Supplementary material

Supplementary Table 1. The pre-treatment (T0) and post-treatment (T1)ab skeletal and soft tissues measurements (mean ± standard deviation).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measurement (s) | | MA group  n = 19 | | | | TB group  n = 15 | | | | Control group  n = 13 | | | |
| T0 | T1 | Difference | *p*-value | T0 | T1 | Difference | *p*-value | T0 | T1 | Difference | *p*-value |
| Skeletal | | | | | | | | | | | | | |
|  | SNA (°) | 81.06 ± 0.54 | 81.37 ± 0.52 | +0.31 | 0.3030 | 80.59 ± 1.11 | 80.37 ± 1.06 | −0.21 | 0.5380 | 79.45 ± 1.06 | 80.08 ± 0.94 | +0.63 | 0.11 |
| OLp-A (mm) | 71.38 ± 0.75 | 72.8 ± 0.74 | +1.42 | 0.0130\* | 73.45 ± 5.07 | 71.06 ± 1.23 | −2.39 | 0.1120 | 68.53 ± 1.50 | 68.49 ± 0.93 | −0.04 | 0.98 |
| SNB (°) | 75.26 ± 0.51 | 76.4 ± 0.45 | +1.14 | <0.0001\*\*\*\* | 74.74 ± 0.91 | 75.71 ± 0.87 | +0.97 | 0.0160\* | 75.88 ± 1.19 | 76.76 ± 1.14 | +0.88 | 0.03\* |
| Go-Pog (mm) | 58.54 ± 0.87 | 61.45 ± 0.80 | +2.91 | <0.0001\*\*\*\* | 58.99 ± 4.05 | 57.47 ± 1.18 | −1.51 | 0.0830 | 58.63 ± 1.21 | 59.41 ± 1.23 | +0.78 | 0.51 |
| Go-Gn (mm) | 70.62± 0.91 | 74.33± 0.86 | +3.71 | <0.0001\*\*\*\* | 73.41± 5.37 | 71.48± 1.53 | −1.93 | 0.1560 | 72.08± 1.39 | 73.05± 1.14 | +0.97 | 0.40 |
| Id-Pog-MP (°) | 78.57 ± 0.88 | 79.91 ± 0.93 | +1.34 | 0.0210\* | 78.64 ± 2.18 | 79.15 ± 1.83 | +0.51 | 0.5870 | 78.88 ± 1.89 | 77.11 ± 1.56 | −1.78 | 0.06 |
| OLp-Co (mm) | 5.10 ± 0.51 | 6.46 ± 0.52 | +1.36 | 0.0260\* | 7.71 ± 1.10 | 7.51 ± 1.09 | −0.21 | 0.8460 | 6.40 ± 0.84 | 6.92 ± 0.92 | +0.52 | 0.87 |
| Ar-Go (mm) | 39.08 ± 0.59 | 42.00 ± 0.60 | +2.92 | <0.0001\*\*\*\* | 42.54 ± 2.61 | 43.11 ± 1.27 | +0.57 | 0.0270\* | 38 ± 1.32 | 38.89 ± 1.18 | +0.89 | 0.37 |
| Y-Axis Length (mm) | 112.61 ± 1.04 | 119.35 ± 1.09 | +6.74 | <0.0001\*\*\*\* | 118.72 ± 9.83 | 116.29 ± 2.12 | −2.43 | 0.0170\* | 112.51 ± 2.08 | 113.78 ± 1.21 | +1.27 | 0.50 |
| ANB (°) | 5.80 ± 0.34 | 4.97 ± 0.37 | −0.83 | <0.0001\*\*\*\* | 5.83 ± 0.55 | 4.63 ± 0.63 | −1.20 | 0.0070\*\* | 3.6 ± 0.86 | 3.32 ± 0.83 | −0.28 | 0.57 |
| Wits Appraisal (mm) | 2.00 ± 0.47 | 0.79 ± 0.39 | −1.21 | 0.0028\* | 4.10 ± 0.72 | 1.25 ± 0.75 | −2.85 | <0.0001\*\*\*\* | 0.18 ± 0.57 | 0.69 ± 0.80 | +0.51 | 0.51 |
| A-NPog (mm) | 5.37 ± 0.40 | 4.74 ± 0.44 | −0.63 | 0.0190\* | 5.53 ± 0.70 | 4.27 ± 0.75 | −1.25 | 0.0240\* | 3.20 ± 0.90 | 2.82 ± 0.85 | −0.38 | 0.43 |
