

# XTRAFIX® External Fixation System

Surgical Technique

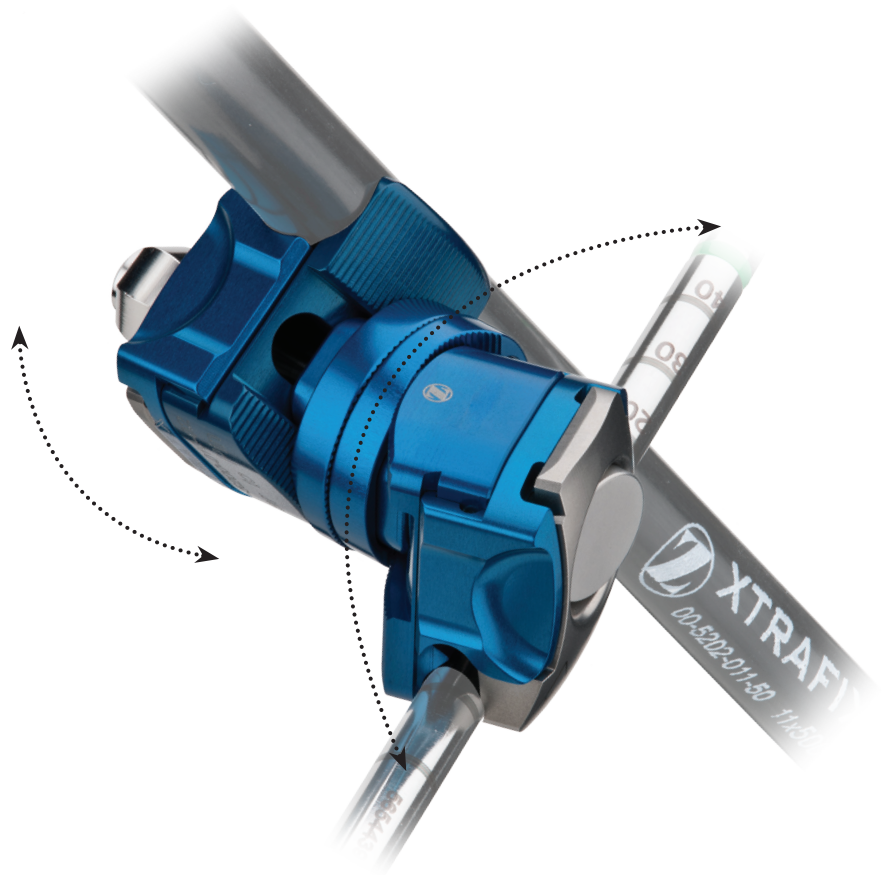


## XTRAFIX External Fixation System Surgical Technique

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## XTRAFIX External Fixation System

- No More Pop-Offs<sup>1</sup>
- 80° of Motion
- 1 Nut Tightening
- More Freedom, More Efficiency, Simply Better



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## Efficiency Clamps

- 45mm, 2-Bar, Multi-Pin Efficiency Clamp



- 75mm, 2-Bar, Multi-Pin Efficiency Clamp



- 45mm, 1-Bar, Multi-Pin Efficiency Clamp



## Item List

### Bar/Pin Tray

ITEM #	BAR/PIN TRAY
00-5207-024-30	Blue 2.4mm Drill
00-5207-032-30	Blue 3.2mm Drill
00-5207-040-70	Yellow 4.0mm Drill Medium
00-5207-040-10	Orange 4.0mm Drill Long
00-5207-045-10	Green 4.5mm Drill
00-5210-040-01	Blue Short Tissue Protector
00-5210-050-01	Blue Short Trocar
00-5210-040-02	Yellow Medium Tissue Protector
00-5210-050-02	Yellow Medium Trocar
00-5210-040-03	Orange Long Tissue Protector
00-5210-050-03	Orange Long Trocar
00-5210-040-06	Green 6mm Tissue Protector
00-5210-050-06	Green 6mm Trocar
00-5210-040-04	Black Transfixing Pin Tissue Protector
00-5210-050-04	Black Transfixing Pin Trocar
00-5204-030-25	Blue 3mm x 100mm x 25mm Half Pin
00-5204-030-15	Blue 3mm x 100mm x 15mm Half Pin
00-5204-040-35	Blue 4mm x 100mm x 35mm Half Pin
00-5204-040-20	Blue 4mm x 100mm x 20mm Half Pin
00-5204-050-35	Yellow 5mm x 160mm x 35mm Half Pin
00-5204-050-55	Yellow 5mm x 160mm x 55mm Half Pin
00-5204-050-45	Orange 5mm x 200mm x 45mm Half Pin
00-5204-050-65	Orange 5mm x 200mm x 65mm Half Pin
00-5204-050-85	Orange 5mm x 250mm x 85mm Half Pin
00-5204-090-28	Black Transfixing 5mm x 275mm, 6mm Thread Pin
00-5204-060-55	Green 6mm x 200mm x 55mm Half Pin

Item #	BAR/PIN TRAY
00-5202-011-10	11mm Bar X 100mm
00-5202-011-15	11mm Bar X 150mm
00-5202-011-20	11mm Bar X 200mm
00-5202-011-25	11mm Bar X 250mm
00-5202-011-30	11mm Bar X 300mm
00-5202-011-35	11mm Bar X 350mm
00-5202-011-40	11mm Bar X 400mm
00-5202-011-50	11mm Bar X 500mm
00-5202-011-60	11mm Bar X 600mm*
00-5202-010-18	11mm Bent Bar 175mm
00-5202-090-00	Straight Post, 11mm
00-5202-090-30	30° Angled Post, 11mm
00-5202-090-90	90° Angled Post, 11mm
00-5202-020-21	Curved Bar 210mm
00-5202-020-38	Curved Bar 380mm
00-5202-020-50	Curved Bar 500mm
00-5210-009-02	T-Handle AO Locking/9mm
00-5210-040-00	Tissue Protector Handle

