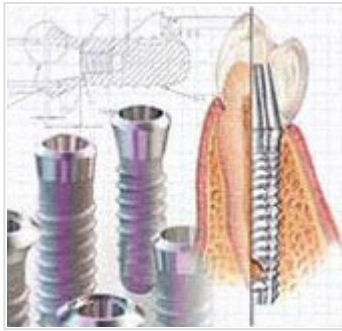


Implants



One of the main focuses of our practice is dental implants. Dr. Schulte has been treating patients with implants since 1986 and has placed well over 3000 implants to date. As a specialist in oral surgery he has followed the evolution of this relatively young discipline with active interest from the very beginning.

Until not so long ago patients with **missing teeth** had only two alternatives: If there were still two healthy adjacent teeth, these were filed down and a **bridge** fitted. But often enough the patients had to make do with a removable partial denture or even with full dentures. Apart from the unsatisfactory cosmetic result and the sometimes poor chewing function it is important to remember that removable dentures often constitute a serious psychological problem for the patient.



*Visibly improved quality of life:
Toothless patient before and after receiving **fixed implant supported replacement teeth**. The good support for the lips and cheeks gives the face a fuller appearance and makes the patient look considerably younger.*

Fortunately, with dental implants it is now possible in most cases to provide patients with **permanent fixed restorations** which look and feel just like natural teeth. The latest studies show that implants placed by an experienced implantologist have **long-term success rates of 95%**. This means that ten years after the implantation 95% of the implants are still fully functional. These long-term results are even considerably better than those obtained with conventional bridges or partial dentures. Today it is considered that properly inserted implants can last a lifetime. For this reason we give our patients a **ten-year guarantee against implant loss**.

In recent years implantology has undergone enormous development. From new diagnostic procedures such as **cone beam volumetric tomography (CBVT)**, to **computer guided navigation** for implant placement and **immediate loading** of the implants there are a number of new developments which promise the patient even more safety and comfort. However, unfortunately the big promises made in advertising and the media are not always fulfilled. On the booming implantology market there are also some dubious players around and it is not always easy for patients to separate the wheat from the chaff.

Implants

What is an implant?



Different types of titanium screw implants

A dental implant is an artificial tooth root made from a biocompatible (tissue-friendly) material that is inserted operatively into the jawbone to replace one or more missing teeth. Standard implants today are screw-shaped or cylindrical and made from pure titanium. Titanium is a unique metal: it fuses directly with the bone without an intermediate layer. This intimate contact between the bone and titanium is called **osseointegration**. Pure titanium is so tissue-friendly that it is not rejected by the body and does not trigger allergic reactions or inflammation of the gums. On account of its excellent

biocompatibility, this hard and durable metal is widely used for other medical implants, too, e.g. for artificial hip joints, cardiac pacemakers etc. The titanium surface of dental implants is roughened by special processes in order to facilitate attachment of the bone cells and accelerate incorporation into bone.

The dental implants used today are usually cylindrical or slightly conical screws (the shape of the tooth root) and normally 6-18 mm long and 3-6 mm in diameter. In the head of the implant is a small internal screw thread for attachment of the support post (known as the abutment). Depending on the use (crowns, bridges, dentures) there are various kinds of abutments.



A dental implant integrated into the bone. The post screwed into the head of the implant protrudes through the gum tissue and acts as a support for the ceramic crown.



Osseointegration under the microscope.

Left: cross section through an implant integrated into the bone.

Right: a bone cell sitting directly on the roughened titanium surface.

There are innumerable implant manufacturers on the market but only few systems are supported by scientific studies and long-term results. In our practice we use implants from the following manufacturers:

- [Straumann \(Switzerland\)](#)
- [Nobel Biocare \(Sweden/Switzerland\)](#)
- [3i \(USA\)](#)

These manufacturers are market leaders with decades of experience and continuously improved systems backed by excellent long-term results.

Ceramic Implants



Ceramic Implant

Recently ceramic implants are often promoted as an alternative to titanium. In contrast to titanium implants they are white, but in our opinion this is not a relevant advantage since the implant is placed inside the bone anyway and is therefore not visible.

A disadvantage, however, is that for reasons of stability ceramic implants can currently often only be made in one piece. This means that it is not possible to work with angulated abutments, which can lead to cosmetic and functional problems in the prosthetic treatment. The excellent biocompatibility of ceramic is another argument put forward in favour of this material. However, as pure titanium is also extremely biocompatible and there have been no reports of titanium allergy anywhere in the world, we do not see this as a relevant advantage of ceramic either. Moreover, ceramic implants are usually considerably more expensive than titanium ones. However, the chief reason why we do not currently use ceramic implants is the **absence of reliable long-term scientific studies** on fracture strength, behaviour in the bone etc. As we do not want to use our patients as "guinea pigs" for materials which have not been sufficiently tested, we will for the time being continue to use the titanium screw

implants which have proved themselves millions of times over.

We also refrain from using other alternative implant forms such as **leaf implants or BOI implants (basal osseointegration implants)** for the same reasons. Most professional associations do not recommend these implants either.

How is an implant placed?

Careful planning is the first step preceding an implant operation. The examination of the patient begins with careful inspection of the oral cavity and palpation of the jawbones. **X-rays** are taken to determine the available height of the bone. In straightforward cases it is sufficient to take a **panoramic X-ray** of the entire mouth (orthopantomogram, abbreviated OPG or OPT), possibly complemented by small dental X-rays taken inside the mouth.

In more difficult cases in which the amount of available bone is limited and we have to operate in the proximity of sensory nerves, for example, we have a **computed tomographic (CT) scan** of the jaw done. **Cone beam volumetric tomography (CBVT or DVT)** is a new type of computed tomography which has been developed specially for the head region. In comparison to normal computed tomography CBVT involves up to 80% **less radiation exposure**. The radiation dose of CBVT is therefore approximately the same as that of a normal panoramic X-ray (OPG). You can find further information on CBVT at [Volumen Tomografie Zentrum Luzern](#).



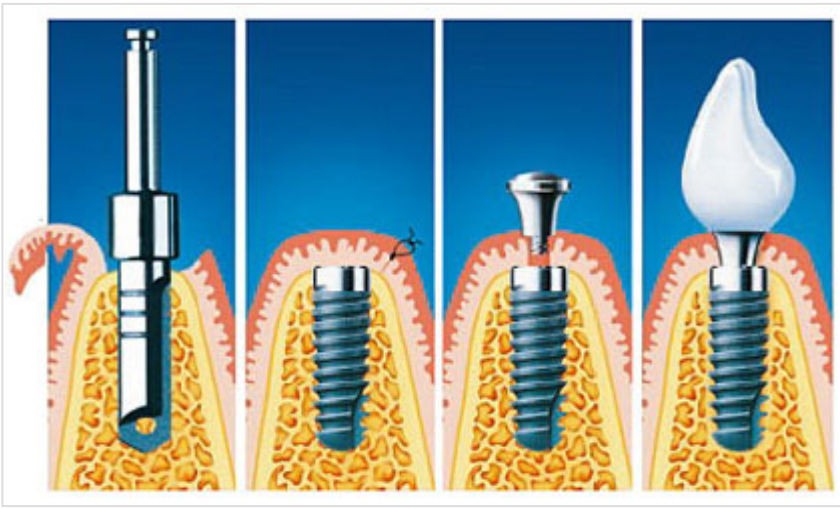
Implant planning with three-dimensional CT images.

Computed tomography or cone beam volumetric tomography produces precise **three-dimensional images** of the jawbone on a 1:1 scale and permits optimal planning of the implant operation. The three-dimensional imaging permits exact measurement of the amount of available bone. The optimal positioning, length and diameter of the implants can now be planned on the basis of the available bone, as well as any necessary bone augmentation. The images also give us information about the quality of the bone (solid or porous). The CT or CBVT images also show the exact position of the **nerves** running through the bone as well as other structures which we must be careful to avoid injuring during the operation. This means considerable **extra safety** for the patient.

A further use of the three-dimensional images is for [computer guided implantation](#), which is the safest and least traumatic method of all for the patient.

The placement of dental implants is a surgical intervention performed under sterile conditions. The operation takes between about 30 and 60 minutes depending on the complexity, possibly longer if several implants are placed in one session. It is normally done under local anaesthesia and is absolutely painless. However, we know that even though there is no pain, many patients find such procedures stressful. Therefore in our practice we often use sedation, e.g. with [laughing gas \(nitrous oxide\) or other sedatives](#), in addition to the local anaesthetic. The benefit of this is that the patient feels fully relaxed and comfortable throughout the procedure.

