

Orthodontic Management in Medically Compromised Patients: A Narrative Review

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ABSTRACT

Medically compromised patients are increasingly encountered in orthodontic practice, and systemic disease may influence diagnosis, treatment planning, appliance selection, tissue response, and treatment-related complications. This narrative review summarizes the orthodontic management of patients with cardiovascular, metabolic, endocrine, respiratory, neurological, developmental, haematological, renal, immunocompromised, and communicable conditions, together with pregnancy and hypersensitivity disorders. Particular consideration is given to infective endocarditis, diabetes mellitus, adrenal insufficiency, osteoporosis, thyroid disorders, asthma, latex and nickel hypersensitivity, epilepsy, Down syndrome, autism spectrum disorder, bleeding disorders, chronic renal disease, hepatitis, HIV/AIDS, and pregnancy. Safe orthodontic care is based on appropriate medical assessment, consultation with the treating physician when indicated, satisfactory oral and periodontal health, controlled orthodontic mechanics, minimization of soft-tissue trauma, suitable appliance and material selection, and modification of appointment timing where necessary. Invasive procedures require particular consideration in patients at increased risk of bleeding, infection, cardiovascular complications, or adrenal insufficiency. Orthodontic teams should also be prepared to recognize and manage relevant medical emergencies. Most medically compromised patients can undergo orthodontic treatment safely when their systemic condition is adequately controlled and appropriate clinical modifications are incorporated.

Keywords: Medically compromised patients, orthodontic management, systemic diseases, orthodontic treatment, risk assessment

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INTRODUCTION

The number of patients seeking orthodontic treatment has increased substantially, including adults and children with systemic medical disorders. Consequently, assessment of general health and recognition of conditions capable of modifying orthodontic treatment have become important components of contemporary clinical practice.[1] Although systemic disease may influence treatment planning or increase the risk of complications, most medical conditions do not represent an absolute contraindication to orthodontic treatment when they are adequately controlled.[2]

Improved medical care has increased the survival and quality of life of patients with chronic and previously difficult-to-treat diseases. Orthodontists may therefore encounter patients with congenital cardiac abnormalities, haemophilia, diabetes, endocrine disease, malignancies in remission, renal disease, neurological disorders, and other chronic conditions during routine practice.[3] A comprehensive medical history is essential for identifying

relevant systemic disease, allergies, previous complications, and circumstances in which preventive measures or emergency preparedness may be required.[4]

Medication history may provide additional information regarding the nature and severity of a medical condition. When the diagnosis, current control of disease, or implications of treatment are uncertain, communication with the patient's physician or relevant specialist is advisable before commencing active orthodontic therapy.[5] Treatment planning should consider both the effects of systemic disease on oral and periodontal tissues and the patient's capacity to tolerate orthodontic treatment. Active therapy may need to be deferred during an acute or uncontrolled phase of illness, whereas patients with stable chronic disease generally demonstrate tissue responses compatible with orthodontic treatment.[6]

Chronic medical disorders are also relevant among children and adolescents and may create clinical, social, behavioural, and practical challenges for both the patient and family.[7] Advances in medical management have consequently increased the

likelihood that dental practitioners will treat medically compromised individuals during routine clinical care.[8]