\*Optional Items

## Item List

### Clamp Tray

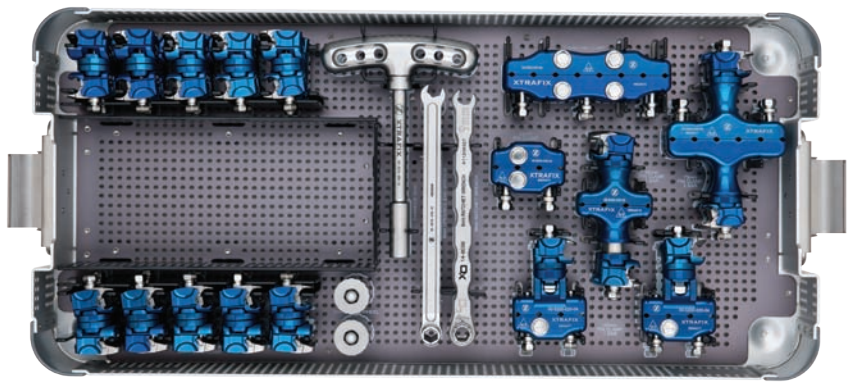
ITEM #	CLAMP TRAY
00-5200-010-01	Bar to Bar Clamp 3-D
00-5200-010-02	Bar to Pin Clamp 3-D
00-5200-040-04	45mm Pin Clamp
00-5200-040-08	105mm Pin Clamp
00-5200-020-04	45mm Pin Clamp, 1-Bar
00-5200-030-04	45mm Pin Clamp, 2-Bar
00-5200-030-06	75mm Pin Clamp, 2-Bar
00-5210-009-01	T-Handle 9mm
00-5210-019-01	9mm Open/Box End Wrench
00-5210-029-01	9mm Ratchet Wrench
00-5210-039-01	9mm Thumbwheel

Item #	OPTIONAL ITEMS
00-5200-090-01	Bar to Bar Clamp 2-D No Motion
00-5200-090-02	Bar to Pin Clamp 2-D No Motion
00-5200-050-04	K-Rod 45mm Pin Clamp, 2-Bar
00-5205-030-15	Blue 3mm x 100mm x 15mm Blunt Half Pin
00-5205-040-20	Blue 4mm x 100mm x 20mm Blunt Half Pin
00-5205-050-30	Yellow 5mm x 120mm x 30mm Blunt Half Pin
00-5205-050-35	Yellow 5mm x 160mm x 35mm Blunt Half Pin
00-5205-050-55	Yellow 5mm x 160mm x 55mm Blunt Half Pin
00-5205-050-45	Orange 5mm x 200mm x 45mm Blunt Half Pin
00-5205-050-65	Orange 5mm x 200mm x 65mm Blunt Half Pin
00-5203-011-07	11mm Carbon Bar 65mm*
00-5203-011-10	11mm Carbon Bar 100mm
00-5203-011-15	11mm Carbon Bar 150mm
00-5203-011-20	11mm Carbon Bar 200mm
00-5203-011-25	11mm Carbon Bar 250mm
00-5203-011-30	11mm Carbon Bar 300mm
00-5203-011-35	11mm Carbon Bar 350mm
00-5203-011-40	11mm Carbon Bar 400mm
00-5203-011-50	11mm Carbon Bar 500mm
00-5203-011-60	11mm Carbon Bar 600mm
00-5203-020-18	11mm Carbon Bent Bar 175
00-5203-020-21	11mm Carbon Curved Bar, 210mm
00-5203-020-38	11mm Carbon Curved Bar, 380mm
00-5203-020-50	11mm Carbon Curved Bar, 500mm

