

DVR® Crosslock
Distal Radius Plating System

Surgical Technique

One Surgeon. One Patient.®

Over 1 million times per year, Biomet helps one surgeon provide personalized care to one patient.

The science and art of medical care is to provide the right solution for each individual patient. This requires clinical mastery, a human connection between the surgeon and the patient, and the right tools for each situation.

At Biomet, we strive to view our work through the eyes of one surgeon and one patient. We treat every solution we provide as if it's meant for a family member.

Our approach to innovation creates real solutions that assist each surgeon in the delivery of durable personalized care to each patient, whether that solution requires a minimally invasive surgical technique, advanced biomaterials or a patient-matched implant.

When one surgeon connects with one patient to provide personalized care, the promise of medicine is fulfilled.

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Introduction

The treatment of distal radius fractures experienced a revolution when the DVR® Volar Plating System was released. Leading the way to a new approach, the DVR® plate has helped restore motion to patients worldwide – in the everyday activities that are driven by the hand and wrist, from artistic to athletic.

With over 10 years of clinical heritage in treating distal radius fractures using the volar approach, the DVR® plate continues to evolve. The new DVR® Crosslock System offers an advanced anatomic design, enhanced fixation options over the existing DVR® System, and streamlined instrumentation. The improved system has been optimized for fit, efficiency, accuracy and stability. With these improvements, the next-generation DVR® Crosslock will continue to refine fracture fixation.



DVR® Crosslock enhancements over the DVR® Anatomic:

- Cross-locking oblique screw options provide additional three-dimensional fixation in comminuted or osteoporotic bone.
- Pegs and locking screws are engineered with tapered heads and triple lead threads to create a stiff construct and to enhance insertion or removal characteristics.
- New 2.7 mm screws create greater procedural efficiency by utilizing only one drill bit and one driver for all the implant screws while maintaining construct strength.
- Narrower shaft increases the ease of fitting the plate to the bone while still providing more fixation options than the current DVR® Anatomic.
- Length offering includes: mini (new), standard, medium, long.

DVR® innovation milestones:

- The first implant system with divergent pegs to capture dorsally displaced fractures from a volar approach.
- A low profile implant designed to mimic the volar aspect of the bone and be used as a reduction template.
- Fixed angle K-wires to confirm implant placement prior to final implantation.
- F.A.S.T. Guide® technology to simplify and speed up surgery.
- Cobalt chrome multi-directional screws to provide the surgeon the flexibility to adjust screw trajectories while still creating a strong, stable construct.

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Implant Features

Oblong screw hole
allows for fine tuning of the plate position.

Cross-locking
oblique screw options provide additional three-dimensional fixation in comminuted or osteoporotic bone.

Volar tilt
can aid in anatomic reduction, restoration of volar tilt, and is particularly useful for corrective osteotomies.

The distal shape of the plate
is contoured to match the watershed line to provide a visual guide for optimal placement and its low profile blends into the bone to mitigate risk of tendon irritation.

All-new
2.2 mm locking pegs and 2.7 mm locking screws with taper heads and triple lead threads create a stiff construct, which can enhance insertion or removal characteristics.

F.A.S.T. Guide® Inserts
technology allows for easy drilling of fixed angle locking screws and visually distinguishes left and right plates.

Fixed angle
holes reference screw trajectory, and aid in optimal plate positioning.

Intersecting proximal and distal pegs
form a patented three dimensional scaffold, providing support of the articulating surface.

Multi-directional screws
Offer up to 10 degrees of angulation (or 20 degree cone) off the fixed angle trajectory

Pegs and Screws

Screws are designed to work in the locking, non-locking, and oblong holes.

Pegs and Screws	Available Lengths	
2.2 mm Smooth Pegs (Locking)	12 mm to 16 mm in increments of 1 mm; 18 mm to 30 mm in increments of 2 mm	
2.7 mm Cortical Screws (Locking)	8 mm to 16 mm in increments of 1 mm; 18 mm to 30 mm in increments of 2 mm	
2.7 mm Multi-Directional Screws (Locking)	8 mm to 16 mm in increments of 1 mm; 18 mm to 30 mm in increments of 2 mm	
2.7 mm Cortical Screws (Non-Locking)	18 mm to 30 mm in increments of 2 mm	

Available plate sizes and lengths listed on page 23

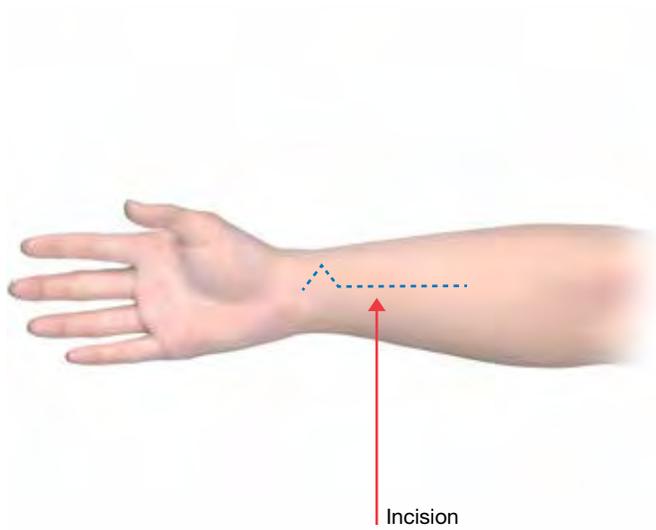


Figure 1

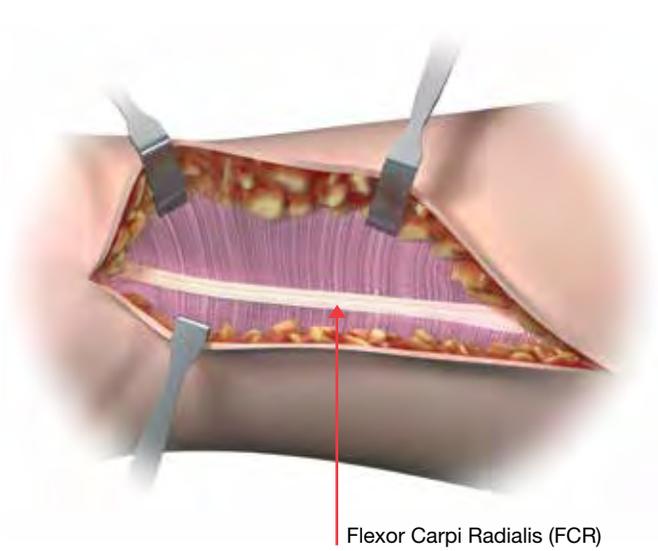


Figure 2

Flexor Carpi Radialis (FCR) Approach

Incision

Make an incision over the course of the FCR tendon.

