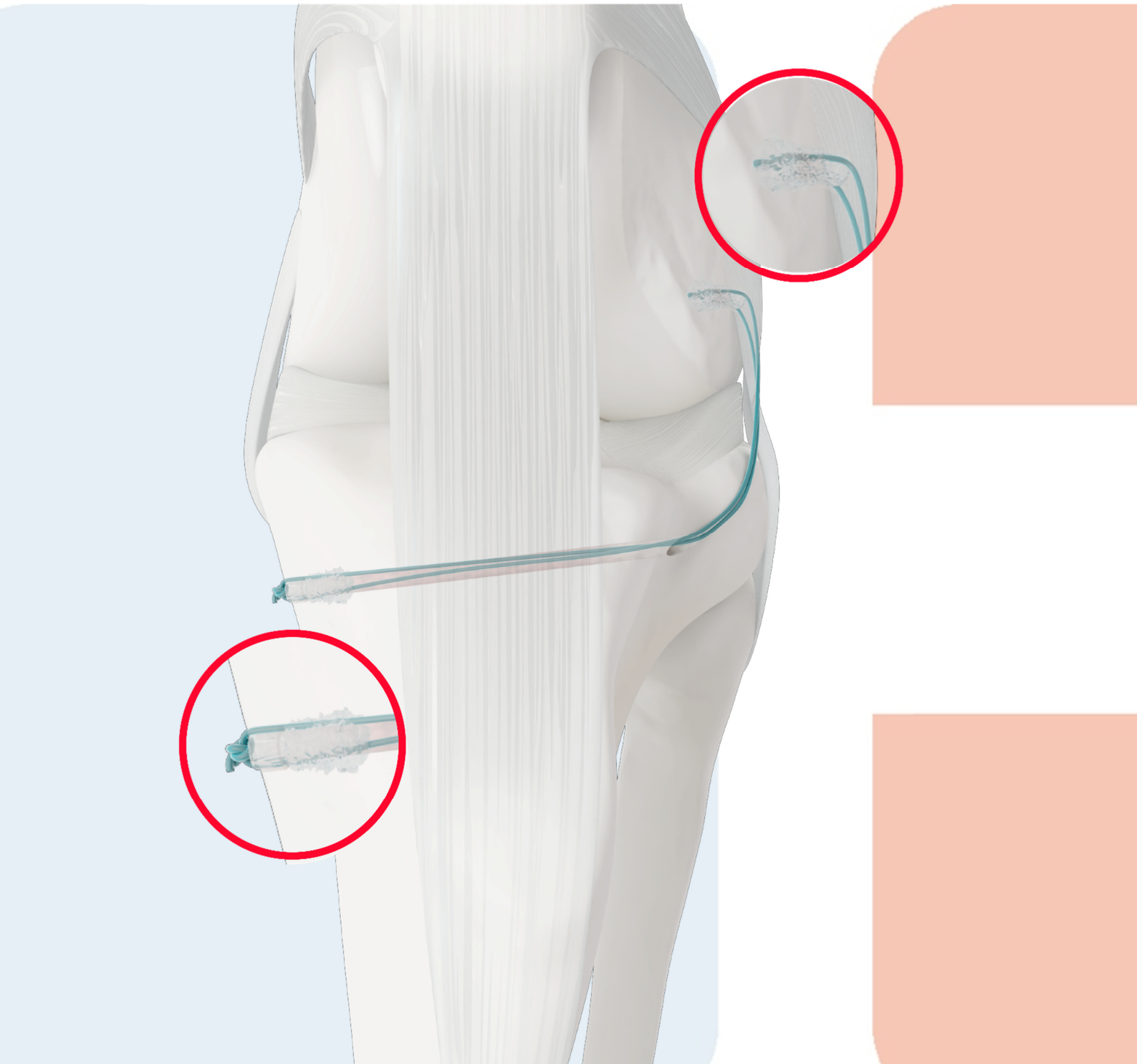
Cranial Cruciate Ligament Repair using the Weldix® Suture Anchor

Surgical Technique

Vet Welding



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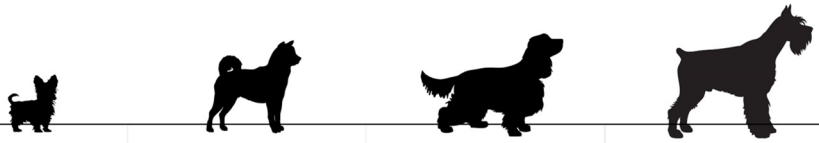
Overview

