Aesculap Hydrolift®

Next Generation Vertebral Body Replacement
Surgical Technique

Aesculap Spine

B BRAUN
SHARING EXPERTISE

Hydrolift®

Table of Contents

General Information

Implant

Hydrolift® is a vertebral body replacement for the thoracic and lumbar spine which can be distracted hydraulically. During the distraction process, the implant endplates can be continuously adjusted to the adjacent vertebral bodies.
Available in six different heights and three endplate sizes (S, M, L), the Hydrolift® implant can be inserted using a (minimally) open or thoracoscopic technique.

Indications

- Fractures of the thoracic and lumbar spine.
- Tumours of the thoracic and lumbar spine.
- Degenerative or inflammatory diseases which require removal of a vertebral body.

Contraindications

- Multi-segmental fusion with more than two vertebral bodies.
- Osteoporosis

A) Pre-Op Preparation

A.1 Assembling the implant applicator FW453R

- Insert the clamping rod (b) into the clamping nut (a) (Fig.1).

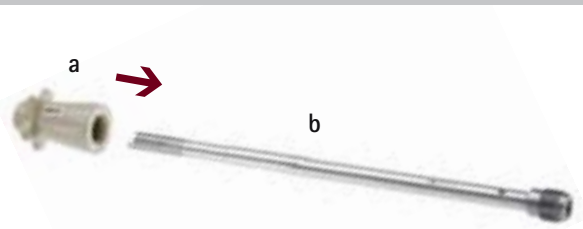


Figure 1

- Screw both parts together (Fig. 2).

Figure 2

- Pull the gold releasing ring (a) on the counter torque down and push the clamping rod (b) through the aperture (Fig. 3).

Note:
Marks (circled in red) must be lined up (Fig. 3).

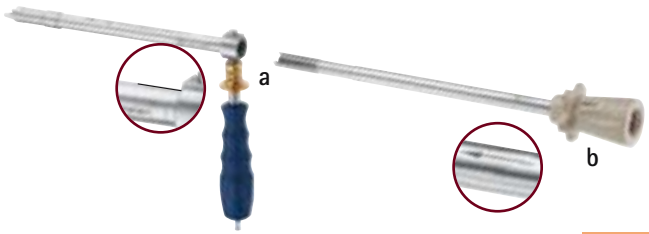


Figure 3

- Insert the cleaning rod (a) into the handle (b) and tighten firmly (Fig. 4).

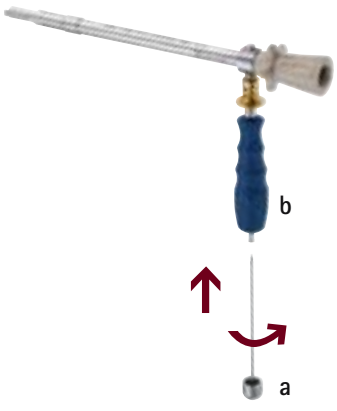


Figure 4

A) Pre-Op Preparation

A.2 Assembling the torque wrench to lock the implant at the correct height

The 12 Nm torque wrench (FW456R) is assembled as follows:

Snap the working component (a) into the torque component (b) (Fig. 5).

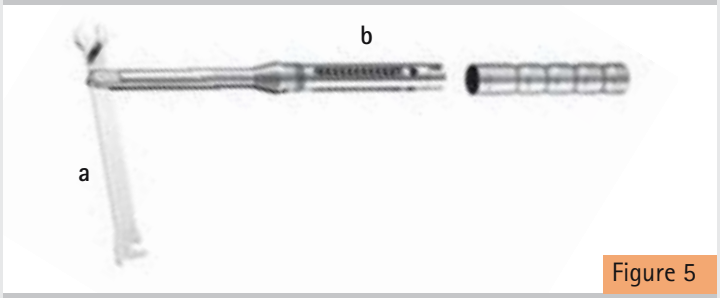


Figure 5

Then screw the fastening sleeve (c) into (b) (Fig. 6).

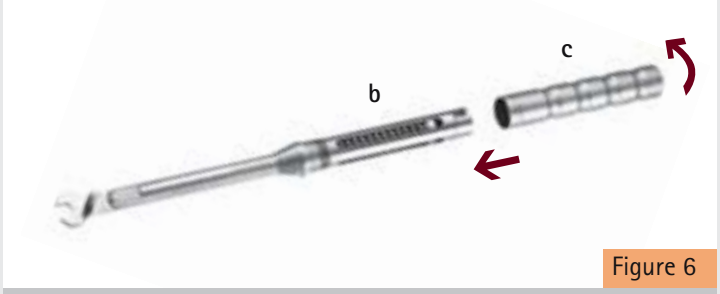


Figure 6

12 Nm torque wrench (Fig. 7).

Figure 7

A.3 Assembling the disconnecting device

The disconnecting device FW452R is needed to remove the hydraulic connector (s. section B.7.2). For this purpose, screw the retaining sleeve (a) to the disconnecting device (b) (Fig. 8).

