

Efficacy of Miniscrew-Assisted Rapid Palatal Expansion (MARPE) in late adolescents and adults with the Dutch Maxillary Expansion Device: A prospective clinical cohort study

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Background: Miniscrew-Assisted Rapid Palatal Expansion (MARPE) is a non-surgical treatment for transverse maxillary deficiency. However, there is a lack of prospective research of higher quality to substantiate its efficacy. This study aimed to provide stronger evidence on the efficacy of MARPE in late adolescents and adults by assessing the success rate, skeletal, dentoalveolar and periodontal effects and side-effects of the Dutch Maxillary Expansion Device (D-MED).

Methods: D-MED was developed as an individualized, 3D-designed and fabricated MARPE appliance supported by 4 palatal miniscrews. Patients from the age of 16 with transverse maxillary deficiency were enrolled consecutively. Pre-expansion and immediate post-expansion CBCTs and intra-oral scans were acquired. Measurements regarding the skeletal, alveolar and dental expansion and dental and periodontal side-effects, were performed by two independent observers.

Results: 34 patients were enrolled, 8 male and 26 female, mean age of 27.0 ± 9.4 years. A success rate of 94.1% was achieved (32/34 patients). The mean expansion duration was 31.7 ± 8.0 days. The mean expansion at the maxillary first molars (M1) and first premolars (P1) was 6.56 ± 1.70 mm and 4.19 ± 1.29 mm, respectively. The expansion was 57.2% skeletal (3.75 ± 1.02 mm), 10.4% alveolar (0.68 ± 1.65 mm) and 32.4% dental (2.12 ± 1.58 mm) at M1 and 92.2% skeletal (3.86 ± 0.95 mm), 0.0% alveolar (0.00 ± 1.22 mm) and 7.8% dental (0.33 ± 1.16 mm) at P1, which was both statistically ($p < 0.001$) and clinically significant. Buccal dental tipping ($3.88 \pm 3.92^\circ$ M1; $2.29 \pm 3.89^\circ$ P1), clinical crown height increase (0.12 ± 0.31 mm M1; 0.04 ± 0.22 mm P1) and buccal bone thinning (-0.31 ± 0.49 mm M1; -0.01 ± 0.45 mm P1) were observed.

Conclusions: MARPE by application of D-MED is a successful and safe non-surgical treatment for transverse maxillary deficiency in late adolescents and adults, delivering a high amount of skeletal expansion with limited side-effects.

Short CV Aldin Kapetanović

Aldin Kapetanović graduated with honour as a dentist at the Katholieke Universiteit Leuven, Belgium, in 2012. After a four year specialisation in Orthodontics at the Radboud University Nijmegen, the Netherlands, he graduated as an orthodontist in 2019.

During his specialisation, he started his doctoral research on Miniscrew-Assisted Rapid Palatal Expansion (MARPE) in collaboration with dr. Tong Xi, oral surgeon, & professor Jan Schols, orthodontist. In the course of this project, they invented the Dutch Maxillary Expansion Device and the Radboud University Medical Centre became the first European hospital to introduce MARPE as a primary treatment for transverse maxillary discrepancy in adults.

Aldin Kapetanović has several scientific publications under his name and has presented his research at various international congresses. He combines his research with work as an orthodontist in practices in the Netherlands and Belgium.