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ORIGINAL ARTICLE

Necessity of surgical dental foci treatment prior to organ transplantation and heart valve replacement

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Abstract Diagnosis and surgical treatment of septic foci (e.g., apical or marginal and profound periodontitis, cysts, unrestorable teeth, or abscesses) in patients awaiting organ transplants and heart valve replacement (HVR) have become a recommended, yet controversial standard procedure. This study aims to evaluate the numerical extent of the required oral surgical procedures removing septic foci in these patients. Data of 204 patients (115 males/89 females) of the Department of Oral- and Maxillofacial Surgery with an average age of 58 years were evaluated in terms of necessary oral surgical procedures before HVR or kidney (K), heart (H), or liver (L) transplant (T) and were compared with data from patients not undergoing transplantation or HVR, who were referred for other reasons such as oral surgery. The number of tooth extractions or apicoectomies per patient averaged two to five for each of the four patient groups (KT, 0–7 affected teeth; HT, 0–5; LT, 1–5; and HVR, 1–10). Treatment of periodontitis was necessary in 64% of patients. A total of 70% of patients required oral surgical procedures before HT, LT, and HVR, while 84% needed before KT. Removal of oral septic foci is necessary to avoid jeopardizing the success of transplantations. With regard to the surprisingly high need for surgical treatment in this patient population, assessment of these patients by the appropriate specialist and continuation with a follow-up program is still highly recommended.

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Introduction

Rising numbers of transplants and new possibilities in transplantation medicine have reached a point where health care must be extended beyond immediate issues related to transplantation. Considering the often life long immunosuppression after organ transplants, the inclusion of the dental specialty as well as the specialty of oral surgery in transplantation concepts and treatment management is required. In immunosuppressed patients, odontogenic infections in theory pose an especially severe risk of secondary infections of various organs via the hematogenous spread of a potentially pathogenic aerobic/anaerobic germinal spectrum consisting of *Streptococci*, *Staphylococci*, *Fusobacteria*, *Porphyromonas*, and *Bacteroides* species [12]. The extent of the suspected risk increase has not been unequivocally documented by scientific studies and therefore might be frequently underestimated [5]. However, individual cases have been reported for which the possibility seems likely of focal dental infection leading to secondary bacterial infections of organ systems [6, 14]. Nevertheless, no universal treatment guidelines for risk minimization according to evidence-based medicine prac tices exist yet. Even so, recommendations are based on established prophylaxis concepts such as that for prophylaxis of endocarditis [4]. Following these points, this clinical study aims to evaluate the scope of oral surgical treatment needs in patients before organ transplants and heart valve replacements (HVRs) compared with patients not undergoing organ transplantations.

Patients

Over the course of 3 years, data were gathered from a total of 204 patients (115 males/89 females; ages 56±8.2 years) referred to the Department of Oral- and Maxillofacial Surgery. They received examinations to evaluate the necessity of oral surgical procedures before planned HVRs (n=73) and kidney (K, n=788), heart (H; n=724), or liver (L; n=719) transplants (T). Non-transplant patients (50 males/50 females; ages 54+7.9 years) referred to this department for problems other than dento-alveolar served as control group (n=7,100).

Materials and methods

Data were collected after clinical oral examination, including periodontal probing and sensitivity tests of teeth and performing an orthopantomogram as well as dental radiographs. After establishing a course of treatment, therapy was carried out accordingly. Extractions with or without surgical devices (osteotomies) were performed on teeth with large carious defects, which could not be preserved satisfactorily or treated prosthetically; teeth with apical osteitis, which could not be restored through root canal fillings and apicoectomies; partially impacted teeth; and teeth with grades II and III periodontal attachment loss and retained roots with radiographically visible periradicular osteolysis. Teeth that were pre-damaged by profound dental caries or non-vital but restorable were treated with root fillings and apicoectomies. If a marginal or profound periodontitis was diagnosed (pocket depths >6 mm), open surgical periodontal restoration was performed with or without extracting teeth not worth preserving. Surgical treatment of all high-risk patients (those with hemorrhagic diathesis and risk for endocarditis) was performed as an in-patient procedure and under local anesthesia with anesthesiological stand-by or under general endotracheal anesthesia. After treatment, patients were transferred back to their original medical centers with a mandatory 3- to 6-month follow-up period with their primary care dentist or the Department of Oral- and Maxillofacial Surgery. Statistical analysis was performed using the t test. Differences above the 95% confidence interval (p<0,05) were regarded as statistically significant.