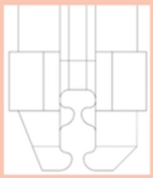
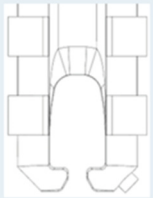
Weight Chart



Cranial Cruciate Ligament	3-7 kg	8-12 kg	13-17 kg	18-25 kg
Weldix® 2.3mm Anchor: multifilament sutures	3-10 kg			
Weldix® 2.3mm Anchor: monofilament sutures	3-10 kg			
Weldix® 3.0mm Anchor: multifilament sutures	3-25 kg			
Weldix® 3.0mm Anchor: monofilament sutures	3-25 kg			

As with all orthopedic procedures, post operative care is of utmost importance and owner compliance an absolute necessity. Patient must be discouraged from running and jumping for at least six weeks. Walks on a static (not retractable) leash are limited to 5 minutes for the first 2 weeks, gradually increasing in time. External coaptation is recommended for 4–6 weeks postoperatively. If the patient is excitable or unpredictable when out of the owner's direct supervision, crate rest is recommended.

Suture Compatibility

Weldix® Anchor	Suture Type	Suture Size
Weldix® 2.3mm 	Monofilament, resorbable, single loaded	
	Polyglyconate (copolymer of glycolic acid & trimethylene carbonate)	USP #2/0 to #2
	Monofilament, non-resorbable, single loaded	
	Polypropylene	USP #2/0 to #1
	Polyamide 6 and 6.6	
	Multifilament, non-resorbable, single loaded	
	Polyester (polyethylene terephthalate)	USP #3/0 to #2
	UHMWPE/polyester	USP #4/0 to #1
Weldix® 3.0mm 	Monofilament, non-resorbable, single loaded	
	Polypropylene	USP #2 to #5
	Multifilament, non-resorbable, single loaded	
	Polyester (UHMWPE & polyethylene terephthalate)	USP #2 to #5
	Polyester Tape	Up to 2 mm

BoneWelder® Vet Equipment

BoneWelder® Vet

The BoneWelder® Vet is the heart of the BoneWelding® system. This small, user-friendly machine provides the energy to power the ultrasonic handpiece. Two handpiece plug-in option allows for dual user capabilities.

Handpiece

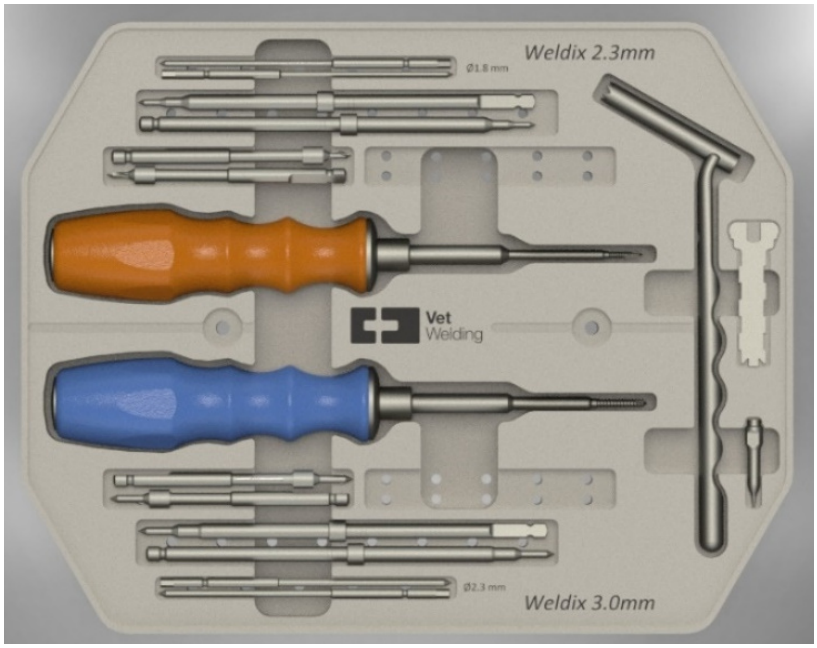
The handpiece to the BoneWelder® Vet is lightweight and ergonomically designed for comfort in handling. One-button technology allows for ease in use for transferring ultrasonic power to the implant.

Wrench

The wrench allows you to mount the sonotrode properly on the handpiece making sure the connection is tight for an appropriate transfer of the ultrasonic energy into the implant. Fits to every sonotrode.

Weldix® Instrument Set

The Instrument Set provides all the instruments to implant the Weldix® Anchors.



