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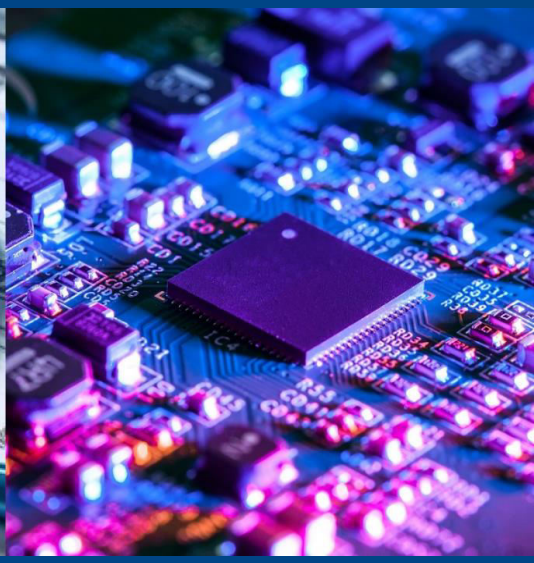

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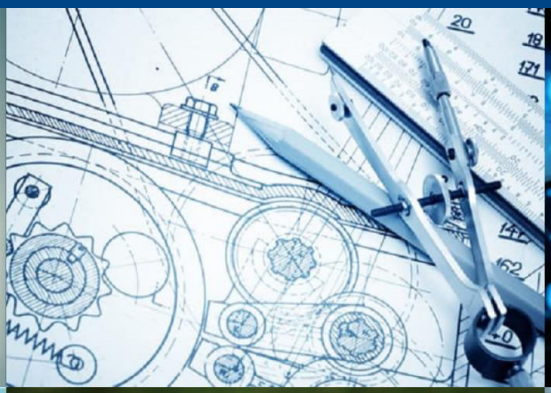

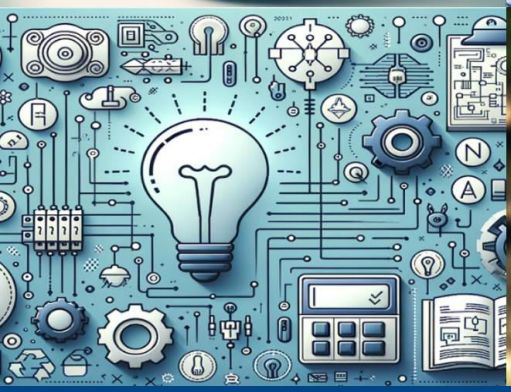

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'Hinge Axis' An Indispensable Element for Prosthodontist- A Review

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ABSTRACT: A key idea in prosthodontics is the hinge axis, commonly referred to as the terminal hinge axis, which is the axis around which the mandible rotates in a centric relationship. This axis is essential for attaining precise occlusal relationships and functional harmony in a variety of prosthetic procedures, such as implant-supported restorations, fixed and removable prostheses, and full-mouth rehabilitations. The simulation of mandibular motions is made possible by the precise localisation and transfer of the hinge axis to an articulator, which lowers fabrication mistakes and guarantees long-term comfort and functionality. Kinematic facebows, digital facebows, and cone-beam computed tomography (CBCT) integration are advanced techniques for determining the hinge axis. Prosthetic design workflows are being revolutionised by these methods, which improve accuracy and blend in seamlessly with contemporary CAD/CAM systems. Occlusal discord, temporomandibular joint dysfunction (TMD), and early prosthetic device failure might arise from improperly locating the hinge axis. The significance of hinge axis determination in modern prosthodontics has been highlighted by recent developments that have made it more effective and accessible, such as virtual articulators and simpler facebow systems. In order to maximise the functional, aesthetic, and biomechanical results of dental prosthesis, this abstract emphasises the need for, techniques for, and developments in hinge axis localisation.

KEYWORDS: occlusion, temporomandibular joint, digital prosthodontics, kinematic facebow, hinge axis, and centric connection.

