

directLINK®

Magazine for Arthroplasty · Issue: August 2015

**"We are very impressed
by the SP-CL®!"**

An interview with Prof. Giuseppe Vincenzo Mineo
and Dr. Massimo Franceschini about the learning
curve, surgical approaches, and the cementless,
anatomical philosophy

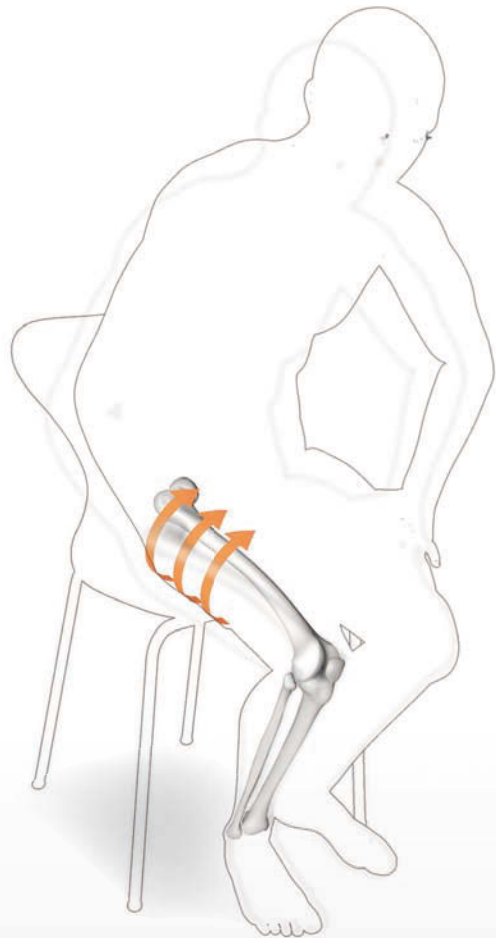


Video interview with co-developer of the SP-CL® Hip System
from LINK, Prof. Dr. med. Thorsten Gehrke. Simply scan the QR
code with your smartphone.

LINK® SP II®: Risk of periprosthetic fracture five times lower than with straight stems
FacetLINK®: New minimally invasive stabilizing system for the spine from LINK



SP-CL®



Anatomically adapted, cementless

The anatomically adapted stem shape of the new cementless SP-CL® Hip System from LINK neutralizes torsional forces which act on the femur during day-to-day activities. This is due to the posterior rotational axis lying outside the curved neutral axis when pressure acts on the anterior prosthesis head. This, together with the simplicity of implantation, means that the SP-CL®, goes a long way toward meeting the demand for a hip prosthesis system that permits speedy treatment of a wide range of patients.



Dear Readers,

Neil Armstrong's famous words might never have been spoken. Not because the Apollo 11 commander had hip problems when he took that "small step for a man, one giant leap for mankind" onto the surface of the moon, but because, the previous year, he only just survived the crash of a Lunar Landing Training Vehicle.

So let's keep our feet firmly on the ground when we seek to take major steps forward. For example, with a new, cementless, anatomically adapted hip prosthesis. The LINK® SP-CL® Hip System can give significantly greater quality of life, especially for younger, more active patients, as surgeons Prof. Giuseppe Vincenzo Mineo and Dr. Massimo Franceschini confirm in their interview. When we developed the SP-CL®, we were able to draw on decades of experience in the development of anatomically adapted prosthetic joints.

The new stabilization system FacetLINK® for the spine is also a great step forwards for us. While LINK is expanding into more and more countries, it is still constant inquiry, responsibility, long experience and state-of-the-art technology that are the driving force behind ground-breaking developments.

Enjoy this issue of directLINK.
Regards.

Helmut D. Link

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SP-CL[®]
The anatomy defines the shape.

International participants at the
Launch Meeting
in Hamburg, from 19 to 20 February 2015

LINK ADEMY 



Anatomically adapted, cementless: A great start for the new SP-CL® Hip System from LINK®

“The SP-CL® prosthesis from LINK® fulfills the high standards in terms of design and materials that today’s orthopedic surgeons demand for the treatment of young patients to ensure a long service life”, said Helmut D. Link, summing up the advantages of the new hip system. Its launch in Hamburg in February 2015 was attended by over 100 visitors from around the world.

One of the outstanding design features of the SP-CL® is its anatomically adapted femoral stem. The S-shape and integrated anteversion largely compensate for the axial and rotational forces that occur during loading, thus providing a high level of joint stability and permitting a wide range of joint movement. The flattened, lateral profile protects the greater trochanter during implantation, while the cancellous bone compressors help to preserve valuable bone substance. “A straight hip stem can be in contact with the cortical bone at several points due to the curvature of the medullary canal, and thus may transmit focal forces to the bone. A stem which has been adapted to suit the anatomy at these points distributes the force more evenly and thus prevents excessive bone formation or resorption,” said Prof. Dr. rer. nat. Bodo Kurz, a biologist at the Center of Clinical Anatomy at the Christian Albrecht University (CAU) in Kiel. “We need to wait for the results of detailed clinical studies, but a cementless, anatomical stem is a

very interesting implant,” confirmed Prof. Johan Kärrholm, director of the Department of Orthopedics at the Sahlgrenska University Hospital of the University of Gothenburg and member of the SP-CL® first-evaluator group.

Superior primary stability and reliable osseointegration

Other outstanding features of the SP-CL® are the pronounced ribbed design and the LINK® Tilastan®-S alloy, which endow the stem with a high level of structural and material-based elasticity compared to other systems. “This has the effect of reducing ‘stress shielding’ because loading is more physiological and thus stiffening of the femur is reduced,” Helmut D. Link explained. The design of the SP-CL® also maximizes intraoperative flexibility. Two CCD angles allow excellent adaptation of the implant to the individual patient anatomy. The flattened and tapered prosthesis neck of the SP-CL® enhances the range of motion



“A straight hip stem can be in contact with the cortical bone at several points due to the curvature of the medullary space” – **Prof. Dr. rer. nat. Bodo Kurz**, a biologist at the Center for Clinical Anatomy at the Christian Albrecht University in Kiel.



“The SP-CL® is very well suited to every surgical approach” – **Prof. Dr. med. Bernd Füchtmeier**, medical director at the Clinic for Traumatology, Orthopedics and Sports Medicine at Barmherzige Brüder Hospital in Regensburg.



