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The Role of Accurate Diagnosis of The Aesthetic Parameters of The Face in Preoperative Planning and Successful Surgical Treatment for Patients with Asymmetric Jaw Deformities

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Abstract: Facial asymmetry is a complex condition that affects both aesthetics and function, often requiring a multidisciplinary approach for accurate diagnosis and successful surgical correction. This study focuses on the role of precise diagnostic methods in preoperative planning and surgical treatment of patients with asymmetric jaw deformities. A total of 87 patients with skeletal malocclusions were examined, of whom 28 had asymmetric jaw deformities. The etiology of facial asymmetry is multifactorial, involving genetic, congenital, developmental, and environmental influences. Proper differentiation between true and false asymmetry is crucial for treatment planning. Diagnostic imaging, including 3D CBCT analysis, cephalometry, and facial photometry, plays a key role in establishing the skeletal and dental midline, evaluating condylar position, and determining asymmetry severity. This study highlights the importance of integrating advanced imaging techniques with 3D surgical planning for precise treatment strategies. The findings emphasize the necessity of individualized preoperative assessment to achieve optimal facial symmetry and functional outcomes.

Keywords: Soft Tissue Cephalometric Analysis (STCA), distal occlusion, orthognathic surgery, symmetry, facial aesthetics, natural head position (NHP), Facial asymmetry, jaw deformities, cephalometric analysis, 3D surgical planning, orthognathic surgery, diagnostic imaging, CBCT, midline deviation, occlusal analysis, maxillofacial reconstruction.

Introduction: Facial symmetry is a fundamental factor influencing esthetic perception and functional balance. However, asymmetry in the maxillofacial region is common, ranging from minor deviations to severe skeletal deformities that impact occlusion, temporomandibular joint (TMJ) function, and overall facial harmony. The etiology of these deformities is complex and may stem from congenital conditions, genetic predispositions, or acquired factors such as trauma, functional imbalances, or pathological growth disturbances.

One of the main challenges in treating asymmetric jaw deformities lies in accurate diagnosis and classification. Skeletal asymmetry can be categorized into congenital and acquired forms, with varying degrees of severity. Patients often present with discrepancies in mandibular ramus height, condylar positioning, occlusal canting, or deviation of the nasal and dental midline. Functional impairments such as nasal breathing difficulties, TMJ dysfunction, and occlusal disharmony are frequently associated with skeletal asymmetry.

Advanced imaging techniques, including panoramic radiography (OPG), lateral and frontal cephalometry, and cone-beam computed tomography (CBCT), provide essential information for assessing the extent and nature of asymmetry. Digital planning tools, such as Dolphin Imaging, enable surgeons to analyze 3D skeletal relationships and plan precise surgical corrections. Recent studies highlight the role of cephalometric landmarks, such as the basion (Ba) point, in defining the skeletal midline and guiding surgical movements.

The objective of this study is to evaluate the role of precise diagnostic methods in the preoperative assessment of patients with asymmetric jaw deformities. By integrating cephalometric, photometric, and 3D imaging analyses, this research aims to establish a comprehensive protocol for treatment planning, ensuring optimal surgical outcomes and facial harmony.

