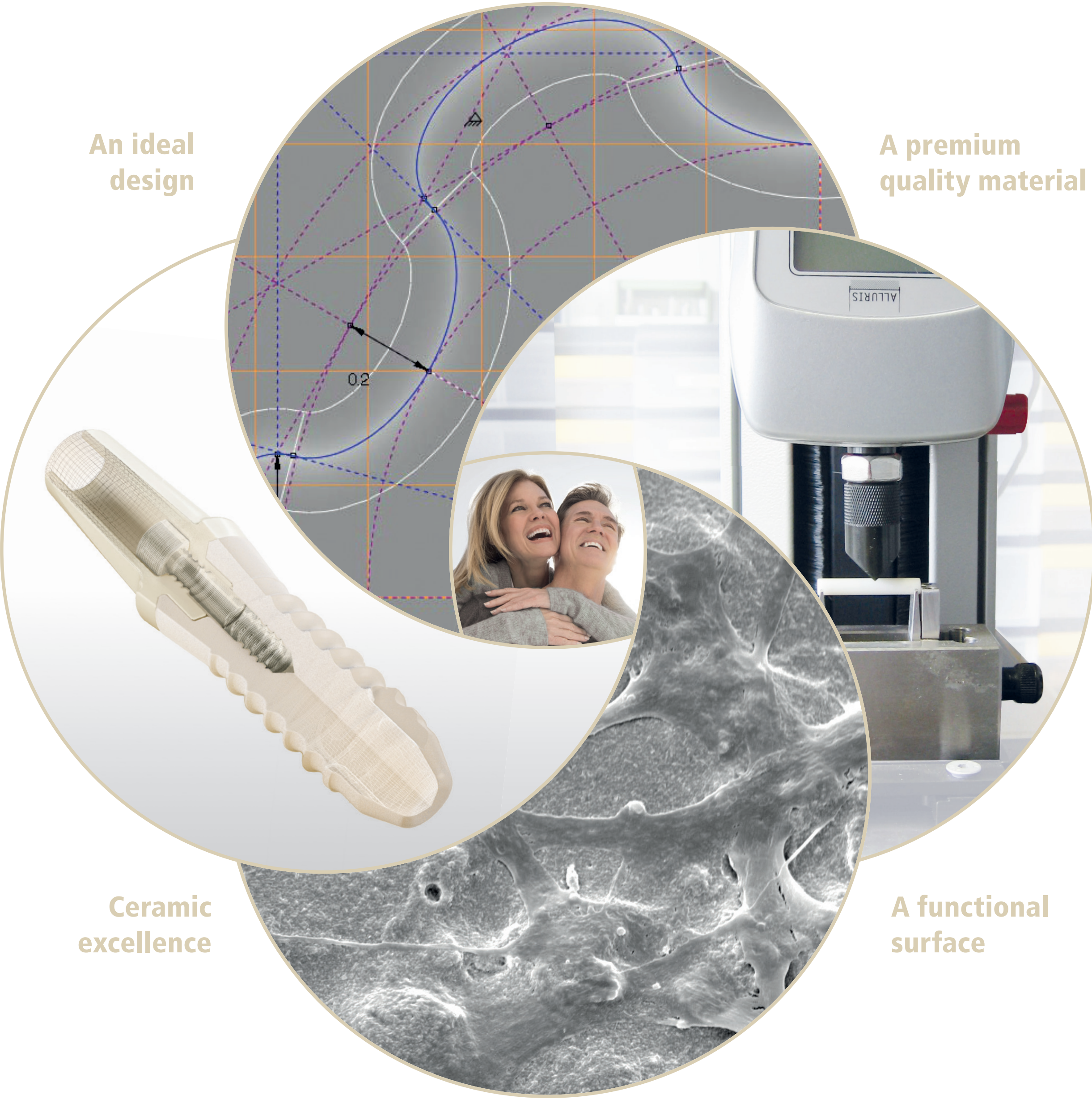
CERALOG® IMPLANT SYSTEM – FACTS AND FIGURES AT A GLANCE

Science behind the next level in ceramic implantology

COMBINING BASIC AND APPLIED RESEARCH – INSPIRING INNOVATION

An ideal design

A premium quality material



Ceramic excellence

A functional surface

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The CERALOG Implant System is the innovative product of a strong cooperation between CAMLOG Biotechnologies AG and Axis biodental SA, a high tech company specialized in the development of dental ceramic implants. This development has resulted in an ideal combination of material, surface and design within the innovative concept of the CERALOG Implant System. CERALOG has more than 10 years of dedicated research and development for the benefit of the patient. Besides the original Monobloc design, the portfolio features the CERALOG Hexalobe implants, the first two-part ceramic implants with screw-retained and retrievable PEKK abutments.

