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MUTARS® RS Revision System

Surgical technique

implantcast

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MUTARS® RS Revision System

Surgical technique

MUTARS® was developed in collaboration with Prof. Dr. W. Winkelmann (former director) and Prof. Dr. G. Gosheger (Director) of the Poliklinik für Allgemeine Orthopädie und Tumororthopädie (Polyclinic for General Orthopedics and Tumor Orthopedics) at the Münster University Hospital, Germany. MUTARS® has successfully been in clinical use since 1992.

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Note: The surgical technique described herein reflects the author's suggested treatment in straightforward interventions. Ultimately, however, the surgeon must decide which procedure is most appropriate and effective for the patient in question. The treatment described must be performed in accordance with the current state of the art. The instruments shown and described with the catalog number in the surgical technique refer to an example size. Further sizes and instrument variants can be found in the appendix to the surgical technique.

Coating

The silver coating

In the field of tumor endoprosthetics, infections are the most severe complication. Despite appropriate local and systemic antibiotic prophylaxis, infection rates of between 5-35% are found in the literature [1]. Reasons for such high rates include the long surgery times, the large surgical site, immunosuppression from chemotherapy or radiation and the increasing resistance of bacteria to antibiotics.

Silver, and especially free silver ions, are known for their broad antimicrobial spectrum. For example, components with a silver coating have been shown to reduce bacterial colonization on the prosthesis surface.

At present, all implant surfaces that are not in direct contact with the bone or are not involved in the articulation of the prosthesis, can be manufactured with a silver coating. In the catalog annex to this surgical technique, the supplement Ⓢ indicates which components are available with silver coating. The eight-digit REF number for silver-coated components receives the supplement S (e.g., 52200020S).

[1] Gosheger et al. (2004). Silver-coated megaendoprostheses in a rabbit model – an analysis of the infection rate and toxicological side effects. Biomaterials 25, 5547-5556.

Important instructions for the use of silver-coated implants

Flushing the wounds with antiseptics containing iodine/heavy metals (e.g., Betaisodona®) or solutions containing H_2O_2 or acetic acid is not allowed during the entire operation, as their oxidative properties may result in a loss of effectiveness of the silver coating! Alternatively, NaCl solutions as well as Lavasept®, Prontosan®, or similar may be used.

The additional use of antibiotic-containing bone cement can be advantageous, especially in cases of septic revisions.

The TiN coating for allergy prophylaxis

All metallic implant components release ions into their environment over time. These ions may elicit allergic reactions in some patients. Nickel, cobalt and chromium, as elements of the base material CoCrMo of the articulating implant components, are considered the most frequently allergy-eliciting metals [2].

The TiN coating is biocompatible and acts like a barrier. Thereby, the potential release of allergy-eliciting ions from the base material is reduced to a minimum [3]. Clinical practice also shows no evidence of the occurrence of allergic reactions despite the use of a TiN-coated implant with an intact surface [5]. Thus, the TiN coating on implant components is especially suitable for patients with a sensitivity to nickel, chromium or cobalt [4][5].

Since most components of the MUTARS® tumor system are made of a titanium alloy, this necessity is only limited to prosthetic parts made of a CoCrMo alloy. In the catalog annex to this surgical technique, the supplement Ⓝ indicates which components are available with TiN coating. The REF numbers for the available TiN-coated implants receive the supplement N (e.g., 57200005N). The components that are coated with both silver and TiN, are provided with the annotation Ⓢ Ⓝ and the REF numbers receive the annotation SN (e.g., 57200042SN).

S: Implants are available with silver coating.
N: Implants are available with TiN coating.
SN: Implants are available with silver and TiN coating.

[2] Eben R et al. (2009). Implantatallergieregister - ein erster Erfahrungsbericht. Orthopädie 38: 557-562.
[3] Wisbey et al. (1987). Application of PVD TiN coating to Co-Cr-Mo based surgical implants. Biomaterials, 11.
[4] Prof. Thomas LMU München Final Report Effect of a TiNbN or TiN surface coating on cobaltchromium- molybdenum and stainless steel test specimens regarding the release of nickel, chromium and cobalt: evaluation via eluate analysis and in-vitro cytokine release from peripheral human blood cells, Data on file.
[5] Baumann A. (2001) Keramische Beschichtungen in der KTEP Standardlösung für Allergiker. JATROS Orthopädie & Rheumatologie 6: 16-17.

Preoperative planning

Preoperative planning and precise surgical techniques are mandatory to achieve optimal results. The instructions and the procedure given in the surgical technique for the system must be adhered to. Familiarity with the surgical technique recommended for this system and its careful application are essential to achieve the best possible outcome. Before surgery, the surgeon must conduct surgical planning in terms of the dimensions of the prosthetic model and positioning of the implant components in the bone.

Implant templates are made available for this purpose:
Digital templates: The templates are included in the databases of conventional planning tools. If the desired templates are not included in the software, please request them from the planning tool supplier.
Radiographic templates: Alternatively, radiographic templates of various scales are available, which can be obtained from your local sales partner upon request.

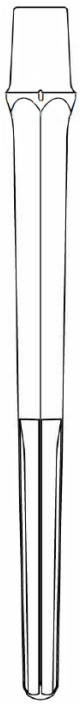
In addition, before surgery it must be ensured that:

- All necessary implant components are available. An adequate number of all necessary implant sizes should be available during every surgery. It must be determined whether the implantation will be performed with or without cement.
- All instruments necessary are present for surgery. Implants may only be used with the corresponding instrument set of implantcast GmbH. The only exception in this case are the instruments standardized for an operation.
- Correctly sized surgical instruments are used in the operation in order to prevent damage to the implant.

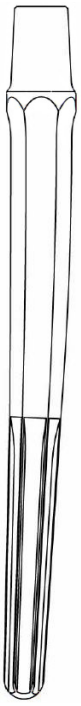
Attention: Please note that the range of implants and instruments in loan sets may differ from the information in the catalog appendix to this surgical technique.

Note: You can find more information in the final section of this surgical technique or in the instructions for use:

