

TeroLab Surface

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**Orthopaedic Surgeon
Dr. Thomas von Waldburg
(Brussels):**

«Without doubt cementless implants and especially surface treatment with hydroxyapatite will be further developed.»

«Teamwork with engineers is important»

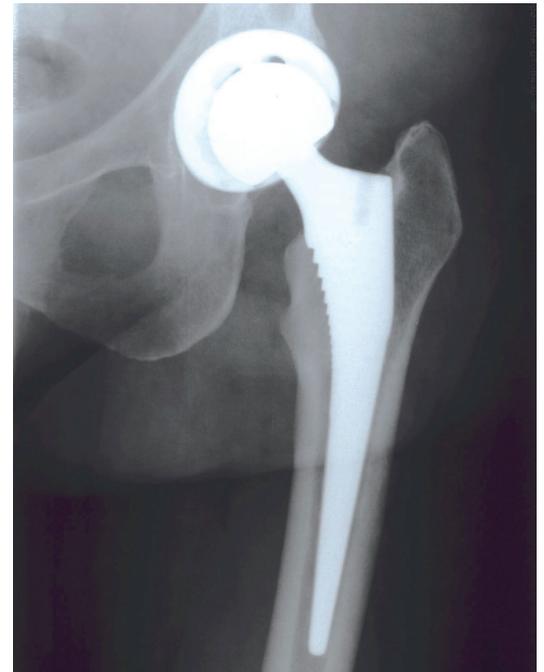
Dr. Thomas von Waldburg, a 47 year-old orthopaedic surgeon, is a real European: grown up in Germany and having completed his studies at the university of Strasbourg in France he is now working in Brussels, the capital of Belgium. Being a practitioner, he reflects for «TeroLab Surface News» his view on the coating of medical implants.

Dr. von Waldburg, what can you tell us about your experiences as an orthopaedic surgeon?
For twelve years at various clinics in Germany and Belgium I have been gaining some experience with cement-free hip and knee implants of various manufacturers. While at the beginning of my activity I had mainly been inserting cemented or hybrid hip prostheses (cemented shaft, cement-free joint socket), at our clinic we have now been using all but cementless prostheses.

Of what relative importance are the implant's geometry and the nature of its interface?
Both a prosthesis' geometry and its interface are very important. Just to mention an example: Some femoral implants had the tendency to block themselves with their diaphysial section – without being endowed with sufficient metaphysial anchorage. Those models often caused postoperative pain in the thigh. Even though this was of transient kind the discomfort for the patients was more or less pronounced. The use of hydroxylapatite has further augmented the safety of cement-free implants and has considerably improved the metaphysial anchorage of thigh implants and joint sockets. Nevertheless, some cementless models without hydroxylapatite are still being implanted successfully.
The femoral implant we have currently been using at our institution is an anatomical model equipped with a collar and hydroxylapatite coating on its metaphysial section, which gives us full satisfaction.

How much are cementless implants in favour with surgeons and patients respectively?

The use of cement for the anchoring of conventional prostheses often gave rise to specific problems such as the application of the cement, the homogeneity of its composition, the risk of pulmonary embolism while cementing and last but not least the pronounced difficul-



Developments aim at longevity: the point with medical implants is to avoid replacement operations as much as possible.

ties with removing the residual cement when exchanging an implant. In that respect the use of cementless implants is simpler. Opposing that convenience is the need to accomplishing the press-fit far more precisely for securing the implant's initial stability sufficiently. This need for precise sizing is connected to the risk of a relative oversize of the implant. Both can lead to diaphysial or cotyloidal fissures or even to fractures of the femur or the acetabulum. The cementless technology has had far less impact with knee implants and cementing has remained the most common method.

Has the cement-free method been retreating?
Modern cement-free implants have been used on a large scale since the eighties and their relative importance hasn't ceased to grow, especially since the nineties.

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Editorial

My Dear Friends,

In times of rapid change and increasing economic and social complexity, the demands



on a company have also increased. A manager has to foresee developments more precisely, assess them reliably and react to them much more rapidly. His responsibility for his actions and his environment has similarly increased. In the long run he must monitor long-term prospects and consider the welfare of future generations.

Therefore, I recently participated in a seminar at the renowned INSEAD Business School in Paris. The seminar was designed for a diverse group of leaders ranging from world-class large private corporations to SMEs and public sector companies. In September I conducted an internal seminar for those responsible at TLS.