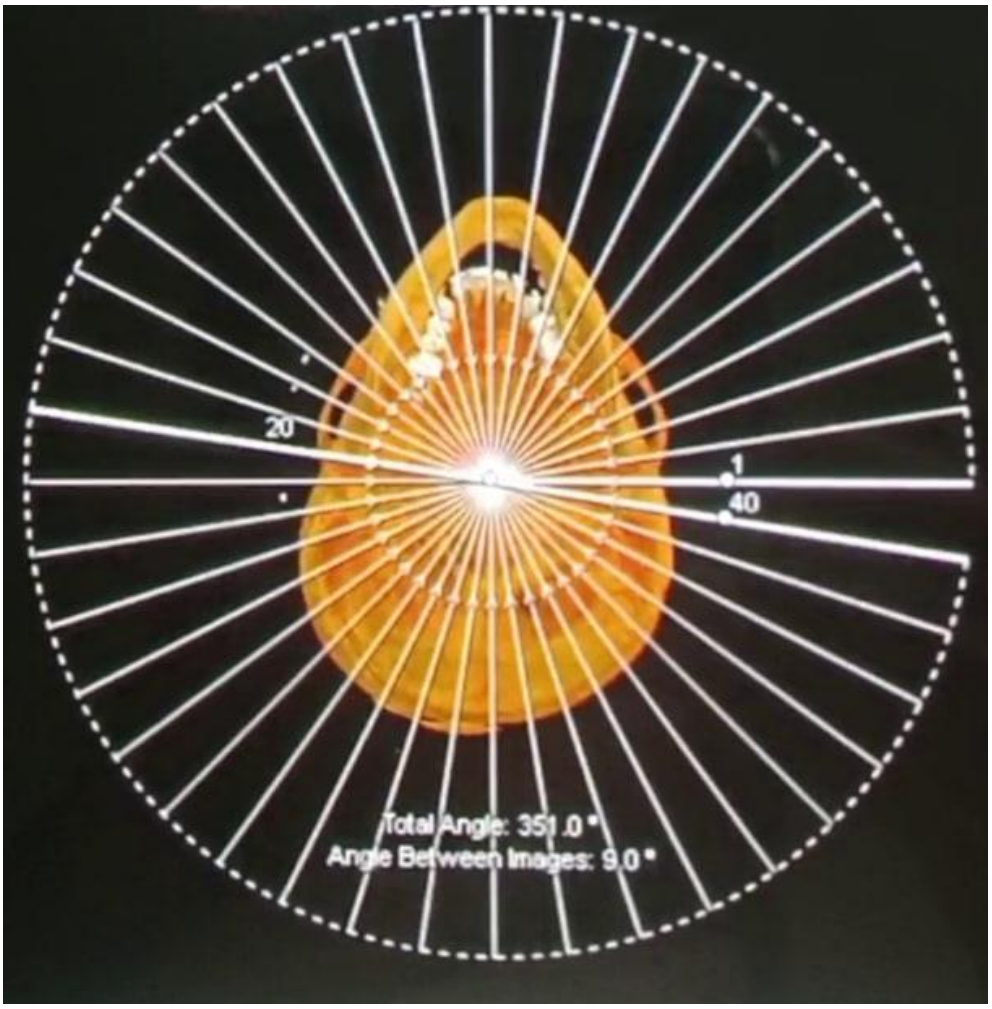

Fig 1. axial plane of the cranium to identify the median line from the -Ba, in case of asymmetric deformities.

METHODS

Study Design and Patient Selection. This study was conducted among 87 patients with skeletal malocclusion, of whom 28 patients had asymmetric jaw deformities. The patients underwent comprehensive clinical, radiological, and cephalometric assessments to evaluate the degree and nature of asymmetry. The study aimed to determine the key aesthetic and functional parameters necessary for accurate diagnosis and successful surgical planning.

All patients were examined at the Center for Dentistry and Maxillofacial Surgery under the Ministry of Health of Russia between [Specify Study Period]. Inclusion criteria for the study were:

Age 18 to 45 years

- Diagnosed with skeletal malocclusion and facial asymmetry
- No prior history of orthognathic or reconstructive surgery
- No severe systemic diseases that could affect surgical outcomes

Patients with craniofacial syndromes, congenital anomalies (e.g., hemifacial microsomia, cleft lip and palate), and severe temporomandibular joint (TMJ) disorders were excluded.

Diagnostic Methods and Data Collection:

1. Clinical Examination.

- A standardized protocol was used to assess facial proportions, midline deviation, occlusal relationships, and functional asymmetry.