A zigzag incision is made across the wrist flexion crease to allow better access and visualization (Figure 1).

Release the FCR Tendon Sheath

Expose and open the sheath of the FCR tendon (Figure 2).

Dissect the FCR tendon distally to the level of the superficial radial artery.

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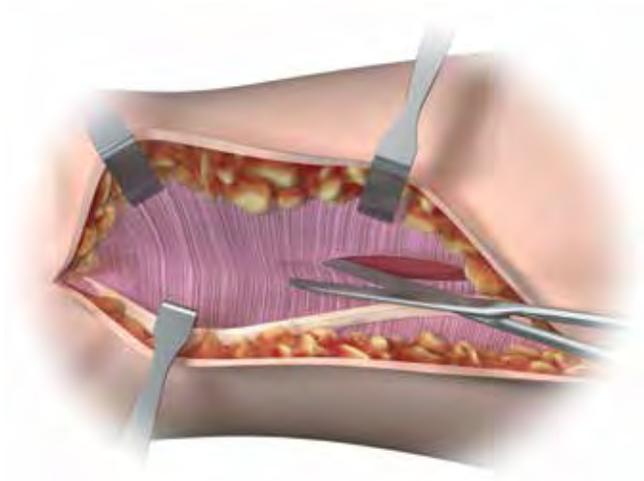


Figure 3

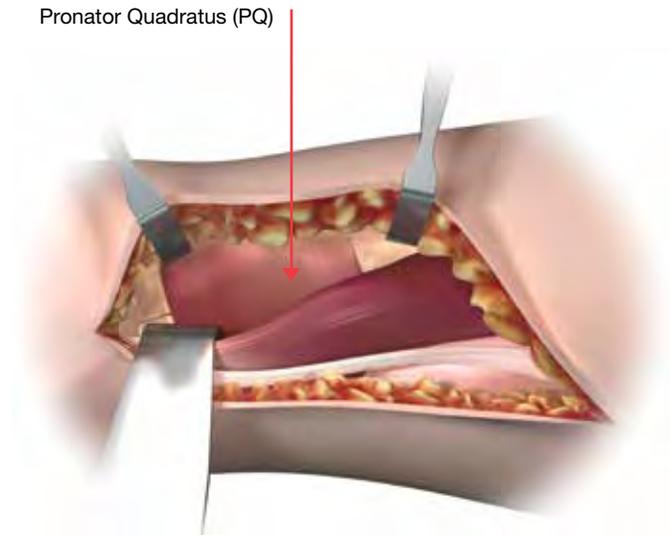


Figure 4

Crossing the Deep Fascia

Retract the FCR tendon toward the ulna while protecting the median nerve (Figure 3).

Incise through the floor of the FCR sheath to gain access to the deeper levels.

Split the sheath of the FCR tendon distally up to the tuberosity of the scaphoid.

Mid-Level Dissection

Develop the plane between the flexor pollicis longus (FPL) and the radial septum to reach the surface of the radius (Figure 4).

Develop widely the subtendinous space of parona and expose the pronator quadratus muscle (PQ).

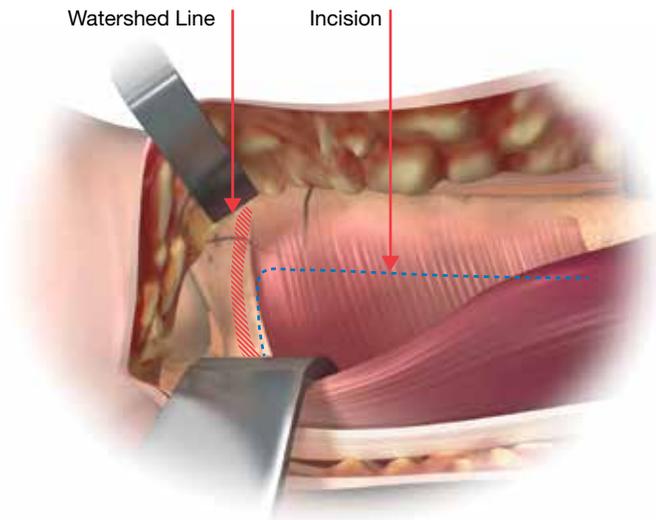


Figure 5

Identifying the Watershed Line

Palpate the radius distally to identify the volar rim of the lunate fossa. This establishes the location of the watershed line (Figure 5).

The transitional fibrous zone (TFZ) is a band of fibrous tissue located between the watershed line and the PQ that must be elevated to properly visualize the fracture.

Release the PQ by sharply incising over the watershed line and proximally on the lateral edge of the radius (Figure 5).

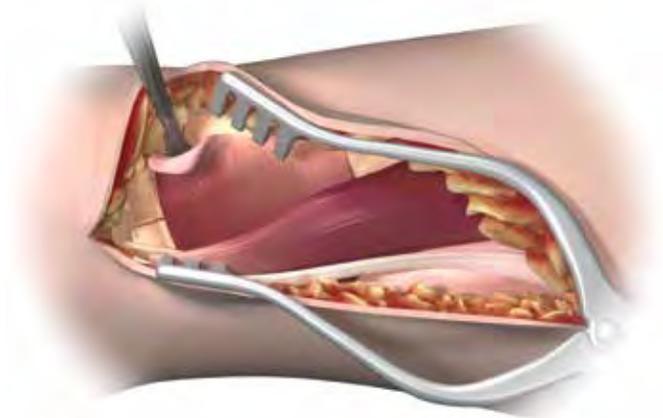


Figure 6

Elevating the Pronator Quadratus

Use a periosteal elevator to elevate the PQ to expose the volar surface of the radius (Figure 6).