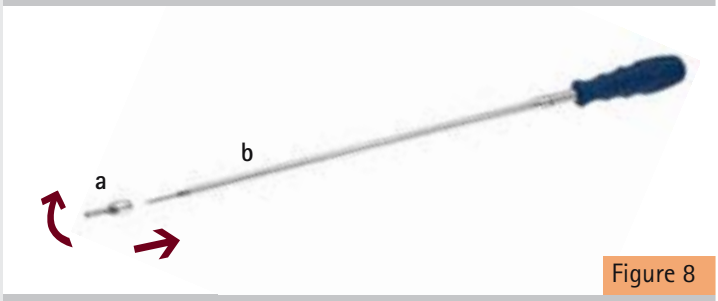


Figure 8

B) Instrumentation

B.1 Partial corpectomy

To perform the partial corpectomy, mark the edges of the implant bed with the chisel (FW813R) (Fig. 9 and 10).

Then remove the bone within the marked area using a rongeur and a rasp.

Figure 9

FW813R chisel (Fig. 10).

Figure 10

Note:
The cover plate of the adjacent vertebral body should be cleaned with a curette to ensure a secure connection to the implant endplate.

B.2 Determining the implant size

- Trial implant to determine the appropriate size of the implant endplate size cranially and caudally (Fig. 11 and 12).

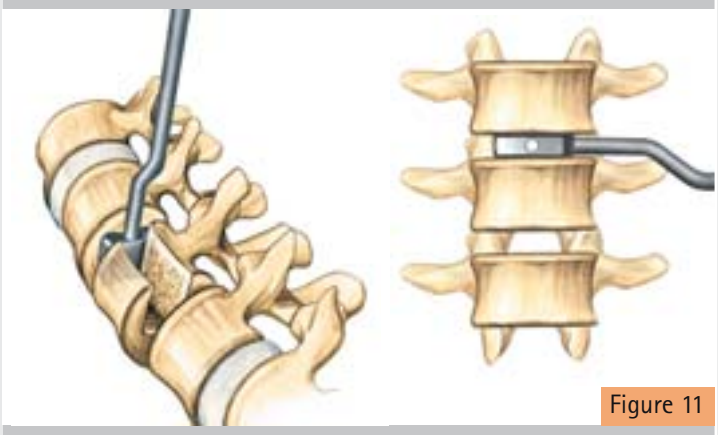


Figure 11

- FW440R handle
  FW447R - FW449R trial implants endplate sizes (Fig. 12).

Figure 12

- Trial implant to determine the appropriate height of implant (Fig. 13 and 14).

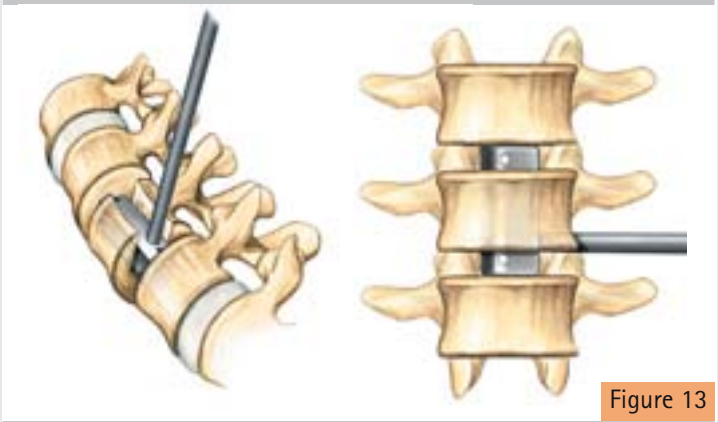


Figure 13

- FW440R handle
  FW441R - FW446R trial implants base bodies (Fig. 14).

Figure 14

Note:
To determine the proper implant size, begin with the smallest trial implant and proceed incrementally.

B) Instrumentation

B.3 Adjusting the endplates

The endplates can not only be adjusted during the distraction process, but also pre-set using an adjusting device (FW454R) in lordosis/kyphosis (Fig. 15).

The endplates are firmly locked in 0° position ex factory. This locking position must first be unlocked by inserting the implant into the adjusting device with two 0° V-blocks and clamping it with the turning knob (Fig. 15).

Figure 15

Unscrew the endplate fastening screws (Fig. 16) with the screwdriver (FW457R) (Fig. 17).

Select the adjusting angle for each endplate using the 0°, 5° and 10° V-blocks.

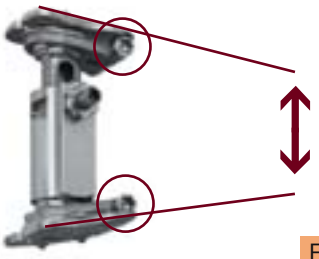


Figure 16

FW457R screwdriver for endplates FW440R handle (Fig. 17).

Figure 17

+ Tighten the endplate screws using the 5 Nm torque wrench FW445R (Fig. 18).

