tst | Orthopedic Implants

TITANIUM ELASTIC PIN

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Introductions

Indications

Titanium Elastic Pin (TEP) is intended for fixation of diaphyseal fractures where the canal is narrow or flexibility of the implant is extraordinary.

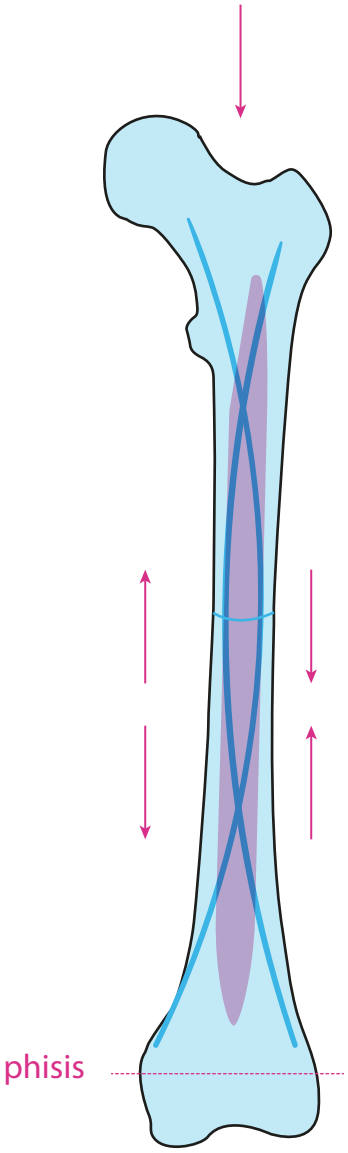
Lower extremity fractures in pediatric and small-statured patients.

Upper extremity fractures in all patients.

In pediatric applications, the flexibility of the elastic nail allows it to be inserted at a point which avoids disruption of the bone growth plate.

Biomechanical Principles of the TEP

It is based on the symmetrical bracing action of two elastic nails inserted into the methaphysis, each of which bears against the iner bone at three points. This produces the following four properties: flexural stability, axial stability, translational stability and rotational stability. All four are essential for achieving optimal results.



Instruments

EXTRACTOR HUMMER GUIDE

TEP CURVED INSERTER

TEP STRAIGHT INSERTER

TEP END CAP INSERTER 2.0-2.5 MM

TEP END CAP INSERTER 3-4 MM

SPECIAL ROD CUTTER FOR Ø 2.0,2.5,3.5,4.0 MM

TITANIUM ELASTIC PIN (TEP) AWL

CURVED AWL

SOFT SCREW DRIVER QUICK LARGE

EXTRACTOR HUMMER

LOCKING PLIERS

JACOPS KEY

TEP CANNULATED INSERTER

Surgical Technique

Nail Selection

TEP nails are available in five diameters (2 mm, 2.5 mm, 3 mm, 3.5 mm, 4 mm) and in two lengths (350 mm-450 mm). Measure the narrowest diameter of the medullary canal with a ruler. The proper nail diameter is no more than 40 % of the width of the canal.
Nail sizes are dependent on patient anatomy and average stature.
Select two nails of the same diameter so the opposing bending forces are equal, avoiding malalignment.