Another option, particularly for larger operations such as bone augmentation or full-mouth reconstruction, is [treatment under general anaesthesia](#). Treatment under general anaesthesia can be performed in our own operation theatre, in which case we call in an [experienced team of anaesthesiologists](#).



From left to right:

1. Drilling the pilot hole in the bone
2. The implant has been inserted and the gum tissue repositioned over the implant and secured with sutures
3. At the end of the healing phase (osseointegration), the gum tissue is opened again, an impression is taken and a healing screw inserted
4. The finished crown on the implant

Uncovering the implant

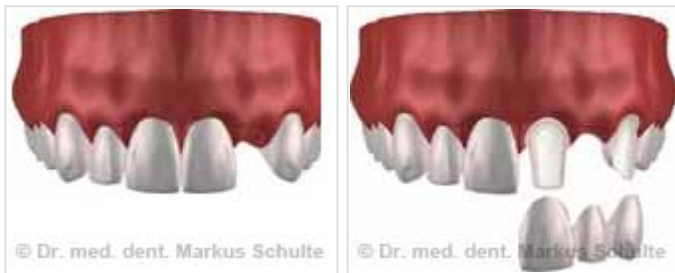
Normally dental implants should be left to heal for 6-12 weeks without being loaded, except in the case of what is known as [immediate loading](#). After the healing phase, a small procedure is performed to uncover the head of the implant. We often do this by laser because this guarantees particularly good wound healing and is painless for the patient. After uncovering the implant head we take an impression and send it to the dental laboratory where the reconstructions (bridge, crown or dentures) are fabricated. There are also open healing implants known as transgingival implants (e.g. some Straumann implants), in which surgical exposure is not necessary. We use these implants particularly in the region of the back teeth.

As soon as the local anaesthetic has taken effect the gum is carefully opened. With a sequence of calibrated burs, the implant bed in the bone is prepared. To prevent overheating of the bone, preparation is done with sterile water cooling. The suitable implant is chosen and carefully inserted. The gum tissue is replaced over the implant and secured with sutures (stitches) and a provisional denture or bridge is fitted. In the case of [template guided implantation](#) the operation can be even performed as a closed procedure, that means without cutting open the gum tissue at all.

Implants

Single-tooth implants

If a single tooth is missing and replaced by an implant we call this a single-tooth implant. In the past a gap caused by a single missing tooth was usually closed by a bridge. The **filing down of the adjacent teeth** that this involves is not necessarily a good idea, particularly if these are healthy teeth with no signs of tooth decay. It can sometimes result in the death of the tooth nerve (dental pulp) and a consequent need for root canal treatment. Also, the crown margins often provoke gum recession with poor cosmetic results.



In the past a missing front tooth was replaced by a bridge after filing down the adjacent teeth. Today the preferred procedure is insertion of an implant.

In the case of a **single-tooth implant** the missing tooth is replaced by an implant which is inserted in place of the lost dental root. During the healing phase of usually a few weeks the implant remains under the gums without loading. During this time the patient wears a provisional restoration which can be either removable or fixed (e.g. adhesive bridge). After uncovering the implant and taking an impression the crown that has been made in the dental laboratory is attached to the implant. If a

tooth has to be extracted, the implantation can be performed at the same time as the extraction. This is called an **immediate implant**. This spares the patient an additional visit and is a standard procedure today. Only in some cases, e.g. in the case of an acute infection, is it better to first remove the tooth and wait until the gum and bone tissue has healed before placing the implant. If the implant is fitted with a firmly attached provisional crown immediately after implantation, this is called **immediate loading**. This procedure is, of course, particularly comfortable for the patient because he leaves the practice with a fixed tooth replacement and does not need a provisional bridge or denture. However, immediate loading is not possible or advisable in all cases and the implantologist needs experience to weigh up the potential benefits and risks in the individual case.

Example I from our practice

Single-tooth implants

Click on the pictures for a larger view.



Our 27-year-old patient S.G. was dissatisfied with the cosmetic appearance of her front teeth. Her two lateral incisors had been missing since birth. On the right the corresponding milk tooth was still there, while on the left the canine tooth had taken the place of the missing incisor and the milk tooth was behind it. She was particularly unhappy about the gaps and the asymmetric gum contours. We removed the two milk teeth and replaced them with implants. We evened out the gum margins by surgically extending the crowns. After bleaching, we then installed all-ceramic crowns on the implants and provided the adjacent front teeth with ceramic veneers. The implant crowns are now indistinguishable from the natural teeth.





Example II from our practice

Single-tooth implants

Click on the pictures for a larger view.



The 48-year-old patient Maria C. had lost both middle incisors a few years ago as a result of an accident and had since then been wearing a clasp-retained removable partial denture. As she was dissatisfied with her appearance and the fit of the denture, she came to see us about implant treatment. Unfortunately, through the accident and the long time without teeth a lot of bone had already been lost.



After bone and gum augmentation and placement of two implants, all four incisors were provided with all-ceramic crowns. The natural cosmetic appearance of the front teeth is restored.

The **alternative** to a single-tooth implant is still a conventional bridge supported by the adjacent teeth. This is an option particularly if the teeth on either side of the gap are already crowned, have large fillings or are decayed and would need crown treatment anyway. In the case of healthy teeth with no tooth decay the preferred solution today is definitely implants, which can be fitted without having to file down healthy teeth. A three-unit bridge costs approximately the same as a simple single-tooth implant with crown.



Advantages of bridges	Advantages of implants
<ul style="list-style-type: none"> • No operation necessary • Good aesthetic and functional results 	<ul style="list-style-type: none"> • No need to file down adjacent teeth • Extendable • Oral hygiene same as for natural teeth • Implant prevents bone loss • No tooth decay possible
Disadvantages of bridges	Disadvantages of implants
<ul style="list-style-type: none"> • Adjacent teeth have to be filed down • This can lead to death of the tooth nerve (dental pulp) • Cannot be extended if further teeth are lost • Tooth decay and gum recession at the crown margin possible • Bone loss due to missing tooth • Oral hygiene more difficult 	<ul style="list-style-type: none"> • Requires a surgical procedure • Surgery is more elaborate if bone or gum augmentation is necessary

Implants for larger gaps (partially edentulous jaw)

If there are several teeth missing we speak of a partially edentulous jaw. **In the past**, when a bridge was not possible, a **removable partial denture** was often the only option. These dentures partially cover the roof of the mouth (palate) and can impair speech or trigger a gag reflex in sensitive patients. With **implants** the gap can be closed with an implant-supported fixed bridge, without removable dentures and without having to file down healthy adjacent teeth. **Cosmetic appearance and chewing function** are excellent with implant-retained bridges in comparison with clasp-retained removable dentures.

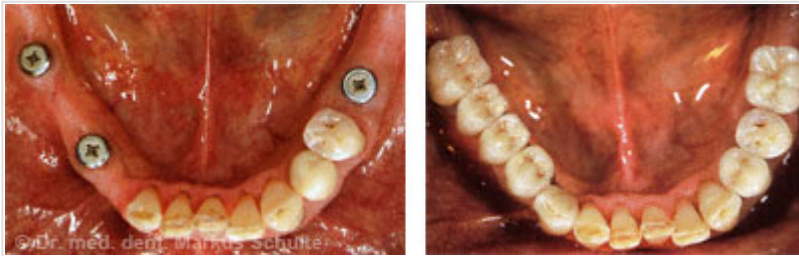
Dental prosthetics yesterday



Missing teeth in the upper and lower jaw are replaced with clasp-retained removable dentures (cast partial dentures). These partially cover the roof of the mouth and do not offer optimal chewing function and cosmetic appearance.

Dental prosthetics today

The back teeth of the lower jaw on both sides are replaced with natural looking, fixed ceramic bridges and crowns on implants.