Figure 18

Note:
Risk of vascular lesion if the clamping screw is positioned ventrally!

- Always assemble the endplates so that both clamping screws of the endplates are in a posterior position.

Note:
Risk of dislocation and vascular lesion through open clamping of endplates on both sides!

- Implantation and distraction must be carried out with one open endplate at the most.

Note:
Beware of insufficient endplate clamping!

- To lock the endplates into place, use the supplied torque wrench.

B) Instrumentation

B.4 Changing the endplates

If required, the endplates of the Hydrolift® implant can be adjusted to suit the anatomical situation and changed individually. For this purpose, unscrew the clamping screw of the endplate using the screwdriver FW457R (a).
Then turn the endplate 45° and take it out (b) (Fig. 19).

To insert the new endplate, proceed in reserve order.

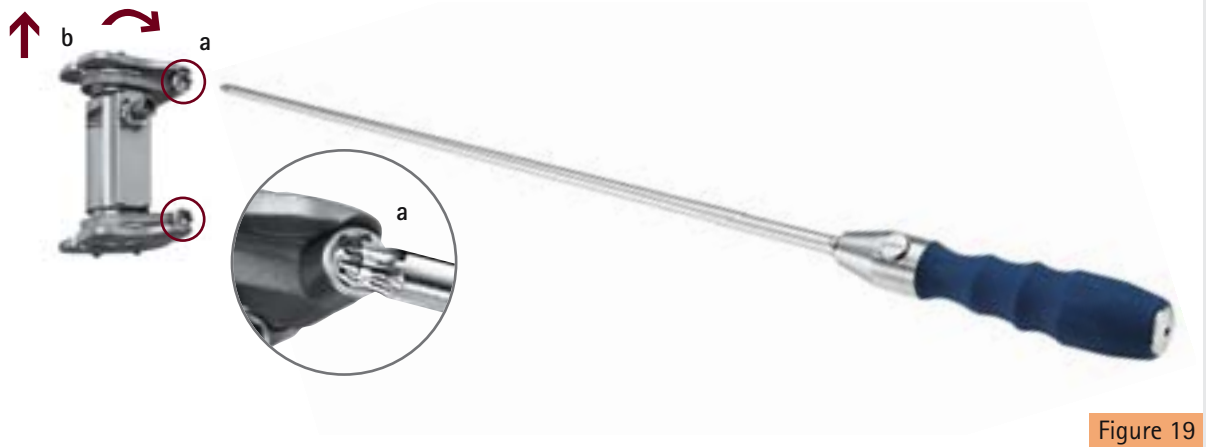


Figure 19

B.5 Implant handling

Take the Hydrolift® implant directly out of the sterile packaging using the implant applicator FW453R (Fig. 20.1 to 20.3).

Before taking the implant out of the sterile packaging, turn the clamping nut (a) up to the stop.

Figure 20.1

Hold the applicator (FW453R) with one hand on the clamping nut and the other on the blue handle and pull it down vertically on the implant (Fig. 20.1).

Figure 20.2

While still holding the applicator vertically with one hand, pull with the other the blue handle down until both sides snap into the grooves on the implant (Fig. 20.2).

Figure 20.3

Turn the clamping nut downwards to tie the implant firmly to the applicator (Fig. 20.3).

B) Instrumentation

B.6.1 Implanting the Hydrolift® implant – Positioning

The implant is inserted using radiographic control. The implant should be positioned as centrally as possible (Fig. 21).

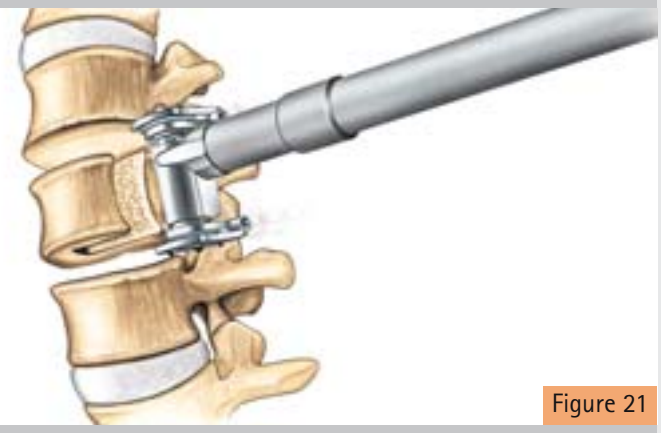


Figure 21

The endplates of the Hydrolift® implant are freely rotatable and allow the operating surgeon to insert the implant from an anterior, anterolateral, posterolateral and posterior position.

Note:
The endplate screws must always point in a dorsal direction (Fig. 22).

