

Risk factors associated with implant sites prepared by orthodontic treatment: a systematic review

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Abstract

The patient's health and quality of life would probably be improved with dental implant. This study aimed to evaluate the risk factors associated with dental implants placed by orthodontic treatment. In this study, information on risk factors associated with implants of sites prepared, radiology stereotypes and hospitalized were obtained from databases such as Scopus, Google scholar and PubMed, and 58 articles were included for this purpose. After analyzing the articles, 24 articles were not accepted and 34 articles were accepted, then, 16 articles were miscarriage and 18 articles were scientific sources. The results showed that orthodontic treatment has a significant effect on a person's sense of beauty and would possibly increase self-confidence and quality of life. The stability of the implant in the healing phase depends on the quality and quantity of the bone. Also, the width of the bone is one of the important issues in creating a successful treatment. When an implant fails, problems and symptoms of failure usually occur within the first year after surgery. After one year, there is only about a 1% chance of failure, and on average only 1% of all implants fail each year.

Key Words: risk factors; dental implant, periodontal gum disease, radiographs.

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As much as the dental implant has a positive effect on the health and quality of life of the patient, it can have significant risks for his health and threaten the quality of life and health of the person.¹⁻³

Implant complications can occur immediately after tooth implantation or long after the procedure. Also, in some cases, implant failure occurs, so called the implant is lost or loose. One of the complications that occur after the failure of this treatment is the need to perform surgery again to repair or replace it.⁴⁻⁶ The skill, knowledge and experience of the surgeon and implant specialists are discussed here.

If you leave your dental implant in the hands of an experienced dental implant specialist, there is no room for worry or regret. Among the risks of dental implants, we can point out improper surgery and infection, which usually results in the loss of the implant.

Improper prosthesis construction causing discomfort and pain are among the possible complications that arise due

to improper design and improper distribution of force in the teeth.⁷

Dental implant infections

Between some parameters of the symptoms of dental implant infection are severe swelling, persistent fever, bad breath, jaw bone loss, sinus infection, pus and bleeding, pain, difficulty chewing, reddening of the gums, increasing the distance between the implant and the gums, and its loosening pointed out are very different.⁸⁻¹⁰

Problems after dental implantation

Although apart from the complications and disadvantages of dental implantation, problems such as loosening of the implant screw, gum disease, nerve damage, may follow after this procedure is clear. Hence, many of these problems are rare, and if you seek help from a professional implant specialist or an experienced clinic, none of these problems will probably arise.¹¹ In the following, we will examine the most common problems after dental implants (Figure 1).¹²



Fig. 1. Fig. 1. Prosthetic considerations for orthodontic implant site development. Upper panel: Lower panel: a) Prosthesis of front teeth – top and bottom row; b) Prosthesis of front teeth - top row; c) Prosthesis and dental wire installation in front teeth - top row; d) The shape of the tooth after the prosthesis

Materials and Methods

Search strategy and selection of articles

Scopus, Google scholar, PubMed were used as databases using keywords such as risk factors associated with implants of sites prepared by orthodontic treatment, radiology stereotypes and hospitalized. (Figure 2)⁷⁻⁹

Results

What are the reasons for loose dental implant screws?

- Hexagonal appearance of the implant: In the past, the appearance of the dental implant screw was hexagonal, which were connected to the abutment with external connections. The hexagonal models had very low resistance and their screws loosened with the slightest pressure, but nowadays these models are obsolete and use screws that have internal connections.¹⁴
- Failure to place the implant screw in its place: Bone profiles over time cause the dental implant to open because in this case this screw is not properly placed in its place.¹⁵
- Lack of suitable torque for screwing the abutment: Previously, the implant screw and the abutment screw were not well designed and their torque was not good

enough to be tightly wound, as a result, these screws loosened very quickly, but today, thanks to the progress made in the field of dentistry taken, the design of implant and abutment screws has been much improved.¹⁶

- Improper material of the implant screw: The screw used for this treatment is made of different materials such as titanium and ceramic, which are very good materials, but for the success of the dental implant, you must choose all the components of the dental implant according to each other. If the material of the screw is not compatible with other components, it can lead to loosening of the implant screw.¹⁷
- Improper size of the implant: One of the points that the surgeon must consider in order to prevent the loosening of the implant screw is that the abutment is no longer than the implant, because in this case the jaw bone will grow and the implant screw will loosen.

Breakage of the implant screw

The dental implant screw may break due to an external impact. This happens as a result of ignoring the loosening of the implant screw. When this screw is broken due to external pressure, the abutment and its screw and the dental crown remain in place.