09300015EN MUTARS® RS Revision System

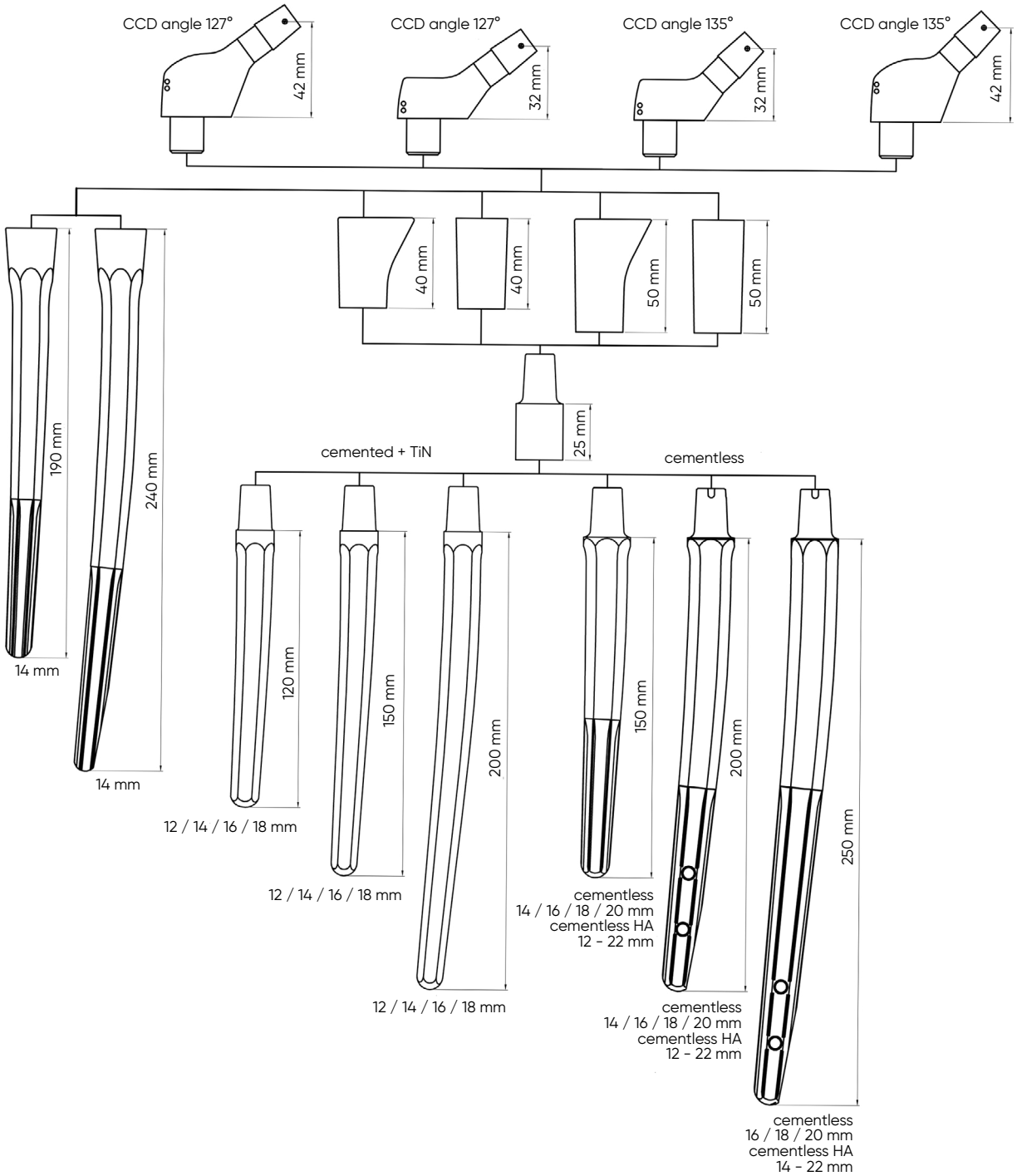


AP view



ML view

System overview



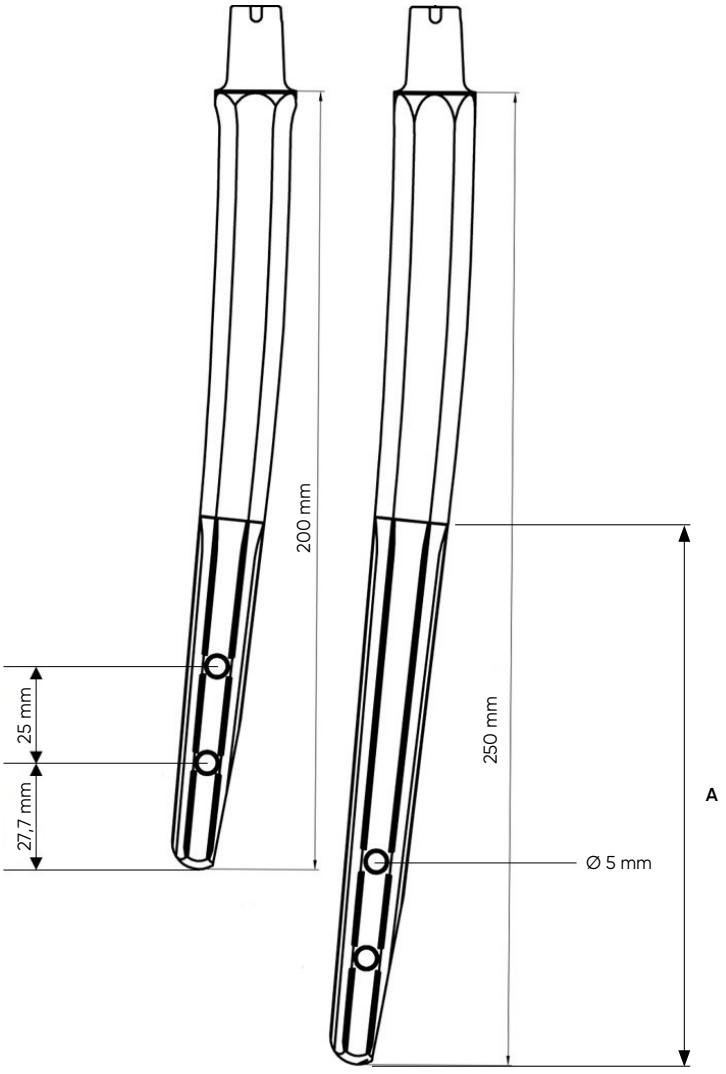
Proximal (metaphyseal) components

The MUTARS® RS system features four different proximal components with lengths of 32 and 42 mm and a 12 / 14 mm taper. Both components are available with CCD angles of 127° and 135°. Metaphyseal components are offered in lengths of 40 and 50 mm. There are also up to three extension pieces, each with a length of 25 mm, for a long prosthesis.

The modular concept of these components facilitates the optimal filling of the proximal femur area without affecting the position of the diaphyseal stem.

Distal (diaphyseal) components

The MUTARS® RS system includes 31 cementless stems in lengths of 150, 200, and 250 mm. The lengths of 150 and 200 mm are each available in 1 mm increments for the diameters 12-22 mm. The lengths of 200 mm (Ø 15-22 mm) and 250 mm (Ø 17-22 mm) have distal locking bolts. In addition, 12 cemented stems in lengths of 120, 150, and 200 mm are each available in the diameters of 12, 14, 16, and 18 mm.



Stem length (mm)	A (mm)
150	70
200	90
250	140

Assembly possibilities

Implant length* (mm)	Proximal component 127° / 135° (mm)	Metaphyseal component (mm)	Extension piece (mm)	Stem (mm)	Screw (mm)
222 / 232	32 / 42	40	-	150	40
232 / 242	32 / 42	50	-	150	50
247 / 257	32 / 42	40	25	150	65
257 / 267	32 / 42	50	25	150	75
272 / 282	32 / 42	40	-	200	40
272 / 292	32 / 42	50	-	200	50
297 / 307	32 / 42	40	25	200	65
307 / 317	32 / 42	50	25	200	75
322 / 332	32 / 42	40	25+25	200	90
322 / 332	32 / 42	40	-	250	40
332 / 342	32 / 42	50	25+25	200	100
332 / 342	32 / 42	50	-	250**	50
347 / 357	32 / 42	40	25	250**	65
357 / 367	32 / 42	50	25	250**	75
372 / 382	32 / 42	40	25+25	250**	90
382 / 392	32 / 42	50	25+25	250**	100

** Measured from the center of the proximal component with the neck length M*

Calculation of the screw length:

Length of screw = length of metaphyseal component + length of extension piece(s)

Overview of ic head combinations

	Ø 22 mm S, M, L	Ø 28 mm S, M, L, XL	Ø 32 mm S, M, L, XL	Ø 36 mm S, M, L, XL	Ø 28 mm XXL, XXXL	Ø 32 mm XXL, XXXL	Ø 36 mm XXL, XXXL
MUTARS® RS proximal component	✓	✓	✓	✓	✓**	✓**	✓**

Attention: **Not permitted: when using the cementless MUTARS® RS stems of the sizes Ø 12 / 150 mm, Ø 12 / 200 mm, and Ø 14 / 250 mm or cemented MUTARS® RS stems. Permitted: only when using cementless MUTARS® RS stems (excluding stem sizes Ø 12 / 150 mm, Ø 12 / 200 mm, and Ø 14 / 250 mm) and a maximum of one MUTARS® RS extension piece. When using the cementless MUTARS® RS stem size Ø 15 / 250 mm, only assembly lengths up to a maximum of 82 mm are permitted (permitted assemblies: MUTARS® RS proximal component size 42 mm / 127° (or 42 mm / 135°) + MUTARS® RS metaphyseal component size 40 mm; MUTARS® RS proximal component size 32 mm / 127° (or 32 mm / 135°) + MUTARS® RS metaphyseal component size 40 mm; MUTARS® RS proximal component size 32 mm / 127° (or 32 mm / 135°) + MUTARS® RS metaphyseal component size 50 mm).

Surgical technique

Preparation of the femoral medullary cavity

Remove the loosened implant and, if necessary, the bone cement. Ream the femur until load-bearing bone is reached (**Fig. 1**).

For cementless implantation, expand the medullary cavity using a flexible drill that is 3 mm smaller in diameter than the planned cementless RS stem. Assemble the MUTARS® RS broach that is the size of the RS stem with the slide hammer (**Fig. 2**).

For cemented implantation, expand the medullary cavity with a flexible drill that is 1 mm smaller in diameter than the planned cemented RS stem. Use the slide hammer to help mount the MUTARS® RS broach that is 2 mm larger than the planned RS stem.

Make sure that the curvature of the broach harmonizes with the antecurvature of the femur while expanding the medullary cavity (**Fig. 3**). Check the marking on the broach while doing so.

Fig. 1

Fig. 2

Fig. 3

The implant length is marked on the broach. The ring markings indicate the implantation depths (**Fig. 4**) and thus the position of the hip center when using the corresponding proximal components (metaphyseal component and, if necessary, the extension piece), starting from the 32 mm MUTARS® RS proximal component (see **Tab. 1**). It is recommended to only use the 25 mm extension piece from a stem length of 200 mm.

Note: To prepare a 250 mm stem, use the 200 mm broach after first reaming the medullary cavity 50 mm longer than when using a 200 mmstem.

For the preparation of the MUTARS® RS stem extra slim, use the 150 mm broach for a 190 mm stem and the 200 mm broach for a 240 mm stem. The 40 mm marking is the reference for both stem sizes.

Trial reduction with the original stem

Note: For the optional use of trial stems, continue to the section "Trial reduction with trial stems (optional)".

Screw the guide rod ES and the MUTARS® RS ES stem impactor to the stem of the correct size (**Fig. 5**).

Fig. 4

Fig. 5

Tab. 1: Possible combinations

"KM" marking (Center of the head)	**Metaphyseal component**		**Extension piece**	
	40 mm	50 mm	25 mm	2 x 25 mm
40	✓			
50		✓		
65	✓		✓	
75		✓	✓	
90	✓			✓
100		✓		✓

Cementless implantation

The stem corresponding to the diameter of the broach is used for cementless stems.

Cemented implantation

If a cemented stem is planned, the stem that is 2 mm smaller than the broach is implanted with cement.

Tap in the stem (**Fig. 6**) while paying attention to the antecurvature. The stem should be tapped in until it is seated firmly. The ring markings on the stem impactor are used to check the implantation depth (**Fig. 7**) (**Tab. 1**).

Loosen and remove the stem impactor ES. Leave the RS guide rod ES in the taper of the stem implant (**Fig. 8**).

Prepare the bone bed for the metaphyseal component using the reamer for the metaphyseal part. Ream until the limit stop. If necessary, clean the reamer and complete the process by reaming the bone a second time. Then rinse the reamed area of the bone and make sure that there are no bone chips above the stem (**Fig. 9** and **10**).

In the case of extremely sclerotic bone, it may be necessary to remove further bone in addition to reaming it.

Screw together the trial components (**Fig. 11**).

Fig. 6

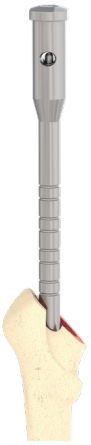


Fig. 7

Fig. 8

Fig. 9

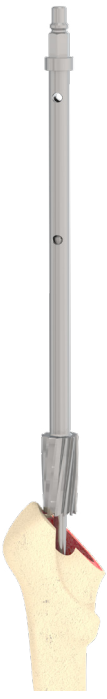


Fig. 10

Fig. 11

Note: If a 25 mm extension piece is planned, the trial sleeve is mounted above the trial metaphyseal component (40 or 50 mm). When the final implant components are implanted later, the metaphyseal component must be positioned above the 25 mm extension piece.