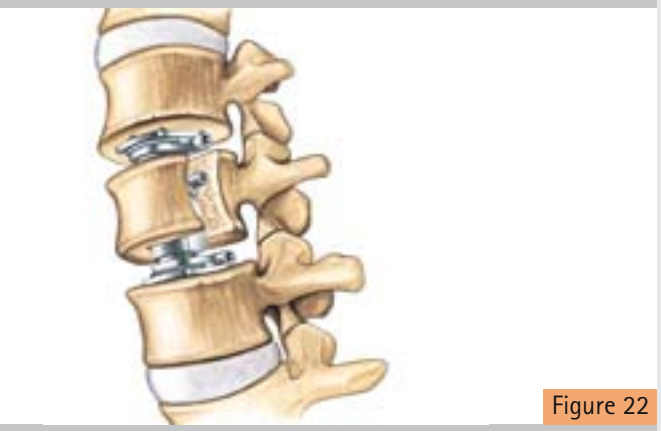


Figure 22

To drive the implant into position, the hit cap (a) must be placed on the applicator FW453R (Fig. 23).

Note:
If a non-lateral approach is used, the endplate angle must be preset and the endplate locked into place using the appropriate torque wrench.

Figure 23

B.6.2 Filling the hydraulic applicator

+ Use the hydraulic applicator (FW450SU) to distract the Hydrolift® implant (Fig. 24).

Note:
To distract the implant, only use the hydraulic applicator FW450SU.

Figure 24

+ To expand the implant hydraulically, use a 0.9 % sterile saline solution (NaCl solution) (Fig. 25).

Figure 25

+ To fill the hydraulic applicator (FW450SU) with the saline solution, first compress the handle of the applicator (a). Then, pull it back (b) to suck the saline solution into the device (Fig. 26).

Note:
Use only a 0.9 % NaCL sterile saline solution to expand the implant!

Figure 26

B) Instrumentation

B.6.3 Connecting the hydraulic applicator to the hydraulic pipe

- Connect the hydraulic pipe (FW453802) to the hydraulic applicator (FW450SU) (Fig. 27 and 28).

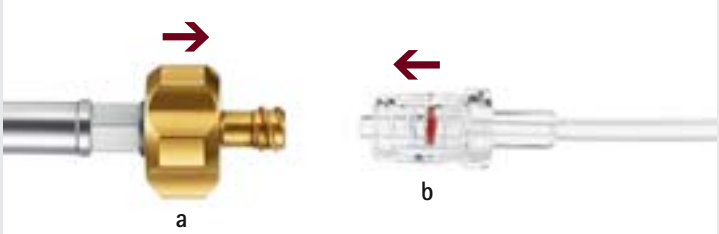


Figure 27

Figure 28

- Evacuate the air out of the hydraulic applicator and the hydraulic pipe to build up pressure (Fig. 29).

Note:
If the air is not evacuated out of the hydraulic applicator and the hydraulic pipe, the implant cannot be distracted in a precise way.

Figure 29

B.6.4 Distracting the Hydrolift® implant

Inserting the hydraulic pipe into the applicator

Pull down the gold releasing ring (a) on the implant applicator (FW453R) and insert the
hydraulic pipe (b) until you hear it clicking into place (Fig. 30).

The hydraulic pipe is now tightly connected to the hydraulic connector of the implant.