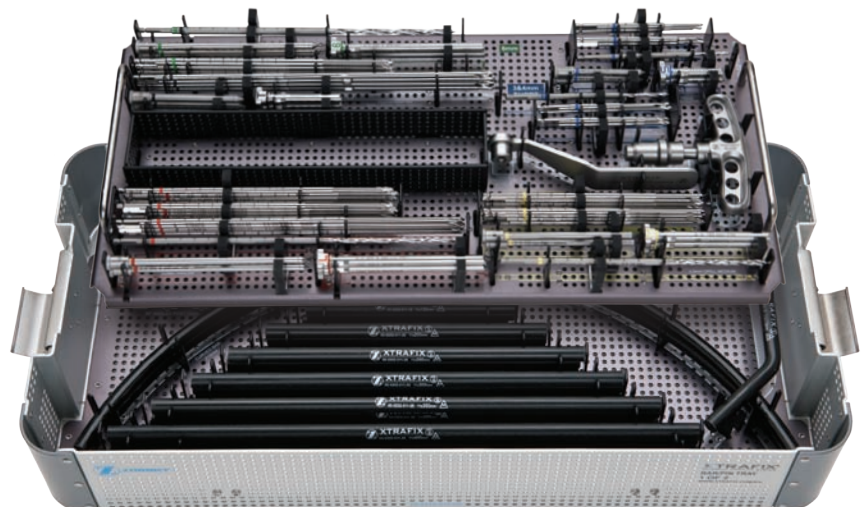
## XTRAFIX Trays

A Complete, Efficient Set in Two Simple Trays

### 1. Clamp Tray



### 2. Bar/Pin Tray

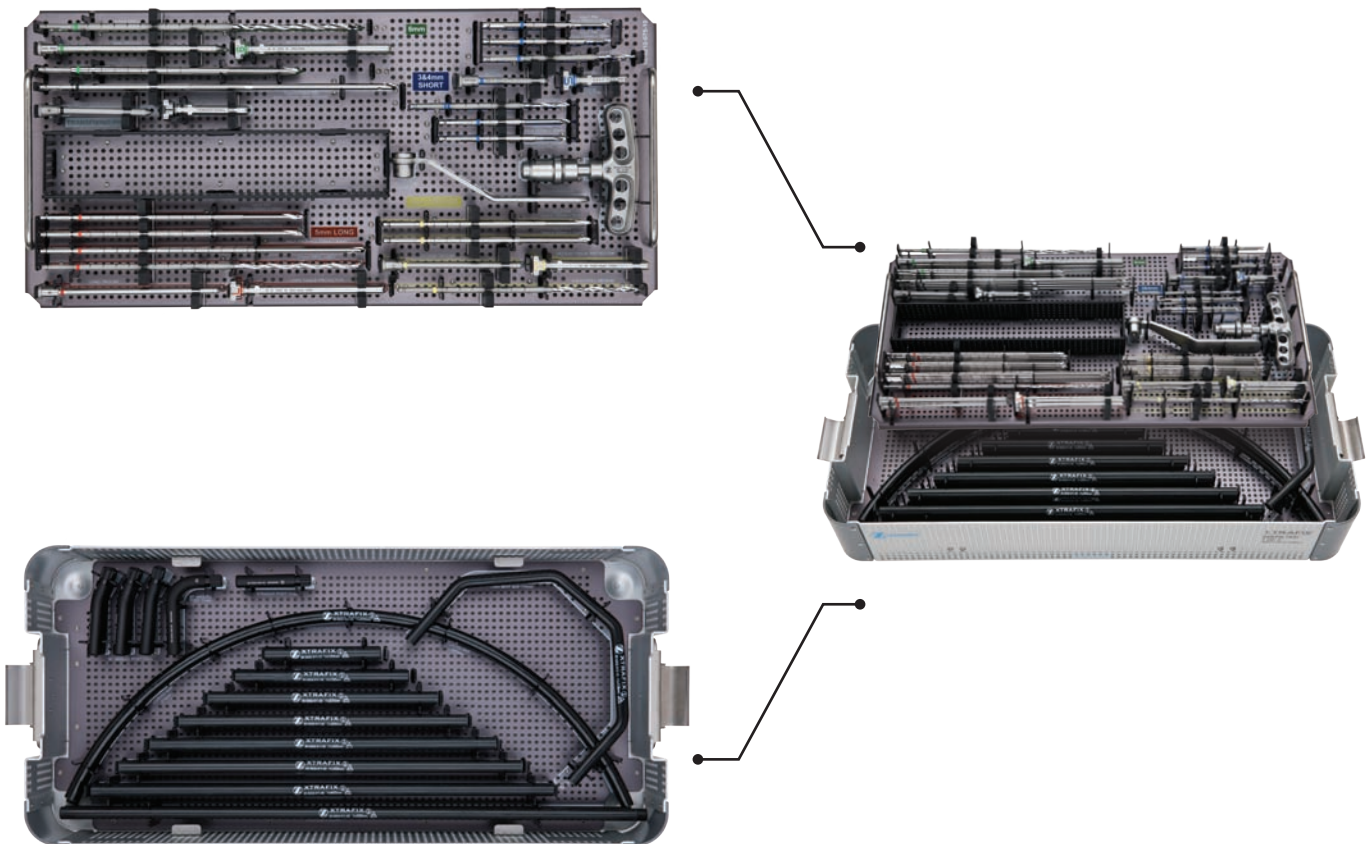




## XTRAFIX Trays

### Bar/Pin Tray Components

The Bar/Pin Tray has two components: the lift-out insert containing pins and drills organized by color, and the bottom containing the bars and posts.



## Surgical Technique

### Choose Pin Size

The *XTRAFIX* stainless steel half pins are self-tapping and self-drilling and can be used with or without pre-drilling. Aggressive flute design helps to cut effectively and quickly (Fig. 1).

Pins are available in short and long threads to accommodate different bone sizes and to minimize thread exposure above soft tissue. (Fig. 2).

*XTRAFIX* pins also have Quick Connect ends that attach directly to most power equipment, saving the time of a separate chuck. (Fig. 3.)

Pins are also available with blunt tips if surgeons desire more feel upon insertion after pre-drilling. (Fig. 4).



Fig. 1



Fig. 2

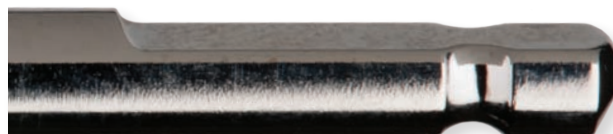


Fig. 3



Fig. 4



### Select Trocar & Tissue Protector

Once the diameter and length of the pin is chosen, select the corresponding size of Trocar & Tissue Protector. The system is color-coded and sized Short (S), Medium (M), Long (L), 6mm (6), and Transfixing (T) to make matching these parts easy (see chart below). It is important to select the correct Tissue Protector if one wants to later utilize depth marks on the drills and pins. (Fig. 5)



Fig. 5

Trocar & Tissue Protector Size	Color	Corresponding Pin Sizes
Short (S)	Blue	3mm x 100mm x 15mm 3mm x 100mm x 15mm blunt tip 3mm x 100mm x 25mm 4mm x 100mm x 20mm 4mm x 100mm x 20mm blunt tip 4mm x 100mm x 35mm
Medium (M)	Yellow	5mm x 160mm x 35mm 5mm x 160mm x 35mm blunt tip 5mm x 160mm x 55mm 5mm x 160mm x 55mm blunt tip
Long (L)	Orange	5mm x 200mm x 45mm 5mm x 200mm x 45mm blunt tip 5mm x 200mm x 65mm 5mm x 200mm x 65mm blunt tip 5mm x 250mm x 85mm
6mm (6)	Green	6mm x 200mm x 55mm
Transfixing (T)	Black	5mm x 275mm, 6mm Thread Transfixing Pin

### Securing Tissue Protectors

Tissue Protectors will lock directly into Multi-Pin Clamps or into the Tissue Protector Handle (for simple bar-to-pin constructs). This allows surgeons to quickly and easily anchor Protectors against the bone. Lock the Tissue Protector into the Multi-Pin Clamp or Tissue Protector Handle by pressing down and turning 90°. Insert the corresponding Trocar through the Tissue Protector, and then insert the assembly through the soft tissue and against the bone (Fig. 6).

The bottom end of each Tissue Protector has a toothed edge to help stabilize the assembly on the bone (Fig. 6).

