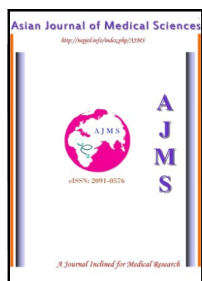


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## Management Of The Medically Compromised Cases In Orthodontic Practice

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### Abstract

Orthodontic therapy is no longer restricted only for healthy patients. With the better management of serious medical problems and increased quality of life expectations, medically compromised individuals are now regular visitors to the orthodontic clinics in every part of the world. As such, there is no absolute contraindication of orthodontic treatment in most of these conditions. A slight modification of the normal orthodontic treatment protocol is obligatory in such patients according to their medical condition. This article reviews and suggests the orthodontic treatment protocol for some common medical conditions.

**Key Words:** Medically Compromised; Orthodontic patients; Treatment protocol

### 1. Introduction

The number of patients seeking orthodontic care is increasing day by day. Some of these patients have significant medical disorders that may alter both the course of their oral disease and the therapy provided.<sup>1</sup> An orthodontist who is treating medically compromised patients should have a working knowledge of the multitude of medically complex problems. This information will support and enable for delivery of high standards of dental care in general and orthodontic care in particular. Treatment plan should be modified according to impact of the particular disease in the oral cavity. The purpose of this article is to review common medical conditions and associated guidelines of orthodontic management.

### 2. Cardiac Diseases

#### 2.1. Infective Endocarditis (IE)

Infective endocarditis (IE) is a disease in which microorganisms colonize the damaged endocardium or heart valves. The organisms most commonly encountered in IE are alpha -hemolytic streptococci (e.g., *Streptococcus viridans*). However, nonstreptococcal organisms often

found in the periodontal pocket have been increasingly implicated, including *Eikenella corrodens*, *Actinobacillus actinomycetemcomitans*, *Capnocytophaga*, and *Lactobacillus* species.<sup>2,3</sup>

According to recent guidelines published by American Heart Association, cardiac conditions associated with the

**Table-1**

#### High risk patients:

- Previous endocarditis
- prosthetic heart valves
- Complex cyanotic congenital heart disease( CHD)
- Unrepaired cyanotic CHD, including

#### Medium risk patients:

- Congenital heart defects eg VSD
- Acquired valvular disease (e.g. from rheumatic fever)
- Hypertrophic cardiomyopathy

#### Low risk patients:

- General population
- Repaired VSD's Isolated secundum atrial defects
- Mitral prolapse with regurgitation
- palliative shunts and conduits
- coronary artery bypass grafts

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highest risk of adverse outcome from endocarditis for which prophylaxis is required with dental procedures are given below (Table-1).<sup>2</sup> High risk patients are best

referred to a specialist centre for treatment in conjunction with the physician. A particular careful assessment of the relative risks and benefits of orthodontic treatment is needed in such cases before proceeding but low risk patients need not any special precautions.

**Table-2: Antibiotic Regimens for a Dental Procedure**

Condition	Antibiotic Agent	Regimen: Single Dose 30-60 Minutes before Procedure		
		Adult	Children	Children
<b>I. Dental procedures under local or no anesthesia</b>				
Patients who have not received more than a single dose of a penicillin in the previous month, including those with a prosthetic valve (but not those who have had endocarditis)	oral Amoxicillin	2-3 g	50 mg/kg	Half adult dose
patients who are penicillin allergic or have received more than a single dose of penicillin in the previous month, who have had endocarditis	Azithromycin/ Clarithromycin	500 mg	15 mg/kg	Half adult dose
	Oral clindamycin	600 mg	20 mg/kg	Half adult dose
	Cephalexin <sup>†</sup>	2 g	50 mg/kg	Half adult dose
<b>II. Dental procedures under general anaesthesia (Unable to take oral medication)</b>				
no special risk (including patients who have not received more than a single dose of a penicillin in the previous month)	Ampicillin/ Cefazolin/ Ceftriaxone	2 g IM or IV	50 mg/kg IM or IV	half adult dose
Allergic to penicillin or ampicillin and unable to take oral medication	Cefazolin or Ceftriaxone <sup>†</sup>	1 g IM or IV	50 mg/kg or quarter adult dose	half adult dose
	Clindamycin phosphate	600 mg IM or IV	20 mg/kg IM or IV Or quarter adult	half adult dose