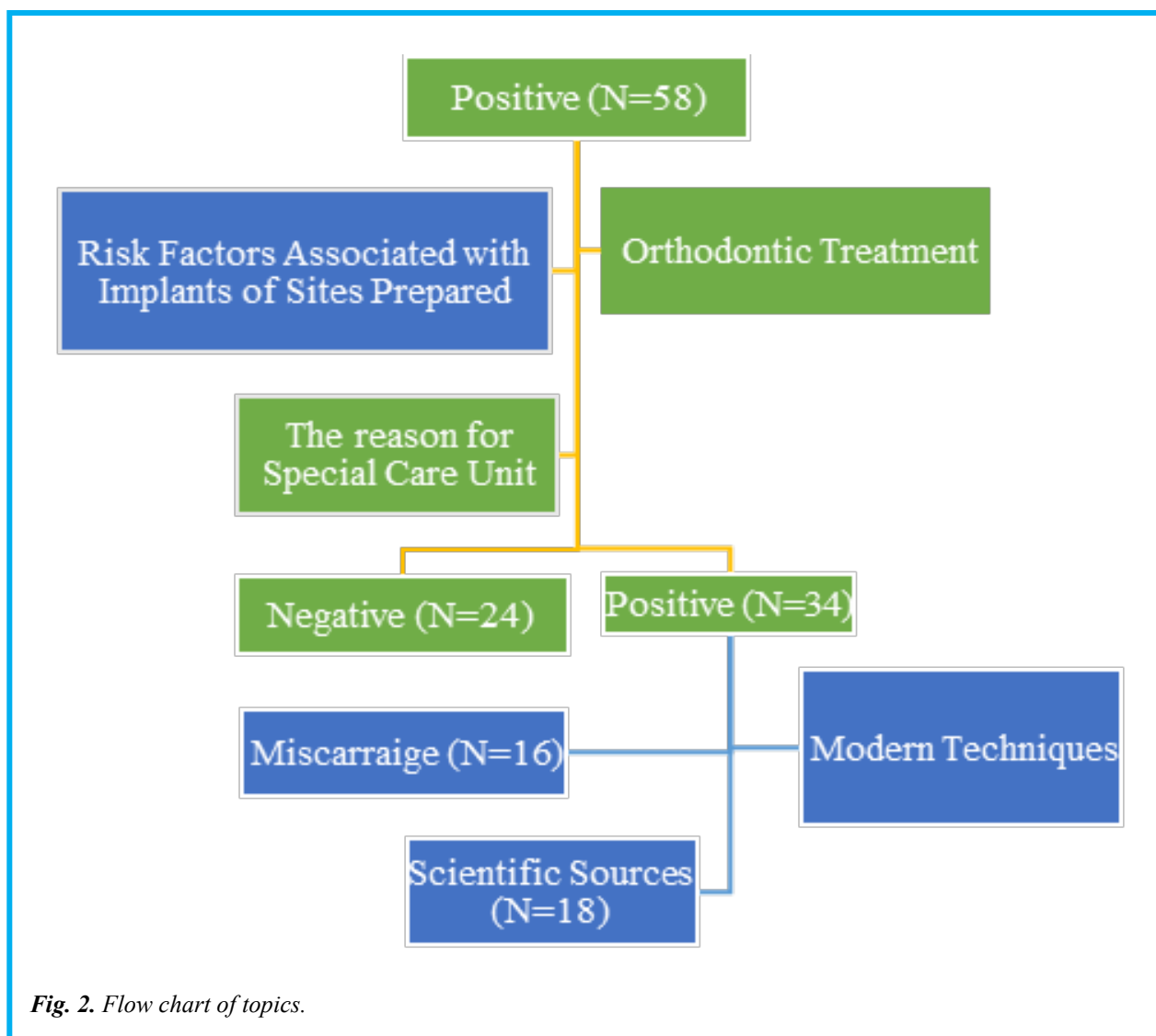


Fig. 2. Flow chart of topics.

Breaking the implant screw can cause pain and discomfort in using implanted teeth. In most cases, when the implant breaks, it must be replaced and a new tooth planted in its place.¹⁸⁻²⁰ The most important factor that is effective in preventing the implant screw from breaking is tightening it properly, that is, not so loose as to cause the screw to loosen and not so tight as to cause it to break.²¹

Sinus problems

Maxillary dental implants can penetrate into the sinus cavities and cause swelling of the sinuses. This is known as sinusitis. Symptoms such as pain, tenderness, swelling around the cheeks, eyes or forehead, green or yellow nasal mucus, blocked nose, decreased sense of smell, sinus headaches, toothache and bad breath can indicate sinusitis in people who have been treated with the method. Dental implants have been used.²²⁻²⁴

Opening of the implant suture

Since the gum is cut in dental implant surgery, the dentist sutures the gum after the operation. After about a week to ten days after stitching, these stitches will probably

loosen, but the problem starts when the stitches are opened before the gum heals completely.²⁵

If you notice the opening of the implant suture in the first days after the tooth implantation, do not press it in any way and go to the dentist immediately because the opening of the gum can cause serious complications such as bleeding, tearing of tissues and exposure of the jaw bone.²⁶

