Bone Healing Study around "Implant Diffusion International" IDOT and IDOH dental implants.

A research study has been conducted by **Pr. Emmanuel SOFFER**, DDS, PhD and **Pr. Fani Anagnostou** DDS, PhD, in the « Laboratoire de Recherches Orthopédique » (Orthopaedic Research Laboratory) UMR CNRS 7052, France in order to address bone healing quantitavely and qualitatively around different surfaces of titanium of IDOH/IDOT dental implants, distributed by « Implant Diffusion International » Society, Montreuil, France.,

Those implants display:

- On the first mm of their neck, a smooth, gold colored surface,
- Then microrough microthreads for cortical bone
- On their body, rougher macro-threads designed to screw into spongiosa
-

Roughness of different implant surfaces have been previously characterized through interferometric microscopy (micromap 512 system) by « art des matériaux » laboratory.

All studies were done on six (6) four-month-old male New Zealand rabbits (Segav, Saint-Mars d'Egrenne, France) with a mean weight of 3.5 kg. They were housed individually in metal hutches in an environment (ambient temperature of 21°C and 50% air humidity) that met the requirements of the European Guidelines for Care and Use of Laboratory Animals (Directive du conseil 24.11.1986, 86/ 609/ CEE), drank water and ate commercial food concentrates (Pietrement, Sainte Colombe France) ad libitum. Artificial lighting was used to maintain a normal day/night biological rhythm. Following EU veterinary guidelines, animals have been allowed to acclimate during one week.

Anesthesia

The rabbits were anesthetized with 0.5 mg/kg Diazepan (Valium®; Roche; Basel, Switzerland), 0.25 mg/kg metedomidine hydrochloride (Domitor®, Virbac; France), and 100 mg/kg Ketamine hydrochloride (Ketalar 500®, Pfizer; France), injected intramuscularly. They were prepared for surgery, shaved and disinfected; both lower limbs sites were draped for operation

Under animal experimentation # 75-239, after general anaesthesia and extensive shaving, a longitudinal skin incision was made to expose the distal lateral aspect of each femoral condyle. A cylindrical cavity (10 mm deep, 3,5 mm wide) was then created in the lateral condyle in a stepwise fashion using color-coded 10-mm-length surgical drills (Implants Diffusion International, Montreuil, France). Implants are then screwed until their neck reach outer cortical bone.

O ne IDOT 1042 (smooth neck, 10 mm long, 4,2 mm diameter at the neck) implant per animal has been inserted in each right distal femoral epiphysis and one IDOH (rough neck, 10 mm long, 4,2 mm diameter at the neck) implant per animal has been inserted in the left distal femoral epiphysis, thus making it possible to compare bone healing within the animals, in correlation with the roughness and surface treatment of the implant neck.

All animals were given intramuscular injections to relieve pain during the postoperative 24 h period. The rabbits were euthanized 6 weeks later; femoral condyles and calvariae were removed and cleared of the surrounding soft tissue. All tissue specimens were prepared for non decalcified histological analysis.

Results :

Titanium surface roughness was quantified using « Ra » parameter and expressed in nm:

423 nm for the smooth neck and 1760 nm for rough necks
847 nm for the microthreads
1760 nm for the macrothreads.

2 parameters have been studied :

- first, the effect of implant's neck surface (smooth or rough) on the bone-to-implant contact (BIC).
- second, the effect of implant's neck surface (smooth or rough) on bone surface area inside the three (3) first microthreads.

Morphometric measurements were made using a phase contrast microscope (Leica GmbH, Germany) linked via a video camera to an image processing system (Leica Qwin)

Histological analysis :

After 6 weeks post implantation, all implants were stable and histologically in direct contact with bone tissue, without any interposition of fibrous tissue nor inflammatory sign at bone/implant or soft tissue/implant interface

Histomorphometrical analysis :

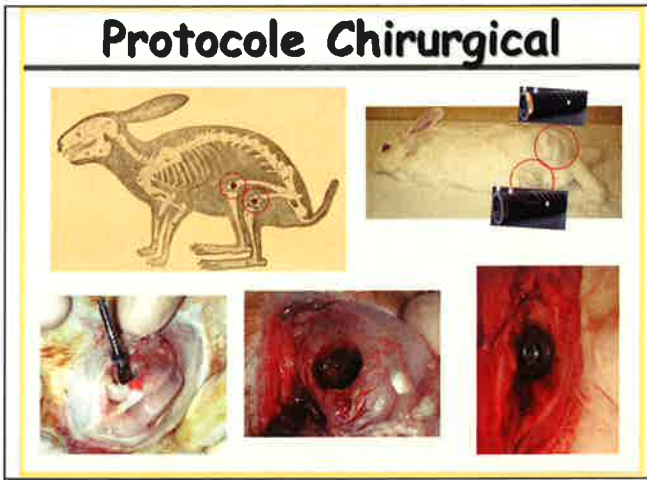
At implant's neck first millimeter, both surfaces (smooth and rough) showed more than 50% BIC. These result is compatible with those of scientific litterature, in particular : J Biomed Mater Res B Appl Biomater. 2008 Nov;87(2):303-11. Biomechanical and histomorphometric study of dental implants with different surface characteristics. Yeo IS, Han JS, Yang JH..

