

# Dental management of patients before and after renal transplantation

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## SUMMARY

The number of patients who are long-term survivors of renal transplantation increases rapidly, and proportionally increases the demand of quality dental care for this group of patients. All the transplant patients are on potent immunosuppressants and also some of them may suffer from other systemic diseases, so their dental management is a challenge for any dentist. This article is an update of the current relevant literature and is aimed to summarize the key points of dental care for renal transplant patients, since no specific guidelines exist. The research for relevant references took place by using Pubmed database, as well as information published by accredited medical societies and health services both in Greece and abroad.

**Key words:** renal transplantation, dental treatment.

## INTRODUCTION

Renal transplantation has been one of the medical miracles of the 20th century and has improved the quality of life of thousands of patients who suffered from chronic end-stage kidney disease throughout the world. These patients have had their life extended by replacing renal function by either peritoneal dialysis or artificial kidney dialysis, and transplantation is the best treatment choice for them (1).

From 1988 until today, 301,072 kidney transplantations have taken place in the USA. Moreover, through new immunosuppressive therapies, significant progress has been made regarding the survival of kidney transplants, which is a fact that is expected to increase the advantages of transplantation in comparison to renal dialysis (2).

As medical science progresses and the life expectancy of transplant patients increases, the number of such patients who will seek dental care increases as well. Dentists now play an active role in preparing a patient before the transplantation, as

well as treating him/her afterwards (3).

Patients who suffer from renal failure need special treatment from the dentist, not only because of the side-effects of the treatment they already follow, but also because of the complications that may arise during dental treatment (4, 5).

For this reason, first and foremost there should be a co-operation between the treating nephrologist and the dentist so as to form a targeted dental therapy plan. The aim is for the patient to reach the transplantation stage while having a healthy mouth, even if it is not possible to maintain the full dentition (3, 6).

By communicating with the treating nephrologist, the dentist obtains information regarding the stage of the disease as well as the kind of treatment the patient receives. Thus, the best time for the patient's dental treatment is set so that the complications that may arise can be limited. Any change in the pharmaceutical treatment of the patient, as well as any invasive procedure should always take place in consultation with the treating doctor (7).

This article analyses the provision of dental care for patients with renal disease before and after the transplantation, as this is indicated by the

**Table 1.** Causes that lead to transplantation

Diabetes
Hypertension
Glomerulonephritis
Polycystic Kidney Disease
Other Urinary Diseases
Other Diseases

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existing protocols and medical instructions that are relevant to organ transplantation. The research for relevant bibliography took place by using Pubmed database, as well as information published by accredited medical companies and health services both in Greece and abroad.

## PRE-TRANSPLANTATION CARE

### What the dentist should bear in mind

Chronic Renal Failure is the development of the course of chronic diseases, which progressively destroy the nephrons, and is characterised by a gradual reduction in kidney function. In order to make a quantitative assessment of the renal function, the GFR (Glomerular Filtration Rate) (normal GFR values: 118-127 ml/min/1,73 m<sup>2</sup>) and the cre-

atinine clearance (normal range 104-125 ml/min) are used (8).

### Medical History

A person suffering from kidney disease may suffer from various diseases as well. These diseases may either be related to the cause that leads to the transplantation (Table 1) or coexist (comorbidity). This is why a patient's medical history has to be checked carefully, so as to determine which further measures must be taken during his/her dental treatment (9, 10).

### Medication

The patients may be taking numerous medicines that affect dental procedures and have oral manifestations. These medicines include anticoagulant medicines, beta blockers, calcium channel blockers, diuretics, etc. The dentist has to be aware

**Table 2.** Adjustment of commonly used in dentistry medication according to creatinine clearance (adapted from ref 5)

Pharmaceutical substance	Adjustment based on Creatinine Clearance (ML/MIN)		
	>50	10-50	<10
<i>Antimicrobials</i>			
Amoxicillin	Usual dosage every 8 hours	Usual dosage every 8 or 12 hours	Usual dosage every 12-18 hours
Erythromycin	Regular dosage and rate of administration	Regular dosage and rate of administration	Reduced dosage to 50-75%
Clindamycin	Regular dosage and rate of administration	Regular dosage and rate of administration	Regular dosage and rate of administration
Metronidazole	Regular dosage and rate of administration	Regular dosage and rate of administration	Reduced dosage to 50%
Aciclovir	Usual dosage every 8 hours	Usual dosage every 12-24 hours	Usual dosage every 48 hours
Ketoconazole	Regular dosage and rate of administration	Regular dosage and rate of administration	Regular dosage and rate of administration
<i>Analgesics</i>			
Aspirin	Regular dosage and rate of administration	Adjustment of the rate of administration	Avoid
Paracetamol	Regular dosage and rate of administration	Regular dosage and rate of administration	Adjustment of the rate of administration
Ibuprofen	Regular dosage and rate of administration	Regular dosage and rate of administration	Avoid
Diclofenac	Regular dosage and rate of administration	Regular dosage and rate of administration	Avoid
Naproxen	Regular dosage and rate of administration	Regular dosage and rate of administration	Avoid
<i>Local anaesthetics</i>			
Lidocaine	Regular dosage and rate of administration	Regular dosage and rate of administration	Regular dosage and rate of administration
Mepivacaine	Regular dosage and rate of administration	Regular dosage and rate of administration	Regular dosage and rate of administration
OTHERS			
Prednisone	Regular dosage and rate of administration	Regular dosage and rate of administration	Regular dosage and rate of administration