Femoral Nail Insertion

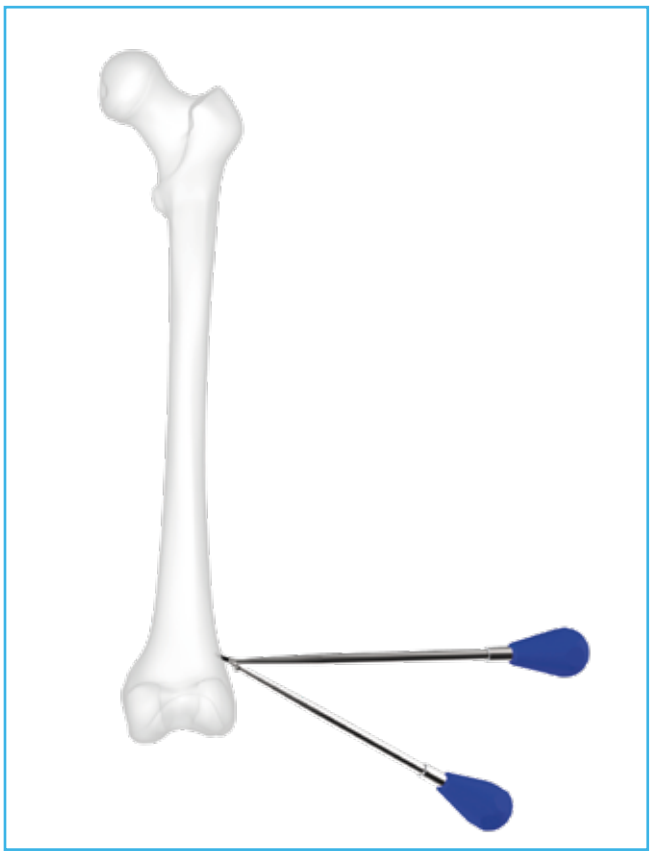
Femoral fractures in children are stabilized with two nails inserted in a retrograde manner from medial and lateral entry points above the distal physis. Antegrade nailing, with a lateral entry point, is normally reserved for very distal femoral fractures.

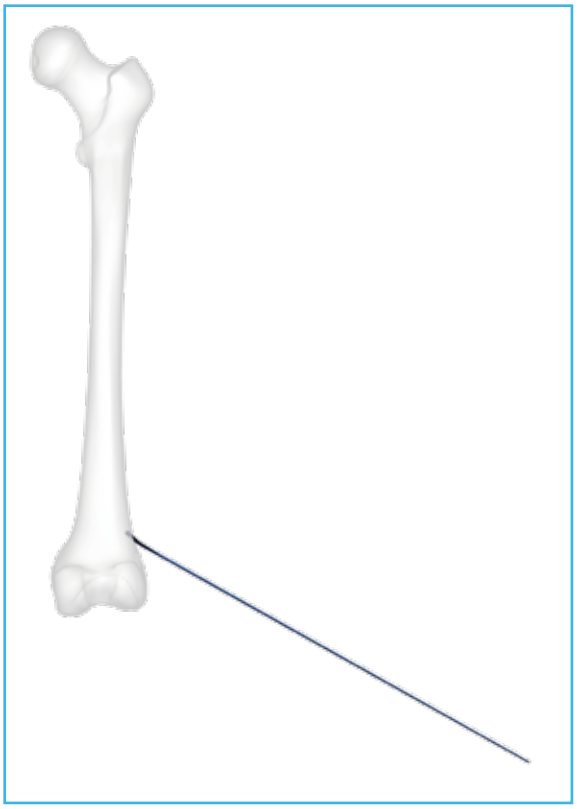
Retrograde Technique for Femoral Fractures;

The patient is placed in the supine in a free position or a fracture table with a traction boot. Reduce the fracture and confirm alignment with fluoroscopy in both the AP and lateral views.
Contour both nails into a bow shape with the nail tip pointing to the concave side of the bowed nail. The etched line on the nail will provide a reference for the nail tip during insertion and should follow the same plane as the bow. Countouring may be done by hand or with the *TEP Bender* The apex of the bow should be at the level of the fracture. This shape allows the nail to generate optimal resistance to malaligning froces. The bow in each nail should be similar for a balanced effect.