Advantages of removable partial dentures	Advantages of implant bridges
<ul style="list-style-type: none"> • Simple clasp-retained dentures less expensive • No surgery necessary 	<ul style="list-style-type: none"> • Optimal chewing function and aesthetic appearance • Feel just like natural teeth • No retainers, plates or bars necessary • No damage to adjacent teeth
Disadvantages of removable partial dentures	Disadvantages of implant bridges
<ul style="list-style-type: none"> • Poor aesthetic appearance, e.g. due to visible clasps • Sometimes unsatisfactory fit • Bar or plate can be uncomfortable • Clasps can damage the supporting teeth 	<ul style="list-style-type: none"> • Surgical procedure necessary • More expensive than simple removable partial dentures

Implants

Toothless (edentulous) jaw and full-mouth reconstruction with implants



In the past the loss of all teeth inevitably meant wearing **full dentures** with all the associated consequences: pressure sores, often poor fitting dentures, particularly in the lower jaw, limited chewing function, reduced sense of taste, sometimes gagging or impaired speech.

In addition, the continuous pressure of the dentures causes **shrinkage of the jawbone** due to accelerated **bone loss** (also known as **bone resorption or atrophy**) and thus leads to an even worse fit of the dentures. Poorly fitting dentures do not provide adequate support for the tissues of the face, particularly the lips, which makes the patients **look older** and encourages the development of **premature wrinkles**. The psychological effect should not be underestimated either as for many people full dentures symbolise old age.

With dental implants we can now break this vicious circle. Only 2-4 implants fitted with studs or other attachments are sufficient to give a full denture **stable support**. With more sophisticated constructions it is possible in most cases to anchor a fixed bridge in a completely toothless (edentulous) jaw. The old dream of new fixed teeth has now become reality and enables many people to regain an important piece of quality of life.



For many years now, one of our key areas of expertise has been the **rehabilitation of toothless patients** and **full reconstruction in patients who have to have all their teeth removed**. In the following we give you an overview of the most important methods used in our practice for removable and fixed dental restoration in toothless jaws.

Visibly improved quality of life:

57-year-old toothless patient before and after receiving fixed implant-supported replacement teeth.

The good support for the lips and cheeks gives the face a fuller appearance and makes the patient look considerably younger.

Removable dentures on implants

This is the simplest and often the least expensive form of implant treatment for toothless patients. It is suitable particularly for patients who are already wearing dentures but are dissatisfied with their fit. In the case of severe shrinkage of the jawbone – after wearing full dentures for years – removable implant-supported overdentures are sometimes preferable to a fixed restoration. Retainer elements (studs or bar) are screwed onto the implants inserted in the jaw and the dentures clip onto these and sit firmly.



Stud anchors and bar give the dentures a firm hold.



Locator® attachments are special studs with which we can adjust the fit of the dentures precisely to suit the needs of the patient. If the dentures become loose the Locator fittings in the denture can be replaced in just a few minutes.

dentures and can immediately chew normally with them; there is no long waiting for the implant to integrate. In the **upper jaw** we do not recommend studs for removable dentures but prefer bar-retained dentures on 4-6 implants. However, a [fixed restoration](#) with an implant bridge is usually better.

Of course the dentures still have to be taken out and cleaned after meals. However, the good fit gives the patients a feeling of security and chewing is much more comfortable compared with normal full dentures. In the **lower jaw at least two implants** are needed, each of which is fitted with one stud. However, we prefer stud constructions with **three implants** because the denture is much more stable if it is anchored at three points and does not wobble or tilt even when biting with the incisors.

An alternative is the insertion of **four implants** which are connected with a bar made of a noble metal or titanium. The prosthesis then clips onto the bar with great precision. The advantage of bar-retained dentures is that they are **immediately functional**. Only one day after implantation the patient is given the

Example I from our practice

Removable tooth replacement on implants



55-year-old patient after full reconstruction with 4 implants in the lower jaw and bar-anchored removable dentures. The firm hold of the dentures ensures comfortable chewing.

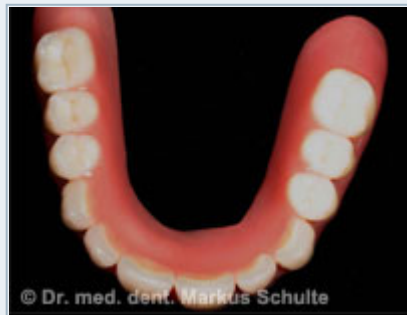


Example II from our practice

Removable tooth replacement on implants



This 39-year-old patient, a former photo model, had had major reconstruction done several years ago in Eastern Europe. All her teeth had been crowned. Unfortunately the work had been done so badly that the patient had developed massive periodontal disease and tooth decay under the crowns. When she came to see us she was suffering from severe depression because she was ashamed to show her teeth in public.



All the teeth in the upper jaw had to be removed. On account of the considerable bone loss we decided in this case to fit bar-retained dentures on 8 implants. The extractions, bone augmentation and implant placement were performed in the same session under general anaesthesia.



After the successful rehabilitation: The patient has rediscovered her smile and overcome her depression.

Fixed implant bridges in the toothless jaw - Fixed teeth in one day

More and more patients today want implant treatment which does not involve removable dentures but provides "permanent teeth" which look and feel just like natural teeth. In the past, this kind of full reconstruction with dental implants was a very major procedure as it involved placing 6 to 8, sometimes 10 implants in each jaw, and bone augmentation was often also necessary. This meant that the treatment was very expensive and unaffordable for many patients. In addition, the whole treatment often took as long as 12 months, with tedious healing phases during which the patients had to put up with removable full dentures, before the final bridgework could at last be fitted.

Today, thanks to the advances in modern implantology we can offer our patients solutions which are considerably less time consuming, more comfortable, safer and less expensive.



With the **All-on-4™** method we can provide immediate fixed tooth replacement with only **four implants per jaw**. The back implants are placed at an angle of 30-45 degrees. This means that we can usually manage **without bone augmentation** and allows us to steer clear of critical anatomical structures such as the maxillary sinus in the upper jaw and the sensory nerve in the lower jaw.



After placement of the 4 implants (any remaining teeth can be removed in the same session) a previously fabricated provisional bridge is screwed onto the implants. The patient leaves our practice with **fixed functional teeth**. About three months later the final bridge is then installed.

All [scientific studies](#) consistently show a **very high success rate** for implant bridges using the All-on-4™ technique. All-on-4™ bridges are just as durable and reliable as constructions with six or more implants. In addition, we can **avoid bone augmentation**, which is often stressful for the patient and not without risk, and can considerably reduce treatment times and costs. For all these reasons we prefer the All-on-4™ method for full reconstruction with implants.

Because of our extensive experience with this method we are convinced of the longevity of the All-On-Four-prosthesis and grant our patients a [10 year guarantee against implant loss](#).

In the case of extreme bone loss in the upper jaw, e.g. after wearing full dentures for decades, there is sometimes no bone left at all and normal implantation is therefore impossible. A good alternative to extensive bone grafting is the [zygomatic implant](#).

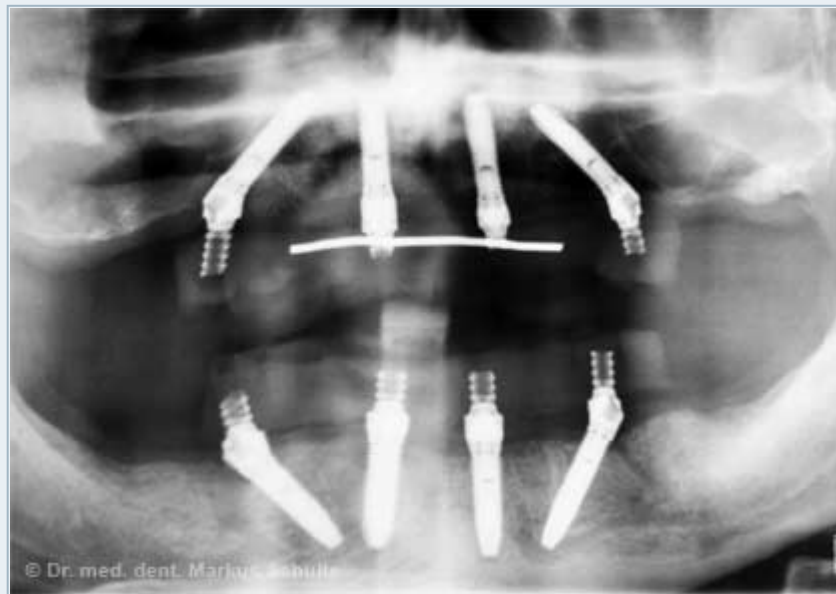
Example I from our practice

All-On-Four Method.

Durch Klicken auf die Bilder gelangen Sie zu einer grösseren Bildansicht.



