Is the initiation of non-invasive dental hygiene procedures* contra-indicated? Possibly (e.g., during the immediate post-transplantation phase, in which only emergency oral care is indicated)

- Is medical consult advised? ............................................ Yes. Medical consultation should determine the following:
  - if/when the patient/client can receive routine dental hygiene (and dental) care;
  - transplant recipient’s medical stability;
  - co-morbidities (e.g., diabetes, cardiovascular disease, etc.);
  - medical management of the transplant recipient, including specific concerns during the pre-transplant and/or post-transplant phases (such as infections); and
  - medication history including 1) determination if patient is susceptible to adrenal crisis, which is associated with high doses or long-term use of steroids; and 2) medication side effects (both for immunosuppressive agents and disease-specific drugs). Patients/clients preparing to undergo organ transplantation may be taking multiple medications, including anticoagulants, beta-blockers, calcium channel blockers, diuretics, and others. Side effects of these medications range from xerostomia and gingival hyperplasia to orthostatic hypotension and hyperglycemia.

Waiting time until anticipated organ transplant should be ascertained so a dental hygiene care plan can be developed for the patient/client in the pre-transplant phase to avoid postoperative complications from poor health and hygiene. Furthermore, the patient/client’s transplant team must be consulted to ensure the safety of any recommended over-the-counter (and prescribed) medications, because cyclosporine levels are easily disrupted, drug interactions are common, and a wide variety of medications are nephrotoxic to transplant recipients. Additionally, post-transplant, the patient/client should be immediately referred to the transplant physician if oral findings are suggestive of organ rejection.

Is the initiation of invasive dental hygiene procedures contra-indicated?** Yes. Immunosuppressive therapy may affect appropriateness or safety, and scaling and root planing, including curetting of surrounding tissue, are contraindicated until the patient/client is medically cleared. In some cases, immunosuppression that warrants antibiotic prophylaxis and/or a bleeding disorder (thrombocytopenia) may be present.

- Is medical consult advised? ............................................ As above. Pre-transplantation, consultation with the patient/client’s physician should occur to establish the degree of organ dysfunction. As well, if emergency oral treatment is required during the immediate post-transplant period, this should be done in close consultation with the patient/client’s physician. Specifically, the oncologist/transplantation specialist should be consulted regarding the status of blood counts (white and red cells), platelets, and clotting factors.

- Is medical clearance required? ............................................ Yes. Blood work should be conducted before dental hygiene treatment to determine if the patient/client’s platelet count, clotting factors, and absolute neutrophil count are sufficient to prevent hemorrhage and infection. Organ recipients are usually on immunosuppressive drugs, such as cyclosporine, azathioprine, prednisone, tacrolimus, mycophenolate (MMF), rapamycin (sirolimus), everolimus (RAD), and antithymocyte and antithymocyte globulins (ALG and ATG). Azathioprine suppresses bone marrow with resultant leukopenia (low white cell count), thrombocytopenia (low platelet count), and anemia. Cyclosporine can cause severe liver and kidney problems, leading to hypertension, bleeding tendency, and anemia. Corticosteroid medication may suppress adrenal function, predisposing the patient/client to adverse reaction (including potential circulatory collapse) from stress associated with emotional, physical (including infection), and surgical stress; thus, supplemental steroids may need to be administered. Furthermore, additional drugs with potential dental hygiene implications may be utilized depending on the type of organ transplant (e.g., diprydiamole, an antiplatelet agent, is given to heart transplant recipients; anticoagulants are given to liver transplant recipients to prevent recurrence of hepatic vein thrombosis).

1 Consultation should involve the transplant physician/surgeon and team.
Is the initiation of invasive dental hygiene procedures contra-indicated?** (cont’d)

- **Is antibiotic prophylaxis required?** Possibly (and likely during the immediate post-transplant period); infections are a very serious concern in the transplant patient/client. Solid organ transplant recipients should be evaluated individually for infectious risk, and medical/dental input should be sought. Post-transplantation patients/clients are susceptible to subacute bacterial peritonitis. Additionally, in some cases following heart transplantation, valvular degeneration will occur, and antibiotic prophylaxis may be indicated.

- **Is postponing treatment advised?** Possibly (depends on timing of invasive procedures relative to transplant procedure and level of patient/client’s immunosuppression). Immediately post-transplantation (and also during the chronic rejection period), only emergency dental care is indicated. In candidates for imminent organ transplantation or in organ recipients immediately post-transplant, elective dental/dental hygiene treatment should be postponed until patient/client is medically cleared (taking into account overall medical condition, level of immunosuppression, any bleeding tendency, etc.) As a general principle, elective dental hygiene (and dental) treatment should be avoided for 3 to 6 months post-transplant, given associated potential complications such as infections, fatigue, medication side effects, and saliva aspiration leading to aspiration pneumonia. If a patient/client’s body begins to reject a transplanted organ, only emergency dental care should be provided.