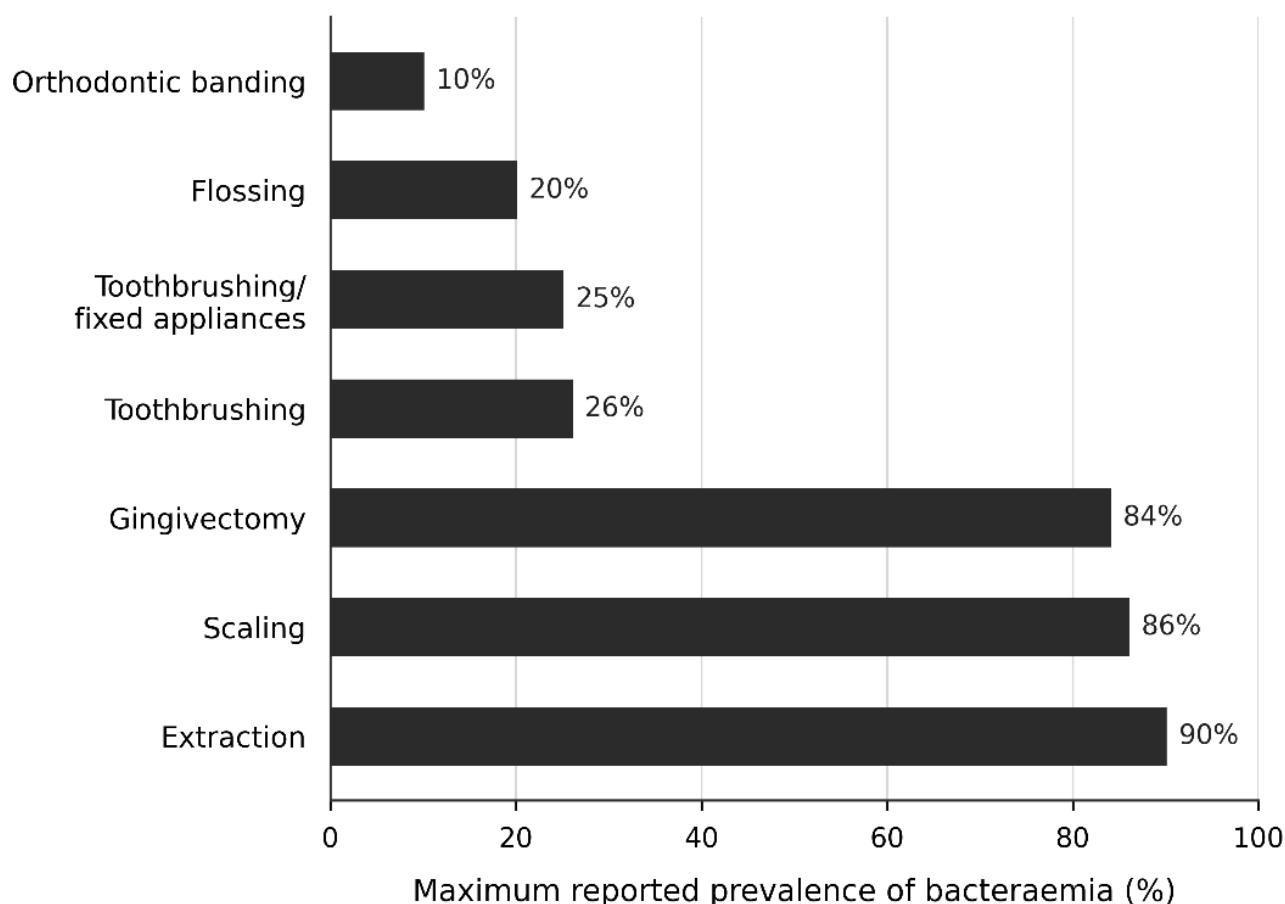
Although orthodontic treatment is relatively non-invasive, potential risks include bacteraemia associated with gingival manipulation, bleeding and infection caused by appliance-related trauma, altered periodontal or bone response, and reduced tolerance of treatment. Identification of susceptible patients before appliance therapy is therefore central to minimizing complications.[9] This review summarizes clinically relevant systemic conditions and the principal modifications required for safe orthodontic management.

Cardiovascular Conditions and Infective Endocarditis

Infective endocarditis is a microbial infection of the endothelial surface of the heart, commonly involving cardiac valves. In

orthodontic practice, concern principally relates to transient bacteraemia produced by procedures that manipulate or traumatize gingival tissues in susceptible patients.[10]

Transient bacteraemia may follow dental procedures as well as routine oral-hygiene activities. Although normally self-limiting, it may have greater significance in patients with cardiac abnormalities that predispose to infective endocarditis.[11] Orthodontic band placement and removal involve gingival manipulation and have been associated with bacteraemia, although reported prevalence is substantially greater after procedures such as extraction, scaling, or gingivectomy. The maximum reported prevalence ranges from approximately 10% after orthodontic banding to approximately 90% after dental extraction.[12]



Maximum reported prevalence of bacteraemia associated with selected dental and orthodontic procedures.

Pretreatment assessment should identify previous infective endocarditis, prosthetic cardiac valves, congenital or acquired cardiac disease, surgically constructed shunts or conduits, and other clinically relevant cardiac abnormalities. When the precise cardiac status is uncertain, consultation with the patient's physician or cardiologist is appropriate.[13] Oral hygiene and periodontal health should be optimized before treatment because fixed appliances increase plaque retention and gingival inflammation.

