Surgical Technique

smith&nephew

SL-PLUS◇

Cementless Femoral Hip System

SL-PLUS◇ Standard and Lateral Stem

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Nota Bene: *The technique description herein is made available to the healthcare professional to illustrate the authors' suggested treatment for the uncomplicated procedure. In the final analysis, the preferred treatment is that which addresses the needs of the patient.*

Comments from the Author's Clinic

In 1979, our cement-free stem system, which consists of a straight conical stem with a rectangular cross-section, was implanted for the first time. Further observations of development led to constant, step-by-step improvements that resulted in the development of the SL stem in 1993. This system is used in the vast majority of surgical indications and the results have improved considerably since the first implantation.

This SL-PLUS◇ straight stem integrates the proven design features of the stem in terms of a large-area anchorage in the bone. However, changes have been made in the proximal section to improve intraoperative manipulation of the implant and to increase primary stability even further by improving proximal force transmission.

The extremely positive clinical results we have obtained over many years have further increased confidence in this stem design. Thanks to consistent integration of the knowledge gained in the meantime, the SL-PLUS system can now be regarded as the "GOLD STANDARD◇" in non-cemented hip arthroplasty.

Professor Dr. med. K. Zweymüller
Vienna Orthopedic Hospital – Gersthof

Indications

All forms of femurs can be treated with the SL-PLUS® straight stem prosthesis, except those with extreme curvature, e.g. after angulation osteotomies. In these cases, a prior corrective osteotomy could be considered.

- Advanced hip joint wear due to degenerative, post-traumatic, or rheumatoid arthritis
- Fracture or avascular necrosis of the femoral head
- State after prior surgery, e.g. osteosynthesis, joint reconstruction, arthrodesis, hemi-arthroplasty, or total hip replacement

Indications Lateral Stem

- Varus femur forms
- Trumpet shape of the proximal femur (champagne flute)
- State after prior surgery (e.g. displacement osteotomies, pelvic osteotomies)

In the case of coxa vara, the CCD angle is smaller than the normal angle of 126°. Implanting stem prosthesis with a CCD angle of 131° or more can result in a medialization and/or lengthening of the leg.

By implanting a lateralizing stem, the lever arms can be reconstructed in such a way that the strength of the pelvic-trochanter muscles is restored. At the same time, this achieves optimal soft-tissue-balancing. This minimizes the risk of insufficient gait and, in extreme cases, the danger of luxation.

The trumpet shape of the proximal end of the femur (sometimes described as a champagne flute) also poses a surgical-technical challenge to most standard stems, which cannot always be ideally solved. If the femoral isthmus is narrow, only a stem model with a relatively short neck cone can be selected. This femoral shape, however, is usually characterized by a long femoral neck with a large femoral head. Implanting a conventional stem with a relatively short neck cone therefore does not always make ideal reconstruction of the anatomical conditions possible. This results in a medialization of the femoral stem. By lengthening the neck area, the lateralizing SL-PLUS stem allows a reconstruction of the anatomical conditions. This means that it is no longer necessary to contract the pelvictrochanter muscles by implanting a stem prosthesis that extends beyond the trochanter region proximally or has an excessively long neck length and leads to a lengthening of the leg.