Oral management implications

- As medical treatment for end-stage organ disease advances, dental hygienists are likely to provide oral treatment to increasing numbers of patients/clients who are solid organ transplantation candidates or recipients.

- **Pre-transplantation**, a thorough dental hygiene (and dental) evaluation is necessary (and is required by most transplant centres) to diagnose and treat existing dental disease, particularly any infection or condition that could result in infection or need for oral surgery/invasive procedures during the immediate post-transplantation period.

- A complete series of radiographs should be considered for all dentate patients/clients.

- Oral infections are potentially dangerous to organ transplant recipients, particularly immediately after transplant surgery. Any infection (such as periodontal abscess or cellulitis) can be reactivated or exacerbated during the introduction and/or continuation of immunosuppressive therapy. Therefore, treatment of active dental disease, including dental hygiene treatment, should ideally be accomplished in advance of organ transplantation. All potential sources of dental infection, teeth with advanced periodontal disease, and nonrestorable teeth should be removed pre-transplantation. The patient/client should be instructed in meticulous, daily oral self-care to minimize bacteremias.

- Orthodontic band removal and/or prosthesis adjustment should be considered if a patient/client is expected to receive cyclosporine after transplant, because some persons taking this drug will develop gingival hyperplasia. This overgrowth can be minimized with good plaque control, and removal of orthodontic bands may make it easier to maintain good oral hygiene.

- The organ transplantation candidate will have significant end-organ disease from the organ system for which the transplant is necessary. Therefore, the dental hygienist must manage the pre-transplantation patient/client as appropriate for severe medical complications.

- Post-transplantation, the patient/client is extremely immunosuppressed from induction immunosuppression. Such therapy is at its most aggressive level immediately after transplant and for several weeks thereafter. Following surgery, the patient/client’s immunosuppressive regimen is gradually reduced and then maintained at a level that balances the risk of rejection with that of infection. Significantly, immunosuppressive therapy can mask oral tissue inflammation, and it impairs wound healing. It can also increase the risk of excessive bleeding.

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2 Depending on the type of organ transplantation, patients/clients may already be on prophylactic antibiotics and/or antifungals (e.g., nystatin) and/or antivirals (e.g., acyclovir). Additional or alternative antibiotic prophylaxis may be required for invasive dental hygiene procedures.
### Oral management implications (cont’d)

- Signs and symptoms of acute adrenal crisis include hypotension, weakness, nausea, vomiting, headache, and fever. Immediate treatment of this complication from prolonged and/or high dose steroid use is required, and emergency transfer to hospital is indicated.
- The anti-rejection drug cyclosporine and other immunosuppressive agents may adversely interact with drugs that dentists may prescribe (e.g., erythromycin, ketoconazole, carbamazepine, phenytoin, and others).
- Blood pressure should be measured in patients/clients taking cyclosporine or prednisone, given the tendency of these medications to cause hypertension.
- During the stable post-transplant phase, meticulous oral self-care should be encouraged, including twice-daily antimicrobial mouth rinses and use of xylitol-containing products. Drug selection/dosage may need to be altered (e.g., avoidance of drugs potentially toxic to the liver or kidney, such as NSAIDs\(^3\)). Frequent dental hygiene recall visits are indicated.
- Gingival enlargement risk can be reduced by appropriate daily oral self-care and frequent oral debridement (3- to 4-month continued-care intervals). Ulcerative lesions should be proactively managed.
- Frequent screening of perioral skin and the oropharyngeal area is important for transplant recipients due to elevated risk of malignancy. This is particularly important for liver transplant patients/clients with a history of tobacco use and/or alcoholism.

### Oral manifestations

- Oral complications arising in patients/clients with organ transplants are usually caused by rejection, over-immunosuppression, or the side effects of immunosuppressive drugs.
- Oral manifestations that may indicate overimmunosuppression include progressive gingival and periodontal disease; mucositis; *herpes simplex* infections; *herpes zoster*; cytomegalovirus (CMV) infection (manifesting as ulcerations); *candidiasis*; aphthous ulcers; alveolar bone loss; hairy leukoplakia; and, more infrequently, lymphoma, Kaposi sarcoma, and basal and squamous cell carcinomas (including the perioral skin and lips). Poor healing and bleeding are other side effects of immunosuppressive agents.
- Azathioprine can cause bone marrow suppression, which may be accompanied by oral ulcerations, petechiae, and bleeding. Cyclosporine can impair healing and increase risk for infection. Tacrolimus and sirolimus cause oral ulcerations, and tacrolimus can cause numbness and tingling around the mouth.
- Gingival hyperplasia may be caused by cyclosporine, and, to a lesser degree, by tacrolimus and sirolimus. It is particularly pronounced in children.
- Xerostomia is common.
- If the patient/client has Cushingoid facies (moon face) resulting from corticosteroid use, oral lesions may be found resulting from cheek and tongue biting.
- Oral findings associated with organ rejection are the same as those in patients/clients with organ failure before transplantation.