Create Nail Entry Point

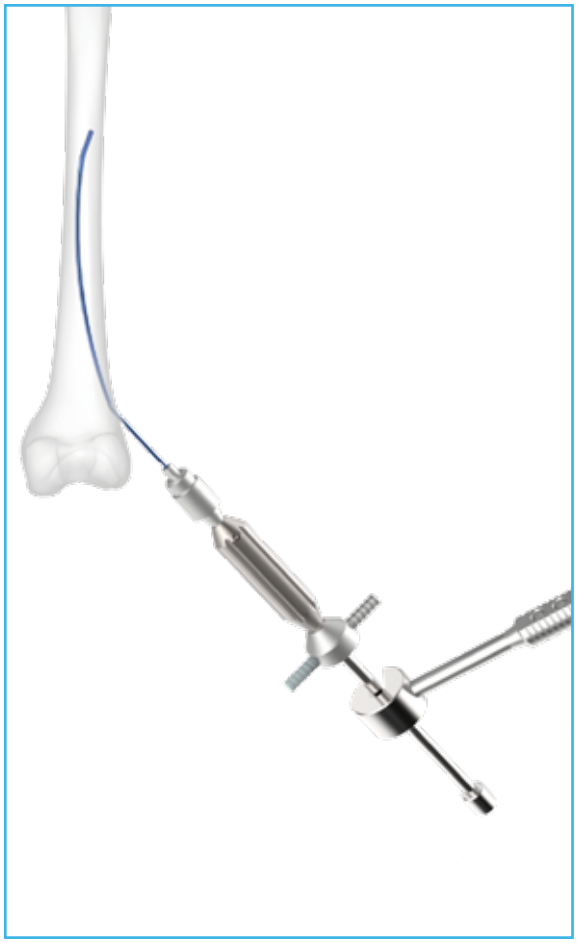
Make an entry point on the lateral or medial aspect of the distal femur, starting 3 cm above the physis and extending distally for 2.5 cm. The entry point for the nail should be 2.5 cm to 3.0 cm proximal to the physis. Select the next largest drill bit relative to the diameter of the nail. Use the 4.5 mm/3.5 mm double drill guide to protect the soft tissues. Start the drill bit perpendicular to the bone surface, 2.5 cm-3.0 cm proximal to the physis. Check the drill bit position with fluoroscopy.
Penetrate the near cortex with the drill bit. With the drill bit rotating, but not advancing, slowly lower the drill to a 45° angle relative to the shaft axis. Now advanced the drill bit at this angle until it reaches the medullary canal. Alternatively the *Awl* can be used to penetrate the near cortex. Vertically insert the Awl down to the bone. With rotating motion, lower the *Awl* to a 45° angle relative to the shaft axis and continue to penatrate the cortical bone at an upward angle. If the operative plan includes use of an end cap for elastic nail, the *Awl* must be inserted fully into the entry site before nail insertion and rotated at least 180° to ensure the end cap fit.





Insert Nail

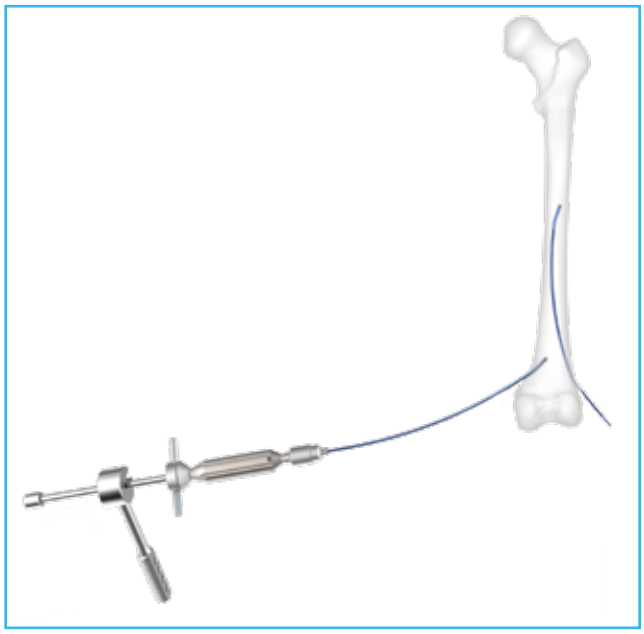
Located and maintain the entry hole with a fingertip while withdrawing the drill bit and introducing the nail. Using fluoroscopy, align the nail tip so the convex side will glance off the far cortex. Advance the nail through the drilled entry hole by hand as far as possible.Attach the *Cannulated Inserter* onto the nail with a length of about 150 mm of nail between the inserter and entry point. The longer this distance, the more difficult hammering will be since the nail will dampen the impact force. Tighten the inserter using the wrench.



