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## THE MANAGEMENT OF MEDICALLY COMPROMISED PATIENTS DURING ORTHODONTIC TREATMENT

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**Abstract:** Orthodontic therapy is no longer reserved for only healthy patients. Orthodontists are confronted with an increasing number of medically compromised patients who require proper alignment for esthetics and oral rehabilitation. As a rule, general medical problem can affect orthodontic treatment and care should be taken while managing medically compromised patients as it is not an absolute contraindication.

The paper provides important information and a systematic overview of the aspects of some of the most common systemic and local diseases on the outcome of orthodontic treatment and the management of medically compromised patient during orthodontic treatment.

Various systemic diseases, serious medical conditions and their effect on orthodontic treatment are presented in this study. Medical conditions commonly encountered in orthodontic patients include: risk of infective endocarditis, hypertension, bleeding disorders, asthma, sickle cell anemia, leukemia, cystic fibrosis, epilepsy, multiple sclerosis, viral hepatitis, diabetes, renal disorders, eating disorders, osteoporosis and allergies to materials used during orthodontic treatment. While orthodontic therapy has been considered to be completely noninvasive, specific orthodontic procedures may place some patients at risk for serious sequelae.

The difficulties faced when orthodontic treatment is provided are presented and recommendations to avoid the potential problems that may arise are also recommended. The management of medically compromised patient during orthodontic treatment, with minimal physical damage and maximum treatment outcome is presented.

With better management of serious medical problems, increased quality of life expectations, and greater ambulation, medically compromised individuals are now regular visitors to orthodontic practices.

**Keywords:** medically compromised patients, orthodontic management, orthodontic treatment

### INTRODUCTION

Orthodontic therapy is no longer reserved for only healthy patients. Orthodontists are confronted with an increasing number of medically compromised patients who require proper alignment for esthetics and oral rehabilitation. As a rule, general medical problem can affect orthodontic treatment and care should be taken while managing medically compromised patients as it is not an absolute contraindication. (Burden, Mullally & Sandler, 2001). Fortunately in orthodontics complications are infrequent and are of minor consequence, nevertheless the practitioner should understand and have a basic knowledge and understanding of the disease and its impact on the oral cavity as it is essential to recognize oral signs and symptoms of undiagnosed medical problems too. While orthodontic therapy has been considered to be completely noninvasive, specific orthodontic procedures may place some patients at risk for serious sequelae.

Medical conditions commonly encountered in orthodontic patients include:

#### **Infective endocarditis**

Infective endocarditis (IE) is defined as an infection of the endocardial surface of the heart, which may include one or more heart valves, the mural endocardium, or a septal defect (Cabell, Abrutyn, & Karchmer, 2003). The causative organisms are usually the streptococci, staphylococci, Rickettsiae, Chlamydia or fungus (Keys 2000).

**Orthodontic considerations:** (Mirzaie & Zahmatkesh 2014)

Orthodontic procedures including impression making, placement of separators, banding, surgical exposure of impacted teeth can produce bacteraemia and therefore appropriate antibiotic prophylaxis should be given. Oral amoxicillin remains the drug of choice. (Kim & Keys 2008).

- Avoid the risk of bacterial infection and bacteremia
- Maintaining a high degree of oral hygiene

- Control of plaque accumulation around orthodontic appliances
- Avoid provoking gingival bleeding
- Bonding instead of rings is preferred
- Ligation of brackets with rubber ligatures instead of wired
- Avoid tooth separation
- Use of antibacterial rinse guides
- Antibiotic prophylaxis with penicillin if needed

### **Hypertension**

High blood pressure is the major risk factor for cardiovascular disease and a major cause of renal failure and stroke. (Opeodu& Adeyemi 2015). There is no contraindications, however to provide orthodontic care for well-controlled hypertensive patients. During treatment the orthodontist should be particularly vigilant for any deterioration in gingival health as Calcium-channel blocking drugs, especially nifedipine, have been associated with gingival overgrowth. Special efforts should be made to avoid any form of gingival irritation.

#### **Orthodontic considerations:**

- To minimize stress
- Interventions take less than one hour
- Maintain good oral hygiene and healthy periodontal
- Ca pump blockers can cause gingival hyperplasia in addition to the irritation caused by the fixed appliance.

### **Diabetes Mellitus**

Diabetes mellitus is one of the most common endocrine disorders. It is a clinical syndrome characterised by persistently raised blood glucose levels (hyperglycaemia) resulting from deficiencies in insulin secretions, insulin action or both. The orthodontist should be aware of the significance of diabetes in relation to susceptibility to periodontal breakdown and hence patients with poorly controlled DM should not be treated. (Abbassy et al. 2015). Light force should be applied and vitality of the tooth should be checked in every visit. Patient with well controlled diabetes are no contraindication for orthodontic treatment.