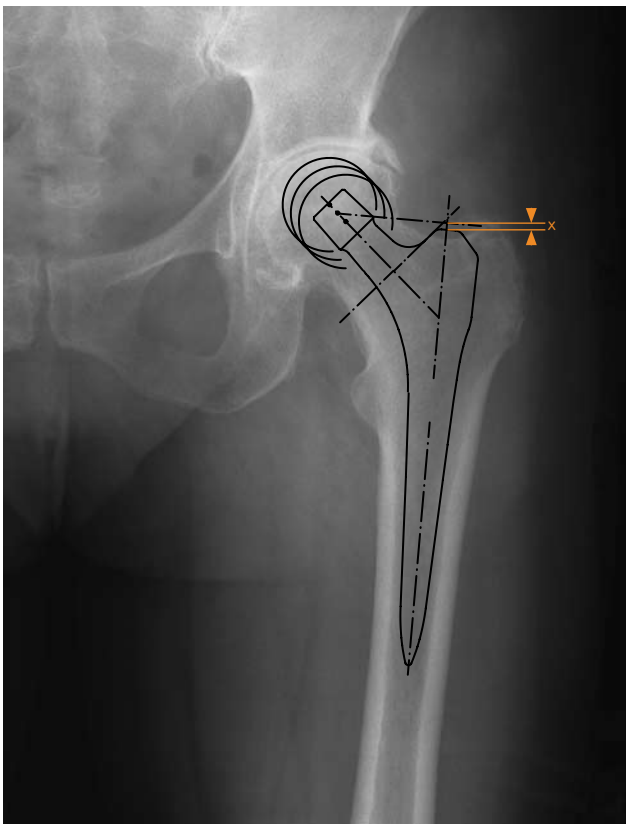
Contraindications

- Acute or chronic infections, local or systemic
- Severe muscle, nerve, or vascular diseases that endanger the respective limb
- Lack of bone substance or defective bone quality that endangers the stable seating of the prosthesis
- Any concomitant disease that may endanger the implant function
- Revision with extensive bone defects

Preoperative Planning

Planning the correct prosthesis size is carried out preoperatively using the X-ray template. This requires an AP X-ray and an axial X-ray. Preoperative planning should always be carried out for orientation purposes. X-ray templates of the SL-PLUS◇ Standard and Lateral stem are available in a magnification of 20%.

To determine the appropriate entrypoint for access of instruments to the medullary canal, it is recommended that the surgeon draw the femoral shaft axis on the AP radiograph and extend it proximally. This line indicates how far laterally it is necessary to place the box chisel to open up the canal. This entry point is easy to locate during surgery.



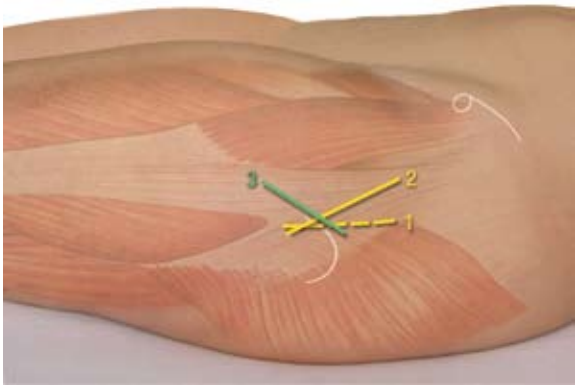
After the preoperative planning, the distance from the SL-PLUS stem to the greater and lesser trochanter can be measured for the purpose of intraoperative monitoring.

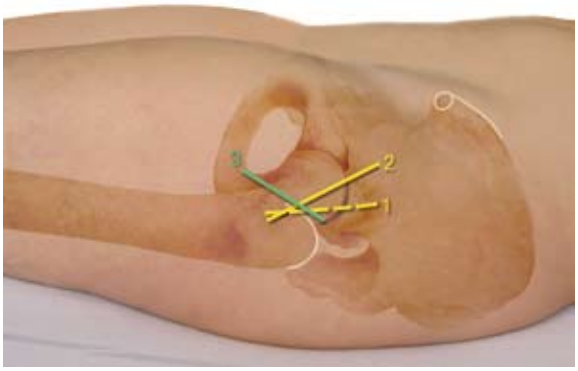
For the implantation of an SL-PLUS stem, both the SL/SLR-PLUS◇ Basic Set as well as the corresponding SL-PLUS trial broach instrumentation are required.

Note

Approach: anterolateral with patient lying in the supine position.

