

Threaded endosseous dental implant

Field of the invention

The invention relates to a threaded endosseous dental implant having a parabolic basic body showing a self-tapping thread construction that is provided with at least two cutting notches, with a parabolic groove of the thread and an upper part that is provided coronally to the thread construction, with a shaped hole for screw-in aids and threads for the fastening and fixing of dental crowns, bridges and similar things, as well as with a convex endosseous part and, if necessary, a conical part and/or a cap.

Background of the invention

Threaded dental implants even those having a self-tapping thread haven been known in many designs for a long time.

The patent specification DE 3735378 C2, for example, deals with a dental implant with an anchoring device, which consists of an oblong, cylindrical basic body whose thread tapers slightly conically in the lower part. Here, an opening is provided that is running outwards and into which osseous tissue can grow after the implant has been seated; this leads to a better adhesive strength. In the implant's upper part, there is a drilling provided with an internal thread, by means of which different adaptors can be accepted, like, for example, crowns provided with a thread, screws or cemented dental prostheses. Moreover, one has affixed a sloped wall area tapering into a shaped hole for a threaded tool.

Moreover, from the patents DE 200 22 420 U1 and DE 200 04 526 U1, one knows conical implants with cutting edges, which at

their coronal ends have a larger diameter than in their apical end, whereas this larger diameter remains constant for a larger period. One uses a self-tapping thread that is - at least in one partial area - interrupted by a groove so that a cutting edge results. Via the cylindrical, threaded section, a connection section follows in the coronal direction, the latter showing positive fit elements for keeping the attachment with the prosthesis in a torsion-resistant way.

In another self-tapping, threaded bone implant for dental purposes according to DE 37 08 638 A1, the threaded body is conical, its thread, however, runs cylindrically and is provided with cutting edges and wedge-shaped sections. The thread flanks have different flank angles. In the upper part of the basic implant body, an internal thread has been provided followed by a hexagon socket.

Finally, from WO 01/21091 A1, one knows a screw-shaped, endosseous dental implant with an apically situated implant tip, a coronally extending implant neck and an outside thread showing a generally parabolic outside contour with the implant tip as apex.

Due to their geometric form, the dental implants that are known due to the shown state-of-the-art cause an unfavourable distribution of the compression forces onto the jawbone during the seating of the implant. In order to completely neutralize their effect in the upper part, the cervical part of the implant has been designed cylindrically, whereas due to the lack of only a minor compression, sealing problems and thus a danger of infection might arise. Apart from that, the cutting notches' dimensions are often too small so that there is no satisfying chip removal when the implant is screwed into the bone and no primary rotation protection, either. The thread flanks' dimensions are often too small, as well, resulting in the fact that the implant doesn't find enough support in the bone.

Task of the invention

It is the invention's task to create a threaded, endosseous dental implant of the kind mentioned in the beginning eliminating the disadvantages of the state-of-the-art, the diameter of which does not increase proportionally from the apical to the crestal end, the lower part of which has a self-centring function during the screw-in process, and in which the compression forces that are exerted on the jawbone decline towards null with an increasing screw-in depth and in which a safe sealing in the endosseous area is achieved.

Summary of the invention

According to the invention, the task is solved by the fact that

- the upper part is designed cylindrically and shows a polished neck section coronally to the thread,
- it has grooves in the crestal passage in order to prevent bone fractures,
- the thread construction at both, the basic body and the groove of the thread are limited by a parable (P2 or P1 respectively) forming intersection points (S1; S2) outside the dental implant area so that the thread construction tapers with a thread depth that is imperceptively declining from the apical to the crestal end, whereas the thread construction reaches up to the upper part,
- the thread flanks of the thread construction show a flank angle of 20 degrees,
- the transition from the basic body to the convex endosseous part has been designed having a round form, and
- the cutting notches have in each case a maximal depth of 1/3 of the basic body's diameter and a width that is at least as large as the width of the respective remaining thread construction between the cutting notches.

The invention's advantages are that during seating the dental implant, its lower part provides for a self-centring of the implant. The distribution and the effect of the lateral compression forces onto the jawbone that is naturally becoming weaker towards the top adjust themselves to these conditions and at the endosseous exit are almost null, whereas a flush seating is guaranteed and thus, a safe sealing and the avoidance of infections due to the invasion of germs are reached to the largest possible extent, which again has a positive effect on the healing process.

The polished neck section in the cylindrical upper part guarantees that after inserting the implant, the mucosa lies against it and there are hardly any irritations so that the healing process is accelerated and gingival inflammations, for example, are prevented. The modified neck section guarantees a good soft tissue adsorption of the gingiva.

In some known dental implants, there is a clearance between the upper part and the thread construction at the basic body. According to the invention, this clearance is avoided so that the thread construction - in an almost unchanged section geometry of the thread flanks, e.g. without a noticeable tapering - directly reaches to the upper part. That means that the strong thread is used on the whole length of the basic body so that the dental implant is firmly fastened in the bone, thus, the primary stability is improved, and the implant's passage area into the bone remains free of chips.