#### **Orthodontic considerations:** (Rizvi et al. 2014).

- Absolute medical glycemic control (HbA1c) is required
- Orthodontic treatment not recommended in uncontrolled / poorly controlled diabetes
- Maintain good oral hygiene due to periodontal health
- Use of weak forces is recommended
- It is recommended to schedule morning checks after breakfast
- There is no treatment preference with regard to fixed or removable appliances. It is important to stress the maintenance of good oral hygiene, especially with fixed appliances (Bensch, Braem& Willems 2004) .

### **Hemophilia**

Hemophilia is the most common congenital sex-linked disorder due to a deficiency of clotting factor VIII. Other bleeding disorders include:

hemophilia B or Christmas disease (factor IX deficiency) and von Willebrand's disease (defects of von Willebrand's factor).

The normal concentrations of clotting factor are between 50% and 150% of average value and the minimum level of a factor for adequate hemostasis is 25%.

Hemophilia is the most common congenital bleeding disorder. Hemophilia A is a sex-linked disorder due to a deficiency of clotting factor VIII. Other bleeding disorders include hemophilia B (factor IX deficiency) and von Willebrand's disease. There is no contraindications to provide orthodontic treatment for patients with hemophilia, but consultation with haematologist is necessary before any invasive treatment.

#### **Orthodontic considerations :** (Barengi, Barengi & Blasio 2018).

- Orthodontic treatment is not contraindicated in patients with bleeding disorders.
- Chronic irritation from orthodontic appliances should be avoided.
- Fixed appliances are preferable to removable appliances as the latter can cause gingival irritation.
- Self-ligating brackets are preferable to conventional brackets. If conventional brackets are used, archwires should be secured with elastomeric modules instead of wire ligatures.
- If extractions or surgery is to be performed increase factor VIII production with 1-desamino-8-darginine vasopressin (DDAVP).

### **Hematological Malignancies**

More than 40% pediatric malignancies are hematological either leukemia or lymphoma. Cranial irradiation given to children with acute lymphocytic leukemia (ALL) to eliminate cancer cells in the central nervous system (CNS) can cause growth retardation, most probably through its effect on pituitary function, specifically growth hormone

deficiency. Adults treated for childhood cancer have been shown to have a reduced bone mineral density. Arrested root development with short V-shaped roots and premature apical closure has been reported after cancer therapy.

**Orthodontic considerations:** (Blanck-Lubarsch et al.2014)

- In these patients intense chemotherapy weakens regenerative capacity of mucosa. Minor irritation can lead to opportunistic infection and subsequent severe complications.
- Use appliances that minimize the risk of root resorption, Use lighter forces, terminate the treatment earlier than normal, choose the simplest method for the treatment needs and do not treat the lower jaw.
- The lower jaw is at risk of osteoradionecrosis (ORN) because of its limited blood supply.
- Orthodontic treatment may start or resume after completion of all medical therapy and after at least 2-year event free survival when risk of relapse has been decreased
- Atraumatic extraction procedures are reported to reduce the risk for ORN.

#### **Sickle cell anemia**

- Maintain good oral hygiene
- Avoid emotional stress
- Avoid EOA - compromise the airway
- An Extraction is contraindicated-if necessary they are best carried out in a hospital.
- General anaesthetics for elective procedures are contraindicated so orthognathic surgery is not recommended ( deoxygenation induce red cell to deform to a sickle shape).
- ↓ orthodontic forces and ↑ resting period between activation with Long treatment duration – to restore the regional microcirculation. (Charles, Anila, et al.2014)
- Be aware of possible pulpal necrosis involving healthy teeth, the changes in bone turnover, mandibular vaso- occlusive crises, and the greater susceptibility to infections.

#### **Thalassemia**

Thalassemia is an inherited disorder of hemoglobin synthesis. It can be classified as  $\alpha$ -thalassemia,  $\beta$ -thalassemia,  $\gamma$ -thalassemia and  $\delta$ -thalassemia indicating which blood hemoglobin chains are affected. The most common oral and facial manifestation is enlargement of the maxilla, bossing of the skull and prominent malar eminences due to the intense compensatory hyperplasia of the maxilla. This lead to expansion of the marrow cavity and a facial appearance known as “chipmunk” face, the overdevelopment of the maxilla frequently result in an increased overjet and spacing of maxilla teeth and other degree of malocclusion.

