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Abutment system and dental methods

Abstract

The present application relates to an abutment system (**12**) and its use. The abutment system (**12**) comprises: a soft tissue level abutment part (**10**) adapted to be attached to a bone level dental implant (**40**) by means of an abutment screw (**56**), wherein the abutment system is adapted to selectively support both a cement-retained final restoration (**66**) and a screw-retained prosthetic component (**68; 70**). The present application also relates to dental methods.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is continuation of U.S. patent application Ser. No. 13/931,118, filed on Jun. 28, 2013, which claims the priority benefit of British Patent Application No. GB1212125.7, filed on Jul. 9, 2012, the entire content of each of these applications is herein incorporated by reference in its entirety.

BACKGROUND
Field of Invention
(1) The present invention relates to an abutment system and its use. The present invention also relates to dental methods.
Description of the Related Art
(2) U.S. Pat. No. 5,810,592 (Daftary) discloses a dental implant system made from four pieces: a rounded equilateral triangle shaped healing abutment, a large bolt member, a matching abutment head, and a small bolt member. The healing abutment has an intermediate shoulder for accommodating the gingival tissues which surround the patient's jawbone. Further, the matching abutment head is secured on the healing abutment for supporting a tooth analogue. The large bolt member is used for fastening the healing abutment to an implant fixture. The small bolt member is for securing the abutment head to the healing abutment. However, the dental implant system in U.S. Pat. No. 5,810,592 appears only to support a cement-retained tooth analogue.
(3) U.S. Pat. No. 5,040,983 (Binon) discloses a coping fixed on a dental implant fixture installed in a jawbone. A transmucosal component, penetrating the overlying gum tissue, is fixed to the implant fixture with a screw, the head portion of which has an internally-threaded socket which receives a bolt cooperating with a shoulder to fix the coping on the transmucosal component. The coping is intended for use in removably fixing a temporary dental restoration on the support consisting of the dental implant fixture and its transmucosal component, where a permanent prosthodontic restoration will eventually be fixed. The temporary dental restoration is mounted on and around the coping. However, the system in U.S. Pat. No. 5,040,983 supports only a screw-retained prosthodontic restoration.
SUMMARY
(4) The present invention is defined in the appended independent claims. Embodiments are defined in the appended dependent claims.
(5) According to a first aspect, there is provided an abutment system, comprising: a soft tissue level abutment part adapted to be attached to a bone level dental implant by means of an abutment screw, wherein the abutment system is adapted to selectively support both a cement-retained final restoration and a screw-retained prosthetic component. That is, either a cement-retained final restoration or a screw-retained prosthetic component can be supported using the same soft tissue level abutment part. This makes the abutment system flexible to use.
(6) The abutment system may further comprise a coronal abutment part adapted to be attached to the soft tissue level abutment part by means of a further screw, wherein the coronal abutment part further is adapted to support the cement-retained final restoration.
(7) The prosthetic component may be a screw-retained final restoration adapted to be directly attached to the soft tissue level abutment part by means of a further screw.
(8) The abutment screw may have a coronal internally threaded portion, wherein the further screw has an apical externally threaded portion for engagement with the coronal internally threaded portion of the abutment screw.
(9) The soft tissue level abutment part may have a flat circumferential top surface at the outer perimeter of the coronal end of the soft tissue level abutment part.
(10) The soft tissue level abutment part may have at least one indexing element exposed to the