The parables' course at the basic body and at the groove of the thread invests the thread with a systematic character, e.g. the parable of the basic body intersects the parable of the groove of the thread at intersection points outside the area of the dental implant and is subsequently sheathed by the parable of the groove of the thread. This allows for an optimisation of the cutting tools for the dental implant as all-purpose cutters can be used at an identical implant

diameter. Moreover, it is thus possible to design the basic body in a slimmer form.

Apart from that, the cutting notches' dimensions cause a better insertability, an optimal chip settlement and better chip removal during the seating of the implant and a safe primary rotation protection during the ossification. Advantageously, at least three cutting notches are provided from the apical end to at least the fifth turn of the thread.

Finally, the round transition from the basic body to the convex endosseous part reduces the risk of injury when inserting the implant into the bone, particularly in the side teeth area of the upper jaw.

According to another design of the invention, the cylindrical upper part is approximately 2 mm high, whereas the polished neck section at the cylindrical upper part is approximately 0.75 mm high.

According to another construction of the dental implant, a cylindrical drilling is provided in the centre of the upper part, starting in the apical direction with a thread and ending in the crestal end with a hexagon socket with a 60 degree chamfer.

Moreover, a collar has been designed as termination of the upper part that is followed by the conical part, preferably with hexagon socket and drilling with thread. The conical part serves as intake and the collar as stop for a cap that can be fixed with a fastening screw. The conical part is grooved and offers a rotation protection for the cap to be accepted.

It goes without saying that the afore-mentioned characteristics that still have to be explained hereinafter, cannot only be used in the respectively stated combination

but also in other combinations. The scope of the present invention is not only defined by the claims.

Short description of the drawings

In the following description, the invention is explained in more detail using application examples that are shown in the drawings. Figures 1 to 6 show the following examples:

Fig. 1 the front view of a dental implant according to the invention according to a first construction form,

Fig. 2 the sectional view of the dental implant according to fig. 1,

Fig. 3 the front view of a dental implant according to a second construction form,

Fig. 4 the sectional view of the dental implant according to fig. 3,

Fig. 5 the front view of a dental implant according to a third construction form, and

Fig. 6 the sectional view of the dental implant according to fig. 5.

Detailed description of the drawings

The invented dental implant 1 according to the figures 1 to 6 consists of a basic body 2 that is tapering from the crestal to the apical end and that is, from the apical to the crestal end, provided with a self-tapping asymmetric thread 3 with a thread depth that is basically constant or imperceptively declining.

The thread cross-section forms an irregular triangle whose

flank angle amounts to 20 degrees. The thread height and thus the thread 3 are sheathed by a parable P2 whose symmetry axis is also the one of the basic body 2 and - for a better exemplification - also the Y axis of a Cartesian coordinate system.

The advantageous selection of the paraboles P1 and P2 produces the thread construction at the basic body 2, whereas the basic body 2 is limited by the parable P2 and the groove of the thread is limited by the parable P1. Outside the area of the dental implant 1, the paraboles P1 and P2 form intersection points S1 and S2, as shown in fig. 1. Thus, the thread construction tapers from the apical end to the crestal end. The thread 3 reaches up to upper part 4 that is not provided with a thread and whose surface has been treated. Moreover, this upper part 4 follows the basic body 2, coronally to the thread construction.

The upper part 4 is designed cylindrically, e.g. its form hasn't been adjusted to the parable P2, and it is provided with a polished neck section 5 that is orientated coronally to the thread 3. The upper part 4 has a height b of preferably 1.2 mm and the polished neck section 5 a height a of preferably 0.75 mm. In the height range b of the upper part 4, the latter is provided with several circular grooves 6 for the protection of the corticalis in the passage area.

According to fig. 2, the cylindrical upper part 4 has been provided with a cylindrical drilling 7 with an apically running thread 8, which leads down to the basic body 2. The drilling 7 is provided with a hexagon socket 9 tampering in a chamfer 10 of 60 degrees. The upper end of the upper part 4 has been ground plane. This guarantees the tightness between implant and the build-ups. Simultaneously, this allows for a safe adoption of diverse build-up parts that are protected by the hexagon socket against rotation. Thus, a safe, power-grip and form-fit connection is created.

At the apical end, the basic body 2 changes to a convex endosseous part 11, whereas the transition from the basic body 2 to the convex endosseous part 11 is round. The endosseous part 11 can also be formed by a circular arc having a large radius or by an elliptic arc.

Three cutting notches 12 that are advantageously offset by 120 degrees, run from the convex endosseous part 11 in a crestal direction via at least five turns of the thread. The cutting notches 12 have in each case a maximal depth of $1/3$ of the diameter of the basic body 2 and a width that is at least as large as the width of the respective remaining thread construction between the cutting notches 12.

The basic body 2 is made of titanium and has been processed additively or subtractively for an optimisation of the surface in order to achieve optimal healing times.

