

AOSTM

ADVANCED ORTHOPAEDIC SOLUTIONS



Proximal Humeral

PLATING SYSTEM

INCLUDING THE PHP, 95° AND ALPHA PLATE SYSTEMS

Surgical Technique

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This Surgical Technique sets forth detailed recommended procedures for using AOS devices and instruments. It offers guidance, but as with any such technical guide, each surgeon must consider the particular needs of each patient and make appropriate adjustments when and as required. Surgeons must always rely on their own professional clinical judgement when deciding which products and surgical treatments to use with their patients. Refer to package insert for information on indications, warnings, precautions and contraindications.

Proximal Humeral Plating System Surgical Technique

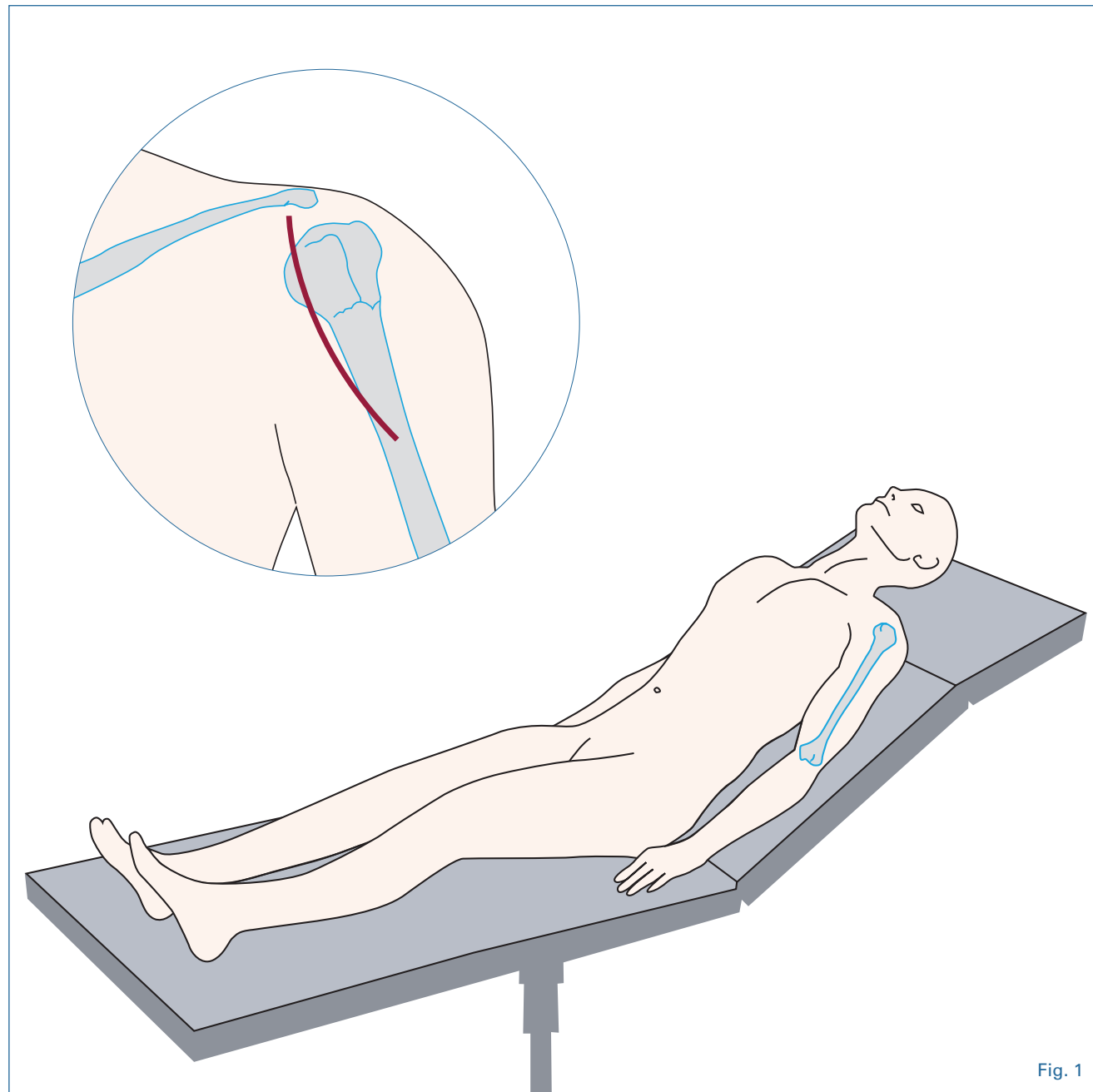
1. Indications

The AOS Proximal Humeral Plate (PHP), the 95° Proximal Plate (95°), and the Anterolateral Proximal Humeral Plate (ALPHA) are indicated for fractures, fracture dislocations, osteotomies, and non-unions of the proximal humerus.

2. Patient Positioning

The patient may be placed in either a beach-chair or supine position with the affected limb positioned to permit visualization of the shoulder with radiography (Fig. 1).

NOTE: To confirm adequate visualization and reduction capabilities, take preliminary images before the patient is fully prepped and completely draped



3. Plate Selection

NOTE: The selection of implants is based entirely on the expertise of the operating physician and the surgical indications presented by the patient at the time of surgery. The following are brief descriptions of intended designs of the plates described in this surgical technique manual.

PHP

The PHP was designed as a limited contact plate in order to reduce plate to bone contact with limited vascular trauma and insult to the bone (Fig. 2A).

95°

The 95° is designed to help buttress the greater tuberosity and higher transverse fracture patterns. (Fig. 2B).