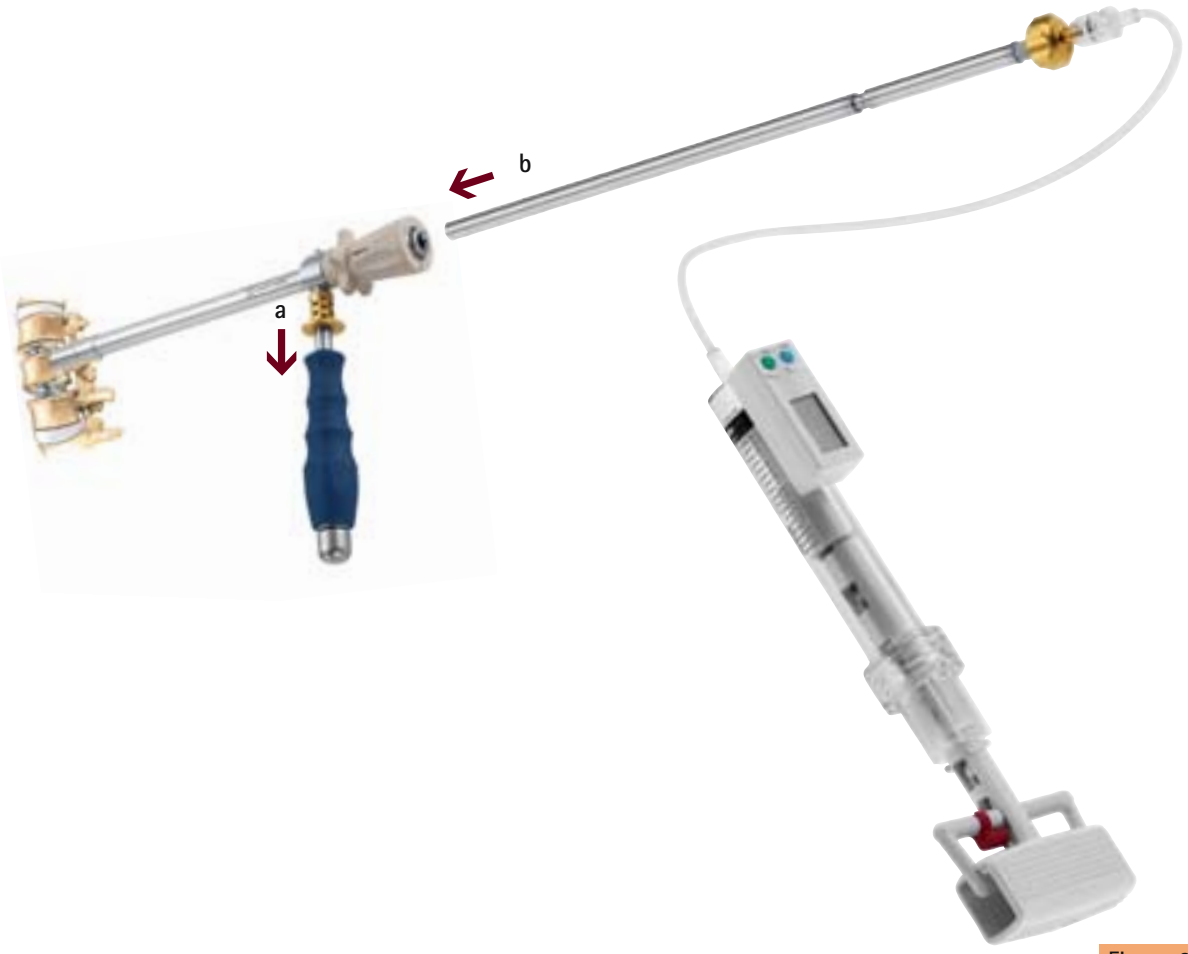


Figure 30

B) Instrumentation

B.6.4 Distracting the Hydrolift® implant

Distraction

By turning the handle (a), the implant is distracted under radiographic monitoring (Fig. 31). The pressure built up in this way is shown digitally on the pressure indicator of the hydraulic applicator (FW450SU). The pressure is limited to a maximum of 30 bar to reduce the risk of overdistraction.

Note:
To prevent the implant from collapsing into the endplates of the vertebral bodies:

- Distract the implant gradually under radiographic monitoring.
- Pay attention to the tactile feedback of the hydraulic applicator.
- Avoid overdistraction.

Figure 31

Pressure–force relationship on the Hydrolift® implant

The adjoining figure shows how much pressure is exerted on the adjacent vertebral bodies when the Hydrolift® implant is distracted (Fig. 32). The force measured increases in a straight line with increasing pressure.

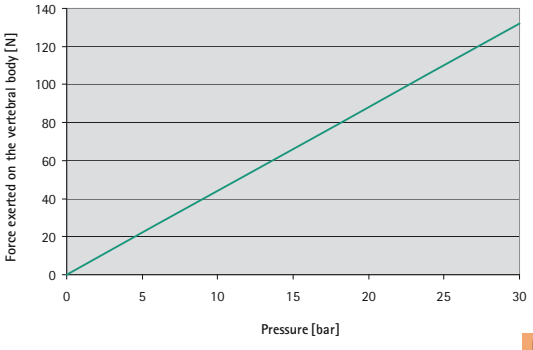


Figure 32

B.6.5 Adjusting the implant endplates to the adjacent vertebral bodies

Fine adjustment of the endplates

To obtain an optimal contact surface between the adjacent vertebral bodies and the implant, first unfasten the screw of the cranial endplate using the screwdriver (FW457R) and the handle (FW440R) (Fig. 33).

In this way, the endplate of the implant can adjust itself to the vertebral body. Then tighten the screw using the 5 Nm torque wrench (FW455R) (Fig. 34 and 35).

The implant applicator (FW453R) serves as a counter-brace (Fig. 35).
Proceed in the same way to adjust the caudal endplate.

Figure 33

Figure 34

Note:
Always tighten up the endplates with the 5 Nm torque wrench, even when implanting them with the preset 0° angle.