Skin incision



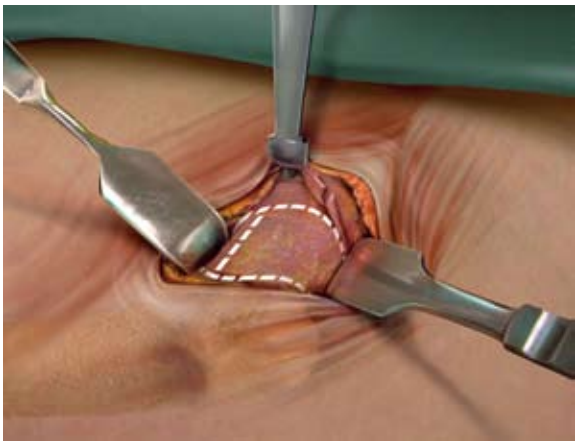


- A longitudinal incision along the anterior edge of the greater trochanter, extending from ⅔ proximally to ⅓ distally to the tip of the trochanter (line 1).
- An oblique incision extending from the anterior edge of the greater trochanter towards the anterior superior iliac spine (line 2).
- A reverse oblique incision approximating the intertrochanteric line (line 3).

The fascial incision extends from the upper edge of the tip of the trochanter towards the anterior superior iliac spine.

Dorsal incision of the iliotibial band is optionally possible.

Capsule incision and preparation

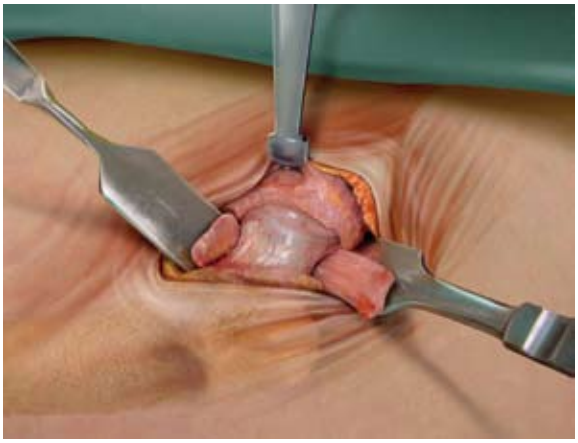


Following between the tensor fascia latae and the glutaeus medius/minimus from lateral, the femoral neck is prepared with the raspatory.

A sharp tipped lateral and a blunt medial Hohmann hook are set in place. The curved rectus tendon is exposed, separated and released from its capsular insertion.

This is followed by an H-shaped incision of the joint capsule:

- Longitudinal incision from the edge of the cup/acetabulum to the trochanteric line as medial as possible
- Transverse incision proximal to the labrum acetabuli from approximately 9 to 3 o'clock
- Transverse incision distal along the trochanteric line

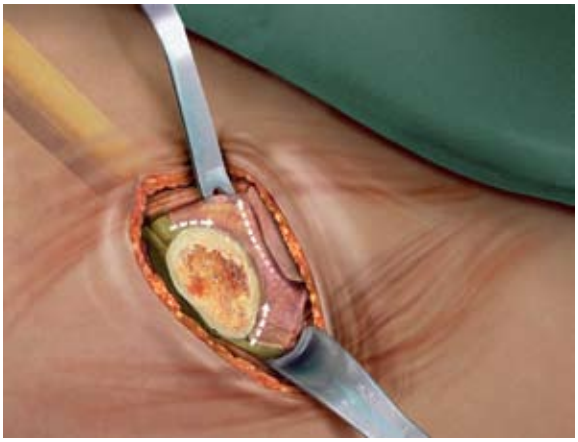


Having opened the joint capsule into two flaps the capsule can then be prepared at the trochanteric line towards the lesser trochanter i.e. the tip of the trochanter and the edge of the acetabulum also in a medial or lateral direction.

Two sharp tipped Hohmann hooks are positioned interarticularly. Any obtrusive osteophytes at the edge of the acetabulum are removed.

The surgeon can select the neck resection method depending on the patient (coxavara/ coxavalga) (single or dual incision technique).

Capsule release



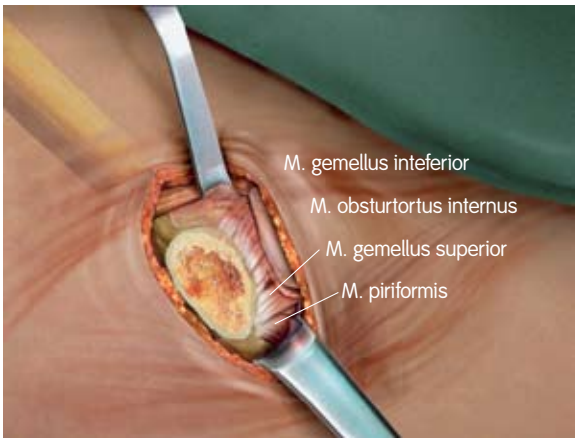
To facilitate the adjustment of the cup at this point the dorsal capsule release is preferred. The surgeon changes to what is known as the “4-point position”.