In another application example according to the fig. 3 and 4, the cylindrical upper part 2 is, in the gingival passage area, terminated by a collar 13 that is coronally followed by a conical part 14 having a conical decline of approximately 6 degrees, which advantageously is provided with a hexagon socket and a thread for the safe fixing and fastening of a flushly seated cap 16 according to the fig. 5 and 6. The central drilling 7 with thread 8 is thus, according to fig. 4, located in the area of the upper part 4 and the conical part 14. The collar 13 serves the exact edge termination of the cap 16 that is fastened on the conical part 9. In this respect, the gap 15 serves as rotation protection for the cap 16.

In the dental implant construction form according to the fig. 5 and 6, the cap 16 can be used as primary element of a bar connection that is not shown. It can be shortened individually and fixed safely via a central occlusal screw

connection, e.g. using the fastening screw. It primarily serves the prosthesis connection in the sense of conditionally removable prostheses, which via bars or conical connections form a functional unit with the implants.

The cap 16 can be shortened individually from the coronal end. It primarily serves the prosthesis connection in the sense of conditionally removable prostheses, which via bars or conical connections form a functional unit with the implants. In particular situations, it is also possible to fasten single crowns, screwed from the occlusal end, on the dental implant 1. Here, the gap 15 serves as rotation protection for the crown.

The dental implant according to the invention benefits from the following effectiveness:

After the opening for the dental implant 1 to be seated has been set into the jawbone in a known way, e.g. making use of a dental bur, the implant is seated. For this purpose, the basic body 2 is screwed into the maxillary sinus using a lead screw-in instrument. In doing so, the cutting notches 12 situated in the apical part allow for a gentle cutting and moreover for the anti-torsion protection. The parabolic-cylindrical form of the dental implant 1 has a centring effect and forces itself gently into the cylindrically prepared bone bed. This results in a minor bone abrasion and a simultaneous, very good primary stability, which is the prerequisite for a good osseointegration of the dental implant 1.

The apical round endosseous part 11 serves the protection of the maxillary sinus membrane when seating the dental implant 1 into the side teeth area of the upper jaw, particularly in case of reduced bone heights and the necessity of an indirect and direct sinus lift.

Due to the parabolic tapering of the basic body 2 in the cylindrical upper part 4, lowest compression forces are effective in the upper part of the insertion drilling so that the endosseous exit is safely closed.

The conical cap 16 that is illustrated accurately fitting and provided with safety pegs can again be used as crown framework and be coated with tooth-coloured materials (plastics or ceramics).

1	Dental implant
2	Basic body
3	Thread of the thread construction
4	Upper part
5	Neck section
6	Groove
7	Drilling
8	Thread
9	Hexagon socket
10	Chamfer
11	Endosseous part
12	Cutting notch
13	Collar
14	Conical part
15	Gap
16	Cap

Claims

1. Threaded endosseous dental implant (1) with a parabolic basic body (2) showing a self-tapping thread construction (3), provided with at least two cutting notches (12), with a parabolic groove of the thread and a top part (4) that is provided coronally to the thread construction (3), with a shaped hole (7) for screw-in aids and threads (8) for the fastening and fixing of dental crowns, bridges and similar things, as well as with a convex endosseous part (11) and, if necessary, a conical part (14) and/or a cap (16),

characterised by the fact that

- the upper part (4) has been designed cylindrically and coronally to the thread (3), shows a polished neck section (5) and in between, circular grooves,
- the thread construction (3) at the basic body (2) is limited by a parable (P2) and the groove of the thread is limited by a parable (P1) forming intersection points (S1; S2) outside the area of the dental implant (1) so that the thread construction (3) tapers with a thread depth that is imperceptively declining from the apical to the crestal end, whereas the thread construction (3) reaches up to the upper part (4),
- the thread flanks of the thread construction (3) show a flank angle of 20 degrees,
- the transition from the basic body (2) to the convex endosseous part (11) has been designed having a round form, and
- the cutting notches (12) have in each case a maximal depth of $\frac{1}{3}$ of the basic body's (2) diameter and a width that is at least as large as the width of the respective remaining thread construction (3) between the cutting notches (12).

2. Dental implant according to claim 1, **characterised by the fact** that the cylindrical upper part (4) is approximately 2 mm high.
3. Dental implant according to claim 1 **characterised by the fact** that the centre of the upper part (4) has been provided with a cylindrical drilling (7) starting in the apical direction with a thread (8) and ending in the crestal end with a hexagon socket (9) with a 60-degree chamfer (10).
4. Dental implant according to claim 1 **characterised by the fact** that the polished neck section (5) at the cylindrical upper part (4) is approximately 0.75 mm high.
5. Dental implant according to claim 1 **characterised by the fact** that at least three cutting notches (12) are provided from the apical end to at least the fifth turn of the thread.
6. Dental implant according to claim 1 **characterised by the fact** that a collar (13) has been designed as termination at the upper part (4).
7. Dental implant according to claim 6 **characterised by the fact** that the collar (13) is followed by the conical part (14) with hexagon socket (9), gap (15) and thread.
8. Dental implant according to claim 7 **characterised by the fact** that the conical part (14) is an intake and the collar (13) is a stop for a cap (16).
9. Dental implant according to claim 8 **characterised by the fact** that the cap (16) has been fixed using a fastening screw.