Clinical and Paraclinical Considerations of Pre-Prosthetic Orthodontic Therapy

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Contemporary oral rehabilitation aims to restore the function, aesthetics, and biological balance of the stomatognathic system through an interdisciplinary therapeutic approach, in which orthodontic treatment frequently represents an essential prerequisite for successful prosthetic and implant-supported rehabilitation. Tooth loss often leads to secondary occlusal changes, including dental migration, molar tipping, overeruption of opposing teeth, and reduction of the prosthetic space, all of which may compromise the achievement of predictable functional and aesthetic restorative outcomes in the absence of adequate orthodontic preparation. Within this context, pre-prosthetic orthodontic therapy plays a crucial role in optimizing dentoalveolar relationships and occlusal conditions before definitive restorative treatment, thereby facilitating prosthetic rehabilitation and contributing to the long-term stability of therapeutic outcomes.

Recent advances in digital dentistry, the increasing demand for orthodontic treatment among adult patients, and the widespread adoption of prosthetically driven treatment planning have considerably reinforced the importance of interdisciplinary management in modern dental practice. Simultaneously, the incorporation of objective functional assessment methods, such as surface electromyography (sEMG), has provided new insights into the neuromuscular adaptation of the stomatognathic system following orthodontic interventions. Nevertheless, current literature predominantly addresses individual pre-prosthetic orthodontic procedures separately, while relatively few studies have comprehensively investigated clinical practice patterns, functional adaptations, and therapeutic applicability within a single research framework.

Based on these considerations, the present doctoral thesis aimed to evaluate the role of pre-prosthetic orthodontic therapy in interdisciplinary oral rehabilitation by investigating contemporary clinical practice patterns, assessing functional changes associated with orthodontic treatment, and demonstrating the clinical applicability of these interventions in the management of complex rehabilitation cases. The research was structured into three complementary studies, each exploring a distinct aspect of pre-prosthetic orthodontic therapy.

Study I: Pre-Prosthetic Orthodontic Interventions in Interdisciplinary Oral Rehabilitation – Evaluation of Clinical Practice Patterns among Orthodontists

The first study aimed to evaluate the frequency and diversity of pre-prosthetic orthodontic interventions performed in daily clinical practice and to identify potential

differences between orthodontic residents and certified orthodontic specialists. A cross-sectional descriptive-analytical observational study was conducted using an online questionnaire completed by 75 orthodontists, including 42 residents and 33 specialists. The survey investigated the most commonly performed pre-prosthetic orthodontic procedures, including prosthetic space management, treatment of maxillary lateral incisor agenesis, uprighting of tipped molars, modification of the occlusal vertical dimension, correction of deep bite, and maintenance of prosthetic spaces. Statistical analysis demonstrated that pre-prosthetic orthodontic procedures are routinely incorporated into contemporary orthodontic practice and revealed significant differences related to professional experience in the selection of specific therapeutic approaches. The findings emphasize the growing importance of interdisciplinary collaboration and reflect current trends regarding the integration of orthodontics into comprehensive prosthetic treatment planning.

Study II: Electromyographic Evaluation of Functional Changes Following Short-Term Increase of the Occlusal Vertical Dimension in Class II Division 2 Malocclusion

The second study investigated the neuromuscular response of the masticatory muscles to a temporary increase in the occlusal vertical dimension in patients presenting with Class II Division 2 malocclusion. Surface electromyography was used to objectively evaluate the activity of the principal masticatory muscles according to a standardized recording protocol. The results demonstrated a favorable short-term neuromuscular adaptation to the induced increase in vertical dimension, without clinically significant muscular imbalance. These findings support the controlled use of occlusal vertical dimension modification during pre-prosthetic orthodontic treatment planning and complex oral rehabilitation. The study provides an original contribution by incorporating objective functional assessment into the evaluation of pre-prosthetic orthodontic therapy.

Study III: Interdisciplinary Management of Severe Skeletal Class II Malocclusion – A Clinical Case Report

The third study presents the interdisciplinary management of an adult patient diagnosed with severe skeletal Class II malocclusion, periodontal involvement, and complex prosthetic rehabilitation needs. Treatment consisted of pre-prosthetic orthodontic therapy, bimaxillary orthognathic surgery, implant surgery, and implant-supported prosthetic rehabilitation performed according to a carefully sequenced interdisciplinary treatment protocol. Clinical follow-up demonstrated that orthodontic treatment represented the cornerstone of therapeutic planning, allowing correction of dentoskeletal discrepancies, optimization of the biological and functional conditions required for implant placement, and achievement of a stable, functional, and

aesthetically satisfactory oral rehabilitation. This case highlights the importance of close collaboration among orthodontists, oral and maxillofacial surgeons, periodontists, and prosthodontists in the management of patients requiring comprehensive interdisciplinary rehabilitation.

The findings of the three complementary studies consistently demonstrate that pre-prosthetic orthodontic therapy represents an indispensable component of contemporary interdisciplinary oral rehabilitation. Correction of tooth position, optimization of occlusal relationships, and biological preparation of the prosthetic field significantly improve the predictability of restorative treatment, enhance stomatognathic function, and contribute to the long-term stability of functional and aesthetic outcomes. Furthermore, the integration of clinical, radiological, and functional assessments allows individualized treatment planning and facilitates evidence-based therapeutic decision-making.

Through its interdisciplinary design, combining an evaluation of current orthodontic clinical practice, an objective functional assessment based on surface electromyography, and the documentation of a complex interdisciplinary clinical case, the present doctoral thesis contributes to the advancement of current knowledge regarding the role of pre-prosthetic orthodontic therapy in contemporary oral rehabilitation. The results support the systematic integration of orthodontic treatment into modern restorative protocols and provide scientific evidence for optimizing interdisciplinary treatment planning in patients requiring complex oral rehabilitation.