Thread the pre-assembled trial components over the guide rod ES (**Fig. 12**). Then loosen the guide rod (**Fig. 13**) and remove it (**Fig. 14**).

Use the trial screw of the correct length to help attach the trial components. To do this, use the socket wrench (**Fig. 15** and **16**).

Attach the trial head of medium neck length and reduce the joint (**Fig. 17**).

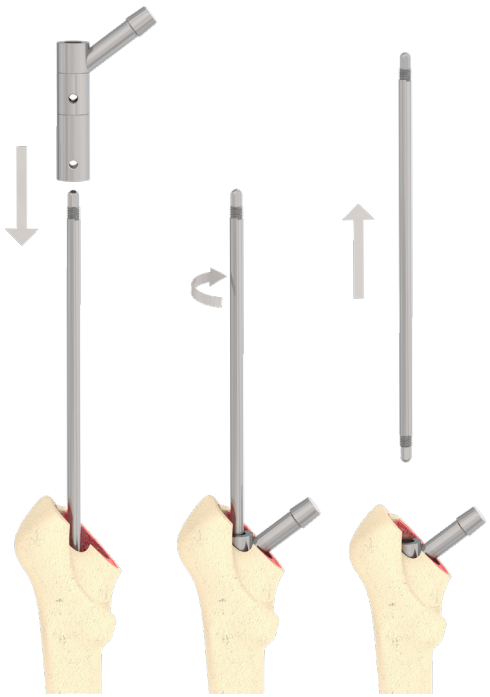


Fig. 12 Fig. 13 Fig. 14

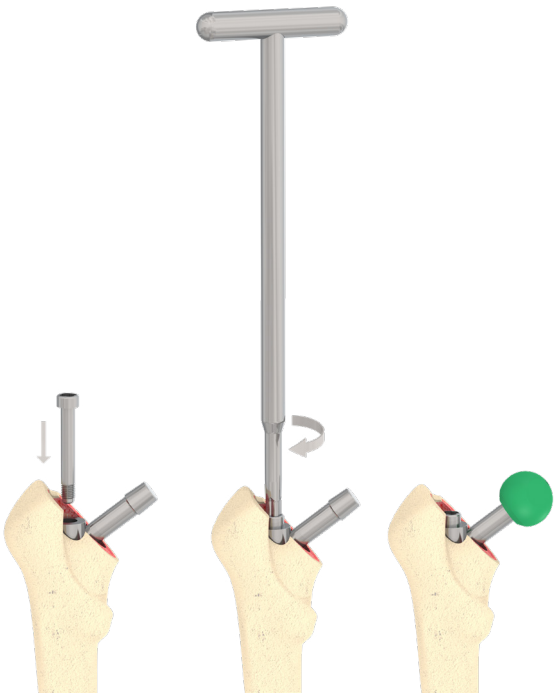


Fig. 15 Fig. 16 Fig. 17

After a successful trial reduction, the trial screw is loosened (**Fig. 18**) and removed (**Fig. 19**). First leave the trial components on the stem (**Fig. 20**).

Use the socket wrench SW 6 to help screw the guide rod ES into the stem again (**Fig. 21** and **22**).

Then remove the trial components while leaving the guide rod in the stem (**Fig. 23**).

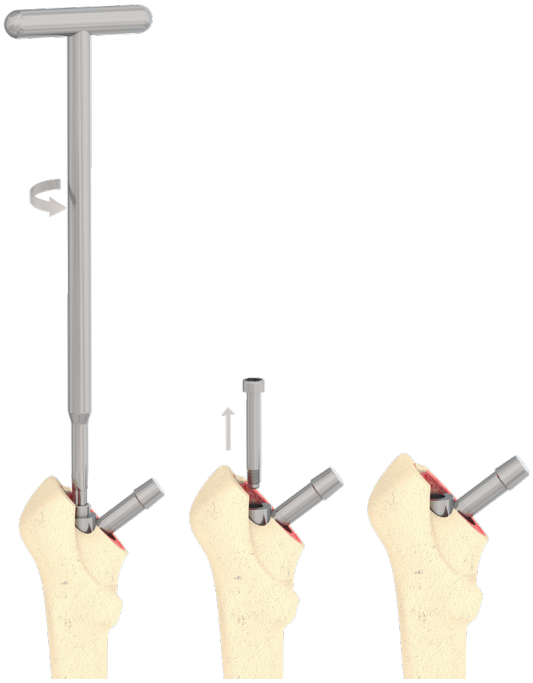


Fig. 18 Fig. 19 Fig. 20

Fig. 21 Fig. 22 Fig. 23

Implantation of the other components

When using a 25 mm extension piece, first clean the morse taper on the stem and make sure that no contamination gets into the taper connection.

Place the extension piece over the guide rod ES onto the stem, and tap it in using the ES impactor for metaphyseal component (**Fig. 24**).

Note: The additional 32 mm and 42 mm markings on the impactor for metaphyseal component are used for orientation during the implantation of a MUTARS® RS stem extra slim cementless.

Use the broach for metaphyseal component of the corresponding size (40 or 50 mm) while the guide rod is fixed in the stem. Prepare the bone bed for the metaphyseal component until the broach hits the implanted stem (or the 25 mm extension piece) (**Fig. 25** and **26**).

Note: In the case of extremely sclerotic bone, it is possible that not enough bone has been removed despite careful broaching, especially in the calcar area. Therefore the broach can't be tapped in deeply enough, which would cause an insufficient seating for the metaphyseal component. It can be helpful to use imaging to check the seating of the broach. There may not be any noticeable space between the broach and the stem.

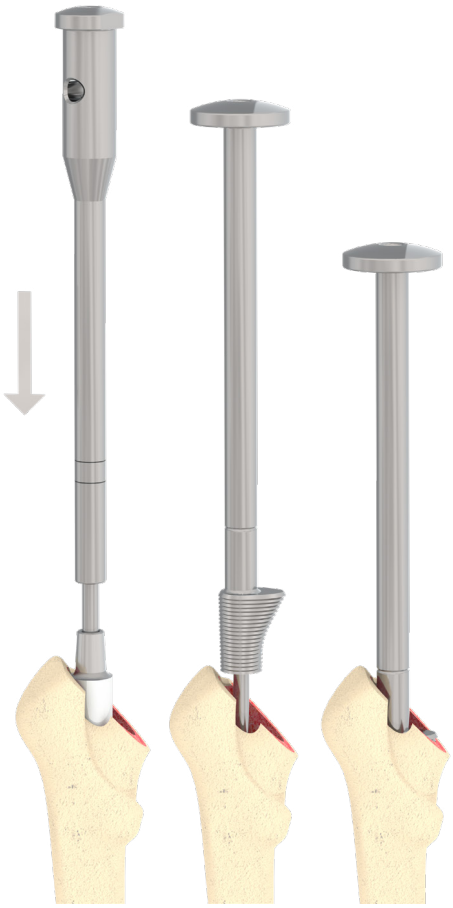


Fig. 24 Fig. 25 Fig. 26

Before tapping in the metaphyseal component, the taper connection must be cleaned (**Fig. 27**).

After correctly positioning the metaphyseal component, remove the impactor while leaving the guide rod (**Fig. 28**).

Add the proximal component in the correct antetorsion (**Fig. 29**) by carefully using the positioner without a hammer.

Remove the guide rod (**Fig. 30**). Fix the components using the RS screw of the correct length. Use the socket wrench to screw it in (**Fig. 31**).

Check the mobility, leg length, and stability of the joint during a final trial reduction. The antetorsion can be adjusted in increments of 5° (**Fig. 32**).

If the joint is not sufficiently stable, we recommend using a 42 mm proximal component.

If the stem is lateralized, please use the 127° proximal component.

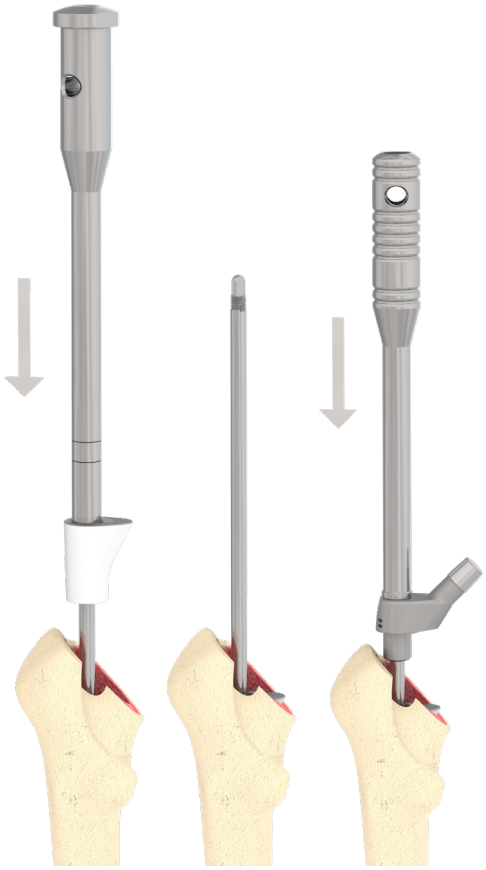


Fig. 27 Fig. 28 Fig. 29

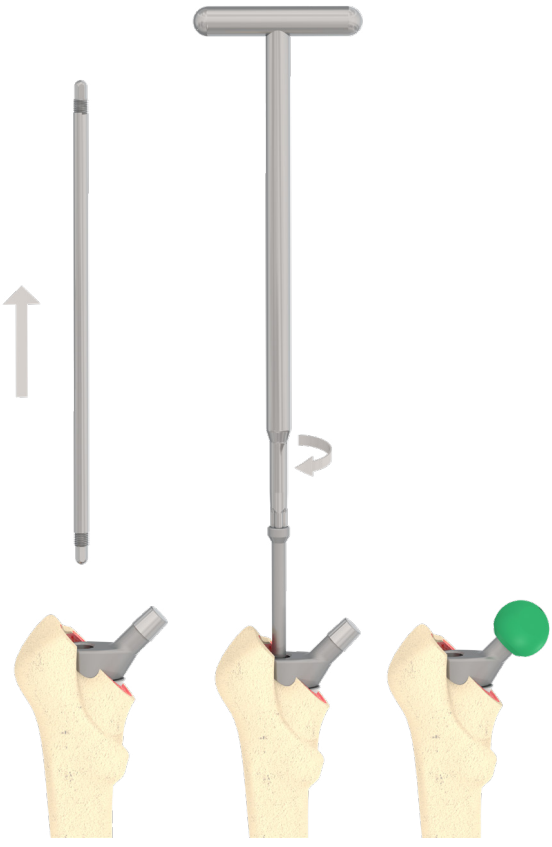


Fig. 30 Fig. 31 Fig. 32

Use the swing wrench to help fix the components while countering with the counter instrument (**Fig. 33**).