In general, if you follow the dentist's advice correctly, the tightness of the implant suture increases significantly.²⁷

Implant loosening

Dental implant loosening is one of the rarest events that may occur after its implantation. The only way to cure this problem is to remove the implant, treat the damaged tissues and re implant. This may happen after a strong impact or pressure on the implant or the loss of the jaw bone.²⁸ Inflammation of the gums around the implant is another because of its loosening. This inflammation is a sign of infection, but sometimes the loosening of the implant is related to its external part, the cover, which is easily resolved.²⁹

Gum analysis

Sometimes the patient may notice that the gum tissue around the implanted tooth begins to degrade. This can lead to inflammation and pain, to the extent that removing the dental implant is the only way to stop these discomforts.³⁰

Gum abscess

One of the possible problems of dental implants is gum abscess, which is caused by untreated gum infection. In order to reduce the possibility of gum abscess as much as possible, you should avoid factors that lead to gum infection and dental implants. One of these factors is dental implants with low-quality brands that are cheap. Another factor is not observing oral and dental hygiene by the patient himself. The recommendations that the specialist gives to the patient after this surgery should be implemented hair by hair.³¹⁻³³ Also, conditions such as smoking or the presence of an autoimmune disease such as diabetes also led to gum abscess after dental implants. Are dental implants harmful for pregnant women? According to the research conducted, this treatment does not harm the fetus and does not cause birth defects, but since many photographs and CT scans of the mouth must be taken for tooth implantation with this method, it is better to have the tooth removed during pregnancy.³⁴ Do not implant yourself, because X-rays are dangerous for pregnant women. One of the reasons why dental implant surgery is dangerous during pregnancy is the changes in oral and dental health during pregnancy, which can increase the chance of dental implant failure. Although there are no controlled studies on the success rate of dental implants during pregnancy, it is generally considered unethical to conduct clinical research on pregnant women, and we know that changes in the immune system, gingivitis, and gestational diabetes increase. The rate of implant failure in pregnant women.³⁵⁻³⁷

Can diabetics get implants?

In a word, yes. Dental implant surgery is safe for people with type 1 and type 2 diabetes. In other words, as long as the general health of the patient complies with the standard health guidelines and recommendations given by the dentist before the operation, you can perform the dental implant.³⁸ Research on diabetics who have had dental implants has shown that this procedure not only did not harm their health, but also improved their overall health. With permanent implants, you can be sure that you have and will maintain a healthy and balanced diet, but that's not all. Dental implants greatly reduce the common problems of artificial teeth such as burning, inflammation and infection. Since inflammatory problems in patients with diabetes are difficult to resolve, special attention should be paid to this matter.³⁹ However, during the consultation and tests required for dental implant surgery, the dentist will extract your medical history completely, and if your diabetes is severe enough to be considered dangerous by the implant specialist, the surgery will be canceled.⁴⁰

Necessity of sinus lift in dental implant surgery

As we said, the implant is placed inside the jaw bone during the surgery and after a few months, they are welded with the jaw bone. This means that there must be enough bone around the implant to heal properly. With age, the size of the human sinus cavity increases and over time the bone degenerates until it is completely lost. Bone loss can also occur after an accident, rough tooth extraction, gum disease, or tumor removal. Sometimes this happens because there is not enough bone height to implant a dental implant in the upper jaw. In such a situation, if the patient intends to have a tooth implant, he must perform the sinus lift procedure before the dental implant.⁴¹ Although the name sinus lift may sound intimidating, this procedure is fairly common and can only be performed by a qualified dentist or experienced surgeon. If you are anxious about a sinus lift, let your dentist know, in which case he will probably inject you with local anesthesia or sedation.

What people are dental implants used for?

Dental implant implantation is used in various cases and is generally a good substitute for natural teeth, but it is better to examine the issue in which cases dental implants are used and can benefit from its benefits?

- Broken or cracked teeth: One of the uses of dental implants is when your natural tooth is cracked or broken. In fact, when the crack or fracture is so deep that it cannot be repaired with normal methods, dental implant is the best solution.
- Tooth decay: When the tooth decay is very high, the doctor will suggest a dental implant after the examination, because the natural tooth cannot be repaired and must be replaced with an implant.⁴²
- Denture loosening: When the denture is loose for any reason, it causes many problems for people, including speech disorder, chewing disorder, etc. In this case, dental implants are a good option.⁴³
- Prevention of jawbone degeneration: Unfortunately, losing one or more natural teeth is very bad and terrible, because over time it causes jawbone degeneration. In this case, dental implants are used to reconstruct the jaw bone and prevent its degeneration.
- Preventing the disturbance of the facial composition: Another use of dental implants is to prevent the disturbance of the jaw and face composition. Because with the loss of natural teeth, the face is messed up and sunken.

