

Backgrounder

Spearheading the Digital Revolution

The substitution of conventional methods with new digital technologies is a key trend that Straumann believes will revolutionize the dental industry. Digitalization is already making an impact in treatment planning and impression-taking as well as in design and manufacturing of restorations. Straumann aims to be at the leading edge of this technological revolution.

Digitalization will have a considerable impact on all aspects of dentistry in the new decade. Digital workflows will supersede labor-intensive analog processes, enhancing interfaces, shortening treatment times, reducing the risk of error and improving quality assurance. These benefits are expected to translate into enhanced predictability, lower treatment costs, added convenience and improved comfort for patients.

Straumann aims to be at the leading edge of this technological revolution and took several significant steps towards that goal. In 2010, Straumann presented an array of integrated computer-based technologies that have been designed to increase confidence, safety, precision and reliability in implant and restorative dentistry. Straumann® CARES® Digital Solutions offer the flexibility of state-of-the-art systems together with seamless connectivity to one of the world's leading implant, restoration and regenerative systems, in addition to guaranteed Straumann quality, service and network support. Straumann is the only leading manufacturer in implant, restorative and regenerative dentistry to offer all these services.

What is Computer-Guided Implant Surgery?

The combined use of 3-dimensional (3D) imaging technology and computers to plan and execute precise implant placement is an emerging trend. Using a CBCT/DVT device generated tomographic image of the patient's jaw, the dental surgeon plans the position, angulation and depth of the implant on a computer using sophisticated planning software. The design is transferred to a plastic template, which the surgeon uses as a guide to drill and prepare the site for the implant(s). Computer-guided surgery offers the dentist a clear view of the bone condition and the final implant location, in addition to simplifying the planning and execution of complex procedures. It thus reduces the risk of surgical and prosthetic complications.

Straumann entered the emerging field of computer-guided implant surgery by acquiring IVS Solutions AG, an established German company developing and selling software applications for computer-guided surgery, including the design and fabrication of surgical templates. The acquired technology simplifies the planning and execution of complex implant procedures and thus reduces the risk of surgical and prosthetic complications. The acquisition in 2009 included the full range of IVS preoperative planning software products as well as the software development team.

Parallel to the acquisition of IVS, Straumann launched a comprehensive surgical instrument kit for guided implant surgery that complements the IVS system perfectly. The surgical instrument kit contains all the tools, drills, profilers and taps needed to place Straumann implants with surgical templates currently made with open library (non-exclusive) 3D software systems. Like other Straumann products, the kit is designed for easy handling and has been clinically tested.

What is CBCT/DVT?

CBCT stands for Cone Beam Computed Tomography and is also known as Digital Volume Tomography or DVT. It refers to an imaging technique that produces three dimensional x-ray images of bony structures with limited radiation exposure and at reasonable prices.

Conventional Computed Tomography scanners produce a fan-shaped beam, which passes through the patient and is picked up by a linear detector. The scanner rotates and generates a two dimensional picture of a 'slice' through the patient. Multiple slices are produced to compile a 3-dimensional image. Improvements in detector technology have led to planar detectors with large surfaces and very good imaging quality. This has made it possible to replace the fan with a cone shaped beam and the linear detector with a two-dimensional planar detector. So, instead of scanning the patient slice by slice, a single rotation of the beam/detector array delivers all the data needed to calculate the 3-dimensional picture.

CBCT/DVT imaging and guided surgery planning procedures			
			
1 Cone beam computed tomography device	2 Diagnostics & 3D planning (Straumann® coDiagnostiX)	3 Surgical template fabrication (Straumann® gonyX)	4 Guided surgery & implant insertion (Straumann® Guided Surgery Kit)

One consequence of this is the patient is exposed to less x-ray radiation. Furthermore, CBCT scanners are mechanically simpler and thus considerably cheaper and easier to produce. Their disadvantages include small scanning volume and a lack of absolute information on bone density. CBCT makes 3-dimensional scanning capability accessible to and affordable for many dentists, which is why it has become the main enabler for three dimensional preoperative simulation and implant planning software such as Straumann CoDiagnostics.

What is Intra-Oral Scanning?

Intra-oral scanning (I.O.) describes a family of technologies for taking 3D measurements of a patient's teeth without the need for a physical impression. Simply described, the dentist takes a series of digital images from which the shape of the teeth can be precisely calculated. This information is then used for treatment planning and the production of restorations using either traditional or CAD/CAM processes. The actual optical scanning techniques used in I.O.

systems include the same laser or optical concepts employed in desktop CAD/CAM model scanning but have been miniaturized and specialized for use directly in the patient's mouth.

I.O. will have a substantial impact on dentistry in the future, offering a number of significant benefits for the patient, the dentist, and the laboratory.

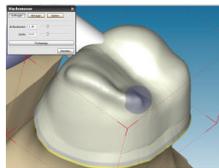
- Starting with the patient, it eliminates the often uncomfortable process of impression taking, which sometimes needs to be repeated due to problems with the impression material. I.O. also reduces the possibility that the finished crown does not fit properly which would necessitate an inconvenient return visit.
- For the dentist, I.O. scanning provides immediate feedback on the quality of the (digital) impression that is not possible with physical impression materials. This allows the dentist to catch issues at the beginning of the restorative process and make immediate adjustments.
- Finally for the laboratory, I.O. scanning improves the quality of the impression that is the basis for their work, it eliminates the handling of physical impressions from the dentist, and eliminates casting models. In addition, in many ways it improves the communication between the lab and the dentist.