The leg is placed in an approximately 30–40° adduction and external rotation of 90°, while the leg on which surgery is to be performed is placed under the leg on the healthy side, i.e. it is extended.

The proximal femur is exposed with two hooks, one lateral trochanter lever and a second hook at the medial side of the femoral neck.

The capsule is opened towards the lesser trochanter and the fossa trochanterica to the trochanter tip. The surgeon can also opt to open at the caudal edge of the acetabulum.

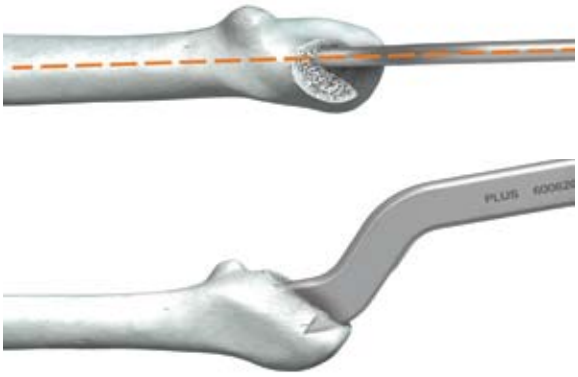
Shaft preparation



The leg is placed in hyperextension of approximately 30–40° and externally rotated by 90°. The leg on which surgery is to be performed is placed under the leg on the healthy side, i.e. it is extended.

If the patient is very muscular or obese or if the femoral neck is valgic or the proximal femur is deep a further dorsal capsule release or notching of the piniformis tendon is required.

Access to the bone cavity



With the lower leg held horizontally, place the box chisel close to the dorsal corticalis, i.e. on the medial resection plane (close to the trochanter minor) and remove a small rectangular block of bone. If the box chisel is not used the trochanter may split. This precise bone removal is the prerequisite for correct broach insertion.

The box chisel should not be inserted too deep.

The curved rasp facilitates opening of the diaphyseal IM canal.

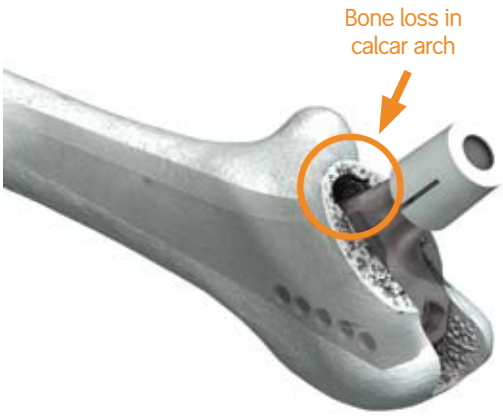
It is recommended that the IM canal is opened further and that the diaphysis is probed within the corresponding room.

In primary implantations, always start with the size 1 rasp to prepare the bony bed.
Then use the rasps of the next sizes up until the corresponding size has been achieved.

The first rasp determines the position of all the following rasps. This is why its orientation is important for an exact positioning of the stem.

Rasping is carried out with the slap hammer or the rasping machine. The weight of this instrument helps to bring the rasp exactly into the longitudinal axis of the femur. It is important that the rasping machine is continually positioned laterally to ensure that the rasp is correctly positioned in terms of the axis and to avoid a varus positioning.

Ensure that the selected antetorsion is set and the rasping machine corresponds to the femoral axis. If the rasp is varus there is the risk of laterally perforating the femur.



At the start of the rasping process it is important to ensure with the small rasp sizes the depth of rasping is observed and checked. With the reduced rasping resistant there is a tendency to rasp too deep into the femur. This results in a gap at the calcar curve between the bone and the pending implant – this gap cannot be rectified by then continuing to rasp with the corresponding rasp to the planned implant.

