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ANTERIOR DEEPBITE : A COMPREHENSIVE REVIEW

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ABSTRACT :

Anterior deep bite is a prevalent orthodontic condition characterized by excessive vertical overlap of the maxillary incisors over the mandibular incisors. It poses significant clinical challenges due to its impact on aesthetics, function, and oral health. The aetiology of anterior deep bite is multifactorial, involving genetic predisposition, habitual behaviours, trauma, and skeletal imbalances. Clinically, deep bite can lead to complications such as excessive tooth wear, temporomandibular joint (TMJ) disorders, periodontal issues, and compromised facial aesthetics, affecting patient self-esteem. Diagnosis requires a comprehensive evaluation, including clinical examination, radiographic assessment, and cephalometric analysis to determine the underlying skeletal and dental factors. Treatment modalities range from orthodontic approaches like growth modification, fixed appliances, and clear aligners to surgical interventions for severe cases. Prosthodontic rehabilitation may be necessary in cases of significant tooth wear. Post-treatment retention is critical to maintaining results and preventing relapse. Early intervention, particularly in growing patients, is essential for optimal outcomes. A tailored, multifaceted treatment plan that addresses both dental and skeletal components is the key to effectively manage the anterior deep bite, ensuring long-term stability, and improving overall patient quality of life.

Keywords: Anterior Deep Bite, Orthodontic Treatment, Orthodontics, Dentistry

INTRODUCTION :

Anterior deep bite is an orthodontic condition characterized by an excessive vertical overlap of the upper front teeth (maxillary incisors) over the lower front teeth (mandibular incisors). In a normal bite, the upper teeth slightly overlap the lower teeth by about 1-2 mm. However, in an anterior deep bite, this overlap is significantly greater, often to the point where the lower incisors may touch the palate behind the upper incisors. Anterior deep bite is a significant concern in orthodontics because it can lead to a range of functional, aesthetic, and health- related problems. Correcting a deep bite is crucial not only for improving the patient's appearance but also for preventing potential complications that can arise from this malocclusion. The prevalence of anterior deep bite varies across different populations and age groups. It is considered one of the most common malocclusions, particularly in children and adolescents. Studies estimate that about 10-20% of the general population exhibits some degree of deep bite, with a higher prevalence in certain ethnic groups.The condition can persist into adulthood if not treated, potentially worsening over time due to natural changes in the dentition and supporting structures. Anterior deep bite can lead to excessive wear on the lower incisors as they constantly come into contact with the upper incisors or the palate. Over time, this can result in shortened teeth, increased tooth sensitivity, and the need for restorative dental work. The abnormal bite forces associated with a deep bite can place additional stress on the temporomandibular joints, leading to TMJ disorders. Patients may experience symptoms such as jaw pain, clicking or snaping sounds in the jaw, headaches, anddifficulty in opening or closing the mouth. In severe cases, the lower incisors may impinge on the gingival tissue behind the upper front teeth, causing gum recession, inflammation, and an increased risk of periodontal disease. A deep bite can significantly affect the patient's facial aesthetics, particularly the smile. The excessive overlap can make the upper teeth appear tooprominent or the lower teeth too hidden, leading to concerns about facial harmony and self- esteem. The altered relationship between the upper and lower teeth can interfere with normal speech, particularly with the pronunciation of certain sounds. An altered relationship between the upper and lower teeth can interfere with normal speech, particularly affecting the pronunciation of sounds like sibilants ("S" and "Z"), labiodentals ("F" and "V"), dental sounds ("T," "D," and "N"), and palatal sounds ("Sh," "Ch," and "J"). These sounds require precise contact between the tongue, teeth, and lips, and changes in tooth alignment or occlusion can lead to issues such as lisping, whistling, or unclear articulation. While speech difficulties are often temporary as individuals adapt, significant dental misalignment or poorly fitted restorations can cause ongoing problems. This can impact the patient's communication abilities and confidence. The protrusion of the upper front teeth, often seen in deep bite cases,

can make them more susceptible to trauma, such as fractures or avulsions, especially in active individuals. This article gives a comprehensive review of anterior deep bite.