Lock the screw using the torque wrench (**Fig. 34**). The correct torque has been attained as soon as the pointer lines up with the "M8" marking. Secure the assembly with the RS counter instrument.

Insert the safety screw and proceed in the same way.

Note: Further information can be found in the Surgical technique MUTARS® torque wrench M8 M10.

Clean and dry the taper before attaching the head of the correct neck length (**Fig. 35**).

Reduce the hip joint.

Then use imaging to check whether each cone is directly connected to the other.

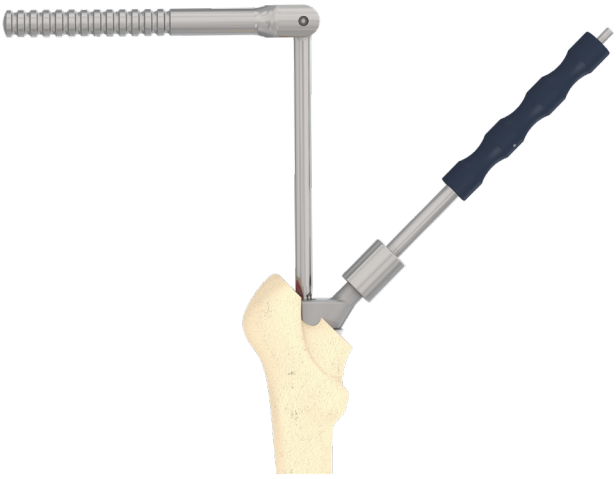


Fig. 33

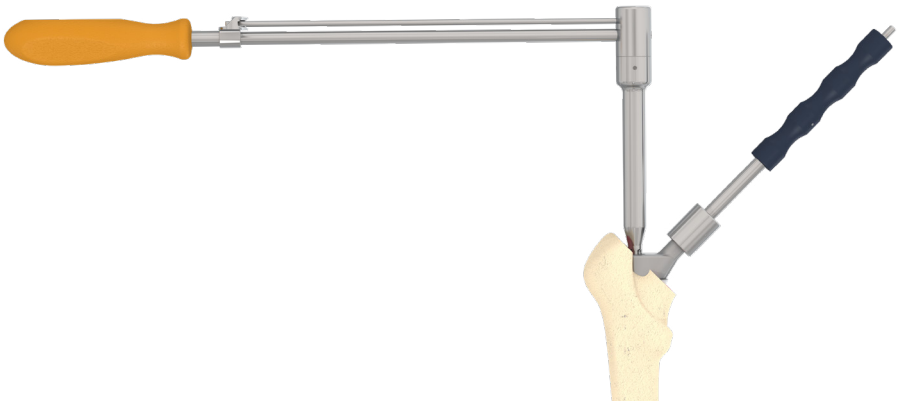


Fig. 34

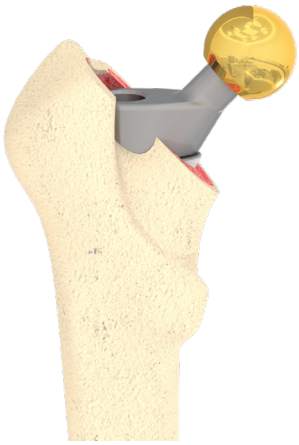


Fig. 35

Explantation of a stem

The RS extractor adapter is screwed into the tapped-in stem (**Fig. 36**). If necessary, insert the guide rod perpendicularly into the adapter.

Attach the slide hammer on the RS extractor adapter and lock it (**Fig. 37**).

Use the slide hammer to help remove the stem and the metaphyseal component (**Fig. 38**).

After removing the prosthesis, remove the slide hammer and the extractor adapter. If necessary, use the guide rod again to detach the instruments from one another.

Trial reduction with trial stems (optional)

Screw the guide rod ES and the MUTARS® RS ES stem impactor to the trial stem of the correct size (**Fig. 39**).

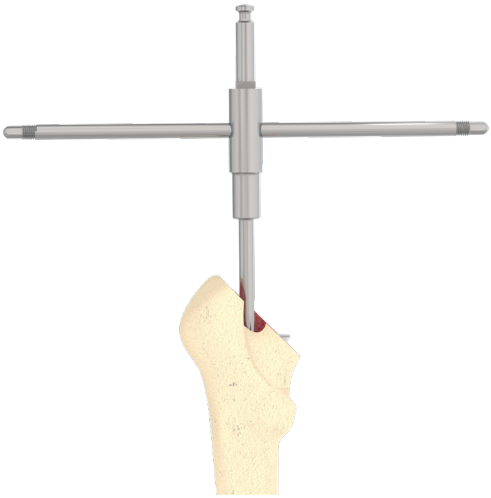


Fig. 36

Fig. 37 Fig. 38 Fig. 39

Cementless implantation

The trial stem corresponding to the diameter of the stem is used for the cementless stem.

Cemented implantation

The trial stem cemented corresponding to the diameter of the stem is used for the cemented stem.

Tap in the trial stem (**Fig. 40**) while paying attention to the antecurvature. The trial stem should be tapped in until it is seated firmly. The implantation depth can be checked using the ring markings on the stem impactor (**Fig. 41**) (**Tab. 1**).

Leave the RS guide rod ES in the taper of the trial stem (**Fig. 42**).

Prepare the bone bed for the metaphyseal component using the reamer for metaphyseal part. Ream until the limit stop. If necessary, clean the reamer and complete the process by reaming the bone a second time. Then rinse the reamed area of the bone and make sure that there are no bone chips above the trial stem (**Fig. 43** and **44**).

Screw together the trial components (**Fig. 45**).

Fig. 40

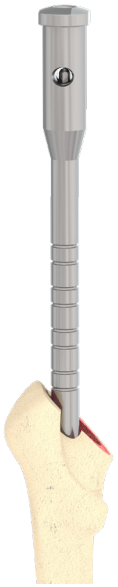


Fig. 41

Fig. 42

Fig. 43

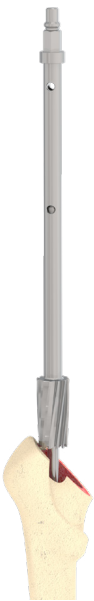


Fig. 44

Fig. 45

Note: If a 25 mm extension piece is planned, the trial sleeve is mounted above the trial metaphyseal component (40 or 50 mm). When the final implant components are implanted later, the metaphyseal component must be positioned above the 25 mm extension piece.

Thread the assembled trial implant over the guide rod ES (**Fig. 46** and **47**) and remove the guide rod ES (**Fig. 48**).

Use the trial screw of the correct length to attach the trial components. To do this, use the socket wrench (**Fig. 49** and **50**).

Attach the trial head of medium neck length and reduce the joint (**Fig. 51**).

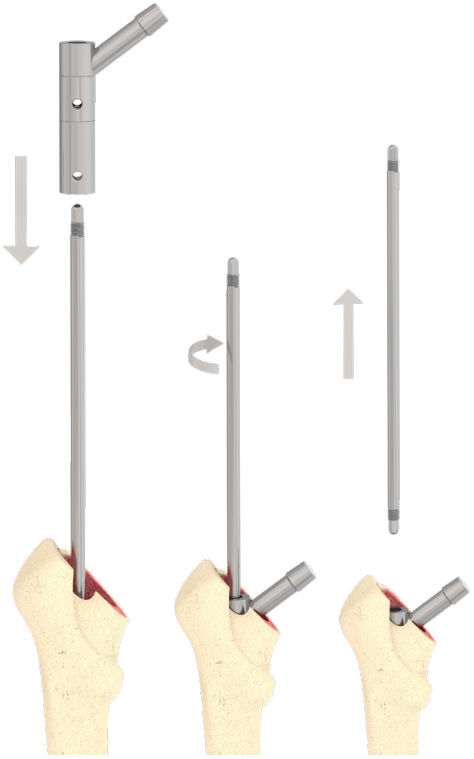


Fig. 46 Fig. 47 Fig. 48

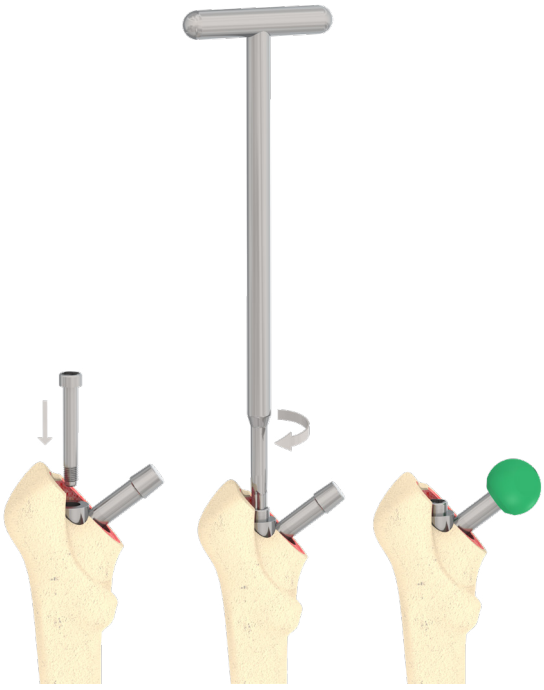


Fig. 49 Fig. 50 Fig. 51

After a successful trial reduction, the trial screw is loosened and removed (**Fig. 52** and **53**). First leave the trial components on the trial stem (**Fig. 54**).

