SQUARE NAIL
SURGICAL TECHNIQUE

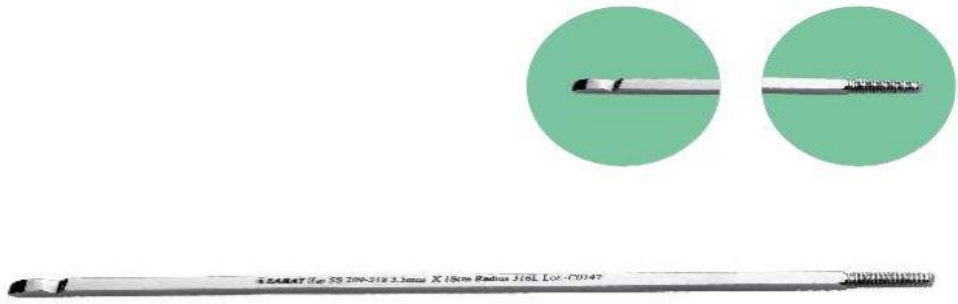
Index

1. Description of Surgical Technique

Name – Square Nail

Available in SS316L & Titanium Gr. 5 materials

2. Feature & Benefits

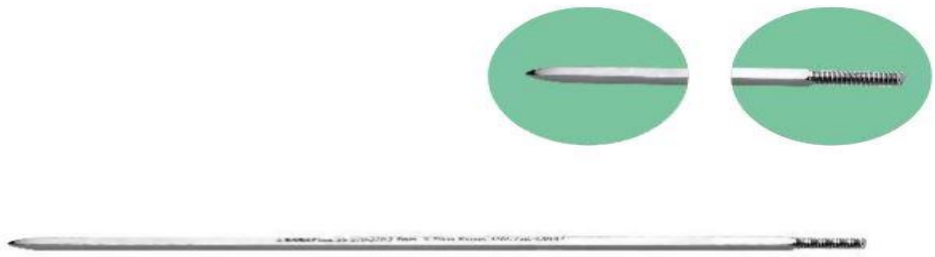


Square Nail for Radius

Diameter:2mm, 2.5mm, 3mm, 3.5mm, 4mm

Length: UPTO 300MM.

Catalogue: 0405



Square Nail for Ulna

Diameter:2mm, 2.5mm, 3mm, 3.5mm, 4mm

Length: 300 UPTO

Catalogue: 0405

3. AO Principle

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation

1. Anatomic reduction Fracture reduction and fixation to restore anatomical relationships.
2. Early, active mobilization Early and safe mobilization and rehabilitation of the injured part and the patient as a whole.
3. Stable fixation Fracture fixation providing absolute or relative stability, as required by the patient, the injury, and the personality of the fracture.
4. Preservation of blood supply Preservation of the blood supply to soft tissues and bone by gentle reduction techniques and careful handling.

4. Indications

- Severely comminuted and segmental fractures.
- Fractures in Osteoporotic bones
- Open fractures and in patients with poor skin conditions.
- Failed plating.
- Bone lengthening procedures.
- In Surgery for Tumour & Deformed bones.Can also be successfully used in all types of fresh fractures, non-unions and mal-unions of proximal, middle and distal third of both radius and ulna.

5. Intended Purpose

Square nail for radius used to treat diaphyseal fracture of radius bone. The square shaft prevent rotation and stabilizes the fixation.

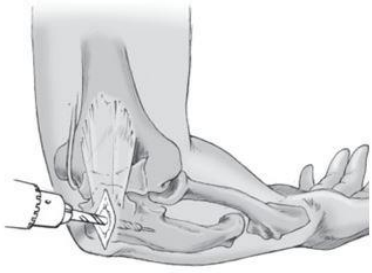
6. Contraindications

- All concomitant diseases that can impair the functioning and the success of the implant
- Infection
- Insufficient blood circulation
- Skeletally immature patients
- Since external fixation devices are often used in emergency situations to treat patients with acute injuries, there are no absolute contraindications for use. The surgeon's education, training and professional judgment must be relied upon to choose the most appropriate device and treatment for each individual patient. Whenever possible, the device chosen should be of a type indicated for the fracture being treated and/or for the procedure being utilized.
- Insufficient quantity or quality of bone which would inhibit appropriate fixation of the device.
- Compromised vascularity that would inhibit adequate blood supply to the fracture or operative site.
- Previous history of infections.
- Any neuromuscular deficit which could interfere with the patient's ability to limit weight bearing.
- Any neuromuscular deficit which places an unusually heavy load on the device during the healing period.
- Malignancy in the fracture area.
- Mental, physical or neurological conditions which may impair the patient's
- Ability to cooperate with the post-operative regimen.
- Patients with a compromised immune system.
- Pre-existing internal fixation that prohibits proper pin placement

7. Surgical Steps

1. **SELECT CORRECT NAIL LENGTH AND DIAMETER:**
   A. Pre bending the thicker nail

- Normally upto 3mm nails are flexible enough to conform to the bows without prebending.
- Bend malleable templates to match contours of radius and ulna using an X-ray.
- Insert selected nail in nail bender so that proximal screw hole is not visible from above.
- Make several small bends along length of nail in order to create a smooth curve according to the contoured template.