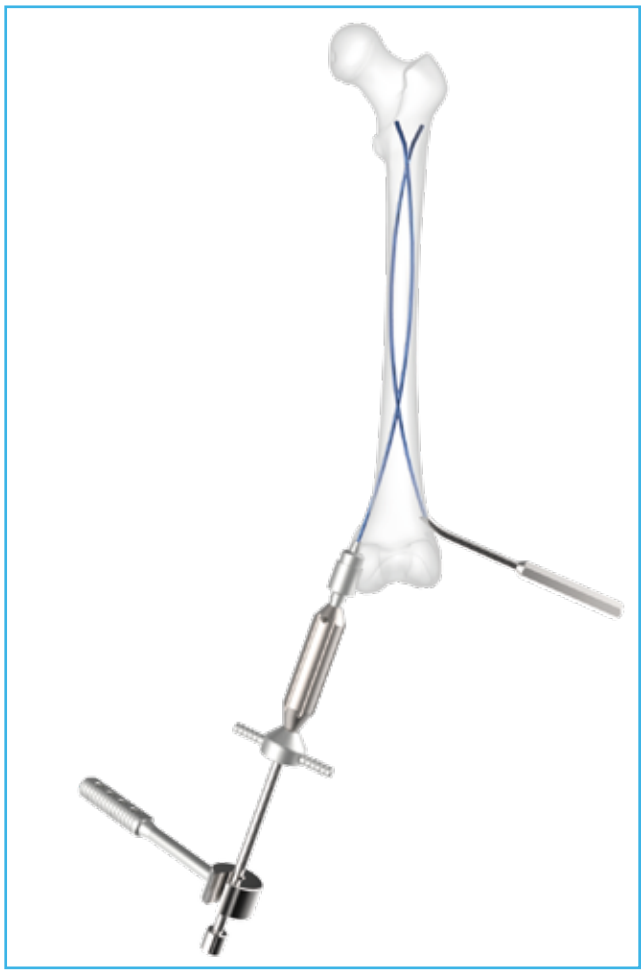
Place slotted hammer on the shaft of the inserter. Use controlled blows to drive the nail up the medullary canal.

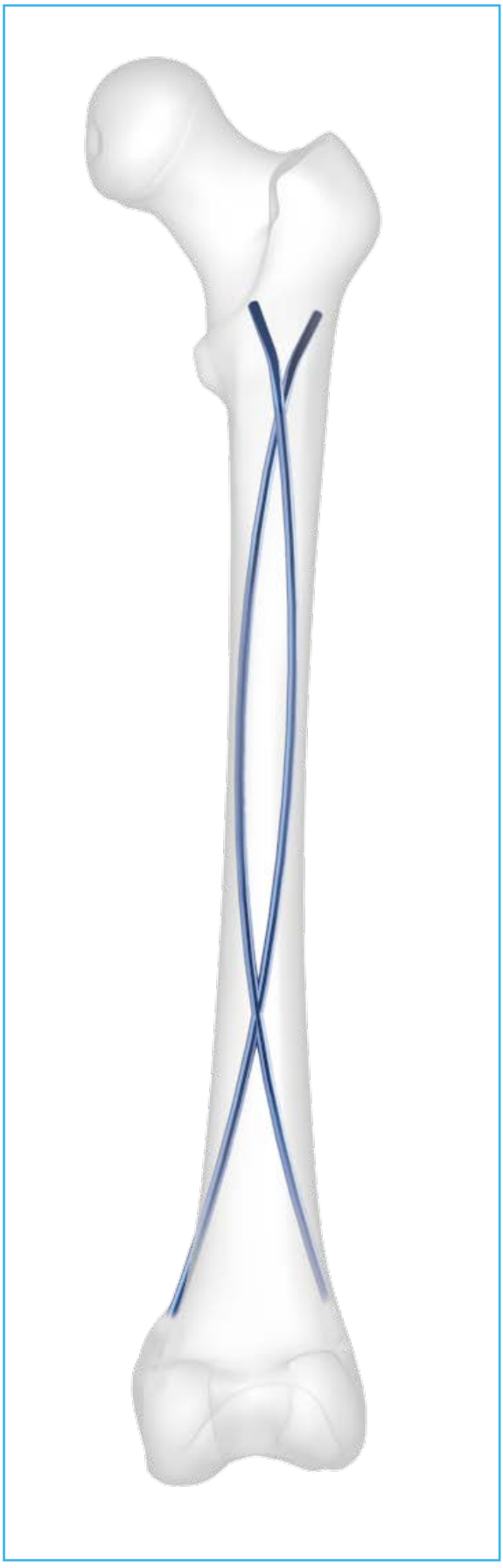
Monitor nail advancement with fluoroscopy Ensure that the convex side of the nail tip is glancing off the far cortex and is advancing with each blow. The nail will bend as it progresses up the canal. This part of the procedure requires the greatest insertion force.