I. INTRODUCTION

During the early phases of mouth opening, the mandible rotates in the sagittal plane around the hinge axis, an imaginary line that passes through the mandibular condyles (pure rotational movement). This motion, which has no translational component, is thought to be necessary to create a centric relationship. The hinge axis is a fundamental concept in dentistry, particularly in the fields of prosthodontics, orthodontics, and occlusion. It refers to an imaginary axis around which the mandible rotates during the initial phase of opening and closing movements. Understanding the hinge axis is crucial for accurate diagnosis, treatment planning, and fabrication of prostheses in dentistry. [1-5]

Other Names for the Hinge Axis
The terminal Hinge Axis; Horozontal axis [Transverse/Inter condylar], kinematic hinge-axis,highlights that it is the terminal (last) position of pure rotation prior to the start of translation. [1,2]

II. TYPES OF HINGE AXES

According to Robert G and Schallhorn A there are different methods for locating honge-axis which can be broadly classified in to 1.Arbitrary and 2. Kinematic [6]

1. Arbitrary Hinge Axis

This is an estimated hinge axis used when the exact location of the true hinge axis is not determined. It is typically located based on anatomical landmarks. [4,7,8]
Clinical Use: Commonly used in routine cases where precise hinge axis determination is not critical.
The commonly used points to locate arbitrary hinge-axis are:

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A. 1 cm in front of the line- from the apex of the tragus of the ear to the outer canthus of the eye.
B. Beyron's point-13 mm anterior to the posterior margin of the centre of the tragus on a line extending from the outer canthus of the eye to the tragus.
C. Bergstrom Point- 10 mm anterior to the centre of the spherical insert for the external auditory meatus and 7mm below the Frankfurt Horizontal plane.
D. Dawson's Palpatory Method- Palpatory method to locate hinge-axis. The operator will stand behind the patient, the index finger will place over the TM Joint area, and the patient will be asked to open the mouth wide. When the patient, repeating open and close, it will be possible to locate the axis and condylar rotation.
E. Gysi Point- On the most upper part of the external auditory meatus, 13 mm in front, a line passing to the ectocanthion. The other researchers such as Hanau, Snow and Gilmer also suggested this point.
F. Lejoyeux Point- On a line to canthus and 5 mm below, 10-11 mm located infront of the ear.
G. Laritzen-Bondner axis- This is determined by the use of specially constructed disks 10 mm in diameter and a plastic ruler. This point is located 12 mm anterior and 2 mm below the portion on the Frankfurt Horizontal plane.
H. Abdul-Hadi Point- Based on the correlation between the width profile of the face and X coordinate of the kinematic point. Abdul-Hadi point is close to Lejougeux point.

2. Kinematic Hinge Axis [True Hinge Axis]
This is the actual rotational axis of the mandible. It is determined using kinematic facebows or specialized tracing devices.
Clinical Use: Used in cases where high precision is needed, such as in orthodontics, full-mouth rehabilitation, and TMD management.
Determination: Devices like kinematic facebows trace mandibular movements and identify the exact location of the hinge axis.
Advantages: Highly accurate, Crucial for creating precise occlusal relationships.
Limitations: Requires sophisticated equipment and expertise. Time-consuming [2].

3. Terminal Hinge Axis
Definition: This is the hinge axis around which the mandible rotates in its terminal (centric relation) position without any translational movement of the condyles.
Clinical Use: Often discussed in the context of centric relation records, where the condyles are seated in their most anterior-superior position in the glenoid fossa.
Characteristics: Critical for maintaining a stable and repeatable jaw position during occlusal adjustments and prosthetic fabrication. [5]

4. Functional Hinge Axis
Definition: This refers to the axis around which the mandible rotates during normal functional movements, as opposed to purely rotational movements.
Clinical Use: Studied in dynamic occlusion analysis and functional movement recordings.
Characteristics: Reflects the adaptive capacity of the temporomandibular joint during functional movements like chewing. [3]

Advantages [Importance] of the Hinge Axis
By facilitating precise diagnosis, treatment planning, and prosthetic restoration manufacturing, the hinge axis offers major benefits in prosthodontics and occlusion management. These benefits are explained in more depth below:
1. Accurate Reproduction of Mandibular Movements
The hinge axis allows precise replication of mandibular movements, which is critical for:
Occlusal adjustments. Creating restorations that harmonize with the patient's natural jaw function. [5]
2. Facilitates Centric Relation (CR) Determination
The terminal hinge axis helps in accurately identifying centric relation, the most stable and repeatable position of the mandible, crucial for Full-mouth rehabilitations. Fixed prosthodontics. Implant-supported restorations. [4]
3. Enhances Articulator Mounting Accuracy
Transferring the hinge axis to an articulator ensures: Precise simulation of mandibular movements. Improved fit and function of restorations. Reduces interferences by aligning the prosthesis with the patient's occlusal dynamics. [2]