The higher quality we are aiming to achieve will pay off for all participants: better flexibility, more tractability an error rate of near zero, more reactivity, as well as innovative and pro-active performances that will bring our customers, our suppliers and our company much closer together.

As a team we can meet the challenges of the future.

In this spirit I wish you and your families a happy and prosperous new year.

Christopher H. Wasserman
President

Surface-layer welding – a technology against extreme wear

Many processes in mining and heavy industry would be impossible without extra-hardened machine elements. Outstanding performance can be gained from armouring heavily used parts by surface-layer welding.

The machine's overall length is up to 240 metres (787 feet), and each of its 18 buckets has a capacity of 6.6 cubic metres (233 cubic feet). Bucket-wheel excavators for surface mining are not only impressive from their enormous outer dimensions, they also are a paradigm of the extreme abrasion and erosion forces to which heavy-duty machinery and large-scale plants are often exposed. Highest strain levels on particular components and constructions are also common in heavy industry, like steel or cement. The solution is in the design: the elements are equipped with wear-resistant coatings of up to 30 millimetres or more in depth. They are



Highest levels of strain: wear and tear components for bucket-wheel excavators require specific armouring.

applied by surface-layer welding, i.e. coating by welding.

Additives

In fusion build-up the most common processes are gas fusion welding, flux cored metal arc welding and gas metal arc welding. There is a broad range of additives available for each kind of coating. Characteristically they are based on iron, nickel or cobalt. The coatings have a thickness ranging from half to several millimetres according to their usage. Integrating hard materials in the coating is crucial in preventing abrasion and erosion. For iron-based alloys carbides such as M_7C_3 and particularly chromium carbides play a leading role. For nickel-based alloys borides and silicides are used to increase wear protection. Adding primary carbides such as WC, WSC or Cr_3C_2 considerably enhances the resistance of these coatings. These composites withstand even the highest abrasion loads. Typical armoured components are the buckets and bucket blades of bucket-wheel excavators, which often have an overall weight of 12 000 tons. Their armour coatings are composed of up to 65 percent WC or WSC – one of the means by which they can achieve an effective displacement capacity of up to 240 000 cubic metres (8.5 million cubic feet) of coal and waste per day.

Successful participation at the EUROSPINE 2007

At the EUROSPINE 2007 congress in Brussels TLS Medical demonstrated hydroxyapatite coatings on PEEK implants.

EUROSPINE is the most important European congress for vertebral implants. 120 companies working in this field were represented, among them Medtronic, Depuy Spine, Biomet Spine, Abbott Spine, Zimmer Spine, Synthes, Stryker and B. Braun Aesculap.

For TeroLab Surface the congress gave an excellent opportunity to present the newly developed hydroxyapatite coatings on PEEK implants. The congress visitors showed avid interest. Currently, the worldwide market volume for spinal implants accounts for over a billion US dollars.

TECHNOLOGY

TLS Team Building Seminar in the Alps

The TLS Supervisory Board and the TLS Executive Board had the opportunity in September 2007 to attend a team building seminar in the relaxing atmosphere of the world-famous mountain resort Verbier in Switzerland.

The AVIRA principles were the guiding theme of this seminar which was run by Christopher Wasserman along with external consultants. AVIRA is an acronym for Awareness, Vision, Imagination, Responsibility, Action. The aim is to support international executives by showing them new ways to meet the challenges of the global economic environment.

The main principles are:

- Increased awareness of yourself as an individual and your environment in order to use your personal resources in a more efficient way. Managed contention and assessed short-term changes vs longterm transformation.
- A deeper insight into the vision of the world, human society and its organisations. Examine alternative models

of the business-society interface.

- Imagination of new scenarios and alternative ways of thinking. The focus lies on your ability to employ your visions.
- An understanding of the close link between responsibility and action at the highest levels of leadership
- A more effective use of knowledge in decision-making and taking action. The principle here is that organisations improve their capabilities to manage change, develop more effective learning structures, identify better with their corporate culture (trust building), be more predictable



A team grows together: participants and trainers at the TLS team building seminar.

and take more responsibility for the future and the forthcoming generations. Think beyond confrontation. Learn from contradictions, manage «dualities» and «subversive knowledge».