Drive the first nail to the level of the fracture. In a similar manner to that previously described, open the femur on the opposite side and insert the second nail up to the level of the fracture. After the reduction visualize the fracture with fluoroscopy. Determine which nail will be easier to pass across the fracture. Advance that nail which will most effectively pull the proximal fragment into alignment. Using the *Inserter* and *Slotted Hammer,* drive the nail across the fracture, monitoring nail position with fluoroscopy.



The nail can be rotated to manipulate the curved tip across the fracture. Rotation is easiest while the nail is being advanced or retracted. Care should be taken not to twist the nails more than 90°. Otherwise, a "corkscrew phenomenon" may be created and stability will be lost. Rotating the nail while it is stationary may be loosen the inserter. Advance the nail into the proximal fragment only enough to ensure reduction will be mantained. Further advancement may cause displacement of the proximal fragment making it more difficult to pass the second nail. Confirm nail position in both the AP and lateral views. Using the inserter and slotted hammer, drive the second nail across the fracture and into the proximal fragment. Continue advancing this nail until it is just distal to the proximal physis. Advance the other nail to the same level. The two nails should diverge in opposite directions, both medial and lateral, for optimal rotational stability. If the fracture is distracted, release traction and impact the patient's heel.

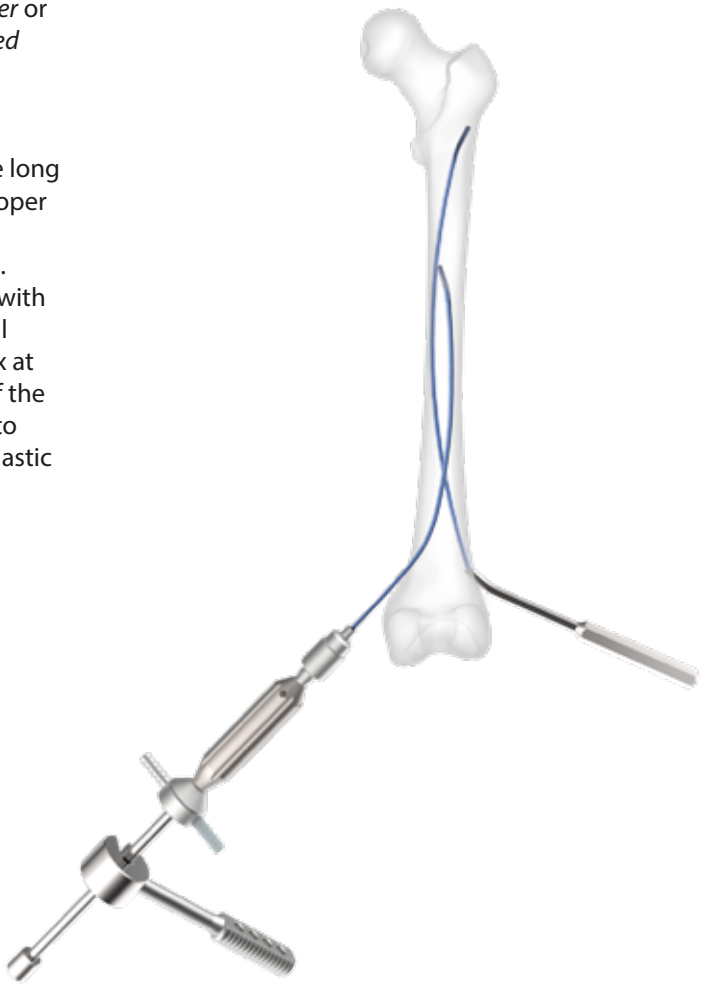




Before cutting the nails to length, verify the position of the nails in relation to the rotation of the leg. Once the nail is inserted to its final position, mark the nail with a pen or clamp at the planned cutoff point. The cutoff point should be 10 mm-20 mm outside of the cortex (only 10 mm if using the end cap). Retract the nail far enough to access the cutoff point from outside of the incision (usually 25 mm -50 mm).