Orthodontic mechanics should minimize gingival and mucosal trauma. Bonded attachments may be preferred to bands where clinically feasible, excess adhesive should be removed, and projecting archwires or ligatures should be avoided. Elastomeric modules may reduce soft-tissue injury compared with traumatic ligature wires. Oral-hygiene instruction should be reinforced throughout treatment, and antimicrobial mouth rinses such as chlorhexidine may be considered as an adjunct to plaque control in selected patients.[14]

The need for antibiotic prophylaxis depends on both the patient's cardiac condition and the procedure being undertaken. Placement or removal of bands and other procedures associated with significant gingival manipulation warrant greater consideration than routine bracket placement, appliance adjustment, or

removable appliance therapy. Decisions should therefore be individualized and coordinated with the treating physician or cardiologist when prophylaxis is considered necessary.

Metabolic and Endocrine Disorders

Systemic disorders affecting glucose regulation, corticosteroid physiology, bone mass, and endocrine function may alter periodontal health, bone turnover, healing, and orthodontic tooth movement.

Diabetes mellitus

Diabetes mellitus is characterized by chronic hyperglycaemia arising from abnormalities of insulin secretion, action, or both. Patients may present with type 1 or type 2 diabetes, and both adolescents and adults with diabetes are increasingly likely to seek orthodontic treatment.[15]

Chronic hyperglycaemia may be associated with impaired healing, increased susceptibility to infection, periodontal disease, xerostomia, candidiasis, recurrent oral infections, and caries. Glycosylated haemoglobin (HbA1c) provides useful information regarding longer-term glycaemic control.[16] Diabetes is not a contraindication to orthodontic treatment when adequately

controlled; however, satisfactory glycaemic control, oral hygiene, and periodontal health should be established before active therapy. Pre-existing periodontal inflammation should be treated, particularly in adult patients.

Light physiological orthodontic forces are preferable because diabetes may influence bone turnover, periodontal-ligament response, osseous regeneration, and microvascular function. Periodontal tissues should be reviewed throughout treatment, and unnecessary gingival trauma should be avoided.

Hypoglycaemia represents an important potential emergency. Patients should maintain their usual meal and medication schedule before appointments, and morning appointments may be advantageous. Treatment should not interfere unnecessarily with normal dietary or medication routines.

Adrenal insufficiency

Adrenal insufficiency may be primary or secondary and is particularly relevant in patients with a history of prolonged corticosteroid therapy. Reduced physiological response to stress can increase the risk of adrenal crisis during stressful or invasive procedures.[17] A detailed corticosteroid history should therefore be obtained. Medical consultation may be required when significant stress or surgery is anticipated and supplemental corticosteroid therapy is being considered. Stress reduction, adequate pain control, and profound local anaesthesia during invasive procedures are important. Routine orthodontic adjustments generally produce limited physiological stress.

Osteoporosis

Osteoporosis is defined as a decrease in bone mass throughout the body. Bone metabolism should be evaluated prior to treatment, particularly if there is pre-existing bone loss, as altered bone metabolism may affect the response to orthodontic forces. When bone support is reduced, lighter and more controlled forces are preferable.[18]

Medication history is important, especially if systemic corticosteroids or hormone-related therapy is being used. Systemic medications should not be altered without consultation with the treating

physician. Appropriate retention and, if necessary, prolonged retention are also important because altered bone turnover may influence post-treatment stability.[18]

Thyroid and parathyroid disorders

Hypothyroidism in children can be associated with delayed eruption, enamel hypoplasia, and anterior open bite, while hyperthyroidism can be associated with accelerated eruption, macroglossia, and osteoporosis involving the maxilla and mandible.[19]

Before active orthodontic treatment, the patient's endocrine status should be determined. Medical consultation is indicated for active or poorly controlled thyroid or parathyroid dysfunction, and effects on skeletal growth, dental eruption, and bone turnover should be taken into account when planning the timing and mechanics of treatment.[20]

Respiratory and Hypersensitivity Disorders

Asthma

Asthma is characterized by variable airflow obstruction, bronchial hyperresponsiveness, and airway inflammation. Symptoms include wheezing, dyspnoea, cough, and shortness of breath, and can be triggered by allergens, respiratory infections, exercise, environmental irritants, and anxiety.[21]

Asthma control should be determined prior to treatment, and physician consultation may be required if asthma is poorly controlled. Patients should bring their prescribed inhaler to their orthodontic appointments. Brief morning sessions, short waiting periods, and anxiety-reduction strategies can enhance treatment tolerability. Non-steroidal anti-inflammatory drugs should be used cautiously in patients with aspirin-sensitive asthma.[21]

If an acute attack does occur, treatment should be discontinued. The patient should be reassured, positioned comfortably in a sitting position, and given the prescribed bronchodilator. If symptoms continue or worsen, oxygen and medical assistance may be required.[21]