Weldix® Anchor

Weldix® 2.3 Anchor

Diameter	2.3mm
Length	7.2mm
Material	PLDLLA
Suture Sizes	USP #4-0 to #2
Drill Footprint	1.8mm x 8.5mm

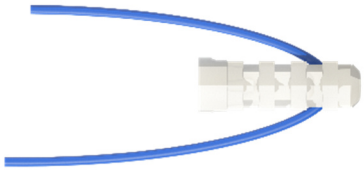
Weldix® 3.0 Anchor

Diameter	3.0mm
Length	8.7mm
Material	PLDLLA & βTCP (composite material)
Suture Sizes	USP #2 to #5 and up to 2mm Tapes
Drill Footprint	2.3mm x 12mm

The Weldix® polymer material is resorbed and substituted by natural bone within 12 – 24 months.

The Weldix® Anchors come without sutures, allowing the surgeon to use the suture of his preference (see suture compatibility table on page 3).

Suture



The Weldix® 2.3mm Anchor fits with a suture UPS #4-0 up to #2. Both multi- and monofilament sutures are compatible with the Weldix® 2.3mm Anchor.

The Weldix® 3.0mm Anchor fits with a suture UPS #2 up to #5 and up to 2mm Tapes. Both multi- and monofilament sutures are compatible with the Weldix® 3.0mm Anchor.

Sonotrode

The sonotrode is mounted on the handpiece. It transmits ultrasonic energy to the Weldix® Anchor. The sonotrode has a press-fit with the Weldix® Anchor preventing it from falling off.

The same sonotrode is used for both anchors.

Drill Bits

The drill bits are sized specifically for the Weldix® 2.3 and 3.0mm Anchors.
There are two types:

A) Drill bits with a drill stop.

B) Drill bits to be used with a drill guide.

The Drill bits are available with an AO or a BOS quick coupling.

Drill Usage Guide

	Weldix® 2.3mm Anchor	Weldix® 3.0mm Anchor
Drill Bit with Drill Stop	Drill Bit Weldix® 2.3mm Anchor with Drill Stop, AO quick coupling 	Drill Bit Weldix® 3.0mm Anchor with Drill Stop, AO quick coupling 
	Drill Bit Weldix® 2.3mm Anchor with Drill Stop, BOS quick coupling 	Drill Bit Weldix® 3.0mm Anchor with Drill Stop, BOS quick coupling 
Optionally available: Drill Guide with Stop 	Drill Bit Weldix® 2.3mm Anchor Drill Stop with Guide, AO quick coupling 	Drill Bit Weldix® 3.0mm Anchor Drill Stop with Guide, AO quick coupling 
	Drill Bit Weldix® 2.3mm Anchor Drill Stop with Guide, BOS quick coupling 	Drill Bit Weldix® 3.0mm Anchor Drill Stop with Guide, BOS quick coupling 
Tunnel Drill	Drill Bit for Bone Tunnel 1.8mm, AO quick coupling 	Drill Bit for Bone Tunnel 2.3mm, AO quick coupling 
	Drill Bit for Bone Tunnel 1.8mm, BOS quick coupling 	Drill Bit for Bone Tunnel 2.3mm, BOS quick coupling 
Bone Tap*	1.7mm Tap for Weldix® 2.3mm Anchor 	2.9mm Tap for Weldix® 3.0mm Anchor 

* The Bone Taps are used when there is no cancellous bone available in which the anchor can safely be attached (e.g. calcaneus of a cat).

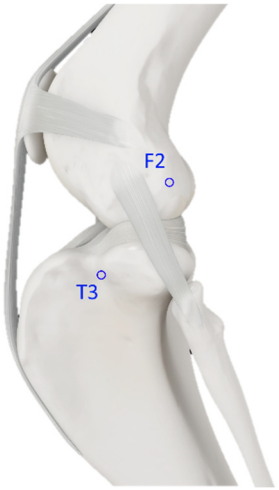
Surgical Technique

1. Position Patient and Prepare Footprint

During the surgery the patient is placed in dorsal recumbency, and the knee is exorotated.

