MODULAR IMPLANT WITH SECURED POROUS PORTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to bone implants and, in particular, to a modular dental implant with structure for securing a porous portion to the implant.

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. Known implant systems include a dental implant made from a suitable biocompatible material, such as titanium. The dental implant is threaded or press fit 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 side, 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 bone grows around the implant to securely anchor the implant, 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. Alternative single stage implants may be used that extend through the transgingival layer so that the gingiva need not be reopened to access the implant.

One way to improve osseointegration onto the implant, and in turn long term stability of the implant, is to provide a porous material on the implant that the bone can grow into. Such a porous material may also increase short term stability for immediate loading because of its large friction coefficient with surrounding bone. Securing the porous material to the dental implant, however, may be difficult due to the small size and geometry of the device. In general, dental implants are 3 mm to 6 mm in diameter and 4 mm to 16 mm in length. If it is desired for the porous material to only cover a portion of the implant with the remainder being made up of, for example, reinforcing element, threads to compliment initial stability or interface geometry to secure a dental prosthesis, the porous section becomes too small to practically include threads or other securing geometry. Therefore, an implant is desired that includes a locking element to economically secure the porous material in place while allowing for other features such as threads, abutment interface geometry or reinforcing members.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a dental implant with porous material in accordance with the present invention;

FIG. **2** is an exploded view of the dental implant of FIG. **1**;

FIG. **3** is an enlarged fragmentary view of a porous tantalum portion for any of the embodiments herein and in accordance with the present invention;

FIG. **4** is a perspective view of a second embodiment of a dental implant in accordance with the present invention;

FIG. **5** is an exploded view of the dental implant of FIG. **4**;

FIG. **6** is a perspective view of a third embodiment of a dental implant in accordance with the present invention;

FIG. **7** is an exploded view of the dental implant of FIG. **6**; and

FIG. **8** is an exploded view of multiple alternative parts of a modular implant in accordance with the present invention; and

FIG. **9** is an exploded, perspective view of another modular implant with stacked portions.

DETAILED DESCRIPTION

Referring to FIG. **1**, an implant **10** for placement in bone in one form, is a dental implant for insertion into a mandible or maxilla. The implant **10** comprises at least three pieces, but may include more pieces. The implant **10** is used to anchor a tooth abutment or other dental prosthesis and includes a coronal part or head **12**, an intermediate part **14** for improving osseointegration onto the implant **10** as explained in greater detail below, and a separate stem, anchor, or apical part **16**. The anchor **16** is configured to engage the head **12** so that at least the head **12** and the anchor **16** cooperatively secure the porous metal part **14** on the implant **10**.

The head **12** and the anchor **16** may also comprise external threads **15** for engaging bone. Patients prefer to leave after initial surgery with some type of restoration, and healing of both soft and hard tissue may be improved if the implant is loaded after surgery. Post-surgical loading, even if less than a full load of occlusion however, is sufficient to displace the implant. Thus, self-tapping threads are used to achieve initial stability. Before osseointegration has time to take place, the thread resists tension, twisting or bending loads applied to the implant. Further, the anchor **16** may have an opening **17** for receiving bone chips while threading implant **10** into the bone. Alternatively, the implant may be without threads to be press fit into bone by a driver and as discussed further below.

In one form, implant **10** may have an outer diameter of approximately 3.0 mm to 6.0 mm and a length of approximately 8 mm to 16 mm. While the implant **10** may have a generally cylindrical outer surface, the implant **10** may also taper so that its diameter increases as it extends coronally to further increase friction with bone within a bore receiving the implant.

Referring to FIGS. **1**-**2**, in the illustrated form, the porous part **14** includes a generally cylindrical sleeve portion **18** that receives and fits on a core **20** on the implant **10**. The sleeve portion **18** has a thickness of about 0.020" to 0.050" and may taper to generally match the taper of the implant, if present. Alternatively, to increase the stability of the implant, the sleeve portion **18** may have an outer periphery or surface **23** (represented by dashed lines) that is non-cylindrical or non-circular (in transverse cross-section) rather than the circular outer surface **21** that is shown. In this case, the outer surface **23** of the sleeve portion **18** does not generally match the taper or outer periphery of the implant and does not match the shape of the bore it sits within. In this case, to further strengthen the fit between the implant and the bore in the jaw bone, the outer periphery **23** of the intermediate part **14** or sleeve portion **18** may be provided with a maximum width slightly greater than the diameter of the bore. So configured, as the implant device