ALPHA

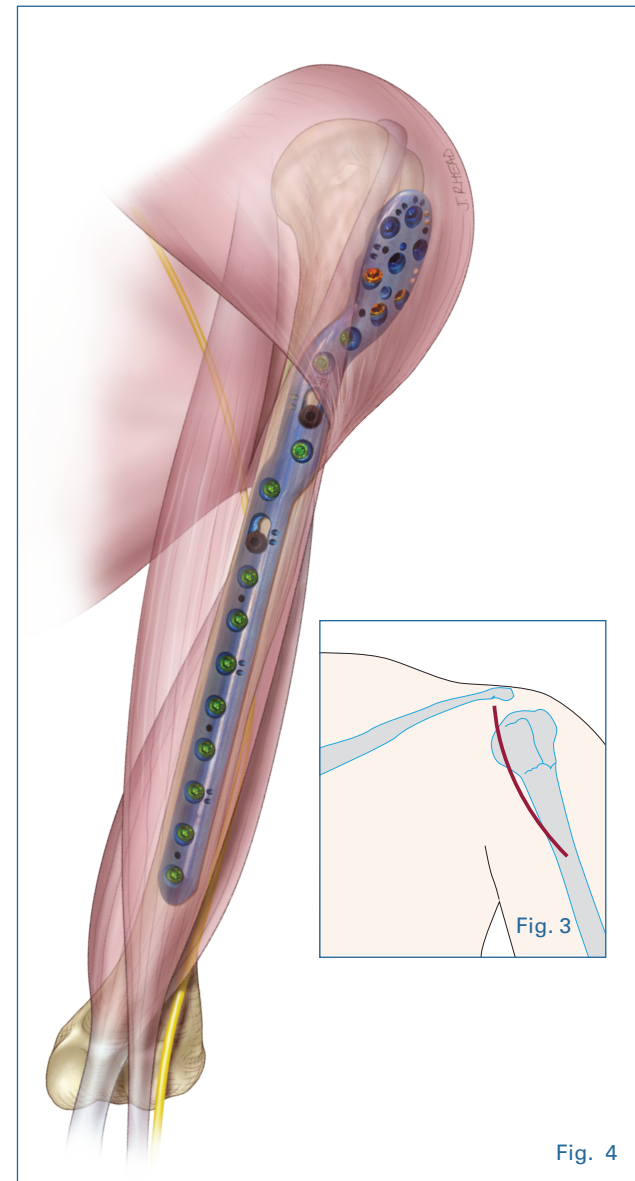
The ALPHA is designed to eliminate the need to release the deltoid insertion and allows for increased fixation in the humeral head while creating an intramedullary strut (Fig. 2C).



4. Incision and Surgical Approach

The incision is made for the standard deltopectoral approach beginning midway between the coracoid and clavicle and extending distally in an oblique manner to the deltoid insertion (Fig 3). The skin and subcutaneous tissues are divided, and the cephalic vein is identified. The cephalic vein marks the location of the deltopectoral interval. The deltopectoral interval is deepened bluntly to the clavipectoral fascia. The clavipectoral fascia is divided to expose the greater and lesser tuberosities and the bicipital groove. Dissection is extended distally down the shaft of the humerus lateral to the pectoralis insertion and medial to the deltoid insertion.

NOTE: If you are planning to implant the ALPHA Plate, take care to not strip or release the deltoid insertion. As described above in Section 3, the ALPHA Plate is designed to be used with deltoid sparing technique (Fig. 4).



5. Fracture Reduction

After exposure and debridement of the fracture site, the fracture is reduced and provisionally fixed under radiography with 2.0mm Guide Pins (0102-150) or 1.5mm Guide Pins (0109-150), reduction forceps or suture fixation.

NOTE: Reduction aids should be placed so as not to interfere with subsequent placement of the plate.



6. Plate Positioning

PHP

The plate should be centered against the lateral aspect of the greater tuberosity and positioned approximately 1.5-2.0cm distal to the rotator attachment on the upper aspect of the greater tuberosity (Fig. 5A & 5B). Avoid placing the plate too superior on the tuberosity as this increases the risk of subacromial impingement.



95°

The plate should be centered against the lateral aspect of the greater tuberosity and positioned approximately 0.5-1.0cm distal to the rotator attachment on the upper aspect of the greater tuberosity (Fig. 6A & 6B). Avoid placing the plate

too superior on the tuberosity as this increased the risk of subacromial impingement.

NOTE: The 95° plate is designed for high transverse fracture patterns so it will be placed more superior than other plates.



ALPHA

The plate should be centered against the lateral aspect of the greater tuberosity and positioned approximately 1.0-1.5cm distal to the rotator attachment on the upper aspect of the greater tuberosity (Fig. 7A & 7B). Avoid placing the plate

too superior on the tuberosity as this increases the risk of subacromial impingement.



7. Primary Plate Fixation

PHP

Before placing the plate on the bone, attach the **Alignment Guide (1250)** to the selected plate. Position the Alignment Guide location pin into the plate and tighten the captured

screw using a **T15 Hex Driver (0432)** and **Screw Driver Handle (5026)**. A 3.5mm Cortical Screw is placed in the slotted hole of the plate in a neutral position. Use the **2.5mm Multiple Drill Guide (0318)** and **2.5mm Calibrated Drill (0237)** and drill through both cortices (**Fig 8A**).



Fig. 8A

95°

Before placing the plate on the bone, attach the **Alignment Guide (1288)** to the selected plate. Position the Alignment Guide location pin into the plate and tighten the captured screw using a **T15 Hex Driver (0432)** and **Screw Driver Handle (5026)**.

A 3.5mm Cortical Screw is placed in the slotted hole of the plate in a neutral position. Use the **2.5mm Multiple Drill Guide (0318)** and **2.5mm Calibrated Drill (0237)** and drill through both cortices (**Fig. 8B**).

