EXPANDABLE BONE IMPLANT

CROSS-REFERENCE TO RELATED APPLICATION

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FIELD OF THE INVENTION

The present invention relates to an implant for insertion into bone and, in particular, an expandable bone implant having improved osseointegration features.

BACKGROUND OF THE INVENTION

One type of bone implant is a dental implant or endosseous root form implant which is surgically implanted into a patient's upper or lower jaw to directly or indirectly anchor and support prosthetic devices, such as an artificial tooth. The implants are usually placed at one or more edentulous sites in a patient's dentition at which the patient's original teeth have been lost or damaged in order to restore the patient's chewing function. In many cases, the implant anchors a dental abutment, which in turn provides an interface between the implant and a dental restoration. The restoration is typically a porcelain crown fashioned according to known methods.

The implant is usually either threaded or press-fit into a bore which is drilled into the patient's mandible or maxilla at the edentulous site. The implant is inserted by applying a force to the coronal end of the implant in an insertion direction.

A patient typically prefers to leave after initial surgery with some type of restoration mounted on the implant, which transfers occlusive loads to the implant. Also, it has been shown that in many instances, healing of both soft and hard tissue is improved if the implant is loaded after surgery through a restoration. While the implant rarely receives the full load of occlusion during this healing phase and even with the restoration, the loading is sufficient to displace the implant. Thus, threads are used to achieve initial stability. Before biologic integration has time to take place, the thread resists tension, twisting or bending loads the implant might be subjected to.

The surgical procedure for inserting the threaded implants, however, can be complicated and requires that the threaded implants be turned into place, which further requires the use of special tools and inserts. The torque needed to place the implant into the jaw can be high and may require tapping of the bore on the jaw, which adds yet another step to the surgical procedure where tapping typically is not desired. Also with threaded implants, it is often difficult to achieve optimal esthetics because the geometry of the thread establishes a fixed relationship between the final vertical and rotational orientation of the implant such that a vertical adjustment of the implant requires a rotational adjustment and vice-versa. Thus, a prosthetic held at an ideal rotational orientation by the implant may not have the ideal vertical position.

Alternatively, although a press fit implant has a much simpler surgical procedure, the current press fit designs provide very little initial stability and are not well suited for early and immediate loading procedures that are currently used in dentistry.

The body of the dental implant has commonly been formed of titanium metal or titanium alloys. Titanium metals and alloys may act to enhance bone attachment to the surface of the dental implant. However, the titanium metals and alloys are orders of magnitude higher in stiffness than human bone and as a result absorb much of the mastication forces introduced in the mouth. This absorption of the forces by the titanium dental implants can result in inadequate stimulation of the surrounding bone tissue in the jaw, which over extended periods of time can cause the bone tissue to be resorbed by the body resulting in saucerization of the bone, or bone die-back. Over time, this bone die-back can cause the dental implant to loosen within its hole and even cause infection to the area. Accordingly, a press-fit implant is desired that provides sufficient initial stability while also providing improved osseointegration.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded, side perspective view of a first embodiment of an implant according to the present invention;

FIG. **2** is a side elevational view of the implant of FIG. **1**;

FIG. **3** is a side elevational view of an osteotome according to the present invention and having the implant of FIG. **2** attached at its distal end;

FIG. **4** is an exploded, side perspective view of a second embodiment of an implant according to the present invention;

FIG. **5** is a side elevational view of the implant of FIG. **4**;

FIG. **6** is a side elevational view of the implant of FIG. **4** showing a porous component expanded through slots in a shell component;

FIG. **7** is a top view of the implant of FIG. **6**;

FIG. **8** is an upper, cross-sectional view of a third embodiment of an implant according to the present invention;

FIG. **9** is an exploded, side perspective view of a fourth embodiment of an implant according to the present invention;

FIG. **10** is a side cross-sectional view of a fifth embodiment of an implant according to the present invention;

FIG. **11** is a side, exploded view of a sixth embodiment of an implant according to the invention and shown on a bore in bone; and

FIG. **12** is an enlarged fragmentary view of a porous tantalum portion for any of the embodiments herein and in accordance with the present invention.

DETAILED DESCRIPTION

Referring to FIGS. **1-2**, an implant **10** is provided for insertion into a surgical site such as a bore on bone, and in the particular examples here, into a mandible or maxilla. The implant **10** is used to support an abutment, and a prosthesis is mounted on the abutment. While two-stage endosseous implants are shown that terminate at the alveolar ridge, it will be understood that the implants may alternatively be single-stage implants with an integrally formed transgingival region or a one-piece implant with an integral abutment.

Implant **10**, as well as other implants described herein, are press-fit implants and forego the use of threads as the main mechanism to engage bone. This permits these implants to be placed at a desired depth in bone by using a longitudinal driving force without the need to rotate the implant and while still forming sufficient initial stability to withstand mastication forces.

More specifically, implant **10** has a first, relatively rigid member or component **12**, and a second, expandable, porous member or component **14** that is at least partially porous. The rigid member **12** is positioned coronally of the porous member **14** and has a coronal or proximal end portion **16** to directly or indirectly support a prosthesis. The porous member **14** engages an apical or distal end portion **18** of the rigid member **12** when it is placed in a bore in bone. With this structure, a