Consensus Development Conference Statement on Osseointegrated Implantology

Dr. Andras G. Haris

INTRODUCTION

The American Society of Osseointegration organized a Scientific Meeting and Consensus Development Conference entitled: "Osseointegration in Dental Implantology" on September 9, 10, 11, 1988 at the Louisiana State University Medical Center School of Dentistry.

The conference was sponsored by The American Society of Osseointegration, Louisiana State University Medical Center Department of Continuing Education, and The International Congress of Oral Implantologists.

This was the first time that the participants were able to view live surgical and prosthodontic demonstrations direct from the operating room, performed by master clinicians, on nine osseointegrated systems. This was also the first Consensus Development Conference held on osseointegrated implantology. After considerable and lively discussion, the Members of the Panel—all experts in the field—were asked to submit answers to the questions:

1. What is the biological basis of osseointegration?
2. What are the surgical and physiological requirements for the development of an osseointegrated interface?
3. What are the requirements for the maintenance of an osseointegrated interface?
4. What are the limitations and health-risks attached to osseointegrated dental implantology?
5. What are the future directions of research and development in osseointegrated dental implantology?

Members of the Panel were:
Dr. Andras G. Haris, Chairman of the Panel
Dr. Arthur Ashman
Dr. Manuel Chanavaz
Dr. Barry Edwards
Dr. Jack Hahn
Dr. Yahia H. Ismail
Dr. Kenneth Judy
Dr. Leonard Linkow
Dr. Michael Meenaghan
Dr. Roland Meffert
Dr. Paul Mentag
Dr. Gerald Niznick
Dr. Gerald Reed
Dr. Alan Stoler
Dr. Hilt Tatum, Jr.
Dr. Anthony Viscido

Written summaries were submitted by:
Dr. Jack Hahn
Dr. Kenneth Judy
Dr. Leonard Linkow
Dr. Michael Meenaghan
Dr. Roland Meffert
Dr. Alan Stoler
Dr. Hilt Tatum, Jr.
Dr. Anthony Viscido

What is the biological basis of osseointegration?

The ability of the living (vital) bone (osseous) tissue to develop and maintain, in physiological function, a direct interface and dynamic union with implants (biocompatible and non-biological entities).

The above ability is derived from the physiological processes:
A. healing and repair
B. regeneration and remodeling.

Healing and repair occur in the presence of injury; regeneration and remodeling do not require invasive trauma but require stimulus.

What are the surgical and physiological requirements for the development of an osseointegrated interface?

Depending upon the nature of the surgical trauma, the osseous healing relative to implants will occur in the form of:
A. direct, vital bone interface (osseointegration)
B. fibrous tissue formation
C. sequestered, necrotic bone

Maximal effort should be made to maintain the vitality (healing and regenerative capacity) of the tissues of the surgical site in order to achieve osseointegration.

This can be assisted by:

A. Minimizing the trauma associated with surgical placement (mechanical, thermal, ionizing radiation) to the osteoperiosteal unit. It is particularly helpful to use:
   a. slow speed, high torque surgical drills for the preparation of the osseous site
   b. copious internal and external irrigation during drilling
   c. minimal stripping of the periosteum
B. Non-contamination (organic, inorganic) of the surgical site and the implant utilizing:
   a. aseptic techniques
   b. sterile surgical protocol
C. Immobile and passive fit of the implant into the prepared surgical site (precision instrumentation)
D. Rough implant surface approximating the bone and highly-polished implant surface approximating the soft tissues. "Medium to high energy" surface charge is optimal.
E. The use of biocompatible materials that are essentially bioinert but display mild bioactivity. Currently, the most widely used are: pure titanium and HA-coated titanium.
F. Protected healing in a mechanically-neutral environment, free of organic and inorganic contaminants to facilitate primary healing (direct union).
   a. two-stage surgical technique
   b. complete immobilization, especially at the initial phase of interface development (first two weeks)
   c. no masticatory load or force should be applied until the matured implant-bone interface (attachment) is developed

What are the requirements for the maintenance of an osseointegrated interface?