**Note: Tissue Protectors may also be left in the unlocked position if the height needs to vary between the first and second Tissue Protector (Fig. 7).**

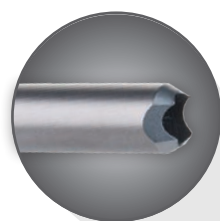
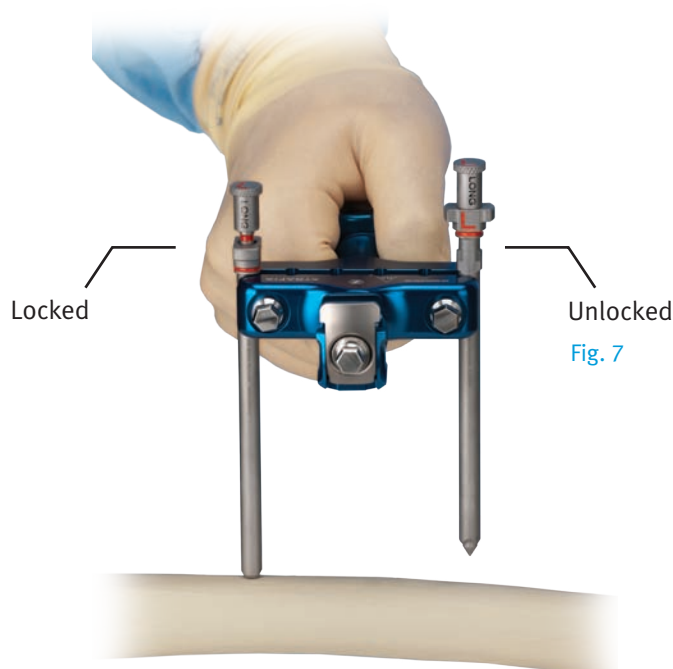


Fig. 6



Tissue Protector in Tissue Protector Handle



Tissue Protectors in Multi-Pin Clamp

### Remove Trocar and Insert Drill (Optional)

Pre-drilling is not required with the XTRAFIX System because the pins are self-drilling and self-tapping.\* However, if desired, pre-drilling is very simple and is only one step. XTRAFIX drills are “stepped up” in diameter from the drill flute to drill shaft so they fill the inner chamber of the Tissue Protector. This provides accurate drilling and eliminates the need for a drill sleeve.

The drill bit diameter is undersized appropriately compared to the corresponding pin diameter to ensure the pins fit snugly into the drilled bone. For example, the drill bit diameter for a 5mm pin is 4.0mm.

In addition, drills are also color-coded to ensure proper depth calibration (Fig. 8).

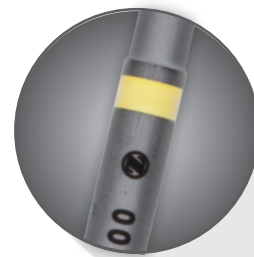


Fig. 8

TISSUE PROTECTOR SIZE	CORRESPONDING DRILL BIT SIZES
Short (S)	2.4mm SHORT Stepped Drill (3mm Pins) 3.2mm SHORT Stepped Drill (4mm Pins)
Medium (M)	4.0mm MEDIUM Stepped Drill (5x160mm Pins)
Long (L)	4.0mm LONG Stepped Drill (5x200mm & 250mm Pins)
6mm (6)	4.5mm 6MM Stepped Drill (6x200mm Pins)
Transfixing (T)	No Drill Required; Transfixing Pin is its own drill through the calcaneus

\* Blunt tip self-tapping pins are not self-drilling. Blunt tip pins are optional items that are available upon request.



**Remove Trocar and Insert Drill  
(Optional) (Cont.)**

When drilling, note the depth markers on the drill bit once the second cortex of the bone has been penetrated (Fig. 9). The number showing on the mark on the bit above the Tissue Protector will determine the pin thread length chosen later.



Fig. 9



### Remove Trocar (or Drill) and Insert Pin

Once the drilling is complete, dispose of the drill bit used and select the appropriate pin. As mentioned earlier, the *XTRAFIX* pins attach directly to most power equipment. However, if one wishes to insert the pin without a drill, use the T-Handle 9mm/AO Wrench. It is a combination tool that tightens and loosens pins and clamp nuts.

Slide the top of the pin into the base of the T-Handle and rotate the wrench until it locks in place. The pin will give tactile and audible feedback that it has fit into the AO channel of the wrench. If using the shorter “locking” T-Handle, pull up on the base of the shaft, rotate the wrench until the pin locks in place. Release the base to lock the pin into the wrench. This allows for additional manual manipulation and joystick-like movements.

Once the pin is secure, proceed by inserting the pin into the Tissue Protector. Note, the pin has the same depth marks as its corresponding drill (Fig. 10). The number shown on the pin at the top of the Tissue Protector is the number of millimeters the pin is protruding from the bottom of the Tissue Protector and into the bone.

If one has previously pre-drilled, simply insert the pin to the same depth mark as was used with the drill bit. This saves time and may reduce fluoro exposure.



Fig. 10



### Attaching Clamps to Pins

#### For Bar-to-Pin Clamps

The Bar-to-Pin clamp (and all bar connectors in the *XTRAFIX* system) have a locking latch that encircles the bar/pin and stays securely attached throughout the procedure. This eliminates troublesome “pop-offs” that can waste precious time and effort at achieving proper reduction.

The clamp should already be in the “open” position; if not, open the Bar-to-Pin Clamp by pulling the clamp latch out until the pin and bar jaws open wide enough to accept the pin and bar (Fig. 11). This is the same process used to remove a locked latch.

Attach the Bar-to-Pin Clamp onto the pin. Notice that the back of the latch is flush with the back of the clamp (Fig. 12). The locking latch will give tactile and audible feedback that it has locked the clamp to the pin.

The blue *XTRAFIX* Bar-to-Pin clamp accepts both 5mm and 6mm pin shaft diameters.

#### Note:

**1. *XTRAFIX* pins include 3,4,5, and 6mm pins. 3mm and 4mm pins have stepped threads to shaft diameters. All *XTRAFIX* Bar-to-Pin clamps are compatible to 3mm, 4mm, 5mm and 6mm pins. See pages 6 and 7 for more information.**

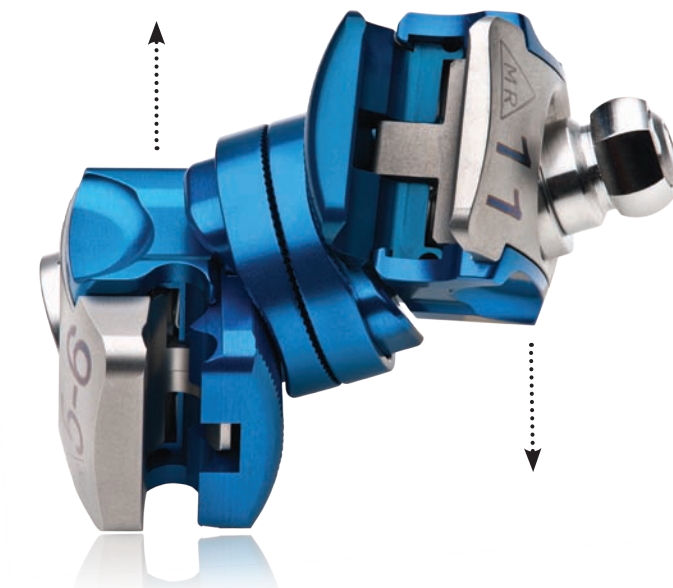


Fig. 11



Fig. 12



### Attaching Clamps to Pins

#### For Multi-Pin Clamps

After the pins are inserted through Multi-Pin Clamps, turn the Tissue Protectors 90° to unlock. Remove the Tissue Protectors by pulling straight up, leaving the Multi-Pin Clamp to grab onto the pin (Fig. 13).