Premium Quality Material

Zirconia as an implant material

The CERALOG implants are made of yttria stabilized tetragonal zirconia (Y-TZP) [1], which is a ceramic widely used in the dental industry and other highly demanding fields. Zirconia is a chemically inert material, which makes it especially suitable as an implant material. Thanks to a process called hot isostatic pressing (HIP) it offers an outstanding combination of excellent mechanical properties and high strength (Fig. 1).

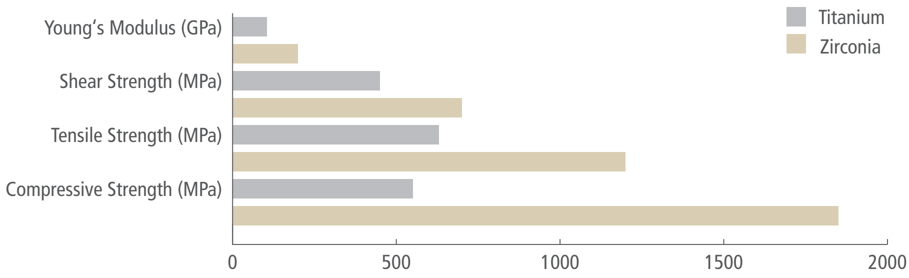

Fig. 1: Comparison of the main static mechanical properties of grade 4 titanium and Y-TZP zirconia
[Sources–Titanium: Titanium grade 4 MatWeb (http://www.matweb.com)| Zirconia: Y-TZP Zirconia, AXIS biodental SA]

PEKK as an abutment material

Poly ether ketone ketone (PEKK), is a high performance polymer that belongs to the poly aryl ether ketone (PAEK) family. It combines excellent mechanical strength with outstanding thermal properties and chemical stability [2]. As a material for implant applications, PEKK is largely prescribed for CMF applications like cranial repair and for spinal applications like fusion cages, lumbar posterior fusion rods (Fig. 2).

Biocompatibility of PEKK implant grade material has been established by Oxford Performance Materials Inc., for long term implantation according to the ISO 10993-1 standard [3].

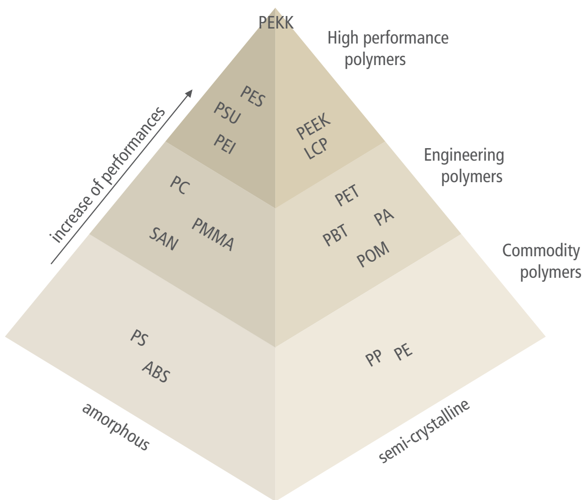

Fig. 2: Diagram presenting the level of performance of the amorphous and crystalline polymers. PEKK presents the highest level of performance

PEKK vs PEEK

Although PEKK and PEEK (poly ether ether ketone) have similar chemical structures and belong to the same polymer family (PAEK), PEKK presents significantly improved properties for implant applications (Fig. 3):

- Higher mechanical stability
- Higher creep resistance
- Compression resistance up to 80% superior in comparison to PEEK
- Less sensitive to water absorption

	PEKK	PEEK
Young's modulus (GPa)	4.5	4.1
Tensile strength (MPa)	138	100
Flexural strength (MPa)	193	165
Compressive strength (MPa)	207	135
Elongation at break (%)	> 30	40
Melting temperature (°C)	360	340
Water absorption after 24 hrs. (%)	< 0.2	0.5
Density (g/cm³)	1.3	1.3

Fig. 3: Comparison of the main properties of PEKK and PEEK
[Sources: PEKK: OXPEKK®- IG 300 (Implantable grade), OPM Inc. | PEEK–OPTIMA LT1 (implantable grade), Invibio Inc.]

Hexalobe – An ideal Implant-Abutment connection Design

The design of the CERALOG Hexalobe implant-abutment connection was developed in close collaboration with the Swiss Federal Institute of Technology of Lausanne. Finite element analysis simulations demonstrate that the Hexalobe connection is the most appropriate shape to transmit a torque to a ceramic implant. [4].

In comparison to a traditional hexagonal connection, the Hexalobe connection, with 0° drive angle, optimizes the torque transmission and eliminates radial stresses (Fig. 4 a–d)

Dual surface structure

CERALOG implants are produced by Ceramic Injection Molding (CIM). This technology makes it possible to manufacture complex shapes with various surface textures without using any post-treatment. These surface textures ensure the proliferation of osteoblasts as evaluated in an in-vitro study performed at the University of Geneva [5] (Fig. 5 a–b).

Clinical Application

CERALOG implants showed excellent primary stability [6], comparable to titanium grade 4 implants with the SLA surface [7]. Full ceramic single crowns were placed after 16 weeks of healing on PEKK abutments; after one year of loading, the success rate was 100%.