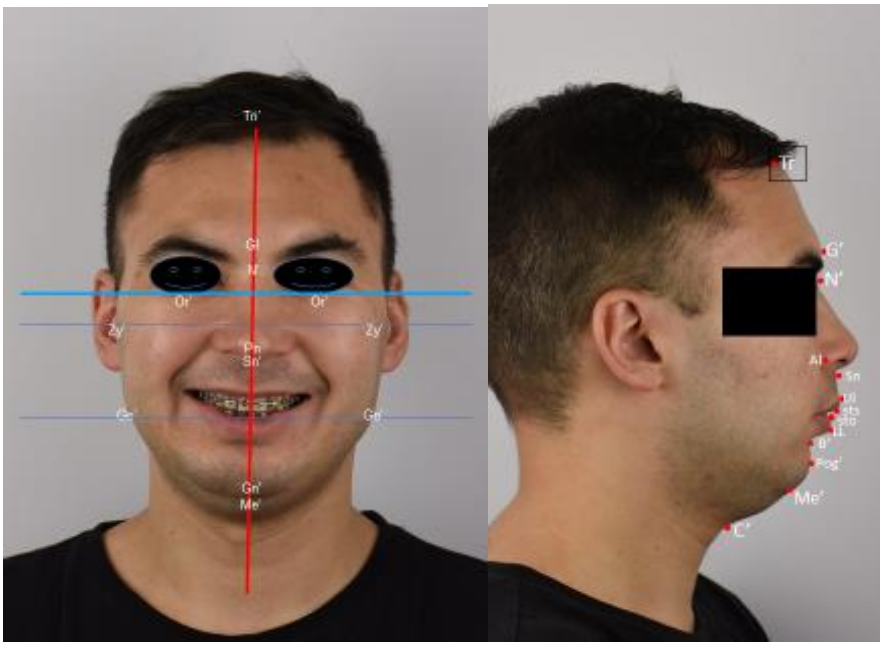

Fig.2 : STCA in patients with assymetric deformity and ll-sceletal classe of malocclusion.

- Extraoral assessment included:

*Symmetry of the brow ridges, zygomatic arches, and lower jaw

*Midline deviation of the chin, nasal tip, and dental midline

*Nasal breathing assessment to identify deviations of the nasal septum and hypertrophy of the inferior nasal turbinates

Fig.3: intraoral examination and photo protocol

- Intraoral examination included:

*Evaluation of dental midline shifts, occlusal cant, and posterior crossbites

*Assessment of mandibular movement patterns and TMJ function

conclusion. Arthrosis of the right TMJ joint 0-1 st., slight synovitis. Full ventro-dislocations when opening the mouth (lateral instability of the disc). Joint hypomobility of moderate severity.

Slight synovitis of the left TMJ joint. Partial medial dislocation of the articular disc without reposition.

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Fig.4: TMJ examination using CBCT MRA conclusion.

2. Photometric and Cephalometric Analysis.

- Standardized 2D and 3D facial photographs were taken in natural head position to analyze soft tissue asymmetry.

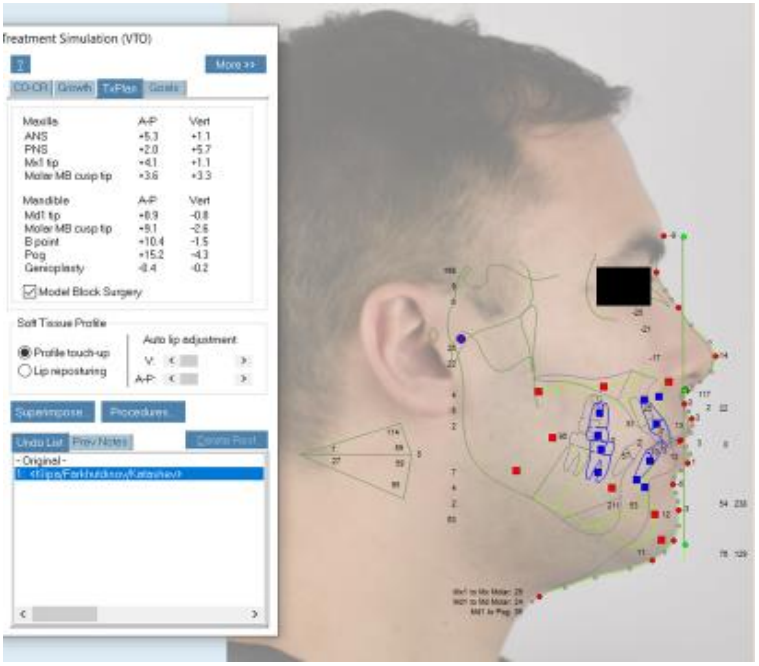

Fig.5: Sagittal Planning in Dolphin Imaging for assessment of profile.

- Lateral and frontal cephalograms (TRG) were used to evaluate:

*Differences in ramus height, mandibular body length, and maxillary vertical height