The fracture line on the volar cortex is usually simple, which facilitates reduction.

The origin of the FPL muscle can be partially released for added exposure.

Caution: During implantation, the pronator quadratus is frequently ruptured.

Please refer to Warnings and Precautions Section on the back cover.

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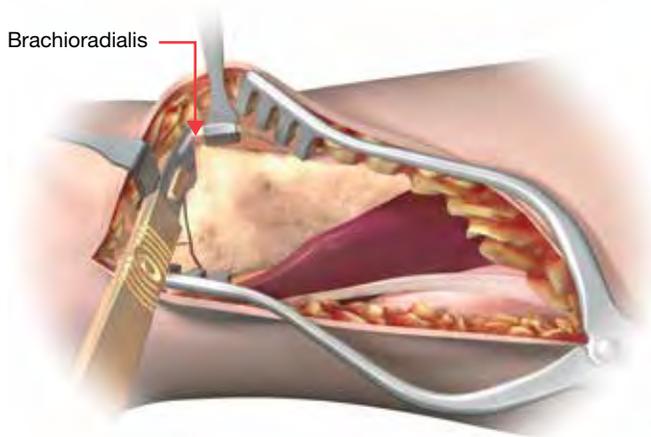


Figure 7

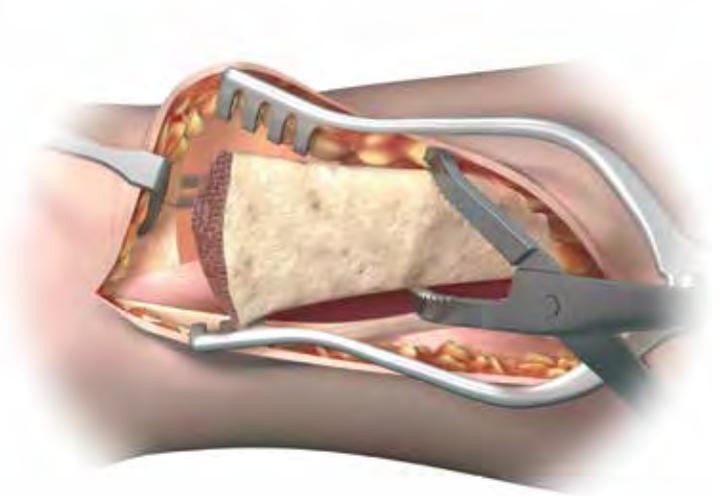


Figure 8

Flexor Carpi Radialis (FCR) Approach (Cont.)

Release of the Distal Fragment

Release the insertion of the brachioradialis which is found on the floor of the first compartment in a step cut fashion (Figure 7).

Note: The brachioradialis is the prime deforming force of the distal fragment.

Identify and retract the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons.

Important: Care should be taken to protect the radial artery.

Extended FCR Approach

Pronation of the proximal fragment out of the way provides exposure to the dorsal aspect of the fracture, allowing fracture debridement and reduction.

Intra-Focal Exposure

Intra-focal exposure is obtained by pronating the proximal fragment out of the way. A bone clamp facilitates this maneuver (Figure 8).

Preserve the soft tissue attachments to the medial aspect of the proximal fragment.

Note: This is where the anterior interosseous vessels that feed the radial shaft are located.

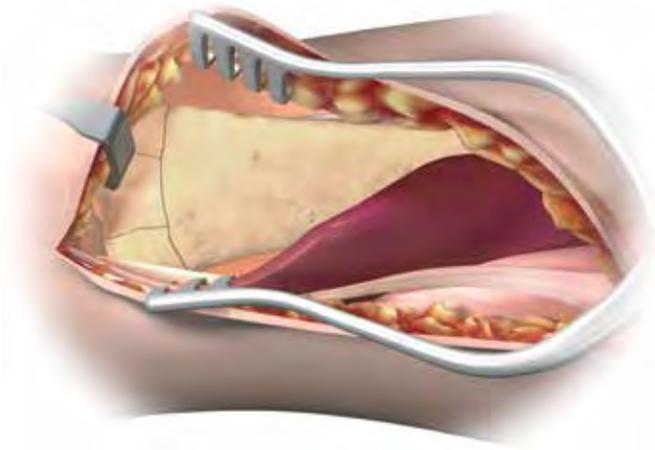


Figure 9

Provisional Fracture Reduction

After fracture debridement, supinate the proximal radius back into place and restore radial length by reducing the volar cortex (Figure 9).

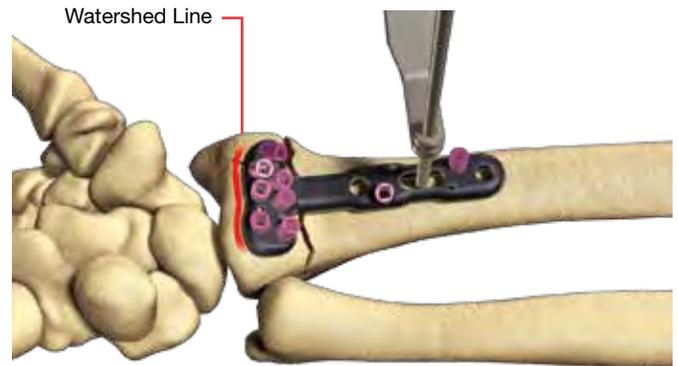


Figure 10

Proximal Plate Positioning

Determine the correct position for the plate by judging how the plate conforms to the watershed line and the volar surface of the radius.

Using the 2.2 mm drill bit with the soft tissue guide, drill through the center of the proximal oblong hole of the plate, which will allow for plate adjustments (Figure 10).