Latex hypersensitivity

Gloves, elastomeric separators, modules, chains, and other orthodontic materials can contain natural rubber latex. If a latex allergy is known, a latex-screened clinical environment should be prepared. Latex-free products should be stored separately to prevent contamination, and natural rubber latex-free gloves and orthodontic materials should be used. Nitrile, neoprene, or vinyl gloves and latex-free orthodontic elastomers are suitable alternatives. Emergency drugs and equipment should also be latex-free. Early morning appointments can also minimize exposure to airborne latex particles in the clinical setting.[22]

Nickel hypersensitivity

Nickel is found in stainless steel and in significantly higher amounts in nickel-titanium orthodontic alloys. Nickel hypersensitivity is more commonly reported in females and in patients with a history of metal sensitivity or pierced ears. Once sensitization has occurred, re-exposure may produce a delayed hypersensitivity reaction.[23]

Nickel hypersensitivity is a Type IV delayed hypersensitivity reaction and can present intraorally as unexplained gingivitis, gingival enlargement, burning sensation, labial desquamation, metallic taste,

angular cheilitis, numbness or tingling, swelling, or soreness of the lateral border of the tongue. Extraoral dermatitis can develop if nickel-containing components remain in contact with the skin for prolonged periods.[24]

These manifestations can mimic other mucosal conditions or mechanical irritation and may require dermatological evaluation and patch testing for diagnosis.[23,24] Orthodontic appliances are tolerated by most patients with cutaneous nickel sensitivity, but if intraoral sensitivity is confirmed, exposure to nickel should be reduced. Alternative bracket options include ceramic, polycarbonate, titanium, gold, and plastic aligner systems, while alternative archwires include titanium-molybdenum alloy, fibre-reinforced composite, pure titanium, and gold-plated wires.[25]

Orthodontic considerations in cardiovascular, metabolic, endocrine, respiratory and hypersensitivity disorders

Condition	Principal orthodontic concern	Pretreatment assessment	Key treatment modification	When to defer or seek medical advice
Cardiac disease/IE risk	Bacteraemia after gingival manipulation	Clarify cardiac diagnosis and periodontal status	Minimize gingival trauma; favour bonding when appropriate; meticulous oral hygiene	Uncertain cardiac risk or need for prophylaxis
Diabetes mellitus	Periodontal inflammation, impaired healing, infection, hypoglycaemia	Assess glycaemic control and periodontal health	Light forces; periodontal monitoring; preserve meal/medication schedule	Poor control, active periodontal disease or recurrent infection
Adrenal insufficiency/prolonged corticosteroids	Reduced tolerance of physiological stress	Detailed steroid history	Stress reduction and adequate analgesia/anaesthesia	Significant invasive treatment or uncertain adrenal status
Osteoporosis	Reduced bone support and altered remodelling	Assess alveolar and periodontal bone; medication history	Light controlled forces; appropriate retention	Markedly compromised bone support or unclear systemic therapy
Thyroid/parathyroid disorders	Altered growth, eruption and bone turnover	Establish endocrine control	Adapt timing and mechanics to growth and bone response	Active or inadequately controlled disease
Asthma	Acute bronchospasm	Assess severity/control; inhaler available	Short, low-stress appointments	Poor control or unresolved acute attack
Latex hypersensitivity	Reaction to clinical or orthodontic latex	Confirm allergy and prepare latex-screened environment	Latex-free gloves, elastomers and equipment	Significant acute reaction
Nickel hypersensitivity	Type IV hypersensitivity	History of metal reaction; investigate uncertain lesions	Nickel-free alternatives when sensitivity confirmed	Persistent unexplained reaction requiring investigation

Neurological and Developmental Conditions

Neurological and developmental disorders may affect cooperation, communication, appliance tolerance, oral hygiene, treatment duration, and emergency preparedness.

Epilepsy

Orthodontic assessment of patients with epilepsy should establish the type, frequency, duration, precipitating factors, degree of seizure control, postictal recovery, medication, and history of seizure-related dental or facial injury.[26] Antiepileptic medications should also be reviewed because drug-associated gingival enlargement may complicate oral hygiene and orthodontic space closure.[27]

Patients with poorly controlled seizures involving falls or uncontrolled movements are at increased risk of injury from intraoral appliances, and active appliance treatment should generally be deferred until adequate seizure control has been achieved. In well-controlled epilepsy, conventional orthodontic treatment may be feasible.