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4. Reduces Adjustments and Chairside Time

Accurate hinge axis records minimize errors in the fabrication of dental prostheses, leading to reduced need for occlusal adjustments. Lower overall chairside time for both dentist and patient. [3]

5. Essential for Functional and Aesthetic Restorations

Aligning restorations with the hinge axis ensures: Functional harmony with mandibular movements.
Stability and comfort for the patient. Better aesthetic outcomes by ensuring proper tooth positioning. [9]

6. Prevents Temporomandibular Joint |(TMJ) Dysfunction

Proper hinge axis determination prevents strain on the TMJ by aligning mandibular movements with the prosthetic design, reducing the risk of Joint pain. Dysfunction or damage to the TMJ structures. [5]

7. Crucial for Advanced Cases

The hinge axis is indispensable in complex cases, such as:
Full-mouth reconstructions. TMD management. Orthognathic surgeries. High-precision implant placements. [10]
Using the hinge axis in clinical practice improves patient comfort, shortens treatment times, and guarantees the precision and durability of prosthetic work. It is essential to the design of both functional and aesthetically pleasing dental treatments.

Philosophies and Concepts of Hinge Axis

Diverse theories and concepts have been used to study the hinge axis in prosthodontics, reflecting distinct methods for analysing mandibular movement and applying it to occlusion and prostheses. An extensive examination of these philosophies can be found below:

1. The Kinematic Philosophy

Core Idea: The true hinge axis is a biomechanical reality that must be located accurately for precise mandibular movement replication.
Concept: Mandibular rotation occurs around a true transverse horizontal axis (kinematic hinge axis) that can be determined dynamically using specialized instruments, such as kinematic facebows. This axis serves as a reference for centric relation and for mounting casts on articulators. [2,5]
Applications: Full-mouth rehabilitation. Complex occlusal adjustments. TMD diagnostics.

2. The Arbitrary Philosophy

Core Idea: An estimated hinge axis is sufficient for most clinical purposes.
Concept: This philosophy relies on locating an arbitrary hinge axis using anatomical landmarks (e.g., Beyron's point, 13 mm anterior to the tragus). The assumption is that minor deviations from the true hinge axis will not significantly affect clinical outcomes. [3,4]
Applications: Routine prosthodontics. General occlusal adjustments where extreme precision is not required.

3. The Functional Philosophy

Core Idea: The hinge axis should be determined based on the dynamic functional movements of the mandible.
Concept: Focuses on how the mandible behaves during chewing, swallowing, and other functional activities. Functional movements may differ slightly from the kinematic hinge axis, emphasizing adaptability. [10]
Applications: Dynamic occlusal analysis. Treatment planning for patients with parafunctional habits or TMJ adaptations.

4. The Terminal Hinge Axis Philosophy

Core Idea: The terminal hinge axis is fundamental to occlusal harmony.
Concept: This axis is the final position of the condyles during pure rotational movement in centric relation.
Emphasizes centric relation as the most stable, repeatable position for occlusion and prosthetic work. [3,5]
Applications: Restorative dentistry. Establishing occlusal schemes for complete dentures and fixed prostheses.

5. The Mechanical or Articulator Philosophy

Core Idea: The hinge axis is integral for articulator-based restorative work.
Concept: Emphasizes transferring the hinge axis to an articulator to replicate mandibular movements precisely. May use either kinematic or arbitrary axis determination based on clinical requirements. [9]
Applications: Fabrication of crowns, bridges, and other fixed prosthetics. Simulating mandibular movements for diagnostic purposes.

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6. The Adaptive Philosophy

Core Idea: The hinge axis is not fixed but can adapt to changes in occlusion and TMJ structure over time.