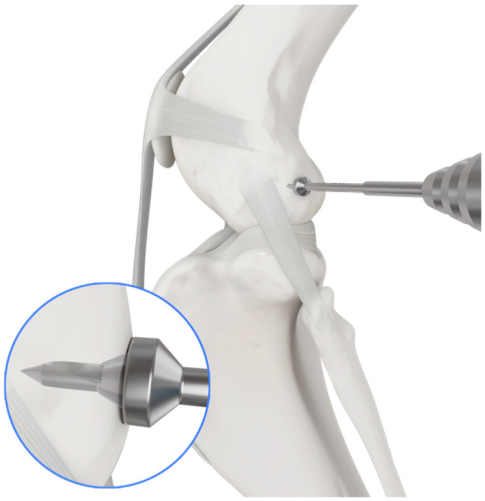
2. Identify Landmarks

Identify the F2 and T3 points. **F2** is the distal point of the lateral fabella, cranial to the margin of the articular cartilage. **T3** is the point of bony prominence caudal to the long digital extensor groove.



3. Drilling the Hole

After identifying the landmarks, the hole at **F2** must be drilled. Use the corresponding drill bit for the Weldix® 2.3mm or 3.0mm Anchor to create the pilot hole. The correct drill depth is reached when the drill stop touches the bone surface.



Attention!

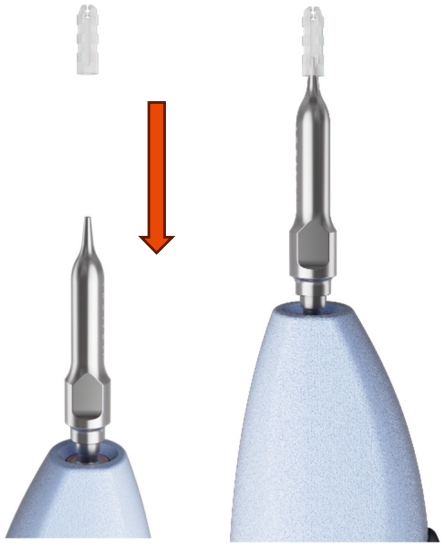
Drilling too deep or not deep enough can cause insufficient anchor stability or increased risk of suture damage. Particular attention has also to be paid not to enlarge the hole diameter during drilling, as this would compromise polymer intercalation into the bone.

4. Optional: Tapping the Hole

In case the hole is drilled in a place with no or minimal cancellous bone stock, it is recommended to tap the pilot hole with the corresponding Weldix® Tap**. Make sure to tap in the same direction as the drill hole to avoid enlarging the cavity.** Once resistance indicates the bottom of the pilot hole the tap can be screw out.

5. Weldix® Anchor Preparation

Remove the Weldix® Anchor from its packaging under aseptic conditions. Secure the Weldix® Anchor on the tip of the sonotrode and clinch an adequate suture into the dedicated suture grooves situated on the tip of the anchor.



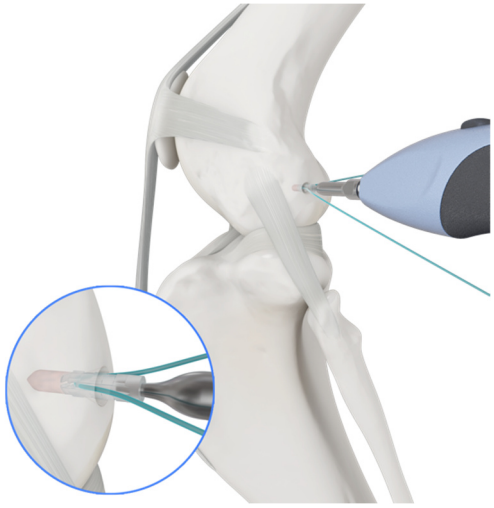
Attention!

- Verify that the Weldix® Anchor is firmly sitting on the sonotrode to ensure optimal ultrasound transmission to the Weldix® Anchor.
- Be careful not to actuate the sonotrode while mounting the anchor and clenching the suture.

6. Insertion of the Weldix® Anchor

a) Position the Weldix® Anchor in the countersink of the pre-drilled pilot hole and make sure that it is aligned with the drill hole.

b) Apply an axial compression force before starting the ultrasound process. The weight applied should be approximately **1 kg for the Weldix® 2.3mm** Anchor and **3kg for the Weldix® 3.0mm** Anchor.



c) Press the pushbutton on the handpiece and insert the Weldix® Anchor by applying constant force until complete implantation (2-3 sec).

d) Stop the implantation process by releasing the pushbutton as soon as the implant is flush with the bone surface.

e) **The handpiece tip must be held in place for at least 5 seconds** to allow solidification of the polymer.

f) Remove the handpiece tip from the Weldix® Anchor with a light twisting movement.

g) Verify the mechanical fixation of the Weldix® Anchor in the bone intraoperatively by pulling concurrently on both suture strands.

h) If you require a gliding suture in the anchor, pull the suture through the anchor with force to release it from the anchor.