The RS extractor adapter is screwed into the tapped-in trial stem (**Fig. 55**).

Attach the slide hammer to the RS extractor adapter, lock it (**Fig. 56**), and remove the trial stem using the slide hammer. Screw the guide rod ES and the MUTARS® RS ES stem impactor to the stem of the correct size (**Fig. 57**).

Fig. 52

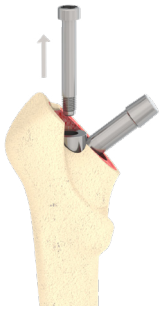


Fig. 53

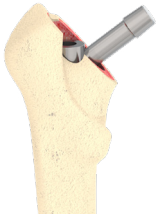


Fig. 54

Fig. 55

Fig. 56

Fig. 57

Cementless implantation

The stem corresponding to the diameter of the broach (trial stem) is used for cementless stems.

Cemented implantation

For cemented stems, the stem corresponding to the diameter of the trial stem cemented is implanted with cement.

Tap in the stem (**Fig. 58**) while paying attention to the antecurvature. The stem should be tapped in until it is seated firmly. The implantation depth can be checked using the ring markings on the stem impactor (**Fig. 59**) (**Tab. 1**).

Implantation of the other components

When using a 25 mmextension piece, first clean the morse taper on the stem and make sure that no contamination gets into the taper connection.

Place the extension piece over the guide rod ES onto the stem, and tap it in using the ES impactor for metaphyseal part (**Fig. 60**).

Note: The additional 32 mm and 42 mm markings on the ES impactor for metaphyseal part are used for orientation during the implantation of a MUTARS® RS stem extra slim cementless.

Use the broach for metaphyseal part of the corresponding size (40 or 50 mm) while the guide rod is fixed in the stem. Prepare the bone bed for the metaphyseal component until the broach hits the implanted stem (or the 25 mm extension piece) (**Fig. 61** and **62**).

Remove the broach.

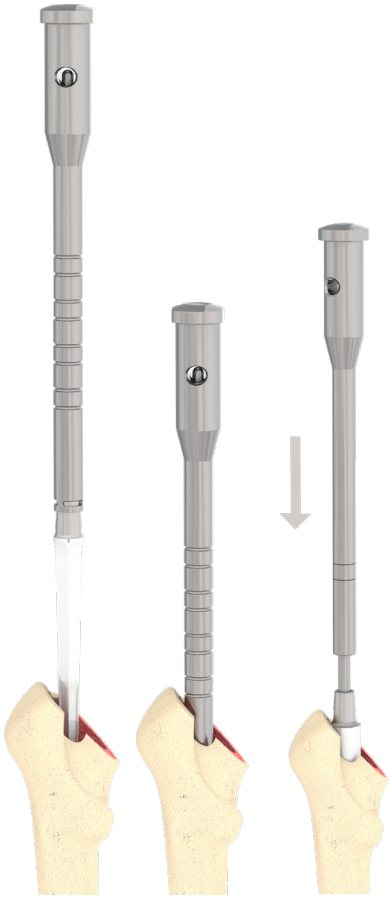


Fig. 58 Fig. 59 Fig. 60

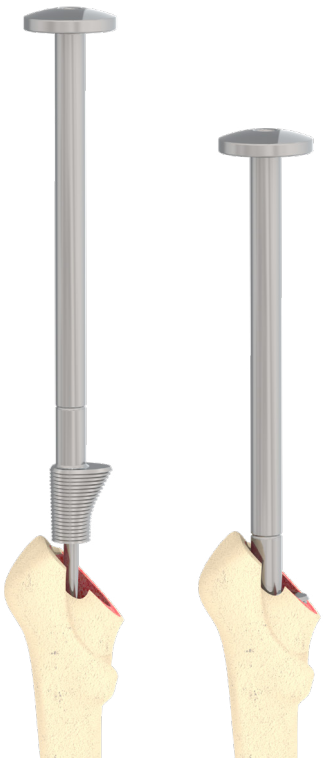


Fig. 61 Fig. 62

Note: In the case of extremely sclerotic bone, it is possible that not enough bone has been removed despite careful broaching, especially in the calcar area. Therefore the broach can't be tapped in deeply enough, which would cause an insufficient seating for the metaphyseal component. It can be helpful to use imaging to check the seating of the broach. There may not be any noticeable space between the broach and the stem. Before tapping in the metaphyseal component, the taper connection must be cleaned (**Fig. 63**).

After correctly positioning the metaphyseal component, remove the impactor but leave the guide rod (**Fig. 64**).

Add the proximal component in the correct antetorsion (**Fig. 65**) by carefully using the positioner without a hammer.

Remove the guide rod (**Fig. 66**). Fix the components using the RS screw of the correct length. Use the socket wrench for screwing in (**Fig. 67**). Check the mobility, leg length, and stability of the joint during a final trial reduction. The antetorsion can be adjusted in increments of 5° (**Fig. 68**).

If the joint is not sufficiently stable, we recommend using a 42 mm proximal component.

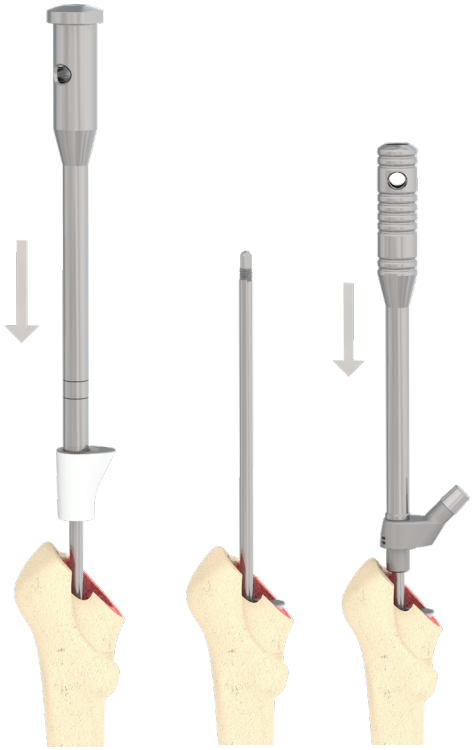


Fig. 63 Fig. 64 Fig. 65

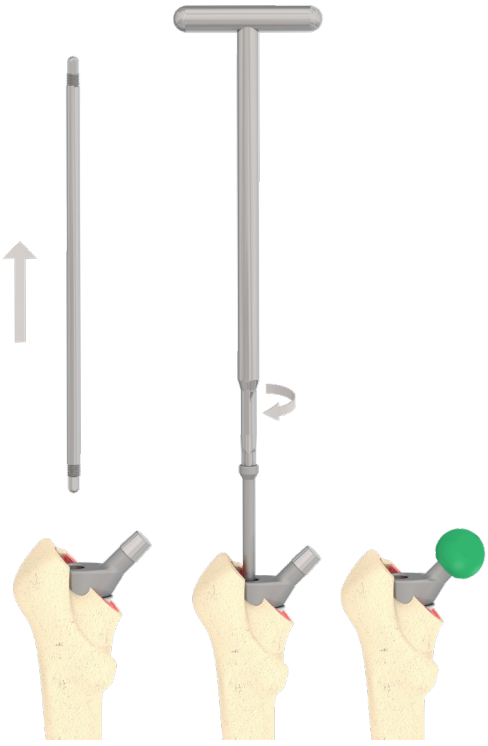


Fig. 66 Fig. 67 Fig. 68

If the stem is lateralized, please use the 127° proximal component.

Use the swing wrench to help fix the components while countering with the counter instrument (**Fig. 69**).

Lock the screw using the torque wrench (**Fig. 70**). The correct torque has been attained as soon as the pointer lines up with the "M8" marking. Secure the assembly with the RS counter instrument.

Insert the safety screw and proceed in the same way.

Note: Further information can be found in the Surgical technique MUTARS® torque wrench M8 M10.

Clean and dry the taper before attaching the head of the correct neck length (**Fig. 71**).

Reduce the hip joint.

Then use imaging to check whether each cone is directly connected to the other.

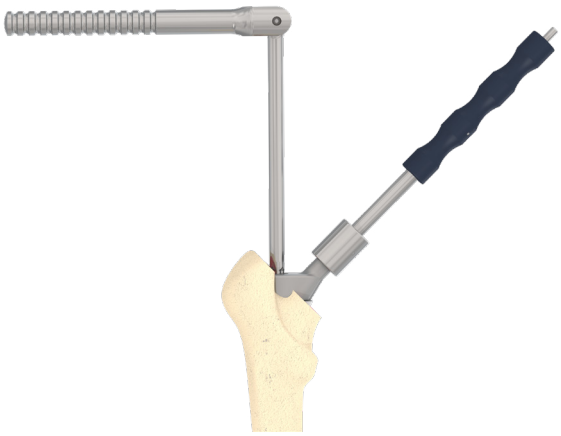


Fig. 69

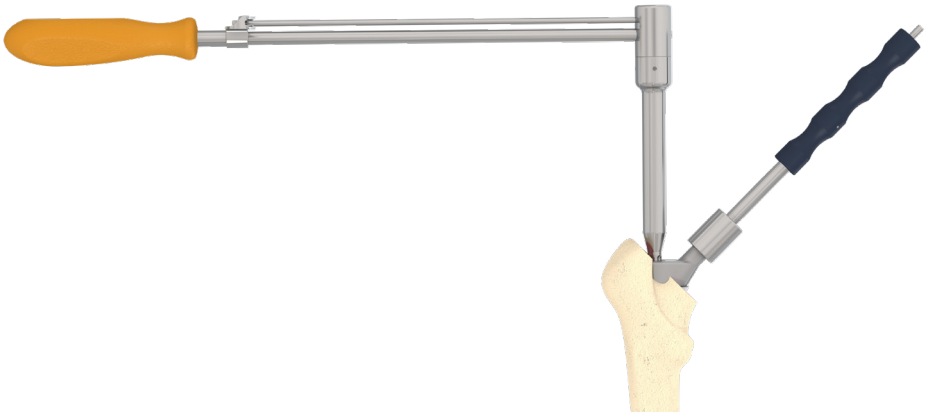


Fig. 70

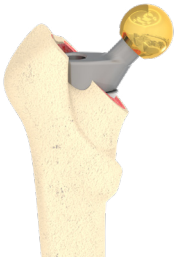


Fig. 71

Explantation of a stem

The RS disassembling adapter is screwed into the tapped-in stem (**Fig. 72**). If necessary, insert the guide rod perpendicularly into the adapter.