Then secure the Multi-Pin Clamp to the pins by tightening the two nuts on the outside of the clamp (Fig. 14).

#### Notes:

1. The 75mm Pin Clamp, 2-Bar needs to be tightened to the pins and bars independently. The 75mm Pin Clamp, 2-Bar differs from the 45mm Pin Clamp, 2-Bar as it is not a one nut tightening clamp.



2. The 45mm Pin Clamp, 2-Bar does not need to be tightened to the pins, as one nut tightens the clamp to bars and pins.

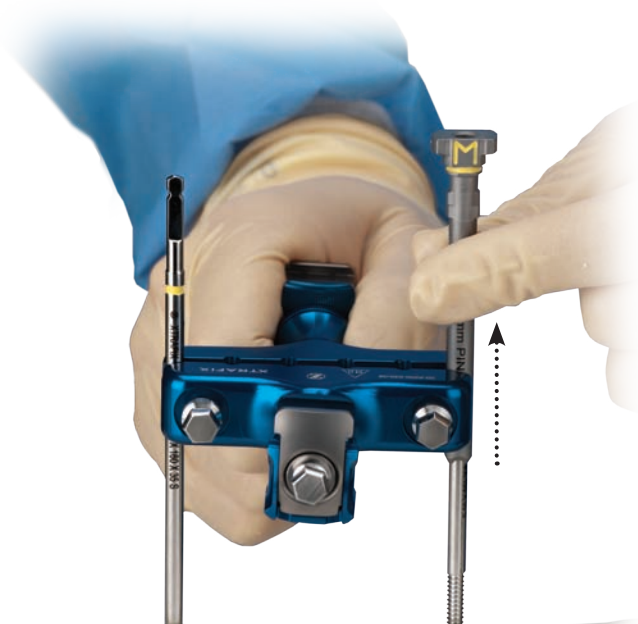


Fig. 13

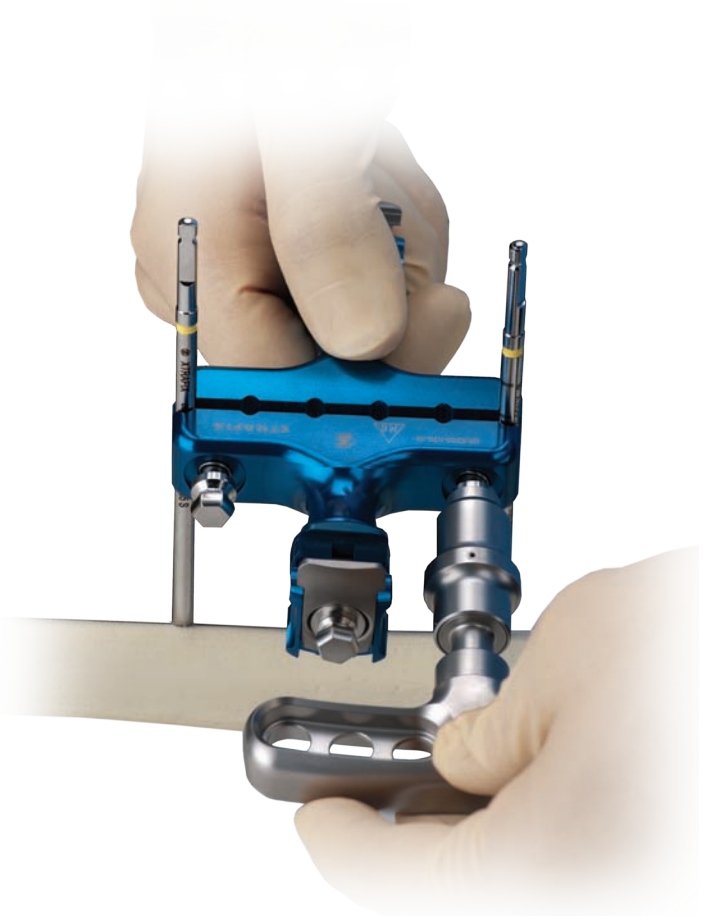


Fig. 14

### Attaching Bars

The technique for attaching bars to clamps is identical to the process for attaching pins. It is also the process for attaching clamps to posts. Simply insert the bar and pinch the bar and the back side of the latch together to lock the jaws (Fig. 15).

The bar and pin(s) are now secured to the clamp, but the clamp motion can still be adjusted. This provides valuable benefit to the surgeon in achieving proper reduction.

Once the bar is in its final desired position, the clamp can be secured by tightening the nut with one of the supplied wrenches. Clamp nuts should be positioned in a convenient and/or accessible manner.

When removing or loosening the clamps, always loosen the nut fully. Otherwise, the clamp may not unlock fully. (Fig. 16).