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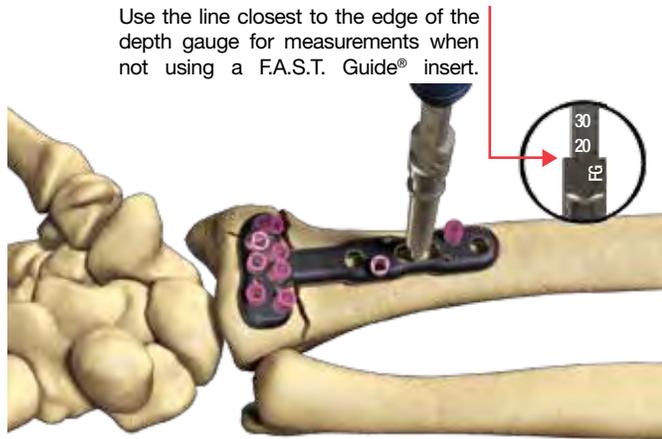


Figure 11

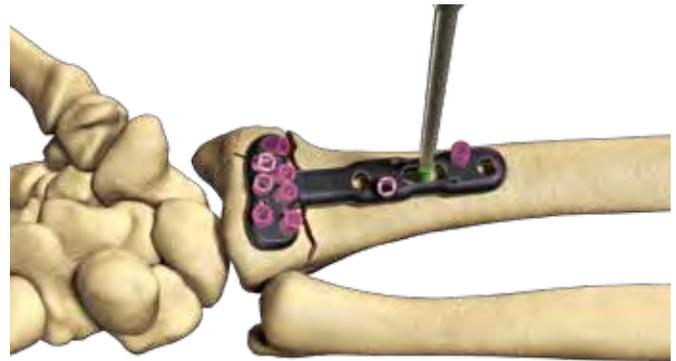


Figure 12

Measure the required screw length using the line closest to the edge of the depth gauge.

When selecting a screw for the oblong hole or any other non-threaded screw hole, round up measurement to the nearest 1 or 2 mm (Figure 11).

Note: The depth gauge has a FG mark to facilitate the use of the gauge with a F.A.S.T. Guide® insert. The opposing side should be used when measuring without a F.A.S.T. Guide® insert.

Insert the appropriate length 2.7 mm locking screw using the square driver (Figure 12).

Note: Locking screws are designed to work in the locking, non-locking, and oblong holes.



Figure 13

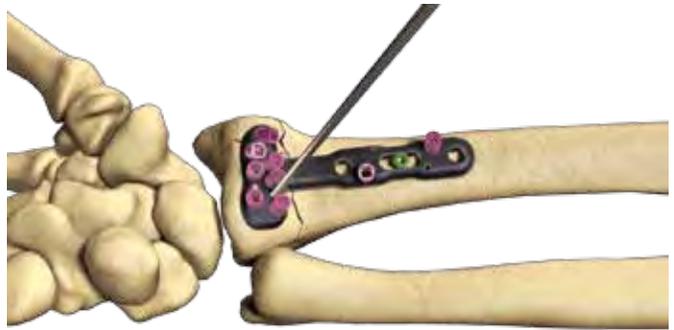


Figure 14

Distal Plate Fixation

Final Fracture Reduction

Final reduction is obtained by indirect means using the DVR® Crosslock plate as a template, then applying traction, ligamentotaxis, and direct pressure over the dorsal aspect (Figure 13).

Note: A properly applied bolster helps to maintain the reduction.

Distal Plate Fixation

First, secure the distal fragment to the plate by inserting a K-wire through the most ulnar K-wire hole in the proximal row (Figure 14).

Proper plate positioning can be confirmed using fluoroscopy by obtaining a 20-30 degree lateral image.

The K-wire should be 2-3 mm subchondral to the joint line on this view.

Note: K-wires installed in the proximal row aid in reduction of the distal fragments and allow proper assessment of peg or screw placement prior to drilling.

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Figure 15

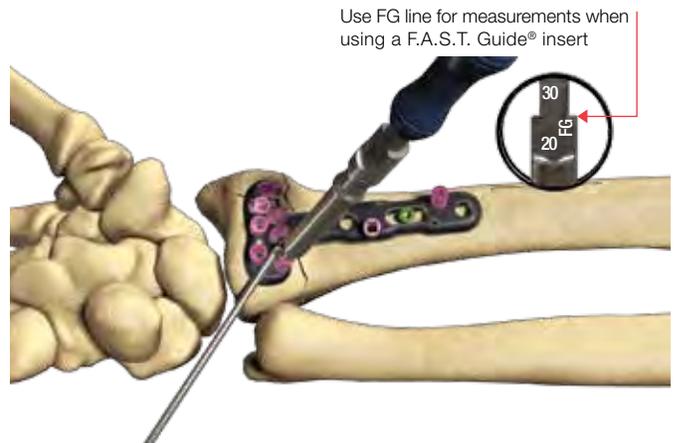


Figure 16

Drilling the Proximal Row

Using the 2.2 mm drill bit, drill through the proximal single-use F.A.S.T. Guide® inserts starting on the ulnar side in order to stabilize the lunate fossa (Figure 15).

Note: Bend the K-wire out of the way to facilitate drilling.

Measuring Through the F.A.S.T. Guide® Insert

Measure the drilled hole with the depth gauge by taking a direct reading from the FG line (Figure 16).

The depth gauge calibration will provide a direct measurement. When selecting screws in the metaphysis, choosing a screw 1 mm or 2 mm less than the reading may reduce the risk of tissue irritation.

Note: If the F.A.S.T. Guide® insert is removed before measuring the screw length, use the line closest to the edge of the depth gauge.