43-year-old man with advanced severe gum disease. Because of anxiety the patient had delayed the treatment for years. When he finally consulted us numerous teeth were loose. The patient suffered from severe chronic pain and had serious psychological problems. The examination showed that there was already very marked bone loss. All the teeth had to be removed. The patient, who had come to us from abroad, wanted full mouth reconstruction under general anaesthesia. As a person in the public eye it was important to him that the treatment time was as short as possible and that he had "fixed teeth" from the start.



In an operation under general anaesthesia we removed all the teeth and immediately placed 4 implants per jaw in the upper and lower jaws using the All-on-4™ method. Through the special approach of this procedure we were able to do without major bone augmentation or grafting in spite of the bone loss. This meant that the implants could be immediately loaded with fixed provisional prosthesis 4 hours after the operation and spared the patient months of waiting with provisional removable dentures.



Example II from our practice

All-On-Four Method.



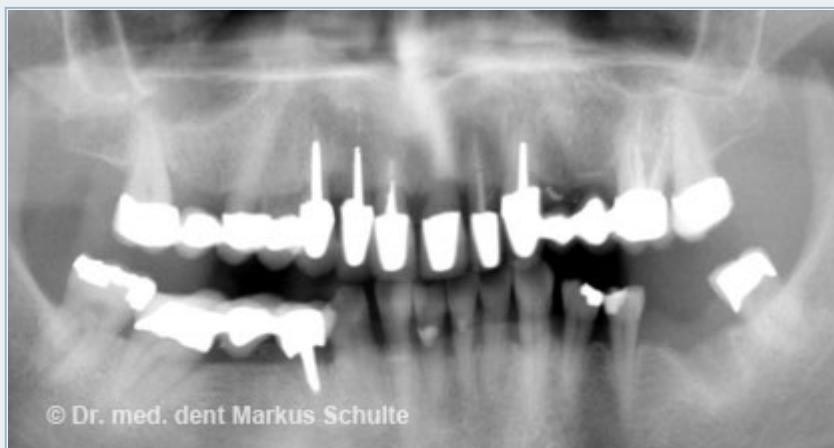
In this 49-year-old patient, advanced gum disease had led to pathologic tooth migration. The pressure of chewing had resulted in a fan-shaped arrangement of the teeth. The top pictures show the situation before the treatment. The patient, who attached great importance to a well-groomed appearance, was understandably miserable about her situation and wanted a full-mouth reconstruction. In an operation under general anaesthesia we removed the upper teeth and, in the same session, placed four implants using the All-on-4™ technique. On the same day, some hours later, the patient was given a fixed provisional denture which was screwed onto the implants (immediate function). In the lower jaw we were able to save most of the teeth through periodontal treatment. Only one implant was necessary here. The bottom pictures show the patient with the final tooth replacement three months after the operation.



Example II from our practice

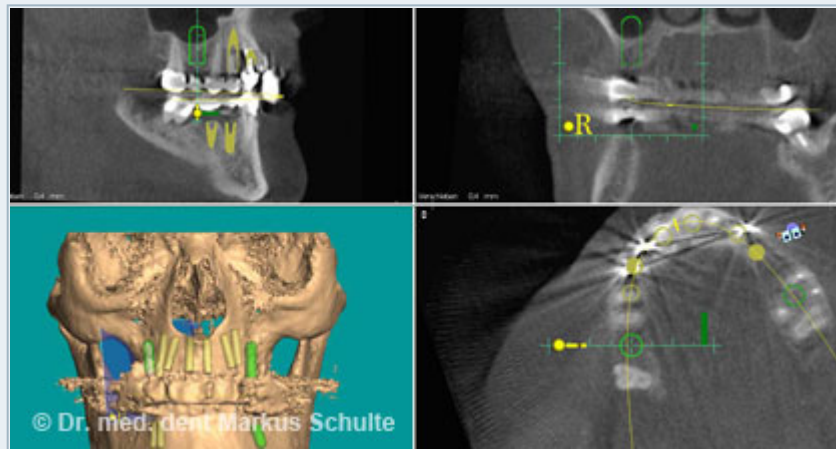
8 implants in the upper jaw

Examples I and II show the [All-On-4 method](#) with a fixed bridge on four implants. In particularly demanding cases it is sometimes better not to fit the jaw with a dental replacement consisting of one piece but to use separate individual ceramic implant bridges instead. For this very elaborate procedure 8 implants usually have to be placed in the upper jaw, while in the lower jaw six implants are usually sufficient. Our aim is always immediate function ([immediate loading](#)) in the region of the front implants in order to spare the patient a tedious healing phase of several months with removable provisional bridgework.



This 65-year-old woman consulted our practice because she was increasingly unhappy with the cosmetic appearance of her 20-year old bridges in the upper jaw. At the first examination we found that the dental substance under the bridges was severely damaged by tooth decay. The prognosis of the pivot teeth under the crowns was so poor that it did not seem advisable to make

new bridges for the existing teeth. The patient therefore decided on full reconstruction with extraction of all upper teeth and replacement with 8 implants and 4 separate ceramic bridges. For the reconstruction of the lower jaw we planned 3 implants and restoration of all teeth with single all-ceramic crowns.



First we performed careful planning on the basis of X-rays, models and photos. A computed tomographic scan (CBVT) permitted a three-dimensional analysis of the jawbone and virtual simulation of the implantation on the computer.

The operation was performed under general anaesthesia. At the same time as removing the teeth we were able to place eight stable implants in the upper jaw; for the back right implant bone augmentation (sinus lift) was necessary. In addition we performed gum augmentation with a gum graft in order to strengthen the gum tissue around the implants and prevent gum loss. At the end of the operation a previously fabricated fixed provisional bridge was firmly screwed on to the front six implants while the two back implants were allowed to heal without loading.



After six months the implants had become fully integrated into the bone so that we were able to install the definitive replacements. After taking an impression, individual ceramic posts (abutments) made in the dental laboratory were screwed onto the implants in the upper jaw. We then cemented the four separate metal-free all ceramic bridges onto these ceramic abutments.

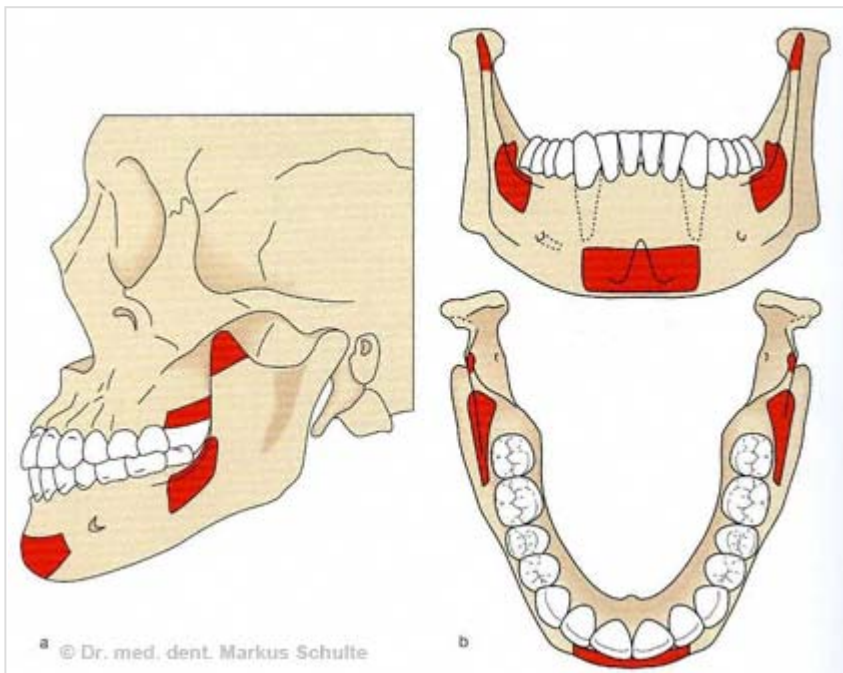


Implants

Bone augmentation

Frequently the height or width of the jawbone is reduced by bone loss (atrophy), leaving insufficient existing bone mass to support an implant. If implants are required the bone needs to be built up. This procedure, known as bone augmentation, can be done before or at the same time as the implant placement. Either the bone from the patient's body or a bone substitute can be used.

The best material for [bone grafting](#) is still bone from the patient's own body (**autogenous bone**), from the lower jaw or the chin, for example. Only in cases of extreme bone atrophy is it necessary to take the bone graft from an extraoral site such as the hip.