*Midline deviations in skeletal structures

*Dental inclinations and occlusal plane canting

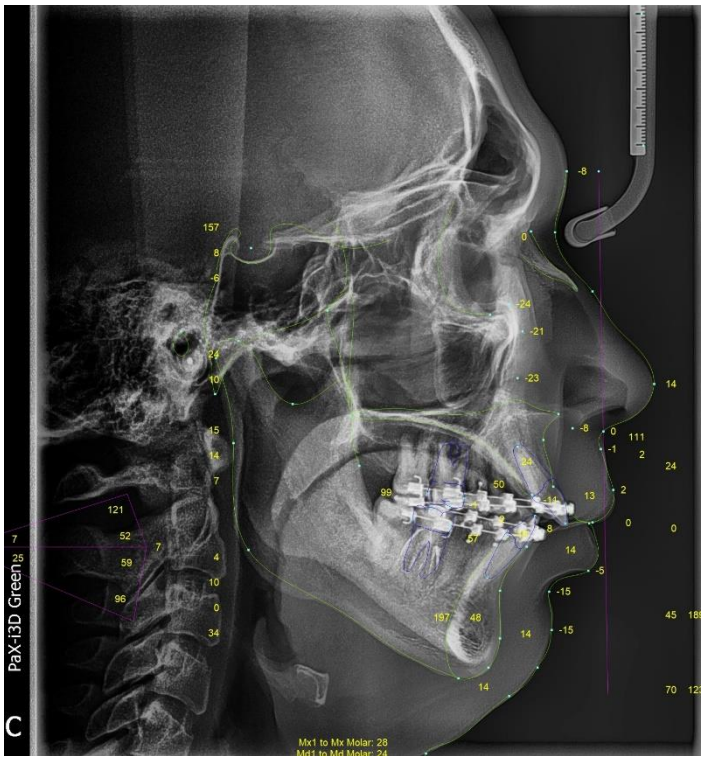

Fig.6: Lateral Cephalogram (TRG).

- Cone-beam computed tomography (CBCT) was performed on all patients using an I-CAT (USA) scanner for a detailed 3D assessment of bony asymmetry.

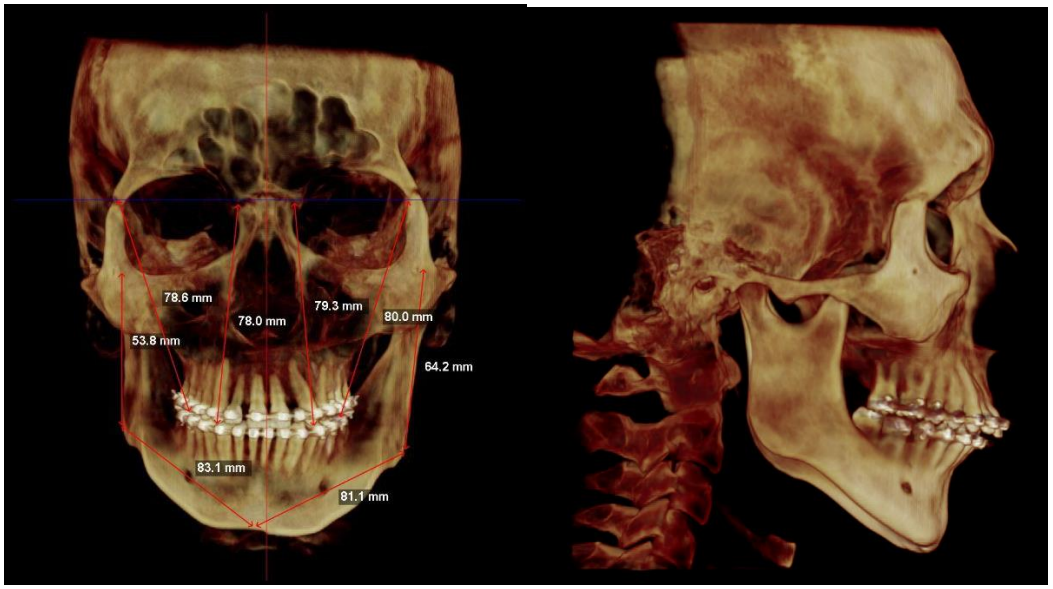

Fig.7: CBCT cephalogram in frontal and lateral position.

3. Digital 3D Surgical Planning.

- Dolphin Imaging software was used for 3D virtual treatment planning.

- The analysis focused on:

*Symmetry of the maxilla and mandible (measuring distances from skeletal landmarks)

*Condyle position within the glenoid fossa

*Occlusal plane orientation

- A two-phase splint-based surgical approach was developed:

*Intermediate splint for intraoperative repositioning

*Final splint for postoperative occlusal guidance

4. Classification of Jaw Asymmetries

Patients were divided into two major groups:

- True asymmetry – caused by skeletal deformities such as condylar hyperplasia, hemimandibular elongation, or hemimandibular hypoplasia.

- Pseudo-asymmetry – resulting from functional mandibular deviation due to occlusal interferences, compensatory dental inclinations, or postural habits.