of the side-effects of these medicines, which may vary from xerostomia to postural hypotension and hyperglycemia, as well as the interactions with other medicines that he/she may prescribe. A lot of medicines that are usually used in dental procedures, including nonsteroidal anti-inflammatory drugs (NSAIDs), opioid analgesics and some antibiotics, are metabolised by the kidneys. Before the dentist administers any medication, he/she should bear the renal function in mind. (patient's GFR – after consulting with the nephrologists). The nephrologist might need to adjust either the dosage or the administration rate of a certain medicine (Table 2) (5, 11).

**Haemorrhage – Anticoagulant treatment**

Patients who are subjected to renal dialysis undergo anticoagulant treatment, which aims to facilitate the dialysis procedure (easier blood flow and maintenance of vascular access) (12). A haematological test (INR\*, PT, PTT, CBC\*\*) should be carried out before any dental procedure that may involve haemorrhaging, and, in consultation with the nephrologist, the best ways to stop any potential haemorrhage should be decided (Table 3).

Moreover, the nephrologist may decide to temporarily reduce the patient's anticoagulant treatment (13).

**Prophylactic treatment with antibiotics**

In the case that chemoprophylaxis needs to be administered in order to prevent systemic infection before an invasive dental procedure (tooth extraction, periodontal treatment, endodontic treatment, apicoectomy, placement of orthodontic appliances, implant placement), the regiment that is suggested – unless otherwise instructed by the nephrologist – is the American Heart Association's (AHA) standard regiment

**Table 3.** Suggested methods to control possible hemorrhage

Use of Oxidised Cellulose
Collagen Fibers
Suturing
Tamponate
Mouth washing with Tranexamic acid 10-15mg/kg per day in 2-3 doses
Vitamin K administration

**Table 4.** Indications for extraction prior to transplantation

Tooth mobility (periodontal pocket >5-6 mm)
Teeth with endo-perio problem
Teeth with periapical lesions
Teeth with very deep or extensive caries

to prevent endocarditis: 2 g of amoxicillin, orally, one hour prior to dental procedure. If a patient is allergic to penicillin, clindamycin is the medicine of choice (600 mg orally, one hour before the procedure). In the case that a patient has an active infection, such as a

periodontal or dental abscess, antibiotic treatment should be given before and after the dental therapy. The choice of the appropriate antibiotic is once again confirmed by the nephrologist (4, 14, 15).

**CARE BEFORE THE TRANSPLANTATION**

To the patient who is about to undergo a transplantation, we initially perform a noninvasive examination (without a periodontal control), we review his/her dental history and we take dental radiographs in order to determine a therapy plan. The patient is informed about the condition of his oral condition as well as the problems that may arise after the transplantation. Oral hygiene instructions are given (i.e. brushing, using dental floss, changing eating habits if it is necessary, and using fluoride solutions and antiseptics such as chlorhexidine) (16, 17).

All the dental problems of a patient with Chronic Renal Failure will have to be treated aggressively prior to transplantation. The reason is that, after the transplantation – and in order for the body not to reject the transplant – the immune system is suppressed and the ability of the body to cope with systemic infections is reduced (3).

The therapy plan includes gingivitis and periodontitis therapy. Carious teeth with a favourable prognosis are sealed. Endodontic therapies are carried out. Teeth with poor or uncertain prognosis, which might become sources of bacteremia if they remain in place, are extracted (Table 4) (17). The orthodontic brackets maybe removed and partial dentures need to be adjusted if a patient is going to be taking cyclosporine after the transplantation, since this immunosuppressant causes gingival enlargement (11). Implant placement is postponed until the patient's health has been stabilized and the transplant has been fully accepted by the body. In order to place any implants prior to transplantation, there should be an adequate period of time allowing the assessment of osteointegration of the implants (18). For these patients, local anesthesia should preferably be applied without vasoconstrictors, as most of these patients are hypertensive (19). The pain medication of choice is Paracetamol, and NSAIDs should be avoided (20).