The broach the next size up is introduced into the cavity until the broach makes contact with the bone. The broach is then driven into the femur with lateral and distal pressure using the slap hammer or the rasping machine. Then go to the next larger broach in sequence until the appropriate size is reached.

The shoulder of the rasp corresponds to the height of the implant measured at the shoulder of the prosthesis and should correspond to the preoperatively determined distance to the greater trochanter (marked X).

The aim is to achieve a long cortical batch with a large surface area. As the IM canal is expanded in increments the contact of the cortex increases and thus also the resistance when rasping. The rasp starts to broach the edges of the shaft, i.e. the rectangular shape from the cortex. As soon as the rasp is fully working on the cortex the pitch is higher and there are signs of the yellow cortex on the edge of the rasp. The ultimate check to ensure that the size is correct is preoperative planning with the X-ray image.

Very rarely the planned prosthesis size may not correspond to the intraoperative rasped size. If there is a discrepancy of two or more sizes it may be that the rasp has failed to achieve the depth required due to the wrong angle or another obstacle. In this case the prosthesis would be too small and cortical anchorage could not be ensured. Therefore, if in doubt a special check should be carried out with the X-ray (image intensifier) to determine what the obstacle is.

The offset adapter is removed from the solid broach.

Trial reposition

The neck module is manually set onto the broach.

The trial head can either be fitted to the neck module in advance or in situ.

In each case, there is a standard modular neck for the detachable rasps of sizes 01–0, 1–6 and 7–12. The “lateral” modular necks are available to fit the detachable rasps of sizes 1–6 and 7–12.

It is important to ensure that the neck module fits onto the rasp and that it clicks into place.

The joint is repositioned and leg length, soft-tissue tension, and range of motion are checked.

If necessary the trial ball-head and/or the modular neck (standard or lateral) are changed until the results are satisfactory.

The modular neck can either be removed from the rasp manually or with a bone clamp.

The offset adapter is connected to the detachable rasp. The detachable rasp is removed from the canal using the slap hammer or the rasping machine.

Implantation of the stem

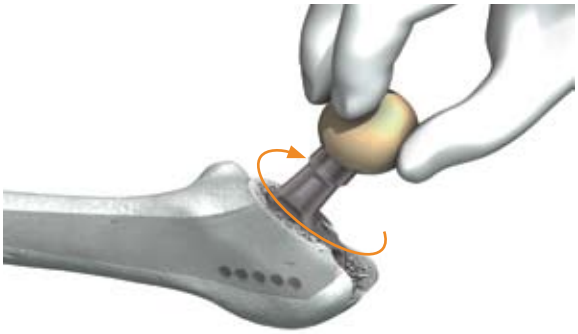
The SL-PLUS◇ stem of the corresponding size is inserted by hand as far as possible and then impacted with the impactor with even blows.

It is not sufficient to press the stem in only manually.

When impacting the protective cap remains on the cone.

It is not possible to impact deeper or correct the position once the stem is in the conus bed as this would inevitably split the stem.

Before repositioning the original ball-head the stem conus is carefully cleaned by hand.



The ball head is then fitted with slight rotation and finally positioned with the plastic hammer.

If using a metal hammer a plastic part needs to be placed between the ball head and the hammer.

It is not sufficient to press the stem in only manually.

Standard conus 12/14 for the accommodation of OXINIUM®, CoCr and ceramic head from Smith & Nephew.

Wound closure

Reposition and check the joint tension and flexibility from all sides. Fit the Redon drains, close the wound, position the leg is slight abduction and internal rotation in a foam splint.

Postoperative Treatment

Postoperative treatment should be carried out in accordance with the standard routine of the clinic in question. The SL-PLUS® stem is immediately load bearing. Boney fixation occurs within 3 months postoperatively at the earliest.

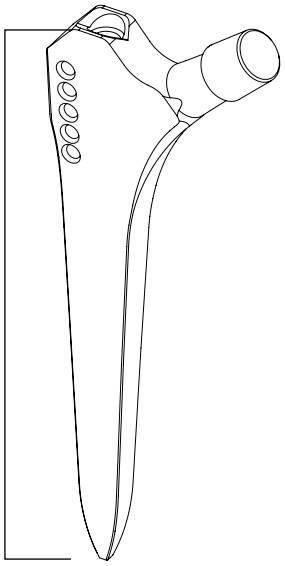
Explantation of the SL-PLUS Stem

The SL-PLUS stem can be removed using the extraction screw M8.