The nail end can be bent away from the bone to deform it slightly (approximately 10°-15° of permanent deffection). This will allow the protruding nail end to sit slightly off of the cortex for easy removal while remaining low profile to minimize soft tissue irritation. (The nail end must not be bent away from the cortex if using an elastic nail end cap.)

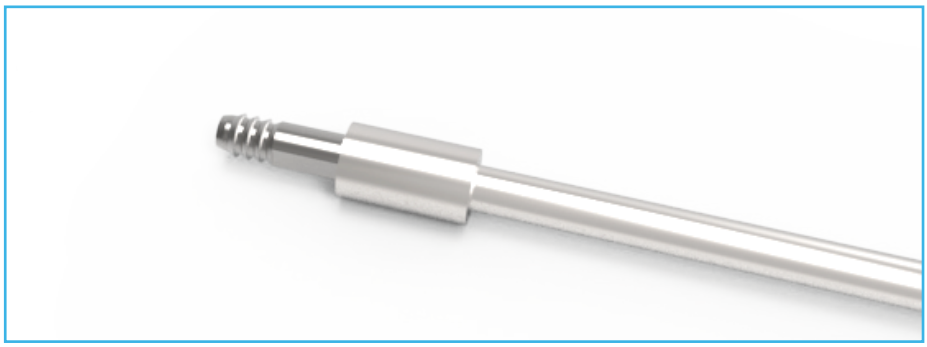
Reinsert the nail with either the *TEP Straight Inserter* or the *TEP Curved Inserter* and the *Hammer.* The *Curved Inserter* captures 6 mm of nail tip and will leave approximately 10 mm of nail protruding from the cortex when the inserter is driven flush to the periosteum. Keep the etched line aligned with the long axis of the bone to keep the beveled surface in proper orientation. İn order to prevent distraction of the fracture, slight blow on the knee is recommended. Confirm final nail position and fracture reduction with fluoroscopy. In its final position, the end of the nail should protrude 10 mm-20 mm outside the cortex at an angle approximately 10°-15° above the bone. If the nail has been overinserted, use the locking pliers to grip and retract the nail. If using the end cap for elastic nail 3 mm-4 mm diameters, the nail should only protrude 10 mm.



The end cap is inserted over the external position of TEP and threaded into the cortical bone in an oblique orientation. This is to prevent nail migration and soft tissue irritation. Use of the end cap also facilitates extraction of the nail.

Attach the end cap inserter to the driver. Connect an end cap to the end cap inserter by aligning the “D“ flats.

