Göteborg, 2021

On dental implant failure and patient-related factors

Akademisk avhandling

Som för avläggande av odontologie doktorsexamen vid Sahlgrenska akademin, Göteborgs universitet kommer att offentligen försvaras i sal Europa, konferenscentrum Wallenberg, Medicinaregatan 20A, fredagen den 29 oktober 2021, klockan 9.00.

av **Malin Olsson Malm**

Fakultetsopponent:

Professor Andreas Thor

Uppsala universitet, Sverige

Avhandlingen baseras på följande delarbeten

I. Jemt T, **Olsson M**, Franke Stenport V. Incidence of first implant failure: A retroprospective study of 27 years of implant operations at one specialist clinic. *Clin Implant Dent Relat Res. 2015;17 Suppl 2:e 501-10.*

II. **Malm MO**, Jemt T, Stenport V. Early implant failures in edentulous patients: A multivariable regression analysis of 4615 consecutively treated jaws. A retrospective study. *J Prosthodont. 2018;27(9):803-812.*

III. **Malm MO**, Jemt T, Stenport VF. Patient factors related to early implant failures in the edentulous jaw: A large retrospective case-control study. *Clin Implant Dent Relat Res. 2021;23(3):466-476.*

IV. **Malm MO**, Jemt T, Trindade R, Stenport V. Gene expression in bone around dental implants with severe bone loss: An experimental pilot study with human biopsies. *In manuscript.*

SAHLGRENSKA AKADEMIN
INSTITUTIONEN FÖR ODONTOLOGI

GÖTEBORGS UNIVERSITET

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Malin Olsson Malm

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Abstract

Dental implants function as anchorage for dental prostheses. In a small number of cases, osseointegration fails to establish or be maintained around the implants, but the reasons for these failures are not yet fully understood. This thesis investigated a cohort of patients rehabilitated with dental implants, with respect to incidence of implant failure and potential risk factors for early implant failure, and explored the gene expression of selected biological markers in peri-implant bone sites with severe bone loss.

Patient data were retrospectively compiled from one specialist referral clinic. Data were analyzed on the patient level covering 27-31 years of implant treatment (Studies I, II and III). **Study I** described the incidence of implant failure for the total group of rehabilitated patients. In **Studies II** and **III**, multivariable logistic regression analyses of several anamnestic and clinical variables were performed to find potential risk factors for early implant failure in edentulous jaws. In **Study IV**, an experimental pilot study, gene expression analysis was performed in biopsies from bone and peri-implant crevicular fluid (PICF) surrounding implants with severe bone loss compared to un-affected bone, using qPCR technique.

In **Study I**, a total number of 39,077 implants were inserted in 8528 patients. Of these, 9% of the rehabilitated jaws were registered with implant failure and 69% of these had the first implant failure during the first year of function. Implant failures were more frequent in the maxilla as compared to the mandible. The change from implants with turned, minimally rough surfaces to implants with different moderately rough surfaces coincided with a decrease of early implant failure. In **Study II**, the incidence of early implant failure in edentulous jaws was higher in the maxilla compared to the mandible, with turned as well as moderately rough surfaces. The highest risk of early implant failure was related to the maxilla together with implants with a turned surface. Older age at implant surgery was associated with lower risk of early implant failure. In **Study III**, nine risk factors for early implant failure were identified: systemic disease, allergies, food allergies, smoking, analgetic medication, implants in the opposing jaw, low primary stability, reduced bone volume, and healing complications. In **Study IV**, an upregulation of pro-inflammatory cytokines and bone degradation markers were found in bone biopsies from bone loss sites compared to biopsies from unaffected bone in the same patients. The results were partly corresponded by the PICF samples. The results need to be interpreted with caution due to the small sample size and the pilot study design.

In conclusion, implant failures occurred in 9% of the jaws. Several risk factors for early implant failure were identified, which need to be considered in future implant rehabilitations. There was a difference in the gene expression around implants with severe bone loss compared to samples from un-affected bone. Further studies are needed to describe the processes associated with implants that display ongoing bone loss.

Keywords: early implant failure, patient factors, multivariable logistic regression analysis, gene expression analysis

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