I.M- Intramuscularly; I.V- intravenously., g-Grams; mg-Micrograms. \*Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage. †Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria

Orthodontic procedures, risk of developing endocarditis and antibiotic prophylaxis:

The prevalence and magnitude of bacteraemia of oral origin are directly proportional to the degree of oral inflammation present. Most bacteraemia arises from everyday activities such as chewing and tooth brushing.<sup>4,5</sup> The bacteraemia experienced by the patient maybe increased by plaque accumulation, which increases in the presence of orthodontic appliances. American Heart Association (AHA) recommends that antibiotic prophylaxis should be given, in all cardiac patients with the highest risk of IE mentioned before, in all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa (Table-2).<sup>1,2,5,6</sup> These include probing, extractions,

banding procedures (both band placement and band removal) and placement of separators. They do not recommend prophylaxis at the placement of removable orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, and bleeding from trauma to the lips or oral mucosa. Resources from British National Formulary suggest supplementation of antibiotic prophylaxis for dental procedures with chlorhexidine gluconate gel 1% or chlorhexidine gluconate mouthwash 0.2%, used 5 min before procedure. It is also recommended to continue antibiotic prophylaxis two days after the dental procedures.<sup>6</sup>

### Orthodontic considerations:

After evaluation of medical history, Patients at risk of endocarditis should be treated in consultation with their cardiologist and within the appropriate guidelines.<sup>1-5</sup> Informed consent requires that a patient is aware of any significantly increased risk.

Patients should be instructed about the importance of maintaining immaculate oral hygiene during the course of orthodontic treatment.

Patients may be encouraged to use a daily antimicrobial mouthwash, e.g. chlorhexidine 2% to aid plaque control, particularly for the two days leading up to fitting, removal or major adjustments of a fixed appliance.

Bonded appliances are to be preferred to banded appliances where possible, exceptions being cases like RME, Quadhelix or Headgear.

For unerupted teeth avoid bonding with closed eruption

## 3. METABOLIC DISORDERS

### 3.1. Diabetes mellitus

Diabetes mellitus [DM] is a metabolic disorder of diverse etiologic factors, characterized by hyperglycemia resulting from deficiencies in the insulin secretion, insulin action or both.<sup>5</sup> The two major types of diabetes are Type 1 (formerly known as "insulin-dependent diabetes") and Type 2 (formerly called "non-insulin-dependent diabetes").<sup>7</sup> Type 1 DM the cause is an absolute deficiency of insulin secretion. Type 1 DM is the most common endocrine metabolic disorder of childhood and adolescence with a peak incidence at 10-14 years of age. Oral manifestations are mainly found in patients while DM is uncontrolled or poorly controlled. Several studies have shown that gingivitis is more common and severe even in well-controlled DM patients, probably because of

impaired neutrophil function.<sup>8,9</sup>

#### Orthodontic considerations:

1. Orthodontic treatment should be avoided in patients with poorly controlled Insulin-dependent DM (HbA1c more than 9%), as these patients are particularly susceptible to periodontal breakdown. There is no upper age limit for orthodontic treatment. In adults especially it is important to evaluate periodontal status before initiating orthodontic treatment. The practitioner can treat both type 1 and type 2 DM patients.<sup>9</sup>

2. There is no treatment preference with regard to fixed or removable appliances. It is important to stress good hygiene, especially when fixed appliances are used. Daily rinses with fluoride mouthwash can provide further benefits. Diabetes related microangiopathy can occasionally occur in the periapical vascular supply resulting in unexplained odontalgia, percussion sensitivity, pulpitis or even loss of vitality. Orthodontist should be aware of this phenomenon and periodical checkups are advised.<sup>9</sup>