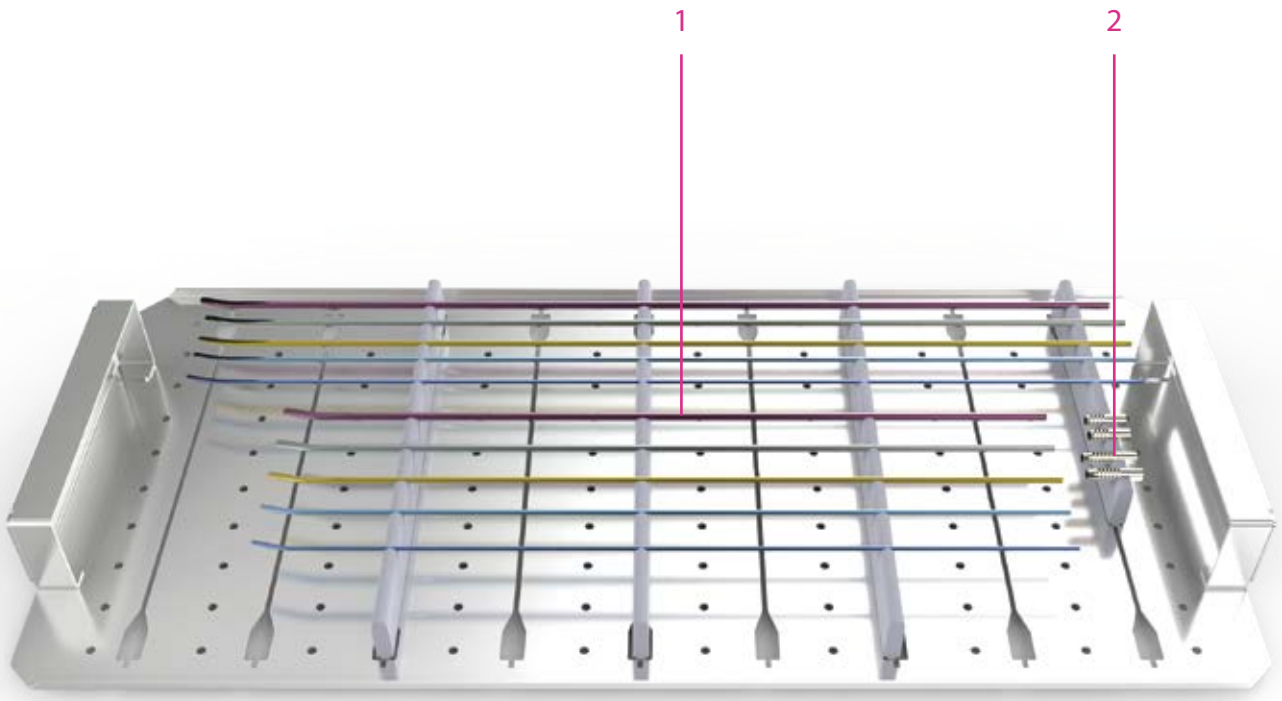
Place the end cap over the elastic nail and thread it clockwise into the bone at the entry site. The threaded portion of the end cap directed toward the bone must be fully inserted.



Set Details

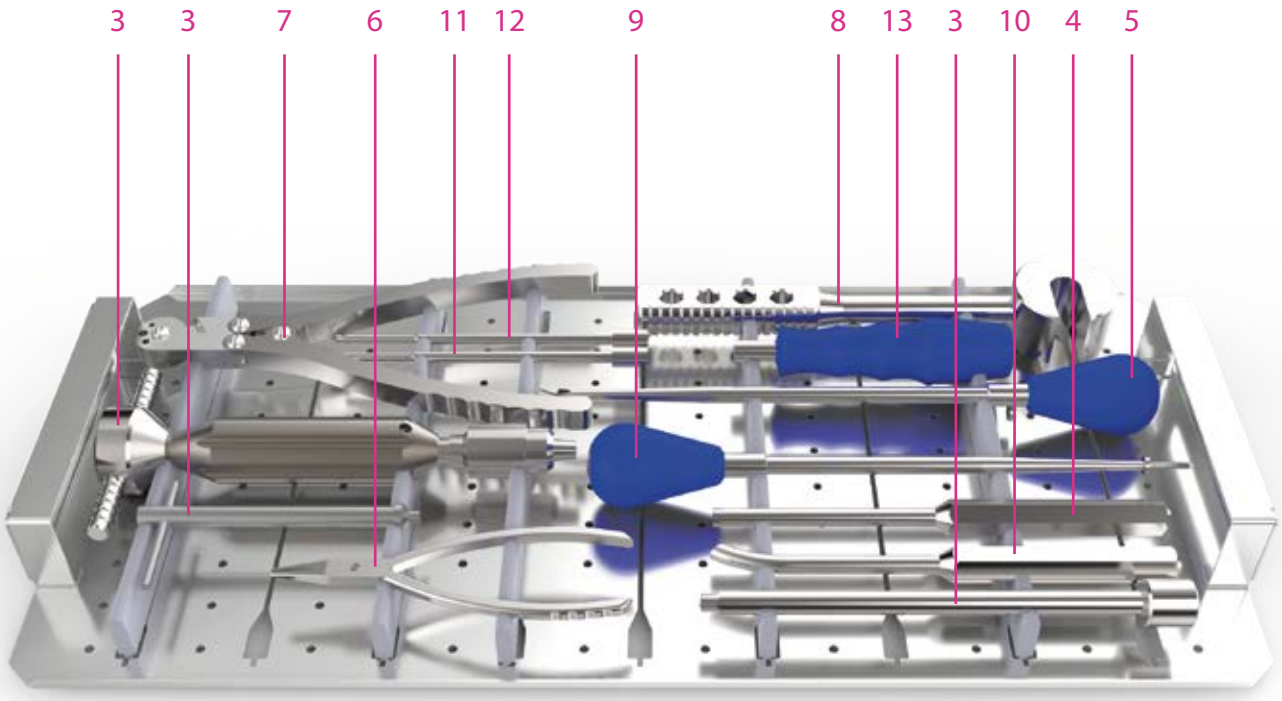
Tray 1 (Implants)

