Planning the future

Using 3-dimensional software in hip surgery



St. Josef Hospital, Wiesbaden, Germany



The Orthopedic Solution





Using digital, 3-dimensional preoperative planning software in hip surgery

Hip joint prostheses are the most frequently used artificial joints in Germany. Approximately 250,000 hip joints per year are replaced with short or straight-shaft prostheses by specialists in Germany. This is the result of an OECD study. Quality of life of many affected people can thus often be restored.

Accurate preoperative planning is crucial to install an endoprosthesis at the lowest possible risk, with the objective of achieving a reliable locomotor system.

Use of digital planning software can substantially facilitate the surgeon's pre-planning and documentation that are legally required. All steps to be performed during surgery can be simulated in advance, therefore minimizing the probability of complications.

2D and 3D planning tools are available as software solutions for the attending physician. Planning with 2D software has nowadays become standard in many hospitals. But the use of 3D planning software is a trendsetting step. The 3D planning tool is especially convincing in the area of short-shaft planning.

As forward-looking hospital that wants to guarantee the best-possible medical care for its patients, the St. Josef Hospital at Wiesbaden, Germany, has long been relying on mediCAD[®] as planning tool for endoprosthetic interventions. With mediCAD[®] 3D Hip, the St. Josef Hospital has an innovative software at its disposal that enables optimum, revision-proof and modern operation planning in the area of hip surgery.

Since successful restoration of a functioning locomotor system is not just dependent on operation planning, the hospital relies on the quality of prosthesis manufacturer Mathys Ltd. Bettlach for long-lived hip prostheses.

Dr. med. Philipp Rehbein, MD, chief physician at the Center for Orthopedics, Spine and Trauma Surgery of St. Joseph Hospital, Wiesbaden, Germany, talks with us about the challenges of hip surgery, the reasons for using mediCAD[®] 3D Hip in short-shaft planning and its lead over 2D planning.

Dr. med. Philipp Rehbein

has been chief physician at the Center for Orthopedics, Spine and Trauma Surgery (ZOWU) of St. Josef Hospital, Wiesbaden. In the largest Clinic for Endoprosthetics in the Federal State of Hesse, over 1,200 hip endoprostheses are implanted per year by Dr. Rehbein and his team.

The hip expert completed his orthopedic training at the General Medical Clinic St. Georg in Hamburg and the Institute for Biomechanics of the Technical University Hamburg-Harburg. Additional stages in his career were the Orthopedic Clinic/ Park-Clinic Grosshansdorf and the Orthopedic University Clinic Stiftung Friedrichsheim in Frankfurt a.M.

The Interview

Question:

Dr. Rehbein, as an experienced surgeon, where do you see the main challenges in hip surgery, and how can accurate planning help to improve the clinical result of a hip prothesis?

Dr. med. Rehbein:

The surgeon must have optimum overview when using his routine access (my favorite access is anterolateral with the patient in the supine position, that can even be performed in a low or minimally invasive manner). This way, the information gained from preoperative planning regarding size and orientation of the implant can be implemented best. Precise planning supports the surgeon to restore functional anatomy, strength ratio and solid movement.



An interview with Dr. med. Philipp Rehbein St. Josefs-Hospital Wiesbaden

mediCAD[®] 3D Hip -Improved information gain

Question:

You are already using the innovative software module **mediCAD**[®] **3D Hip** for your work. What were your reasons for using this planning software?

Dr. med. Rehbein:

Twodimensional preoperative endoprosthesis planning has already been established for decades. It must therefore be seen as integral part of the surgery itself, and consequently a criterion for certifications or guidelines. Threedimensional planning is an additional enhancement that greatly improves the information gain for surgery planning. Above all, mediCAD[®] 3D Hip Planning, when compared to conventional 2D planning, offers exciting opportunities when complex anatomic variants are involved (dysplasia, anamnesis with repositioning surgery etc.), such as dynamic movement simulation.