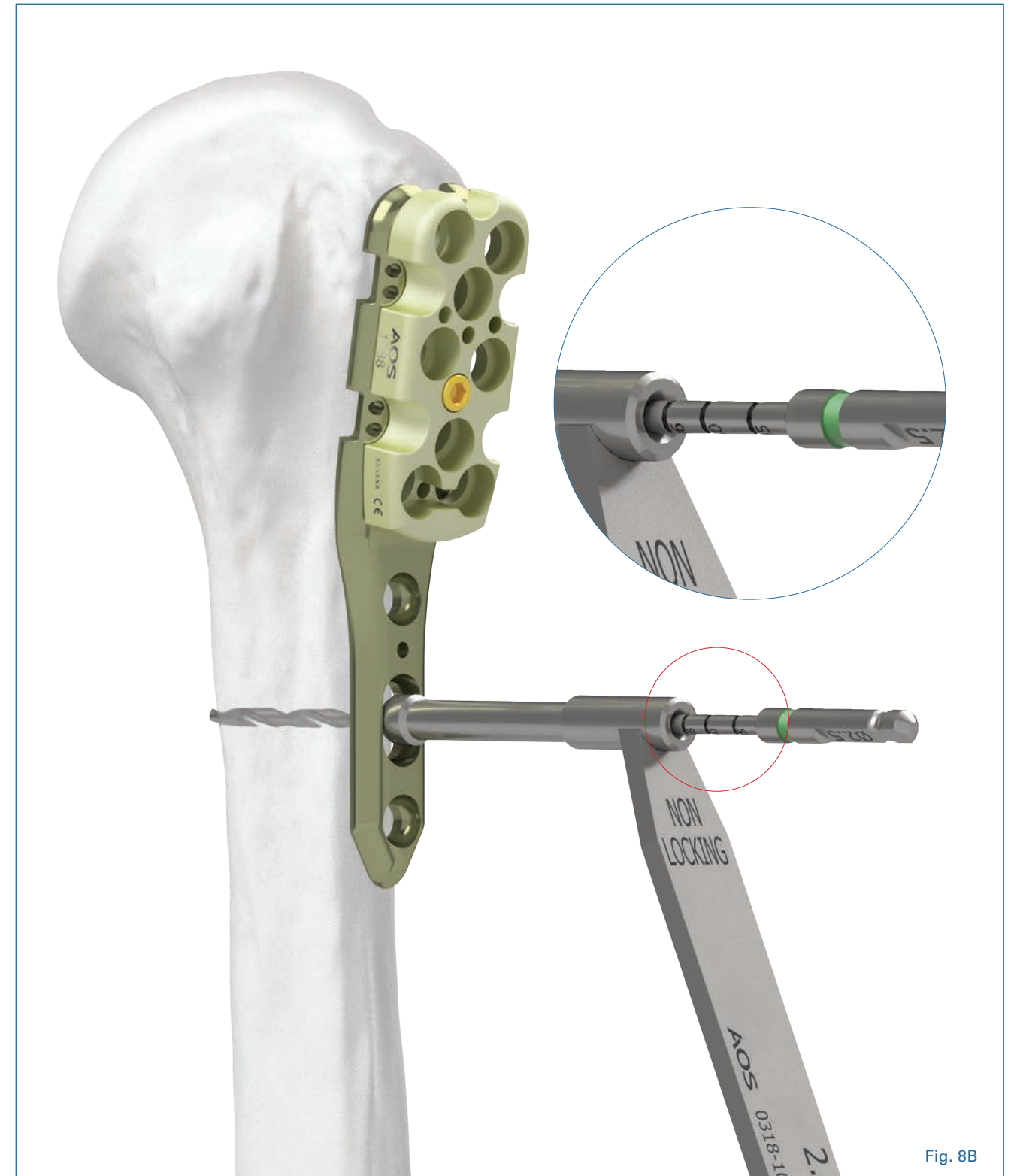


Fig. 8B

ALPHA

Before placing the plate on the bone, attach the **Alignment Guide (1296 or 1297)** to the selected plate. Position the Alignment Guide location pin into the plate and tighten the captured screw using a **T15 Hex Driver (0432)** and **Screw Driver Handle (5026)**.

A 3.5mm Cortical Screw is placed in the slotted hole of the plate in a neutral position. Use the **2.5mm Multiple Drill Guide (0318)** and **2.5mm Calibrated Drill (0237)** and drill through both cortices (**Fig. 8C**).

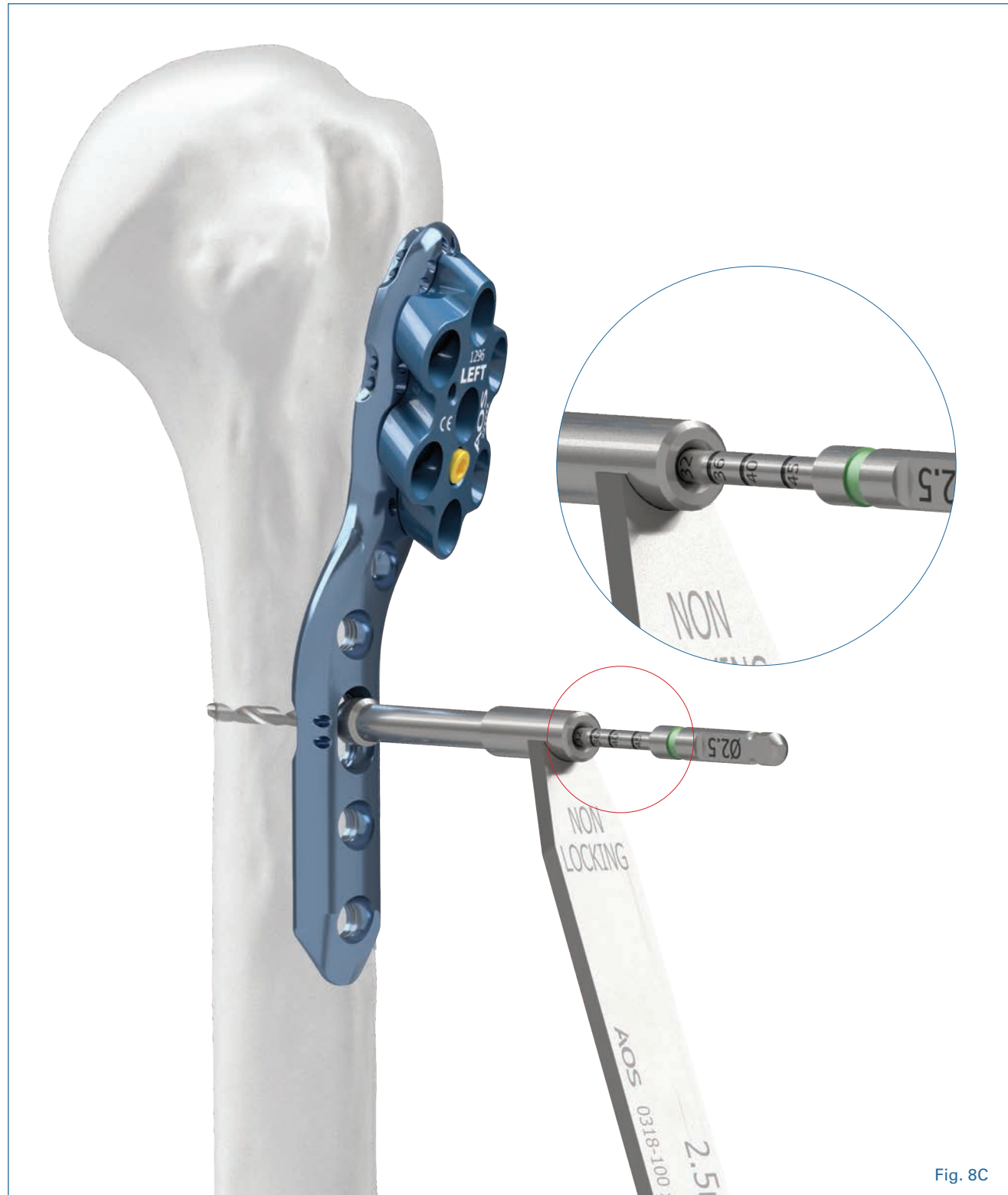


Fig. 8C

Ensure that the Drill Guide end marked “non-locking” is utilized (**Fig. 9**). Read the calibration line on the Drill bit that lines up with the end of the Drill Guide to determine screw length.



Fig. 9

Alternatively, screw length may be determined using the **Hook Tip Depth Gauge (0523)**. Read screw length using edge marked “non-locking”. The appropriate length screw is then inserted using **Screw Gripper (0433)**, **T15 Hex Driver (0432)** and Screw Driver Handle.