“The anatomically adapted stem plays a very important role in our hospital, mainly because of the improved fixation and the fact that it avoids fractures” – **Dr. Miquel Pons**, orthopedic surgeon, San Rafael University Hospital, Barcelona.



“We need to wait for the results of detailed clinical studies, but an anatomical, cementless stem is a very interesting implant” – **Prof. Johan Kärrholm**, director of the Department of Orthopedics at the Sahlgrenska University Hospital of the University of Gothenburg.

without detracting from its durability or stability, while the compact, ergonomically designed instrument set permits effective, smooth surgery. “Our initial experiences have shown that the SP-CL® is very easy to use and involves only a short learning curve. As a training hospital with 20 junior doctors, it is extremely important for us that a new implant can be introduced smoothly and effortlessly,” said Prof. Dr. med. Bernd Füchtmeier, medical director at the Clinic for Traumatology, Orthopedics and Sports Medicine at Barmherzige Brüder Hospital in Regensburg. “In addition, the SP-CL® is also very well suited to every surgical approach.”

High reproducibility of clinical results expected

With the new SP-CL®, surgeons now have a hip system that promises highly reproducible clinical results. “In the last twelve months, we have implanted a hundred SP-CL®, and have not encountered any implant-related complications,” said Prof. Dr. med. Thorsten Gehrke, medical director of the HELIOS ENDO-Klinik in Hamburg and co-author of the SP-CL® stem, at the launch meeting. “I have great faith in the implant, and our patients are very satisfied; they report very little postoperative discomfort and are able to put their weight on the treated hip again very quickly.” The SP-CL® Hip System, shares its clinical heritage with the anatomical cemented SP II® Hip Prosthesis System, which has been in successful use for over 30 years, will be available soon.



“I am certainly impressed by the implant, and our patients are very satisfied” – **Prof. Dr. med. Thorsten Gehrke**, medical director of the HELIOS ENDO-Klinik in Hamburg and co-author of the SP-CL® stem.



Focus of attention: the new, anatomically adapted, cementless **SP-CL® Hip System** from LINK®

“We are **very impressed** by the **SP-CL®!**”

How are physicians finding the new, anatomically adapted, cementless SP-CL® Hip System from LINK? An interview with surgeons Prof. Giuseppe Vincenzo Mineo and Dr. Massimo Franceschini from Milan about the learning curve, surgical approaches, and the cementless, anatomical philosophy.

Prof. Mineo, Dr. Franceschini, you are among the first surgeons to use the SP-CL®. What do you think of it?

Prof. Mineo: We are very impressed! The SP-CL® is easy to implant and the learning curve is short. The SP-CL® allows us to reproduce exactly what we have carefully planned on the computer in every operation.

Have you noticed any differences compared with other cementless stems in terms of complications and hospitalization times?

Dr. Franceschini: We have implanted sixteen SP-CL® prostheses so far. What is already very apparent is that the anatomically adapted design ensures excellent primary stability, with the result that patients can place their full weight on the leg and can start with rehabilitation just three days after the operation. We usually expect the patient

to remain in our hospital for four or five days. No complications have been encountered.

Can the SP-CL® be implanted particularly quickly?

Dr. Franceschini: We think that it depends on the approach. We use the lateral, anterolateral, and the direct anterior approaches. The SP-CL® can be implanted very quickly via the direct anterior approach – there is a difference of approximately 20 minutes between the direct anterior approach and the other approaches. With more experience, it will probably take the same time to implant the SP-CL® via all approaches.

Prof. Mineo: Modern cementing techniques save a great deal of time, so the difference between a cementless and cemented stem is only a few minutes in any case. However, this is not the deciding argument. The cementless philosophy is what is important to us – not the possible time saving.



“We are seeing more and more patients under 60 years of age, who want to jog and ski or play golf and tennis with an artificial hip joint” – **Prof. Giuseppe Vincenzo Mineo** and **Dr. Massimo Franceschini**, Gaetano Pini Orthopedic Institute at the University of Milan.

What are your reasons for using the SP-CL®?

Dr. Franceschini: We are very impressed by its cementless philosophy across the board. The important thing is that an anatomically adapted, cementless hip stem prevents high stress on the femur. In our view, the best features of all the anatomically adapted hip systems available from LINK, such as the SP II, the C.F.P. and the Ribbed System, have now all been united in the SP-CL®. That's another reason why we are so impressed by the SP-CL® concept.

Prof. Mineo: Anatomic hip systems have proven their worth for decades and the results from the Scandinavian registers speak for themselves. In our hospital we treat a lot of patients under 60 years of age with an active lifestyle. They want to jog and ski or play golf and tennis with an artificial hip joint, and thus require a hip system which allows this sort of activity without any problems. For younger, active patients, a tissue-sparing, cementless stem with good primary stability, like the SP-CL®, is therefore an excellent choice.

“We are treating more and more younger patients with an active lifestyle in our hospital.”

In your hospital you have studied the periprosthetic fracture behavior of anatomically adapted stems.

Prof. Mineo: Together with the Biotechnology Laboratory at the University of Milan, we are conducting a study to compare the risk of a periprosthetic fracture with straight stems and anatomically adapted stems. From what we've seen so far, the risk and the number of fractures are approximately the same for both types of stem, but the fracture patterns are considerably different. The distribution of force during a fall is different; the fracture pattern is much more problematic for straight stems compared with anatomically adapted stems.

How does the bone density of the proximal femur progress with the SP-CL®?

Dr. Franceschini: We haven't yet had a sufficiently long follow-up to be able to say definitively. In theory, the density of the proximal femur should be largely preserved with the SP-CL® Hip System thanks to the LINK® Tilastan®-S alloy and the ribbed structure. We will know more in two or three years.

“We're very impressed by the SP-CL® concept!”

Prof. Mineo, you have proposed the Forgotten Joint Score particularly for the assessment of patients with good implant function. What is the idea behind the FJS?

Prof. Mineo: The result of a hip prosthesis implantation is determined by a score which conveys the surgeon's point of view. For example, a score of 95 is an excellent result, but a significant number of patients – approximately 14 per cent – are unsatisfied with the operation even after two years. They don't have any pain, but they do complain about restrictions in terms of functionality. The FJS places the focus on the patient's perspective and thus helps to distinguish between the good and excellent results. Ideally, the FJS is recorded two years after the operation.

