# Chapter 1

## Introduction and aim of the study

## Introduction

Maxillofacial prosthodontics is the discipline that concerns the prosthetic rehabilitation of patients with acquired and congenital defects of the head and neck (Beumer 3rd et al. 2011). Examples of such patients are head and neck cancer patients, patients with defects as a result of trauma and cleft patients. The prosthetic rehabilitation of these patients is challenging, particularly when aiming for optimal facial aesthetics and oral functioning (speech, chewing, swallowing). Furthermore, maxillofacial prosthodontists are involved in the dental care of patients with a compromised immune status, such as Sjögren's patients. Currently, dental implants play an important role in the multidisciplinary rehabilitation of patients with a compromised intraoral and/or extraoral condition (Beumer 3rd et al. 2011). Implants are used for retention of a large variety of prostheses, such as full dentures, single tooth replacements and craniofacial prostheses. Treatment planning of compromised patients, particularly when including implant-retained prostheses, should be performed in a multidisciplinary team, aiming for optimal rehabilitation of the patient, with the prosthodontist being involved from the intake of the patient until the final prosthetic rehabilitation. Next, prosthodontists play an important role in the aftercare of these patients (Visser 2009).

With regard to head neck cancer patients, conventional prosthetic rehabilitation is often challenging (Hayter & Cawood 1996, Marker et al. 1997, Misiek & Chang 1998, Schoen et al. 2007, Tang et al. 2008). Yet, adequate prosthetic rehabilitation is a crucial factor for these patients to regain oral functions that are lost due to the intra- or extraoral defect and/or compromised oral condition (Kamstra et al. 2011). E.g., when a tumour is located in the oral cavity, its surgical resection has a profound effect on oral functions such as chewing, swallowing and speech intelligibility. In addition, when postoperative radiotherapy is needed, oral functioning is usually further compromised due to the resulting xerostomia and intolerance of the denture-bearing mucosa to mechanical loading (Beumer 3rd et al. 1995, Kwakman et al. 1997, Visch et al. 2002, Vissink et al. 2003).

When being provided with implant-retained prostheses, it is presumed that many head and neck cancer patients will experience an improved level of oral functioning (Schoen et al. 2008, Tang et al. 2008). It has to be mentioned, however, that many patients postpone or simply decline an offered implant-based treatment after tumour surgery and postoperative radiotherapy notwithstanding the great benefits patients can expect from implant-retained prostheses (Kwakman et al. 1997, Schoen et al. 2008, Mizbah et al. 2013). To let more patients benefit from implant-retained prostheses, it is therefore advocated to insert the implants already during ablative surgery (primary implant insertion; Urken et al. 1989, Sclaroff et al. 1994, Schepers et al. 2006, Schoen et al. 2008, Mizbah et al. 2013). Although the early results of primary implant insertion, as mentioned in these studies, are very promising (Barber et al. 2011), systematic reviews show that to date most publications on dental implants in oral cancer patients are still on implants inserted after the surgery and/or radiotherapy has been completed. Besides that, studies reporting on primary

implant insertion are often of retrospective design (Colella et al. 2007, Barber et al. 2011, Chrcanovic et al. 2014). Thus, it remains unclear whether the benefits of primary implant insertion outweigh the risk that implants will not be used for prosthetic rehabilitation, which indeed is the case in about 10-25% of the patients with primary mandibular implants (Schoen et al. 2008, Schepers et al. 2006, Mizbah et al. 2013).
Therefore, further study is needed to estimate which head and neck cancer patients can benefit from primary implants. Does it, e.g., depend on the primary location of the tumour, the tumour size, if the patient is irradiated and/or the type of reconstructive surgery? Furthermore, insight is needed whether oral functioning, patients' satisfaction and quality of life related to implant-retained prostheses is also beneficial in the long term in head and neck cancer patients with primary mandibular implants.
Besides for intra-oral prosthetic rehabilitation in head and neck cancer patients, implants are also used in the rehabilitation of patients with extraoral defects (ear, nose, orbit). Surgical reconstruction of such defects is difficult or even impossible to perform (orbit) and the outcome of such reconstructions has not been described for large patient numbers. Furthermore, treatment of a local tumour recurrence may necessitate removal of the surgical reconstruction. A major advantage of rehabilitation with extra-oral prostheses is that the defect resulting from ablative tumour surgery can be observed in total, allowing for thorough oncological inspections (Ariani et al. 2013). While there is ample evidence that implant-retained prostheses serve very well for replacing missing ears and eyes, there is still a lot of concern how to optimally restore a nasal defect with implant-retained prostheses (Parel et al. 1986, Lundgren et al. 1993, Granström et al. 1994, Roumanas et al. 1994, Nishimura et al. 1996, Tolman & Taylor 1996, Flood & Russell 1998, Roumanas et al. 2002, Visser et al. 2008, Karayazgan-Saracoglu et al. 2010, Ethunandan et al. 2010, Dings et al. 2011, Curi et al. 2012). E.g., treatment protocols how to insert implants for implant-retained nasal prostheses vary largely. There is no consensus with regard to implant location, type and length of implants and how to treat irradiated and non-irradiated patients and edentulous and dentate patients. Also the need for aftercare and the satisfaction experienced by the patients are hardly established (Nishimura et al. 1996, Flood & Russell 1998, Ethunandan et al. 2010).
Besides head and neck cancer patients and patients with facial defects, the prosthetic rehabilitation of patients with a compromised immune status can be challenging as well. Particularly Sjögren's patients can suffer from severe problems with oral functioning, as well as that wearing conventional dentures on their dry and tender mucosal surfaces is very uncomfortable. Currently, there is some evidence that systemic conditions and their therapy, e.g., rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), osteoporosis and corticosteroid therapy, are no longer considered as risk factors for successful osseointegration of dental implants (Slagter et al. 2008, Diz et al. 2013, Clementini et al. 2014). With regard to Sjögren's syndrome the sparse evidence for insertion of dental implants is mainly from case-reports and small case-series (Payne et al. 1997, Isidor et al. 1999, Binon 2005, Spinato et al. 2010, Krenmair et al. 2010).

## Aim of the study

The overall aim of this PhD study was to assess the treatment outcome of implant therapy in patients with a compromised intra- or extraoral condition.

The specific aims were:

- to assess the long term results of prospective studies on mandibular implants in oral cancer patients installed during ablative tumour surgery, focussing on oral functioning, quality of life, denture satisfaction, peri-implant health and implant survival (Chapter 2);
- to describe the use of implants in patients treated for rhabdomyosarcoma during childhood (Chapter 3);
- to assess the clinical outcome, the need for surgical and prosthetic aftercare, and satisfaction of patients provided with implant-retained nasal prostheses (Chapter 4);
- to assess the clinical outcome of implant therapy in a cohort of well-classified patients with Sjögren's syndrome compared with healthy controls (Chapter 5).

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