Zygomatic implant

There is another type of dental implant known as zygomatic (Figure 3). This treatment is used in people whose jaw structure is severely degraded and lack jaw bone. In this method, a metal structure is screwed to the upper jaw bone and the jaw is ready for the implant. Zygomatic implant, like sub periosteal, is no longer used due to the expansion of the bone grafting method.

Sites of implants prepared by orthodontic treatment

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Fig. 3. Zygomatic implant. Upper panel: Using overdentures in teeth; Middle panel: Dental wiring along with the use of implant materials; Lower panels: Using implants and wire for irregular and stretched teeth.

Types of dental implants in terms of size and diameter
Dental implants are divided into the following types based on size:

- Conventional implants: This type of implant consists of two separate parts, the base and the abutment, which are connected to each other by means of the abutment screw. Its diameter is about 3.25 to 5 mm.
- Mini-implant: Mini-implant has a diameter of 1.8 to 3.3 mm and has a one-piece design. This type of implant is used to implant front teeth because it has small dimensions. This type is also used to fix lower jaw artificial teeth.⁴⁵
- Micro implant: This type of dental implant has smaller dimensions than the mini model. Its only use is when the distance between the teeth is very small.

Types of dental implants in terms of body surface

Dental implants are divided into titanium and zirconia types based on the body material. Titanium metal has a long lifespan, but nowadays implants made of zirconium

are used as a new method. It is the responsibility of the dentist to choose the right type for the patient. Also, implants are divided into conical, smooth and cylindrical types in terms of the appearance of the body.⁴⁶⁻⁴⁸

Types of dental implants in terms of connection with abutment

Dental implants are divided into three categories according to the type of connection to the abutment

- Internal hexagonal connection: The implant hole is in the shape of a hexagon into which the abutment is inserted and screwed.
- External hexagonal connection (male connection): The head of the implant is hexagonal and convex, in which the abutment is screwed.⁴⁹
- Octagonal connection (female connection): The implant hole is octagonal in which the abutment is placed and screwed.

Types of dental implant implantation based on steps

Dental implants are divided into several different types based on the number of work steps

- Immediate implant: As the name suggests, all the steps of immediate tooth implantation, including tooth extraction, implant placement and temporary veneer connection, are done in one step, that's why this method is also called one-day dental implant. Immediate dental implants are used for patients who intend to replace their front teeth or who do not want to wait a long time for the bone to heal and fuse with the implant.
- One-stage implant: In this method, the base of the implant is placed in the gum. A part of it can be seen protruding from the jaw. Then, after the complete welding of the crown part, it is easily mounted on it.⁵⁰
- Two-stage implant: In this method, which is also called delayed implant, the base of the implant is completely placed inside the gum and sewn. Therefore, the implant cannot be seen. Then, after a few weeks, it is operated again and the tissue on it is opened. After improvement, it is time to mold and make a permanent prosthesis.
- Strengthening the sinus: The key to the success of the dental implant is the quantity and quality of the bone in which the base is placed. The area behind the upper jaw is one of the most difficult places to place dental implants because the quality and number of bones is low and this point is close to the sinus. Sinus augmentation can help correct this problem by elevating the sinus floor and bone growth for dental implant placement.⁵¹

Procedures before implanting teeth by implant method

Since the dental implant is a surgical operation, you must take measures like any other surgery before doing it so that you do not have any problems during and after the

dental implant. Among the measures that must be taken before dental implants are the following:

- Before implanting a dental implant, it is better to research about the implant method and the type of implant. So do not rush to do this.
- Never forget that an implant is a permanent tooth implant method if you choose the best type, brand and model.⁵²
- The health status of your gums and jaw bones should be checked.
- Choose a skilled and specialized dentist to do this.
- It is better to familiarize yourself with the advantages and disadvantages of this treatment method before implantation.

What is the method of dental implant implementation?

If you are planning to get a dental implant, surely one of the things that occupy your mind is the steps of implementing this procedure. If you are familiar with the surgical steps and procedure before getting a dental implant done, there is no more worry and fear and you are completely ready for it because you know exactly what happens at each step. Dental implant steps include 4 main steps, which are:

- Evaluation and overall examination of the mouth: In the first step, the dental implant specialist evaluates the overall health of your mouth and gums. Oral health testing is usually done by OPG photos and other imaging methods to identify the exact location of the implant. At this stage, the dentist examines the patient's jawbone to ensure its strength and stability. If the jawbone is not strong enough, it cannot be a good base to hold the dental implant, so bone grafting surgery is needed. Another thing that the dentist checks at this stage is that if the patient has just pulled his tooth, that area has completely healed. Informing the dental implant specialist about the general health of the patient is one of the most important stages of dental implantation because it affects the healing process and duration.⁵³
- Implant placement: Your doctor will decide on the exact location of the implant according to the X-ray radiographs. Then he will operate on your jawbone.
- Recovery period: What leads to an increase in the resistance and strength of the dental implant is the growth of the surrounding bone. This process is called Osseointegration and it takes time. This period may take a few months for the implant to fully fuse to the jaw. After that, it is time to place temporary teeth. This is done for your comfort in chewing food and talking. Finally, permanent tooth placement can be done in just one session.⁵⁴
- Placement of permanent prosthesis cover: In this step, a dental crown cover unit or a piece of artificial teeth (implant-supported bridge and dentures) will be molded and made for you. Finally, it is placed on the dental implant base (implant posts).