Prof. Mineo, Dr. Franceschini – How would you summarize the new SP-CL® Hip System?

Dr. Franceschini: We are very confident about the SP-CL®. For us as surgeons, it is very important to have a good feeling when we're implanting something. We think the SP-CL® is excellent and have a very good feeling about achieving a good FJS score.

Prof. Mineo, Dr. Franceschini, many thanks for giving us this interview.

New from LINK:

Femur First resection technique for GEMINI® SL®

The high degree of accuracy achieved with the LINK® GEMINI® SL® instrument set means even more reliable outcomes of total knee replacements. Several fundamental implantation techniques are implemented:

- Measured Resection (Femur First)
- Gap Balancing (Tibia First)
- Adaptations such as Distal Cut First (which combines and optimizes the first two techniques)

In addition to the conventional Tibia First resection technique, the Femur First technique is now available for the GEMINI® SL® Total Knee Replacement.

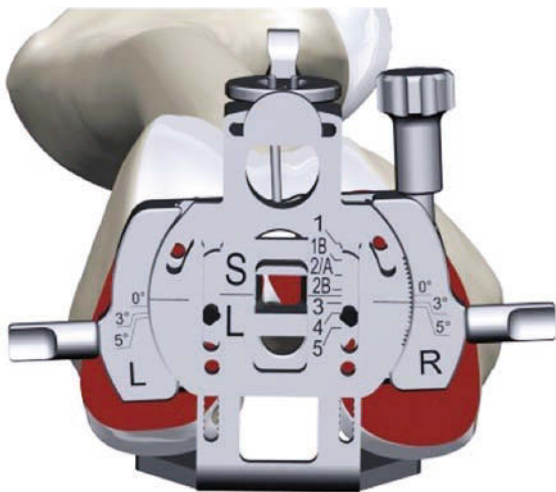
For Measured Resection (Femur First) it is principally the femoral sizing and rotation alignment instrument that is employed as a simple means of adjusting the femoral external rotation and sizing.

The external rotation is referenced on the basis of the following:

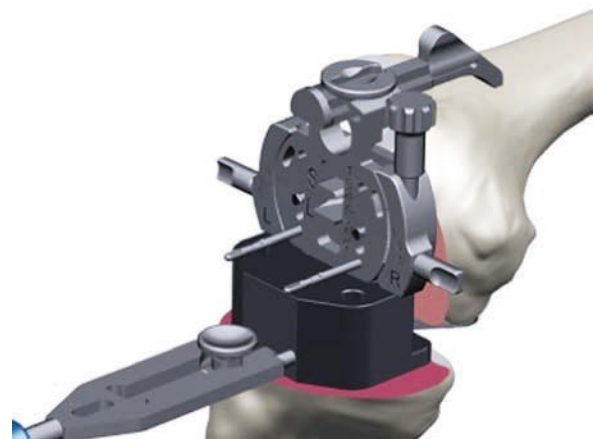
- transepicondylar axis
- AP axis (Whiteside line)
- dorsal condyle tangent

Infinite adjustment from 0° to 5° is possible.

The GEMINI® SL® instrument set also permits the Tibia First and the Distal Cut First techniques. Once the extension gap has been adjusted, suitable spacers are used to check the flexion gap prior to resection.



Femoral resection during implantation of the LINK® GEMINI® SL® Total Knee Replacement



Femoral sizing and rotation alignment instrument with flexion gap spacer, which is used to check the flexion gap and adjust the femoral size



Workshop participants, speakers and LINK personnel (l. to r.): Juliana Castro-Risueno, Riccardo Signoretti, Massimo Calafiore (all LINKSpine, USA), Fabian Schöllchen (LINK), Dr. med. Christian Reparón, Dr. med. Angelika Hübner, Prof. Dr. med. Friedrich Weber, Dennis Farrell (LINKSpine, USA), Priv.-Doz. Dr. med. Jörg Herdmann, Dr. med. Tanyo Hristov, Dr. Malte Steiner (LINK), Dr. med. Igor A. Nikiforov, Dr. med. Jan Frischmuth

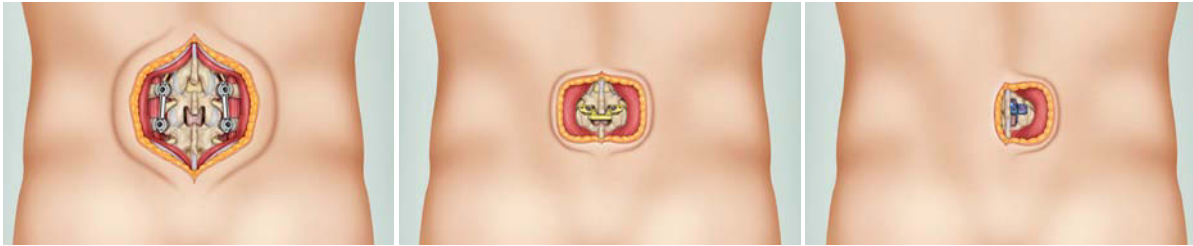
Small implant with a big potential: Workshop for the new **FacetLINK® Stabilization System**

The workshop for surgeons held in Mülheim an der Ruhr in April provided tips and tricks on handling of the new minimally invasive FacetLINK® Stabilization System for the spine. Those attending were able to try out the surgical technique themselves on a human anatomical specimen, and they were positively surprised.

“From my point of view, FacetLINK® is a very promising system”, said Prof. Dr. med. Friedrich Weber, medical director of the Department of Neurosurgery at Merheim Hospital in Cologne and workshop participant. “It appears to function very well in biomechanical terms. We shall be testing it in our department.” The other participants were also very satisfied with the workshop and gained a positive impression of the new FacetLINK® Stabilization System: “I’m surprised how simple and elegant insertion of the contralateral screw is, for example”, said Dr. med. Christian Reparón, a neurosurgeon who practices in Göttingen.