Patients who have undergone corticosteroid treatment for a long period of time, might require a supplementary corticosteroid dose in order to prevent an Addisonian crisis\*\*\*. Moreover, it is suggested that dental sessions take place in the morning, in a quiet working environment, and that abrupt and unexpected movements be avoided during dental therapy (5, 12, 16).

The dentist should bear in mind that patients who undergo kidney dialysis, are at increased risk of being infected with viruses such as HIV, HBV, HCV, as well as the mycobacterium tuberculosis. Periodic laboratory testing is essential for these patients. Dentists should also be taking measures to avoid cross contamination in the dental office (4, 13).

## CARE AFTER THE TRANSPLANTATION

### What the dentist should bear in mind

#### *Before Dental Treatment*

The dental treatment of transplant patients requires close consultation between the dentist and the treating nephrologist. The aim of this consultation is to determine the pharmaceutical treatment the patient will receive by the dentist and whether the nephrologist, prior to dental treatment, should adjust the immunosuppressives and anticoagulants (11).

#### *Medications*

Transplant recipients may be taking one or more medicines that may affect the dental treatment. The biggest obstacle to organ transplantation is the reaction of the recipient's immune system itself, which views the transplant as a foreign body and rejects it either immediately or over time. Thus, it is essential to administer medicines that suppress the immune system. These medicines should be taken by the patient for the rest of his/her life (10).

The basis of most immunosuppressive regimens is prednisolone, which is a corticosteroid. Prednisolone suppresses the immune system, but it is usually insufficient by itself to prevent the rejection of the kidney transplant. For this reason, prednisolone is administered in combination with other non-steroid immunosuppressive medicines, which, in turn, allows the administration of a lower dose of prednisolone. The most common pharmaceutical regimen nowadays is a combination of tacrolimus, mycophenolate and prednisolone. Instead of this, some patients receive cyclosporine, sirolimus or azathioprine (3, 10).

A large number of transplant patients also suffer from hypertension, diabetes or cardiovascular diseases, so it is essential for them to receive anticoagulant/antiplatelet treatment. Coumarin anticoagulants (sintrom, warfarin) are usually avoided due to the doctors' difficulty to adjust the medicine levels, given that, even after the kidney transplantation, the renal function is not fully restored and this may result in hemorrhage. Thus, in the rare occasion that the transplant patient is administered coumarin anticoagulants, a recent INR should be required before any dental work that may involve bleeding. If

the INR is above 2.5, there should be a consultation with the nephrologist so as to adjust the dose. In the case that the patient receives antiplatelet treatment with aspirin or clopidogrel, it is safe to proceed to the extraction of up to 3 teeth, without stopping the medication intake. In the case that the doctor recommends stopping the antiplatelet medication, the period of time should be seven days before the scheduled operation and 5 to 7 days after the operation, always in consultation with the treating doctor who administers the medication (3, 9, 21).

#### *Infection risk*

Patients who have undergone an organ transplant surgery are at greater risk of serious infection. Bacterial, viral and fungal infections are very common, especially immediately after surgery. The decision to administer antibiotics prior to any dental procedure, as well as the selection of antibiotics, should always be made in consultation with the patient's doctor (3, 17, 22).

Throughout the international bibliography, there are no clear guidelines as to if and when prophylactic antibiotic therapy should be given to transplant patients who are about to undergo dental procedures, in order to prevent transient bacteremia. Through a research which was carried out using a questionnaire that was given to a large number of doctors who work in transplant centres in the USA, most doctors stated that they recommend the use of prophylactic antibiotic therapy to all the patients that have been subjected to transplantation and are about to go through dental procedures. Most of these doctors said that they recommend the AHA's standard regimen to prevent endocarditis as a suggested prophylactic therapy (3, 7, 17, 22).

## THE FIRST 6 MONTHS AFTER THE TRANSPLANTATION

### *Dental Treatment*

This is the most critical period for the patient's life. During this period of time they receive the highest dosage of immunosuppressive medicines because they are at higher risk of rejecting the transplant as well as developing serious complications. That is why only emergency dental therapies are performed, only in the hospital environment and only after the treating nephrologist has been informed (11).

At this phase, dental treatment in the dental office is, in essence, palliative and preventive.