ETIOLOGY

The development of an anterior deep bite is influenced by a combination of genetic, habitual, traumatic, and skeletal factors. Genetic predisposition plays a significant role in the development of deep bites, a condition where the upper teeth excessively overlap the lower teeth. Hereditary factors such as jaw structure, tooth size, and muscle development, all determined by genetics, can contribute to this misalignment. Disproportionate jaw growth, improperly sized or shaped teeth, and imbalanced chewing muscles can all lead to a deep bite. Additionally, family patterns show that children of parents with deep bites are more likely to inherit the condition, as these traits are passed down, making family history a strong indicator of genetic susceptibility to malocclusions like deep bites. TWIST1 is involved in the formation of the neural crest, which gives rise to facial structures. Mutations in TWIST1 can lead to abnormalities like cleft lip and palate, affecting the alignment of teeth and jaws. MSX1 influences tooth development, while RUNX2 is involved in bone growth, particularly the jawbone. Mutations in either gene can impact tooth size, shape, and jaw alignment. HOX genes, responsible for body patterning, also influence jaw and tooth development. Mutations in these genes can contribute to a deep bite, a dental condition where the upper teeth significantly overlap the lower teeth. Habits such as thumb-sucking, lip-biting, and tongue thrusting during childhood can exert abnormal forces on the developing jaws and teeth, leading to an imbalance in their growth and contributing to the formation of a deep bite. Trauma to the jaw or teeth, particularly during the critical growth periods of childhood and adolescence, can disrupt normal development, leading to an abnormal bite. Such injuries can alter the position of teeth or the alignment of the jaw, resulting in a deep bite. Skeletal imbalance is another critical factor, where the deep bite may be due to disproportionate growth between the maxilla and mandible. For instance, if the upper jaw (maxilla) is positioned too far forward, or the lower jaw (mandible) is underdeveloped and positioned too far back, the result can be an excessive overlap of the upper front teeth over the lower front teeth, characteristic of a deep bite.

CLINICAL IMPLICATIONS OF ANTERIOR DEEP BITE

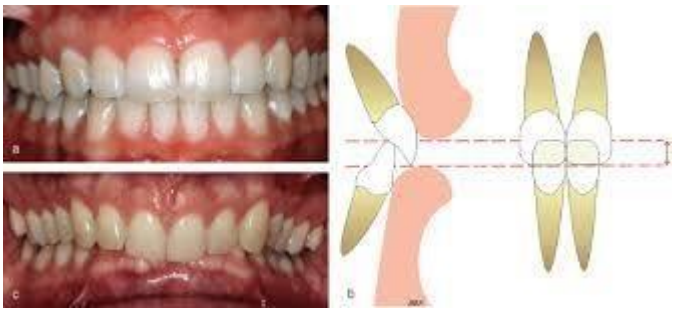

Figure 1: Anterior deep bite

Figure 2: Clinical implication DEVELOPMENT DEEP BITES:

- **Dentoalveolar Deep Bite:**
  - **Infraocclusion of Molars:** This occurs when the molars are positioned too low, creating a large gap between the upper and lower teeth. It's often associated with lateral tongue thrusting and a smaller jawbone angle also termed as an acute gonial angle.
  - **Supraocclusion of Incisors:** Here, the upper incisors excessively overlap the lower incisors, creating a deep curve of Spee. There's less space between the teeth.
- **Skeletal Deep Bite:** This is primarily genetic and characterized by a short upper face and a long lower face. The jawbones are misaligned, leading to a deep bite.
- **Acquired Deep Bite:** This develops over time due to habits like tongue thrusting, tooth drifting, or excessive wear from bruxism (teeth grinding).