FacetLINK® is a minimally invasive stabilization and augmentation system for microsurgery techniques. The components stabilize the operated segment and help in achieving fusion, especially in the case of the following indications:

- Pseudarthroses and unsuccessful earlier fusions
- Grade I or milder spondylolisthesis
- Degenerative vertebral disk disorders defined as back pain of diskogenic origin and confirmed by radiology
- Degeneration of the facets with instability



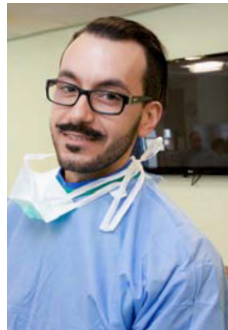
Placement of the FacetLINK® implant system (center: MINI; right: HEMI) can be performed via a smaller access port than with bilateral pedicle screw and rod systems (left) – which, in turn, can mean a shorter recovery time, less postoperative discomfort and faster postoperative healing than with pedicle screws.



“Placement of the contralateral screw was surprisingly simple” – **Dr. med. Angelika Hübner** is an orthopedic and traumatology specialist in the Spine and Pain Department at St. Vinzenz Hospital in Düsseldorf



“It was also good that we were able to work in pairs in the workshop” – **Dr. med. Christian Reparon** is a neurosurgeon practicing in Göttingen



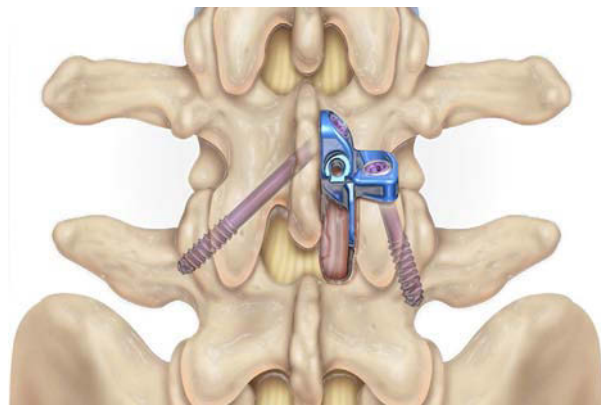
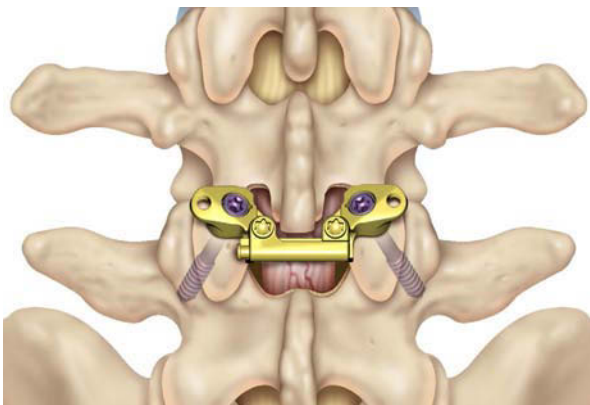
“I’m greatly impressed by the FacetLINK® system, and implantation is very simple and elegant” – **Dr. med. Tanyo Hristov** works in the Neurosurgery Department at Merheim Hospital in Cologne



“I’m excited to see how the system will perform under clinical conditions” – **Prof. Dr. med. Friedrich Weber** is medical director of the Neurosurgery Department at Merheim in Cologne



“The ipsilateral approach is particularly advantageous – it saves a lot of time and also predefines the direction” – **Igor A. Nikiforov** is an orthopedic and traumatology specialist at SpineNanoPraxis in Potsdam



Available as STANDARD and MINI for bilateral decompression, and as HEMI für unilateral decompression: the new minimally invasive FacetLINK® Stabilization System for the lumbar spine

Decompression without loss of stability and with minimal tissue trauma

A spinal fusion construct must limit movement within the surgical segment until fusion has taken place. The FacetLINK® System offers numerous implant solutions covering a wide range of pathological, anatomical and surgical scenarios. It enables the surgeon to stabilize the vertebral column via a midline or unilateral microsurgical approach – without any need for an additional or enlarged access port for implanting a stabilization system, as is often the case with pedicle screws. Angle-stable connection of the FacetLINK® implants and screws increase the rigidity of the construct, which means that a similar biomechanical performance is achieved as with bilateral pedicle screw and rod fixation – in spite of a considerably smaller access port and less tissue retraction.

With the FacetLINK® system, the implants are decompression-specific, so the surgeon is able to augment the bone resection in a number of increments. Unlike pedicular fixation, the surgeon does not have to enlarge the site prepared for decompression in order to implant the FacetLINK® system. Implantation is by means of the inside-out technique. The screws run from the pars interarticularis in dense cortical bone, pass through the facet joints and end at the lateral and caudal walls of the pedicle. Ideally, the screws pierce three layers of cortical bone.

FacetLINK® as a system is available in all necessary sizes.



Heading up the workshop: **Priv.-Doz. Dr. med. Jörg Herdmann** (top) and **Dr. med. Jan Frischmuth** (bottom left, with **Prof. Dr. med. Friedrich Weber**)

Study: **Minimal** periprosthetic fracture risk with **LINK® SP II® Hip Prosthesis**

In addition to age, gender, preoperative diagnosis and fixation, the prosthesis design is also a risk factor in respect of implant revisions caused by periprosthetic fracture within two years after the primary intervention. That is the result of a study* comprising 325,730 cemented and 111,899 cementless femoral hip stems implanted between 1995 and 2009. The study was conducted at the *Institute of Clinical Sciences of Sahlgrenska Academy, University of Gothenburg* in Sweden, and was based on records of the *Nordic Arthroplasty Register Association*. Five cemented and two cementless stems were examined, including cemented, anatomically adapted stems such as the LINK® Lubinus® SP II® Hip Prosthesis and several straight stems.

The authors found that the revision risk on account of premature periprosthetic fracture in the period

from 2003 to 2009 increased in comparison to the period from 1995 to 2002, both before and after consideration of demographic factors and fixation (relative risk 1.44 [95 percent confidence interval, 1.18–1.69]; $p < 0.0005$). They also concluded that “The hazard ratio for the Exeter stem was about five times higher than that for the Lubinus® SP II® stem” (hazard ratio, 5.03 [95 percent confidence interval, 3.29–7.70]; $p < 0.0005$). Even though the incidence of premature periprosthetic fractures is generally low, and other reasons for revision also have to be taken into account, nevertheless special attention must be given, in the authors’ view, to the choice of fixation and, in the risk groups, to the stem design.