Front tooth implant

Front tooth implant is the best treatment method to replace a missing tooth. One of the most common methods used to replace a missing front tooth is the bridge method, but in this method, two healthy teeth adjacent to the victim of the missing tooth are removed because two side teeth must be cut to perform the bridge.⁵⁵ To be used as a support base to connect the cover. But in the implant method, there is no need to trim the adjacent teeth. Also, the implementation of the implant can prevent the degeneration of the jaw bone in this area.

Complete upper and lower jaw implants

If you have lost all or most of your teeth, dental implants can still be a good option for you. In the full mouth implant method, 28 or 20 teeth are implanted. You may be wondering why 28? Because the number of teeth that play an essential role in correct speech and chewing food is 28. Full upper and lower jaw implants are much better than similar methods such as prostheses and dentures because they both have a natural appearance and are completely stable and do not have the problems of loose dentures, but to perform this procedure, the patient must meet certain physical conditions.⁵⁶

Molar tooth implant

Molar teeth are wide and flat teeth located at the back of the mouth. When eating, molars help to break, grind and crush food to make it easier to swallow. Similarly, molars play an important role in keeping the jaw and face aligned. In case of loss of one or more molar teeth, the implant is the best replacement option, because in other methods such as bridges, the adjacent teeth are cut to install the bridge on it, even if the adjacent teeth are completely healthy. The molar implant does not cause any damage to other teeth. The steps of molar tooth implant are not much different from implanting other teeth. The dentist opens the gum to expose the jawbone and then places the implant in the bone.⁵⁷⁻⁵⁹ Then it takes several months for the molar tooth implant post to fuse with the bone; During this time, the patient can use a prosthesis to replace the missing tooth. Once the metal base is fixed in the jaw, the specialist dentist fixes the abutment on it. Approximately two weeks later, the dentist will place an artificial tooth on the abutment to complete the molar implant surgery.

Canine implant

Canine teeth are upper and lower jaw teeth that are sharper than other teeth. If you have lost your canine teeth due to an impact, you can use implants to compensate them. The steps of canine tooth implant are similar to back teeth and molar implants, and after examining the condition of the mouth and teeth by the surgeon, this base should be implanted in the jawbone and after several months, if the recovery conditions are favorable, the next step, i.e. placing the veneer, should be done. If the jawbone is not strong enough, bone grafting should be done before tooth implantation.⁶⁰⁻⁶²

The difference between an implant and a dental cover

A dental implant consists of an implant base that is implanted by a surgeon in the gum. After that, a cover is attached to this base. As a result, this method can be used to replace lost and rootless teeth. Hence, dental veneers can also be used to replace a lost crown. This work is conditional on the health and preservation of the tooth root.

Implant cover

The dental implant cover is the part that is mounted on the fixture. This veneer is usually made of zirconia. Molding and doing this step is done about three months after the fixture is implanted in the gums. In case of bone grafting, this period increases to 6 months. The types of implant cover are:

- PFM coating: The base of this coating is made of precious metal alloy and it is covered with ceramic.
- Veneer with zirconia frame: The base of this veneer is made of zirconia, which is covered with porcelain or ceramic.
- Zirconia coating: The frame and top of this coating are made of zirconia.

Also, in terms of how to connect, the coatings are divided into the following two types

- Screw retained implant cover: This cover and abutment are connected and connected to the implant with the help of screws.
- Cemented implant cover: The abutment is installed on the fixture and this type of cover is connected to the abutment.⁶³

Dental implant post-operative care

The time required to recover from dental implant surgery depends on the number of implants placed, whether bone grafting surgery is also necessary, and your personal recovery time. A secure bond between the implant and the surrounding bone usually requires at least six weeks and up to six months. Maintaining hygiene and cleaning the implant site has a significant impact on the long-term success and durability of the dental implant. Lack of hygiene may lead to dental infections. Dental implant care refers to points that are done before and after this dental implant procedure so that problems such as pain, swelling and bleeding do not occur after the implant and to increase its lifespan.

- You can expect your gums and jaw to be sore for the first few days after surgery, but this should go away in the following weeks. You will be given antibiotics to take and rely mainly on over-the-counter pain relievers such as ibuprofen for any pain you may have. A little pain after a dental implant is not out of the question. In the first week after tooth implantation
- After surgery, you will be limited in what you can eat and exercise for a week.
- Do not eat crunchy or hard foods that can irritate your gums.