coronal end of the soft tissue level abutment part for preventing rotation of a component attached to the soft tissue level abutment part.
(11) The flat circumferential top surface may have an inner circular perimeter, wherein the at least one indexing element is at least one lobe extending apically from the inner circular perimeter.
(12) The soft tissue level abutment part may have an outer surface devised for exposure to soft tissue. The outer surface may be curved in the coronal-apical direction of the soft tissue level abutment part. The curved outer surface may extend from a larger coronal diameter to a smaller apical diameter first in a convex shape and then in a concave shape.
(13) The soft tissue level abutment part may have an external surface adapted to abut against an internal connection surface of the bone level dental implant.
(14) The abutment system may comprise several soft tissue level abutment parts (of the general type described above) with different diameters and/or heights.
(15) Another aspect relates to the use of an abutment system as described above to selectively support both a cement-retained final restoration and a screw-retained prosthetic component. This aspect may exhibit the same or similar features and advantages as the previously described aspect, and vice versa.
(16) According to yet another aspect, there is provided a dental method, which comprises: providing an abutment system including a universal soft tissue level abutment part adapted to be attached to a bone level dental implant; and attaching the universal soft tissue level abutment part to the bone level dental implant installed in the jawbone of a patient, wherein the abutment system is adapted to selectively support both a cement-retained final restoration and a screw-retained final restoration. This aspect may exhibit the same or similar features and advantages as the previously described aspects, and vice versa.
(17) The universal soft tissue level abutment part may remain attached to the bone level dental implant during subsequent steps of the method, which include: selecting one of a cement-retained final restoration and a screw-retained final restoration; and attaching the selected final restoration to the abutment system.
(18) The universal soft tissue level abutment part may be attached to the bone level dental implant immediately after the bone level dental implant is installed in the jawbone of the patient.
(19) The bone level dental implant may be allowed to at least partly osseointegrate before the selected final restoration is attached.
(20) The bone level dental implant may be installed in the jawbone such that the coronal end of the bone level dental implant is substantially in level with the edge of the jawbone.
(21) The attached universal soft tissue level abutment part may have an outer surface exposed to soft tissue.
(22) According to still another aspect, there is provided a dental method, wherein a universal soft tissue level abutment part of an abutment system is attached to a bone level dental implant installed in the jawbone of a patient, and wherein the abutment system is adapted to selectively support both a cement-retained final restoration and a screw-retained final restoration, which method comprises: selecting one of a cement-retained final restoration and a screw-retained final restoration; and attaching the selected final restoration to the abutment system. This aspect may exhibit the same or similar features and advantages as the previously described aspects, and vice versa.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) These and other aspects of the present invention will now be described in more detail, with reference to the appended drawings showing currently preferred embodiments of the invention.
(2) FIG. **1***a* is a cross-sectional side view of a soft tissue level abutment part of an abutment system

according to the present invention.
(3) FIG. **1***b* is a perspective view of the soft tissue level abutment part of FIG. **1***a*.
(4) FIG. **2***a* is a cross-sectional side view of the soft tissue level abutment part of FIG. **1***a* attached to a dental implant.
(5) FIG. **2***b* is a perspective view of the arrangement in FIG. **2***a*.
(6) FIG. **3** is a perspective view of the soft tissue level abutment part and dental implant of FIG. **2***a* together with a cover screw.
(7) FIG. **4***a* is a side view of the soft tissue level abutment part and dental implant of FIG. **2***a* together with a coronal abutment part for supporting a cement-retained final restoration.
(8) FIG. **4***b* is a cross-sectional side view of the arrangement in FIG. **4***a*.
(9) FIG. **4***c* is a perspective view of the arrangement in FIG. **4***a*.
(10) FIG. **4***d* is a cross-sectional perspective view of the arrangement in FIG. **4***a*.
(11) FIG. **5***a* is a perspective view of the soft tissue level abutment part and dental implant of FIG. **2***a* together with a screw-retained final restoration.
(12) FIG. **5***b* is a cross-sectional side view of the arrangement in FIG. **5***a*.
(13) FIG. **5***c* is a cross-sectional perspective view of the arrangement in FIG. **5***a*.
(14) FIG. **6** is a flow chart of methods according to the present invention.