*Periprosthetic Femoral Fracture within Two Years After Total Hip Replacement. *J Bone Joint Surg Am.* 2014; 96:e167(1–7)

Study: **High** osseointegration rate with **MP® Reconstruction Prosthesis** from LINK

Hip revisions with the MP® Reconstruction Prosthesis from LINK in patients with substantial loss of bone substance in the proximal thigh lead to a high degree of osseointegration of the stem in the medium-term follow-up. This is the result of a study* conducted by the *Mayo Clinic* in Minnesota, USA.

The aim of the study was to evaluate the clinical and radiological results of hip revisions performed by a single center, using the MP® Reconstruction Prosthesis in patients with substantial bone loss in the proximal femur. The preoperative diagnoses of the 92 hip revisions included in the study between January 1998 and December 2004 were aseptic loosening, infection and periprosthetic fracture; the mean clinical follow-up was 6.4 years (2–12).

“All the patients in our study had severe proximal bone loss according to the Paprosky or Vancouver classification systems. Despite this high degree of bone loss, the LINK® MP® Reconstruction Prosthesis fluted, tapered modular stem performed well up to 12 years following surgery. Only one patient required revision for aseptic loosening (1%), and all retained stems had radiographic evidence of osseointegration”, according to the authors.

*Revision total hip arthroplasty in patients with extensive proximal femoral bone loss using a fluted tapered modular femoral component. *Bone Joint J* 2015; 97-B:312–17



"At LINK my ideas were acted on immediately!" – **Dr. med. Erwin Lenz** is medical director of the Department of Revision Arthroplasty, Customized Prosthetics and Septic Revision Surgery at Rummelsberg Hospital in Schwarzenbruck

"Short modular stems are the icing on the cake with the LINK[®] Endo-Model[®] SL[®]!"

What difference does a reduction in stem length by a few centimeters make with a rotational and hinge knee prosthesis? An interview with Dr. med. Erwin Lenz, medical director of the Department of Revision Arthroplasty, Customized Prosthetics and Septic Revision Surgery at Rummelsberg Hospital in Schwarzenbruck, on the subject of the LINK[®] Endo-Model[®] SL[®] rotating hinge knee with extra short cemented modular stems.

Dr. Lenz, you implant the LINK[®] Endo-Model[®] SL[®] Rotational Hinge Knee Prosthesis with extra short cemented modular stems. How did this come about?

Explantation of a long stem during revision surgery is relatively time-consuming, partly because of the larger amount of cement. Furthermore, a lot of bone substance is lost in the process. The new stem

then has to be inserted deeper into the healthy bone in order to ensure optimal fixation. All this is disadvantageous for patients who are likely to require further revisions. A shorter stem is an interesting implant design for certain patients, particularly in regard to multiple revisions. At LINK my ideas were acted on immediately, and they kindly manufactured the LINK[®] Endo-Model[®] SL[®] with short modular stems as a custom-made prosthesis for my particular patients.

Do you prefer knee prostheses with short rather than long stems in all cases?

No, the longer stems have been very successful for knee prostheses over many years. In any event, the question as to which stem lengths are more suitable still requires further scientific investigation. But as revision arthroplasty is becoming increasingly important, the first short stems are now coming onto the market. The initial results, which are not scientifically validated, would seem to be not bad at all.



Short cemented modular stem of the LINK[®] Endo-Model[®] SL[®] Rotational Knee Prosthesis

For which indications is the short stem suitable?

The short stem is particularly suitable for young patients who are likely to require further revisions in the future. In general, we are seeing a growing number of young revision patients in the field of knee arthroplasty, and elsewhere. Older patients whose bone quality is still good enough for fixation of a short stem are also potential candidates. However, if bone quality is poor, there is no alternative to a longer stem in order to achieve strong diaphyseal fixation of the prosthetic joint.

“The short stem is an interesting implant design with multiple revisions in mind.”

What about young patients who require a hinge because of more pronounced instability?

Patients who no longer have sufficiently strong ligaments are candidates for a hinge knee prosthesis with a short stem. The diaphyseally fixed stem does not need to penetrate deep into the diaphysis. This can also be a good option for primary implantation, for example in the case of rheumatism sufferers, or if the ligaments have been severely damaged following an infection. At the end of the day, it is ligament insufficiency that demands a prosthesis with a higher degree of constrained. For these patients, this short stem is a genuine alternative.

Are there other possible indications?

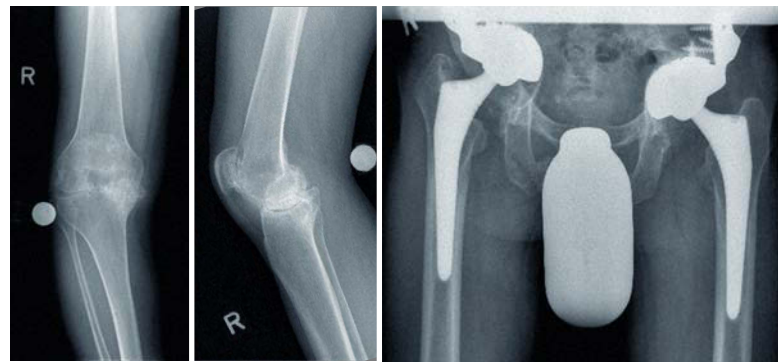
In my view, the short stem is also indicated in the field of septic arthroplasty. Infections cause the ligaments to suffer, and here too, the surgeon has to bear in mind possible follow-up revisions.

Is the surgery time identical for short and long stems?

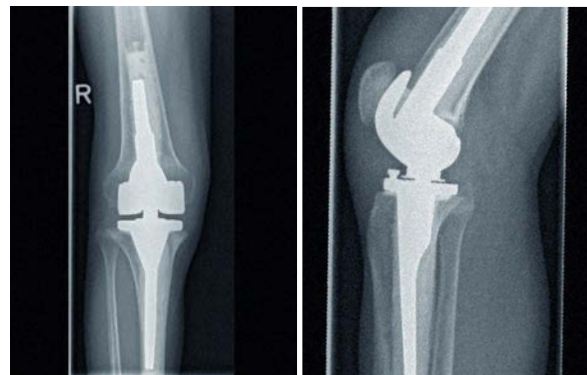
Yes, the length of the intervention is identical. So there is no time gain or loss. The follow-up treatment is also exactly the same for both.

How have the results with the extra short stem looked so far?