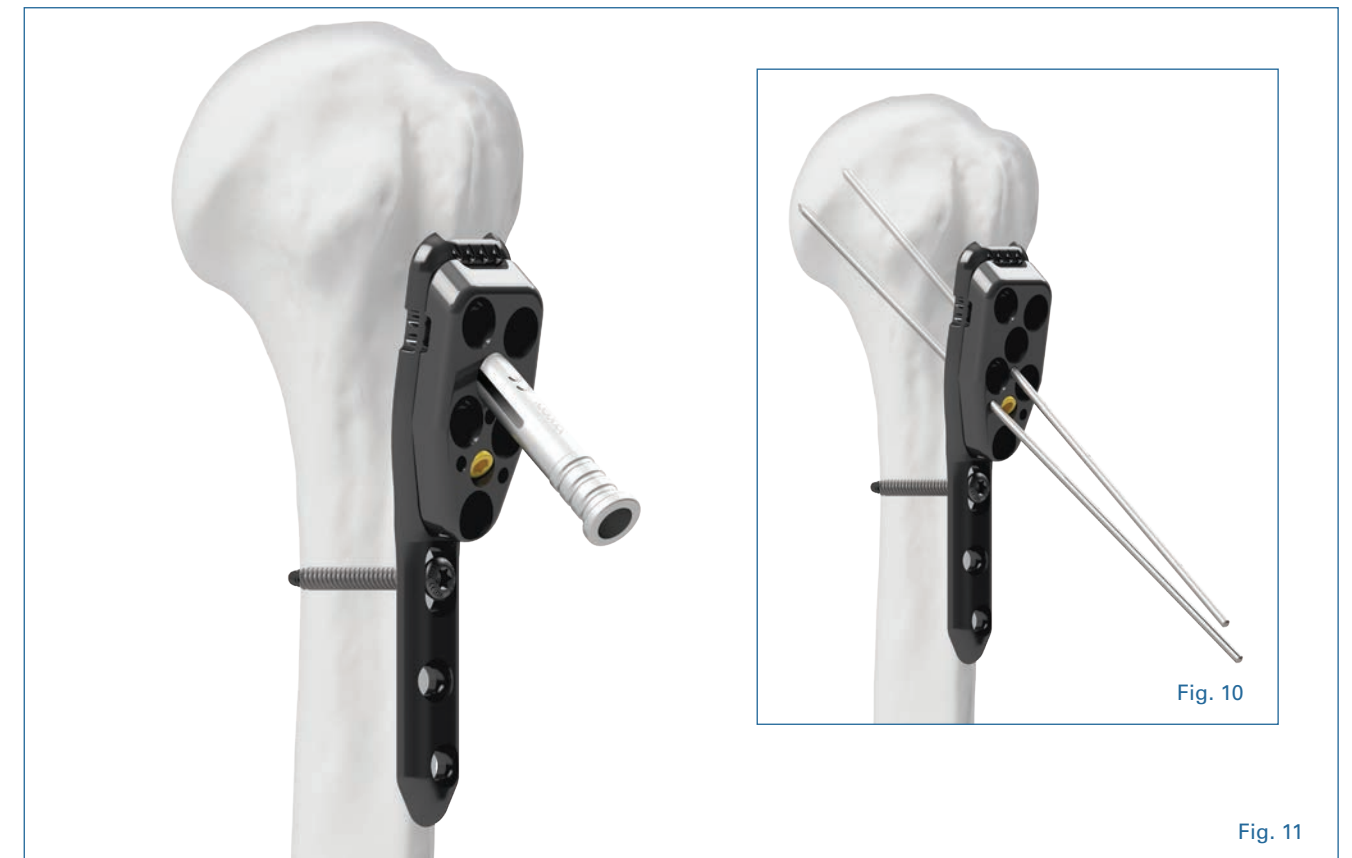


Fig. 10

Fig. 11

8. Proximal Screw Insertion

NOTE: The proximal cluster of screw holes in all three plates (PHP, 95°, and ALPHA) have been designed to accept either a fully threaded or partially threaded screw. The fully threaded screws are color coded blue and correspond to the blue drill guide and drill. The partially threaded screws are color coded yellow and correspond to the yellow drill guide and drill. Use of both style of screws is illustrated in this surgical technique. The final decision of whether to use a fully or partially threaded screw must be determined by the surgeon.

PHP

2.0mm or 1.5mm Guide Pins may be utilized in any of the two guide pin holes positioned in the plate and Alignment Guide to verify correct plate and proximal screw placement using fluoroscopy (**Fig. 10**). If the axial alignment of the plate is unsatisfactory, remove the Guide Pin and repeat the above procedure to adjust the plate to the desired position.

Insert the **Screw Sheath (0316)** into the desired hole of the Alignment Guide and press firmly until it locks (**Fig. 11**). Fracture pattern and/or patient anatomy will determine the order of screw insertion.

Insert the **3.5mm Drill Guide (0331)** into the Screw Sheath and thread into the plate. Drill through the Drill Guide using the **3.5/2.5mm Calibrated Step Drill (0254)** until the tip reaches the subchondral bone. Use the fluoroscope to confirm the position of the Step Drill in both the A/P and lateral planes (**Fig. 12**). Adjust the Step Drill location if necessary.

Read the calibration line on the Step Drill that lines up

with the end of the Drill Guide to determine screw length. Alternatively, screw length may be determined using the **Proximal Screw Depth Gauge (0522)** after the Drill Guide has been removed (**Fig. 13**).

When the Drill Guide is removed, the appropriate length **4.0mm Partially Threaded Cancellous Locking Screw** (or fully threaded screw) is inserted through the Screw Sheath



using the Screw Gripper, T15 Driver and Screw Driver Handle (**Fig. 14**). The Hex Driver is etched with a laser line that will align with the end of the Screw Sheath when the screw is fully threaded into the plate. Ensure that the screw is securely tightened and locked into the plate.

Follow the same procedure for each proximal screw. As an alternative to the Partially Threaded Screw, a 4.0mm Fully

Threaded Cancellous Locking Screw may be used. Use the 2.5mm Drill Guide and **2.5mm Long Calibrated Drill (0250)** to insert the Fully Threaded Cancellous Screw.



95°

2.0mm or 1.5mm Guide Pins may be utilized in any of the two guide pin holes positioned in the plate and Alignment Guide to verify correct plate and proximal screw placement using fluoroscopy (**Fig. 15**). If the axial alignment of the plate is unsatisfactory, remove the Guide Pin and repeat the above

procedure to adjust the plate to the desired position. Insert the **Screw Sheath (0316)** into the desired hole of the Alignment Guide and press firmly until it locks (**Fig. 16**). Fracture pattern and/or patient anatomy will determine the order of screw insertion.

Insert the **2.5mm Drill Guide (0327)** into the Screw Sheath and thread into the plate. Drill through the Drill Guide using the **3.5/2.5mm Calibrated Step Drill (0250)** until the tip reaches the subchondral bone. Use the fluoroscope to confirm the position of the Step Drill in both the A/P and lateral planes (**Fig. 17**). Adjust the Step Drill location if necessary.