Fig. 15

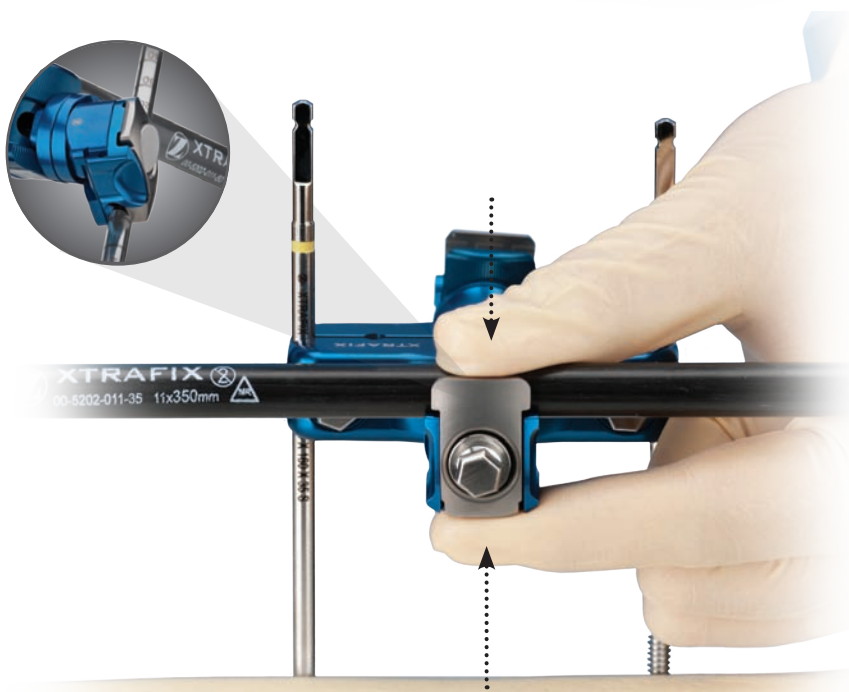


Fig. 16

### Attaching Bars to Multi-Pin Clamps (Optional)

The XTRAFIX System also offers multi-pin clamps with post holes that allow for a more traditional construct: a 45mm, 4-Pin Clamp and a 105mm, 8-Pin Clamp. Attach the desired post (Straight, 30°, or 90°) and tighten the post bolt (Fig. 17)

**Note:**

**When using the 105mm Pin Clamp with two posts on a single side, make sure both posts are in place before tightening the corresponding top bolt. Otherwise the second post may not fit into the post opening (Fig. 18).**



Fig. 17



Fig.18

### Removing Bars

The technique for removing bars/pins is different from traditional external fixation systems. To remove bars or pins from a clamp place the index finger and thumb around the clamp latch and pull back on the latch (Fig. 19).



Fig. 19

### Removing Bars

Be sure not to pull the bar/pin simultaneously out of the clamp while trying to unlock the latch. The clamp will not open easily with outward pressure on a bar/pin (Fig. 20).

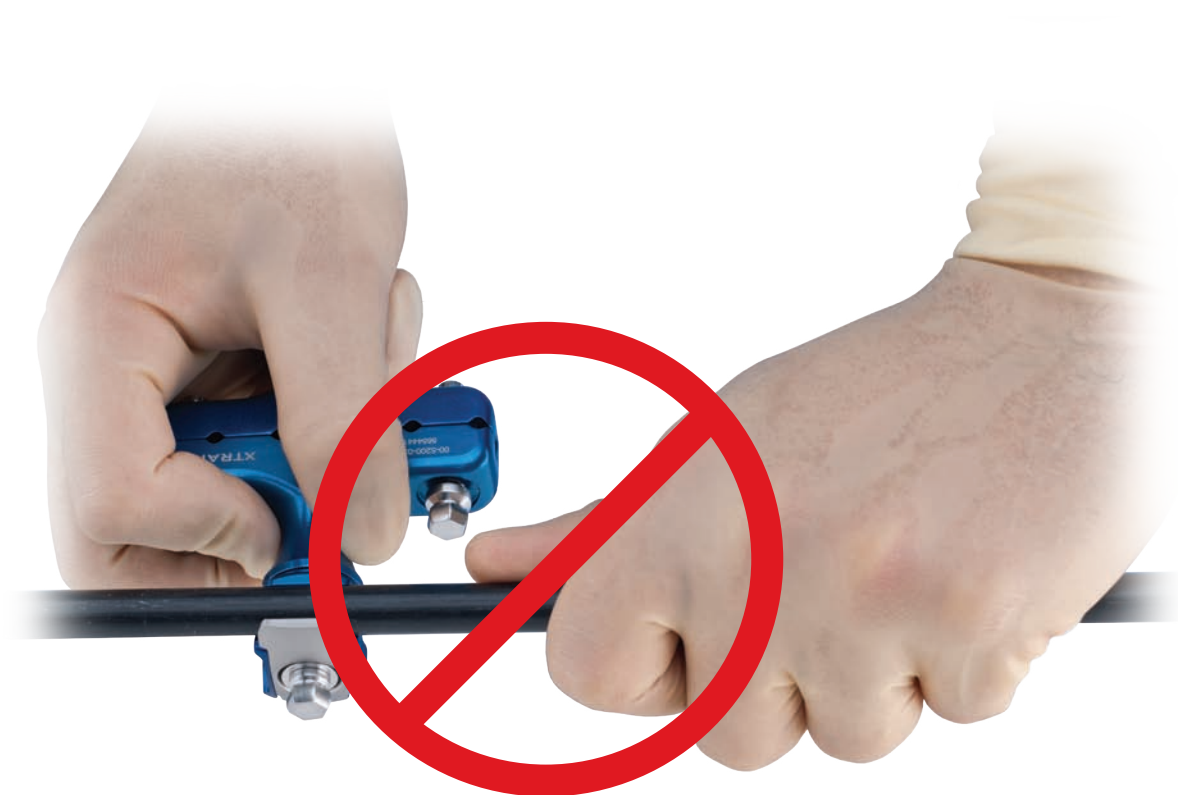


Fig. 20

## Efficiency Multi-Pin Clamps

### 45mm, 2-Bar, Multi-Pin Efficiency Clamp

Five parts in one: Replaces two Bar-to-Bar Clamps, two Posts, and a 45mm Multi-Pin Clamp. Also, only requires ONE nut to be tightened, vs. six with the five individual components (Fig. 21).

The 45mm, 2-bar clamp is locked on the pins and both bars by tightening only one nut. Use the wrench of choice to tighten the nut (Fig. 22).