Attach the slide hammer on the RS disassembling adapter and lock it (**Fig. 73**).

Use the slide hammer to help remove the stem and the metaphyseal component (**Fig. 74**).

After removing the prosthesis, remove the slide hammer and the disassembling adapter. If necessary, use the guide rod again to detach the instruments from one another.

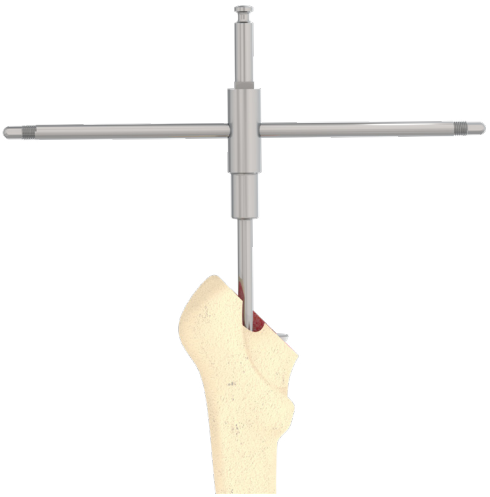


Fig. 72

Fig. 73

Fig. 74

Implants

Key:

with two locking drill holes at the shaft end
Observe the weight limit in accordance with the instructions for use

MUTARS® RS screw

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3

Article number	*Length*	*Thread*
67204008	40 mm	M8
67205008	50 mm	M8
67206508	65 mm	M8
67207508	75 mm	M8
67209008	90 mm	M8
67201008	100 mm	M8
67201158	115 mm	M8
67201258	125 mm	M8

MUTARS® RS proximal component

incl. safety screw

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3

Article number	*Length*	*Angle*
67101527	32 mm	127°
67101527S	32 mm	127°
67101535	32 mm	135°
67101535S	32 mm	135°
67101627	42 mm	127°
67101627S	42 mm	127°
67101635	42 mm	135°
67101635S	42 mm	135°

MUTARS® RS metaphyseal component

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3

Article number	*Size*	*Length*
67304021		40 mm
67305021		50 mm
67304321	slim	40 mm
67305321	slim	50 mm

MUTARS® RS metaphyseal component HA

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3
Coating: implaFix® HA; HA coating in accordance with ISO 13779-2

Article number	*Size*	*Length*
67304121		40 mm
67305121		50 mm
67304221	slim	40 mm
67305221	slim	50 mm

MUTARS® RS extension piece

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3

Article number	*Length*
67300025	25 mm

MUTARS® RS extension piece HA

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3
Coating: implaFix® HA; HA coating in accordance with ISO 13779-2

Article number	*Length*
67300125	25 mm

MUTARS® RS stem cementless

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3

Article number	*Size*	*Length*	
67601514*	14	150 mm	
67601516*	16	150 mm	
67601518*	18	150 mm	
67601520*	20	150 mm	
67612014*	14	200 mm	
67612016*	16	200 mm	◎
67612018*	18	200 mm	◎
67612020*	20	200 mm	◎
67612516*	16	250 mm	
67612518*	18	250 mm	◎
67612520*	20	250 mm	◎

** Not contained in the loan set and must be requested separately.*

MUTARS® RS stem cementless HA

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3
Coating: implaFix® HA; HA coating in accordance with ISO 13779-2

Article number	*Size*	*Length*	*Maximum weight*
67621512	12	150 mm	
67621513*	13	150 mm	
67621514	14	150 mm	
67621515*	15	150 mm	
67621516	16	150 mm	
67621517*	17	150 mm	
67621518	18	150 mm	
67621519*	19	150 mm	
67621520	20	150 mm	
67621521*	21	150 mm	
67621522*	22	150 mm	
67622012	12	200 mm	
67622013*	13	200 mm	
67622014	14	200 mm	
67622015*	15	200 mm	
67622016	16	200 mm	
67622017*	17	200 mm	
67622018	18	200 mm	
67622019*	19	200 mm	
67622020	20	200 mm	
67622021*	21	200 mm	
67622022*	22	200 mm	
67622514	14	250 mm	65 kg
67622515*	15	250 mm	
67622516	16	250 mm	
67622517*	17	250 mm	
67622518	18	250 mm	
67622519*	19	250 mm	
67622520	20	250 mm	
67622521*	21	250 mm	
67622522	22	250 mm	

** Not contained in the loan set and must be requested separately.*

Cortical screw

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3

Article number	*Diameter*	*Length*
57924525	4,5 mm	25 mm
57924530	4,5 mm	30 mm
57924535	4,5 mm	35 mm
57924540	4,5 mm	40 mm
57924545	4,5 mm	45 mm
57924550	4,5 mm	50 mm
57924555	4,5 mm	55 mm
57924560	4,5 mm	60 mm

TI locking screw

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3

Article number	*Diameter*	*Length*
120-0045-025T-ST1 *	4,5 mm	25 mm
120-0045-030T-ST1 *	4,5 mm	30 mm
120-0045-035T-ST1 *	4,5 mm	35 mm
120-0045-040T-ST1 *	4,5 mm	40 mm
120-0045-045T-ST1 *	4,5 mm	45 mm
120-0045-050T-ST1 *	4,5 mm	50 mm
120-0045-055T-ST1 *	4,5 mm	55 mm
120-0045-060T-ST1 *	4,5 mm	60 mm

** As an alternative to: Cortical screw*

MUTARS® RS stem cemented

Material: implavit®; CoCrMo in accordance with ISO 5832-4

Article number	*Size*	*Length*	*Maximum weight*	
67601212	12	120 mm		
67601412	14	120 mm		
67601612	16	120 mm		
67601812	18	120 mm		
67601215	12	150 mm		
67601415	14	150 mm		
67601615	16	150 mm		
67601815	18	150 mm		
67611220	12	200 mm	70 kg	
67611420	14	200 mm		
67611620	16	200 mm		
67611820	18	200 mm		
67601212N	12	120 mm		
67601412N	14	120 mm		
67601612N	16	120 mm		
67601812N	18	120 mm		
67601215N	12	150 mm		
67601415N	14	150 mm		
67601615N	16	150 mm		
67601815N	18	150 mm		
67611220N	12	200 mm	70 kg	
67611420N	14	200 mm		
67611620N	16	200 mm		
67611820N	18	200 mm		

MUTARS® RS stem cementless extra slim HA

Material: implatan®; $TiAl_6V_4$ in accordance with ISO 5832-3
Coating: implaFix® HA; HA coating in accordance with ISO 13779-2

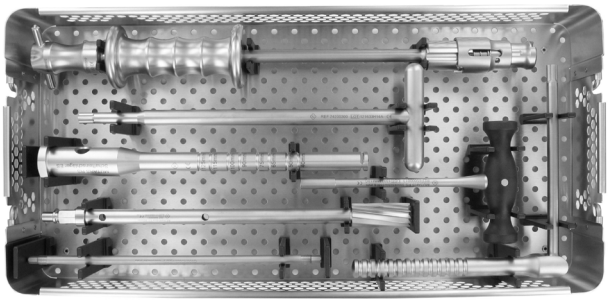
Article number	*Size*	*Length*
67641514HA *	14	190 mm
67642014HA *	14	240 mm

** These stems are used without a metaphyseal component and are suitable for treating dysplastic malalignments. In combination with the proximal component, the 40 mm screw is always used.*

