S.S.T.® Small Bone Locking Nail

Fibula Nail

Surgical Technique
Introduction

The S.S.T.® (Stainless Steel Taper) Small Bone Locking Nail is the first fully cannulated internal locking system for small bones. The S.S.T. nail’s small diameter – 3.5mm and 4.5mm fibula nail, allows for rigid fixation to maintain axial and rotational alignment and preserves musculoskeletal function.

- Ideal for unreamed applications.
- Readily treats the most complex fractures, non-unions, or osteoporotic bone.
- Fully cannulated nails and screws simplify insertion.
- One set of user-friendly instruments.
- Closed technique may reduce operative time, blood loss and minimize tissue trauma.

The S.S.T. Small Bone Locking Nail was designed by J. Dean Cole, M.D., Orlando, Florida.

This brochure is presented to demonstrate the surgical technique utilized by J. Dean Cole, M.D. Dr. Cole is not an agent or employee of Biomet and, as such the surgical procedures and opinions stated herein are not necessarily those of Biomet. Biomet, as the manufacturer of this device, does not practice medicine and does not recommend this or any other surgical technique for use on a patient. The surgeon who performs any implant procedure is responsible for determining and utilizing the appropriate techniques for implanting the prosthesis in each individual patient. Biomet is not responsible for selection of the appropriate surgical technique to be used for an individual patient.
Closed intramedullary nailing techniques have largely replaced the use of plates and screws in the treatment of long bone fractures. The Biomet S.S.T. Small Bone Locking Nail is a new intramedullary device which combines the proven advantages of a closed operative technique with true locking capabilities. One simple, precise set of instruments are used for either the forearm or fibula.

**Case History #1**
Pre-op X-ray depicts a 61-year-old female who sustained a distal fibula fracture with impaction to the left ankle.

Post-op X-ray exhibits ideal reduction with the use of a 4.5 x 15cm S.S.T. Small Bone Locking Fibula Nail.

**Design Rationale**

The S.S.T. Small Bone Locking Nail System is fabricated from 316 LVM Stainless Steel. The self-tapping screws are cannulated to allow easy insertion over a .045" diameter K-wire.

The fibula nail has a triangular cross-section and is available in 3.5mm and 4.5mm diameters. The fibula nail is 15cm in length. All implants are sterile packed for convenience.
The S.S.T. Small Bone Locking Nail is indicated for distal fibula fractures. Applications include ankle fractures, pilon fractures, and associated distal tibia and fibula fractures. The fibula nail is most advantageous over traditional plating techniques when the distal fibula fracture is segmentally comminuted, bone quality is osteoporotic, or soft tissue trauma is severe.

Preoperative Planning

Care should be taken to assess the canal diameter prior to nailing. The fibula nail is available in 3.5 or 4.5mm nail diameters.

The fibula nail is 15cm in length. However, the forearm nail can easily be utilized to treat a more proximal fibula fracture if additional length is required.
**Patient Positioning**

The patient is placed in the supine position on a radiolucent table. Internal rotation of the limb improves exposure and frontal plane alignment is easier to assess. A padded bolster is placed under the hemipelvis to allow easier access to the lateral ankle. A second roll towel is used to elevate the affected distal leg to allow easy lateral radiographic visualization during the nailing procedure (Figure 1). A tourniquet is placed on the thigh and the leg is prepped and draped above the knee.

**Surgical Approach**

An oblique 2cm incision is made distal to the fibula. The incision begins posterior to the distal fibula and curves anteriorly directed toward the fourth metatarsal between the sural and superficial peroneal nerve branches. Care should be taken to avoid injury to the cutaneous nerve branches. Scissors are recommended for dissection after the initial skin incision is made (Figure 2).
The ideal entry point is in line with the canal axis which is on the medial border of the lateral malleolus. To aid the surgeon in making the canal entrance site, a pin placement guide is included with the S.S.T. instrumentation. Initially, a 3/32" diameter Steinmann pin is placed at a 10 degree angle in the tip of the malleolus which can be palpated easily (Figure 3). The pin is inserted only 1cm and serves as a stabilizer for the pin placement guide. A/P and lateral images are taken to confirm good frontal and sagittal plane alignment of the pin. The second 3/32" Steinmann pin is placed through the pin placement guide into the central axis of the fibula canal (Figure 4). Once the pin has been inserted, its position is verified for the entry point. Remove the initial placed pin and guide. The entry site is now enlarged by using the 5.5mm diameter cannulated drill over the second placed pin in line with the canal (Figure 5).

Canal Location

Canal Reaming

Canal preparation is performed by reaming the intramedullary canal of the fibula with the T-handle reamers (Figure 6). Clockwise rotation of the reamers may be required to advance the cutting end. To allow for optimal rotational control of the nail, one should not overream the canal, but should match the reamer size to the intramedullary nail, either 4.5mm or 3.5mm. A .045" diameter x 50cm guidewire is inserted past the fracture site and the position is confirmed in both planes by image prior to nail insertion.
**Instrument Assembly**

The driver bolt is passed through the driver bushing and fully threaded into the nail (finger tighten – Figure 7). This assembly is placed through the proximal target and properly seated. The driver bolt is then firmly tightened down using the 1/4" hex socket T-wrench (Figure 8). The driver handle is placed over the driver bolt hex and tightened down on the threaded end of the driver bushing. The extractor shaft can be attached to the driver handle as needed (Figure 9).