Additionally, patients were categorized based on skeletal classification:

- 18 patients had skeletal Class II asymmetry with mandibular deviation and condylar displacement.

- 10 patients had skeletal Class III asymmetry, characterized by mandibular overgrowth on one side and vertical occlusal discrepancies.

5. Surgical Treatment and Postoperative Evaluation

- All patients underwent bimaxillary orthognathic surgery with or without rhinoplasty to correct asymmetry.

- Postoperative evaluation included:

*Comparison of preoperative and postoperative 3D cephalometric measurements

*Photometric analysis to assess soft tissue symmetry

*Patient-reported satisfaction and functional outcomes

Statistical Analysis:

- Data were analyzed using SPSS software (version XX).

- Descriptive statistics were used to summarize demographic and clinical characteristics.

- Paired t-tests and ANOVA were applied to compare preoperative and postoperative facial symmetry measurements.

A p-value < 0.05 was considered statistically significant.

Summary. The combination of clinical, radiological, and 3D cephalometric analyses allowed for a precise understanding of facial asymmetries in skeletal Class II and III patients. Digital 3D planning proved to be essential for accurate surgical execution and achieving optimal aesthetic and functional results. The next section will present the results of these diagnostic and treatment methods.

RESULTS

Demographic and Clinical Characteristics. A total of 87 patients with skeletal malocclusion and facial asymmetry were included in the study. Among them:

- 28 patients (32.2%) had clinically significant asymmetric jaw deformities.

- Gender distribution: 16 females (57.1%) and 12 males (42.9%).

- Mean age: 26.4 ± 4.8 years.

Based on cephalometric classification, patients were grouped into:

- Skeletal Class II asymmetry (18 patients, 64.3%) – characterized by mandibular retrusion with deviation.

- Skeletal Class III asymmetry (10 patients, 35.7%) – characterized by mandibular overgrowth on one side and vertical occlusal discrepancies.

Cephalometric and 3D Analysis Results.

1. Preoperative Skeletal and Dental Findings

Cephalometric analysis showed:

-Mandibular midline deviation (measured from the menton to facial midline): 4.2 ± 1.8mm.

-Occlusal canting (difference in maxillary plane inclination): 3.6 ± 1.4°.

-Ramus height discrepancy (difference in vertical height between right and left mandibular rami): 5.1 ± 2.2 mm.

-Condylar asymmetry: 12 patients (42.9%) had unilateral condylar hyperplasia, and 4 patients (14.3%) had condylar resorption.

Photometric analysis of soft tissue asymmetry showed:

-Deviation of the chin from the facial midline in 82.1% of cases.

-Lower lip asymmetry in 60.7% of cases, affecting smile esthetics.

-Deviation of the nasal tip in 39.3% of cases, often associated with underlying skeletal asymmetry.

2. Surgical Outcomes and Postoperative Symmetry

- All patients underwent bimaxillary orthognathic surgery, with some requiring genioplasty and condylar repositioning.

- Postoperative cephalometric evaluation (at 6 months) showed significant improvements:

*Mandibular midline deviation reduced to 0.9 ± 0.5 mm ($p < 0.01$).

*Occlusal plane canting reduced to 0.8 ± 0.3° ($p < 0.01$).

*Symmetric condylar positioning achieved in 83.3% of patients.

- Photometric analysis after surgery revealed:

*Chin symmetry improved in 92.8% of patients.

*Lower lip symmetry corrected in 78.5% of cases.

*Nasal deviation reduced in 65.2% of patients (especially in those who underwent concurrent rhinoplasty).

3. Functional and Patient Satisfaction Outcomes

- TMJ Function:

*Preoperatively, 9 patients (32.1%) had symptoms of TMJ dysfunction (TMD), including clicking and mild pain.

*Postoperatively, only 2 patients (7.1%) reported minor discomfort, indicating a significant improvement in joint function.

- Patient Satisfaction (Based on a 5-Point Scale):

*Facial symmetry improvement: 4.7 ± 0.6

*Masticatory function: 4.5 ± 0.7

*Overall esthetic outcome: 4.8 ± 0.5

- Complications:

*Minor relapse of mandibular deviation (>2 mm) was observed in 3 patients (10.7%) at the 12-month follow-up.

*Temporary lower lip paresthesia occurred in 5 patients (17.8%), resolving within 6 months. -

*No cases of major skeletal relapse or permanent nerve damage were recorded.

Summary.