Question:

Which advantages and functions do you appreciate in **mediCAD**[®] **3D Hip**, particularly in regard to short-shaft planning?

Dr. med. Rehbein:

The idea behind the short-shaft prosthesis is its metaphyseal anchor, realized with the advantage of bone-preserving femoral neck osteotomy via the concept of "Bone Preservation". Using short-shaft planning with medi-CAD[®] 3D Hip, the femoral neck osteotomy can be determined much more precisely. Another important point is evaluation of the femoral offset in three-dimensional space. In the conventional staight-shaft prosthesis, the offset and the proximal anterotation are reconstructed by rotation of the implant itself, while the shortshaft prosthesis achieves this by anatomic reconstruction of the femoral neck. 3D planning clearly exceeds 2D planning in this respect.



Question:

A long-lived hip prosthesis is the result of various factors. How important is interaction between you as surgeon and prosthesis and planning?

Dr. med. Rehbein:

Not least, the course of the surgery is influenced by a low or minimally invasive and tissue-conserving access and the experience of the surgeon. The short-shaft prosthesis «Optimys» by Mathys Ltd. Bettlach is a major contributing factor here. The achievements gained from the interaction of issue-conserving access and the method of preserving the essential attachments of both muscles and tendons when placing the prosthesis are as follows:

- Optimum movement ranges (ROM)
- Stability
- Security against dislocation and
- best muscular function

In 3D planning, this interaction between surgical access and the short-shaft prosthesis philosophy is made perfect by optimizing placement. Positioning can then be evaluated during planning stage already, even at simulated dynamic conditions, in order that an impingement-free situation can be created that is important for longevity. After all, longevity does not just mean long life but in addition: perfect and reliable function should be possible for decades.



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An interview with Dr. med. Philipp Rehbein St. Josefs-Hospital Wiesbaden

It is primarily the patients who profit from mediCAD[®] 3D Hip

Question:

From your point of view, what is the added value of mediCAD® 3D Hip for Clinics and also for the patients?

Dr. med. Rehbein:

In the first place, I see the additional value for the patients. Even later in life, demands regarding activity and physical mobility are high. The same is true for younger patients anyway. Essential preconditions for fulfilling these demands can therefore be set by threedimensional prosthesis planning with mediCAD[®] 3D Hip. Of course, the risk and complications rate must be kept as low as possible. At this point, not only patients, but also clinics will profit since their quality data become increasingly transparent in registers and quality reports.



Orthopädisches Krankenhaus Schloss Werneck

The future

Question:

Looking at the trends and developments, what could be the next pathbreaking step in terms of hip endoprosthetics planning?

Dr. med. Rehbein:

Even though threedimensional planning is superior to twodimensional planning in many areas, it is still very time-consuming. Software solutions with simple and userfriendly workflows keeping the time factor as low as possible will be pioneers here. In addition, I am sure that intraoperative monitoring of perfectly precise planning data during operation must be adjusted to the planning stage precision in the future. At the current stage, this is done by the surgeon only by means of visual / subjective observation and evaluation of the intraoperative X-ray or image converter shot. Strictly speaking, precise monitoring of the biometric data gained from planning can then only be performed digitally. These developments presumably go in the direction of navigation or even robotics. Endoprosthesis surgery using a good access and a good implant is already a very safe and successful procedure, but thanks to digitalization I see potential for a still more precise intraoperative quality control. A further improvement in this direction could then also be to increase the indication range for endoprosthesis operations.

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mediCAD GmbH

In 1994, mediCAD GmbH began developing software solutions for orthopedic surgeons. In 1999, mediCAD GmbH became the first company in the world to provide a software program that allows fully digitalized pre-operative planning of a joint replacement with just a few clicks. **www.medicad.eu**

Mathys Ltd. Bettlach

The Swiss orthopaedic company was founded in 1946. The portfolio of the company currently ranges from implants for hip, knee and shoulder to bone graft substitute synthetic. In 2013, Mathys has entered the sports orthopedic market. www.mathysmedical.com

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