12 February 2008

Erosion and corrosion protection in energy plants and waste incinerators by thermal spraying

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What's Up

11 March 2008

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11 – 13 March 2008

MEDTEC
Exhibition & Conference
New Landesmesse Stuttgart
www.medtecstuttgart.de

Industry News

New iron-based additive for surface-layer welding

The American «NanoSteel» corporation has introduced to the market a new iron-based additive for surface-layer welding called SHS 9700. With this substance, which contains the high-quality alloying elements molybdenum, nickel and tungsten, a high degree of hardness – up to 69 Rc (Rockwell) – can be achieved. According to statements by NanoSteel, SHS 9700 is extremely wear-resistant. Under specific conditions SHS 9700 performs noticeably better than conventional chromium carbide-based additives.

Informative Website for copper and nickel

For many years copper-nickel alloys have proved their value as non-corroding construction materials in seawater applications. These alloys have high inherent resistance to biofouling

and good fabricability and have provided reliable service for several decades whilst offering effective solutions to today's technological challenges. In order to make available the knowledge about these materials and their applications to scientists and engineers, international specialists have set up a highly informative website www.coppernickel.org. It is regularly updated.

New with TLS

- From January 2008 Marc Morel will be CEO of TLS Medical. Previously Marc Morel headed the French branch of Waldemar Link GmbH & Co. KG, a manufacturer of orthopaedic implants.
- In 2007 TLS recruited 18 new staff group wide, among them an apprentice for precision mechanics.



Continued from page 1: «Teamwork with engineers is important»

Do you reckon it is sufficient if material engineers develop implants on their own or do you think a partnership between surgeons and engineers is necessary or even indispensable?

In my view the teamwork with engineers is very important for it is they who can supply information if a project is feasible, it is they who know about the different materials and it is they who have a profound knowledge of mechanics. On the other hand, the cooperation with the surgeon is no less important. He takes the responsibility of implanting a particular model. He possesses the experience with different models and materials that have been used before. The orthopaedic surgeon has also deeper knowledge of the biomechanics and thus the way of which an organism reacts to the strain imposed. The concept of the model we have been using for fifteen years originates from the surgeons. They conducted the first biomechanical tests. The prosthesis and its instruments have subsequently been produced by the industry and have been refined through the dialogue between surgeons and engineers.

Is it entirely the surgeon's decision which implant is chosen? What about the impact of the hospital or clinic's administration?

In fact, the choice of the implant is first and foremost the surgeon's decision. In support of his decision he can consult scientific publications or consider his own experience or that of his colleagues. Even extra-medical factors can be relevant. In Germany for instance the cost of the implant is at the clinic's expense, which in turn is compensated by a case-based lump sum from the health insurance. Hence the clinic is interested in choosing the less costly implant, providing its quality is on a par.

Is the exchange of cemented prostheses difficult? Is it a serious impediment to developing this concept further?

An exchange on grounds of loosening or wear is always delicate. The bone's quality is often less good than it was at the first implantation. Moreover, polyethylene particles provoke osteolysis (thinning and resorption of the bone). These two factors can make the



Bioactive implant: TeroCoating® enables the bone to grow on to the implant rapidly.

exchange of an implant difficult and dangerous. The ablation of cement residues from a thinned-down bone is rather precarious. Therefore, the exchange for a cementless prosthesis can indeed be difficult as well. Except for the case of complete loosening, a cementless prosthesis will always adhere to the bone to some extent. In order to assist the surgeon several special instruments have been developed in order to remove the prosthesis. Without doubt those difficulties have contributed in favouring the development of cementless implants – even though the principal enemy which causes wear is polyethylene used as an anti-friction surface. But also in that respect considerable progress has been accomplished, especially where the interplay of new gliding surfaces is concerned (metal-metal, ceramic).

What do you think of the future market development?

For some time the portion of cementless implants has become more and more important, especially with hip prostheses. But the fixation with cement is by no means out of date. Without doubt the cementless fixation and especially the surface treatment with hydroxyapatite will be further developed. The aim is to increase the performance of the anchorages and thus avoiding as much as possible the need of replacement intervention. In this respect the technology is tied to other fields of progress, especially to tribology and some innovative concepts (e.g. resurfacing). This will contribute to the longevity of the prostheses and help to improve the quality of living of our patients.

Interview: Nicole Rouquet and Ellen Gall

Insider Views

- Siemens has founded a joint venture with a Chinese company in Shanghai aimed at coating stationary turbine components.
- A large American supplier of motor car parts has ordered a fully automated nitration plant for its production in China from Nitrex Metal Inc. (Canada).
- The «American Society for Testing and Materials» has revised two standards: the ASTM international standards E10 (for Brinell hardness of metallic materials) and E18 (measuring system for Rockwell hardness of metallic materials). For further information see www.astm.org.

TeroLab Surface

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 **TLS**
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