3. The most common dental office complication seen in diabetic patients taking insulin is symptomatic low blood glucose or hypoglycemia. When planning dental treatment, it is best to schedule appointments before or after periods of peak insulin activity. This requires knowledge of the pharmacodynamics of the drugs being taken by the diabetic patient.<sup>7,8</sup> Morning appointment is preferable. If a patient is scheduled for a long treatment session e.g. about 90 minutes, he or she should be advised to eat a usual meal and take the medication as usual. This is important to avoid hypoglycemic reaction. When a hypoglycemic reaction occurs in the dental office, the orthodontist should recognize the symptoms and act appropriately. Most patients are familiar with these symptoms and can tell orthodontist in time. The cooperative and conscious patient who demonstrates clinical symptoms of hypoglycemia should be given high carbohydrate beverage such as orange juice. Management of the unconscious patient includes airway maintenance, oxygen administration and monitoring of vital signs.<sup>7,8</sup>

#### 3.2. Adrenal insufficiency (cortical crisis)

Acute adrenal insufficiency is associated with peripheral vascular collapse and cardiac arrest. Therefore, the orthodontist should be aware of the clinical manifestations and ways of preventing acute adrenal insufficiency in patients.<sup>1</sup> There are two types of adrenal insufficiency i. primary adrenal insufficiency (Addison's

disease) or ii. Secondary adrenal insufficiency (secondary to the use of exogenous glucocorticosteroids).<sup>5,7</sup>

#### Orthodontic considerations

Before treating a patient with a history of steroid use, physician consultation is indicated to determine whether the patient's proposed treatment plan suggest a requirement for supplemental steroids. Steroid coverage should be considered for minor oral surgery procedures. Use of a stress reduction protocol and profound local anesthesia may help to minimize the physical and psychological stress associated with therapy and reduce the risk of acute adrenal crisis. Hydrocortisone 200 mg (IV/IM immediately pre-operatively or orally 1 hour preoperatively) and continue normal dose of steroids post-operatively.<sup>8</sup>

#### 3.3. Thyroid and Parathyroid Disorders

Orthodontic therapy requires minimal alterations in the patient with adequately managed thyroid disease. Patients with histories of hyperthyroidism should be carefully evaluated to determine the level of medical management, and they should be treated in a way that limits stress and infection. Medications such as epinephrine and other vasopressor amines should be given with caution in patients with treated hyperthyroidism, although the small amounts are used in dental anesthetics.<sup>5</sup> Patients with hypothyroidism require careful consideration due to the potential for excessive sedation.

Routine orthodontic therapy may be provided to patients with parathyroid disease once that disorder has been identified and the proper medical treatment given. However, patients who have not received medical care may have significant renal disease, uremia, and hypertension.<sup>1</sup>

#### 4. HEMATOLOGICAL DISORDERS

##### 4.1. Bleeding disorders

The main inherited coagulation disorders include hemophilias A and B and von Willebrand's disease.<sup>5</sup> Two main areas to be considered in treatment of these patients are chances of iatrogenic viral infection and risk of bleeding during extraction.<sup>5,8</sup> Medical treatment of choice in bleeding disorders is administration of various factor concentrates. Transfusion of these concentrates derived from human blood may spread viral infections like hepatitis B, C and HIV. The orthodontist should consult the patient's physician before dental treatment to determine the risk for bleeding and treatment modifications required. To prevent surgical hemorrhage,

factor VIII levels of at least 30% are needed. Parenteral 1-deamino-8-D-arginine vasopressin (DDAVP) can be used to raise factor VIII levels 2- to 3-fold in patients with mild or moderate hemophilia. The recent introduction of genetically manufactured factor VIII products has reduced the risk of viral transmission in this age group. If tooth extraction or other surgery like exposure of impacted canine are required as a part of orthodontic treatment is required, most patients are submitted to factor VIII concentrate infusion before the procedures. They are usually hospitalized and the missing clotting factor is administered in advance of the procedure. Wherever possible a nonsurgical approach should be adopted.