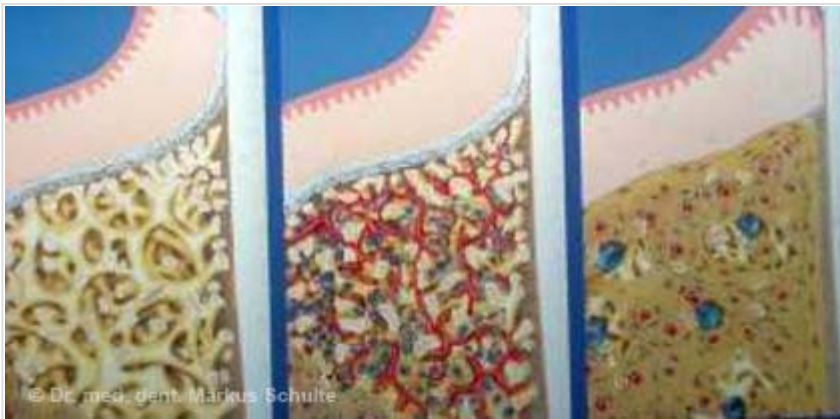


The harvested bone is used in the form of blocks which are fixed with small titanium screws to the part of the jaw requiring augmentation; alternatively the bone may be ground and used in the form of granules which are covered with a special membrane (e.g. Bio-Gide®). After about 6 months the bone graft is integrated and the implants can be placed.

The areas marked in red indicate the possible bone harvesting sites in the mouth: chin, mandibular angle, ascending ramus of the lower jaw and maxillary tuberosity in the posterior upper jaw.



Bone substitute materials and membranes: artificial bone (here Bio-Oss®) is available in the form of granules of different sizes or as block.

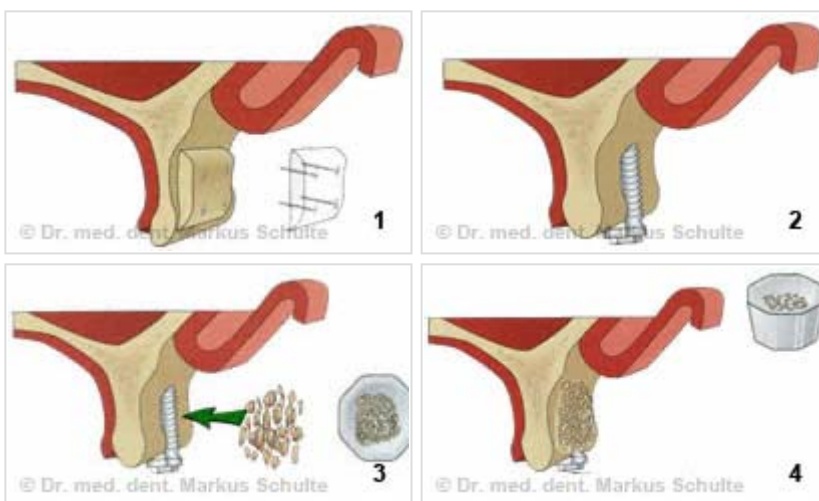


Guided bone regeneration (GBR):

Left: Bone substitute material (Bio-Oss®) is covered with a collagen membrane (Bio-Gide®).

Middle: After about 8 weeks blood vessels and bone-forming cells have grown into the artificial bone

Right: After several months the membrane has dissolved, the foreign material has been completely replaced by newly formed bone from the patient's own body..



Deficient alveolar ridge: Before implant placement the bone is augmented with a block graft (1). Smaller bony defects are filled with bone granules or bone substitute during the implant procedure (2-4).

Bone augmentation using **membranes** is also called **GBR** (guided **b**one **r**egeneration) or **GTR** (guided **t**issue **r**egeneration). Bio-Gide®, for example, is a collagen membrane which dissolves and therefore does not have to be removed.

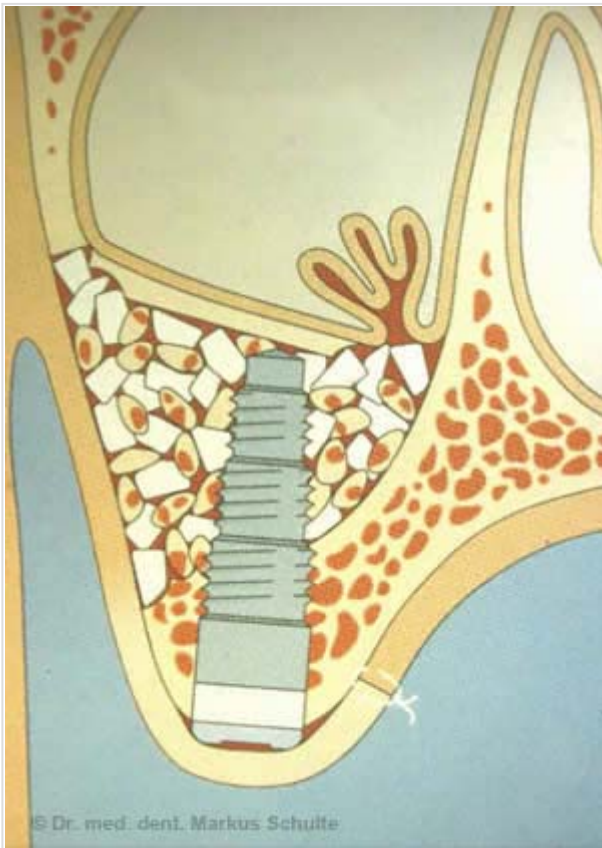
Bone substitutes (e.g. Bio-Oss®) of synthetic or natural origin can also be used for smaller defects.

"Artificial bone" is infiltrated and gradually replaced by bone from the patient's own body in the course of 3-8 months. Advantage: The use of bone substitutes means that no bone has to be harvested from the patient's body. Artificial bone and autograft bone from the patient's own body can also be mixed.

Sinuslift (Sinus floor augmentation)

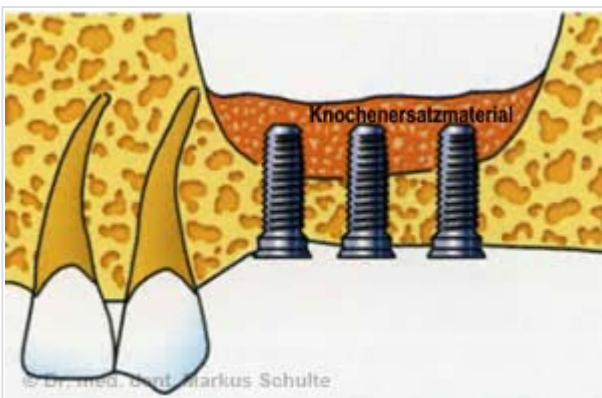
A special kind of bone augmentation is the sinus lift. In the region of the back teeth of the upper jaw the large air-filled **maxillary sinus** often leaves insufficient bone mass for successful implant placement. Here the bone augmentation procedure known as sinus lift can help. Through an operative access from the mouth, the floor of the maxillary sinus is exposed and the membrane lining the sinus is carefully raised. The resulting space is filled with bone substitute material. In the case of sufficient height of the alveolar bone, the implants can be immediately placed. If the bone thickness is insufficient for stable anchorage of the implant, the bone is first built up and implants are placed into the reconstructed bone after six months.

The video simulation (1 MB) shows how the sinus lift procedure is performed.



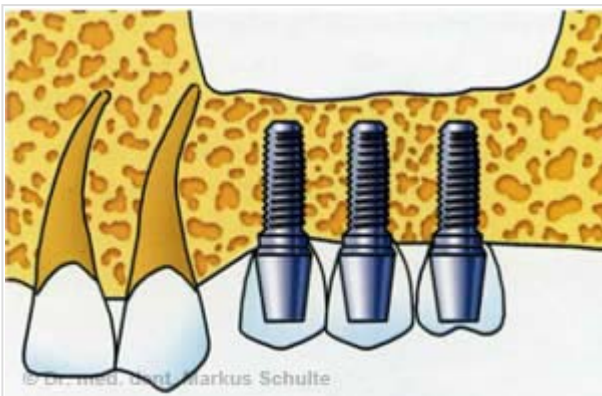
Scientific studies have shown without any doubt that in the case of maxillary sinus floor elevation (sinus lift) the results obtained with artificial bone are just as good as those obtained with autograft bone. For this reason we use only bone substitutes such as Bio-Oss® for the sinus lift procedure and thus spare our patients the harvesting of autogenous bone.