A. The implant should have biomechanically favorable form to avoid overloading, which creates microfractures of the bone that might lead to connective tissue formation around the implant.
   a. modulus of elasticity of the implant should be ideally identical to bone
   b. balanced stress distribution at the interface
   c. attenuation of masticatory forces
   d. controlled mobility of the implant system (within physiological limits)
B. Lack of infection. Since there is no predictable muscosal seal of epithelium to an implant surface, the diligent practice of optimal home care is essential. The presence or creation of an adequate band of keratinized tissue makes it much easier to maintain good tissue health and prevent gingivitis.
C. Presurgical design of the prosthetic architecture and versatility of the implant superstructure will further aid the construction and maintenance of an adequately balanced superstructure. Consideration should be given to the proper embrasures, contour, pontic design, functional occlusion, and articulation as important elements of the final prosthesis.

What are the limitations and health-risks attached to osseointegrated dental implantology?

Provided that adequate osseous structure is available or can be created, no specific health-risks have been documented or attached to osseointegrated implantology other than what would pertain to routine surgical procedures; however, it is important to realize that in a medically compromised patient, the development of a mature osseous-implant interface could be considerably delayed. A patient with extensive organ damage or body-part replacement needs special evaluation.

The periodic monitoring of the healing process by trained, medical personnel is essential.

Local complications, such as damage to the surrounding major anatomical structures (maxillary sinus, nasal cavity, the mandibular-neurovascular bundle) may occur; but corrective measures are generally effective especially if, on a timely fashion, a definitive diagnosis is established.

During the surgery, the bony topography will be altered. In the event of failure, some loss of the supporting bone can be expected; however, in most cases, almost complete healing and regeneration of the implant site have been observed after removal.

Contraindications

Absolute

Recent myocardial infarction
AIDS
Allergy to titanium or other component of implanted material
Uncontrolled diabetes
On-going radiation therapy of face, neck, and upper chest
Debilitating or uncontrolled disease
Chronic or severe alcoholism or confirmed severe drug-addiction
Hematopoetic disorders

Relative General

Prolonged corticosteroid usage
Brittle diabetes mellitus
Blood dyscrasias
Collagen diseases
Malignancies
Personality disorders, psychoses
Drug dependency
Chronic renal failure/disease
Chemotherapy
Bone metabolic disease
Sever endocrine disorders
Chronic alcohol and/or tobacco usage
Coagulopathies
Factors related to comprehension, motivation, and finances

Relative Local

Gingival-mucosal infections
Bony infections
Cysts, tumors of mandible or maxilla
Incomplete healing of extractions
Vesiculo/bullous mucosal diseases or syndromes of the oral cavity

What are the future directions of research and development in osseointegrated dental implantology?

Further study is needed, at least in the following areas:

— The physiological and biomechanical aspects of the implant-tissue interface. Its development, maturation, and continuous vital interaction with the body will need further in-depth qualitative and quantitative analysis, especially on the molecular level.
— The use of methods of molecular biology and genetic determination might be especially helpful in searching for factors enhancing or directing the healing processes and protein synthesis and cell differentiation.
— Ion exchanges (leaching zone), surface mechanics, and surface physics and their effects on healing and interface maintenance.
— Biophysical aspects, including the effects of electrical stimulus, and piezoelectric activity of bone.
— Integration of implant prosthesis into the masticatory mechanism and the determination of proper, biological load-distribution.
— Development of new materials.
— Wider, clinical application of the principles of osseointegration and the development of new techniques for the management of complex situations (e.g. preformation, sinus grafting, inlay-onlay grafts).
— The development of new and even more physiologically oriented implant modalities.

Dr. Andras Haris presenting the "Oral Implantologist of the Year" Award to Dr. Roland Meffert at the banquet of the "Osseointegration in Dental Implantology" seminar, Louisiana State University on September 9, 1988. Mrs. Haris is seated to the right.