

## **NEW TRENDS IN THE ISRAELI DENTAL MEDICAL INDUSTRY**

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Growing knowledge and information in the fields of dentistry, biotechnology and digital technology have a great impact on dental practice. The article presents an overview of some advanced technologies of Sunran Ltd. which is one of the dynamic rapid developing high-tech R&D companies specializing in development and implementation of pioneer solutions in the field of dentistry, videlicet designing a full spectrum of dental implants and their components. Sunran also explores the possibility of developing new technologies of obtaining efficient and accelerated osseointegration of the implant with bone tissue by immobilization of growth factors (GFs) on the surface of titanium dental implants and by low-intensity ultrasound or acoustic treatment. Sunran has developed a micro-electromechanical system that brings the acoustic fields into the bone around dental implants. For the first time, acoustic fields are utilized to significantly accelerate and strengthen a bone growth as well as treat any infections around dental implants. Part of the described technologies is in R&D phase and part is under preliminary clinical evaluation and short-term clinical studies.

### **BACKGROUND**

From ancient times Homo sapiens was looking for the ways of finding substitution for the lost teeth: numerous archeological findings bring convincing evidence to this fact. A fragment of an Inca man's jaw, for example, has preserved implants made of shells of sea mussels. A metal implant was discovered in the jaw of a woman that lived in the first century A.D. At the end of the 18<sup>th</sup> century a number of scientists investigated an idea of dental implantation, but due to the absence of antiseptics an operational wound in most cases got infected and the implant was rejected.

At the end of the 19<sup>th</sup> century scientists studied various biological materials and introduced metals into clinical practice. In the mid-20<sup>th</sup> century various forms of implants were designed: screw and demountable screw implants and the ones with intraosseous plate. In the eighties a two-stage screw implant design became widely used. In the nineties a possibility of osseointegration while using one-stage screw implants was proved. And nowadays dental implantation has become an affordable and effective treatment method.

Historically the science of dental implantology developed in such a way that initially the researches' attention was directed to studying the osseointegration process, i.e. examining its characteristics and finding biomaterials necessary for its successful accomplishment. The majority of the first generation researchers tried to determine optimal alloys, their surface properties, special implant coatings and threading. Evolution of those investigations in the sphere of dental implants industry resulted in more than 90% success of implant integration in the bone. Dental implant integration became a proven fact. The goals of dental implantology lie not only in the sphere of restoring the lost teeth functions, but also in the sphere of comfort, aesthetics and health of a person. Clinical use of dental implants has a number of advantages over traditional prosthetics, e.g.: dentition defects are corrected without the necessity of turning the neighboring teeth; possibility of using fixed prosthesis in case of complete lack of the teeth; implant placement makes it possible to stop bone loss in the area of the lost teeth.

In this implant sector Israel is considered to be a Value for Money player. The Israeli dental industry includes about 100 manufacturing firms. During 2012-2014, aggregated exports of Israel's top 100 dental device companies surpassed 500 million USD. From 2000s, the oral and dental industry increased almost by 50% in terms of the number of new companies. 50% of Israeli dental companies participated in IDS in 2015. The number of Israeli companies participating in IDS grew by 66% from 2010. Over the last decade some of successful companies were purchased by the biggest players on the market: Urident was bought by Dentsply for about \$95M in 2006; AlphaBioTec was

bought by Nobel Biocare for \$95M in 2008; Cadent was bought by Align Technology Inc. for \$190M in 2011; MIS was bought by Dentsply Sirona for \$375M in 2016.

## **DENTAL TECHNOLOGIES OF SUNRAN**

Sunran Ltd. is a dynamic, fast-growing high-tech research and production company focused on the development of advanced solutions in dentistry. Sunran designs, develops, manufactures and markets a full range of dental implants and their components. Top quality products of Sunran meet stringent international standards. Despite the competition the company can still find ways for innovations in the sphere of implantology, the purpose of which is to facilitate usage of implants by the dentists, introduction of new tools and equipment designed and developed using new technologies. One of Sunran researches was aimed at the possibility of predetermining the final abutment position before surgical interference, its transferring on the model and prosthesis manufacturing. However, a large number of elements involved in the two-stage implantation system, necessity of careful transfer of the implant position in the oral cavity onto the working model and usage of pre-inclined abutments for compensation of undesirable, incorrect implant position created barriers for attending dentists' understanding of the role of dental implants in their daily practice. Quantity and variations of different dental systems, their elements and parts, complexity of choosing a certain type of abutment could confuse the most experienced dental implantologist. Methods of determining the final implant position did not have distinct explanations. Correlation between intended tooth position, implant placement into the bone and transferring this correlation onto the model as well as final position of the artificial tooth required further proper investigation and simplification.