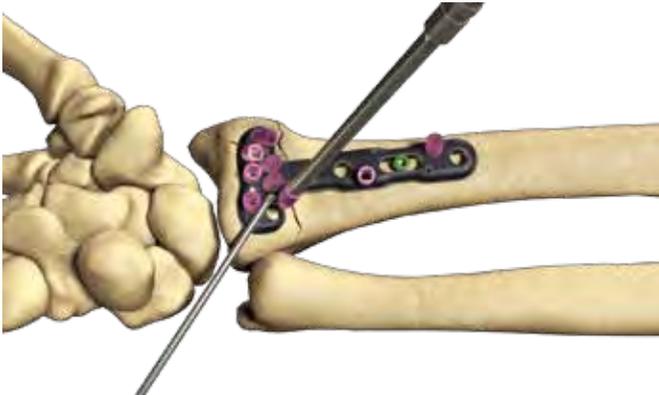


Figure 17

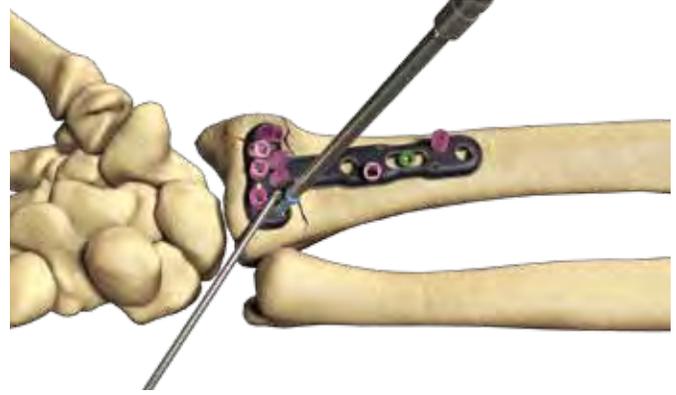


Figure 18

Proximal Row of the Head of the Plate

Remove each F.A.S.T. Guide® insert with the square driver after checking the drilled depth (Figure 17).

Using the same driver, fill the holes in the head of the plate with the appropriate length locking screws or pegs. The illustration shows a peg being installed (Figure 18).

Note: 2.7 mm non-locking screws are provided for temporary lagging of bone fragments in distal portion of plate. Replacing non-locking screws with locking screws or pegs in the plate will provide rigid fixation. 2.7 mm non-locking screws can also be used as stand alone lag screws for loose fragments.

Note: Using a power screwdriver is not recommended for insertion of any screw. Perform all final screw tightening by hand.

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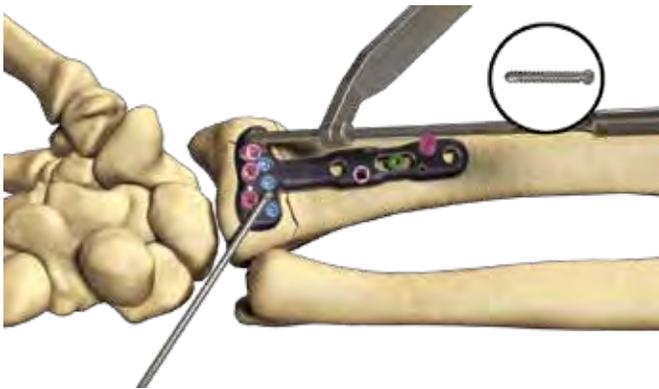


Figure 19



Figure 20

Installation of a Multi-Directional (MD) Screw

A MD screw option is provided for locked fixation within a 20 degree cone of angulation off the fixed angle trajectory.

Remove the F.A.S.T. Guide® inserts using the square driver.

Place the 2.2 mm end of the soft tissue guide into the radial styloid and/or the most ulnar hole in the proximal row of the DVR® Crosslock plate.

Note: Fluoroscopy should be used to avoid placing a MD screw in the intra-articular joint space.

Place the 2.2 mm drill bit through the soft tissue guide until it comes in contact with the bone. Determine the trajectory of the drill bit by varying the angle of the soft tissue guide and drill (Figure 19).

Note: A MD screw can be used in any threaded locking hole.

Distal Row Plate Fixation

Final Plate Fixation

Fill all the holes of the distal row (Figure 20).

As the distal row of the head of the plate converges on the proximal row between 14 mm and 16 mm, typically a 16 mm length peg/screw is all that is needed in the distal row.

Note: The proximal row provides support to the dorsal aspect of the articular surface. The distal row provides support to the central and volar aspects of the subchondral plate.

Remove all F.A.S.T. Guide® inserts even if the screw hole is not used.

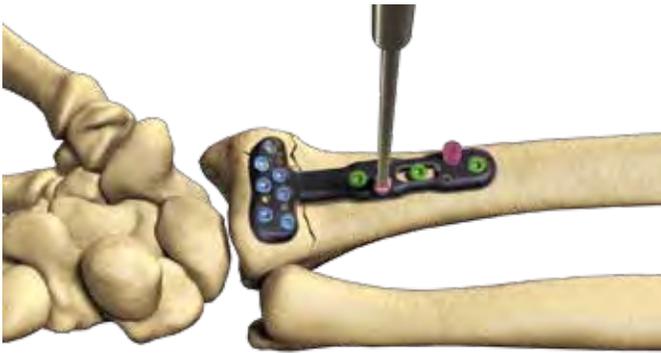


Figure 21

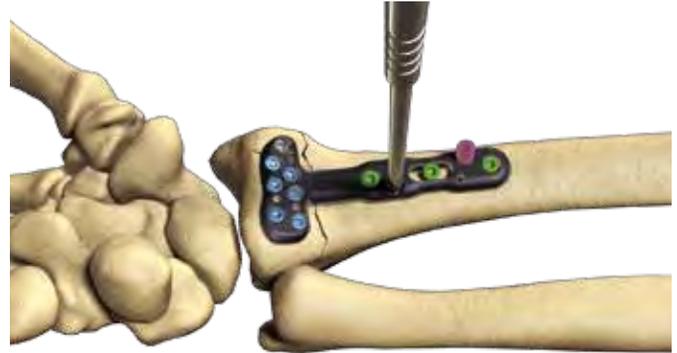


Figure 22

Final Proximal Plate Fixation

Apply the remaining 2.7 mm locking screws in the non-threaded screw holes. Use the same technique as inserting a screw through the oblong hole (see page 9).

Angled screw holes with F.A.S.T. Guide® inserts are locking screw hole options. To apply locking screws in the shaft, use the same technique as applying locking screws in the distal end of the plate (Figures 21 and 22).

The 2.2mm locking drill guide is available for use in any threaded hole. Install the threaded drill guide until fully seated. Drill both cortices with the 2.2 mm drill bit. Read the required length from the line closest to the edge of the depth gauge and install appropriate length 2.7 mm locking screws

Note: Long plates will not have preinstalled F.A.S.T. Guide® inserts in every threaded shaft hole.