Today, the sinus lift is a routine operation which produces predictably good results in experienced hands. Nevertheless, the exposure and fenestration of the lateral maxillary sinus wall constitute a not inconsiderable operative trauma for the patient. Therefore the current trend is towards the use of minimally invasive surgical techniques for this procedure. In **balloon-assisted sinus floor elevation** (Balloon Lift Control) a balloon is inserted under the lining of the maxillary sinus through a small access at the site of the planned implantation and carefully filled with fluid. The pressure of the balloon gently raises the membrane lining the sinus while the sinus is viewed through an **endoscope**. When the desired volume has been achieved the balloon is emptied and removed and bone substitute placed in the resulting space through the same access.



This minimally invasive sinus lift is not particularly stressful for the patient and minimises the risk of an infection after the procedure. We therefore use this procedure in suitable cases.

In spite of all progress, bone augmentation always carries certain risks. For example, the bone graft can be lost through a wound infection. For this reason we try to avoid major bone augmentation wherever possible. New procedures help us to do this: [Three-dimensional X-rays](#) and [computer guided implantation](#) enable us to make optimal use of the available bone and with innovative methods such as [All-On-4](#) und [zygoma-implants](#) we can often do without bone grafting entirely.



Sinus lift with simultaneous implant placement. The inserted bone substitute is gradually replaced by natural bone within about 6-9 months.

The balloon is filled and lifts the lining of the maxillary sinus. After removal of the emptied balloon a space remains. The space is filled with artificial bone.



Implants

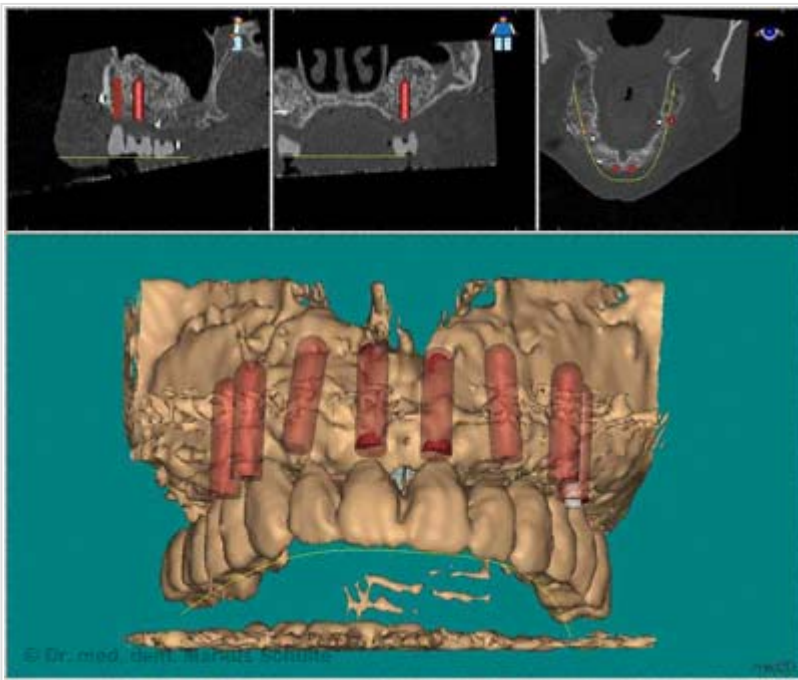
New surgical procedures

Computer guided implantation



Computed tomography permits the preparation of true to scale three dimensional images (3D) of the facial bones. With special software (e.g. Med3D®, NobelGuide® or Siplant®) it is now possible to select the suitable implants virtually on the computer screen and place them in the optimal position. Sensitive anatomical structures, such as sensory nerves, can be made visible and damage to them can be avoided. In addition, the precise imaging permits optimal use of the patient's available bone which in some cases makes bone augmentation unnecessary.

*NewTom®: the latest generation
cone beam scanner – precise 3D-
images with low radiation exposure*



Virtual implantation on the computer and 3D-template

The digital data obtained in this virtual implantation are then used to prepare a **three-dimensional template** made of plastic or titanium. This drilling template is placed in the patient's mouth during the implant operation. Drill sleeves in the template guide the bone drill during the implantation and ensure that the implants are placed exactly in the **ideal position** planned on the computer. The benefit for the patient is that the gums often do not have to be opened (no swelling, practically no pain after the procedure). A further advantage of template guided implantation is the possibility of preparing an exactly fitting provisional bridge before the implant placement. This means that ideally the patient can go home with fixed, functional teeth shortly after the implant placement. In order not to raise false expectations and give you honest information we should, however, mention that at the present time computer guided template implantation is **not possible or appropriate in all cases**. We always use this particularly safe and gentle method if it brings the patient concrete benefit.

Example from our practice

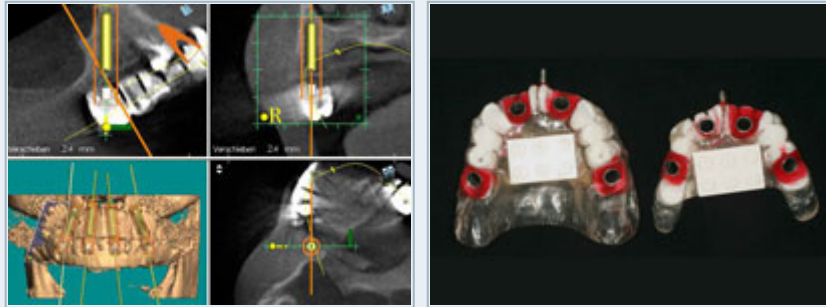
Full-mouth reconstruction with computer guided implantology

This 84-year-old woman could no longer cope with her old, poorly fitting dentures and came to us for advice about fixed tooth replacement on implants. On account of the patient's advanced age we wanted to offer her the least traumatic, minimally invasive procedure possible.

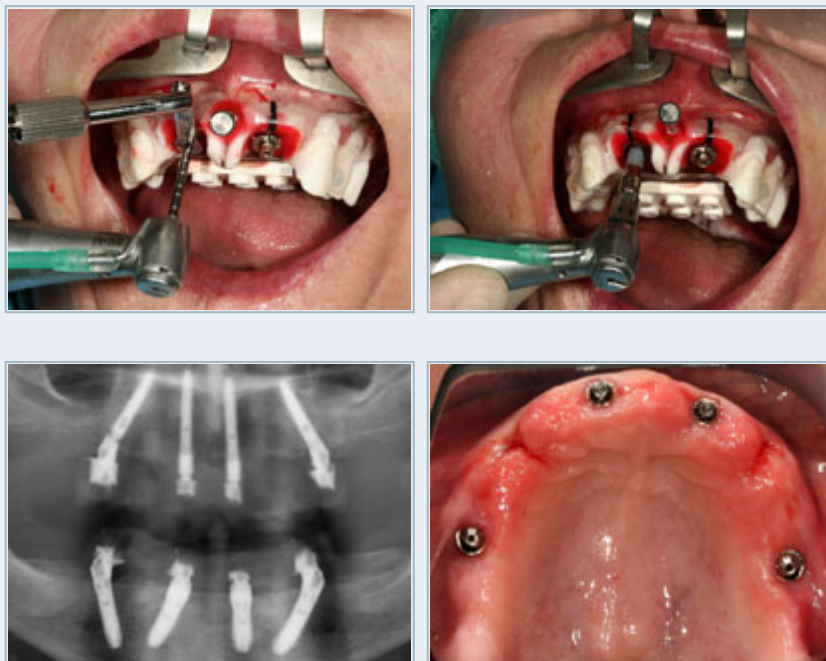


First we obtained a CT scan with X-ray films placed in the upper and lower jaws ([cone beam volumetric tomography](#) (CBVT) with particularly low radiation exposure) in order to perform a three-dimensional analysis of the available bone. The evaluation of these X-rays showed that there was sufficient bone mass for immediate implant placement without bone augmentation using the [All-On-4-method](#).

The planning of the optimal positioning of the implants in the bone and the determination of the diameter and length of the implant were performed virtually on the computer using the Med3D® software. The digital data thus obtained were sent to a specialised dental laboratory which fitted the X-ray templates with highly precise drill sleeves which serve to guide the drilling and the implants into exactly the previously planned correct position during implantation.