DETAILED DESCRIPTION

(15) FIGS. **1***a-b* show a (universal) soft tissue level abutment part **10** of an abutment system **12**. The soft tissue level abutment part **10** is 'universal' in that it can be used with both a cement-retained final restoration and a screw-retained prosthetic component, as will be explained further below.
(16) The soft tissue level abutment part **10** is preferably made in one piece, and it can be made of for example titanium or ceramic material (e.g. zirconia).
(17) The soft tissue level abutment part **10** has a coronal end **14** and an apical end **16**. At the coronal end **14**, the soft tissue level abutment part **10** may have a flat circumferential top surface **18** at the outer perimeter of the soft tissue level abutment part **10**. The flat circumferential top surface **18** allows for an effective seal without any cement or the like against another component having a corresponding flat surface.
(18) The flat circumferential top surface **18** has an inner perimeter **20** which may be circular. The inner circular perimeter **20** may accommodate at least one indexing element, here in the form of three concave lobes **22***a-c* uniformly distributed about the inner circular perimeter **20**. The three concave lobes **22***a-c* extends apically from the inner circular perimeter **20**, in an inner side wall **24** of the soft tissue level abutment part **10**. The indexing elements may prevent rotation (around the longitudinal axis **26** of the soft tissue level abutment part **10**) of a component having corresponding indexing elements being attached to the soft tissue level abutment part **10**. Such a component may for instance be a screw-retained single restoration (crown). However, a component without corresponding indexing elements may not be prevented to rotate. Such a component may (only) have a circular interface corresponding to the inner circular perimeter **20**. It is appreciated that other indexing elements are possible, for example convex lobes (not shown) instead of the concave lobes **22***a-c*. Also, the number of indexing elements may be varied.
(19) Extending apically from the flat circumferential top surface **18**, the soft tissue level abutment part **10** further has an outer surface **28** devised for exposure to soft tissue or gum. Hence the term 'soft tissue level' abutment part **10**.
(20) The outer surface **28** may have a length L that is greater than its height H, in order to increase the soft tissue contact length and improve soft tissue health. The length may for example be about 2.5 mm, while the height may be about 2 mm. The limited height or low profile of the soft tissue level abutment part **10** also enables healing without unnecessary loading of the dental implant (see below).
(21) The outer surface **28** may for instance be at least partly curved between its coronal and apical

ends. In the embodiment shown in FIGS. **1***a-b*, the curved outer surface **28** extends from a larger coronal diameter D**1** to a smaller coronal diameter D**2**, first in a convex shape **30***a* and then in a concave shape **30***b*. It is appreciated that other configurations are possible. For example, the outer surface **28** can comprise straight portions that are inclined in relation to each other.

(22) Also, the outer surface **28** may be provided with one or several circumferential or ring-shaped grooves (not shown), whereby sufficient length and additional geometrical locking of the soft tissue may be established.

(23) Also, a lower (apical) portion of the outer surface **28** may be roughened for improved stabilization.

(24) The outer surface **28** transitions apically into an external surface **32** of the soft tissue level abutment part **10**. The external surface **32** is generally adapted to abut against an internal connection surface of a bone level dental implant, as will be explained further below. The external surface **32** may be straight but inclined with respect to the longitudinal axis **26** of the soft tissue level abutment part **10**, with a decreasing diameter towards the apical end **14** of the soft tissue level abutment part **10**. In other words, a conical portion is formed on the soft tissue level abutment part **10**. In an alternative embodiment (not shown), the external surface may be parallel to the longitudinal axis **26** of the soft tissue level abutment part **10**, depending on what implant the soft tissue level abutment part **10** should be attached to.

(25) At the apical end **14**, the soft tissue level abutment part **10** may comprise an interlock portion **34**. The interlock portion **34** may comprise an external, generally hexagonal shape that is sized to fit within an interlock recess of the bone level dental implant.

(26) The soft tissue level abutment part **10** further comprises an internal bore **36** extending from the coronal end **14** to the apical end **16** and coinciding with the longitudinal axis **26** of the soft tissue level abutment part **10**. In the internal bore **36**, there is a seat **38**.

(27) FIGS. **2***a-b* show the soft tissue level abutment part **10** attached to a dental implant **40**. The dental implant **40** is a ‘bone level’ dental implant, meaning that its coronal end **42** is substantially in level with the edge or crest **44** of the jawbone **46** of a patient, when the dental implant **40** is installed in the jawbone **46**.

(28) The dental implant **40** may for example be of the type disclosed in WO 2008/128757 A2, the contents of which herein is incorporated by reference. However, other (bone level) implants may be used as well.