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\(^3\) NSAIDS = non-steroidal anti-inflammatory drugs (e.g., ibuprofen, naproxen, etc.)
Solid organ transplantation refers to surgical procedures in which a viable, functioning organ (such as a kidney, liver, heart, pancreas, lung, or small intestine) is placed into a patient/client with end-stage organ disease. Organ transplant procedures are common today, with kidney transplants being most frequent (with 623 being performed in Ontario in 2015), followed by liver (234) and lung (127) transplants.

The post-transplantation period typically has three phases: immediate post-transplantation period (first 3 to 6 months post-transplant, in which patient/client is at greatest risk for technical complications, acute rejection, and infection); stable post-transplantation period (3 to 6 months post-transplant onwards, in which new organ functioning nearly normally and in which susceptibility to bleeding and blood chemistry profiles will likely have returned to within normal limits); and chronic rejection period (which begins with signs and symptoms associated with organ failure along with histologic/biopsy findings associated with chronic rejection).

In the immediate post-transplant period, the patient/client is susceptible to acute respiratory distress syndrome; bacterial, viral, and fungal infections; bleeding problems; hypertension; acute renal or hepatic failure; and acute pancreatitis (which manifests as upper abdominal pain radiating to the back).

In the stable post-transplantation period, the main medical considerations relate to the effects of immunosuppressive drugs, particularly over-immunosuppression (which increases the risk of infection and sepsis) and under-immunosuppression (which increases the risk of acute organ rejection). If the transplanted organ fails, then the signs and symptoms associated with end-stage organ (be it kidney, liver, heart, pancreas, etc.) failure re-emerge.

Although acute rejection is relatively rare given today’s advanced immunosuppression therapy, chronic rejection remains a relatively common occurrence. Unlike the case with acute rejection, chronic rejection cannot be reversed with intensified immunosuppressive therapy, and it leads to worsening signs and symptoms of organ failure.

Many transplant patients/clients are treated with a trio of immunosuppressive medications (e.g., cyclosporine, prednisone, and mycophenolate mofetil). Due to immunosuppressive therapy, any infection (such as pneumonia, vascular or catheter infections, etc.) can be reactivated or exacerbated in the immediate postoperative period or afterward, depending on the level of immunosuppression.

Major complications of transplantation and/or signs of excessive immunosuppression in post-transplant patient include viral infections (HSV, EBV, CMV, HBV, HCV, and HIV), bacterial infections (wound, respiratory, urinary), impaired healing, organ rejection, graft failure, excessive bleeding, weakness, fatigue, tumours, and death.

Diabetes mellitus, hypertension, osteoporosis, bone fracture, Cushingoid features (i.e., moon facies, edema, ascites, “buffalo hump” on upper back, etc.), and depression are side effects of steroid (e.g., prednisone) therapy.

Immunosuppressed patients/clients are at increased risk of certain cancers, particularly squamous cell carcinoma of the skin, cervical cancer, lymphomas, Kaposi sarcoma, kidney carcinoma, and carcinomas of the vulva and perineum.

Different types of organ transplants entail different clinical issues. For example, many heart transplantation patients/clients experience accelerated coronary artery disease; however, because the transplanted heart has no nerve supply, pain is not associated with angina or infarction.

Waiting periods for organ donation vary, with the median Canadian wait time for a deceased donor kidney being 3.5 years (with the patient/client typically receiving dialysis in the interim). In 2015, there were 1,086 solid organ transplants in Ontario.
Disease/Medical Condition

ORGAN TRANSPLANTATION

(also known as “solid organ transplantation” and “SOT”)

References and sources of more detailed information

- International Transplant Nurses Society
  - What Every Transplant Patient Needs to Know About Dental Care
- National Institute of Dental and Craniofacial Research, National Institutes of Health
- Dentistry IQ (The Dentistry Network)
- Trillium Gift of Life Network
  http://www.giftoflife.on.ca/en/?gclid=CLajkZWe_coCFYsCaQod8swFpg
  http://www.giftoflife.on.ca/en/publicreporting.htm#transplantsytd-cal
- Kidney Foundation of Canada
- UptoDate

* Includes oral hygiene instruction, fitting a mouth guard, taking an impression, etc.

** Ontario Regulation 501/07 made under Dental Hygiene Act, 1991. Invasive dental hygiene procedures are scaling teeth and root planing, including curetting surrounding tissue.

Date: March 24, 2016