The patient is informed about the oral hygiene procedure that must be followed (use of a very soft toothbrush, fluoride toothpaste and antiseptic

mouthwash, such as chlorhexidine). It is suggested that the patient should stop smoking and drinking alcohol and that his/her eating habits change as well (soft foods should be consumed; food irritants, foods that cause tooth decay and too hot foods should be avoided). Dentures and orthodontic appliances are removed, in case this has not been done prior to operation. A stomatological examination is carried out to detect for any opportunistic infections and mycoses (5, 17, 18, 23).

## 6 MONTHS AFTER THE TRANSPLANTATION

### No signs of rejection

#### *Dental Treatment*

The patient is given oral hygiene instructions. At this stage, dental procedures may take place selectively. The dentist may safely perform dental cleaning, sealing, endodontic treatments and fixed prosthetic work. As far as periodontal treatment is concerned, it would be advisable to proceed with it based on a plan that incorporates many sessions. During each of these sessions, a small number of teeth should be scaled.

Attention should be drawn to invasive dental treatments, such as implant placement and extraction. In these cases, a haematological test (INR, PT, APTT, CBC) should be carried out. All measures to prevent haemorrhage should be taken (suturing, use of oxidised cellulose, etc.) and it is essential to consult with the nephrologist, who will decide whether chemoprophylaxis should be administered. Moreover, the nephrologist might adjust the dosage of anticoagulant medicines to avoid bleeding, as well as corticosteroids to avoid an Addisonian crisis. The dentist, in turn, in order to avoid an Addisonian crisis, makes sure that the sessions are short in duration and take place in the morning, in a relaxed atmosphere (12, 20, 24). The local anaesthesia that is used for a patient that has had kidney transplantation is the same that is used for all patients (lidocaine, mepivacaine); the only difference is that, before the use of local anaesthesia, a mouthwash containing chlorhexidine should be used for 1 minute.

During every session, the patient must be checked for any oral lesions and malignancies that are related to immunosuppressive therapy.

Many complications and malignancies that are connected with the immunosuppressive pharmaceutical therapy the organ recipients follow are manifested in the mouth. Infections such as candidiasis and secondary recurrent oral herpes, appear very often. Cyclosporine may cause gingival enlargement.

(3, 20, 25). Malignancies can occur decades earlier in immunosuppressed patients than in the rest of the general population. After kidney transplantation, transplant recipients have been shown to have high susceptibility to developing epithelial dysplasia and squamous-cell carcinoma of the lip: this is due to iatrogenic immunosuppression, which also increases the susceptibility of the oral mucosa to viruses that are related to tumours, such as Kaposi's sarcoma and non-Hodgkin lymphoma.

In any case, if the dentist observes any of the aforementioned lesions, he/she should inform the treating nephrologist (3, 7, 17, 26).

### In case the transplant is rejected by the body

#### *Dental Treatment*

The recipient's body may reject the transplant either during the first few months or gradually, within a five-year period. The patient is in bad condition, as he/she receives immunosuppressive treatment and at the same time his/her body rejects the transplant. Under such circumstances, any dental treatment will have to be postponed; only emergency dental procedures may be performed, preferably within a hospital environment. For any dental treatment of a patient at this stage, constant consultation with the treating nephrologist is required. The nephrologist also determines the antibiotic regimen the patient should receive (in order to prevent bacteremia), the pain medication and any other adjustments that must be made to the medication the patient takes for other present diseases (23, 24).

## CONCLUSIONS

Organ transplantation is a rapidly developing medical field. The complications a transplant patient develops, including the stomatological ones, are numerous. This results in a constant effort to adjust the treatment regimens for these patients, as well as to find new treatment strategies so as to face these complications in the best way possible and to ensure the patients' quality of life.

A dentist needs to be informed, as it is up to him/her to quickly diagnose and treat the complications that are developed in the mouth of these patients, so as to contribute in promoting the patients' health.

The patients who have undergone transplantation need special dental care. The reduced defense of their body as well as their already compromised health, puts them at high risk of developing a plethora of systemic and stomatological diseases. This fact should be taken into account when planning

their dental treatment before and after the transplantation, and close consultation with the treating nephrologist is mandatory.

### ABBREVIATIONS

\*INR – International Normalized Ratio is a test for blood coagulation calculated by the ratio of the patients Prothrombin Time PT to the Standard Prothrombin Time (PT/st PT) normal range

is 0,8-1,2 INR is useful for monitoring patients on coumarin anticoagulants APPT (activated Partial Thromboplastin Time) is useful for monitoring patients on heparin.

\*\*CBC – Complete Blood Count.

\*\*\*Addisonian crisis – a medical emergency state due to adrenal insufficiency manifesting as loss of consciousness due to low blood pressure and hypoglycemia accompanied by severe electrolyte disturbances.

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