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Figure 23



Figure 24

Final Radiographs

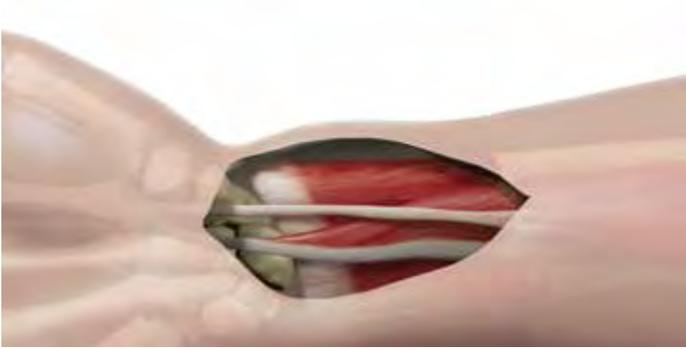
A 20-30 degree elevated lateral fluoroscopic view allows visualization of the articular surface, evaluation of the volar tilt, and confirmation of proper peg/screw placement 2-3 mm proximal to the subchondral plate (Figure 23).

To confirm that the length of each individual peg/screw is correct, pronate and supinate the wrist under fluoroscopy.

Final Appearance

A properly applied plate should be just proximal to the watershed line and not project above or beyond it in order to avoid contact with the flexor tendons (Figure 24).

Caution: Ensure all F.A.S.T. Guide® inserts are removed prior to closing.



Wound Closure

Repair the TFZ in order to cover the distal edge of the DVR® Crosslock Plate.

Repair the brachioradialis.

Suture the PQ to the TFZ and the repaired brachioradialis.

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Figure 25



Figure 26

Distal Fragment First Technique For Established Malunions

Complete exposure and place a K-wire 2-3 mm proximal to the articulating surface and parallel to the joint line (Figure 25).

Note: Use the K-wire hole on the distal row of the DVR® Crosslock Plate as a guide for proper implant placement (Figure 26).

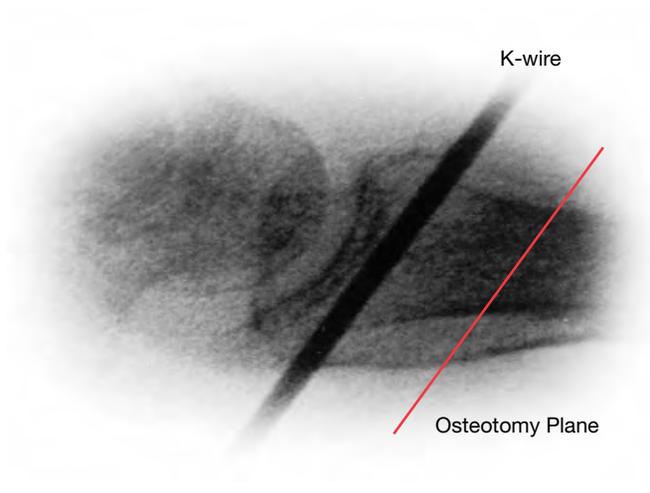


Figure 27

Create the osteotomy plane parallel to the K-wire (Figure 27).

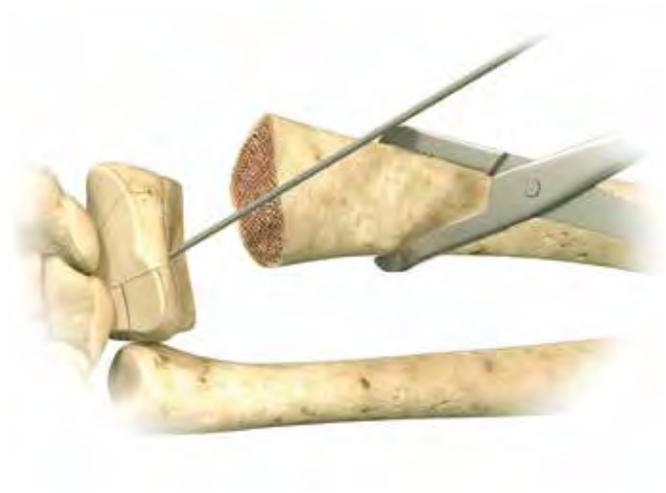


Figure 28

Release the brachioradialis, then pronate the radius and release the dorsal periosteum (Figure 28).

Note: The location of the distal row can be identified and drilled prior to the osteotomy.

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Figure 29

Supinate the proximal fragment and slide the DVR® Crosslock Plate over the K-wire.

The K-wire will assure proper restoration of the volar tilt (Figure 29).

Note: Plate acts as a template that aids in the proper restoration of the volar tilt.

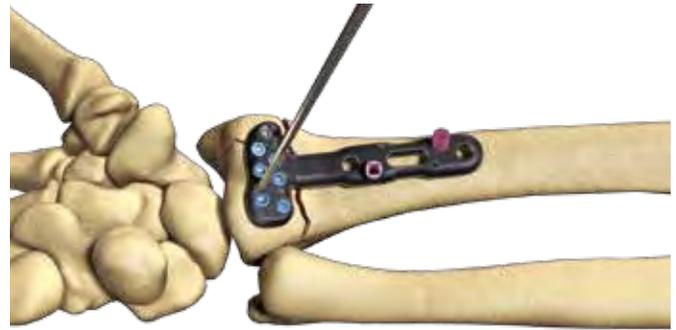


Figure 30



Figure 31

Fix the DVR® Crosslock Plate to the distal fragment (Figures 30 and 31). The watershed line provides guidance for proper radiolunate deviation.

Once distal fixation is complete, the shaft of the implant is secured to the shaft of the radius to re-create the normal volar tilt.



Figure 32

If applicable after fixation, autograft is applied and the wound is closed (Figure 32).

Confirm postoperative results with radiographs.

Interfragmentary Technique

Reduce the fracture and maintain the reduction with bone forceps. Drill a gliding hole in the near cortex with the 2.9 mm drill bit using the 2.2/2.9 mm soft tissue guide.

Insert the 2.2 mm end of the 2.2/2.9 mm soft tissue guide into the glide hole. Drill a pilot hole into the far cortex with the 2.2 mm drill bit.

Determine the required screw length by taking a direct reading using the line closest to the edge of the depth gauge. When selecting a 2.7 mm non-locking screw, round up measurement to the nearest 1 or 2 mm. Insert the appropriate length 2.7 mm non-locking screw with the square driver.

