Two-stage dental implants inserted in a one-stage procedure
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Chapter 1
Introduction and aim of the study
Extraction of teeth is followed by gradual resorption of the bone of the residual ridge. As a consequence, the denture bearing area gradually reduces and may become inadequate for denture support. Approximately 35 years ago osseointegrated endosseous titanium implants were introduced for fixation of dental prosthesis. Patients with a severely resorbed mandible treated with implant retained mandibular overdentures appear to experience less complaints, to be more satisfied and to have better subjective chewing abilities compared with patients wearing conventional dentures (Boerrigter et al. 1995). Many different endosseous implant systems are currently used in oral implantology. Roughly, a distinction can be made between implants inserted in a one-stage approach and implants inserted in a two-stage approach. If an implant is inserted in a two-stage approach, the implant is submerged during the first surgical procedure (Figure 1.1). During the second surgical procedure the soft tissue covering the implant is reflected and after removing the covering screw, a transmucosal abutment is connected (Figure 1.2). At the junction between implant and abutment is a microgap, which is situated at crestal level. By contrast, in a one-stage implant system the transmucosal part is usually integrated into the implant (Figure 1.3). The microgap

**Figure 1.1.** A two-stage IMZ implant is inserted in the jaw. A thin screw is connected to the implant and covered by oral mucosa.

**Figure 1.2.** After an osseointegration period of 3 months the implant is exposed, the covering screw is removed and a healing abutment is connected. This abutment will be replaced by a titanium connector during manufacturing the new prosthesis. The arrow marks the microgap at crestal level.

**Figure 1.3.** A one-stage ITI implant is inserted in the jaw. The transmucosal part is integrated into the implant that perforates the oral mucosa. On top a temporary screw is connected. This screw will be replaced by the further prosthetic provision after an osseointegration period of 3 months. The arrow marks the microgap a few millimetres above crestal level.

**Figure 1.4.** A two-stage IMZ implant is inserted in the jaw in a one-stage procedure. A healing abutment is connected at once to the implant perforating the oral mucosa. In this way a second surgical procedure after the osseointegration period is not required. The arrow marks the microgap at crestal level.
in this implant type is situated a few millimetres above crestal level. Both one-stage and two-stage implants showed favourable results. Because only one surgical procedure is required for one-stage implants this implant type appears to be the implant of choice for mandibular overdenture treatment (Batenburg et al. 1998b). Insertion of implants in a one-stage procedure has several advantages (Buser 1999):

- only one surgical intervention is required, which is much more convenient for the patient;
- there is a cost-benefit advantage;
- there is a time-benefit since the prosthetic phase can start earlier because there is no wound healing period involved related to a second surgical procedure;
- during the osseointegration period, the implants are accessible for clinical monitoring.

However, there are situations in which it is favourable to insert implants in a two-stage procedure (Røynesdal et al. 1999):

- in combination with a bone augmentation procedure and guided bone regeneration when the wound has to be closed tightly to prevent bone or membrane exposure;
- to prevent undesirable loading of the implants during the osseointegration period when the temporary suprastructure can not be adjusted effectively;
- to provide the possibility to remove supramucosal and transmucosal parts when the patient is not able to perform a sufficient level of oral hygiene and when possible infections endanger general health;
- when implants are inserted in patients who will receive radiotherapy in the implant region in the foreseeable future.

Moreover, the coronal part of the implant is located at crestal level, giving the possibility for a more flexible emergence profile of the transmucosal part;

It has been proposed that marginal bone loss is more extended around two-stage implants compared to with one-stage implants (Hermann et al. 1997, Buser et al. 1999). Possibly, the microflora colonising the microgap or their products are responsible for the occurrence of this bone loss (Lindhe et al. 1992, Quirynen et al. 1993, Ericsson et al. 1995, Persson et al. 1996). However, when measured on standardised intra-oral radiographs, marginal bone loss has been observed around one-stage ITI implants as well (Weber et al. 1992, Batenburg et al. 1998b). This implies that the suggestion that the microgap is entirely responsible for marginal bone loss is questionable.

In several recent studies, applying two-stage implants in a single surgical procedure has been reported to be promising (Bernard et al. 1995, Ericsson et al. 1994, 1996, 1997, Becker et al. 1997, Collaert & de Bruin 1998, Abrahamsson et al. 1999, Røynesdal et al. 1999, Fiorellini et al. 1999) (Figure 1.4). In this way the advantages of both system types are combined and there are two additional advantages. First, the surgeon only needs to have a two-stage implant system in stock for executing both submerged and non-submerged procedures. Second, there is a possibility to switch per-operatively or during the osseointegration period from a non-submerged procedure to a submerged procedure if this appears to be preferable.

The general aim of this study was to evaluate in a clinical trial the possibility of using a two-stage implant system in a one-stage procedure.

Specifically, the aims of this investigation were:
• to evaluate the long term treatment outcome of two mandibular two-stage implants supporting an overdenture in a retrospective study (chapter 2).
• to provide an overview of the common peri-implant microbiology and to assess, based on the evidence available in the literature, whether bacteria associated with periodontitis exert a possible risk for peri-implant tissue breakdown (chapter 3).
• to compare the crestal incision with the labial flap design when inserting a two-stage implant system in a one-stage procedure (chapter 4).
• to compare peri-implant clinical parameters, radiographic bone loss and microbial colonisation following the insertion of two-stage implants, either inserted in a one-stage or two-stage procedure, and one-stage implants (chapters 5, 6, 7 and 8).

REFERENCES


