DENTAL IMPLANT FOR A JAW WITH REDUCED BONE VOLUME AND IMPROVED OSSEOINTEGRATION FEATURES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 12/065,259, filed Feb. 22, 2008, now U.S. Pat. No. 8,075,312 which is a National Stage Application of International Application PCT/US2006/033893, with an international filing date of Aug. 30, 2006, which claims the benefit of U.S. Provisional Patent Application No. 60/712,577, filed Aug. 30, 2005, all of which are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to bone implants and, in particular, to a dental implant with improved osseointegration features.

2. Description of the Related Art

Dental implants are commonly used as anchoring members for dental restorations to provide prosthetic teeth at one or more edentulous sites in a patient's dentition at which the patient's original teeth have been lost or damaged. Typically, known implant systems include a dental implant made from a suitable biocompatible material, such as titanium. The dental implant is typically threaded into a bore which is drilled into the patient's mandible or maxilla at the edentulous site. The implant provides an anchoring member for 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.

Many current dental implant surgeries are performed in two stages. In the initial or first stage, an incision is made in the patient's gingiva at an edentulous site, and a bore is drilled into the patient's mandible or maxilla at the edentulous site, followed by threading or impacting a dental implant into the bore using a suitable driver. Thereafter, a cap is fitted onto the implant to close the abutment coupling structure of the implant, and the gingiva is sutured over the implant. Over a period of several months, the patient's jaw bone grows around the implant to securely anchor the implant in the surrounding bone, a process known as osseointegration.

In a second stage of the procedure following osseointegration, the dentist reopens the gingiva at the implant site and secures an abutment and optionally, a temporary prosthesis or temporary healing member, to the implant. Then, a suitable permanent prosthesis or crown is fashioned, such as from one or more impressions taken of the abutment and the surrounding gingival tissue and dentition. In the final stage, the temporary prosthesis or healing member is removed and replaced with the permanent prosthesis, which is attached to the abutment with cement or with a fastener, for example.

Most patients, however, prefer to leave after the initial stage of surgery with some type of restoration in place. Furthermore, in many instances healing of both the soft and hard tissue can be improved if the implant is loaded after surgery. However, post-surgical loading of the implant, even if it is not the full load of occlusion, is sufficient to displace the implant, thus requiring some mechanism to achieve initial stability of the implant before osseointegration. One such mechanism can be a threaded dental implant. The threaded implant can achieve initial stability immediately after surgery because the threads resist any tension, twisting, or bending loads that the implant might be subjected to before biologic integration has taken place.

One disadvantage of the threaded implants, however, is that the surgical procedure is quite involved. A threaded implant needs to be turned into place, i.e., into the bore or socket of the jaw. This requires special tools, such as special ratchet wrenches and inserts. The torque required to place the threaded implant into the socket can also be high and sometimes tapping it into place is also needed, thus adding another step to the surgical procedure. Furthermore, the geometry of the thread establishes a relationship between the final vertical and rotational orientation of the implant and this can complicate implant placement by making optimal esthetics hard to achieve.

Press fit implants, on the other hand, are often preferred because the surgical procedure to place a press-fit implant is less complicated than that for a threaded implant. Press fit implants typically comprise a titanium cylinder. These types of cylindrical press fit implants, however, are not useful for immediate or early loading of the implant prior to osseointegration of the bone into the implant because they lack a mechanism to provide initial stability. Therefore, the current press fit design is not well suited for early and immediate load procedures that are currently very popular in dentistry. Thus, a press-fit dental implant is desired that provides adequate initial stability.

The known implants also have minimum size requirements to present sufficient surface area in contact with bone to form adequate initial and/or final stability, Thus, most common sizes for endosseous root form implants are about 7 mm to about 20 mm in length and about 3 mm to about 5 mm in diameter. In order for the jaw bone to have sufficient strength to hold the implant in place during mastication without damaging the jaw bone, generally, there should be adequate bone volume in addition to adequate bone density. For bone volume, there should be about 1-3 mm of bone on all sides of the implant. All sides refers to the apical, facial, and lingual directions from the implant and to the outer surface of the jaw, and in the distal and mesial directions from the implant and to the roots of adjacent teeth or implants.

Some dental patients, however, have a reduced depth alveolar ridge that does not provide sufficient bone volume to support the typical implant sizes. The reduced depth can be due to the patient's natural anatomy or due to bone atrophy caused by disease. The reduced alveolar ridge is often seen in edentulous or partially edentulous patients because the denture restorations they use do not load the jaw sufficiently to preserve bone. If bone is not stimulated by loading, the body finds other uses for the minerals that make up the tissue resulting in bone atrophy. The shallow ridge can result in a lessened dimension between the crest of the ridge and anatomic structure such as the mandibular canal or the sinus cavities.

Surgical bone augmentation procedures may be used before a dental implant is placed, such as bone grafting or sinus lifts, to increase the depth of the alveolar ridge. The procedures are typically invasive, however, requiring incisions to be made to harvest natural bone or to provide access to the sinus area to place grafting materials. Bone for grafting is often harvested from the chin or the hip, thus providing further discomfort to the patient. Also these procedures can add to the treatment time where healing of the graft must occur before the implant can be placed.

Alternatively, several short implants exist to treat these reduced depth areas. However, these implants are typically inadequate and prone to failure even though the implants may