Figure 35

B) Instrumentation

B.6.6 Locking the Hydrolift® implant into place

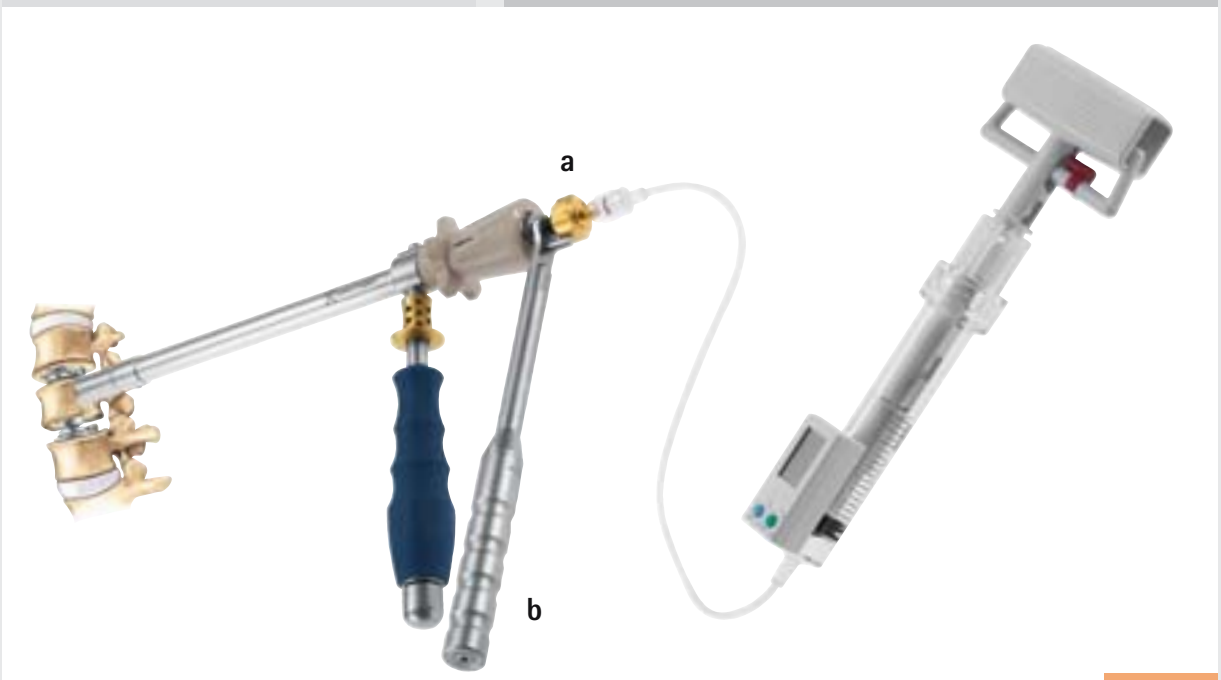


Figure 36

Once the desired distraction height is reached, the Hydrolift® implant must be locked mechanically into place. Using the crown (a), first activate the locking mechanism manually (Fig. 36).

Note:
Double check the implant's fit.

Figure 37

Lock the implant definitively into place using the 12 Nm torque wrench (FW456R) (Fig. 37).

The implant applicator (FW453R) serves as a counter-brace (Fig. 36).

The FW450SU hydraulic applicator can now be unscrewed from the hydraulic pipe.

Note:
Correction can be lost through insufficient axial clamping and insufficient clamping of the implant endplates!

- For axial and endplate clamping, always use the supplied torque wrench (tightening torque for axial clamping: 12 Nm, tightening torque for endplate clamping: 5 Nm).

B) Instrumentation

B.7.1 Removing the hydraulic pipe

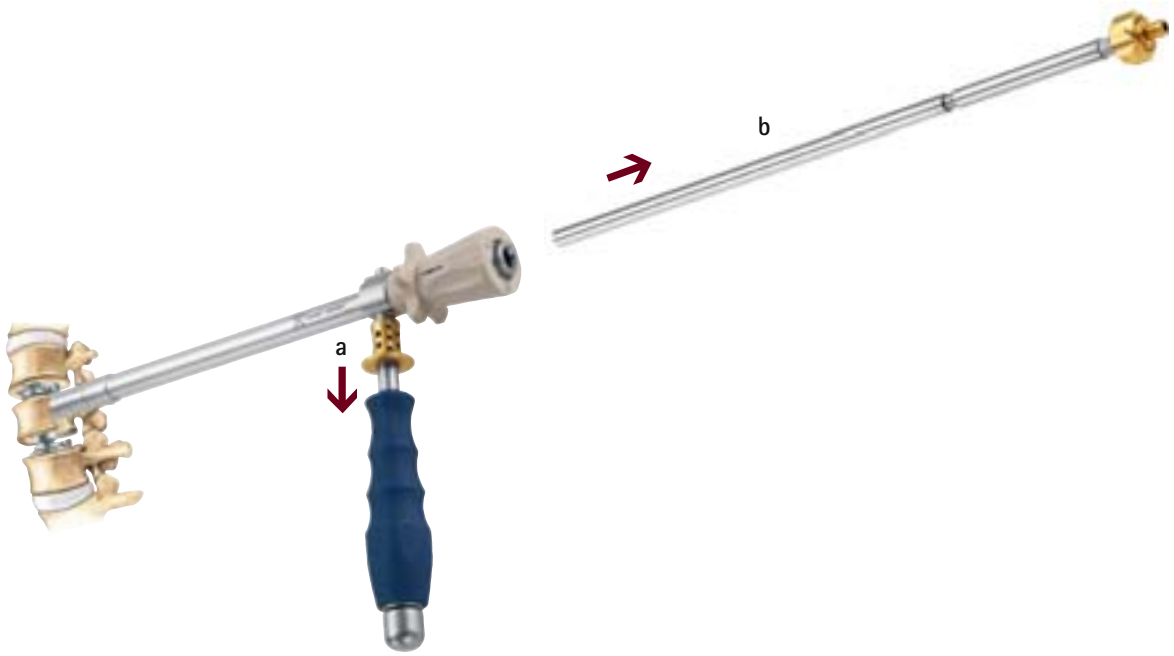


Figure 38

Pull down the gold release ring (a) on the applicator and pull the hydraulic pipe out (Fig. 38).