If this causes difficulties, the extraction block can be used.

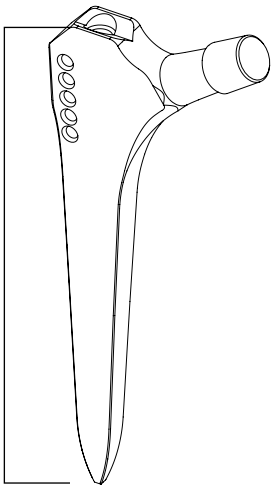
Standard Implants

Part No.	Size	Length (L)
7500-2717	01	128 mm
7500-2719	0	132 mm
7500-2695	1	136 mm
7500-2697	2	140 mm
7500-2699	3	145 mm
7500-2701	4	150 mm
7500-2703	5	154 mm
7500-2705	6	158 mm
7500-2707	7	163 mm
7500-2709	8	168 mm
7500-2711	9	173 mm
7500-2713	10	178 mm
7500-2714	11	183 mm
7500-2715	12	188 mm



Lateral Implants

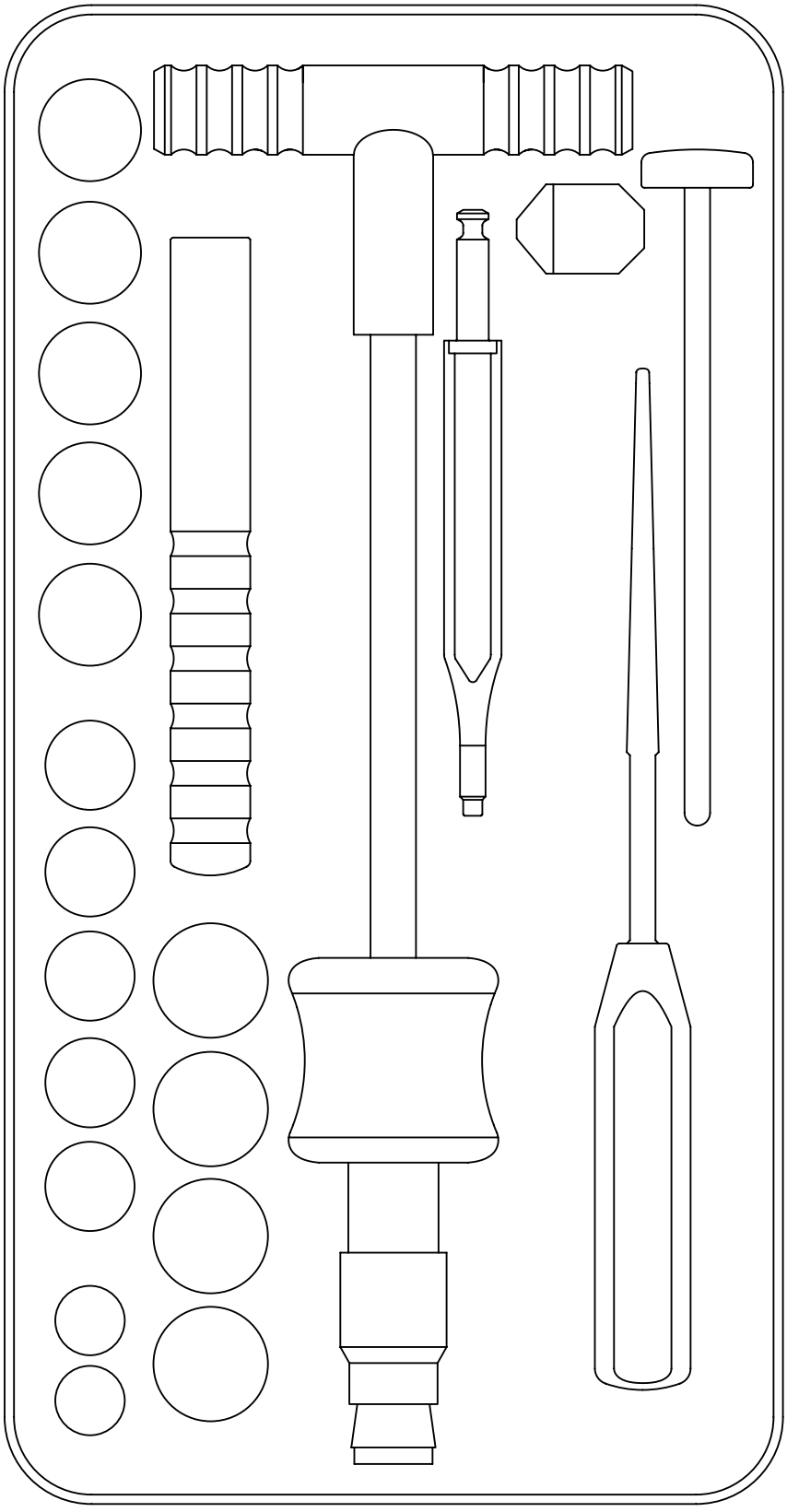
Part No.	Size	Length (L)
7500-2748	1	136 mm
7500-2750	2	140 mm
7500-2752	3	145 mm
7500-2756	4	150 mm
7500-2758	5	154 mm
7500-2760	6	158 mm
7500-2762	7	163 mm
7500-2764	8	168 mm
7500-2766	9	173 mm
7500-2768	10	178 mm
7500-2769	11	183 mm
7500-2770	12	188 mm