Concept: Recognizes the plasticity of the temporomandibular joint and its ability to adapt to prosthetic interventions and occlusal changes. Highlights the need for individualized treatment planning. [11]

Applications: Managing patients with long-term TMJ dysfunction or altered occlusal patterns. Designing flexible occlusal schemes.

Depending on the objectives of treatment and the needs of the patient, each hinge axis philosophy has a unique clinical value. Functional and adaptive philosophies acknowledge the biological heterogeneity of the mandibular system, whereas kinematic approaches place a higher priority on accuracy. Combining these ideas enables a customised prosthodontic treatment strategy.

Methods of Locating the Hinge Axis

For precise prosthodontic operations and mandibular movement analysis, the hinge axis must be located. To determine the hinge axis, several approaches have been devised, each requiring certain tools and methodologies.

1. Arbitrary Hinge Axis Location

Definition: An estimated hinge axis location based on anatomical landmarks without kinematic verification.

Techniques: Beyron's Point: Located 13 mm anterior to the tragus on a line connecting the outer canthus of the eye and the tragus. External Auditory Meatus Landmarks: A hinge axis estimated near the center of the external auditory meatus.

Instruments Used: Arbitrary facebow (e.g., Hanau Spring-Bow, Whip Mix Facebow).

Advantages: Quick and easy. Sufficient for routine prosthodontics.

Limitations: May introduce minor errors in complex cases. [1,4,7]

2. Kinematic Hinge Axis Location

Definition: The precise determination of the true hinge axis using mandibular movement tracing.

Techniques: Kinematic tracers detect the true rotational axis of the mandible. Repeated opening and closing movements are recorded until the axis is identified.

Instruments Used: Kinematic facebow. Electronic or mechanical mandibular movement analyzers. Hinge axis locator (e.g., Denar Slidematic Hinge Axis Locator).

Advantages: High accuracy. Essential for full-mouth rehabilitations, TMD management, and advanced prosthetics.

Limitations: Time-consuming. Requires technical expertise and specialized equipment. [2,5]

3. Functional Hinge Axis Location

Definition: Based on dynamic mandibular movements during functional activities.

Techniques: Recordings are taken during chewing, swallowing, or speaking. The hinge axis is inferred from these dynamic movements.

Instruments Used: Jaw tracking devices (e.g., JMA system, ARCUSdigma).

Advantages: Reflects real-life mandibular movements. Useful for patients with parafunctional habits.

Limitations: Less precise than kinematic methods for prosthetic fabrication. [10]

4. Terminal Hinge Axis Location

Definition: Located by positioning the mandible in centric relation (CR) and identifying the axis where pure rotational movement occurs.

Techniques: Manual manipulation of the mandible into centric relation. Verification using articulators and CR records.

Instruments Used: Articulators with facebow transfer (e.g., SAM, Panadent articulators).

Advantages: Provides a stable and repeatable mandibular position. Ideal for occlusal adjustment and centric relation records.

Limitations: Requires careful technique to avoid positional errors. [2]

5. Radiographic Hinge Axis Location

Definition: Identification of the hinge axis using imaging techniques.

Techniques: Cephalometric or panoramic radiographs may be used to approximate the condylar position.

Cone Beam Computed Tomography (CBCT) can provide detailed visualization of condylar anatomy.

Instruments Used: CBCT scanners. Digital radiography systems.

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Advantages: Non-invasive. Useful for patients with anatomical abnormalities.
Limitations: Limited applicability for dynamic hinge axis determination. [12]
The clinical situation and level of precision needed determine which technique and tool are best for locating the hinge axis. While random methods are adequate for routine instances, kinematic methods are the gold standard for high-precision work. Digital technology advancements like jaw tracking systems and CBCT are improving hinge axis determination's precision and usability.