Read the calibration line on the Step Drill that lines up with the end of the Drill Guide to determine screw length. Alternatively, screw length may be determined using the **Proximal Screw Depth Gauge (0522)** after the Drill Guide has been removed (**Fig. 18**).



When the Drill Guide is removed, the appropriate length 4.0mm Fully Threaded Cancellous Locking Screw is inserted through the Screw Sheath using the Screw Gripper, T15 Hex Driver and Screw Driver Handle (Fig. 19). The Hex Driver is etched with a laser line that will align with the end of the Screw Sheath when the screw is fully threaded into the plate.

Ensure that the screw is securely tightened and locked into the plate.

Note: To help prevent articular penetration a 4.0mm Cancellous Tap (0255) with Screw Driver Handle can be used in conjunction with drilling through the Drill Guide.

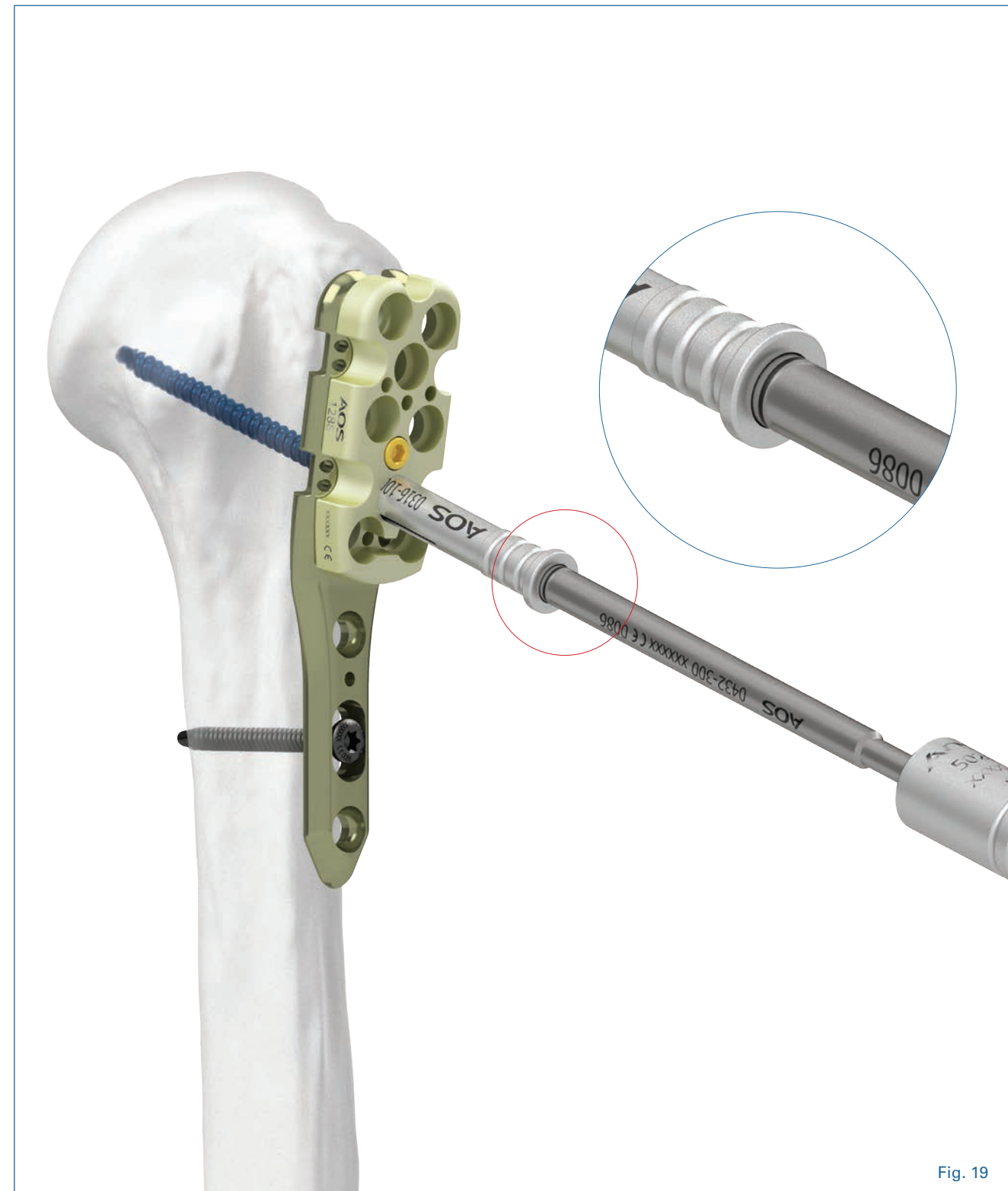


Fig. 19

ALPHA

2.0mm or 1.5mm Guide Pins may be utilized in any of the two guide pin holes positioned in the plate and Alignment Guide to verify correct plate and proximal screw placement using fluoroscopy (Fig. 20). If the axial alignment of the plate is unsatisfactory, remove the Guide Pin and repeat the above

procedure to adjust the plate to the desired position. Insert the Screw Sheath (0316) into the desired hole of the Alignment Guide and press firmly until it locks (Fig. 21). Fracture pattern and/or patient anatomy will determine the order of screw insertion.



Fig. 21

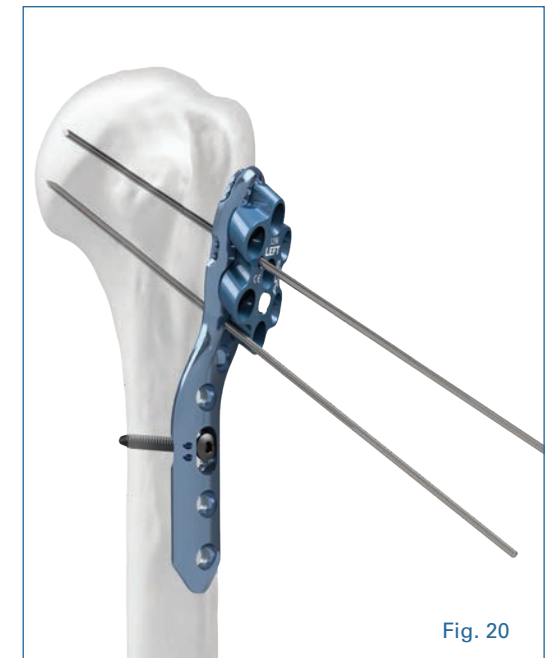


Fig. 20

Insert the 3.5mm **Drill Guide (0331)** into the Screw Sheath and thread into the plate. Drill through the Drill Guide using the **3.5mm/2.5mm Calibrated Step Drill (0254)** until the tip reaches the subchondral bone. Use the fluoroscope to confirm the position of the Step Drill in both the A/P and lateral planes (**Fig. 22**). Adjust the Step Drill location if necessary. Read the calibration line on the Step Drill that lines up with the end of the Drill Guide to determine screw length.