Then the operation could be performed with local anaesthesia. The remaining pivot teeth were removed. Then the templates were fixed in the mouth, the implant drilling performed through the drill sleeves, and the implants placed in the planned position, again using the template. The great advantage of the computer guided implantology is that it is no longer necessary to first open the gums with a scalpel and expose a large area of bone. As the implant position has already been planned on the computer the drilling can be performed minimally invasively through the closed gum tissue and the implants placed in the drill holes. According to the all-on-4 method, four implants were placed in each jaw.



The operating time was thus considerably shortened to about 45 minutes per jaw. The swelling and pain normally observed after

major implant operations were almost entirely absent, there was no bleeding or bruising either.

As the implant positioning had already been decided preoperatively (before the operation), the dental technician was able to make the provisional restorations before the implant placement. These bridges were screwed onto the implants immediately after the operation ([immediate loading](#)).

The patient was able to leave our practice with fixed tooth replacement on implants. The definitive [All-On-4 bridges](#) were fitted after three months.



Piezo-Surgery



Piezosurgery is a novel bone surgery technology developed by Prof. Tomaso Vercellotti that also opens up new horizons for dental implantology. Specially developed surgical instruments that utilize microvibrations at ultrasound frequencies allow extremely atraumatic bone cutting with minimal damage to tissue. The biggest advantage of Piezosurgery compared with the conventional scalpels, drills and burs used for cutting bone is its selective cut. This means the instrument cuts easily through hard tissue (bone) while soft tissue such as nerves, blood vessels or gum tissue remains undamaged even if it comes into direct contact with the tip of the instrument. Another advantage of Piezosurgery is that there is practically **no bleeding**, the bone is not traumatized and **wound healing** is therefore much better. We use this innovative technology mainly for taking bone grafts, for the sinus lift procedure and for all operations in which there is a danger of injuring nerves or blood vessels.

[Further information on Piezosurgery](#)

PRP: Growth factors from the patient's blood

A recent development in implantology is the administration of factors which stimulate bone growth. The aim of this strategy is to accelerate integration of the implants into the bone and thus shorten the often tedious healing phase (with provisional bridge or dentures) following implant placement.

The **platelet rich plasma (PRP)** obtained from the patient's blood contains high concentrations of a number of growth factors in addition to the [platelets](#). These growth factors lead to good bone regeneration and help achieve faster and better wound healing particularly in high-risk patients (e.g. diabetics, smokers). In our practice we use the automatic PCCS system from the company 3i to obtain the PRP. The system requires only 60 ml of the patient's blood to prepare the concentrate.

Zygomatic implants

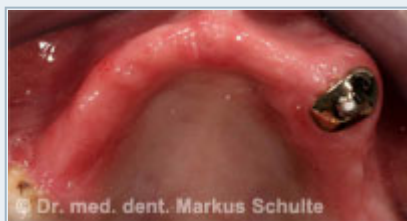


Zygoma implants are an interesting alternative to bone grafting in the case of severe bone loss in a **toothless upper jaw**. Special very long (about 50 mm) implants are anchored in the [zygomatic bone](#) and used to support a fixed implant bridge. The bone volume of the zygomatic bone remains quite stable even when there is bone loss in the region of the jawbones. One can either combine two to four normal implants at the front with two zygoma implants or use four zygoma implants (two on each side). The bridge which is screwed onto the implants is then fitted using the [All-On-4](#) method. If there is severe bone loss in the upper jaw, zygoma implants are the only means of providing fixed tooth replacement without extensive bone grafting. The stress and risk of the operation are far less than in the

case of major bone augmentation. Further advantages are the drastically shortened treatment times due to the possibility of immediate loading of the implants and the considerably lower [cost](#) as no bone grafting and no hospitalization are necessary.

Example from our practice

Zygomatic Implants



This 56-year-old patient consulted us because she had serious problems with her poorly fitting removable upper dentures. The X-ray and CT scan showed massive bone loss (atrophy) in the upper jaw so that placement of implants would have required prior major bone augmentation. For this bone graft we would have had to take bone from the hip. This is quite a stressful procedure for the patient. After the bone graft patients have to remain in hospital for a few days and there is often some difficulty walking in the first weeks after the operation due to the bone removal from the hip. In addition, in the initial phase not even provisional dentures can be used so as not to jeopardize the integration of the grafted bone. Then, for about nine months after the procedure, only a provisional removable full denture can be worn. It should also be mentioned that such large bone grafts have a relatively high failure rate of about 15-20%.

After thorough discussion of all the options, our patient therefore decided on zygoma implants. In an outpatient operation under general anaesthesia we removed the remaining teeth from the upper jaw and stably anchored four zygoma implants, two on

each side, in the zygomatic bone. On the very same day we were able to install a fixed provisional bridge on the implants (immediate loading). Three months later the definitive prosthetic rehabilitation was performed (see pictures below).



Implants

Immediate implants

Immediate implantation (not to be confused with [immediate loading](#)) means that a tooth is extracted and replaced immediately with an implant in the same session. This spares the patient an additional operation and is a standard procedure today. However, sometimes, e.g. in the case of infected teeth, it is better to remove the tooth first and wait until the inflammation in the bone has subsided before placing the implant.

Immediate loading of implants

As described above, implant treatment traditionally consisted of several successive phases:

1. Extracting the tooth
2. Placing the implant
3. Healing phase (6 weeks to 6 months)
4. Uncovering the implant
5. Installing the permanent crown, bridge or dentures

The long waiting time before completion of the final permanent restoration can be a problem, particularly if a satisfactory fixed provisional restoration cannot be fitted. In the case of major full-mouth reconstruction with implants, which involves removing all the teeth and replacing them with implants, the patients often had to wear full dentures for months until the implants had integrated and could be loaded.

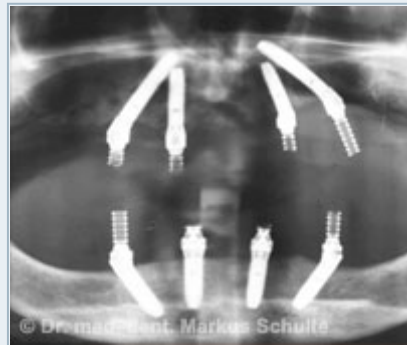
In such cases, **immediate loading of the dental implants** can be particularly advantageous. In a single session (also under general anaesthesia), all teeth are removed, the implants placed and a provisional fixed bridge prepared which is screwed onto the implants some hours after the operation. This procedure offers a great **gain in comfort and time** for the patient. However, it is important to emphasise that immediate loading is only feasible if there is a sufficient bone mass and bone quality to ensure stable anchoring of the implants. If this is not the case, it is always advisable to leave the implants to integrate without loading and only install the restoration when this has taken place.

Example I from our practice

Immediate loading



54-year-old patient with severely compromised dentition. Periodontal gum disease and dental decay had led to such serious damage that it was no longer possible to save the teeth. The patient had suffered considerably from her cosmetic "disfigurement" and expressed a wish for full-mouth reconstruction under general anaesthesia with "permanent teeth" from the very beginning. It was important to her that she remained aesthetically presentable throughout the entire treatment period.



Under general anaesthesia all teeth in the upper and lower jaws were removed. In the same session we placed 4 implants per jaw. The [All-On-4 method](#) allows such stable anchoring of the implants in the bone that fixed, functional bridges can be installed immediately. On the same day, 4 hours after the operation the patient was fitted with fixed provisional bridges screwed onto the implants and was able to return to her home town. The definitive bridges were then fitted three months after the beginning of treatment.



Implants

Risks and complications of dental implants

Today dental implants have a very good long-term prognosis. More than 90% of implants placed by experienced implantologists are still in full service after ten years. These are figures which cannot be matched by other medical disciplines, if we think of hip replacement in orthopaedics for example. Nevertheless, even with the most careful planning and performance of the procedure failures can still occur. Overloading of the bone or bacterial infections can lead to failure of implants or bone augmentations, less often adjacent sensory nerves or dental roots may be damaged.

The **main risk factors for implant failure** are:

- poor oral hygiene
- heavy smoking
- marked bone loss in the jaw
- poorly controlled diabetes with fluctuating blood glucose levels
- reduced immunity, e.g. in patients taking immunosuppressants after organ transplantation or patients with severe rheumatoid arthritis or other autoimmune diseases.