Results

Comparing the average number of teeth extracted or restored with apicoectomies, significantly more teeth had to be surgically restored or extracted in patients before KT (4.3) and HVR (5.2) compared to patients in the control group (1.1; p<0,05). On the other hand, there was no significant difference from the control group in patients before HT (3.1) and before LT (2.9; p>0,05; Fig. 1). The difference in patients needing periodontitis therapy before transplants and HVRs was more evident when compared to the control group: In 28.4% of patients before KT, in 20.8% before HT, in 21.1% before LT, and in even 30.1% before HVR, treatment of periodontitis was indicated compared to only 11% in patients of the control group (p<0,05; Fig. 2). Considering all necessary dental surgical measures such as open periodontitis therapy, tooth extractions, and apicoectomies, the results for patients awaiting transplants and HVRs were even more pronounced: In comparison to patients from the control group (15%), dental surgical intervention was necessary for 66.7% of patients before HT, 68.4% before LT, 70.5% before HVR, and most significantly, 84.1% for patients before KT compared to all other patient groups (p<0,05; Fig. 3). Age or gender of patients did not influence these results. Within 6 months after transplantation or HVR, a total of four patients (2%; HT, n=1 and HVR n=3) reported dental problems. These patients had radiological signs of apical periodontitis of previously symptom-free teeth and had to be re-hospitalized for treatment.

Discussion

The results of this study show a high need for dental surgical treatment in patients awaiting organ transplants and HVRs. One reason for the high number of diagnosed treatment needs in this study could be a negative selection of patients by the referring department. However, Lund et al. [9] reported a comparably high proportion of necessary dental surgical treatment after screening the patients in transplantation centers. No less than 84% of patients before heart transplants required a septic focus removal. This makes the negative selection in our study unlikely. The

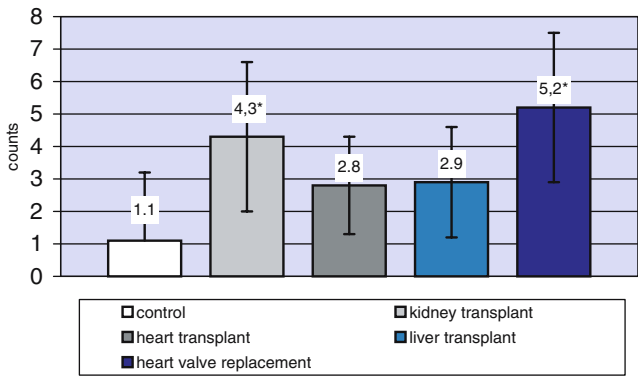

Fig. 1 Average number of tooth extractions and apicoectomies in the control group and in patients before organ transplants and HVRs. *Asterisks* indicate significance at level 0.05 towards control

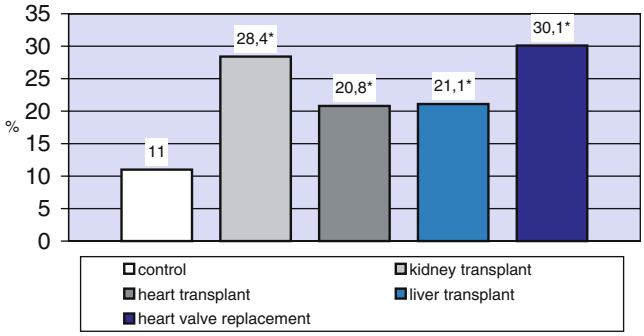

Fig. 2 Need for surgical treatment of periodontitis in the control group and patients awaiting organ transplants or HVRs. *Asterisks* indicate significance at level 0.05 towards control

increased need for therapy in patients awaiting organ transplants and HVRs can rather be explained by the fact that these patients had been without dental treatments and check-ups for an extended period of time before this dental foci screening. Mainly due to physical restrictions, the most recent dental visit of these patients took place on average 2 years earlier [15]. On the other hand, a possible cariogenic potential of cumulative metabolites seems unlikely. In a contrary example, children with chronic kidney insufficiency were reported to have a significantly lower incidence of caries compared to healthy children due to the inhibitory effect of increased levels of salivary urea [8].