III. INSTRUMENTS USED TO LOCATE TRUE HING-AXIS

1. Arbitrary Hinge Axis Location Instruments
Common Instruments:
Hanau Spring-Bow: A widely used arbitrary facebow that utilizes anatomical landmarks such as Beyron's point to approximate the hinge axis. Features adjustable arms and reference planes for ease of use.
Whip Mix Facebow: A lightweight and versatile facebow that allows transfer of maxillary cast to an articulator using arbitrary hinge axis approximation.
Workflow: Identify anatomical landmarks (e.g., Beyron's point or external auditory meatus). Position the facebow on the patient, aligning the reference points. Secure the bite fork to record the maxillary relationship. Transfer the assembly to the articulator for further prosthetic work.
Advantages: Quick and cost-effective. Adequate for routine clinical cases. [4.7]

2. Kinematic Hinge Axis Location Instruments
Common Instruments:
Denar Slidematic Hinge Axis Locator: Features adjustable arms and tracing needles for identifying the true hinge axis dynamically.
Kinematic Facebows: Devices such as the Denar kinematic facebow enable precise hinge axis tracing through mandibular movement recordings.
Electronic Analyzers: Advanced systems like the ARCUSdigma use electronic sensors to identify the hinge axis with high precision.
Workflow: Attach the facebow or kinematic locator to the patient. Use tracing needles or electronic sensors to record mandibular movements. Perform repetitive opening and closing motions until the rotation point stabilizes. Mark the true hinge axis on the skin or capture it digitally. Transfer this information to an articulator for precise prosthetic fabrication.
Advantages: High accuracy in locating the true hinge axis. Ideal for full-mouth rehabilitation, complex prosthodontics, and TMD cases. [2,5]

3. Functional Hinge Axis Location Instruments
Common Instruments:
Jaw Tracking Devices (e.g., JMA System, ARCUSdigma): Digital systems that capture functional mandibular movements to infer the hinge axis.
Pantographic Tracers: Devices that trace mandibular movements dynamically and identify the functional hinge axis.
Workflow: Attach the jaw tracking device or pantograph to the patient. Record dynamic movements such as chewing, speaking, or swallowing. Analyze the movement data to locate the functional hinge axis. Use the data for creating prosthetic designs that align with the patient's natural movements.
Advantages: Reflects real-life mandibular function. Useful for patients with adaptive or parafunctional habits. [10]

4. Terminal Hinge Axis Location Instruments
Common Instruments:
SAM Articulator with Facebow: High-precision articulator system for transferring terminal hinge axis records.
Panadent Articulator: Known for its versatility and ability to replicate mandibular movements accurately.
Workflow: Position the patient's mandible in centric relation manually or with a CR jig. Attach the facebow and locate the hinge axis based on CR. Verify pure rotational movement by observing the condyles or using tracers. Mark and transfer the axis to the articulator for occlusal analysis and prosthetic design.
Advantages: Provides a stable and repeatable mandibular position. Essential for occlusal harmony in restorative dentistry. [5]

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The Glossary of Prosthodontic Terms (GPT-9).

5. Radiographic Hinge Axis Location Instruments
Common Instruments:
Cone Beam Computed Tomography (CBCT): Provides detailed imaging of the condylar head and joint anatomy.
Digital Panoramic Radiographs: Used to approximate condylar positions relative to the skull.
Workflow: Position the patient in the CBCT scanner or panoramic unit. Capture images in centric relation to visualize condylar positioning.
Analyze the images to locate the hinge axis relative to anatomical landmarks. Use the data for planning prosthetic restorations or surgical interventions.
Advantages: Non-invasive and detailed. Useful for patients with anatomical anomalies or complex joint conditions. [12]
The clinical case determines the workflow and instrument selection. While random approaches are appropriate for regular prosthodontics, kinematic and terminal hinge axis methods are preferable for precision work. Finding the hinge axis is now more accurate and efficient thanks to developments in digital methods like CBCT and jaw tracking.

Technique for Locating the hinge-axis on the patient
Step-by-Step Procedure for Locating the Hinge Axis on the Patient
The following steps detail the kinematic method, which is the most accurate technique for hinge-axis location:
1. Patient Preparation
Seat the patient in an upright position with their head comfortably supported.
Instruct the patient to perform smooth opening and closing movements without protruding or retruding the mandible.

2. Marking Approximate Hinge Axis Points
Identify and mark the approximate hinge axis points on the skin near the tragus of the ear.
Landmark: Approximately 12–13 mm anterior to the tragus along the canthus-tragus line (aligned with the outer canthus of the eye).