B.7.2 Removing the hydraulic connector

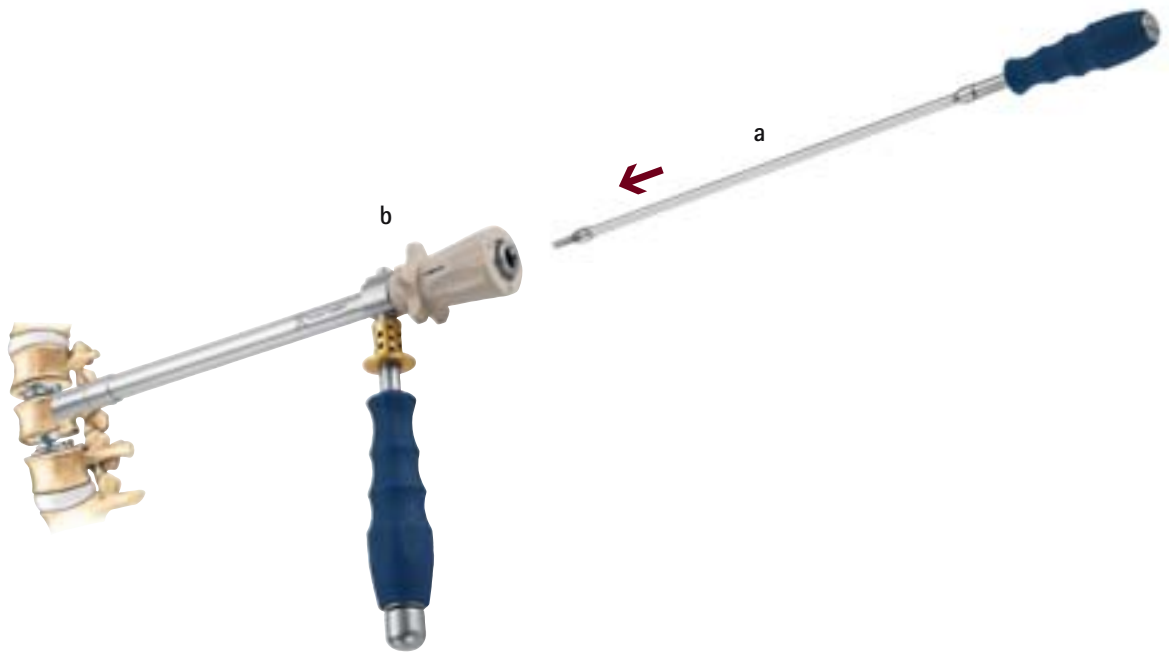


Figure 39

To avoid soft tissue irritation, the hydraulic connector must be removed from the implant (Fig. 39 and Fig. 40).

For this purpose, insert the disconnecting device (FW452R) (a) into the implant applicator FW453R (b).

B) Instrumentation

B.7.2 Removing the hydraulic connector

Unscrew the hydraulic connector from the implant (Fig. 40).

Figure 40

Then pull the disconnecting device together with the unscrewed connector out of the applicator (Fig. 41).

Figure 41

B.7.3 Removing the implant applicator

- Unscrew the clamping nut (a) (Fig. 42).

Figure 42

- Pull the handle back to the clamping nut (Fig. 43), then pull the applicator (b) vertically out of the implant (Fig. 44).