(29) Among other things, the dental implant **40** comprises an internal connection interface that is open to the coronal (or proximal) end **42** of the dental implant **40**. The internal connection interface comprises a conical chamber **48**, a hexagonal interlock recess **50**, and an internally threaded portion **52**. The conical chamber **48** has an inclined internal connection surface **54** matching the external surface **32** of the tissue level abutment part **10**.

(30) In use, the soft tissue level abutment part **10** is attached to the bone level dental implant **40** by means of an abutment screw **56**, as shown in FIGS. **2***a-b*. The abutment screw **56** may be comprised in the abutment system **12**. The abutment screw **56** has an apical external threaded portion **58** for engaging the internally threaded portion **52** of the dental implant **40**. Further, the abutment screw **56** has a head **60** that rests against the seat **38** of the soft tissue level abutment part **10**. The head **60** may have a coronal internally threaded portion **62**. Upon tightening the abutment screw **56**, the soft tissue level abutment part **10** is firmly attached to the dental implant **40**, and the matching surfaces **32** and **54** create an effective and tight seal.

(31) As also seen in FIG. **2***a*, the height H of the outer surface **28** of the soft tissue level abutment part **10** may correspond to the height of soft tissue **64** adjacent the installed bone level dental implant **38**.

(32) The present abutment system **12** selectively supports both a cement-retained final restoration **66** (see FIGS. **4***a-d* and **6**) and a screw-retained final restoration **68** (see FIGS. **5***a-c* and **6**). In other words, either of a cement-retained final restoration and a screw-retained final restoration can be

supported using the same soft tissue level abutment part **10**. Also, the abutment system **12** can support other screw-retained prosthetic components, such as a cover screw **70** (see FIG. **3**), an impression coping, a bar, etc.

(33) The present invention could also be regarded as a two-piece soft tissue level dental implant, wherein the two pieces are the (bone level) dental implant **40** and the (soft tissue level) abutment part **10**.

(34) In FIG. **3**, a cover screw **70** is attached to the a soft tissue level abutment part **10**. The cover screw **70** may have an externally threaded portion (not shown) for engagement with the internally threaded portion **62** of the abutment screw **56**. The cover screw **70** may further have flat circumferential surface matching the flat circumferential top surface **18** of the soft tissue level abutment part **10**, for creating an effective seal between the cover screw **70** and the soft tissue level abutment part **10**. The top of the cover screw **70** can be slightly rounded not to damage soft tissue.

(35) In FIGS. **4***a-d*, the abutment system **12** further comprises a coronal abutment part **72**. The coronal abutment part **72** is adapted to be attached to the soft tissue level abutment part **10** by means of a further screw **74**. The further screw **74** may also be comprised in the abutment system **12**.

(36) The coronal abutment part **72** has an apical end **76** at least partly matching the coronal end **14** of the soft tissue level abutment part **10**, as seen in FIGS. **4***b* and **4***d*, such that an effective seal between the abutment parts **10** and **72** can be achieved. The coronal abutment part **72** further comprises an internal bore **78** extending between its coronal end **80** and the apical end **76**. In the internal bore **78**, there is a seat **82**. The coronal abutment part **72** is further adapted to support a cement-retained final restoration (not shown in FIGS. **4***a-d*), such as a crown or bridge. To this end, an outer surface **84** of the coronal abutment part **72** may include one or several longitudinal grooves **86** for accommodating cement. The outer surface **84** may also comprise a plurality of (smaller) transversal grooves and ridges **87**. Further, the coronal abutment part may be designed such that a portion of the flat circumferential top surface **18** remains exposed when the coronal abutment part **72** is attached to the soft tissue level abutment part **10**. The exposed portion of the flat circumferential top surface **18** may also serve as a support for the cement-retained final restoration.