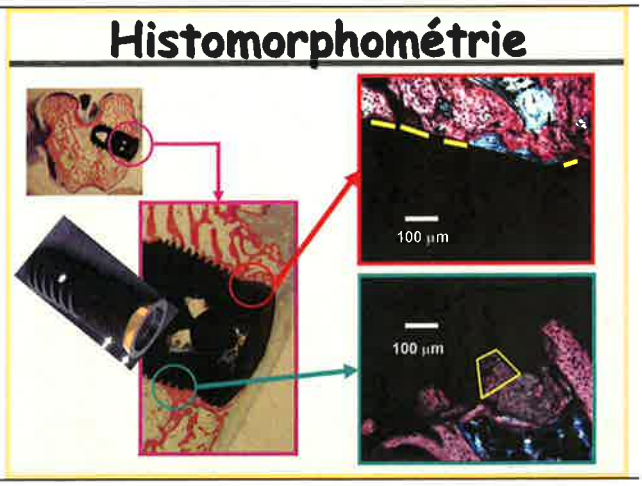
Mean BIC was 52% and 59% at implant's neck first millimeter for smooth neck (Ra=423nm) and rough neck (Ra=1760), respectively. Difference was not statistically different (p=0,12) according to a Wilcoxon test for paired datas.

Living bone surface area within the first three microthreads was 68 and 82% for smooth neck (Ra=423nm) and rough neck (Ra=1760), respectively. Again, difference was not statistically different (p=0,08) according to a Wilcoxon test for paired datas.

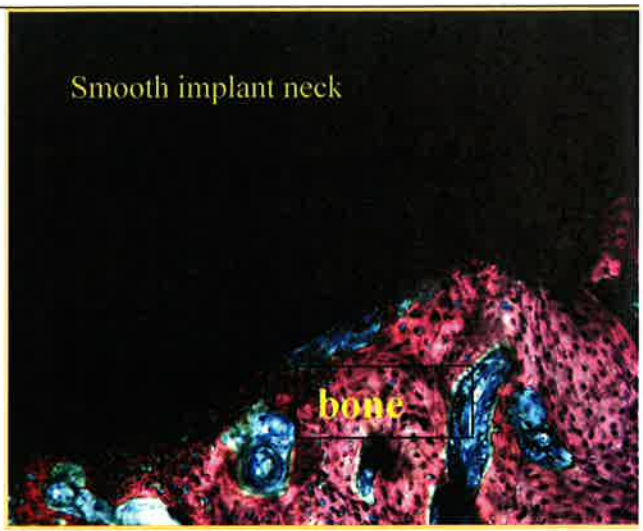
Conclusion.

Bone healing around the tested implants is compatible with scientific literature on the same animal model. Qualitative and quantitative (BIC and bone surface area) differences observed are not statistically significative. This finding is in contradiction with the results generally accepted in the literature for the same surface roughness.

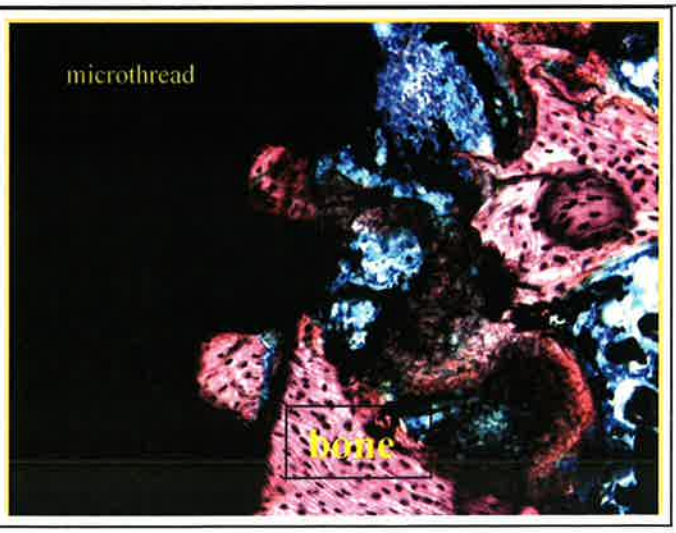




B.I.C. on rough neck surface



B.I.C. on a smooth neck surface



Bone healing in the first 3 micro threads,
Rough neck implant

Bone healing in the first 3 micro threads,
smooth neck implant