| SN-NPog (°) | 75.66 ± 0.53 | 76.78 ± 0.46 | +1.12 | <0.0001\*\*\*\* | 75.27 ± 0.90 | 76.23 ± 0.88 | +0.96 | 0.0180\* | 76.07 ± 1.18 | 77.10 ± 1.16 | +1.03 | 0.16 |
| MP-SN (°) | 37.51 ± 0.88 | 37.03 ± 0.84 | −0.48 | 0.3210 | 34.67 ± 2.00 | 35.1 ± 1.79 | +0.43 | 0.5350 | 37.05 ± 2.20 | 35.32 ± 1.90 | −1.73 | 0.01\*\* |
| N-ANS (mm) | 49.84 ± 0.57 | 51.73 ± 0.54 | +3.92 | <0.0001\*\*\*\* | 53.16 ± 4.04 | 51.29 ± 1.15 | −1.71 | 0.1050 | 48.45 ± 0.78 | 49.08 ± 0.71 | +0.52 | 0.41 |
| ANS-Me (mm) | 62.48 ± 0.77 | 66.40 ± 0.77 | +5.77 | <0.0001\*\*\*\* | 65.58 ± 6.36 | 63.87 ± 1.81 | −3.25 | 0.0500\* | 62.37 ± 1.46 | 61.85 ± 0.79 | +0.23 | 0.63 |
| ANS-Me/N-Me (%) | 56.15 ± 2.13 | 56.56 ± 1.94 | +0.41 | 0.0740 | 52.82 ± 0.62 | 53.53 ± 0.51 | +0.71 | 0.0170\* | 56.15 ± 2.45 | 55.69 ± 2.02 | −0.45 | 0.16 |
| N-Me (mm) | 108.11 ± 0.91 | 113.88 ± 0.88 | +5.77 | <0.0001\*\*\*\* | 114.82 ± 9.76 | 111.57 ± 2.43 | −3.25 | 0.0600 | 107.02 ± 1.43 | 107.24 ± 0.81 | +0.23 | 0.89 |
| S-Go (mm) | 68.88 ± 0.70 | 73.38 ± 0.86 | +4.32 | <0.0001\*\*\*\* | 75.91 ± 5.46 | 74.24 ± 1.52 | −1.67 | 0.1050 | 67.78 ± 1.85 | 69.43 ± 1.54 | +0.99 | 0.16 |
| S-Go/N-Me (%) | 63.78 ± 0.60 | 64.43 ± 0.6 | +0.65 | <0.0001\*\*\*\* | 66.82 ± 1.60 | 66.71 ± 1.27 | −0.11 | 0.8590 | 63.40 ± 1.60 | 64.75 ± 1.37 | +1.35 | 0.89 |
| Dental | | | | | | | | | | | | | |
|  | U1-A-Pog (mm) | 8.89 ± 0.32 | 7.79 ± 0.29 | −1.11 | <0.0001\*\*\*\* | 11.07 ± 1.47 | 6.98 ± 0.65 | −4.09 | <0.0001\*\*\*\* | 8.80 ± 0.85 | 9.15 ± 0.87 | +0.35 | 0.37 |
| U1-A-Pog (°) | 37.32 ± 1.18 | 32.73 ± 0.85 | −4.60 | <0.0001\*\*\*\* | 41.45 ± 2.40 | 31.28 ± 1.98 | −10.17 | <0.0001\*\*\*\* | 37.69 ± 2.58 | 38.08 ± 2.83 | +0.38 | 0.74 |
| L1-A-Pog (mm) | 2.72 ± 0.32 | 3.91 ± 0.28 | +1.19 | <0.0001\*\*\*\* | 0.79 ± 0.77 | 2.73 ± 0.49 | +1.93 | 0.0090\*\* | 3.48 ± 0.39 | 2.62 ± 0.36 | −0.86 | 0.01\*\* |
| L1 to A-Pog (°) | 24.29 ± 0.78 | 26.1 ± 0.66 | +1.81 | 0.0250\* | 18.41 ± 1.62 | 22.72 ± 1.15 | +4.31 | <0.0001\*\*\*\* | 22.63 ± 1.31 | 21.08 ± 1.44 | − 1.55 | 0.05\* |
| U1-L1 (°) | 118.4 ± 1.56 | 121.18 ± 1.18 | +2.78 | 0.0400\* | 120.15 ± 3.31 | 125.97 ± 2.26 | +5.83 | 0.0490\* | 119.66 ± 2.97 | 120.83 ± 3.27 | +1.17 | 0.45 |
| Overjet (mm) | 6.18 ± 0.21 | 3.92 ± 0.18 | −2.26 | <0.0001\*\*\*\* | 10.05 ± 1.06 | 4.28 ± 0.44 | −5.77 | <0.0001\*\*\*\* | 5.38 ± 0.69 | 6.58 ± 0.83 | +1.19 | 0.02\* |
| Overbite (mm) | 2.83 ± 0.25 | 1.64 ± 0.24 | −1.19 | <0.0001\*\*\*\* | 4.17 ± 0.43 | 2.23 ± 0.42 | −1.94 | <0.0001\*\*\*\* | 1.93 ± 0.56 | 2.74 ± 0.42 | +0.81 | 0.28 |