- Line with the longitudinal axis of the ulnar shaft because it bows laterally in proximal third. Avoid dissection medial to olecranon in region of ulnar nerve.
- A 2.0-mm trocar pin is drilled into the medullary canal parallel to the posterior border of the ulna.
- Care has to be taken that the axis of the locking hole at If the guide pin advances down

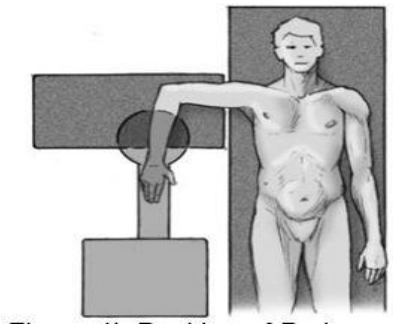
canal freely then it is in the base of the nail is always parallel to the frontal plane of the forearm. Take care to not make sharp bends in nail

B. Guidelines for Pre-bending

- Make a 3-degree bend in proximal portion of nail. The nail is inserted with this 3 degree bend facing laterally in radius & posterior in ulna.
- In the sagittal plane, both nails have a small, dorsally convex curvature.
- In the frontal plane, nail for radius should have a bow to match the radial convexity & ulnar nail to have a lazy S shape to maintain proximal lateral bow

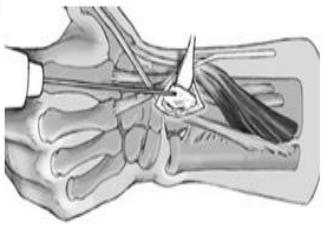
POSITIONING:

- Forearm fracture table with radiolucent arm board & modified finger trap set up is advantageous otherwise pull by surgical assistant.

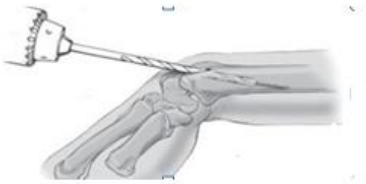


ENTRY POINT

- For ulna: The entry point should be on the radial side of the olecranon tip about 5mm from lateral cortex in the correct planes.



- For radius:Make 2.5 to 3 cm longitudinal incision over distal radius on radial side of Lister's tubercle starting at the level of wrist joint.
- Bluntly dissect subcutaneous tissues to avoid injury to superficial radial nerve branches.
- Opening of the of the second extensor compartmentthrough longitudinal incision on of the extensor retinaculum radial to Lister's tubercle leaving proximal third intact.
- Retract extensor carpi radials longus and bevies tendon to radial side.
- Entry point should be 5 mm to 1 cm proximal to articular surface



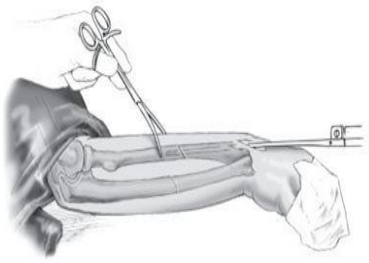
- 2.0-mm trocar pin is inserted into the second compartment and advanced into the medullary canal at a low angle (30 degree) to prevent engaging the palmarcortex.
- Flexion of wrist over a stack of towel helps in preventing penetration of volar cortex.

ENLARGE ENTRY PORTAL:

- Use manual reamers to enlarge canal.Use 6.0 mm cannulated reamer over pin & ream first 2 to 5 cm to accept larger diameter base of nail.Reamed \non-reamed insertion Depends on surgeons choice
- We normally do not ream in fresh fractures.

REDUCTION:

- Radiolucent Reduction Forceps helps in holding the achieved closed reduction.
- If closed reduction does not succeed, Do limited open reduction or a percutaneous stab incision and use reduction forceps with pointed tips.



DRILL GUIDE ASSEMBLY:

- During assembly keep in mind the position of locking holes.
- For the ulna, the proximal hole is preferably directed from posterior border to anterior along coronoid process for maximum purchase. (Can also be directed lateral to medial)
- Anterior to posterior trans fixation distal hole in ulna. Lateral to medial trans fixation both the holes of radius.