The orthodontic team must also be prepared for a seizure in the clinic. The patient should not be forcibly restrained. Nearby dangerous objects should be removed, the patient protected from injury and positioned safely, preferably laterally when possible. The duration should be recorded and the patient observed until fully alert. Urgent medical assistance is indicated for a seizure lasting more than five minutes, associated cardiopulmonary compromise, or a first known seizure.[26]

Down syndrome

Down syndrome is commonly associated with delayed or altered eruption, microdontia, small or conical roots, enamel abnormalities, taurodontism, maxillary underdevelopment, Class III relationships, anterior open bite, crowding, and crossbite.[28]

Treatment objectives should be individualized according to systemic status, intellectual ability, behaviour, oral-hygiene capability, and caregiver support. Associated cardiac abnormalities should be identified because these may influence invasive dental procedures. Simplified mechanics and lighter forces can improve comfort and treatment acceptance. Removable

appliances may be useful where they can meet the treatment objective and cooperation is adequate; when fixed appliances are required, appliance duration and complexity should be minimized. Retention can be challenging in the presence of skeletal discrepancy or macroglossia. Removable retainers may be considered where patient cooperation permits. Orthodontic treatment is therefore feasible in appropriately selected individuals but requires realistic treatment goals and sustained caregiver involvement.[28]

DiGeorge syndrome

Congenital cardiac disease, immunodeficiency, hypocalcaemia, developmental impairment, delayed dental development, enamel hypoplasia, open bite, micrognathia and increased caries susceptibility may be associated with DiGeorge syndrome or 22q11.2 deletion syndrome. If there are cardiac or immune abnormalities, orthodontic treatment should be coordinated with the relevant medical and dental specialists.

Oral hygiene is especially crucial because enamel abnormalities raise the risk of caries. If there is corticosteroid therapy or altered bone metabolism, lighter orthodontic forces are better. Enamel hypoplasia can impact on bracket bonding and developmental or learning challenges can impact on compliance. Treatment goals and appliance choice should thus be tailored to the individual.

Autism spectrum disorder

Autism spectrum disorder patients can have communication issues, restricted or repetitive behaviours, sensory sensitivities, and decreased tolerance for new procedures. Preliminary visits can be used to get used to the orthodontic environment and to see if procedures like impressions, scanning, or bonding can be tolerated.

A quiet clinical setting with less sensory stimulation may be helpful. Treatment can be facilitated by tell-show-do, positive reinforcement, and gradual familiarization. The design of appliances should be as simple, small and durable as possible. If basic anxiety-control techniques are not sufficient, more complex techniques may be needed. Realistic objectives and cooperation between clinicians and caregivers are central to successful treatment.

Orthodontic management of neurological and developmental conditions

Condition	Main concern	Pretreatment assessment	Orthodontic modification	When treatment may require deferral/modification
Epilepsy	Seizure-related injury and medication effects	Determine seizure type, frequency, control, triggers, drugs and previous trauma	Appliance selection according to control; manage gingival enlargement; emergency preparedness	Poorly controlled seizures with falls or uncontrolled movements
Down syndrome	Cooperation, oral hygiene, eruption abnormalities, skeletal discrepancy and relapse	Assess systemic status, cardiac disease, behaviour and caregiver support	Simple mechanics; light forces; removable treatment where appropriate	Inadequate medical control, oral hygiene or cooperation
DiGeorge syndrome	Cardiac disease, immunodeficiency, enamel defects, altered bone metabolism	Medical consultation as required; assess enamel and oral health	Light forces; careful bonding; individualized treatment duration	Uncontrolled systemic disease or insufficient medical clearance
Autism spectrum disorder	Communication, sensory response and appliance tolerance	Identify communication needs, cooperation and sensory triggers	Familiarization, reduced stimulation, simple durable appliances	When treatment cannot be completed safely with an appropriate behavioural/anxiety-control strategy

Bleeding Disorders and Chronic Renal Disease

Bleeding disorders

Coagulation-factor deficiencies, platelet abnormalities, fibrinolytic disorders, and vascular defects are all types of bleeding disorders. Haemophilia A is caused by a deficiency of factor VIII, haemophilia B by a deficiency of factor IX, and von Willebrand disease by quantitative or qualitative abnormalities of von Willebrand factor.[29]

Oral symptoms may include spontaneous bleeding of the gums and prolonged bleeding after trauma or invasive procedures. Poor oral

hygiene and gingival inflammation may further increase the tendency to bleed.[30] If the systemic condition is managed, orthodontic therapy is not contraindicated.