Alternatively, screw length may be determined using the **Proximal Screw Depth Gauge (0522)** after the Drill Guide has been removed (**Fig. 23**).

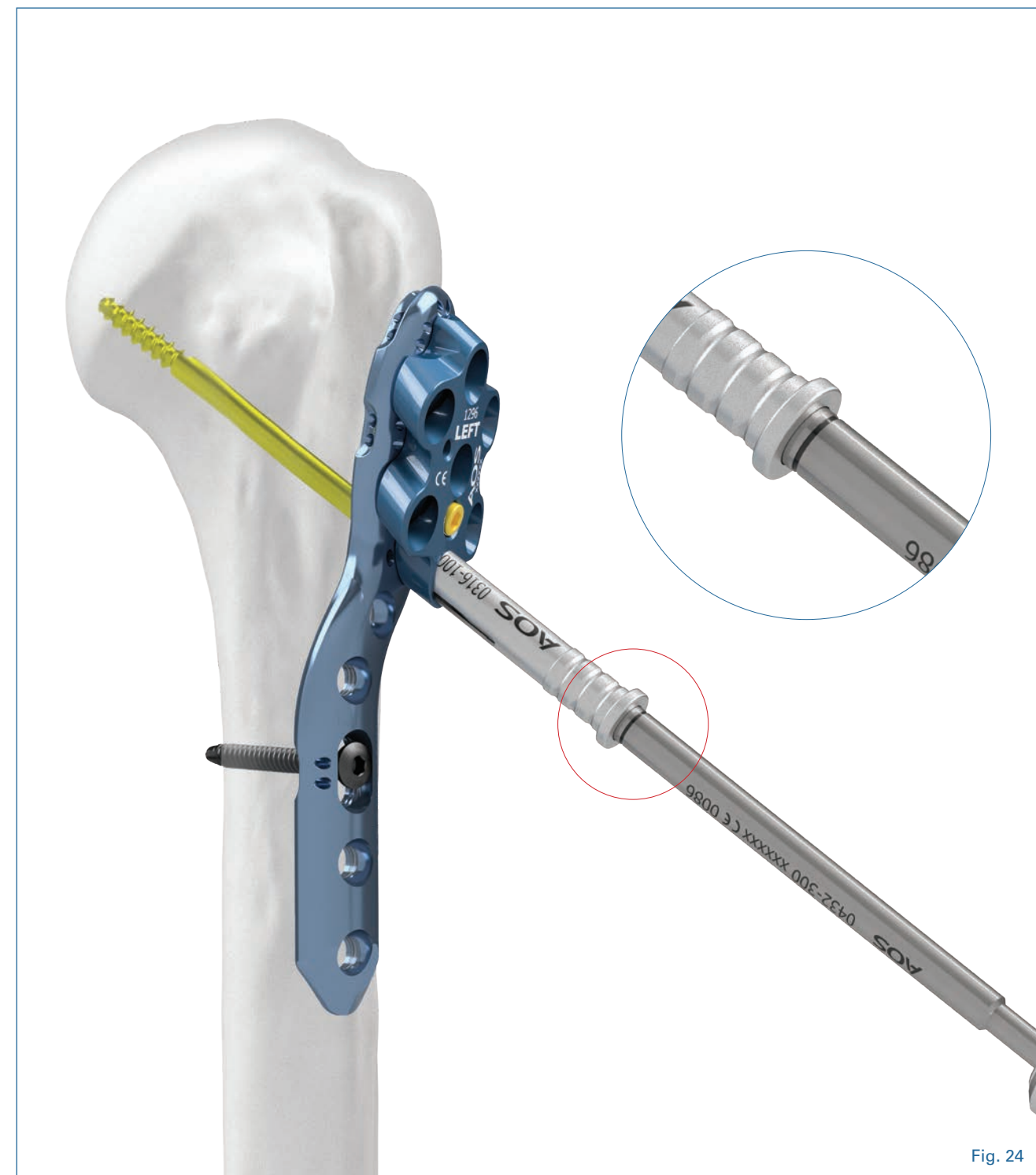
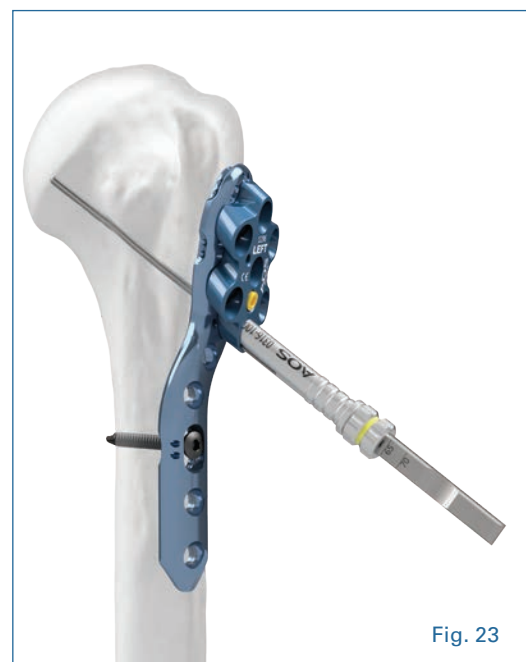
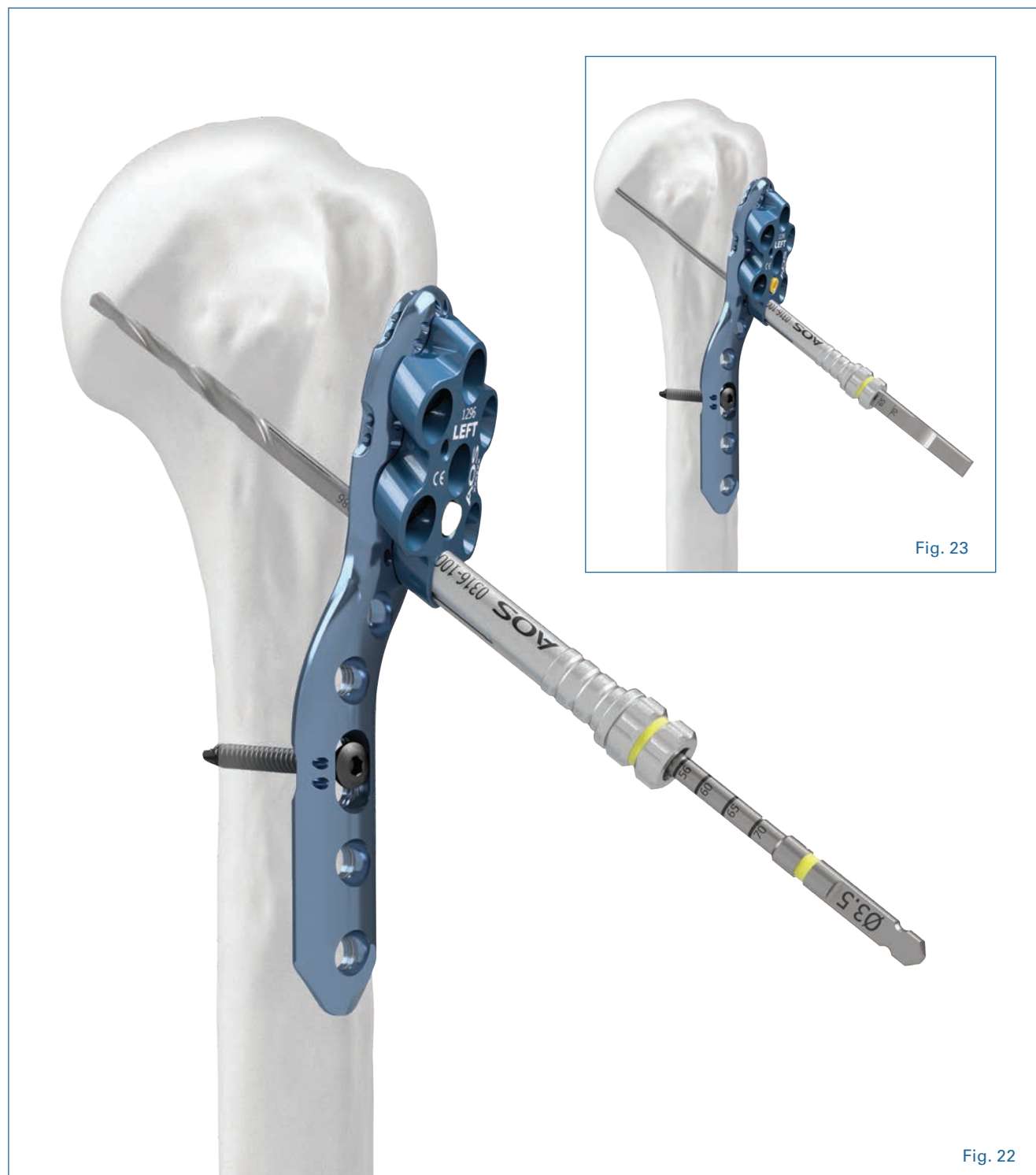
When the Drill Guide is removed, the appropriate length 4.0mm Partially Threaded Cancellous Locking Screw is inserted through the Screw Sheath using the Screw Gripper, 2.5mm Hex Driver and Screw Driver Handle (**Fig. 24**). The Hex