Extensive research and development have resulted in creating a simple, flexible, reliable and ergonomic dental implant system called SUNRAN. Joint efforts of surgeons, periodontists, prosthetists and technicians have lead to the appearance of the high-quality system meeting all the highest requirements and developed for using in all types of clinical situations that can arise in cases of completely or partially edentulous jaws.

Every implant is passing a quality test by monitoring the quality throughout the production process when using and combining a Hi-Tech and Low-Tech technology. Sunran motto is continuous improvement of products and services in order to increase the effectiveness of medical aid and of individual doctor's practice.

Sunran constantly improve and expand the range of the products. The company enjoys well-earned reputation of technology innovator in the field of implantology having a firm scientific and technical base. To help the research and development, Sunran maintains academic and business relationships with universities and well-known physicians in all key market segments, including general dentistry, periodontics, oral surgery, orthopaedic dentistry, as well as with dental laboratories.

### **What are Distinctive Features of Sunran Implant System?**

#### *Design Features:*

- Extremely precise internal hex
- One platform for all diameters

The connection is extremely precise; being a platform for all diameters, it enables a simple restoration process.

#### *Sterilization:*

The implants are treated by gamma-rays sterilization on specialized and certified equipment of a large nuclear center and are packed in double blister packaging appropriate for this type of sterilization.

### **The "Harmonious" Implants**

The "Harmonious" is a standard cylindrical implant with a double thread step. During the placement process the implant cuts into the bone with far less friction due to its surface design and ensures multidirectional fixation. The "Harmonious" is an easy-to-use implant enabling a good

control in the process of implantation. It is suitable for all bone types, however it is highly recommended for bone types I and II due to its cylindrical shape. This shape combined with the conical thread of the implant ensures easy placement with minimal pressure to the hard bone.

The "Harmonious" implant is therefore an excellent solution for the hard bone and for the limited vertical size of the bone.

### **The "Victorious" Conical Implants**

The "Victorious" is a tapered implant with internal hexahedron; its unique design ensures easy placement and high initial stability. The distinctive shape of the implant body and its variable thread design (double thread) attach to it some exceptional features.

The "Victorious" implant ensures self-screwing, self-tapping and condensation of the trabecular bone, which provides outstanding advantages while dealing with all bone types and in abnormal situations. It is suitable for all bone types and especially recommended for the pure type of the bone.

Thus, the "Victorious" implant is a perfect solution for immediate implantation and immediate loading.

### **Distinctive Characteristics of the Sunran Implants**

Sunran cooperates with an innovative chemical laboratory which has conducted research and implemented advanced dental implant treatments using technologies based on comprehensive surface treatment (CST) process, sand blasting large-grid acid etching (SLA), resorbable blast media (RBM). In the SLA process, alumina is used for sand blasting followed by aggressive acid treatment of the surface. Blasting titanium implants with alumina particles forms a porous surface structure by creating craters originating from impacts with the particles. In most of the craters there are alumina particles left. They have to be removed and the craters must be turned into an integral part of the implant surface. Alumina is insoluble in any acidic medium in conditions acceptable for implant treatment. With the help of the new technologies the surrounding layer of titanium is dissolved and the particles are expelled under pressure of gases, generated during the reaction between titanium and mixture of acids.

In the RBM process, calcium phosphates are used for blasting followed by light acid washing of the surface. Strong acids are not used in the RBM process, therefore there is no danger of excessive acidic treatment. At the same time, since the acids rapidly and fully dissolve calcium phosphates, their residues are completely removed during the following washing. As a result, the RBM process has wide technological opportunities, is easily controlled and is distinguished by almost zero inactivation risks.

The Sunran company employs the SLA and RBM technological processes for optimal implant surface, which is required to achieve successful osseous integration.

The study of the surface of Sunran implants by electron microscopy techniques —Scanning Electron Microscopy (SEM) and Energy Distribution Spectrum (EDS), X-Ray Photoelectron Spectroscopy (XPS) and Optical Profilometry has shown their equivalence to the samples of the world's leading brands.

Sunran has mastered and brought into production the narrow implant. This is a threaded self-drilling, self-tapping implant with integrated transgingival abutments. Implant is intended for one-stage surgical procedure and cemented renovations. It is generally installed into narrow alveolar ridges and lesser mesiodistal spaces of mandible and maxilla.

Self-condensing thread and unique shape of an implant body provide its reliability in disputed situations. The implant is suitable for any type of bone and for immediate functional use. Excellent gingival fitting prevents grey translucency of the implant collar.