3. Mounting the Hinge-Axis Locator
Attach a kinematic facebow to the patient.
Place the ear pieces into the external auditory meatus or use a head support system.
Secure the facebow to prevent movement during the procedure.

4. Initial Positioning of the Pointer
Position the hinge-axis locator pointer on the marked hinge axis point on one side.
Ask the patient to perform opening and closing movements of the mandible.

5. Adjusting the Pointer
Observe the movement of the pointer:
If the pointer moves up or down, the marked point is not the true hinge axis.
Adjust the position of the pointer incrementally and repeat the opening and closing movements.
True hinge axis is located when the pointer remains stationary during pure rotational movement.

6. Repeat on the Opposite Side
Repeat the above steps on the opposite side of the patient's face to confirm bilateral hinge axis location.
Ensure symmetry and consistency between both sides.

7. Record the Hinge Axis
Lock the position of the kinematic facebow to maintain the recorded hinge axis.
Transfer the facebow assembly to the articulator for accurate mounting of dental casts.

8. Verification
After transferring the casts to the articulator, check for any deviations by simulating mandibular movements.
Ensure no discrepancies in occlusal relationships or articulator functionality [1,4,7]

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significance of Raymond Cohen Trainer in relation to hinge-axis location

Raymond Cohen's contributions, specifically through the development of the Cohen Hinge Axis Locator (or Trainer), are significant in advancing techniques for accurately locating the hinge axis in dental patients. Here's how the Cohen Trainer is related to hinge-axis location:

Significance of the Cohen Trainer

Precision in Identifying the True Hinge Axis

The Cohen Trainer is a device used to identify the true hinge axis of the mandible, which is essential for accurate articulation of dental casts.

It simplifies the kinematic method by providing a reliable and repeatable means to locate the hinge axis with minimal error.

Educational Tool

The device serves as a training aid for clinicians and dental students to understand the principles of mandibular movements and the importance of hinge-axis location.

It allows users to practice and visualize the difference between the approximate (anatomic) and true (kinematic) hinge axis.

Improved Articulator Mounting Accuracy

By accurately locating the hinge axis, the Cohen Trainer ensures that the facebow transfer to the articulator reflects the patient's actual mandibular movements.

This results in better prosthodontic restorations with fewer occlusal adjustments and improved function.

Integration in Clinical Practice

The device is practical for clinical use, enabling efficient and precise hinge-axis location without requiring advanced technology.

Key Features of the Cohen Trainer

Pointer Mechanism: A visual pointer that helps identify when there is no translation during mandibular movements, signifying the true hinge axis.

Adjustability: Allows for incremental adjustments to pinpoint the axis.

Ease of Use: Designed for both clinical and educational purposes, making it accessible to practitioners of varying experience levels.

Historical and Practical Importance

Raymond Cohen's work highlights the necessity of hinge-axis identification in achieving functional and esthetic dental restorations. His Trainer remains an important tool in the teaching and practice of occlusion and prosthodontics, serving as a foundation for modern developments in hinge-axis locating devices and techniques. [5,13]

What will happen without locating hinge axis and treating a patient with different prosthesis

A variety of clinical, functional, and aesthetic issues can arise from improperly locating and transferring the hinge axis during prosthodontic therapy. Disparities between the patient's real mandibular movements and the articulator's simulated movements are the cause of these problems. The repercussions of treating patients with different prostheses while ignoring hinge axis position are explained in detail below.

1. Compromised Occlusal Accuracy

Cause: Without hinge axis location, the maxillary and mandibular casts may not be aligned accurately on the articulator. Mandibular movements simulated during prosthetic design may not match the patient's actual movements.

Clinical Impact: Premature occlusal contacts. Occlusal disharmony leading to chewing inefficiency. Increased adjustment time during prosthesis delivery.

Example: A bridge or crown fabricated without accurate hinge axis transfer might cause hyperocclusion on one side, requiring chairside corrections. [5]

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2. Increased Temporomandibular Joint Dysfunction (TMD) Risk

Cause: Prostheses designed without hinge axis alignment may introduce occlusal interferences, disrupting the natural mandibular path. This can strain the TMJ and surrounding musculature.

Clinical Impact: TMD symptoms such as pain, clicking, or limited jaw opening.

Muscle fatigue or spasms.