- Be sure to stick to your regular oral hygiene routine. Brush and floss as usual, but do not disturb the surgical site, especially if you have stitches.
- Gargling with warm salt water can also help your recovery. The water is soothing to the gums and its salt content has antiseptic properties.
- Once your dentist is sure that the implants are secure, you will then go in for a proper restoration.

How long is a dental implant?

How long the dental implant lasts depends on many things and it is different in different clients, because their physical conditions are different. The longevity of the implant depends on many factors, including the brand of the implant, the skill and knowledge of the dentist, how to care for and maintain the implanted tooth, the health of the patient's body and the absence of underlying diseases, etc., but it can be said that the durability of the dental implant is 10 to 25 years.

Dental implant failure and rescue

The success rate of initial dental implant implantation is about 95%. This is as long as your implant dentist placed it correctly and you had no signs of gum disease prior to surgery.

When is bone grafting needed?

If the patient's jawbone is not strong enough, bone grafting should be done before the dental implant. The reason for this is because the act of chewing puts a lot of pressure on the jawbone, and if the jawbone cannot support the implant, this surgery is likely to fail. Bone graft surgery can create a stronger base for the implant. There are various choices for bone graft surgery, for example, some dental implant specialists first transplant a part of the natural bone from another part of the body to the jaw, sometimes they create an artificial graft using bone substitute materials. Which method the dentist uses for bone grafting depends on the condition of your mouth and teeth. Even in some cases, only partial bone grafting is needed and is done at the same time as the dental implant. Dentures cannot be "Implanted". Implants are metal screws that are inserted into the jawbone to help support and support artificial teeth. It may be possible to place an implant under the existing dentures to help stabilize and support that denture. This is only done if the current dentures are in excellent condition.⁶⁴

Discussion

Today, a large number of people in society are inclined to perform orthodontic treatment in order to improve psychosocial problems related to beauty. In addition, recent studies emphasize that jaw abnormalities clearly affect people's self-confidence in social interactions. The results of the present study showed that the score of quality of life is related to oral health and the index of the need to orthodontic treatment. Various factors affect the definition of the quality of life, these factors can be examined in two social and individual groups; the

different results of different studies related to the quality of life are also related to these categories.⁶⁵⁻⁶⁶

In line with the results of the present study, in various studies, the average quality of life score decreases simultaneously with the increase of oral-dental problems.⁶⁴ On the other hand, adults who underwent orthodontic treatment in childhood did not differ from control group adults in terms of quality of life.⁶⁵ This result is not consistent with the results of the present study, because it does not report an increase in the quality of life in connection with orthodontics.⁵⁷ In justifying the differences in the results of different studies, two points are considered: Firstly, the age of the evaluated population in the mentioned studies and other similar studies of the investigated population had a different average age. Children up to the age of twelve see the concept of health as a multi-dimensional category, and in the range of 14-18 years, they will be able to evaluate their Older people Quality of Life (OQOL) according to its effects on their daily functioning, which can justify the selection of this age group in this study. Secondly, the quality of life evaluation method; Due to the great importance of the category of quality of life, many measurement tools have been presented and reviewed in recent years. For example, in a study,⁵⁷ the health-related quality of life index was used to examine the overall quality of life of the body in relation to the need for orthodontic treatment, while it seems that orthodontic treatment does not have a significant effect on other body organs and is more relevant with oral and dental health. In the case of children and adolescents, OQOL is very important because children and adolescents are constantly evolving and changing psychologically, socially and perceptually. Also, their current dysfunction can affect their psycho-social development in the future. When a tool is selected for measurement in a country, it should be culturally valid for that society while providing acceptable psychological characteristics. In another study, it was shown that self-confidence, dental-facial beauty and awareness of dental-facial beauty are effective factors in the lives of teenagers.⁶⁷ In the current study, the correlation between OQOL and Index of Complexity, Outcome and Need (ICON) was examined, the reason for examining the ICON index in this study is that this index is newer and more complete than other indices. Among the older indicators, Index of Orthodontic Treatment Need (IOTN) had more credibility, but ICON was considered as an alternative to this index.⁶⁷

The superiority of ICON over IOTN includes the possibility of simultaneously examining the need for treatment, determining the complexity of treatment and also predicting the results of treatment in the future, while IOTN only examines the need for orthodontic treatment. In addition to these cases, in the ICON index, there is more emphasis on examining anterior teeth than posterior teeth, which affect the pink appearance more. Chen's study showed that orthodontic treatment can have a

contradictory effect on the amount of OQOL, although there was an inverse relationship between ICON and OQOL temporarily and in the first month of the presence of the orthodontic appliance in the patient's mouth, for this reason, people undergoing orthodontic treatment were excluded from the study.³⁶ Some social restrictions can also be seen as influencing the results of the studies. The results of the present study and other studies show that oral and dental problems have an impact on the psychological, social aspects and the condition of the patient, and they can clearly affect the quality of life and important aspects of a person's life through disruption of social presence and interpersonal relationships. On the other hand, it was found that most people with different malocclusions feel embarrassed in social situations and may have individual impressions related to their pink-dental appearance.⁶⁸ Different people's perception of malocclusion is different and a person's awareness of the existence of malocclusion may not be related to its severity, and these things cause differences in the demand for orthodontic treatment by different people. Considering the cross-sectional nature of the present study, it is suggested to investigate the quality of life at different stages before and after treatment. Also, by separating the components of the ICON index and examining the relationship between its beauty component and other components, more favorable results can be obtained.

