. This will be a problem, especially in small dogs under 4 kg, even if the smallest plate fits. The stable fixation of the cerclage wire between the bone and the plate and around the distal screw, and correct tensioning and twisting, do not always succeed, leading to slightly unstable conditions and delayed healing. The osteotomised tuberosity must also be handled with bone grasping forceps on the tibial shaft and laterally against the plate, which requires skill.

Overall, the new technology is easy to learn for experienced surgeons. The increased effort is worthwhile, thanks to less postoperative work and complications.

Literature:

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