Up to now, I have implanted a dozen short stems and have initial results from patients who have come to follow-up appointments. These results indicate that there are no more complications with



Preoperative X-ray, 45-year-old male patient with aseptic bone necrosis in both knee and hip joints following chemotherapy for Hodgkin's disease in 2014; hip implants in situ



LINK® Endo-Model® SL® Rotational Knee Prosthesis with extra short, custom-made cemented modular stems in situ. “As hip revision operations are to be expected in the future, femoral bone was preserved”, says Dr. med. Erwin Lenz.

short stems than with long-stem knee prosthesis systems. What I can confirm already is that they are revision-friendly, as we have had to revise some short-stem implants as a result of complications that were not attributable to the implant itself.

Could you summarize your conclusions?

Short modular stems are the icing on the cake with the LINK® Endo-Model® SL®. As a surgeon, you have to keep future revisions in mind, and this is where the short stems can be very advantageous. I certainly would like the LINK® Endo-Model® SL® to be available as a short-stem version.

Dr. Lenz, many thanks for this interview.

Maximum stability: Primary LINK® Endo-Model® SL® Pure Hinge Knee surgery in a case of gonarthrosis and quadriceps paresis

For an 83-year-old patient with advanced valgus gonarthrosis, a PS or CCK type knee replacement was relatively contraindicated because of massive quadriceps weakness. A LINK® Endo-Model® SL® Pure Hinge Knee prosthesis was implanted in order to achieve maximum stability. A case report by Dr. med. Ralph Wetzel, medical director of Orthopedics at the Paracelsus-Klinik in Karlsruhe.



Preoperative X-rays of the right knee joint: advanced valgus gonarthrosis on the left, absent joint space in the lateral knee joint compartment; advanced narrowing of the patello-femoral joint space

Arthroplasty in cases of advanced gonarthrosis and insufficient extensor mechanism, as can be observed with quadriceps paresis resulting from poliomyelitis or multiple sclerosis, is a major challenge for surgeons. Although knee arthroplasty is successful in significantly reducing pain in most cases, the implantation of an uncoupled PS or CCK type of total knee replacement often results in instability, massive hyperextension and a poor functional outcome even in the medium term. Relevant quadriceps paresis is therefore regarded as a contraindication for such type of implants. In the present case, a very good functional outcome was achieved by implanting a LINK® Endo-Model® SL®

pure hinge total knee replacement in combination with a special orthotic device.

Clinically the patient presented with genu valgum of approximately 20° with an extension/flexion of 0/0/120° and synovitis, a joint effusion and an unstable collateral ligament. It was not possible to correct the valgus deformity by passive means. The radiological findings showed advanced valgus gonarthrosis on the left, absence of joint space in the lateral compartment of the knee joint, and advanced narrowing of the patello-femoral joint space. The history comprised a massive quadriceps weakness on the right with a 2/5 of normal strength after interlaminar fenestration of L3/4 and L4/5 in April 2013, following sequestered disk



Postoperative X-rays of the right knee joint: LINK® Endo-Model® SL® Pure Hinge Knee Prosthesis in situ

Two months postop: the patient is free of symptoms, with an extension/flexion of 0/0/110°, a very good functional result; he is mobile with a “T-Lifter” orthotic device, and able to live independently in his own home

herniation and spinal stenosis. Further diagnoses were condition after bilateral total hip replacement and arterial hypertension and bilateral hypacusia.

Restricted therapy options on account of quadriiceps paresis

As conservative therapy had been exhausted, and the patient categorically rejected arthrodesis, the treatment options were limited due to the quadriiceps paresis. In view of the foreseeable instability and the problems of hyperextension with a joint prosthesis offering little or no constraint, the decision was taken jointly with the patient to opt for a fixed-hinge LINK® Endo-Model® SL® total knee replacement. The intervention was performed at the Paracelsus-Klinik in Karlsruhe in May 2014 without any complications.

No postoperative complications

The postoperative phase was also free of complications and the radiological findings were normal. The after-treatment comprised physiotherapy, intensive gait training and adaptation of a “T-Lifter” orthotic device. The “T-Lifter” is a very lightweight carbon orthotic device designed to support stability in the knee joint. The ankle is fixed in order to utilize the ground reaction forces as from the mid-stance phase in order to support knee extension. The danger of a fall caused by unintended knee flexion is thus reduced. The patient was discharged to rehabilitation on the 11th day postop with an extension/flexion of 0/0/90° and normal wound conditions. At the outpatient follow-up two months later, the patient was free of symptoms, with an extension/flexion of 0/0/110°, a very good functional outcome and mobile with a “T-Lifter” orthotic device. He is still living independently in his own home.



LINK® Endo-Model® SL® Pure Hinge Knee Prosthesis



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Osteoporotic bone: **LINK[®] Megasystem-C[®] distal femur replacement in traumatology**

In 2007, a female patient diagnosed with hypertension and osteoporosis underwent TKA of the left knee because of osteoarthritis. At the end of 2012, the patient, who today is 75 years old, suffered a distal femoral fracture in the same limb. A case report.

Due to poor bone quality in the fractured distal segment of the femur, it was not possible to treat the fracture with osteosynthesis as originally planned. Consequently, the patient was transferred to the University Hospital in Gothenburg, Sweden, where the patient received a LINK[®] Endo-Model[®] with components of the LINK[®] Megasystem-C[®].

A high degree of modularity enables partial bone replacement with maximum bone conservation

The high degree of modularity of the LINK Megasystem-C[®] enables partial bone resection in the proximal and distal femur in small 1cm increments, and also total femur replacement. For knee arthroplasty, joint components of the Endo-Model[®] SL[®] are integrated into the LINK Megasystem-C[®]. Since the system is modular, the physician is able to respond flexibly to any unforeseen situations which may arise during surgery. On account of this patient's poor bone quality, the tibial stem implant was fully cemented.

Full extension and flexion

During a follow-up examination seven weeks postop, the patient reported that she was pain-free in the knee joint, but presented with crepitus in the lateral soft tissue of the knee. Extension/flexion of the knee joint was 0/95°, and the knee joint was found to be stable. At four months postop, extension/flexion was 0/110°, but strength in the quadriceps had decreased significantly. Furthermore, at a flexion greater than 90°, a 'jumping' patella, was observed, but without subluxation. At this time, the patient complained of pain in the anterior knee region. At 13 months postop, the patient was pain-free and stable in the left knee joint, and displayed extension/flexion of 120°. She was able to lift her left leg, but atrophy of the quadriceps was still evident. The patient was mobile without a walking aid. She was advised to continue with physiotherapy.