Appliances should cause as little trauma to the gums and mouth as possible. Where clinically appropriate, elastomeric modules are better than sharp metal ligatures as they minimize the risk of impingement of the gums or irritation of the mucous membranes.[31]



Use of elastomeric modules for securing the orthodontic archwire to minimize soft-tissue trauma.

The ends of the archwire should be cut carefully and examined at each appointment. If irritation is expected, orthodontic wax can be given. The lighter the forces and the simpler the treatment that can be used to get the desired results, the better. Non-surgical treatment should be considered if possible. If extraction, surgical exposure, orthognathic surgery or another invasive procedure is necessary, treatment should be planned in conjunction with the patient's physician or haematologist, and factor replacement and haemostatic support should be provided as needed.[32]

The same rules are followed in von Willebrand disease. Bleeding history and medical management should be determined and a non-extraction treatment plan may be more appropriate when

orthodontically indicated. Lighter mechanics and longer activation intervals could further reduce tissue trauma.

Chronic renal disease

Xerostomia, mucosal pallor, altered taste, periodontal disease, renal osteodystrophy, decreased bone density, impaired healing, tooth mobility, and gingival enlargement are all potential manifestations of chronic renal disease.[33]

Treatment is based on the severity of the disease and the current medical management. In patients with severe disease, communication with the nephrologist is crucial to understand medication, cardiovascular abnormalities, bleeding risk, and

systemic stability. When renal disease is well controlled, orthodontic treatment can be carried out, but should be postponed in advanced or medically unstable renal failure.

Appointments for patients on haemodialysis should be coordinated with the dialysis schedule as anticoagulation may increase bleeding. Invasive procedures and banding are best performed on a non-dialysis day, usually when the anticoagulant effect of dialysis has subsided. Platelet dysfunction and anaemia may persist and local haemostatic measures may still be necessary.

Renal transplant patients may be immunosuppressed and may be taking drugs that cause gingival enlargement. The best possible oral health should be achieved prior to active orthodontic treatment, and significant untreated gingival overgrowth should be controlled prior to the fitting of fixed appliances. Fixed-appliance duration should be as short as possible, with periodic periodontal monitoring.

Communicable Infections and Infection-Control

Considerations

The saliva, blood, mucosa, impressions, instruments, and parts of the appliances are all areas of repeated contact in orthodontic practice. Other procedures such as interproximal enamel reduction, adhesive removal and prophylaxis can also produce aerosols. Thus, proper infection-control measures are crucial.

Viral hepatitis

Hepatitis B, C and D are of special concern due to the risk of transmission through blood, contaminated instruments and sharps. Prevention of occupational exposure relies on proper sterilization and disinfection, safe handling of sharps, immunizing clinical staff, wearing personal protective equipment, and having protocols in place for post-exposure.[34]

Liver dysfunction can also affect the body's ability to coagulate and metabolize drugs. Medical consultation may be warranted prior to procedures that have significant bleeding potential, and drugs that are primarily metabolized by the liver should be used with caution in patients with hepatic impairment.[35] Orthodontic impressions should be appropriately disinfected before laboratory handling, and reusable instruments should be sterilized according to established procedures.

Human immunodeficiency virus and acquired immunodeficiency syndrome

Oral candidiasis, hairy leukoplakia, aphthous ulceration, herpes simplex infection and other mucosal abnormalities may be associated with HIV infection, but routine orthodontic treatment can be provided in medically stable patients who do not have significant haematological abnormalities.[36]

Thrombocytopenia, anaemia, granulocytopenia, xerostomia, drug interactions and active oral lesions should be given special attention. All patients should be treated with standard infection-control precautions, not just those with HIV.

Other communicable infections

Sharp components should be adjusted and orthodontic wax used as needed, and elective orthodontic adjustment may be delayed during active painful oral herpes simplex infection when the appliance components can aggravate the mucosal lesions.[36]

If a patient has active measles or mumps, elective orthodontic treatment should be deferred until the infectious disease has cleared up. Extra care is needed when treating suspected or active infectious tuberculosis, as it is spread through the air; elective treatment should be delayed until medical assessment has confirmed that the patient is no longer infectious.