Instrumentation

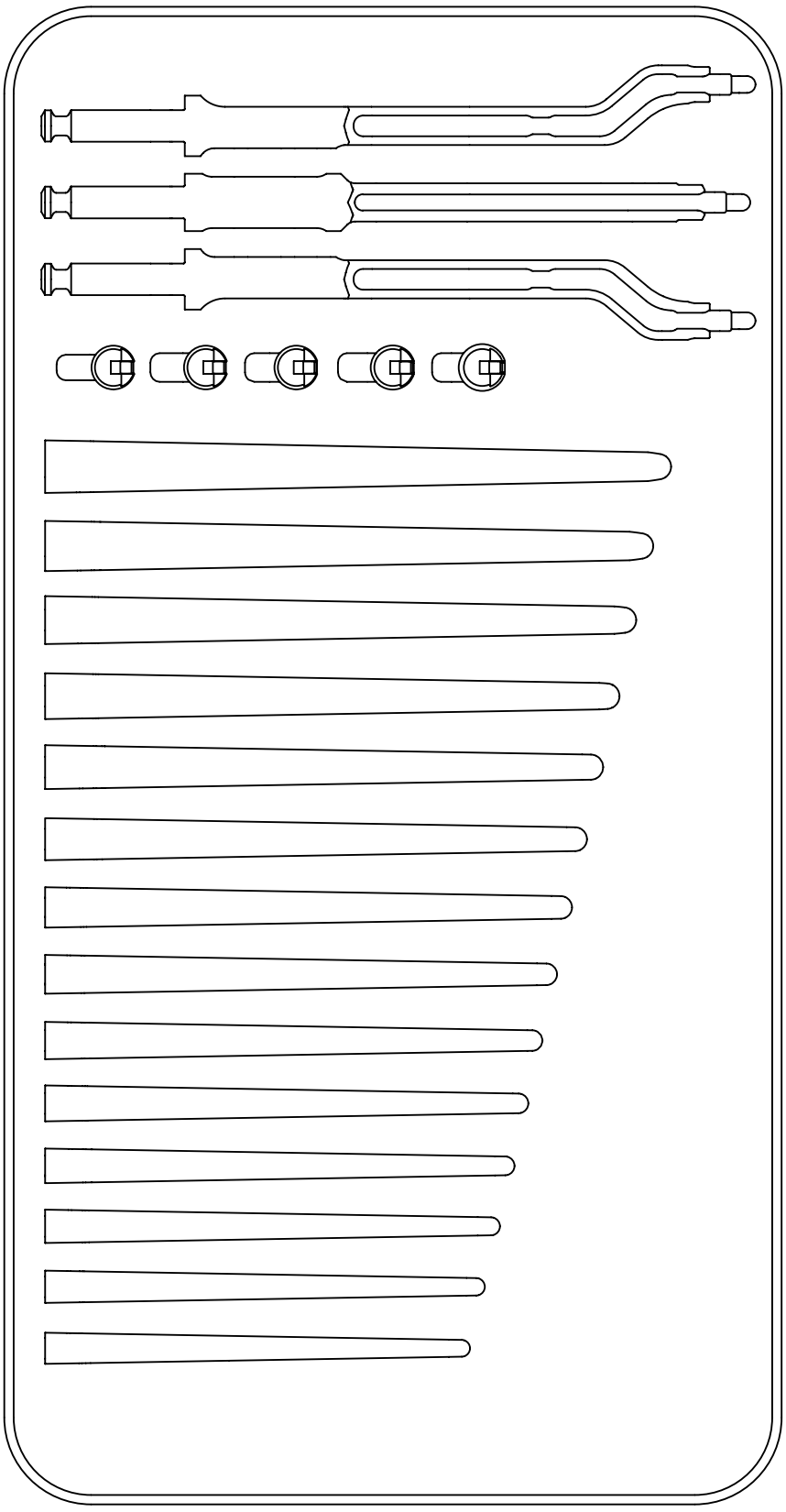
SL/SLR-PLUS◊ Basic Instrumentation

7500-2198	**Case Basic Instruments 1/4**
7500-7661	Easy Tray Lid Plastic
7500-2319	Slap Hammer
7500-2320	Extractor Block
7500-2321	Impactor
7500-2322	Box Chisel
7500-2325	Extraction Screw M8
7500-2160	Head Impactor
7136-9708	Trial Ball-Heads 22 M
7136-9709	Trial Ball-Heads 22 L
7136-9710	Trial Ball-Heads 28 S
7136-9711	Trial Ball-Heads 28 M
7136-9712	Trial Ball-Heads 28 L
7136-9714	Trial Ball-Heads 28 XL
7136-9715	Trial Ball-Heads 28 XXL
7136-9716	Trial Ball-Heads 32 S
7136-9717	Trial Ball-Heads 32 M
7136-9718	Trial Ball-Heads 32 L
7136-9721	Trial Ball-Heads 32 XL
7136-9722	Trial Ball-Heads 32 XXL
7136-9723	Trial Ball-Heads 36 S
7136-9724	Trial Ball-Heads 36 M



SL-PLUS® Trial Broach with Adapter 25 mm
Set No. 0943001

Part No.	Description
7500-7312	**Instrument Case**
7500-7661	Easy Tray Lid Plastic
7500-7293	Trial Broach 01
7500-7294	Trial Broach 0
7500-7295	Trial Broach 1
7500-7296	Trial Broach 2
7500-7297	Trial Broach 3
7500-7298	Trial Broach 4
7500-7299	Trial Broach 5
7500-7300	Trial Broach 6
7500-7301	Trial Broach 7
7500-7302	Trial Broach 8
7500-7303	Trial Broach 9
7500-7304	Trial Broach 10
7500-7305	Trial Broach 11
7500-7306	Trial Broach 12
7500-4603	Trial Neck Std 01–0
7500-4604	Trial Neck Std 1–6
7500-4605	Trial Neck Std 7–12
7500-4606	Trial Neck Lat 1–6
7500-4607	Trial Neck Lat 7–12
7500-7307	Broach Handle 25 mm
7500-7309	Broach handle 10 mm



Sterilization

Implants

All the implants described in this Surgical Technique are sterile when they are delivered by the manufacturer. Resterilization is not allowed.

Instruments

System components and instruments are not sterile when they are delivered. Before use, they must be cleaned by the usual methods in accordance with internal hospital regulations and sterilized in an autoclave in accordance with the legal regulations and guidelines applicable in the relevant country.

The correct settings are given in the instructions for use issued by the autoclave manufacturer. Instrument manufacturers and dealers accept no responsibility for sterilization of products by the customer.

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