Figure 43

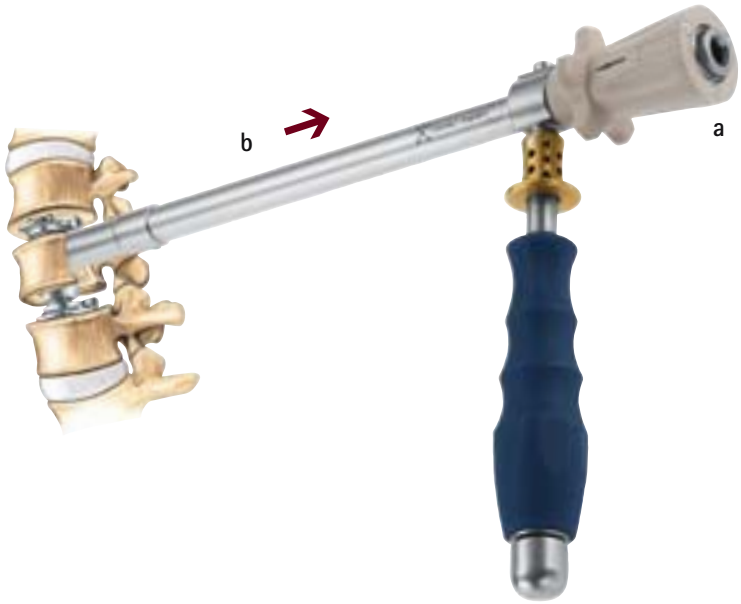


Figure 44

C) Additional Stabilization Systems

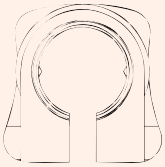
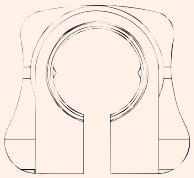
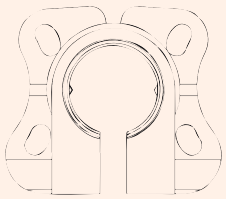
C. MACS TL® and S4® Spinal System

Vertebral body replacement systems are never used without additional anterior and/or posterior stabilization systems. For a secure and reliable treatment with Hydrolift®, it is recommended that the treatment be complemented by using the S4 posterior stabilisation and the MACS TL ventral stabilization systems.

Dr. Dirk Brücher
Town Hospital
Karlsruhe

D) Set Overview

D.1 Implants

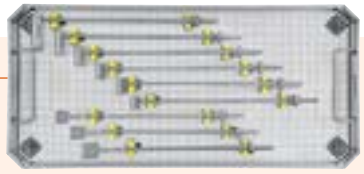
Implants			
			
	S 20.5 x 20.5 mm	M 21.0 x 24.0 mm	L 24.0 x 28.0 mm
Size 1 21.0 – 24.0 mm	SV001T		
Size 2 23.0 – 28.0 mm	SV004T	SV005T	
Size 3 26.0 – 33.5 mm	SV007T	SV008T	SV009T
Size 4 31.0 – 43.0 mm	SV010T	SV011T	SV012T
Size 5 40.0 – 60.5 mm		SV014T	SV015T
Size 6 57.0 – 93.5 mm			SV018T
Endplates			
Endplate Size S	SV019T		
Endplate Size M		SV020T	
Endplate Size L			SV021T
Hydraulic Applicator			
Hydraulic Applicator	FW450SU		

D) Set Overview

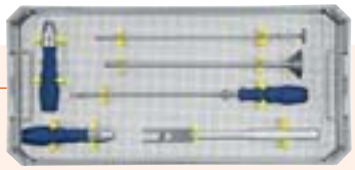
D.2 Instruments

Instrument trays - bare*

FW461R Hydrolift® instrument tray I

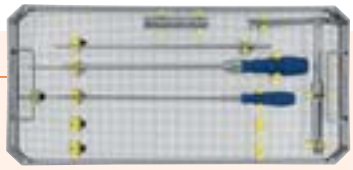


FW462R Hydrolift® instrument tray II



FW463R Hydrolift® instrument tray III

FW464R Hydrolift® instrument tray IV



*Instruments must be ordered separately.

Trial Implants		Unit	
FW441R	trial implant base body 1	1	
FW442R	trial implant base body 2	1	
FW443R	trial implant base body 3	1	
FW444R	trial implant base body 4	1	
FW445R	trial implant base body 5	1	
FW446R	trial implant base body 6	1	
FW447R	trial implant endplate S	1	
FW448R	trial implant endplate M	1	
FW449R	trial implant endplate L	1	

Applicators	Unit		
FW453R	implant applicator to FW453R counter torque	1	
	to FW453R hit cap	1	
	to FW453R hydraulic pipe	2	
	to FW453R rod	1	
	to FW453R clamping nut	1	
	to FW453R cleaning rod	1	
FW454R	adjusting device	1	
	to FW454R angle block 0° to FW454R angle block 5° to FW454R angle block 10°	2 2 2	
	to FW454R threaded rod	1	

D) Set Overview

D.2 Instruments

Fastening Devices		Unit	
FW452R	disconnecting device	1	
	to FW452R sleeve	1	
FW455R	5 Nm torque wrench	1	
FW456R	12 Nm torque wrench	1	
	to FW456R handle	1	
FW457R	screw driver for endplates	1	

Additional Instruments		Unit	
FW243R	slot hammer	1	
FW440R	handle	2	
FW813R	chisel	1	
FW819R	spongiosa plunger	1	
	to FW819R stick	1	

Recommended Containers		Unit	
JK441	container body, 592 x 24 x 120 mm	1	
JK442	container body, 592 x 24 x 135 mm	1	
JK489	silver lid	2	

D.3 Spare Parts

FW453216	hit cap	
FW453800	counter torque	
FW453801	clamping rod with clamping nut	
FW453802	hydraulic pipe	
FW453803	cleaning rod	
FW452200	sleeve for disconnecting device	
FW454201	threaded bar for adjusting device	

Note:
In case of damage to the FW453800 counter torque or the FW453801 clamping rod, the whole instrument must be sent in for inspection.

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