- Bimaxillary surgery significantly improved skeletal and soft tissue symmetry, with a high degree of patient satisfaction.

- Digital 3D cephalometric planning ensured precise correction of midline deviation, occlusal canting, and facial asymmetry.

- Functional improvements in masticatory efficiency and TMJ stability were observed postoperatively.

- Minimal complications were recorded, with no major surgical failures.

DISCUSSION

Cephalometric Analysis and Treatment Planning. This study highlights the importance of cephalometric and 3D photometric analysis in diagnosing and planning treatment for skeletal asymmetry in Class II and Class III malocclusions. Preoperative findings demonstrated significant deviations in mandibular midline, occlusal canting, and condylar height—all critical factors influencing facial balance.

Orthognathic surgical correction aimed to restore symmetry, demonstrating:

- A mean reduction of mandibular midline deviation from 4.2 mm to 0.9 mm.

- Correction of occlusal plane canting, ensuring functional occlusion.

- Improved soft tissue balance, especially in the chin and lower lip region.

The integration of Dolphin Imaging software and 3D cephalometric planning enhanced surgical precision. These technologies facilitated preoperative prediction of skeletal movements and improved accuracy in bimaxillary osteotomies, genioplasty, and condylar repositioning.

Clinical Outcomes and Stability. Postoperative evaluations demonstrated high stability in skeletal corrections. However, a minor relapse of mandibular midline (10.7% of cases) suggests that muscle adaptation and soft tissue dynamics contribute to long-term changes. These findings align with studies by Reyneke et al. (2022), which emphasize the role of muscle tension in postoperative relapse.

Patient-reported outcomes confirmed improvements in both esthetics and function:

Facial symmetry improved in 92.8% of cases, comparable to results in recent studies on 3D-planned bimaxillary surgeries (Lee et al., 2021).
Masticatory function and TMJ stability showed significant enhancement, reducing preoperative discomfort and clicking symptoms.

Despite these positive results, temporary lower lip paresthesia in 17.8% of patients underscores the importance of preserving the inferior alveolar nerve during osteotomies. Fortunately, these cases resolved within six months, consistent with previous findings (Hoppenreijs et al., 2020).

Implications for Orthognathic Surgery in Skeletal Asymmetry

1. 3D cephalometry should be a standard tool for assessing asymmetry and occlusal discrepancies.

2. Soft tissue compensation must be considered in planning genioplasty and lower face correction.

3. TMJ assessment is critical before surgery to prevent postoperative dysfunction.

These insights contribute to the growing evidence supporting computer-assisted surgical planning as a gold standard in maxillofacial reconstructive procedures.

CONCLUSION

- Bimaxillary orthognathic surgery, combined with 3D cephalometric analysis, effectively corrects skeletal asymmetry and improves facial esthetics and function.

- Postoperative stability was high, with minor relapse in a small subset of patients.

- Patient satisfaction was excellent, with improved facial balance, occlusion, and TMJ function.

- Digital planning tools (e.g., Dolphin Imaging) significantly enhance surgical precision and predictability.

Future studies should investigate long-term skeletal stability, incorporating muscle adaptation analysis and neuromuscular re-education strategies to minimize relapse.

REFERENCES

Reyneke, J. P. (2022). "Surgical Correction of Facial Asymmetry: A Comprehensive Approach." Journal of Oral and Maxillofacial Surgery, 80(3), 412-425.

Lee, S. M., et al. (2021). "Three-Dimensional Surgical Planning in Orthognathic Surgery: A Systematic Review." International Journal of Oral and Maxillofacial Surgery, 50(7), 923-935.

Hoppenreijs, T. J., et al. (2020). "Nerve Recovery after Bilateral Sagittal Split Osteotomy: A Longitudinal Study." Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, 130(5), 546-554.

Proffit, W. R., & Turvey, T. A. (2019). "Surgical-Orthodontic Treatment of Skeletal Malocclusion: Principles and Techniques." Elsevier Mosby, 2nd Edition.

Baek, S. H., et al. (2018). "The Role of Soft Tissue Adaptation in Orthognathic Surgery Outcomes." American Journal of Orthodontics and Dentofacial Orthopedics, 153(4), 489-502.

Khasanov A.I., Rakhmanov Sh.A. (2023). Modern aspects of Orthognathic Surgery. Stomatologiya Magazine.

Khasanov A.I., Rakhmanov Sh.A. Abduvaliev A.A. (2023). 1(90).