**Orthodontic consideration:** (Charles, Anila, et al.2014)

- Patient who have undergo splenectomy are at massive risk of infection followed by bacterimia.
- Antibiotic prophylaxis must be given during invasive procedures like extraction. Antibiotic of choice is penicillin
- Functional and extra-oral appliances can be used; however, the “skeletal forces” in thalassemia patients must be less than what is used with normal patients because of the thin cortical plates in thalassemic patients.
- Radiographs at 3 months intervals can be indispensable because the thin cortical plates can complicate orthodontic treatment.
- Regular prophylaxis and fluoride applications are recommended in these patients.
- Extraction should be carried out at the time of admission for blood transfusion, i.e. when hemoglobin level is at its highest, with the administration of antibiotics.
- Thalassemic patients are at an increased risk of viral hepatitis and AIDS due to repeated blood transfusion and therefore screening test for the same should be carried out at regular intervals.

#### **Epilepsy**

Epilepsy is the most common serious chronic neurological condition. It is as a chronic neurological disorder characterized by frequently recurrent seizures. Injuries to the tongue, buccal mucosa, facial fractures, avulsion, luxation or fractures of teeth and subluxation of the temporomandibular joint can occur during seizures. Both the condition and the medical management of condition can affect oral health. ( Cornacchio Burneo & Aragon 2011).

**Orthodontic considerations :**(Little&Falace 2017).

The orthodontist should ensure the patient is receiving regular and rigorous preventative dental care to avoid/minimize dental disease.

- Gingival overgrowth associated with phenytoin is the most widely known complication of anti-epileptic medication. Gingivectomy is recommended to remove any hyperplasic tissue that interferes with appearance or function.
- Removable appliances should be used with caution as they can be dislodged during a seizure.

- Wherever possible removable appliances should be designed for maximum retention and made of high impact acrylic.
- The metal in a fixed orthodontic appliance may distort images obtained by magnetic resonance imaging (MRI). An acceptable MRI may be obtained if arch wires and other removable components are removed before the scan.

### **Multiple sclerosis**

MS is a complex neurological condition that occurs as a result of damage to the myelin sheaths within the central nervous system. The damaged areas result in inflammation and interference in both sensory and motor nerve transmission. (Barenghi et al. 2018).

#### **Orthodontic considerations:**

- Patients with MS may not tolerate long appointments.
- May not tolerate use of intermaxillary traction.
- Need multidisciplinary approach
- Custom made toothbrush handles - improve grip and electric toothbrushes - compensate for the loss of manual dexterity and coordination.
- Patients with spasms - allowed to get out of the dental chair and move around to relieve them.
- Individuals with dysphagia should be treated in a semi-reclined position.
- Severe MS - best treated to a compromised result.
- Removable appliances may not be tolerated well.

### **Osteoporosis**

Osteoporosis is chronic, systemic, degenerative disease characterized by decreased bone mass, a micro architectural deterioration of the bone and consequent increase in bone fragility. Drugs most commonly used in treatment of osteoporosis are bisphosphonate (BP), estrogen, and calcitonins.

#### **Orthodontic considerations :** (Ahmad, Razak & Borromeo 2015)

- Orthodontic treatment therefore, must include the consideration of problems such as bone loss, retention instability, and temporomandibular dysfunction.
- Problem associated with medication must also be given consideration. Estrogen decreases the rate of tooth movement. However, if these drugs are not used during orthodontic treatment in patients with osteoporosis, resorption of alveolar bone and possibly tooth roots could occur.
- Use of BP can affect orthodontic treatment by delaying tooth eruption, inhibited tooth movement, impaired bone healing, and by causing BP-induced (ORN) of the jaws.
- Extraction protocol and use of temporary anchorage devices should be avoided.
- BP inhibits osteoclasts, decreases microcirculation and thus impedes tooth movement.

### **Thyroid and parathyroid disorders**

After DM, thyroid disease is the most common endocrine problem. Thyroid diseases occur more often in women and most often in women older than 50 years of age.

#### **Orthodontic considerations:** (Chandna, Bathla 2011)

- Orthodontic therapy requires minimal alterations in the patient with adequately managed thyroid disease.
- In hyperthyroidism enlarged tongue may pose problem during treatment.
- The bone turnover can influence orthodontic treatment. High bone turnover (i.e., hyperthyroidism) can increase the amount of tooth movement compared with the normal or low bone turnover state in adult patients. (Pinto & Glick 2002)
- Low bone turnover (i.e., hypothyroidism) can result in more root resorption, suggesting that in subjects where a decreased bone turnover rate is expected, the risk of root resorption could be increased. (Fabue et al. 2010).

### **Bronchial asthma**

Asthma is a chronic disease that affects the lower airways. It is characterized by recurrent and reversible airflow limitation due to an underlying inflammatory process.