NAIL INSERTION:

Drive nail until fully seated, flush with the cortex under hand pressure or by lightly tapping with hammer. For insertion in radius the wrist is flexed, retract the tendon of the extensors (EPL). For insertion in the ulna the elbow is bent.

To lock the driving end:

Before locking pronation & supination are tested to exclude any rotational misalignment. Proximal locking thru jig- 100% accurate.

To interlock non-driving end of nail-

a- Thru distal aiming device (accuracy higher for ulna).
b- Via free hand technique with Image magnification.
c- Make a slightly bigger hole in the bone corresponding to hole in the nail and then locate.

For the ulna- locking occurs from posterior to anterior in maximal pronated position.

For the radius- It is reached from the radial side with the forearm in neutral rotation.

Stab incision, carried down sharply through skin and subcutaneous tissues.

An incision is made in the fascia.

Develop plane between muscles to reach bone and expose it.

Maintain exposure by retractor. Use of self-retaining retractor is advantageous.

Soft issue separation of less than 5 mm along 2 cortices of bone is done to accommodate the clip.

Use image intensifier with magnification and find perfect circle view of screw hole.

Locate, drill & verify the hole with K wire.

After drilling near cortex cross the hole in nail with hand pressure. Do not drill as k-wire tends to break.

Place correct length and size clip lock and then rotate so that it fits snuggly over bone.

In proximal radial fractures --Rotate the clip towards wrist so that it is away from nerve.

END CAP:

The end-cap is inserted with the 2.5mm screwdriver into the proximal end of the nail.

8. Implant Removal

First all the locking bolts and the end cap is removed and the extractor rod is screwed into the distal open end of the nail. The combined Hammer is placed in line with the hammer guide as show in the image. Now with reverse hammering, then it removed. According to second approach, first all the locking bolts and the end cap is removed and then the extractor rod is attached to the nail. The handle for extractor is screwed on top of the Nail holding guide and on top of which the hammer guide is attached. The combined hammer is placed in line with the hammer guide and with reverse hammering, the nail is removed.

9. Caution

An implant shall never be reused. Previous stresses may have created imperfections which can lead to device failure. Instruments shall be inspected for wear or damage prior to usage. Protect implant appliances against scratching and nicking. Such stress concentrations can lead to failure.

Single Brand Usage:

Implant components from one manufacture should not be used with those of another. Implants from each manufacture may have metal, dimensions and design differences so that the use in conjunction with different brands of devices may lead to inadequate fixation or adverse performances of the devices.

Used Implants:

Used implants which appear un-damaged may have internal and/or external defects. It is possible that individual stress analysis of each part fail to reveal the accumulated stress on the metals as a result of use within the body. This may lead ultimately to implant failure after certain point of time due to metal fatigue. Therefore, reuse of implants is strictly not recommended.

10. Disposal of Implants

Every used or removed implant must be discarded after use and must never be re- used. It should be bent or scratched & then disposed of properly so that it becomes unfit for reuse. While disposing it off, it should be ensured that the discarded implant does not pose any threat to children, stray animals and environment. Dispose of the implants as per applicable medical practices and local, state and country specific regulatory requirement of Bio Medical Waste rules

11. Packaging Material Disposal

The packaging material of this device is made special packing material and therefore if swallowed, may cause choking Hazards. Therefore, it should be disposed of in such a way that keep out of reach of children and stray animals.

12. MRI Information

IMPORTANT:

- Yogeshwar Implants (I) Pvt. Ltd. implants are manufactured from SS 316L and Titanium Grade 5 material both are non-magnetic material, hence it do not pose any safety risk.
- Patients should be directed to seek a medical opinion before entering potentially adverse environments that could affect the performance of the implants, such as electromagnetic or magnetic field or including a magnetic resonance environment.
- Doctor shall conduct a Risk Benefit Analysis before directing the patient to enter electromagnetic or magnetic fields or including a magnetic resonance environment.
- The Yogeshwar Implants (I) Pvt. Ltd. implants has not been evaluated for safety and compatibility in the MR environment but on the basis of literature study below mentioned points can be taken care during MRI
  - ✓ The minimum recommended time after the implantation that allows patients to safely undergo MRI examination or allowing the patient or an individual to enter the MRI environment is 6 (six) weeks.
  - ✓ The maximum recommended time limit for MRI examination in patients implanted with the evaluated device is 30 min with a scanner operating at 1.5T (Tesla) or less.

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