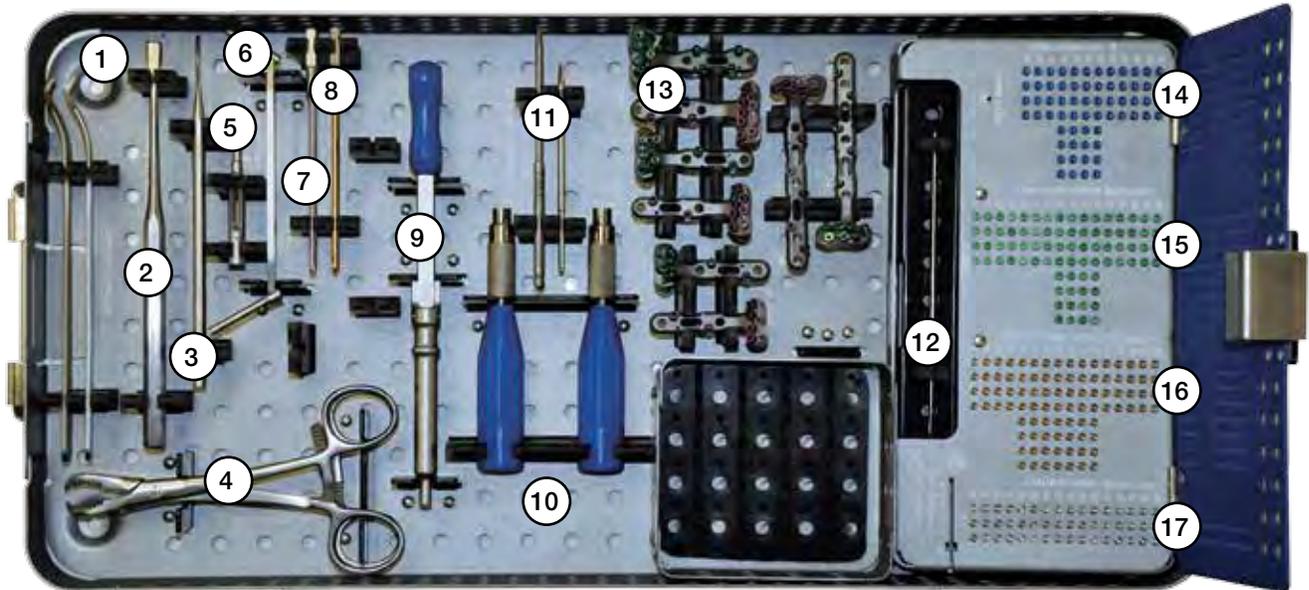
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DVR® Crosslock Modular Tray

Fully modular tray system addresses multiple applications with the use of a single tray.

- Reduced OR Instruments
- Improved Workflow



Product	Label	Part Number	Description
DVR® Crosslock Tray	1	MHR	Mini Hohmann Retractors
	2	2312-00-112	Key Elevator
	3	9399-99-280	Sharp Hook
	4	BC 9399-99-518	Bone Clamp DRT Stagbeetle Forceps
	5	2312-00-109	2.2 mm Locking Drill Guide
	6	2312-00-104	2.2/2.9 mm Soft Tissue Guide
	7	2312-00-200	2.2 mm Drill Bit
	8	2312-00-201	2.9 mm Drill Bit (Overdrill)
	9	2312-00-100	Bone Depth Gauge
	10	2312-00-106	Quick Connect Handle Blue
	11	2312-00-101	1.7/2.2 mm Square Driver
	12	KW062SS	1.6 mm K-Wire Stainless Steel
DVR® Crosslock Implants	13	1318-XX-0XX	DVR® Crosslock Plates
	14	1312-27-0XX	2.2 mm Locking Smooth Pegs
	15	1312-27-1XX	2.7 mm Locking Screws
	16	1312-27-2XX	2.7 mm Non-Locking Screws
	17	1312-27-3XX	2.7 mm Multi-Directional Screws
Trays	-	2312-00-001	DVR® Crosslock Complete Case and Tray
	-	2312-00-004	DVR® Crosslock Screw Caddy

Ordering Information

DVR® Crosslock Plates

Narrow Mini Locked Plate*		
22 mm X 41 mm		
1318-11-040	Right	<i>New Plate Length</i>
1318-21-040	Left	
Mini Locked Plate*		<i>New Plate Length</i>
24 mm X 43 mm		
1318-12-040	Right	
1318-22-040	Left	
Narrow Locked Plate		
22 mm X 51 mm		
1318-11-050	Right	
1318-21-050	Left	
Standard Locked Plate		
24 mm X 51 mm		
1318-12-050	Right	
1318-22-050	Left	
Wide Locked Plate		
28 mm X 56 mm		
1318-13-050	Right	
1318-23-050	Left	
Medium Locked Plate		
24 mm X 62 mm		
1318-12-060	Right	
1318-22-060	Left	
Long Locked Plate		
24 mm X 85 mm		
1318-12-090	Right	
1318-22-090	Left	