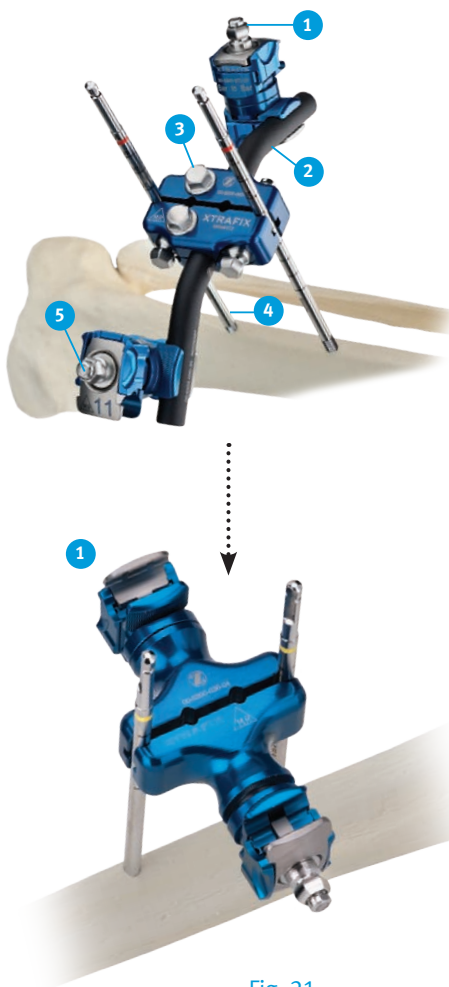


Fig. 21



Fig. 22



### 75mm, 2-Bar, Multi-Pin Efficiency Clamp

The 75mm, 2-bar clamp can be used when more distance is desired between the bars and between the pins. In addition, the 75mm, 2-bar clamp allows the pins to be locked independent of the bar clamps. Use the wrench of choice to tighten the pin locking bolts (Fig. 23).

Once the bar position is set, lock both bar clamps on each side independently, one at a time (Fig. 24).

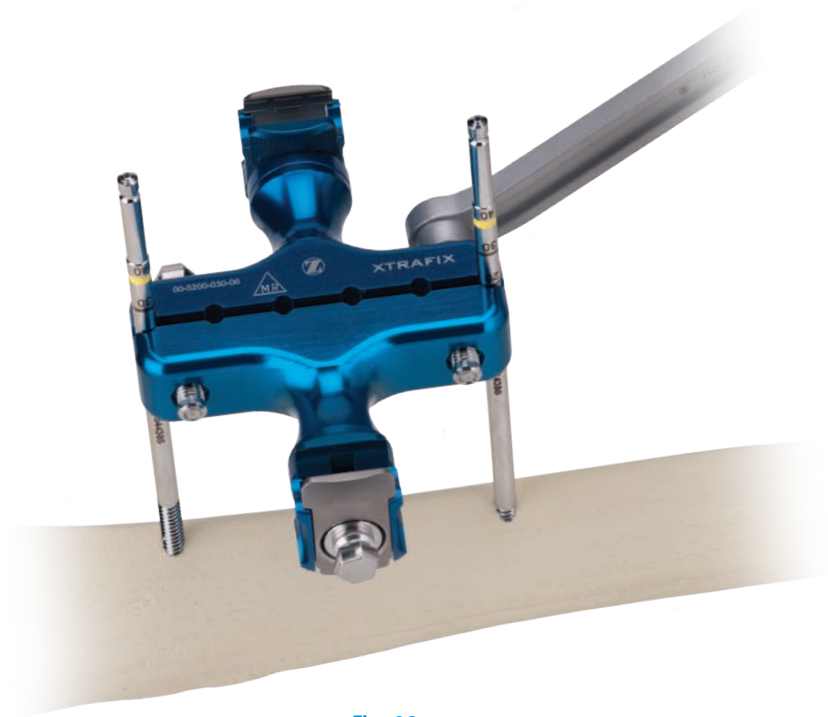


Fig. 23



Fig. 24

### 45mm, 1-Bar Pin Clamp

When two transfixing pins are preferred (e.g., through the calcaneus in a pilon fracture procedure), the *XTRAFIX* System offers surgeons a choice in Efficiency Clamps. The 45mm, 1-Bar Pin Clamp attaches to both pins and has a pivoting, swivel bar attachment that allows for easy connection to a tibial clamp. Secure the 45mm, 1-Bar Pin Clamp to the pins by tightening the two pin locking bolts. Then adjust the pivot and swivel as desired and tighten the nut by the bar attachment.

**Note:**

**1. This clamp could also be used in other situations: as a pelvic multi-pin clamp, a tibial clamp with a post and Bar-to-Bar clamp attached on one side, etc.**



## Sample Constructs

### Pin-to-Bar Construct

The unmatched 80° of motion in the *XTRAFIX* clamp allows pins to be placed where the fracture – not the fixator – dictates.



### Tibial Frame Construct

The 45mm, 2-Bar Multi-Pin Clamps can save time, effort and weight on the patient when compared to standard external fixation constructs.

Only two nuts need to be tightened for this construct.



### Knee-Spanning Construct

The unmatched 80° of motion in the XTRAFIX clamp allows pins to be placed where the fracture – not the fixator – dictates.