Akerly Classification:

This classification focuses on the relationship between the upper and lower incisors:

- **Type I:** The lower incisors touch the roof of the mouth.
- **Type II:** The lower incisors touch the gumline of the upper incisors.
- **Type III:** Both upper and lower incisors are tilted inward, touching their respectivegumlines.
- **Type IV:** Wear facets are seen on the back of the upper incisors and the front of thelower incisors due to excessive contact.

ANTERIOR AND POSTERIOR DEEP BITES

Anterior deep bite can significantly impact facial aesthetics, affecting both the patient's smile and overall facial profile. The excessive vertical overlap of the upper front teeth often makes the lower teeth almost invisible when the patient smiles, which can create an imbalanced and less pleasing appearance. This can also contribute to a shortened lower facial height, giving the chin a more prominent or "protrusive" appearance. These changes in appearance can
negatively affect a patient's self-esteem and confidence, leading to social anxiety and self- consciousness about their smile and facial appearance. Deep bites can cause several functional problems, particularly related to mastication and speech. The excessive overlap of the front teeth can hinder the normal function of the teeth during chewing, making it difficult to bite through food effectively. This can lead to uneven wear on the teeth and strain on the jaw muscles. Additionally, the altered positioning of the teeth can interfere with speech, particularly in the articulation of certain sounds, which can affect communication. Moreover, the protrusion of the upper front teeth in deep bite cases increases the risk of trauma, as these teeth are more exposed and vulnerable to injury from accidents or falls. The excessive vertical overlap in anterior deep bite places undue stress on the periodontal tissues supporting the front teeth. This can lead to gingival trauma, where the lower teeth can impinge on the palatal tissues behind the upper front teeth, causing irritation, inflammation, and even recession of the gums. The continuous excessive force exerted on the anterior teeth can also contribute to bone loss around the teeth, increasing the risk of periodontal disease.[10] over time, this can compromise the stability of the teeth, leading to further dental complications. There is a strong association between anterior deep bite and temporomandibular joint (TMJ) disorders. The abnormal occlusal relationship caused by a deep bite can lead to an improper alignment of the jaws, which places extra strain on the temporomandibular joints. This can result in TMJ dysfunction, characterized by symptoms such as jaw pain, headaches, clicking or snapping sounds in the jaw, and difficulty opening or closing the mouth. Patients with deep bites are also more prone to developing muscle fatigue and pain in the facial and neck muscles due to the abnormal forces exerted during jaw movement. If left untreated, TMJ disorders can become chronic, significantly affecting the patient's quality of life.

Diagnosis

The diagnosis of anterior deep bite involves a comprehensive approach that includes clinical examination, radiographic assessment, cephalometric analysis, and advanced diagnostic tools. Clinicians begin by evaluating the patient's occlusion, facial profile, and intraoral conditions to identify the extent of the deep bite and any related issues like tooth wear or gum recession. Radiographic tools, such as lateral cephalograms, panoramic X-rays, and CBCT, provide detailed insights into the skeletal and dental structures, helping to identify underlying skeletal imbalances. McNamara analysis further aids in understanding the vertical and skeletal discrepancies contributing to the deep bite. McNamara analysis is a diagnostic tool in orthodontics that helps assess the skeletal relationship between the upper and lower jaws. By measuring facial dimensions and calculating ratios, orthodontists can determine the type of malocclusion, identify underlying causes, and plan appropriate treatment options. This analysis is valuable for understanding the severity of malocclusions and guiding treatment decisions. The Burstone analysis is an important cephalometric analysis technique used in orthodontics to assess craniofacial relationships, particularly focusing on the dental and skeletal components. Developed by Dr. William Burstone, this analysis aids in diagnosing malocclusions and planning orthodontic treatments by evaluating various measurements that reflect the patient's craniofacial morphology. Additional tools like 3D imaging and digital
models offer precise visualization for accurate diagnosis and treatment planning, ensuring a tailored approach to correcting the malocclusion.