Container

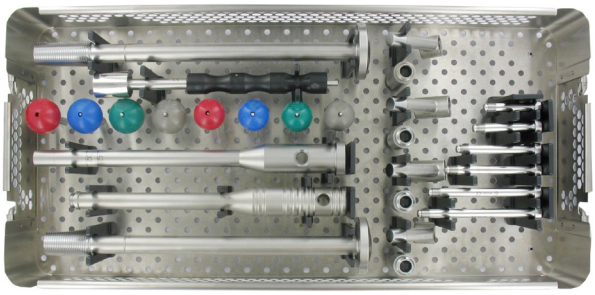
MUTARS® RS ES – container 2

79996715



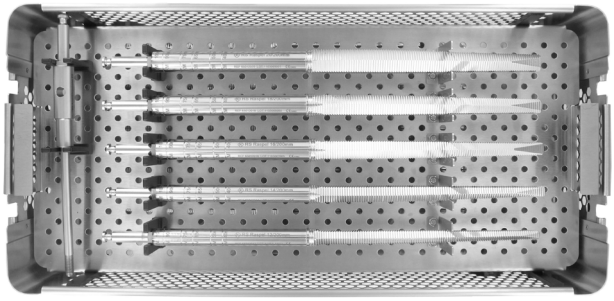
MUTARS® RS ES – container 3

79996716



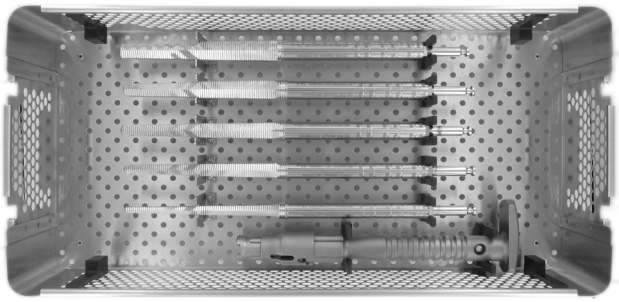
MUTARS® RS broach – container

79996721 top



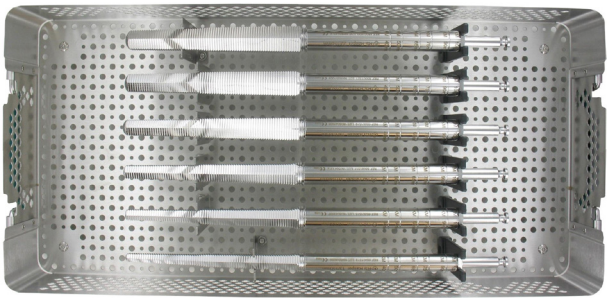
MUTARS® RS broach – container

79996721 bottom



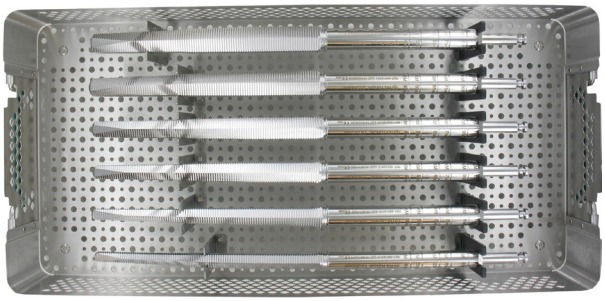
MUTARS® RS broach 150 mm – container

79996722



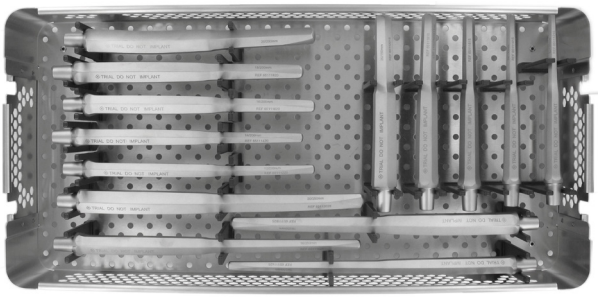
MUTARS® RS broach 200 mm – container

79996723



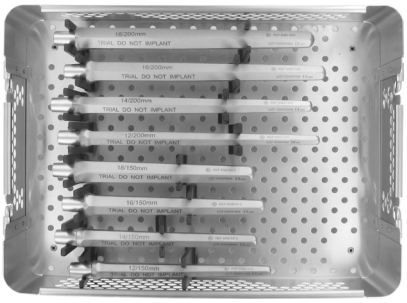
MUTARS® RS trial stem – container

79996724



MUTARS® RS trial stem cemented – container

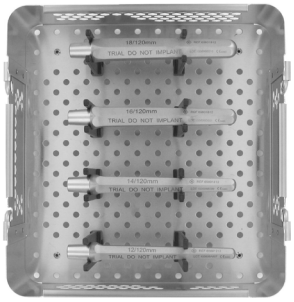
79996725



Attention: Instruments are delivered non-sterile. The relevant information on processing must be observed.

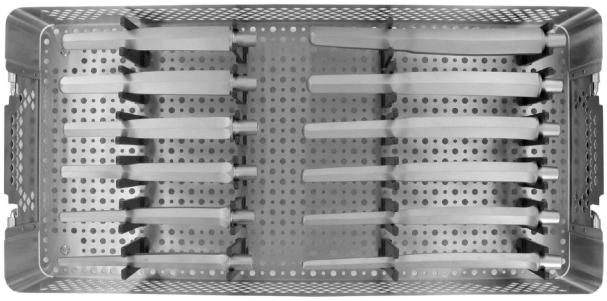
MUTARS® RS trial stem 120 mm cemented – container

79996726



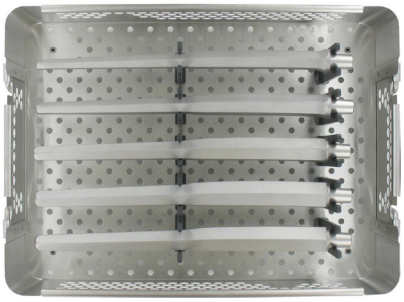
MUTARS® RS trial stem 150 mm + 200 mm – container

79996727



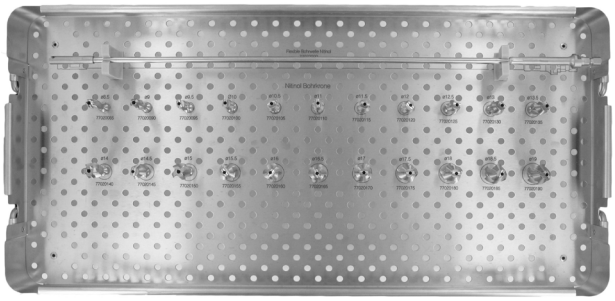
MUTARS® RS trial stem 250 mm – container

79996731



Flexible drill nitinol – container

79997000



Attention: Instruments are delivered non-sterile. The relevant information on processing must be observed.

Instruments

MUTARS® RS ES – container 2

79996715

Slide hammer with snap mechanism

65000012

MUTARS® RS socket wrench

Article number	Wrench size
65000013	6

MUTARS® RS ES stem impactor

65003000

MUTARS® RS guide rod ES

65003003

MUTARS® RS reamer for metaphyseal part ES

Article number	Diameter
65003021	21

MUTARS® swing wrench

Article number	Size
74110001	long

MUTARS® socket wrench

Article number	Length
74200300	300

MUTARS® RS trial stem 250 mm – container

79996731

MUTARS® RS trial stem

Article number	Length	Diameter
65111525	250	15
65111725	250	17
65111925	250	19
65112125	250	21
65112225	250	22

Flexible drill nitinol – container

79997000

Flexible drill shaft nitinol

77020000

Alternative instrument:

Flexible drill shaft nitinol

003-0143-470

Nitinol drill bit

Article number	Diameter
77020085	8,5
77020090	9,0
77020095	9,5
77020100	10,0
77020105	10,5
77020110	11,0
77020115	11,5
77020120	12,0
77020125	12,5
77020130	13,0
77020135	13,5
77020140	14,0
77020145	14,5
77020150	15,0
77020155	15,5
77020160	16,0
77020165	16,5
77020170	17,0
77020175	17,5
77020180	18,0
77020185	18,5
77020190	19,0

Alternative instrument:

Nitinol drill bit

Article number	Diameter
003-0145-085	8,5
003-0145-090	9,0
003-0145-095	9,5
003-0145-100	10,0
003-0145-105	10,5
003-0145-110	11,0
003-0145-115	11,5
003-0145-120	12,0
003-0145-125	12,5
003-0145-130	13,0
003-0145-135	13,5
003-0145-140	14,0
003-0145-145	14,5
003-0145-150	15,0
003-0145-155	15,5
003-0145-160	16,0
003-0145-165	16,5
003-0145-170	17,0
003-0145-175	17,5
003-0145-180	18,0
003-0145-185	18,5
003-0145-190	19,0

Guide wire nitinol

Article number	Length
77020001	900
77020002	450

Alternative instrument:

Guide wire 2.4 mm with ball head (single use)

Article number	Length
012-1874-010ST1	900
012-1874-009ST1	450

MUTARS® RS ES – container 3

79996716

MUTARS® RS ES positioner for the proximal component

65000019

MUTARS® RS ES metaphyseal component impactor

65003001

MUTARS® RS metaphyseal component broach ES

Article number	Length
65003004	40
65003005	50

MUTARS® RS trial extension piece

Article number	Length	quantity
65003025	25	2

MUTARS® RS trial metaphyseal component ES

Article number	Length
65003040	40
65003050	50

MUTARS® RS trial proximal component ES

Article number	Length	Angle
65003327	32	127
65003335	32	135
65003427	42	127
65003435	42	135

MUTARS® RS trial implant screw

Article number	Length
65004008	40
65005008	50
65006508	65
65007508	75
65009008	90
65001008	100

Trial head snap

Article number	Diameter	Size	taper
79622800	28	S	12 / 14
79622805	28	M	12 / 14
79622810	28	L	12 / 14
79622815	28	XL	12 / 14
79623200	32	S	12 / 14
79623205	32	M	12 / 14
79623210	32	L	12 / 14
79623215	32	XL	12 / 14

n.v.