#### **Orthodontic considerations:**

1. Excellent oral hygiene is must for preventing gingival bleeding before it occurs. Every effort should be made to avoid any chronic irritation from orthodontic appliance.
2. Arch wires should be secured with elastomeric modules rather than wire ligatures, which carry the risk of cutting the mucosal surfaces. Special care is required when placing and removing arch wires.
3. Duration of orthodontic treatment for any patient with a bleeding disorder should be given careful consideration. Lengthier the treatment duration may increase potential complications.
4. Bleeding can be managed by replacement of missing clotting factors, so extractions and orthognathic surgery is not contraindicated if managed carefully
5. Intense orthodontic or orthopedic forces such as extra oral anchorage or maxillary distraction should he managed with more care.

#### **4.2. Hematological malignancies**

More than 40 percent pediatric malignancies are hematological either leukemia or lymphoma. Leukemias account for 30 percent of all childhood malignancies.<sup>10</sup> Oropharyngeal lesion can be the initial signs in 10% of acute leukemia. In the absence of local causative factors, orthodontist should be suspicious of patients who present with gingival redness pain or hypertrophy, pharyngitis and lymphadenopathy. In such cases prompt referral to a physician is necessary to exclude hematological malignancy. In most cases, orthodontist will see a patient who has been already diagnosed with a hematological malignancy. Those receiving chemotherapy have an increased potential for infection that is the leading cause of morbidity in immune compromised patients. The

orthodontist should be aware of the implications of preexisting infection. Developing dental tissues are particularly sensitive to radiation. Careful consideration should be given to the patients having severe root shortening while planning the treatment.<sup>10</sup>

#### **Orthodontic considerations:**

1. As orthodontic treatment is an elective procedure, patient's physician should be consulted before starting the procedure.
2. If orthodontic treatment has been already started the orthodontist should contact the patient's physician possible for prognosis. As the time of diagnosis of malignancy is very stressful for the patient and family, orthodontist should be aware of its psychological implications.
3. Intense chemotherapy weakens regenerative capacity of mucosa. Minor irritation can lead to opportunistic infection and subsequent severe complications. It is advisable to remove all orthodontic fixed appliances before starting chemotherapy as a safety procedure.
4. To counter xerostomia during cancer therapy use of sugar free chewing gum, candy, saliva substitutes, frequent sipping of water, and/or moisturizers is recommended.<sup>1,10</sup>
6. 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 and patient is not on immunosuppressive drugs. American Academy of Pediatric Dentistry recommends following strategy to provide orthodontic care for patient with dental sequelae.<sup>10</sup>
  - a. Appliances that minimize root resorption should be used.
  - b. Light force should be used.
  - c. Treatment should be terminated earlier than normal.
  - d. The simpler method for treatment needs should be chosen.
  - e. Lower jaw should not be treated.

However, specific guidelines for orthodontic management including optimum force and pace remain undefined.

#### **5. Auto Immune Disorders**

##### **5.1. Juvenile rheumatoid arthritis**

Juvenile rheumatoid arthritis (JRA) is an autoimmune inflammatory arthritis occurring before the age of 16

years. Juvenile rheumatoid arthritis is more severe than the adult disease and leads to gross deformity. Temporomandibular joint (TMJ) can be damaged up to complete bony ankylosis. In 30 per cent of the cases, a severe skeletal class II jaw discrepancy occurs due to restricted growth of the mandible. Classic signs of rheumatic destruction of the TMJ include condylar flattening and a large joint space.<sup>7,8</sup> It has been suggested that orthodontic treatment for patients with JRA would prevent worsening of TMJ condition by reducing mechanical loads resulting from stabilization of occlusion. This contributes to long-term stability with a functional improvement.<sup>1</sup>

If the wrist joints are affected these patients have difficulty with tooth brushing. They require additional support from a hygienist during their orthodontic treatment and the use of an electric toothbrush should be considered. Sugar-free medicines should be preferred to minimize caries. Other considerations include the corticosteroid therapy of the patient for the underlying disorder and the associated problems.