Regular check-ups and meticulous daily oral hygiene are the best prerequisites for lasting success of the implant treatment. If there is nevertheless implant failure, a renewed implantation can usually be performed after the bone has healed.

Implants

Costs and guarantee of implant treatment

In our practice we attach great importance to maximum cost transparency. As specialist practice with high costs for equipment and manpower we cannot and do not wish to compete with discount offers at home and abroad. What we do want is to offer our patients expertise at a fair price. Naturally the costs in each individual case will depend on the work involved (e.g. bone augmentation etc.) and we can only make a precise and reliable cost estimate after a thorough examination. At this point we only wish to give you a guide to the costs that you can expect for the most common treatments.

Some examples of the costs for implant treatment

Treatment	Costs
Single-tooth implant without bone augmentation with ceramic crown	CHF 4'000,- to 5'000,-
Two implants with two crowns	CHF 7'000,- to 9'000,-
Bone augmentation or sinus lift	CHF 700,- to 3'000,-
Ball-retained dentures with 2-3 implants	CHF 10'000. bis 15'000,-
Bar retained dentures with four implants	CHF 15'000,- to 25'000,-
Fixed implant bridge on 4-6 implants to replace all teeth, per jaw	CHF 20'000,- to 35'000,-

For elaborate major treatments such as the replacement of all teeth with implants we offer our patients a guaranteed fixed price. This price will not be exceeded even if unforeseen additional procedures, e.g. bone augmentation or additional implants, become necessary during the treatment.

Do you want to convert the CHF prices (Swiss francs) to euros? Use the [online currency converter](#)

Our ten year guarantee on implants

After more than 25 years of experience with several thousand of successfully placed implants we are convinced of the quality and longevity of our work. This is why we grant our patients a 10 year guarantee against the unlikely event of an implant loss:

If an implant exceptionally should not heal (get integrated) properly, become loose or break, it will be replaced by us free of charge within the guarantee period . The only condition: The control and hygiene appointments (2-3 times yearly) must be carried out regularly in our practice. Should problems as for example inflammations of gums or bone arise, these must be treated immediately, if necessary.

Excluded from the guarantee are damages from falling down, injury or accident or foreign interventions not authorized by us.

Implants

Questions and answers

How long do implants last?

The durability of implants has been studied for about 30 years in long-term studies. The results to date are encouraging and indicate that, with good oral hygiene and regular check-ups, implants placed by an experienced dental surgeon can last a lifetime.

Are implants an option for all patients?

Generally speaking, yes, except in the case of some rare diseases. Age is not relevant. Implants in older patients have the same good prognosis as in young patients. However, good oral hygiene is essential.

What are the advantages and disadvantages of dental implants?

Advantages

With implants it is possible to provide aesthetically pleasing fixed tooth replacement even in cases where in the past only removable bridges or dentures were possible. Another advantage is that, in contrast to bridges, it is not necessary to file down the adjacent teeth. Implants prevent bone loss and give full dentures firm anchorage.

Disadvantages

The need for a surgical procedure can be perceived as a disadvantage, likewise the healing time for integration of the implants (except in the case of [immediate loading](#)). Implant treatments can also be more expensive than conventional dentures or bridges.

Before deciding on implant treatment the advantages and disadvantages of the treatment must be carefully weighed up in each individual case.

Is implant placement painful? What can I expect after the operation?

The procedure under local anaesthesia is completely painless. If desired, additional [sedative medication \(conscious sedation\)](#) can be given or the procedure can be performed under [general anaesthesia](#). After the treatment it is normal to feel some soreness for a few days. This can easily be controlled with pain medication. Some more or less marked swelling for 3-5 days is also normal, sometimes there can be bruising but it will fade rapidly.

How long is the healing period and can I wear a temporary tooth replacement during this time?

The healing time required before an implant can be loaded depends on the bone quality and the number, length and diameter of the implants. In ideal cases when several stable implants are involved [immediate loading](#) is sometimes even possible. Otherwise it is normally necessary to wait 6-12 weeks before the implants can be uncovered and loaded. If bone augmentation is necessary, the healing period can be as long as 6 months or so. We usually make a provisional tooth replacement before implant placement which can normally be fitted immediately after the operation so that the patient is not without teeth at any time.

Is an implant necessary for each missing tooth?

No, implant supported bridges are possible in which missing teeth can be replaced by bridge elements. If all the teeth are missing or have to be extracted it is often sufficient to place four implants to support a complete bridge with 12 teeth ([All-on-4](#)).

Are implants covered by health insurance?

The statutory health insurance funds in Switzerland generally only pay for dental treatment with or without implants in exceptional cases if the tooth damage was caused by serious medical conditions. [Click here for further information on costs and insurance cover.](#)

Is general anaesthesia necessary for dental implants?

As the procedure can be performed painlessly with local anaesthesia, general anaesthesia is not usually necessary for simple implant placement. General anaesthesia is only indicated in the case of more major operations involving implants in both jaws and bone augmentation. However, many patients prefer not to be conscious during their treatment and therefore choose treatment under general anaesthesia which we offer as an option. A good alternative is sometimes additional sedation with medication or laughing gas in addition to the local anaesthesia. This is known as conscious sedation.

[For detailed explanations on the topic of general anaesthesia and sedation click here](#)

How much time do I need to take off work after implant placement?

This depends on the extent of the operation. After a single-tooth implantation you can normally go back to work immediately. After larger operations you should take it easy for 2-3 days.

Can you have implants at any age?

In young people implants can only be placed when jaw growth is complete, that is from about the age of 18 years. In adults there is no upper age limit. Statistically, implants in older people are just as successful as in young people as the ability of the bone to integrate the implant does not decline with increasing age. However, meticulous oral hygiene is essential.

Is implant treatment still possible if there is severe bone loss?

Normally, when we talk of bone loss we mean osteoporosis, a condition which occurs particularly in women after menopause and in which the bone loses its stability. Osteoporosis can also affect the jawbone. However, in most cases implantation is possible even with osteoporosis. It may be

necessary to place more implants to support larger bridges and to allow a longer healing period in order to prevent overloading. Sometimes we also talk of bone loss when we mean local loss of bone in the mouth, e.g. after periodontal gum disease or in toothless parts of the jaw. This kind of bone loss is also called atrophy. If there is insufficient bone for implantation as a result of atrophy [bone augmentation](#) can help. We also use methods which permit implant placement without bone grafting even in a toothless jaw with extreme atrophy ([zygoma-implant](#)).

Is smoking bad for implants?

Today we know that heavy smokers (more than 10 cigarettes per day) have a higher risk of losing implants than non-smokers. Smoking suppresses the body's local mechanisms for fighting off harmful bacteria with appropriate antibodies. This means that smokers are more likely than non-smokers to develop bone loss around their natural teeth (periodontal disease) or implants (peri-implant disease). In particular after major operations with bone augmentation smokers have a definitely higher risk of complications. We therefore advise our smoking patients to give up smoking before implant treatment.

Can dental implants be rejected by the body?

Titanium is an extremely biocompatible material which does not cause a foreign body reaction in the bone. There are no reports of allergy to titanium either. A genuine rejection reaction is therefore not possible. Loosening or failure of implants is due to overloading of the bone (e.g. too short a healing time, poor bone quality) or bacterial infections but not to rejection by the body

Are there different quality implants?

There are innumerable implant manufacturers on the market but only few systems are supported by long-term scientific studies. We use implants from the companies Straumann, Nobel Biocare and 3i that are supported by excellent documentation. Furthermore, these market leaders guarantee the component supply even after many years. This is extremely important when, for example, we need to replace a connecting screw after ten years.

What do you think about claims such as "permanent teeth in a day"?

As we all know, advertising claims often have little to do with reality. The immediate loading of implants, meaning the immediate attachment of a fixed tooth replacement to freshly placed implants, has considerable benefits for the patient: chewing is significantly more comfortable during the healing phase, there is no need for removable provisional bridgework and a significant time saving. However, in each individual case these benefits must be weighed up against the potential risks, which should not be underestimated. It is also important that the implantologist has extensive experience with immediate loading of implants. In our practice we use this method in selected cases in which the benefits for the patient clearly outweigh the risks.

How do I care for my implants?

The rules for implants are basically the same as for natural teeth: Good oral hygiene is recommended and pays. The use of dental floss and interdental brushes is helpful for keeping the area between the implants clean. Our experienced dental hygienists will be happy to help you and give you instructions about proper use of the various dental care products.