Example: A complete denture without proper hinge axis consideration may cause uneven force distribution [2]

3. Failure in Full-Mouth Rehabilitation

Cause: Full-mouth rehabilitation involves restoring multiple teeth or arches, requiring precise occlusal relationships. Lack of hinge axis location may lead to errors in occlusion during dynamic mandibular movements.

Clinical Impact: Restorations may fracture or wear prematurely. Occlusal interferences may necessitate frequent repairs or replacements.

Example: A patient with full-arch zirconia restorations may experience functional difficulties due to improper occlusal contacts caused by inaccurate mandibular movement replication. [9]

4. Poor Esthetic and Functional Outcomes

Cause:Without hinge axis transfer, the orientation of the maxillary cast on the articulator may not match the patient's natural occlusal plane.

This misalignment impacts the esthetic design and functional efficiency of the prosthesis.

Clinical Impact: Misaligned dental prosthetics (e.g., tilted crowns or bridges). Difficulty in speaking and chewing. Esthetic concerns due to unnatural tooth alignment.

Example: An implant-supported prosthesis fabricated with an arbitrary hinge axis may exhibit improper alignment, resulting in an unnatural smile line. [12]

5. Uneven Force Distribution and Prosthetic Failures

Cause: Prostheses fabricated without hinge axis transfer may lead to improper occlusal loading during mastication. Uneven forces can damage the prosthesis or supporting structures.

Clinical Impact: Increased wear or fracture of prosthetic materials. Bone resorption around implants or natural teeth due to excessive forces.

Example: An overdenture without hinge axis consideration may cause undue stress on the abutments, leading to failure of the attachments. [4]

6. Complications in TMD and Complex Cases

Cause: Patients with pre-existing TMD or complex occlusal conditions require precise mandibular movement simulation for effective treatment. Inaccurate hinge axis identification may exacerbate their condition.

Clinical Impact: Worsening of TMD symptoms. Ineffective occlusal splints or orthotic devices. Delayed or failed treatment outcomes.

Example: A bite splint fabricated without hinge axis transfer may fail to relieve joint stress, prolonging the patient's symptoms. [11]

7. Digital Workflow Errors

Cause: Digital workflows rely on accurate hinge axis data for virtual articulators and CAD/CAM prosthesis design. Missing this data leads to inaccuracies in digital simulations.

Clinical Impact: Prostheses fabricated using digital workflows may require remakes or excessive chairside adjustments. Patient dissatisfaction due to prolonged treatment times.

Example: A digital complete denture with an arbitrary hinge axis may exhibit a poor occlusal relationship, requiring extensive modifications. [14]

The effectiveness of prosthodontic therapies is jeopardised when hinge axis localisation and transfer are neglected. Kinematic or functional hinge axis identification is essential for complex prostheses, full-mouth rehabilitations, and TMD care, but random approaches can be adequate for simple instances. Long-term success and patient satisfaction are ensured by precise hinge axis transfer, which improves biomechanical, functional, and aesthetic results.

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IV. CONCLUSION

An essential anatomical reference in prosthodontics, the hinge axis is necessary to achieve precise occlusion and guarantee functional harmony in restorative dental procedures. Clinicians can recreate mandibular movements by accurately detecting and transferring the hinge axis to an articulator. This allows for the creation of exact prosthetic designs that maximise patient comfort, aesthetics, and long-term success. The way doctors approach prosthetic planning and manufacture has been completely transformed by recent developments in hinge axis location, such as the use of digital facebows, kinematic facebows, and 3D imaging techniques like CBCT. Improved accuracy and usability brought about by these technology advancements enable more effective workflows and a decrease in human error. In addition to reducing the chance of issues like occlusal disharmony and temporomandibular joint dysfunction (TMD), the continuous improvement of these techniques guarantees that patients obtain restorations that fit better and are more effective.

Despite these developments, physicians still need to have a thorough understanding of the function of the hinge axis and the best methods for determining it because improper localisation can result in dysfunctional occlusion, patient discomfort, and prosthetic failures. In order to get the best results in full-mouth rehabilitations, implant-supported prostheses, and both fixed and removable prosthodontics, it is crucial to precisely incorporate the hinge axis in clinical practice.

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