Sunran has developed and improved the new short implant, 6.0x5.7 mm in size. The use of this implant allows resolving a number of clinical issues related to the necessity of sinus lift or bone transplantation. Insignificant length of the endosseous part enables implantation in the areas with minimal bone volume, prevents injury of mandibular nerve as well as perforation of maxillary sinus cavity. Configuration features and unique thread design ensure atraumaticity of the surgical invasion,

excellent survival rate and outstanding aesthetics. Implant is intended for one-stage implantation after tooth extraction, before the new osseous tissue has formed, and for immediate functional use.

### **The Sunran Implants**

The Sunran's unique concept is to join two key trends in the dental industry:

- increasing usage of dental implants across the globe;
- satisfying the dentists' need for inexpensive, quality one-stop-shop solutions (including diagnostics) that conform both to their needs and their patients' expectations.

While there are already many manufacturers in the dental implant market, the growth potential is huge, with many untapped opportunities remaining in the developed market (USA, EU), BRIC and other countries. The business concept has already achieved a solid foundation and leverages long-term working relationships with various industry players around the world.

The Sunran implant product possesses all the standard features of the industry's most advanced dental implant solutions and is packaged with a hi-tech look and feel.

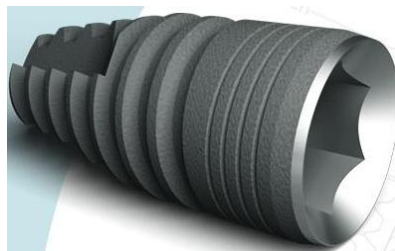
The Sunran implant system solves most of the known clinical cases, not only at the beginning of treatment (the implantation procedure itself), but also throughout all the subsequent treatment stages.

The unique bio-physical structure of the implant allows easy bone penetration without damaging bone tissue. The system is provided with all necessary tools for easy and successful implantation procedure.

The Sunran implants and their packaging system have successfully passed the tests required to receive European CE Certificate. Among them there are fatigue test and microbiological tests including bacterial resistance (bio-burden) and antibacterial stability over time, i.e. confirmation of three year long shelf life (aging tests).

Sunran also explores a possibility of developing new technologies to obtain efficient and accelerated osseointegration of the implant with bone tissue by immobilization of growth factors (GFs) on the surface of titanium dental implants and by low-intensity ultrasound or acoustic treatment. Sunran developed a micro-electromechanical system that brings the acoustic fields into the bone around dental implants. For the first time, acoustic fields are utilized to significantly accelerate and strengthen a bone growth as well as treat any infections around dental implants.

### **Distinctive Features of the Sunran Implant System in Figures:**



**Figure 1.** Victorious Implant — Isometric view



**Figure 2.** Victorious Implant — Front view



Figure 3. Victorious Implant — Top view

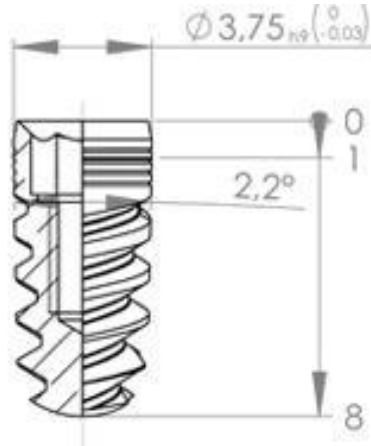


Figure 4. Victorious Implant — Cross section



Figure 5. Victorious Implant — Types

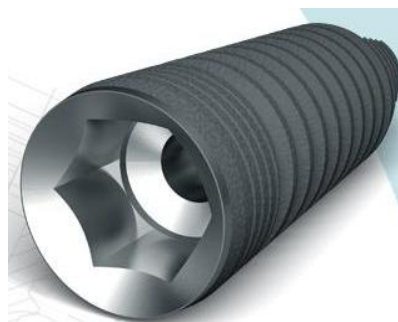


Figure 6. Harmonious Implant — Isometric view



Figure 7. Harmonious Implant — Front view



Figure 8. Harmonious Implant — Top view

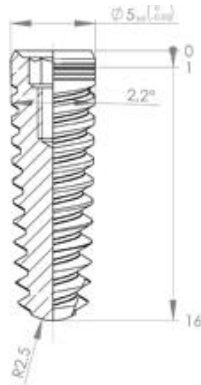


Figure 9. Harmonious Implant — Cross section

| Ø 3.3  | Ø 3.75  | Ø 4.2   | Ø 5   |
|--|---|---|---|
|  10mm |  8mm |  8mm |  8mm |
| 11.5mm   | 10mm  | 10mm  | 10mm  |
| 13mm   | 11.5mm  | 11.5mm  | 11.5mm  |
| 16mm   | 13mm  | 13mm  | 13mm  |
|  | 16mm  | 16mm  | 16mm  |

Figure 10. Harmonious Implant — Types



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