



## Guest editors' introductory remarks

What do Wilhelm Conrad Röntgen, Alexander Fleming, George de Mestral and Per-Ingvar Brånemark have in common? One could reformulate the question by asking what do x-rays, penicillin, Velcro and osseointegration have in common? They were all serendipitous findings and led to practical applications with a major benefit for mankind. Serendipity is a word coined in the 18th century by Horace Walpole, son of the famous Prime Minister of Great Britain. It referred to a novel *The Three Princes of Serendip* dating back to the 16th century. He explained that the three princes travelling through the island Serendip, presently called Ceylon or Sri Lanka, 'were always making discoveries, by accident and sagacity, of things which they were not in quest of'. Many discoveries are due to hazard and made by people who were searching for something different. However you need the observational skills and the genius, the 'sagacity' to interpret properly the meaning of the accidental occurrence. Röntgen was working on cathode rays and found by accident that new kinds of rays, which were called 'x-rays', travelled at a distance from the blinded cathode tube to trigger a fluorescent screen at 1 metre. Radiology was born!

Fleming noticed that where a tear had fallen in a culture dish a clear halo appeared indicating the inhibition of bacterial growth. He called the substance lysozyme, which would lead to the discovery of penicillin. Indeed, a few years later he observed again a halo in a Petri dish of *Staphylococcus aureus* around a contaminant fungus. Penicillin was born ...

Mestral, a Swiss electric engineer, was always confronted with burdock burrs that kept sticking to his clothes and his dog's fur. He examined them under the microscope and found small hooks were embedded in his jacket's fabric loops. Several years later he patented it as a fastener under the name of Velcro.

Brånemark investigated *in vivo* the microcirculation of the marrow in the long bones of animals. To achieve this, he inserted a microscopic device embedded in a pure titanium holder piercing the skin that could be put under a microscope. When he wanted to remove the device after ending the experiment, he literally had to break it out. He realised that contrary to a common belief at the time, bone could strongly adhere to a titanium surface. He coined the phenomenon osseointegration. The potential to anchor prostheses firmly to the skeleton, to alleviate the handicap of amputation, became evident, reaching from the oral cavity to orthopaedics.

By far the most common application of Brånemark's findings took place intraorally. In 1965, the first such clinical application was performed to deal with edentulism. The mid-1970s saw the application of transcutaneous implants to treat amputations in the ENT field. Even functional implants were tried out to alleviate conduction deafness.

After the Toronto meeting in 1982, which was an eye-opener for North America, the first international 'Tissue Integration Congress on Oral & Maxillo-Facial Reconstruction' was organised in Brussels in 1984, already gathering people from some 25 countries worldwide. In 1990, the first leg amputation was treated by a transcutaneous femoral implant, which osseointegrated.

Today, osseointegration has revolutionised the approach to oral amputees, the (partially) edentulous patient. After attending some of the many demonstration surgeries Brånemark performed throughout the world, oral surgeons, periodontologists and dentists also learned to focus more on asepsis; more than Semmelweis ever achieved.

Today tens of millions of patients have one or more oral implants. Although the plasma-sprayed implants, which regularly led to marginal bone loss, have more or less disappeared, the maintenance of the original marginal bone level around oral implants remains a universal quest. It even led to the introduction of the term 'peri-implantitis', evidently referring to an analogy with the well-documented phenomenon of periodontitis. While in the 1990s there were less than 5 papers each year referring to peri-implantitis in their title, it now is more than 50 annually.

Nobel Biocare, as a pioneering company in osseointegration and heavily involved in the development of oral implants and their marketing, felt there was a need to take stock of the various aspects related to marginal bone maintenance. Since, for example, nearly 1 million oral implants are inserted annually in North America, a further elucidation of the, often emotionally debated, issue of marginal bone maintenance and loss is an ethical issue.

The participants of the working group were selected on the basis of a PubMed search, geographic distribution and the willingness to take

the time to prepare, without any compensation, a review of the literature on the different possible causes of and preventive and therapeutic approaches to marginal bone loss. It was not limited to the often-heard premise that a plaque-related inflammatory reaction (so-called peri-implantitis) is the only possible cause for marginal bone loss. Since the available data on marginal bone are surprisingly still very limited even after 30 years of intensive use of oral implants, the reviewers were allowed to consider papers that did not reach the highest level of evidence (i.e. randomised controlled trials). This is why multiple time series with or without the intervention were sometimes included, or even animal experiments. Otherwise, the vast majority of reported problems on this issue might not have been considered.

The coordination of the selection of participants and proposed topics was given to one of the two co-signatories, while the second acted as host during the 2-day meeting.

Björn Klinge and Daniel van Steenberghe