Clinical case

A 38 years old female patient presented a vertical root fracture at the left upper first premolar. The tooth was extracted 4 months before insertion of a CERALOG Hexalobe implant (L 10 mm). The implant was restored with a screw-retained zirconia crown cemented in laboratory on PEKK abutment after a 4-month healing time (Fig. 6–11).
(By courtesy of Dr. F. Hermann, Zug, Switzerland)

TAKE HOME MESSAGE:

1. CERALOG implants are setting a new trend in terms of ceramic dental implant development and clinical use.
2. The retrievability of the screw-retained abutments is just one of the key benefits with CERALOG Hexalobe implants.
3. The primary stability of CERALOG implants is comparable to titanium implants.

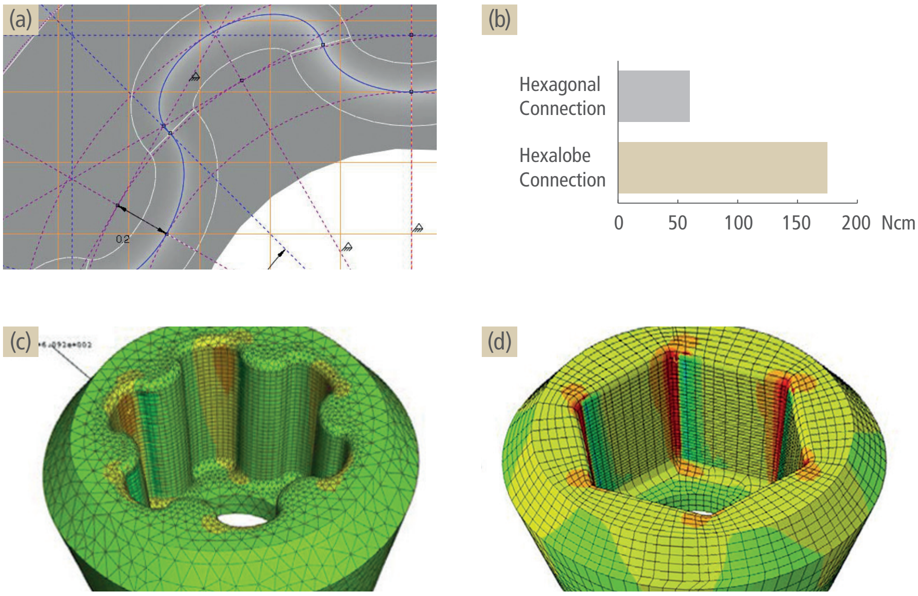

Fig. 4: The Hexalobe connection (a) allows a sharp reduction of the stress level in comparison to the hexagonal connection during the application of a torque (c-d). As consequence, there is a significant increase of the maximum transmissible torque (b).

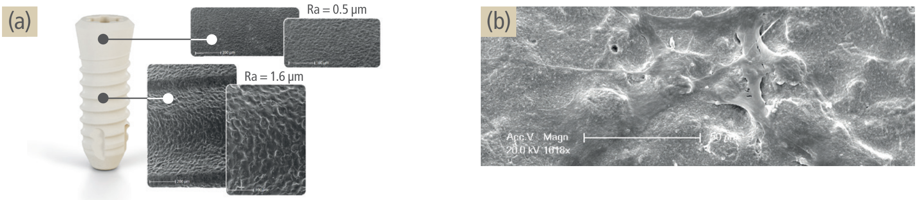

Fig. 5: Surface morphology of the CERALOG implant (a) and osteoblast on the body surface after 7 days of growth at a 1000x magnification (b).

Fig. 6: Initial clinical situation 4 months post extraction (FDI #24)

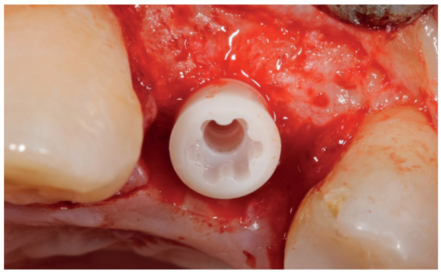

Fig. 7: Implant insertion, supra crestal positioning of the prosthetic shoulder (1.5 mm)

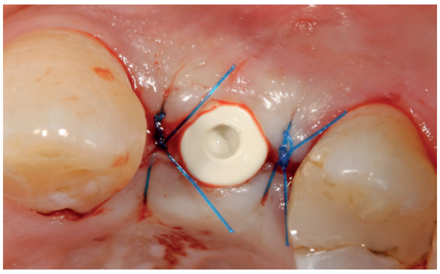

Fig. 8: Adaptive wound closure to the PEEK cover cap

Fig. 9: Final restoration on PEKK abutment 4 months post-surgery

Fig. 10: Lateral view with ceramic crown–dynamic functionalization

Fig. 11: Final restoration after 1 year of loading

Subject to change: · X.J6708.02/2017

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