Driver is etched with a laser line that will align with the end of the Screw Sheath when the screw is fully threaded into the plate. Ensure that the screw is securely tightened and locked into the plate.

Follow the same procedure for each proximal screw. As an alternative to the Partially Threaded Screw, a 4.0mm Fully Threaded Cancellous Locking Screw may be used. Use the

2.5mm Drill Guide and **2.5mm Long Calibrated Drill (0250)** to insert the Fully Threaded Cancellous Screw.

Note: To help prevent articular penetration a **4.0mm Cancellous Tap (0255)** with Screw Driver Handle can be used in conjunction with drilling through the Drill Guide.



9. Distal Screw Insertion

The distal end of the plate has been designed to accept either 3.5mm Cortical Screws (Non-Locking) or 3.5mm Locking Cortical Screws.

Non-Locking

When using the 3.5mm Cortical Screw, use the **2.5mm Multiple Drill Guide (0318)** and 2.5mm Calibrated Drill. Drill through both cortices.

Ensure that the Drill Guide end marked “non-locking” is utilized (**Fig. 25**). Read the calibration line on the Drill bit that lines up with the end of the Drill Guide to determine screw length. Alternatively, screw length may be determined using the Hook Tip Depth Gauge. Read screw length using edge marked “non-locking”. The appropriate length screw is then inserted using the Screw Gripper, 2.5mm Hex Driver and Screw Driver Handle.



Fig. 25



Fig. 26

Locking

When using a 3.5mm Locking Cortical Screw the surgeon has two drill guide options.

Option 1:

Use the **2.5mm Multiple Drill Guide (0318)** and 2.5mm Calibrated Drill. Insert Drill Guide into plate and seat perpendicular then drill through both cortices. Ensure that the Drill Guide end marked “locking” is utilized (**Fig. 26**). Read the calibration line on the Drill bit that lines up with the end of the Drill Guide to determine screw length. Alternatively, screw length may be determined using the Hook Tip Depth Gauge. Read screw length using edge marked “locking”. The appropriate length screw is then inserted using the Screw Gripper, 2.5mm Hex Driver and Screw Driver Handle.

Option 2:

Use the **2.5mm Perpendicular Placement Drill Guide (0324)** and 2.5mm Calibrated Drill. Fully thread Drill Guide into plate and drill through both cortices. Read the calibration line on the Drill bit that lines up with the end of the Drill Guide to determine screw length (**Fig. 27 A, B, C**).