**Nail Insertion**

With the 3-degree bend laterally oriented, the fibula nail is placed over the guidewire and driven into the canal (Figure 10).
The guide bushing is placed into the guide tube and is inserted into the proximal target. Using the guide for alignment, a stab incision is made through the skin. The subcutaneous tissues are retracted, and blunt dissection performed to the anterior cortex. Under fluoroscopic control, a .045" x 6" guidewire is placed through the drill guide. It should pass through the nail into the far cortex (Figure 11). An A/P image may be helpful to confirm passage of the guidewire through the interlocking nail holes. Use of the screw depth gauge allows selection of the proper screw length (Figure 12).

The guide bushing is removed. With the guidewire in place, the 2.7mm cannulated drill is used to tap-drill for the 3.5mm bone screw (Figure 13). The cannulated 3.5mm bone screw is then placed over the guide pin using the cannulated hex driver (2.5mm hex) (Figure 14). The second locking screw is placed in a similar fashion. Screw placement should be verified by image before removing the instruments.
Fibula Length

Restoration of fibula length is just as important as transversal frontal plane alignment. Care should be taken to assure optimal fibula length after nail insertion. Over drilling the distal fragment is mandatory to ensure nail sliding during insertion. If fracture impaction occurs, it can be corrected by distracting the fracture site.

Malleting the extractor shaft in the reverse direction after interlocking screw placement can be utilized to restore fibula length. Care should be taken to assure good locking screw purchase and good bone quality of the distal fragment prior to the use of this distraction method. An indirect method of distraction should be used if osteoporosis, poor screw purchase, or comminution prevents direct distraction. A lateral talus or calcaneal half pin should be used with a lateral tibial half pin to distract the fragments.

Once fibula length has been restored, a cannulated screw can be placed at the proximal end of the nail to prevent proximal nail migration. Note: the screw should be in contact with the nail tip (Figure 15). A .045" K-wire is placed over the lateral fibular cortex just proximal to the tip of the nail. The handled pin placement guide is then inserted over the K-wire prior to drilling of the guide pin. This is to protect muscle or avoid nerve injury. The guidewire is drilled through both cortices. Screw length is measured by using a second 6" K-wire. Overdrill the K-wire with the 2.7mm cannulated drill. The 3.5mm cannulated screw is placed over the guidewire. Due to the narrow canal of the fibula, one screw is usually adequate to impinge the nail against the canal and prevent proximal migration.
End-Cap Placement

The end cap is inserted with the cannulated 2.5mm hex drive screwdriver into the proximal end of the nail (Figure 16). The end cap and screwdriver are cannulated to go over a 0.045" diameter guidewire if so desired.

Postoperative Care

The wound is closed in the usual manner. Full motion of the ankle is recommended immediately. The patient should be placed in a stirrup type ankle orthosis (Active Ankle™) and limited weight bearing encouraged as determined by the treating physician. Partial weight bearing restrictions are recommended for the initial six to eight weeks until fracture healing is adequate to support full weight bearing, as determined by the treating physician.

Nail Removal

If the nail is to be removed, the distal interlocking screws and end cap should be removed utilizing the 2.5mm hex screwdriver. The nail extractor adapter should be threaded into the proximal end of the nail. The extractor shaft is then attached and the slotted hammer is utilized to back the nail out.
Nail Implants

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<th>Part No.</th>
<th>S.S.T. Fibula Nail</th>
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<tr>
<td>244610</td>
<td>3.5mm x 15cm</td>
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<tr>
<td>244615</td>
<td>4.5mm x 15cm</td>
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<th>Part No.</th>
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<tr>
<td>244550</td>
<td>S.S.T. End Cap</td>
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Instrumentation

Driver Bushing

Driver Bolt

S.S.T. is a registered trademark of Biomet, Inc.
Instrumentation cont’d

Cannulated Hex Drive Screwdriver 2.5mm
471326

Cannulated Twist Drill 5.5mm x 178mm (7")
471328

T-Handle Reamer
471330  3.0mm
471332  3.5mm
471334  4.0mm
471336  4.5mm
471338  5.0mm

Guidewire .045" x 19.6" (50cm) - Pk-6
471340

Extractor Shaft
471344

Slotted Mallet
471346

Nail Extractor Adaptor
471348

Fracture Reduction Lever
471350

Cannulated Tap 3.5mm
471354

Pin Placement Guide 3/32" Pin
471362

Screw Depth Gage
471364

Steinmann Pin 3/32" x 9" Trocar Point
Round Shank - Pk-6
27-361278

S.S.T. Instrument Case
592026

Templates
471305