Implants in teenagers and before puberty

Although the implant in a young patient has advantages such as improved bone quality, good ossification, wound healing and healthy condition of the person, but all these factors are under the influence of one main factor, growth; Therefore, implant placement should be delayed until puberty or after adolescent growth occurs. Patients and families should be educated about the fact that implant placement before the completion of growth, which is around the age of 18 years, can have an unfavorable outcome. Waiting several years is the best way to ensure long-term success in your permanent dental restorations. Because we recognize the many challenges of tooth loss at any age, we offer alternative solutions for those who are too young to receive implants. We can help your general dentist replace a dental bridge or a custom-made removable partial denture to maintain function and appearance.

Implants in the elderly

Because people are likely to lose teeth as they age, dental implants are often an excellent and common solution to dentures.

Many people who are in their 70s, 80s and even 90s have had dental implants and have experienced very good treatment results. Studies show that dental implant treatment can be predictable and safe for the rapidly growing elderly population. Elderly patients who are medically stable are suitable candidates for implant surgery and ossification, and they will have better oral function, comfort and quality of life.

Factors inhibiting implants in old age

Theoretically, older patients potentially require longer recovery time, have more systemic health factors, and are more likely to have poor bone conditions at the site. Most studies show that aging is not a contraindication for implant treatment because the bone has a stored capacity for ossification. Instead of old age, the specific nature of the disease process, such as osteoporosis or diabetes, and the quality and quantity of bone at the implant site are considered for successful dental implant treatment (Supplementary Materials Table 1). For example, an elderly person who has been missing his teeth for many years may have lost jawbone or gingivitis during this time. Without adequate tissue density, a person is not a good candidate for dental implants. Bone grafting and gum grafting surgeries can be performed, which add several months to the overall treatment process, but some elderly patients prefer traditional dentures.

The ideal age of the implant

In general, it can be said that after puberty, any age is ideal for implant placement. Advances in medical science have made life easier for the elderly, and replacing and treating missing teeth in the elderly is a necessity. Studies show that implants have an ideal success rate for people over 80 years old, and experts encourage people in old age to turn to implant treatment instead of traditional and mobile artificial teeth that cause gum and bone loss over time.

Conclusive remarks

Different aspects of the quality of life can influence the willingness to perform the treatment of maxillofacial abnormalities and orthodontics. Also, orthodontic treatment has a significant effect on a person's sense of beauty and will increase self-confidence and, as a result, increase the quality of life. Sometimes, autoimmune diseases such as diabetes can increase the possibility of complications during dental implant surgery. According to an article in the Journal of the American Dental Association, dental implants are generally possible for people with controlled diabetes. This study monitored patients with controlled diabetes who had dental implants. After one year passed, neither the dental implant site nor blood sugar had any special complications. This does not mean that if you have diabetes, you will not experience certain complications, but in any case, having diabetes should not raise your concern about the safety of dental implants. Dental implant complications and its prevention can be one of the most important steps after dental implants, which can be very vulnerable if not done correctly. But this is not because all people suffer from complications after implanting a dental implant, but the implant can be very useful and affordable in a practical treatment. We must say that this treatment method has advantages and benefits twice as many as its side effects, which should not be neglected. Dental implants, like any other surgical procedure, can have side effects. Many complications can be resolved without serious problems. However, in

some cases complications can cause dental implant failure or even life-threatening conditions. Avoiding complications begins with careful treatment planning based on careful anatomic evaluations before surgery and understanding all possible complications. Studies show that implant surgery is more than 90% successful. The success of dental implants is directly related to the discovery of methods to increase the bone connection between the implants, and this also requires the creation of strong and healthy collagen tissue between the implant and the bone.