(37) In use, the coronal abutment part **72** is attached to the soft tissue level abutment part **10** by means of the further screw **74**. The further screw **74** has an apical external threaded portion **88** for engaging the internally threaded portion **62** of the abutment screw **56**. Also, the further screw **74** has a head **90** that rests against the seat **82** of the coronal abutment part **72**. The head **90** may have a coronal tool socket **92**. Upon tightening the further screw **74**, the coronal abutment part **72** is firmly attached to the soft tissue level abutment part **10**. Thereafter, the cement-retained final restoration may be cemented on top of the coronal abutment part **72** in a manner known per se.

(38) FIGS. **5***a-c* show a screw-retained final restoration **68** attached to the soft tissue level abutment part **10** by means of a further screw **74**. The screw-retained final restoration **68** in FIGS. **5***a-c* is embodied as a crown, but it can also be a bridge, etc.

(39) The screw-retained final restoration **68** has an apical end **94** at least partly matching the coronal end **14** of the soft tissue level abutment part **10**, as seen particularly in FIGS. **5***b-c*, such that an effective seal between the soft tissue level abutment part **10** and the screw-retained final restoration **68** can be achieved. The screw-retained final restoration **68** may be designed such that no portion of the flat circumferential top surface **18** remains exposed when the screw-retained final restoration **68** is attached to the soft tissue level abutment part **10**. This ensures a smooth transition between the screw-retained final restoration **68** and the soft tissue level abutment part **10**. The screw-retained final restoration **68** further comprises an internal bore **96** extending between its coronal end **98** and the apical end **94**. In the internal bore **96**, there is a seat **100**.

(40) In use, the screw-retained final restoration **68** is directly attached to the soft tissue level abutment part **10** by means of the further screw **74**. The further screw **74** has an apical external

threaded portion **88** for engaging the internally threaded portion **62** of the abutment screw **56**. Also, the further screw **74** has a head **90** that rests against the seat **100** of the screw-retained final restoration **68**. The head **90** may have a coronal tool socket **92**. Upon tightening the further screw **74**, the screw-retained final restoration **68** is firmly attached to the soft tissue level abutment part **10**. Thereafter, the open portion of the internal bore **96** may be filled with a filler (not shown).
(41) With reference to FIG. **6**, the abutment system **12** may be used in the following way:
(42) First, the bone level dental implant **40** is installed (a) by a surgeon in the jawbone **46** of a patient in a manner known per se. The dental implant **40** should be installed such that the coronal end **42** of the dental implant **40** is substantially in level with the upper edge **44** of the jawbone **46**.
(43) Then, after installation, the soft tissue level abutment part **10** is attached (b) to the dental implant **40** by the surgeon by means of the abutment screw **56**. This soft tissue level abutment part **10** will normally not be removed after it has been attached to the implant **40**. The outer surface **28** is here exposed to soft tissue **64**. The soft tissue level abutment part **10** may be attached to the dental implant **40** immediately after the dental implant **40** has been installed.
(44) A prosthodontist, which typically is not the same person as the surgeon, is thereafter free to decide or select (c) which one of a cement-retained final restoration **66** and a screw-retained final restoration **68** that should be used. This makes the present system very flexible.
(45) The selected final restoration may then be attached (d) as described in relation to FIGS. **4***a-d* or FIGS. **5***a-c*, i.e. without having to remove the soft tissue level abutment part **10**, and without breaking any soft tissue seal. Also, any intermediate operations, such as attaching the cover screw or an impression coping to the soft tissue level abutment part **10** can be carried out without breaking any soft tissue seal. Step (d) may be performed several weeks or months after step (b) (attachment of soft tissue level abutment part **10**), to allow for osseointegration of the dental implant **40**. Alternatively, an immediate/early loading protocol can be used.
(46) Further, several soft tissue level abutment parts **10** with different diameters (widths) and/or different heights may be provided, to cater for various clinical situations. This makes the present system and method more flexible than a one-piece soft tissue level dental implant system.
(47) The person skilled in the art realizes that the present invention by no means is limited to the preferred embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims.