Attention!

- During the insertion procedure, the suture must NOT be kept under tension.
- The direction of the insertion must exactly follow the pre-drilled hole.
- If the Weldix® Anchor is not fully inserted the implant performance cannot be ensured.

Tip

Holding the handpiece like a pen makes it easier to simultaneously press the button and apply a constant force to the handpiece.

6.1. Troubleshooting

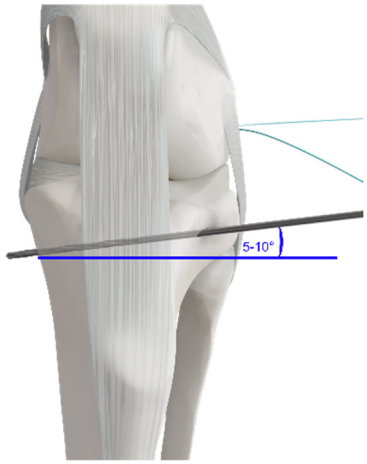
COMPLICATIONS	CAUSE	REMEDY
Weldix® Anchor pull-out with partial melting and backflow of polymer to the surface during insertion.	Very dense bone, which prevents the liquefied polymer from infiltrating into the surrounding cancellous bone.	Remove the anchor either by pulling it out or drilling it out using the same drill bit. Then carefully tap the pilot hole with the appositely designed Weldix® Tap. A new Weldix® Anchor can be placed in the tapped hole.
Weldix® Anchor pull-out with no or with only very limited melting of the surface. Anchor "falling into the hole" during insertion.	The pre-drilled and/or tapped cavity is enlarged. Insufficient bone-anchor contact during insertion.	**The cavity cannot be re-used!** Drill a new cavity and insert a new Weldix® Anchor.
The Weldix® Anchor is not fully inserted.	Either the button was released too early or not enough axial force was applied to the Weldix® Anchor.	Remove the Weldix® Anchor either by pulling it out or by drilling it out using the same drill bit. Care must be taken to drill in the same direction as the original hole. A new anchor of the same size can be placed in the same hole.
The Weldix® Anchor won't insert, the head of the Weldix® Anchor melts.	The Weldix® Anchor is not aligned properly to the countersink. The direction of insertion does not exactly follow the pre-drilled hole. Insufficient pre-load on the implant during the activation of the ultrasound.	A new Weldix® Anchor can be placed in the same location. Ensure that the Weldix® Anchor is properly placed in the countersink and aligned with the hole. Apply sufficient axial force (1kg for 2.3-Anchor / 3kg for 3.0-Anchor) before activating the ultrasound.

Attention!

- Do not re-use or re-sterilize the Weldix® Anchor!

7. Drilling the Tunnel

Identify the **T3** point as described in the first step. Drill the 1.8mm or 2.3mm bone tunnel completely to the medial side with the corresponding twist drill. The tunnel is drilled at a 5-to-10-degree angle with respect to the tibia plateau from lateral to medial.

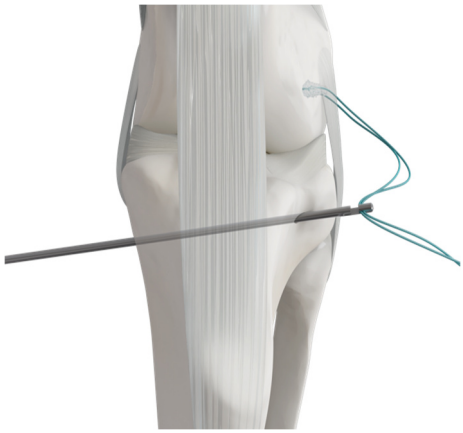


Use the corresponding Weldix® Drill to overdrill the end of the bone tunnel.

Attention!
When using your own drill, make sure that the diameter is maximal 1.8mm for the Weldix® 2.3mm Anchor and 2.3mm for the Weldix® 3.0mm Anchor.

