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Prospective Evaluation of an Adjustable Bone Fixation System for the Sagittal Split Ramus Osteotomy

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Introduction

Stabilizing of the fragments after sagittal split osteotomy is usually performed by means of rigid or semi-rigid fixation to avoid maxillo-mandibular-fixation (MMF). Sometimes this procedure leads to a malpositioning of the fragments with resulting "immediate post-operative relapse" or temporo-mandibular joint (TMJ) disturbances.
Therefore, we developed a new bone fixation system which allows a three-dimensional adjustment even after fixation of the fragments. The use of soft titanium and a special configuration of the system avoid the dislocation of the mandibular condyle.
Aim of the present study was the prospective evaluation of the TMJ-function in patients who underwent sagittal split osteotomy and in which the new bone fixation system was used.

Material and methods

47 patients who underwent sagittal split osteotomy were included in the study over a 2-year period of time. Patients with syndromes and patients with clinical of axiographical evidence of myoarthropathies were excluded. Within the study group there were 22 females and 25 males with an age distribution between 16 and 46 years and a mean vaule of 26.3 years. Of these patients, 22 were treated for mandibular prognathism and 25 for mandibular retrognathism. The patients were examined pre-operatively (T0), 6 month post-operatively (T1) and 12 months post-operatively (T2).
All of the patients underwent a clinical examination at T0, T1 and T2 including the assessment of the TMJ-function. Axiographies with the String Condylocomp LR3 were performed at the same time using individual paraocclusal trays. The movement of the condyles were recorded three-dimensionally for mouth-opening, protrusion and mediotrusion.

Results

TMJ-symptom were found in 6% as crepitus and in 2% as clicking. The clinical examination did not elicit any dysfunction of the masticatory muscles. Disturbances of the neurosensory function were diagnosed in 8% as hypaesthesia and in 6% as paraesthesia of small areas within the lower alveolar nerve distribution. The results for maximal mouth-opening by recording the inter-incisal distance (IID), for maximal protrusion and laterotrusion showed a mean IID of 45.8 mm pre-operatively, 42.8 mm 6 months post-operatively and 44.6 mm 12 months post-operatively. A little restriction after 6 months was almost completely compensated after 12 months which was similar for the protrusion and laterotrusion. The differences were not significant.
Even the analysis for patients with mandibular prognathism and mandibular retrognathism respectively revealed little differences which were not significant.

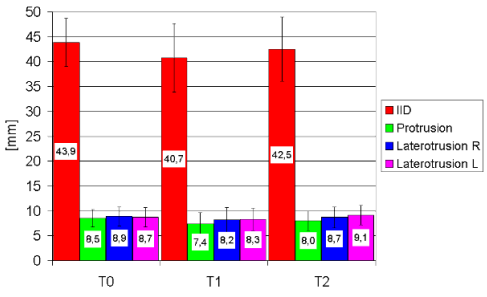

Fig. 1 Results: Clinical assessment

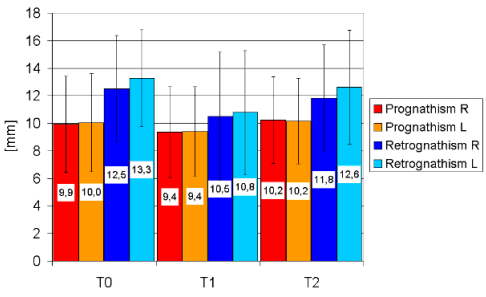

Fig. 2 Results: Condylar path length (Mouth-opening)

Fig. 2 shows mean values of the condylar path length for mouth-opening at T0-T2. The little non significant decrease at T1 for mandibular retrognathism was almost reduced at T2. At the same time a little increase for mandibular prognathism was noted. The mean values of the condylar path angles for mouth-opening revealed no significant changes for mandibular prognathism. Similar values for mandibular retrognathism at T0 showed an increase at T1 and T2. Analysis of the protrusion revealed different pre-operative values depending on the diagnosis. An increase of post-operative values was noted for mandibular prognathism at T1 (Fig. 3). The decrease for mandibular retrognathism at the same time was significant. Differences at T2 were significant as well with a further increase for mandibular prognathism and a decrease for mandibular retrognathism respectively. No significant changes were found regarding the condylar path angles for mandibular prognathism. A significant increase instead was found for mandibular retrognathism at T1 and T2 (Fig. 4).

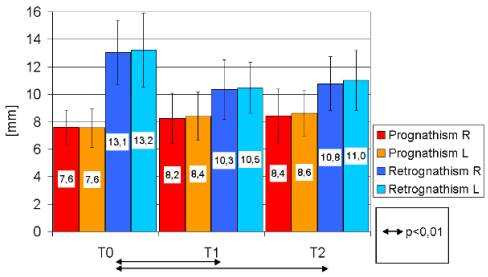

Fig. 3 Results: Condylar path length (Protrusion)

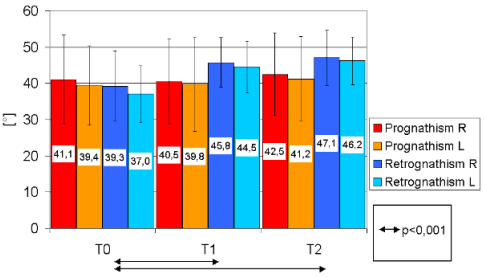

Fig. 4 Results: Condylar path angle (Protrusion)

Discussion

The present prospective study revealed no relevant post-operative differences regarding the clinical findings and the data for mouth-opening, protrusion and laterotrusion.
Axiographical analysis of the condylar path length of the protrusion showed a decrease of mobility for mandibular retrognathism at T2 of 17%. An increase of mobility at the same time for mandibular prognathism of 12% was found. The results support that the hypomobility of the condyles is a problem of the mandibular advancement which was already described by Storum and Bell, Aragon et al., and Zimmer et al. In comparison the decrease found in the present study is small but still statistically significant. Also the increase of mobility after mandibular set-back was described in the literature. The results support the hypothesis of adaptions within the supraomohyoid muscle complex after mandibular advancement described by Carlson et al. The analysis of the condylar path angle gives additional support because the significant increase of the angle after mandibular advancement can be explained by a restriction of the condylar path mainly in the horizontal plane caused by an increased tension within the supraomohyoid muscle complex.

Conclusion

Orthognatic surgery requires a typical adaption within the TMJ-function and the masticatory muscle complex function which is related to the movement of the mandible after sagittal split osteotomy. The evaluation of the adjustable bone fixation system without application of a condyle positioning deviced showed no clinical or axiographical changes which were related to the method or material. Disturbance of the TMJ-function caused by the bone fixation system were not identified.

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This poster was submitted by Dr.Dr. Sirichai Kiattavorncharoen.

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Poster Faksimile:

PROSPECTIVE EVALUATION OF AN ADJUSTABLE BONE FIXATION SYSTEM FOR THE SAGITTAL SPLIT RAMUS OSTEOTOMY

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(Director: U. Joos MD, DDS, PhD)

INTRODUCTION

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MATERIALS AND METHODS

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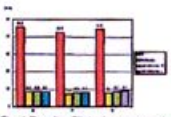

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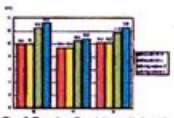

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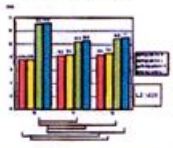

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