Article number	Diameter	Size	taper
79652800	28	S	12 / 14
79652805	28	M	12 / 14
79652810	28	L	12 / 14
79652815	28	XL	12 / 14
79653200	32	S	12 / 14
79653205	32	M	12 / 14
79653210	32	L	12 / 14
79653215	32	XL	12 / 14

ic counter instrument

86500003

MUTARS® RS broach – container

79996721

MUTARS® RS broach

Article number	Length	Diameter
65001512	150	12
65001514	150	14
65001516	150	16
65001518	150	18
65001520	150	20
65012012	200	12
65012014	200	14
65012016	200	16
65012018	200	18
65012020	200	20

MUTARS® RS broach handle

65000008

MUTARS® RS disassembling adapter ES

65003007

MUTARS® RS broach 150 mm – container

79996722

MUTARS® RS broach

Article number	Length	Diameter
65001513	150	13
65001515	150	15
65001517	150	17
65001519	150	19
65001521	150	21
65001522	150	22

MUTARS® RS broach 200 mm – container

79996723

MUTARS® RS broach

Article number	Length	Diameter
65012013	200	13
65012015	200	15
65012017	200	17
65012019	200	19
65012021	200	21
65012022	200	22

MUTARS® RS trial stem – container

79996724

MUTARS® RS trial stem

Article number	Length	Diameter
65111215	150	12
65111220	200	12
65111415	150	14
65111420	200	14
65111425	250	14
65111615	150	16
65111620	200	16
65111625	250	16
65111815	150	18
65111820	200	18
65111825	250	18
65112015	150	20
65112020	200	20
65112025	250	20

MUTARS® RS trial stem cemented – container

79996725

MUTARS® RS trial stem cemented

Article number	Length	Diameter
65601215	150	12
65601220	200	12
65601415	150	14
65601420	200	14
65601615	150	16
65601620	200	16
65601815	150	18
65601820	200	18

MUTARS® RS trial stem 120 mm cemented – container

79996726

MUTARS® RS trial stem cemented

Article number	Length	Diameter
65601212	120	12
65601412	120	14
65601612	120	16
65601812	120	18

MUTARS® RS trial stem 150 mm + 200 mm – container

79996727

MUTARS® RS trial stem

Article number	Length	Diameter
65111315	150	13
65111320	200	13
65111515	150	15
65111520	200	15
65111715	150	17
65111720	200	17
65111915	150	19
65111920	200	19
65112115	150	21
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Instructions for use

Intended purpose and product description

The **MUTARS® RS revision system** is a modular femoral hip system for primary and revision hip arthroplasty in patients with severe femoral bone deficiencies whose bone stock is inadequate for other more conservative methods of treatment.
The **MUTARS® RS proximal component** is a femoral component intended to replace the proximal part of the femur in proximal or total femur replacement.
MUTARS® RS metaphyseal components are femoral components intended to be placed in the metaphyseal part of the proximal femur. They connect proximally to the MUTARS® RS proximal component. They are intended for cementless application.
MUTARS® RS extension pieces are intended for intraosseous length adjustment in the area of the proximal, diaphyseal, and distal femur. They are intended for cementless application.
MUTARS® RS stems cemented are stems for cemented fixation intended for a diaphyseal anchorage in the femur and in the tibia, respectively.
MUTARS® RS stems cementless are stems for cementless fixation intended for a diaphyseal anchorage in the femur and in the tibia, respectively.
MUTARS® RS stems extra slim cementless are stems for cementless fixation intended for a diaphyseal anchorage in the femur.
MUTARS® RS screws are intended to join components of the MUTARS® RS Hip System.
The **MUTARS® RS coupling device** is intended to provide coupling of a component with the MUTARS® male taper connection to a component with the MUTARS® female cylindrical fit connection.
The **MUTARS® screw for RS coupling device** is intended to join components with the MUTARS® male taper connection with components with the MUTARS® cylindrical fit connection.
The **MUTARS® intramed. connecting module for KRI, MUTARS® intramed. connecting module for GenuX® femur,** and **MUTARS® intramed. connecting module for GenuX® MK femur** are placed intramedullary in the diaphyseal part of the femur and connect the proximal and distal femoral components in cases of intramedullary total femur replacement. The intramedullary connecting modules are intended for cementless application.
The **MUTARS® RS safety screw** is a screw intended to secure the MUTARS® RS screw.

Preoperative instructions

Preoperative planning is mandatory for optimal results. Before surgery, surgical planning with regard to the dimensions of the prosthetic model and the positioning of the implant components in the bone has to be carried out by the surgeon.
For this purpose, two kinds of implant templates are available:
Digital templates: The templates are included in the databases of conventional planning tools. If the desired templates are not included in the software, please request them from the planning tool supplier.
Radiographic templates: Alternatively, radiographic templates of various scales are available, which can be obtained from your local sales partner upon request.
In addition, before surgery it must be ensured that:

- All necessary implant components are available. An adequate number of all necessary implant sizes should be available during every surgery. It must be determined whether the implantation will be performed with or without cement.
- All instruments necessary are present for surgery. The insertion instruments must match the implant being used. Only instruments designed for use with the implant system by implantcast GmbH may be used. The only exception are those instruments that are standardized for operations.
- The surgeon must ensure that the correct surgical instrument sizes are used during the operation, in order to prevent damages to the implant.

Intraoperative instructions

When removing the implant from the packaging, it must be checked if the implant matches the description on the packaging (REF, LOT, and size).
When removing the implant from the packaging, the corresponding hygiene rules must be adhered to. The user undertakes full responsibility for this. Implants should be implanted immediately after removal from the original packaging.
The surface of the implants is extremely sensitive. Implants must not come into contact with objects that could damage the surfaces.
Before implantation, the implant must be visually inspected by the user for possible damage. Damaged implants must not be used.
The implant must not be modified or manipulated in any way! Damage impairs the performance of implants and may lead to failure of the prosthesis. In case of manipulation, the regulatory responsibility is transferred to the person manipulating the components and the manufacturer is no longer liable for the product.
When bone cement is used, the instructions for use from the respective manufacturer must be followed.
Bone cement must not come into or remain in contact with the sensitive sliding surfaces (articulation surfaces) of the implant during or after the surgery.
Bone cement residues that could dislodge over time and get between the articulation surfaces must be removed. These may lead to increased wear or to destruction of individual implant components.
In cementless applications, a firm fixation of the implant at the time of surgery is essential for the success of the implantation. The cementless components are to be anchored in the bone by press-fit, which requires precise surgery and the use of the instruments provided for this purpose.
A reliable fit of taper connections is only possible with completely intact surfaces of the tapers.
The taper of the MUTARS® RS proximal component must be cleaned and dried before being connected to the taper of the head. Both tapers must be of matching size.
Prior to wound closure, the surgical area including the articulation surfaces of the implant must be thoroughly cleaned to remove any foreign bodies, such as bone splinters, bone cement residues, and any remaining fragments of a previously revised component or an instrument.
It is also recommended that an intraoperative X-ray image be taken and examined for remaining particles, and that they be removed before wound closure.

Postoperative instructions

Postoperative patient care, patient instructions and warnings from the attending medical doctor are of the utmost importance. The use of external support for the operated limb to facilitate the healing process is recommended for a limited period.
Active and passive movements of the operated limb must be exercised with great caution.
The postoperative therapy should be structured so as to prevent overloading of the operated limb and stimulate the healing process.
Regular monitoring of the position and condition of the prosthetic components and the surrounding bone is recommended.

Indications and target group

Risk of postoperative complications can be limited by careful evaluation of the individual anatomical and load conditions, the condition of the soft tissues, and the condition of the bone bed for the implants.
The necessary preoperative examinations should be performed by

the attending medical doctor before the intervention. The examinations depend on the patient's medical history.
Under consideration of these conditions, the following indications apply for the MUTARS® RS revision system:
Need for femoral arthroplasty due to e.g., femoral defects caused by:

- Non-inflammatory degenerative joint disease including osteoarthrosis and avascular necrosis,
- Post-traumatic osteoarthrosis,
- Fractures,
- Rheumatoid arthritis,
- Revision of loosened femoral prosthesis components with extensive bone resorption of the proximal femur and widening of the medullary cavity or strong thinning of the cortical bone in the proximal region of the femur,
- Revision of loosened femoral prosthesis components in the case of a periprosthetic or subprosthetic fracture,
- Revision of non-loosened femoral prosthesis components in the case of a periprosthetic or subprosthetic fracture that cannot be treated in any other way,
- Revision surgery in cases of an extensive comminuted fracture in the proximal third of the femur in elderly patients in whom there is an indication for prosthetic treatment, but a sufficient fixation of a standard endoprosthesis is not possible.

The surgeon decides which version of the prosthesis is to be used for the individual patient.
ATTENTION: In the case of implantation of the MUTARS® RS revision system in pregnant or breastfeeding patients, there is a risk of released metal ions passing through the placenta to the fetus or getting into the breast milk. The resulting risks are not sufficiently investigated and cannot be evaluated by implantcast.
The target group is patients who meet the indications given in these instructions for use and for whom the implantation of the MUTARS® RS revision system is a suitable therapy. The attending medical doctor decides if the product is suitable for the individual patient, and which implant is to be used. This decision depends on several factors, such as the patient's age and weight, bone quality, shape of the bone and deformation of the joint. The provision of MUTARS® RS revision system is generally only indicated in patients whose skeleton is fully grown.

Contraindications

The durability of an implant can be limited in time by biological, material, and biomechanical factors. Therefore, a careful examination of the indications is recommended in overweight patients, in patients with very high joint loads due to high physical activity and in patients under the age of 60.
The MUTARS® RS revision system is contraindicated in cases of:

- Allergy to one of the implant materials (the label on the secondary packaging of the respective component indicates the materials used. It is strongly recommended that an allergy test be performed);
- Active infections;
- Physiological or anatomic conditions, which preclude or are not expected to maintain an adequate osseous support of the implant, or do not allow the implantation of a sufficiently large prosthesis;
- Severe atrophy of the femoral diaphysis which prevents a stable anchorage of the MUTARS® RS prosthesis;
- Insufficient length of intact diaphysis for preparation of the prosthesis bearing;
- Bone tumors in the implant anchorage area;
- Untreated vascular diseases which limit blood supply to the affected limb;
- Metabolic disorders that may impair bone formation.

In case of insufficient quantity and quality of bone stock, an alternative prosthetic treatment allowing for sufficient osseous anchorage should be considered.

Risk factors

The following risk factors may affect the success of the MUTARS® RS revision system:

- Excessive strain on the operated joint due to strenuous physical labor and/or unsuitable sporting activities
- Severe deformities which lead to an impairment of bone fixation or the exact positioning, or the function of the implant
- Therapies that degrade bone quality
- Muscular insufficiency
- Neuromuscular diseases in the affected limb
- Conditions that restrict the patient's ability or willingness to comply with medical instructions, especially during the healing process
- Obesity
- Nicotine and/or drug abuse
- Alcoholism
- Previous surgeries on the affected limb
- Diabetes
- Psoriasis
- Intra-articular injection of corticosteroids
- State after infection.

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