## 6. Respiratory Disorders

### 6.1. Bronchial Asthma

Asthma is a diffuse chronic inflammatory obstructive lung disease with episodes of chest tightness that causes breathlessness, coughing, and wheezing all of which are related to bronchiole inflammation. It is associated with hyper reactivity of the airways to a variety of stimuli and a high degree of reversibility of the obstructive process.<sup>11</sup>

#### Typical oral health conditions in asthma:

Greater rate of caries development than do their non-asthmatic counterparts because of anti-asthmatic drugs-induced xerostomia.<sup>12</sup> The use of nebulized corticosteroids can result in throat irritation, dysphonia and dryness of mouth, oropharyngeal candidiasis and, rarely, tongue enlargement. In an asthmatic patient, the common mouth breathing habit and immunological factors will cause gingival inflammation.<sup>12</sup>

#### Orthodontic considerations:

Management in orthodontic care can be divided in two parts- before orthodontic treatment, during treatment.

#### Before treatment:

When an asthmatic dental patient seeks care, the clinician must assess his or her risk level by reviewing the medical history of the illness: ascertaining the frequency and severity of acute episodes, the patient's medications and determining the specific triggering agents. Preventing a sudden episode of airway obstruction is essential when

treating an asthmatic patient.<sup>13</sup>

As a rule in general, elective orthodontics should be performed only on asthmatic patients who are asymptomatic or whose symptoms are well controlled. To minimize the risk of an attack, the patient's appointment should be in the late morning or the late afternoon. Orthodontist needs to be aware of the potential for dental materials and products to exacerbate asthma. These items include dentifrices, fissure sealants, tooth enamel dust (during interproximal slicing) and methyl methacrylate. Therefore, fixed appliances and bonded retainers without acrylic are preferable.<sup>1</sup>

Oxygen and bronchodilator should be available during treatment.<sup>13</sup> Dental local anesthetics with vasoconstrictors should be used with caution in asthmatic patients, as many vasoconstrictors contain sodium metabisulfite, a preservative that is highly allergenic.<sup>14</sup> Anxiety is a known 'asthma trigger', so the orthodontist should reduce the stress level of the patient.

#### During treatment:

It has been found that improper positioning of suction tips, fluoride trays or cotton rolls could trigger a hyper reactive airway response in sensitive subjects. Eliciting a coughing reflex should be avoided. Prolonged supine positioning, bacteria-laden aerosols from plaque or carious lesions and ultrasonically nebulized water can provoke asthma triggers in the dental setting. In case of acute attack, following steps should be taken.<sup>13,14</sup>

- Discontinue the procedure and allow the patient to assume a comfortable position.
- Maintain a patent airway and administer bronchodilator via inhaler/nebulizer.
- Administer oxygen via face-mask. If no improvement is observed and symptoms are worsening, administer epinephrine subcutaneously (1:1,000 solution, 0.01 milligram/kilogram of body weight to a maximum dose of 0.3 mg)
- Alert emergency medical services. Maintain a good oxygen level until the patient stops wheezing and/or medical assistance arrives.

Owing to chances of allergy, offending NSAIDs include ketorolac, ibuprofen and naproxen sodium should be avoided after banding and bonding. In such cases, choice of analgesic is acetaminophen.

## **7. Allergies**

### **7.1. Latex allergy**

Allergy to latex is a common in dental office. Atopic individuals are at increased risk of allergy.<sup>15</sup> Latex can cause immediate hypersensitivity reaction, Irritant contact dermatitis or Delayed cutaneous reaction. Allergic history should be evaluated during taking of case history. Refer the patient to physician if signs of latex allergy are suspected. In confirmed latex allergy cases, use latex-free products and ensure the patient's notes marked "latex allergy". Use of powder free and low free latex protein gloves recommended for all patients.