**Ankle-Spanning Construct**

Single Transfixing Pin, Bar-to-Pin Clamps

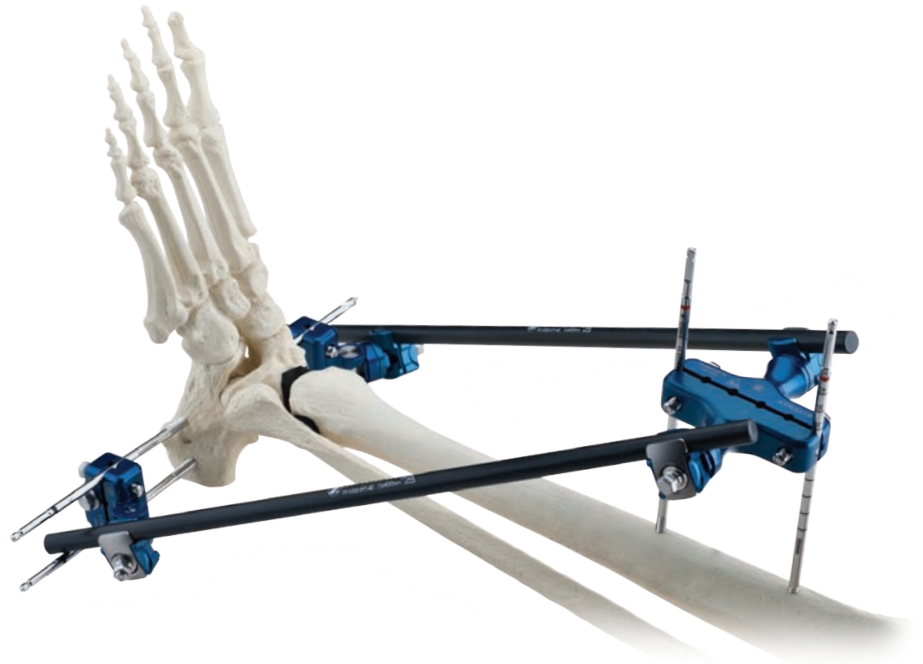
**Ankle-Spanning Construct**

Single Transfixing Pin, Metatarsal Pins, Bar-to-Pin Clamps



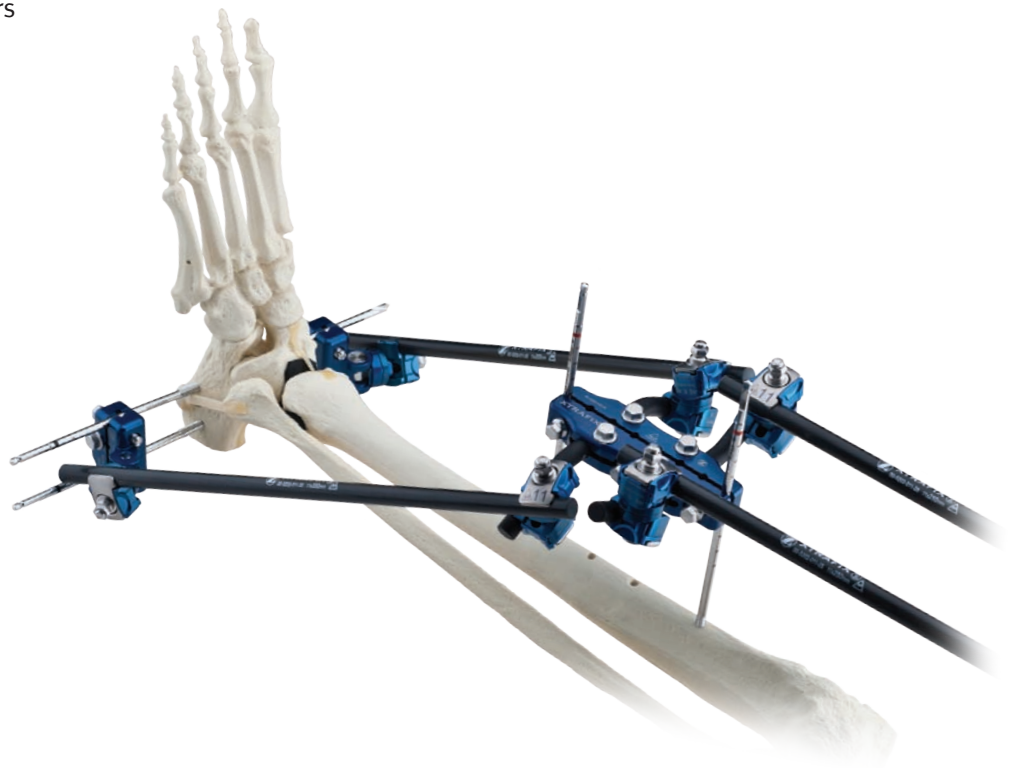
### Ankle-Spanning Construct

Double Transfixing Pins, Single Bar per Side



### Ankle-Spanning Construct

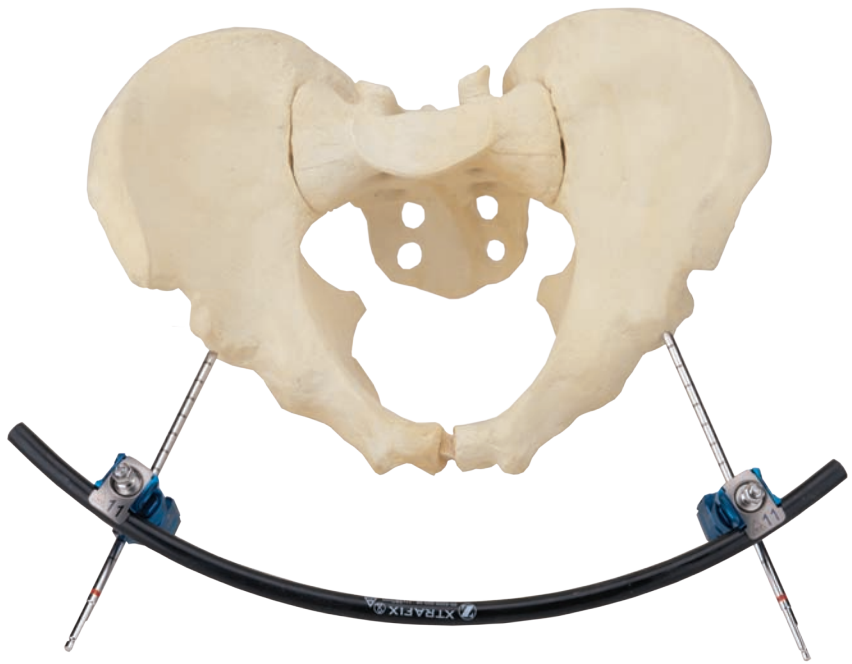
Double Transfixing Pins, Double Bars per Side





**Pelvic Construct**

Two 5x250mm Pins, Bar-to-Pin  
Clamps, Curved Bar

**Pelvic Construct**

Four 5x250mm Pins, 1-Bar Pin  
Clamps, Curved Bar



## References

<sup>1</sup>Design encircles the bar/pin to provide a positive and secure connection

## Disclaimer

This documentation is intended exclusively for physicians and is not intended for laypersons. Information on the products and procedures contained in this document is of a general nature and does not represent and does not constitute medical advice or recommendations. Because this information does not purport to constitute any diagnostic or therapeutic statement with regard to any individual medical case, each patient must be examined and advised individually, and this document does not replace the need for such examination and/or advice in whole or in part.

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