Pregnancy and Orthodontic Treatment

Pregnancy is not a contraindication for orthodontic treatment, but medical and obstetric history should be reviewed and obstetric consultation should be sought if there are any complications related to pregnancy.[37]

Particular attention should be given to the periodontal status, as hormonal changes can increase gingival inflammation. Plaque control should be emphasized during treatment. If there is significant gingival inflammation, periodontal pocketing, bleeding or poor oral hygiene, it may be advisable to delay active treatment. If treatment is continued, mechanics should be simple and comfortable, with light controlled orthodontic forces and avoidance of unnecessary painful or stressful procedures.[38]

Radiographs, medications, extractions and other invasive procedures should be planned according to the stage of pregnancy. Unnecessary radiographic exposure should be avoided and clinically necessary imaging should be used only when it is helpful to patient care. If possible, elective procedures should be delayed. Appointments need to be brief and comfortable, especially during the later stages of pregnancy. Extended treatment in the supine position may lead to supine hypotensive symptoms. Patients should be able to change position during longer appointments and may find it more comfortable to be positioned towards the left side or to have the right hip raised about 5–6 inches.

Medications such as analgesics, antibiotics, local anaesthetics and others should be considered with regard to pregnancy, and unnecessary pharmacological treatment should be avoided. In general, uncomplicated pregnancy should not be an indication for the cessation of orthodontic treatment, but rather for modification, as long as periodontal health, appointment scheduling, mechanics, positioning and invasive procedures are taken into consideration.[37,38]

Orthodontic considerations in bleeding disorders, renal disease, communicable infections and pregnancy

Condition	Principal risk	Orthodontic management	When to postpone or coordinate medically
Haemophilia/coagulation disorders	Mucosal and procedural bleeding	Excellent hygiene; light forces; avoid sharp components; minimize trauma	Extraction, surgical exposure, orthognathic surgery or uncertain haemostatic control
von Willebrand disease	Prolonged bleeding	Minimize trauma; consider non-extraction treatment when appropriate	Significant bleeding tendency or invasive procedures
Chronic renal disease	Bleeding, altered bone metabolism, impaired healing	Periodontal monitoring; minimize treatment complexity	Advanced or medically unstable renal failure
Haemodialysis	Anticoagulation and platelet dysfunction	Coordinate appointments with dialysis schedule	Invasive treatment when haemostatic status is uncertain
Renal transplantation	Immunosuppression, infection and gingival enlargement	Optimize oral health; minimize fixed-appliance duration	Active infection or significant untreated gingival overgrowth
Viral hepatitis	Bloodborne transmission, coagulation and drug metabolism	Standard precautions; sterilization; impression disinfection	Significant hepatic impairment or invasive procedure requiring assessment
HIV/AIDS	Immunosuppression, oral disease and haematological abnormalities	Routine orthodontics if medically stable; assess blood abnormalities and medication	Significant uncontrolled systemic or haematological complications
Active herpes	Painful mucosal lesions	Remove appliance irritation	Defer elective adjustments until lesions resolve
Measles/mumps	Active contagious illness	—	Defer until infectious period has resolved
Tuberculosis	Airborne transmission	Appropriate infection-control precautions	Suspected/active infectious TB until medical clearance
Pregnancy	Gingival inflammation, comfort and procedural considerations	Good plaque control; light forces; short appointments; modified positioning	Significant periodontal disease, obstetric complication or deferrable invasive procedures

Emergency Preparedness in the Orthodontic Clinic

While orthodontic treatment is usually a relatively simple process, medical emergencies can occur. The first step in preparedness is to have an up-to-date medical history, know what risks to expect, plan appointments accordingly, train staff, and have emergency drugs and equipment readily available.

Hypoglycaemia can manifest as sweating, tremor, shivering, tachycardia, dizziness, confusion or weakness in patients with diabetes. If the patient is conscious, treatment should be discontinued and oral glucose given. If the patient loses consciousness or does not recover promptly, emergency management and medical assistance are required.

Acute asthma can manifest as breathlessness, expiratory wheezing, tachycardia and accessory muscle use. Treatment should be

discontinued, the patient should be positioned upright and reassured, and the prescribed bronchodilator should be given. If breathing difficulty persists or worsens, urgent medical assistance is required.

The patient should not be forcibly restrained during a seizure, but should be protected from injury. The duration should be noted and recovery should be monitored. Seizures that last longer than 5 minutes, a first seizure, or seizures associated with respiratory or cardiopulmonary compromise require immediate medical attention.

Patients with adrenal insufficiency or long-term corticosteroid use should be medically evaluated and have their stress reduced prior to major invasive procedures. In latex hypersensitivity, prevention is also critical, with the need for a latex-screened environment and latex-free emergency equipment.