### **7.2. Nickel allergy**

Intra-oral reactions to nickel are extremely rare and cannot usefully be predicted from skin tests. Contact hypersensitivity may occur on the skin of the cheeks or neck in response to the outer headgear bow or studs of the headgear in patients with nickel allergy. Most patients with nickel allergy can tolerate orthodontic treatment with normal orthodontic appliances. In the rare event of a marked intra-oral reaction, nickel free components will need to be used. The outer bow of the headgear or any studs can be covered if a skin reaction occurs. In case of doubt, a trial appliance with one or two bands and brackets may be used to assess reaction. A length of arch wire should also be fitted in case nickel is released by galvanic reaction. Wires and brackets are available in nickel-free alloys of titanium and cobalt-chromium or non-metallic materials.<sup>16</sup>

## **8. Central Nervous System Disorders**

Some of the young patients seeking orthodontic treatment may have seizure disorders, Epilepsy (e.g. Grand mal), Hydrocephalus, Cerebrospinal shunts etc. Epilepsy is not a disease in itself but a term applied to recurrent seizures, either of unknown origin (idiopathic epilepsy) or due to congenital or acquired brain lesions (secondary epilepsy). It affects about 0.5-2% of the population.<sup>17</sup> In these patients, avoid removable appliances if epilepsy is poorly controlled. Phenytoin may cause gingival hyperplasia. A very high standard of oral hygiene is required to minimize the development of gingival enlargement and orthodontic treatment should never be contemplated unless the oral hygiene is good. Stress may occasionally precipitate seizures and sedation may be indicated.

### **8.1. Neuromuscular Disorders Cerebral palsy**

Cerebral palsy is a group of non-progressive neuromuscular disorders caused by brain damage, which can be pre-, peri-, or postnatal in origin, and is classified

according to the type of motor defect: i. Spasticity ii. Athetosis iii. Rigidity iv. Ataxia.<sup>5</sup> The oral and dental features that may be seen in children with cerebral palsy are increased periodontal disease with drug-induced gingival enlargement, increased prevalence of malocclusion, increase in caries prevalence, Enamel hypoplasia, drooling, decreased parotid flow rate etc.<sup>18</sup> Hypoplastic enamel does not have the same ordered prism structure as normal enamel. Acid etching in these cases may not provide optimum retention for bonding. Another area of concern is children with neuromuscular disorders may have reduced manual dexterity for self-cleansing. Proper maintenance of oral health care should be given due importance in this type of patients in general and particularly during orthodontic therapy. Powered toothbrushes may be useful.

## **9. Pregnancy**

Pregnancy as such is not a contraindication for orthodontic treatment. Care should be taken to minimize the potential exaggerated inflammatory response related to pregnancy-associated hormonal alterations. Meticulous plaque control and oral hygiene should be maintained during treatment. Avoid X-rays or drug therapy and extractions particularly in the first trimester. The second trimester is the safest time to perform extractions.<sup>19,20</sup>

Avoid supine position in late pregnancy. Supine hypotensive syndrome may occur due to obstruction of the vena cava and aorta. This may result in reduction in return cardiac blood supply with decreased placental perfusion; this can be prevented by placing the patient on her left side or simply by elevating the right hip 5 to 6 inches during treatment. Appointments should be short, and the patient should be allowed to change positions frequently. A fully reclined position should be avoided if possible.<sup>19</sup> However, long, stressful appointments and surgical procedures should be delayed until the postpartum period. Analgesics, antibiotics, local anesthetics, and other drugs required during pregnancy should be reviewed for potential adverse effects on the fetus.<sup>19, 20</sup>

## **10. Conclusion**

An orthodontist needs to recognize the systemic disease processes and significance of different systemic diseases. Good patient cooperation, consent before treatment, proper referral when required and constant monitoring of the progress of the treatment are necessary to minimize physical damage and to maximize treatment outcome. While carrying out orthodontic treatment, Careful and

practical selection of the treatment objectives, timing of treatment and type of appliance is must in each patient with medical disorder.

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