Claims

1. An abutment system, comprising: an abutment screw comprising a screw head and a shaft extending apically from the screw head, the screw head having a first outer diameter, the shaft having a second outer diameter smaller than the first outer diameter of the screw head; a soft tissue level abutment part adapted to be attached to a bone level dental implant by the abutment screw; and a further screw adapted to attach a component to a coronal portion of the soft tissue level abutment part, wherein the abutment screw has an apical externally threaded portion on the shaft configured to engage the bone level dental implant, wherein the abutment screw further has a coronally internally threaded portion arranged in the screw head and not extending into the shaft, wherein the soft tissue level abutment part comprises a soft tissue collar having a coronal flat circumferential top surface, the coronal flat circumferential top surface having an outer perimeter and an inner circular perimeter, the inner circular perimeter accommodating at least one indexing element configured to prevent rotation of the component attached to the coronal portion of the soft tissue level abutment part, wherein the at least one indexing element of the inner circular perimeter of the coronal flat circumferential top surface does not extend to the outer perimeter of the coronal flat circumferential top surface, wherein the soft tissue level abutment part comprises an external surface comprising a conical portion adapted to abut against an internal connection surface of the bone level dental implant such that a coronally facing surface of the bone level dental implant is

exposed to soft tissue when the conical portion of the soft tissue level abutment part forms an effective seal with the internal connection surface of the bone level dental implant, and wherein the further screw has an apical externally threaded portion configured to engage with the coronally internally threaded portion of the abutment screw such that the apical externally threaded portion of the further screw sits at least partially within the soft tissue level abutment part.

2. The abutment system according to claim 1, wherein the component comprises a coronal abutment part adapted to be attached to the soft tissue level abutment part by the further screw, wherein the coronal abutment part further is adapted to support a cement-retained final restoration.

3. The abutment system according to claim 1, wherein the component is a screw-retained final restoration adapted to be directly attached to the soft tissue level abutment part by the further screw.

4. The abutment system according to claim 1, wherein the at least one indexing element is at least one lobe extending apically from the inner circular perimeter.

5. The abutment system according to claim 1, wherein the soft tissue level abutment part has an outer surface devised for exposure to soft tissue.

6. The abutment system according to claim 5, wherein the outer surface is curved in the coronal-apical direction of the soft tissue level abutment part.

7. The abutment system according to claim 6, wherein the curved outer surface extends from a larger coronal diameter to a smaller apical diameter first in a convex shape and then in a concave shape.

8. The abutment system according to claim 1, comprising several soft tissue level abutment parts with different diameters and/or heights.

9. The abutment system according to claim 1, wherein the system is adapted to selectively support both a cement-retained final restoration and a screw-retained prosthetic component.

10. The abutment system according to claim 1, wherein the component is a final restoration comprising a coronal abutment part having a corresponding at least one indexing element at an apical end of the coronal abutment part, the corresponding at least one indexing element configured to attach to the at least one indexing element accommodated by the inner circular perimeter of the coronal flat circumferential top surface at a coronal end of the soft tissue level abutment part thereby preventing rotation of the final restoration.

11. The abutment system according to claim 10, wherein the corresponding at least one indexing element of the coronal abutment part does not engage with an anti-rotational feature of a crown supported on the coronal abutment part.

12. The abutment system according to claim 1, wherein the at least one indexing element comprises one or more concave lobes.

13. The abutment system according to claim 1, wherein the at least one indexing element comprises one or more convex lobes.

14. The abutment system according to claim 1, wherein the at least one indexing element comprises three lobes.

15. The abutment system according to claim 1, wherein the soft tissue level abutment part is made of titanium or ceramic material.

16. The abutment system according to claim 1, wherein the outer perimeter of the coronal flat circumferential top surface of the soft tissue level abutment part defines a maximum diameter of the soft tissue level abutment part.

17. The abutment system according to claim 1, wherein the soft tissue level abutment part comprises an inner seat configured to support the component attached to the coronal portion of the soft tissue level abutment part.

18. The abutment system according to claim 1, wherein the screw head of the abutment screw extends higher than the coronal flat circumferential top surface of the soft tissue level abutment part when the abutment screw attaches the soft tissue level abutment part to the bone level dental

implant.

19. The abutment system according to claim 1, wherein the abutment screw comprises an internal bore extending in the screw head and not extending into the shaft.