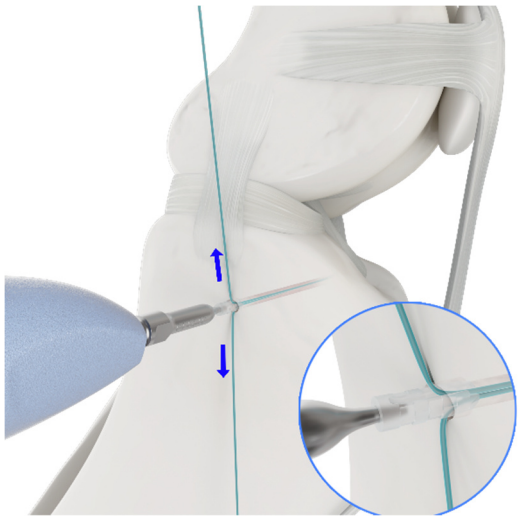
8. Passing the Suture

Pass the suture through the bone tunnel with the suture passer from lateral to medial.



9. Insertion of second Weldix® Anchor

For the insertion of the second Weldix® Anchor an assistant is required. The suture must be pulled strongly, one end in proximal direction and one end in distal direction. Tightening the suture ensures a good stabilization of the joint. Whilst inserting the Weldix® Anchor, a bit of extra rotation on the tibial tuberosity is suggested.



10. Knotting the Suture

We recommend using one double knot and three surgical knots on top of the Weldix® Anchor.

11. Postoperative Care

Postoperative follow up, postoperative care and the duration of treatment depend on the patient's condition and is determined by the surgeon.

Patient must be discouraged from running and jumping for at least six weeks. Walks on a static (not retractable) leash should be limited to 5 minutes in the first 2 weeks, gradually increasing in time for an additional 6 weeks.

External coaptation is recommended for 4–6 weeks postoperatively to protect the repair during the early phases of healing.

Ordering Information

1. Implants

PRODUCT NAME	DESCRIPTION	REF NO.
Weldix Anchor 2.3mm (1pcs) in a 10box (10total)	Implant	02-01-007
Weldix Anchor 2.3mm (2pcs) in a 10box (20total)	Implant	02-01-008
DEMO Weldix® 2.3mm Anchor, 10pcs (not for clinical use)	DEMO Implant	02-01-901
Weldix Anchor 3.0mm (1pcs) in a 10box (10total)	Implant	02-01-011
Weldix Anchor 3.0mm (2pcs) in a 10box (20total)	Implant	02-01-012
DEMO Weldix® 3.0mm Anchor, 10pcs (not for clinical use)	DEMO Implant	02-01-903

2. Instruments

PRODUCT NAME	DESCRIPTION	REF NO.
BoneWelder® Vet System Incl. Ultrasonic Device, Handpiece, Wrench and Power Cord	Set	01-00-001
BoneWelder® Vet Ultrasonic Device - Incl. Power Cord	Ultrasonic Device	01-01-001
BoneWelder® Vet Handpiece	Instrument	01-02-001
BoneWelder® Vet Wrench	Instrument	01-03-001
BoneWelder® Vet Long Conical 1.4mm Sonotrode (for Weldix 2.3 & 3.0)	Instrument	01-04-004
Drill Bit Weldix® 2.3mm Anchor with Drill Stop, AO quick coupling	Instrument	01-05-009
Drill Bit Weldix 2.3mm Anchor with Drill Stop, BOS quick coupling	Instrument	01-05-010
Drill Bit for Tunnel 1.8mm AO Quick coupling	Instrument	01-05-011
Drill Bit for Tunnel 1.8mm BOS Quick coupling	Instrument	01-05-012
Drill Bit Weldix® 2.3mm Anchor Drill Stop with guide, AO quick coupling	Instrument	01-05-017
Drill Bit Weldix® 2.3mm Anchor Drill Stop with guide, BOS quick coupling	Instrument	01-05-018
Drill Bit Weldix® 3.0mm Anchor with Drill Stop, AO Quick coupling	Instrument	01-05-006
Drill Bit Weldix® 3.0mm Anchor with Drill Stop, BOS Quick coupling	Instrument	01-05-015
Drill Bit Weldix® 3.0mm Anchor Drill Stop with guide, AO quick coupling	Instrument	01-05-008
Drill Bit Weldix® 3.0mm Anchor Drill Stop with guide, BOS quick coupling	Instrument	01-05-016
Drill Bit for Tunnel 2.3mm AO Quick coupling	Instrument	01-05-013
Drill Bit for Tunnel 2.3mm BOS Quick coupling	Instrument	01-05-014
Weldix® Drill Guide - Short	Instrument	01-06-001
Suture Passer, 1.5mm, 25cm	Instrument	V24-550-15-07
2.3mm Tap for Weldix® 2.3mm Anchor	Instrument	01-07-001
2.9mm Tap for Weldix® 3.0mm Anchor	Instrument	01-07-002
Tray for Weldix Instruments	Casing	01-09-001

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