Various factors are involved in the successful fusion of bone tissue and implant placement such as having a bio-compatible material, an implant that is completely compatible with the prepared bone site, non-traumatic surgery with the aim of minimal tissue damage, the restoration phase without movement and intact, technical and precise surgical methods performed by a maxillofacial surgeon or a perio specialist. It takes place and the correct use of devices to minimize the distance between the implant and the bone. The first month after placing the fixture (implant) is the most important time for the initial repair of the surgical area. When pressure is applied to the implant during initial restoration, initial stability is lost. The stability of the implant in the healing phase depends on the quality and quantity of the bone. Also, the width of the bone is one of the important issues in creating a successful treatment. When an implant fails, problems and symptoms of failure usually occur within the first year after surgery. After one year, there is only about a 1% chance of failure, and on average only 1% of all implants fail each year. The desire and prescription of implants increased between 1986 and 1999, and now it is estimated that more than half of the alternative treatments for edentulous areas are implant surgery. Dental implants can be done for almost anyone who has lost one or more teeth or has had all of their teeth extracted in both jaws and decide to maintain their appearance or ability to chew. General health, the number and position of extracted teeth, and the quantity and quality of your bone tissue are all important in surgery. Implants also need hygiene just like natural teeth and maybe even more than them. The risk of an infection around the implant will cause it to fail and lose it. Therefore, your maxillofacial surgeon will ensure the health of your mouth before implanting and give you the necessary instructions to follow the points after the surgery; because the long-term success of implants depends on good hygiene control. After completing the treatment, the surgeon will check up on you during specific sessions and check the conditions of the operated area so that he/she can evaluate the implants and take the necessary measures to prevent any complications in the early stages. For implant placement, your mouth must be active without common tooth decay and periodontal disease. It is better that the implant surgery is performed by a maxillofacial surgeon or a periodontist, so that detailed examinations of the bone and gum tissue can be carried out before the surgery, and

if inflammation and special diseases are observed in that area, additional surgeries should be performed first to maintain the bone and gum health around the implant then proceed to place the implant to increase the useful life of the implant.

List of acronyms

ICON: Index of Complexity, Outcome and Need

IOTN: Index of Orthodontic Treatment Need

OQOL: Older people Quality of Life

Contributions of Authors

Conceptualization, MT, BS, AF. and MS.; methodology, SMS, MT and BS; validation, AF and MS.; formal analysis, BS and MS; investigation, MT; resources, AF; data curation, SMS; writing—original draft preparation, MT and BS; writing—review and editing, AF, MS and SMS; supervision, MT and BS; project administration, BS and MT. All authors have read and agreed to the published version of the manuscript.

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Sites of implants prepared by orthodontic treatment

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Supplementary Materials Table 1. Forest plot of risk factors associated with implants sites.

Raw	Study	Year		Proportion	Wight 98%	Weight %
1	Ellakany et al. ⁶⁷	2021		0.85	[0.39 – 1.02]	6.02
2	Daneste et al. ⁵⁷	2022		0.83	[0.42 – 1.01]	5.92
3	Fontes et al. ⁶²	2023		0.74	[0.55 – 1.02]	5.65
4	Duailibi et al. ⁴⁷	2008		0.91	[0.48 – 1.08]	6.03
Heterogeneity $t^2=0.00$, $I^2= 0.00$, $H^2=1.00$				0.98	[0.20 – 1.08]	
Test of $\Theta= \Theta$, $Q (4) =3.99$, $P= 0.66$						
1	Jedliński et al. ⁶⁴	2022		0.68	[0.52 – 1.06]	6.02
2	Bezerra et al. ⁵⁹	2021		0.74	[0.31 – 1.08]	5.92
3	Costa et al. ⁵⁸	2021		0.89	[0.19 – 1.01]	5.65
4	Leo et al. ⁵⁶	2016		0.90	[0.29 – 1.02]	6.03
Heterogeneity $t^2=0.00$, $I^2= 0.00$, $H^2=1.00$				0.98	[0.20 – 1.06]	
Test of $\Theta= \Theta$, $Q (4) =4.44$, $P= 0.71$						
1	Tian et al. ⁵³	2020		0.92	[0.39 – 1.06]	5.03
2	Casaña-Ruiz et al. ⁵²	2020		0.87	[0.54 – 1.02]	6.02
3	Oshima et al. ⁵¹	2015		0.88	[0.63 – 1.01]	5.57
4	Duailibi et al. ⁵⁰	2004		0.60	[0.25 – 1.08]	6.13
Heterogeneity $t^2=0.02$, $I^2= 0.00$, $H^2=1.00$				0.95	[0.22 – 1.07]	
Test of $\Theta= \Theta$, $Q (4) =5.55$, $P= 0.74$						
1	Shibli et al. ⁴⁶	2015		0.84	[0.27 – 1.08]	6.08
2	Geurs et al. ⁴⁵	2010		0.76	[0.36 – 1.06]	5.82
3	Patel et al. ⁴³	2012		0.69	[0.28 – 1.05]	5.85
4	Górski et al. ⁴¹	2023		0.82	[0.34 – 1.02]	6.09
Heterogeneity $t^2=0.01$, $I^2= 0.00$, $H^2=1.00$				0.0.95	[0.29 – 1.06]	
Test of $\Theta = \Theta$, $Q (4) =3.49$, $P= 0.80$						