Left knee joint: Preoperative X-rays: knee prosthesis of 2007 in situ, dislocated distal femoral fracture



Left knee joint: X-ray images one year postop; LINK Megasystem-C[®] in situ



“We are one of the few municipal hospitals that are **firmly in the black.**”

What are the factors to successfully run a hospital efficiently? An interview with David-Ruben Thies, director of Waldkrankenhaus “Rudolf Elle” in Eisenberg, about key issues, competitive advantages and his recipe for success.

Mr Thies, when you became director in 2008, your hospital was nose-diving into the red, and patients were having to wait too long for a prosthetic joint. Today the Waldkrankenhaus is Europe’s largest university-based orthopedic hospital, it’s profitable, and the waiting time for a hip implant is around 14 days. How was this turnaround achieved?

Before 2008 the situation at our hospital was not ideal. But we had an outstanding reputation in expert circles, and also among the population of Germany’s new federal states (the former GDR). So we concentrated on key issues: doing excellent medicine and ensuring that our establishment was run with a clear focus on the needs of patients and staff. The rest was a matter of restructuring - often unpopular, but unavoidable when total income scarcely covers your costs.

What form did the restructuring take?

We did not want to increase the number of cases treated, so we lowered our costs. We left the

municipal employer’s association in order to establish a medical service enterprise, and we invited EU-wide tenders from prosthetic joint manufacturers, and so on. Wherever there was little patient contact, we took decisive action. This phase took a year. And now we are one of the few municipal hospitals that are firmly in the black.

“We are able to act considerably faster than many private hospitals to ensure efficiency.”

The Waldkrankenhaus is a private limited company, and the shareholders are the regional government and the university hospital, with a Supervisory Board comprising members of the district council – a set-up that sounds problematic.

That’s true. Municipal hospitals are often subject to a lot of political influence, and job security and collective pay agreements are more important than

economic viability. However, our shareholders make very quick, good decisions, so we are even able to act considerably faster than many private hospitals to ensure efficiency. I think that is actually our recipe for success.

Your hospital performed over 1,400 primary implantations and 365 revisions in 2014. How long does a patient wait for a knee or hip replacement today?

About two weeks. Following a primary operation, the patient stays for around seven days. But we are currently looking at the possibility of building our own in-patient rehabilitation center to discharge patients even earlier, while still enabling a continuous therapy concept.

Some surgeons complain that operating rooms are not always used to full capacity due to long turnaround times. What is the situation in your hospital?

We are satisfied with our turnaround times. We are, however, working on organizing the outpatient department/operating room interface, including the documentation which surgeons have to complete, so as to minimize lost time and spread the work load evenly. This will mean even shorter waiting times for patients, and less rush plus greater job satisfaction for everyone who works here.

“LINK is one of our six partners for primary and revision implants.”

Is it really possible to successfully reconcile the needs of staff members and economic imperatives?

In fact, that can be achieved extremely well if staff are closely involved in the organization of how they work. Currently our staff are playing an important role in the design of our new ward block. Everyone can contribute his or her ideas and criticisms. In spite of some disadvantages in terms of location, we have no shortage of qualified personnel. In fact, we have more applicants than we can take on, and they come to us because of the good reputation we enjoy and the good working conditions.

Do manufacturers’ representatives provide support for joint operations at your hospital?

No, we have so much in-house technical knowledge that we are able to handle all surgeries independently. At many hospitals it’s different because they alternate between many different products and instrument sets. When I came here in 2008, we too had systems from 48 different manufacturers. Today we work with four manufacturers for primary arthroplasty, two for knee implants and two for hip implants. Then we have one partner for



Eisenberg Rudolf-Elle-Krankenhaus



“Towards the end of World War II, our establishment was a military hospital for war invalids, and was also responsible for the after-care of amputees in terms of orthotic devices. Orthopedics grew out of this. In collaboration with the ceramics factories in Hermsdorf, many arthroplasty products were produced for patients all over the Eastern Bloc.”

revision implants in each field, which means that we are supported by six listed manufacturers and we stick to them. LINK is our partner in primary and revision implants.

Are you deliberately conservative in your purchasing?

Yes, our purchasing policy is generally very conservative. If we change to new products, we do so slowly and carefully. We don't believe in jumping on the bandwagon of each new trend. Although we belong to a purchasing group, we have explicitly reserved the right to negotiate prices ourselves for key products, which means joint prostheses in particular. This condition is so important to us that we would rather leave the purchasing group than abandon our independence.

How does your hospital stay ahead of the strong competition existing among hospitals in Germany?

By making quality our central priority and doing everything to make this possible. High-quality medicine is only possible if you have an extremely high level of clinical, physiotherapy and nursing expertise. Our ratio of nursing staff, surgeons and physiotherapists per case is significantly better than the German benchmark. That makes for satisfied patients and, in the final analysis, the success of the hospital. In the "White List", an anonymous survey of patient satisfaction, we top the list. The website www.klinikbewertungen.de also tells you what patients think about us.

"A clear focus on a few key issues is important."

In medical matters, patients sometimes find it difficult to assess quality.

That's correct, but what patients are very aware of is whether a hospital and its staff have time for them. That is what influences where they choose to be treated. In most German hospitals, the attitude tends to be that the patient should be happy if he or she gets to see a physician. So the challenge for health care is to make the step from decent medicine to top-rate medicine, while also being serious about making patients feel at home. We are incorporating this concept of the hospitable



"We are going to build a hotel that functions like a hospital"

hospital into our new ward block, which functions as a hospital but is more like a hotel. Building work is scheduled to start in the first quarter of 2016.

To sum up, what are the key factors in running a successful hospital efficiently?

Success always depends on the the people on the ground, and whether you've got an entrepreneur or an administrator in charge. The problem with many hospitals is that people's hands are tied by rules and regulations. Freedom in a democratic sense is also very important. You have to listen to the opinions of your staff and be prepared to negotiate when opinions differ, because the outcome of this process is extremely valuable for the success of a hospital. Focusing on a small number of key issues is very important also. For us that means the high quality of medical care, followed by hospitality. But the third point, which is decisive for success is: you have to organize the entire set-up so as to maximize patient and staff satisfaction.

Mr Thies, many thanks for this interview.