TREATMENT MODALITIES FOR ANTERIOR DEEP BITE

Early intervention in growing patients is crucial for correcting deep bites by guiding the development of the jaws and teeth. Growth modification techniques, such as the use of functional appliances or headgear, can help redirect jaw growth to balance the vertical relationship between the upper and lower jaws. This approach is most effective during the pubertal growth spurt when the bones are still developing and can be influenced by external forces. Growth spurts typically occur during puberty. For boys, this usually happens between the ages of 12 and 16. For girls, it tends to occur a bit earlier, between the ages of 10 and 14. Braces are a common method for treating deep bites, using various components to achieve bite correction. Anterior bite planes are used to temporarily disclude the posterior teeth, allowing the lower front teeth to move upward and reduce the deep bite. Reverse curve arch wires apply upward forces to the lower incisors and downward forces to the upper incisors, helping to level the bite. Intrusion mechanics are specifically designed to intrude the anterior teeth, reducing the vertical overlap. This can be achieved using mini-implants or other anchorage devices to provide the necessary force for tooth movement. Aligner therapy, such as Invisalign, offers a more aesthetic and comfortable option for treating deep bites. Clear aligners can be designed to incorporate bite ramps or other features that facilitate the intrusion of the upper or lower front teeth. While aligners are generally more effective in mild to moderate cases, advances in technology have made them increasingly capable of addressing complex deep bite cases. In severe cases of deep bite where significant skeletal discrepancies are present, orthognathic surgery may be indicated. Surgery is typically considered when orthodontic treatment alone cannot achieve the desired results, especially in adults where growth modification is no longer

possible. The procedure involves repositioning the jaws to correct the vertical relationship between the upper and lower teeth. Orthognathic surgery can be combined with orthodontic treatment for comprehensive bite correction, leading to improved facial aesthetics and function. Orthognathic surgery is the most prevalent surgical approach for correcting deep bites, involving the precise repositioning of the upper jaw (maxilla), lower jaw (mandible), or both to achieve optimal alignment of the teeth and jaws. A common procedure within this category is the Le Fort I osteotomy, where the upper jaw is surgically cut and can be moved forward, backward, or upward to enhance occlusion. Mandibular advancement surgery is another procedure that involves cutting the lower jaw and repositioning it forward, thereby improving the bite relationship. Additionally, genioplasty focuses on reshaping the chin to enhance facial aesthetics while further addressing bite issues. On the other hand, distraction osteogenesis is a less frequently used yet effective technique for severe deep bites that involves significant jaw movement. This method involves surgically creating a controlled fracture in the jawbone and gradually widening it over time using a specialized device, promoting new bone growth and allowing for substantial adjustments in jaw positioning. Together, these surgical interventions provide comprehensive solutions for correcting deep bite conditions and improving overall dental function and facial harmony. Maintaining the results of deep bite treatment is critical to preventing relapse. Retention typically involves the use of fixed retainers, which are bonded to the back of the teeth, or removable appliances like Hawley retainers or Essix retainers. These devices help to stabilize the teeth in their new positions while the surrounding bone and tissues adapt to the changes. Long-term retention is often necessary, particularly in cases where significant tooth movement or skeletal correction has been achieved, to ensure that the deep bite correction remains stable over time.