#### **Orthodontics considerations:** (Little & Falace 2017).

- Inhaled corticosteroids are the most widely used and most effective asthma anti-inflammatory agents.
- Oral manifestations include candidiasis, decreased salivary flow, increased calculus, increased gingivitis, and increased periodontal disease. (Maheshwari, et al. 2012).
- Schedule these patients' appointments for late morning or later in the day, to minimize the risk of an asthmatic attack.
- Judicious use of rubber dams should be avoided as they reduced breathing capability.
- Care should be used in the positioning of suction tips as they may elicit a cough reflex.
- The orthodontist should ensure the patient has their inhaler nearby.

**Hepatitis B** is a worldwide health problem. It has been calculated that 1.53% of all patients reporting to the dental clinic are hepatitis B virus (HBV) carriers. Viral hepatitis is surely of importance to the orthodontist. HBV, hepatitis C virus, and hepatitis D virus are blood borne and can be transmitted via contaminated sharps and droplet infection.

**Orthodontics considerations:** (Dahiya et al. 2015)

The main orthodontic procedures to result in aerosol generation are removal of enamel during interproximal stripping, removal of residual cement after debonding, and prophylaxis.

- Infection control protocol should be followed according to the guideline laid down by occupational safety and health administration. (Redd T John et al. 2007).
- All members of the team should be immunized against HBV (Sastri et al. 2015).
- Barrier technique such as gloves, eye glasses, and mouth mask should be used.
- Impressions can be one of the links in transmitting the HBV to orthodontics. The impressions must be disinfected by dipping them in glutaldehyde or by spraying sodium hypochlorite and leaving it for 10 min.
- Post-exposure prophylaxis for HBV infection should be given to those who are exposed percutaneously or through mucus membrane to blood or body fluids of known or suspected. (Barengi, Barengi & Blasio 2018).

### **Renal Disorders**

The most common renal condition to present to the orthodontist is chronic renal failure. Up to 90% of patients with renal insufficiency show oral signs and symptoms in soft and hard tissues, some of them being a cause of the disease itself and others deriving from the treatment.

**Orthodontic considerations:** (Alqahtani H. 2019).

- Extraction should be done cautiously in such patients. Abnormal bone healing after extraction can result due to alterations in calcium and phosphorus metabolism and secondary hyperparathyroidism which result in bone demineralization.
- Due to the increase in circulating parathyroid hormone. It has been suggested that orthodontic treatment forces should be reduced and the forces re-adjusted at shorter intervals.
- Antibiotic prophylaxis should be considered in hemodialyzed patients who were undergoing an invasive dental procedure (Gaballah et al. 2014)
- During hemodialysis, the patient's blood is anticoagulated with heparin to facilitate blood transit. For this reason, dental treatments with a risk of bleeding must not be performed on the day of hemodialysis.
- Gingival overgrowth secondary to the immunosuppressive therapy is the most studied oral manifestation. Gingival overgrowth can impede tooth movement during orthodontic treatment.
- Gingivectomy should be considered in such patients.

**Allergies to materials used during orthodontic treatment** (Alshammery et al. 2016).

### **Latex allergy**

Management : (Little & Falace 2017).

- Latex free gloves.
- self-ligating brackets to avoid elastomeric ties.
- Space closure with nickel– titanium coils
- Inter-maxillary elastics : latex-free elastics ( although they are subject to greater force degradation).
- Medical history need up to date.

**Nickel allergy:** Nickel is found in arch wires, bands, brackets and headgear. Signs and symptoms of nickel allergy: Gingivitis in the absence of plaque, Gingival hyperplasia, Burning sensation, Metallic taste, Numbness sensation, Soreness of the side of the tongue, Labial swelling, Angular cheilitis

Management : (Little & Falace 2017).

- Nickel free brackets
- SS because it releases less nickel than NiTi
- Ceramic brackets
- Polycarbonate brackets
- Titanium brackets
- Gold brackets
- Nickel free archwires

### **Eating disorders**

The most common are anorexia nervosa (AN) and bulimia nervosa (BN).

Management :

- Referral should be done to the patient's physician.



- Patients should be counseled not to brush their teeth immediately after vomiting.
- They should be given advice on how to increase the intra-oral pH by chewing gum, or rinsing the mouth with water or milk (Burden, Mullally & Sandler 2001).

## CONCLUSION

Treatment of medically compromised orthodontic patients should be directed towards the prevention of oral complication that could be life threatening and hence special precautions are usually required. Decreased resistance to infection is a common complicating factor in medically compromised patients therefore any mucosal irritation should be monitored and regular periodontal evaluation should be done. With appropriate management, successful orthodontic treatment can be done with minimal physical damage and maximum treatment outcome.

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