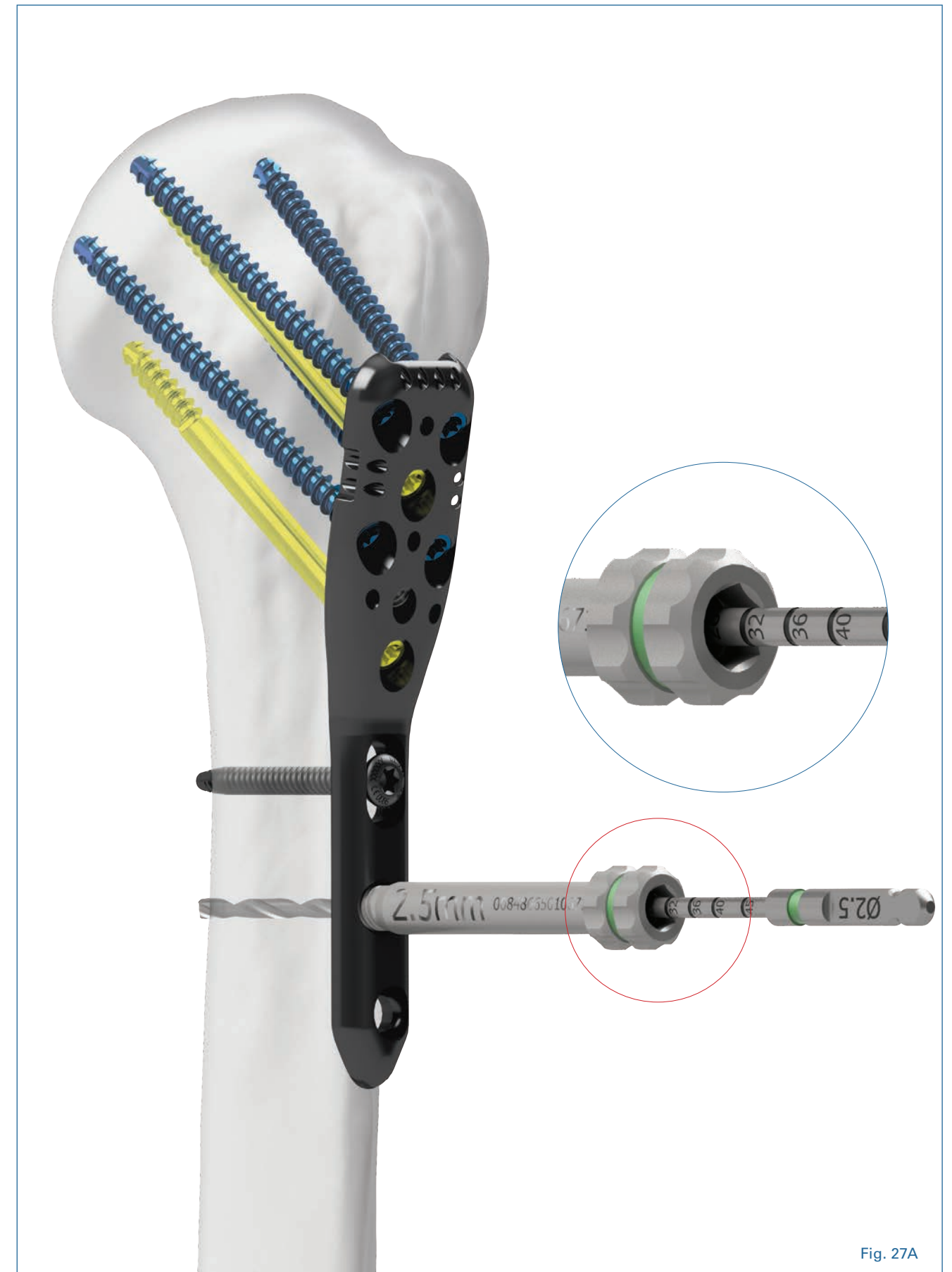
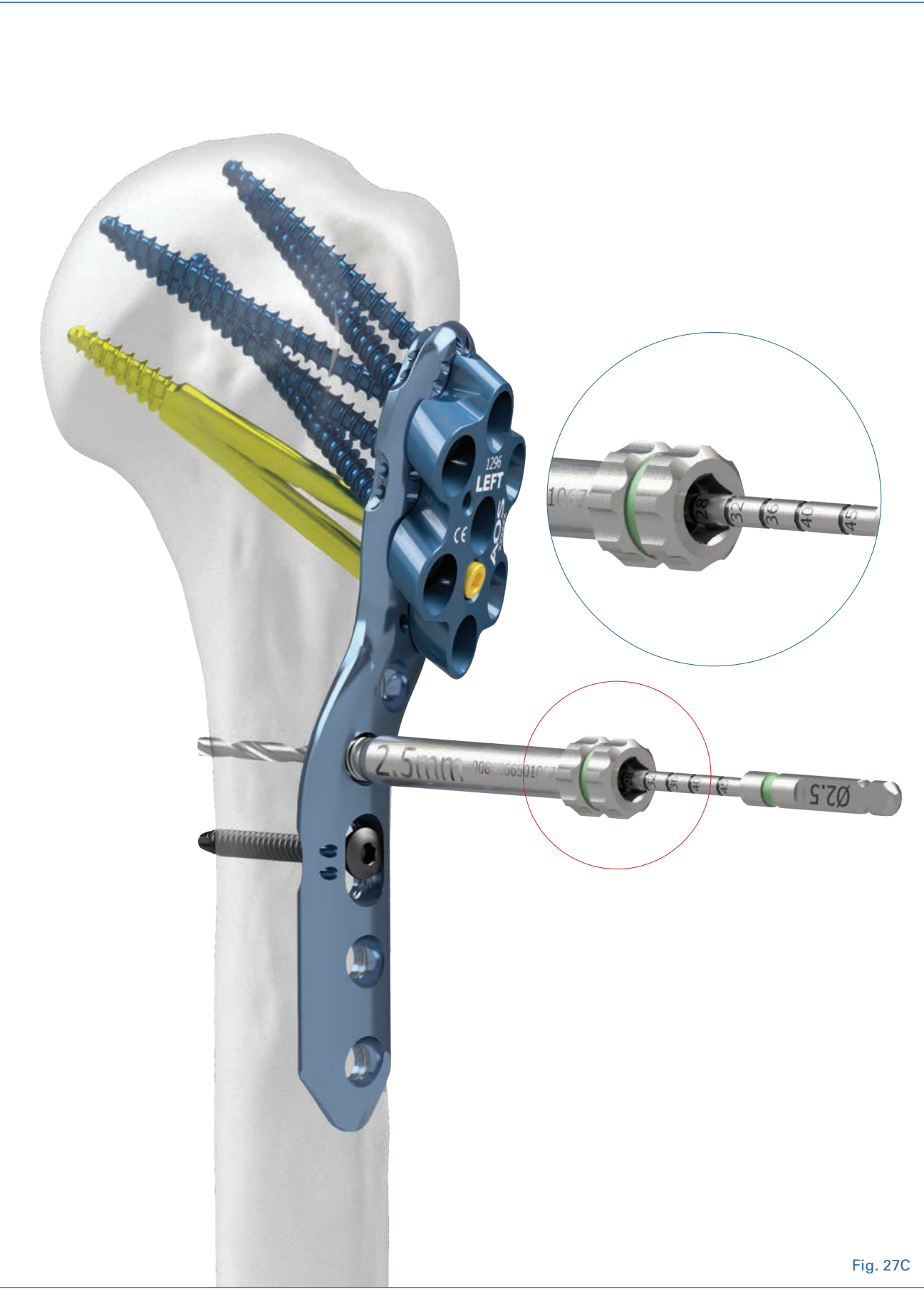


Fig. 27A



Alternatively, screw length may be determined using the Hook Tip Depth Gauge after removing the Drill Guide. Read screw length using edge marked "locking". When the Drill Guide is removed, the appropriate length screw is then inserted using the Screw Gripper, 2.5mm Hex Driver and Screw Driver Handle.

It is recommended that all shaft locking holes are filled with either a cortical or locking cortical screw of the appropriate

length to ensure maximum stability. Follow the same procedure for each additional distal screw.

Note: To improve screw insertion in hard cortical bone a **3.5mm Cortical Tap (0226)** may be used with Screw Driver Handle after drilling.

Remove the Targeting Block and any Guide Pins (**Fig. 28 A, B, C**).



Fig. 28A



Fig. 28C



Fig. 28B

10. Incision Closure

Final verification using fluoroscopy is recommended to check correct screw placement. Use the appropriate method for surgical closure of the incision.