Despite the obviously high need for dental surgery in patients before transplants and HVRs, the need for septic focal treatment remains controversial. Meyer et al. [11] could not provide evidence in their study on 74 heart transplant recipients proving that dental septic foci led to an increase in incidence of infections, in frequency and severity of rejection episodes, or in mortality. However, their post-operative follow-up time was short. Reportedly, during follow-up time, even the obvious presence of dental foci did not cause oral complications (e.g., abscesses or viral stomatitis) after transplantation or under immunosuppression. Therefore, they concluded that preventive dental surgical treatment does not improve the prognosis for patients awaiting transplants. However, Velich et al. [15] reached a different conclusion in their trial with 55 patients, also heart transplant recipients. Dental septic foci existed in 34.5% of patients and most likely caused organ damage in one patient through an infection. Hence, this study highly recommended dental focus screening before transplants and regular follow-up monitoring of these patients, especially considering lifelong immunosuppression. If dental septic foci are present, both systemic and local complications seem possible when performing dental surgical treatment after transplants and HVRs. Possible local complications include post-operative bleeding caused by anticoagulative treatment and impeded wound healing as well as osteomyelitis due to immunosuppression [9]. Even after completing therapy, however, the need for future dental treatment cannot be ruled out, but it is minimized. In this study, only four patients (2%) needed further dental surgical therapy.

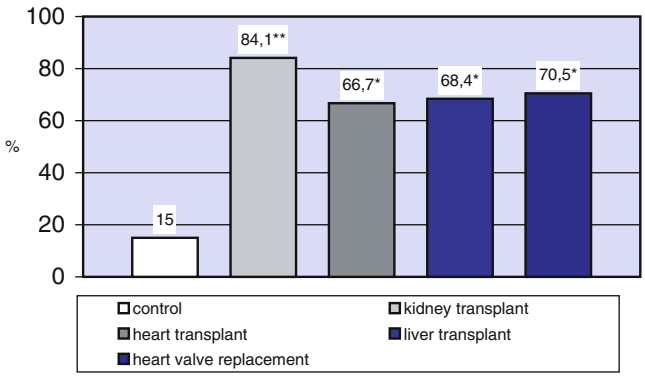

Fig. 3 Necessary dental surgical procedures for septic focal treatment in the control group and in patients before organ transplants or HVRs. *Single asterisks* indicate significance at level 0.05 towards control; *double asterisks* indicate significance at level 0.05 towards other groups

In this study, not only is the prevalence of teeth requiring treatment higher in patients awaiting KTs and HVRs compared to the control population, but the prevalence of periodontitis requiring treatment is also significantly higher in patients awaiting organ transplants and HVRs. Bacteriaemias caused by periodontitis are relevant not only for prognosis immediately after surgery but also for the rest of the patients' lives, especially when taking immunosuppressive medications after transplantation and a higher risk for endocarditis after HVR into account. Not only are secondary infections possible through the hematogenous spread of bacteria [16] but also is a hyperinflammatory monocytic response to bacteremias, particularly to the periodontitis-causing germ *Porphyromonas gingivalis*, with the potential for inducing thromboembolism and arteriosclerosis [3, 7, 10]. Additionally, restoration of the periodontium, encouragement of oral hygiene, and frequent follow-ups are recommended by many authors [2, 13] to improve the prognosis for teeth in patients after organ transplants and HVRs, especially considering a possible cyclosporine A-induced gingival overgrowth [1].

Although no evidence-based guidelines for dental septic focal treatment exist, patients should be advised to have their dental foci restored before organ transplants or HVRs to avoid post-transplant systemic and local oral complications, as documented for individual cases. In addition, these patients should be integrated into an organized dental or oral–maxillofacial surgical follow-up program. According to our own experiences, patients with dental septic foci are often referred to us only a few days before undergoing organ transplantation. Transplantation check-lists and guidelines have to involve an early dental foci screening as a standard to improve treatment of these patients without

time pressure, and so, it does not become true that "medicine forgets dentistry"[5].

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