Medical emergencies relevant to orthodontic practice

Emergency	Important warning signs	Immediate orthodontic response	When urgent medical assistance is required
Hypoglycaemia	Sweating, tremor, shivering, tachycardia, dizziness, confusion, weakness	Stop treatment; give oral glucose if conscious; institute emergency glucose management if unconscious	Loss of consciousness or failure to recover promptly
Acute asthma	Breathlessness, expiratory wheeze, accessory muscle use, tachycardia	Stop treatment; reassure; sit upright; administer prescribed bronchodilator; oxygen when required	Persistent or worsening respiratory distress
Seizure	Generalized or focal motor activity with altered consciousness	Do not restrain; protect from injury; position safely; record duration	>5 minutes, first seizure, apnoea or cardiopulmonary symptoms
Risk of adrenal crisis	Adrenal insufficiency/prolonged corticosteroids, especially before stressful treatment	Minimize stress; adequate pain control; obtain medical advice when needed	Suspected acute adrenal deterioration or haemodynamic instability
Latex hypersensitivity	Known allergy or development of systemic reaction	Stop exposure and use latex-free emergency materials	Significant systemic reaction

Practical Clinical Recommendations

The key to successful management of medically compromised orthodontic patients is early identification of risk, medical assessment, realistic treatment goals, and ongoing monitoring. Orthodontic care should be tailored to the individual patient and not denied due to the presence of a medical disorder.[39]

A medical history should be documented and reviewed verbally to confirm the diagnosis, current disease control, medications, allergies, past complications and any recent hospitalizations or

changes in systemic health. If the diagnosis, medication, or safety of a planned procedure is not clear, consultation with the physician or specialist should be done before active treatment.

Oral and periodontal health should be good prior to appliance placement. Active caries, gingival inflammation and periodontal disease should be treated, especially in patients in whom systemic disease increases the risk of bleeding, infection or impaired healing.[40]

Treatment goals should be realistic. Unnecessary complexity or extended treatment should be avoided when a simpler approach will yield an acceptable result. Light and controlled forces are especially suitable when systemic disease or medication may impact bone metabolism or periodontal response. Mucosal and gingival trauma should be avoided in appliance design, and latex-free, nickel-free or simplified appliance systems should be used when clinically indicated.

Patients with bleeding disorders, significant cardiac disease, adrenal insufficiency, renal dysfunction or immunosuppression should be considered carefully for invasive procedures. Interdisciplinary planning and appropriate prophylactic or

haemostatic measures may be necessary for extractions, surgical exposures, skeletal anchorage and orthognathic procedures.

The timing and length of appointments should also be based on systemic status. Morning appointments may be helpful for patients with diabetes or asthma, dialysis patients need coordination with dialysis times, and comfort and positioning are important for pregnant patients.

Disease control, medications or risk factors may change, and medical status should be reassessed throughout treatment. Safe continuity of care is facilitated by effective communication between the orthodontist, patient, caregiver and treating physician.

Practical framework for orthodontic management of medically compromised patients

Stage of care	Recommended approach
Medical history and risk identification	Record systemic disease, severity, level of control, medication, allergy history and previous complications
Medical consultation	Liaise with physician/specialist when diagnosis, control, medication or procedural safety is uncertain
Oral and periodontal assessment	Establish satisfactory hygiene and manage active caries, gingivitis or periodontal disease before treatment
Treatment planning	Select realistic objectives and avoid unnecessary complexity or prolonged therapy
Biomechanics	Prefer light, controlled forces when systemic disease or medication may alter bone or periodontal response
Appliance selection	Minimize gingival/mucosal trauma and use latex-free, nickel-free or simplified appliances when indicated
Invasive procedures	Coordinate surgery or extractions with the relevant medical specialist in higher-risk patients
Appointment modification	Adapt timing, duration, positioning and frequency to the systemic condition
Emergency preparedness	Ensure staff can recognize and immediately manage anticipated medical emergencies
Follow-up	Reassess medical status, medication, oral hygiene, periodontal tissues and treatment tolerance throughout therapy

CONCLUSION

When systemic disease is well controlled, most medically compromised patients can receive orthodontic treatment safely. A thorough medical evaluation, appropriate physician consultation, maintenance of oral and periodontal health and individualized treatment planning are fundamental.

Clinical modifications include lighter controlled forces, simplified mechanics, reduced mucosal and gingival trauma, appropriate selection of appliance materials, modified appointment timing, and interdisciplinary coordination of invasive procedures. Monitoring and emergency preparedness are also crucial. In most medically compromised patients, satisfactory orthodontic results can be obtained with proper risk assessment and medical cooperation.

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