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DVR® Crosslock Screws

2.2 mm Locking Smooth Pegs	
1312-27-012	Locking Smooth Peg 2.2 mm, 12 mm
1312-27-013	Locking Smooth Peg 2.2 mm, 13 mm
1312-27-014	Locking Smooth Peg 2.2 mm, 14 mm
1312-27-015	Locking Smooth Peg 2.2 mm, 15 mm
1312-27-016	Locking Smooth Peg 2.2 mm, 16 mm
1312-27-018	Locking Smooth Peg 2.2 mm, 18 mm
1312-27-020	Locking Smooth Peg 2.2 mm, 20 mm
1312-27-022	Locking Smooth Peg 2.2 mm, 22 mm
1312-27-024	Locking Smooth Peg 2.2 mm, 24 mm
1312-27-026	Locking Smooth Peg 2.2 mm, 26 mm
1312-27-028	Locking Smooth Peg 2.2 mm, 28 mm
1312-27-030	Locking Smooth Peg 2.2 mm, 30 mm
2.7 mm Locking Screws	
1312-27-108	Locking Screw 2.7 mm, 8 mm
1312-27-109	Locking Screw 2.7 mm, 9 mm
1312-27-110	Locking Screw 2.7 mm, 10 mm
1312-27-111	Locking Screw 2.7 mm, 11 mm
1312-27-112	Locking Screw 2.7 mm, 12 mm
1312-27-113	Locking Screw 2.7 mm, 13 mm
1312-27-114	Locking Screw 2.7 mm, 14 mm
1312-27-115	Locking Screw 2.7 mm, 15 mm
1312-27-116	Locking Screw 2.7 mm, 16 mm
1312-27-118	Locking Screw 2.7 mm, 18 mm
1312-27-120	Locking Screw 2.7 mm, 20 mm
1312-27-122	Locking Screw 2.7 mm, 22 mm
1312-27-124	Locking Screw 2.7 mm, 24 mm
1312-27-126	Locking Screw 2.7 mm, 26 mm
1312-27-128	Locking Screw 2.7 mm, 28 mm
1312-27-130	Locking Screw 2.7 mm, 30 mm

2.7 mm Multi-Directional Screws	
1312-27-308	Multi-Directional Screw 2.7 mm, 8 mm
1312-27-309	Multi-Directional Screw 2.7 mm, 9 mm
1312-27-310	Multi-Directional Screw 2.7 mm, 10 mm
1312-27-311	Multi-Directional Screw 2.7 mm, 11 mm
1312-27-312	Multi-Directional Screw 2.7 mm, 12 mm
1312-27-313	Multi-Directional Screw 2.7 mm, 13 mm
1312-27-314	Multi-Directional Screw 2.7 mm, 14 mm
1312-27-315	Multi-Directional Screw 2.7 mm, 15 mm
1312-27-316	Multi-Directional Screw 2.7 mm, 16 mm
1312-27-318	Multi-Directional Screw 2.7 mm, 18 mm
1312-27-320	Multi-Directional Screw 2.7 mm, 20 mm
1312-27-322	Multi-Directional Screw 2.7 mm, 22 mm
1312-27-324	Multi-Directional Screw 2.7 mm, 24 mm
1312-27-326	Multi-Directional Screw 2.7 mm, 26 mm
1312-27-328	Multi-Directional Screw 2.7 mm, 28 mm
1312-27-330	Multi-Directional Screw 2.7 mm, 30 mm
2.7 mm Non-Locking Screws	
1312-27-218	Low Profile Non-Locking Screw 2.7 mm, 18 mm
1312-27-220	Low Profile Non-Locking Screw 2.7 mm, 20 mm
1312-27-222	Low Profile Non-Locking Screw 2.7 mm, 22 mm
1312-27-224	Low Profile Non-Locking Screw 2.7 mm, 24 mm
1312-27-226	Low Profile Non-Locking Screw 2.7 mm, 26 mm
1312-27-228	Low Profile Non-Locking Screw 2.7 mm, 28 mm
1312-27-230	Low Profile Non-Locking Screw 2.7 mm, 30 mm

IMPORTANT: This Essential Product Information does not include all of the information necessary for selection and use of a device. Please see full labeling for all necessary information.

INDICATIONS: The use of metallic surgical appliances provides the orthopaedic surgeon with a means of bone fixation and helps generally in the management of fractures and reconstructive surgeries. These implants are intended as a guide to normal healing, and are **NOT** intended to replace normal body structure or bear the weight of the body in the presence of incomplete bone healing. Delayed unions or nonunions in the presence of load bearing or weight bearing might eventually cause the implant to break due to metal fatigue. All metal surgical implants are subjected to repeated stress in use, which can result in metal fatigue.

THE SYSTEM IS INTENDED FOR FIXATION OF FRACTURES, MALUNIONS AND OSTEOTOMIES INVOLVING THE DISTAL RADIUS.

CONTRAINDICATIONS: Screws, plates, intramedullary nails, compression hip screws, pins and wires are contraindicated in: active infection, conditions which tend to retard healing such as blood supply limitations, previous infections, insufficient quantity or quality of bone to permit stabilization of the fracture complex and/or fusion of the joints, conditions that restrict the patient's ability or willingness to follow postoperative instructions during the healing process, foreign body sensitivity, and cases where the implant(s) would cross open epiphyseal plates in skeletally immature patients.

ADDITIONAL CONTRAINDICATION FOR ORTHOPAEDIC SCREWS AND PLATES ONLY: Cases with malignant primary or metastatic tumors which preclude adequate bone support or screw fixations, unless supplemental fixation or stabilization methods are utilized.

WARNINGS AND PRECAUTIONS: In using partial weight-bearing or nonweight-bearing appliances (orthopaedic devices other than prostheses), a surgeon should be aware that no partial weight-bearing or nonweight-bearing device can be expected to withstand the unsupported stresses of full weight bearing.

- Do NOT open the volar wrist capsule. Doing so may cause devascularization of the fracture fragments and destabilization of the volar wrist ligaments.
- If necessary, contour the plate in small increments. Excessive contouring may weaken or fracture the plate.
- Do NOT use screw lengths that will excessively protrude through the far cortex. Protrusion through the far cortex may result in soft tissue irritation.
- Do NOT permanently implant K-wires through the holes of the plate as they may back out and cause tissue damage. Use of the K-wires allows you to provisionally secure the plates to the anatomy.
- Do NOT use the multidirectional screws in the distal row of the plate. Ensure they are installed after insertion of the fixed angle pegs.

ADVERSE EVENTS: The following are the most frequent adverse events after fixation with orthopaedic screws, plates, intramedullary nails, compression hip screws, pins and wires: loosening, bending, cracking or fracture of the components or loss of fixation in bone attributable to nonunion, osteoporosis, markedly unstable comminuted fractures; loss of anatomic position with nonunion or malunion with rotation or angulation; infection, both deep and superficial; and allergies and other adverse reactions to the device material.

NOTE: It is NOT required to remove the F.A.S.T. Guide® inserts to sterilize the plate.

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For product information, including indications, contraindications, warnings, precautions and potential adverse effects, see the package insert herein and Biomet's website.



One Surgeon. One Patient.®

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