LINKademy® International Revision Symposium: **Revision arthroplasty** of the highest standard

Speakers and participants from four continents made the LINKademy® International Revision Symposium in Berlin in November 2014 a great success. The focus of the proceedings was on the challenges posed by revision surgery today. A brief retrospective.

“The number of revision cases is growing exponentially, and at the same time surgeries are becoming increasingly problematic, due in part to infections”, said Prof. Dr. Mazhar Tokgözoğlu from Turkey, and he made an appeal: “With the new implants, we now have the tools to meet the challenges. However, thorough training for surgeons in the use of the implants is indispensable.”

Prof. Luis Bahamonde, from Chile, underlined the great problem-solving potential of modular implants like the LINK® Megasystem-C®: “In our trauma center, we treat a number of cases involving massive bone loss at knee level caused by trauma and/or infection. In these cases, we have succeeded in performing limb-preserving surgeries with the LINK® Megasystem-C®, especially knee arthrodesis. For the

construction of the arthrodesis we used the implant as a very large, diaphyseal replacement, which connects the residual femur and the tibia, thus creating a stable limb.”

Megasystem-C® can also be used in traumatology

Mr. Keith Eyres (Great Britain) reported on his experiences with the LINK® Endo-Model®: “The hinge knee appears to solve every problem that I have come across as a revision surgeon. It provides good rotational stability and offers numerous implant components from the knee to the hip. Our patients are very satisfied with the range of movement in the joint, and they report good pain alleviation.” Mr. Eyres also uses the Endo-Model® Hinge Knee in problematic primary interventions, for example in patients with difficult deformities and



“We have successfully performed a number of limb-preserving interventions with the LINK® Megasystem-C®” – **Prof. Luis Bahamonde**, director of the Orthopedic Department, Universidad de Chile, Santiago, Chile



“For revisions with moderate bone loss, we use primary implants such as the LCU® Hip Prosthesis from LINK” – **Prof. Chen Jiying**, head of the Arthroplasty Department, PLA General Hospital (301 Hospital), Beijing, China



“Thorough training for surgeons in the use of the new implant technologies is indispensable!” – **Prof. Dr. Mazhar Tokgözoğlu**, senior physician, Hacettepe University, Faculty of Medicine, Ankara, Turkey



“The hinge knee appears to solve every problem that I come across as a revision surgeon” – **Mr. Keith Eyres**, consultant orthopedic surgeon, Exeter Knee Reconstruction Unit, Princess Elizabeth Orthopaedic Centre Exeter, Great Britain

tibial fractures. “In my experience, trauma patients quickly regain their mobility with a joint-replacement implant”, said Mr. Eyres.

Patients with a joint-replacement implant are mobile again more quickly

An insight into the challenges posed by revision surgery in China was provided by Prof. Chen Jiying. “We implant around 230,000 hip prostheses a year in China. Up to 8,000 of them are revisions, and this number is increasing by up to 20 percent each year. Some five percent of revisions are required for reasons affecting the implant itself, while in up to 50 percent of cases, infections are the cause.” Prof. Chen Jiying also reported that the causes of revisions are not the same as in Germany: “In China, bone necrosis is the most common indication for a hip prosthesis”. There

are also differences in the surgical protocols: “In the case of revisions with moderate bone loss, we implant primary implants such as the LCU[®] Hip Prosthesis from LINK, especially if it appears possible that further revisions will be required. The most frequently implanted revision prosthesis in China is the MP[®] Reconstruction Prosthesis from LINK, as it is suitable for most revisions and reliably delivers good long-term outcomes.”

**The next LINKademy[®] International Revision Symposium will be held in Berlin on 25 and 26 January 2016
For further details go to www.linkademy.de.**



LINK is growing – **worldwide!**

LINK quality is also in increasing demand beyond Europe. Consequently, LINK is actively developing its business in numerous new export regions around the world – including Turkey and especially the USA.

In addition to the big BRIC states (Brazil, Russia, India, China), LINK also increasingly exports to the second division of emerging markets, such as Turkey, Thailand, South Africa, the Philippines, Indonesia, South Korea, Mexico and Colombia. There is great demand for training, and the surgical product training in many of these countries is delivered by surgeons from Germany and Europe.

“In Thailand and South Korea, we have been very successful in bringing the LINK® GEMINI® SL® Total Knee Replacement to market in spite of strong competition”, says Helmut D. Link. “In the USA, we have established LINKSpine,

a company dedicated to developing sophisticated minimally invasive solutions for spinal surgery, such as our FacetLINK®.”

Each year new regions are added, most recently Ecuador, Uruguay, Jordan and Northern Iraq in 2015. “At the end of 2014, we established a subsidiary in Turkey , LINK Orthopedics Turkey”, explains LINK Export Manager Bülent Topal. “In the first stage, we are concentrating on supporting and optimizing the appropriate local dealer structures.” The particularly successful LINK products in Turkey include the LINK® Megasystem-C® and the LINK® Endo-Model® Rotational Knee Prosthesis.



Ercan Durmus, General Manager of LINK® Orthopedics Turkey, with colleague **Bahar Yesildal**



A LINK partner in Jordan since December 2014: **Alsaadeh Orthopedics** is currently focusing on knee arthroplasty with the GEMINI® SL® and the Endo-Model® Rotational Knee Prosthesis from LINK

SP-CL®



Trochanter-sparing implantation

The anatomically adapted stem and the integrated anteversion of the new SP-CL® largely compensate for the axial and rotational forces, while ensuring high stability and a large ROM in the joint. The pronounced rib design and the proven LINK® Tilastan®-S alloy make for a highly elastic stem. The flattened lateral profile and the use of cancellous bone compressors permit minimally invasive, tissue-sparing implantation and conservation of valuable bone substance. The LINK® HX® (CaP) coating promotes ongrowth of bone precursor cells, thus ensuring excellent secondary stability.

SP-CL[®]

The anatomy
defines the shape.



We have applied our decades of experience in the design of anatomically adapted joint prostheses to the development of a new implant system. The end result is very close to nature: the anatomically adapted, cementless LINK[®] SP-CL[®]. It continues with the clinical heritage of the LINK[®] SP II[®] Hip Prosthesis System, which has been in successful use for decades, as is repeatedly confirmed by clinical studies and registers*.

*Annual Report 2012; Swedish Hip Arthroplasty Register; www.shpr.se