NO	CATALOG NO	UBB NO	DESCRIPTION	QTY
1	82020350020	8698673457881	TITANIUM ELASTIC PIN (TEP) Ø 2 X 350 MM	3
	82020350025	8698673458055	TITANIUM ELASTIC PIN (TEP) Ø 2.5 X 350 MM	3
	82020350030	8698673458062	TITANIUM ELASTIC PIN (TEP) Ø 3 X 350 MM	3
	82020350035	8698673458123	TITANIUM ELASTIC PIN (TEP) Ø 3,5 X 350 MM	3
	82020350040	8698673458147	TITANIUM ELASTIC PIN (TEP) Ø 4 X 350 MM	3
	82020450020	8698673457676	TITANIUM ELASTIC PIN (TEP) Ø 2 X 450 MM	3
	82020450025	8698673457683	TITANIUM ELASTIC PIN (TEP) Ø 2.5 X 450 MM	3
	82020450030	8698673458079	TITANIUM ELASTIC PIN (TEP) Ø 3 X 450 MM	3
	82020450035	8698673458130	TITANIUM ELASTIC PIN (TEP) Ø 3.5 X 450 MM	3
	82020450040	8698673458154	TITANIUM ELASTIC PIN (TEP) Ø 4 X 450 MM	3
2	82020002025	8699931015805	TEP END CAP 2.0-2.5 MM	3
	82020303540	8699931015799	TEP END CAP 3-4 MM	3
	802100		TEP 1. DESIGN TRAY	1



Tray 2 (Instruments)

NO	CATALOG NO	UBB NO	DESCRIPTION	QTY
3	08201000001	8698673493698	TEP CANNULATED INSERTER	1
	08201000110	8680858431151	TEP EXTRACTOR HAMMER GUIDE	1
	03310000001	8680858400201	T-HANDLE JACOBS CHUCK-KEY	1
4	08201000002	8698673493667	TEP STRAIGHT INSERTER	1
5	08201000010	8699931019254	TITANIUM ELASTIC PIN (TEP) AWL	1
6	08201000004	8698673495036	LOCKING PLIERS	1
7	03210000002	8680858400218	SPECIAL ROD CUTTER FOR Ø (2.0-2.5), (3.0-3.5), 4.0 MM	1
8	08201000006	8699931010985	EXTRACTOR HUMMER	1
9	8201000007	8698673496958	CURVED AWL	1
10	08201000008	8698673493681	TEP CURVED INSERTER	1
11	08260030040	8699931032338	TEP END CAP INSERTER 3-4 MM	1
12	08260020025	8699931032345	TEP END CAP INSERTER 2.0-2.5 MM	1
13	02010101002	8698673493308	SOFT SCREW DRIVER QUICK LARGE	1
	00560270125	8699931010923	CONTAINER 560X270X125 MM	1
	802200		TEP 2. DESIGN TRAY	1



Warning:
This description is not sufficient by itself for direct and proper use of the instrument set intraoperatively.
Instruction by a surgeon who is thoroughly trained and experienced in handling these instruments and in doing the procedure are highly recommended.

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Istanbul, Turkey

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