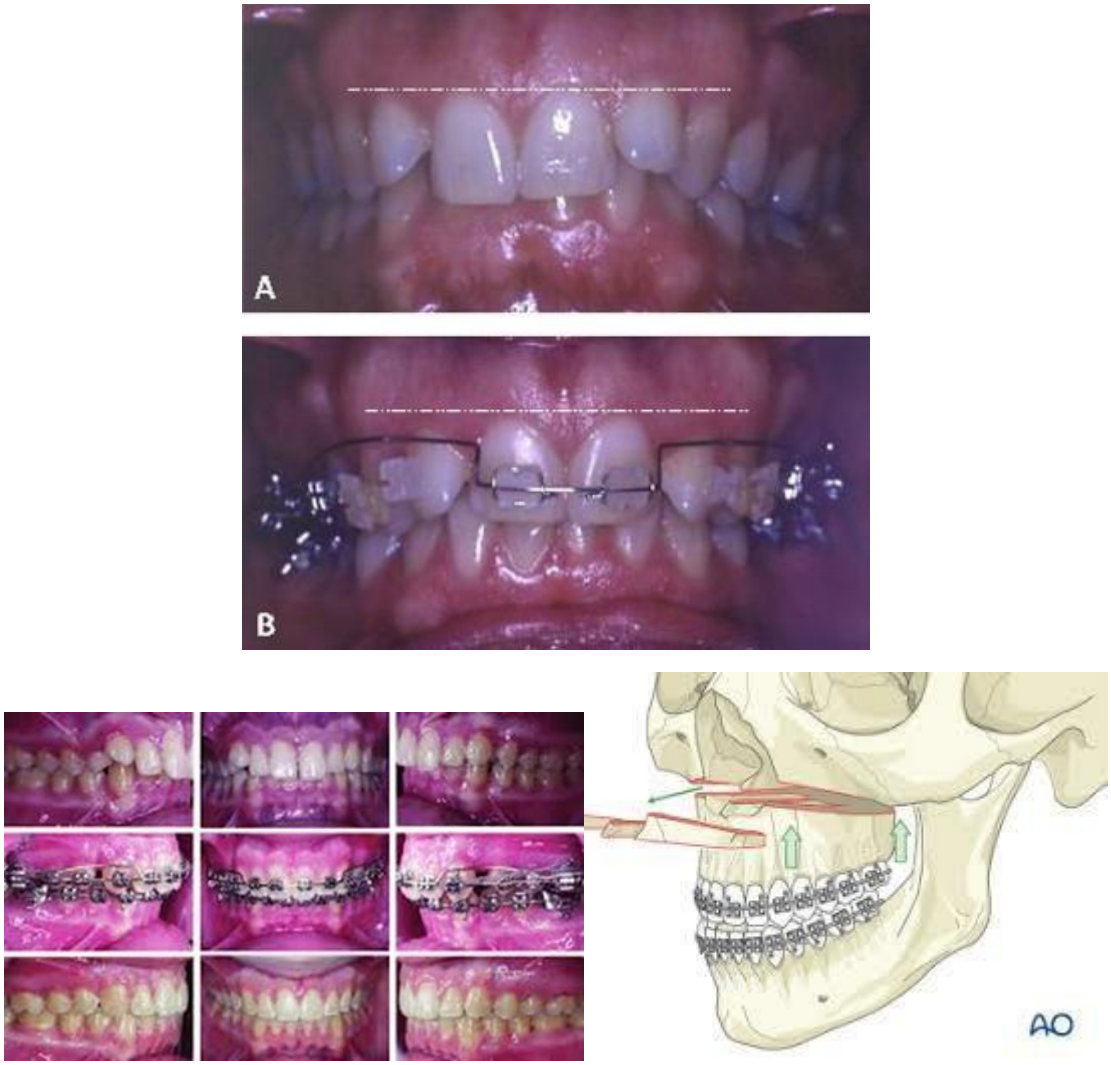

Figure 3: Treatment Options: Appliances, Orthognathic surgery

CONCLUSION :

In conclusion, anterior deep bite is a complex malocclusion that requires a multifaceted approach for effective treatment. Early diagnosis and intervention are key, particularly in growing patients, where growth modification can play a pivotal role in correcting the bite. Orthodontic options such as fixed appliances and clear aligners offer effective solutions for various severities of deep bite, while orthognathic surgery is reserved for cases with significant skeletal discrepancies. In situations where deep bite has led to severe tooth wear or where orthodontic treatment alone is insufficient, prosthodontic rehabilitation provides a valuable restorative option. Finally, ensuring long-term stability through retention is crucial to prevent

relapse and maintain the functional and aesthetic benefits achieved through treatment. A comprehensive, individualized treatment plan that considers both dental and skeletal factorsis essential for successfully managing anterior deep bite and improving patient outcomes.

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