In addition to high precision, intra-oral scanning offers considerable time and cost savings for both the lab and the dental practice.

Straumann® CARES® Digital Solutions prosthetics production process featuring intra-oral scanning



1 Dentist performing intra-oral scan for digital 3D impression taking



2 Technician designs restoration using Straumann® CARES® Visual 6.0 software



3 Prosthetic milling at the Straumann CAD/CAM Production Center



4 Prosthetic is delivered to lab

Straumann's agreement with Cadent Inc, a leading provider of 3D imaging solutions based in the US, provides Straumann with the exclusive European distribution rights for the Cadent iTero® digital impression system. iTero digital impression data are connected with Straumann's CAD/CAM workflow. This enables Straumann to offer European customers leading intra-oral scanning technology as part of an integrated range of tooth replacement and restoration solutions.

Restorative Solutions

The final part of a dental restoration is a crown or a bridge, which is fixed to an implant (with an abutment) or to the stump of a natural tooth. Over the past years, Straumann has progressively strengthened its portfolio of high-end esthetic solutions and now offers implant and tooth-borne prosthetics in top performance materials including glass ceramics. Our implant-borne restorative solutions include a wide range of standardized, pre-shaped and customized abutments.

In 2009, Straumann added a number of new prosthetic components to its Bone Level implant line to facilitate impression-taking and the preparation of provisional restorations. We also launched a pre-shaped ceramic abutment for esthetic restorations, which can be modified both in the dental laboratory and in the practice. The Straumann Anatomic IPS e.max Abutment offers a flexible, 'off -the-shelf' solution in a choice of heights, shades and angles. It builds the basis for a full ceramic implant restoration, which would otherwise only be possible through CAD/CAM.

What is CAD/CAM?

Modern dental prosthetic inlays, onlays, veneers, crowns, bars and bridges are designed on computers (CAD) and milled on computerized machines (CAM). This procedure is considerably more efficient than traditional processes and is very profitable for dental laboratories. It also offers precise, reliable, esthetic, individual solutions for patients.

Straumann provides a comprehensive CAD/CAM product portfolio including scanners, software and a full range of prosthetics in modern biocompatible, durable and esthetic materials, including polymer, metals and ceramics, including high-performance glass ceramics.

Design software is a key component in CAD/CAM. Straumann provides regular updates for installed scanners. In contrast to some systems, Straumann® CARES® CAD/CAM is fully integrated and meets FDA and ISO standards, reflecting the high quality, esthetics and precision for which Straumann is renowned.

Straumann continues to advance its CAD/CAM service with new features and powerful software updates, giving laboratories greater flexibility and precision.

What are screw-retained bars and bridges?

Screw-retained bars and bridges are used when several teeth in a row are missing or – especially in the case of solutions using bars – when the patient is completely toothless. A screw-retained bar for example, based on four implants, supports a removable complete denture, which guarantees a firm fit without any rocking and is taken out by the patient in the evening for cleaning. The bars serve to ensure correct guidance and secure retention when denture is inserted.

Screw-retained bars and bridges have various advantages over conventional cemented solutions or conventional complete plastic dentures:

- Unlike conventional complete plastic dentures, which cover the palate with its important taste receptors, neither the enjoyment of food nor speech quality are compromised.
- The load on the bone that comes with implant-based solutions helps to prevent bone resorption.
- Compared to fixing a cemented solution, repair work is much easier and more pleasant for the patient.
- Implant-based solutions are more stable than plastic full dentures and ideally hold for life.



New Materials for super esthetic restorations

Straumann supplies CAD/CAM copings, crowns, bars and bridges in a range of modern materials including zircon (ceramic), titanium, cobalt chrome, and polycon (polymer). To complement its range of prosthetic materials, Straumann offers IPS Empress® and the high-performance IPS e.max® ceramic technology in partnership with Ivoclar Vivadent.

IPS Empress® is a homogeneous leucite-based ceramic which scatters light like natural enamel and blends in well with its surrounding dentition. Restorations fabricated with this material exhibit lifelike translucency and convincing esthetic properties.

IPS e.max® CAD lithium-disilicate glass ceramic enables Straumann to offer super-esthetic crowns and copings in various shades and translucencies along with all the advantages of the Straumann CAD/CAM solution. Strength, quality and durability combined with translucence and natural vitality are the distinguishing properties that make IPS e.max® CAD lithium-disilicate glass-ceramic a material of choice for highly esthetic results.

Value Creation for Customers and Patients

In implant dentistry savings on materials could jeopardize the overall treatment and lead to breakage. Failures are costly and traumatic, particularly if they necessitate explantation and replacement. Over time, long lasting high quality premium solutions can save money on maintenance and replacement. Straumann innovations and improvements make important contributions not only to increasing product longevity and esthetics but also to saving time, discomfort and inconvenience.

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