| ms-OLp (mm) | 50.53 ± 0.69 | 51.76 ± 0.69 | +1.22 | 0.1120 | 50.74 ± 3.85 | 50.01 ± 1.20 | −0.73 | 0.2220 | 49.43 ± 1.60 | 49.3 ± 1.24 | −0.13 | 0.91 |
| mi-OLp (mm) | 50.76 ± 0.77 | 53.16 ± 0.73 | +2.39 | 0.0120\*\* | 49.36 ± 4.01 | 50.96 ± 1.39 | +1.60 | 0.0290\* | 49.08 ± 1.55 | 48.98 ± 1.27 | −0.10 | 0.93 |
| Molar Relation (mm) | −0.23 ± 0.25 | −1.41 ± 0.22 | −1.17 | <0.0001\*\*\*\* | 1.36 ± 0.40 | −0.93 ± 0.59 | −2.29 | <0.0001\*\*\*\* | 0.37 ± 0.33 | 0.32 ± 0.31 | −0.05 | 0.88 |
| Soft tissues | | | | | | | | | | | | | |
|  | Lower Lip to E-Plane (mm) | 3.15 ± 2.52 | 2.83 ± 2.44 | −0.33 | 0.0740 | 3.46 ± 0.81 | 2.82 ± 0.69 | −0.64 | 0.2380 | 3.21 ± 2.46 | 3.40 ± 2.57 | +0.19 | 0.70 |
| Upper Lip to E-Plane (mm) | 1.85 ± 1.86 | 0.45 ± 1.63 | −1.40 | <0.0001\*\*\*\* | 3.92 ± 0.33 | 1.51 ± 0.36 | −2.41 | <0.0001\*\*\*\* | 2.11 ± 2.34 | 1.52 ± 2.50 | −0.59 | 0.10 |
| B-B’ (mm) | 12.12 ± 2.92 | 13.93 ± 2.53 | +1.81 | <0.0001\*\*\*\* | 11.74 ± 0.56 | 11.99 ± 0.73 | +0.25 | 0.1730 | 14.23 ± 3.69 | 14.44 ± 2.73 | +0.21 | 0.82 |
| Pog-Pog’ (mm) | 10.72 ± 1.81 | 11.94 ± 1.56 | +1.22 | <0.0001\*\*\*\* | 9.65 ± 0.50 | 9.86 ± 0.49 | +0.21 | 0.6840 | 10.56 ± 1.59 | 10.18 ± 2.09 | −0.38 | 0.49 |
| Gn-Gn’ (mm) | 8.96 ± 1.99 | 9.46 ± 2.21 | +0.50 | 0.0750 | 7.40 ± 0.64 | 7.08 ± 0.56 | −0.32 | 0.4740 | 8.39 ± 1.97 | 8.38 ± 2.48 | −0.01 | 0.98 |
| Me-Me’(mm) | 7.12 ± 2.35 | 7.72 ± 2.28 | +0.61 | 0.0550 | 5.82 ± 0.37 | 5.74 ± 0.40 | −0.08 | 0.8480 | 6.22 ± 2.34 | 6.57 ± 2.38 | +0.35 | 0.36 |
| Soft tissue chin (mm2) | 254.68 ± 55.28 | 300.80 ± 66.28 | +46.12 | <0.0001\*\*\*\* | 222.94 ± 10.23 | 235.51 ± 13.85 | +12.57 | 0.2180 | 245.54 ± 54.76 | 247.91 ± 67.87 | +2.37 | 0.85 |
| Nasolabial Angle (°) | 103.49 ± 8.95 | 101.05 ± 9.61 | −2.44 | 0.1430 | 105.93 ± 2.90 | 108.93 ± 2.82 | +3.00 | 0.2920 | 102.36 ± 7.89 | 102.88 ± 8.82 | +0.52 | 0.77 |
| G’-Sn-Pog’ (°) | 16.41 ± 5.60 | 15.01 ± 6.29 | −1.40 | 0.0070\*\* | 19.57 ± 1.84 | 16.65 ± 1.65 | −2.92 | 0.0080\*\* | 12.44 ± 6.34 | 13.10 ± 6.55 | +0.66 | 0.43 |
| G’-Pog’ perpendicular (mm) | −10.21 ± 7.00 | −7.74 ± 5.94 | +2.48 | <0.0001\*\*\*\* | −10.95 ± 1.62 | −9.6 ± 1.83 | +1.35 | 0.2120 | 18.98 ± 4.49 | 18.46 ± 5.08 | −0.53 | 0.38 |
| Sn-Gn’-C (°) | 108.53 ± 9.67 | 109.29 ± 9.13 | +0.76 | 0.6210 | 106.45 ± 3.02 | 98.09 ± 3.66 | −8.37 | 0.0480\* | 1.32 ± 0.20 | 1.25 ± 0.16 | −0.07 | 0.21 |
| H-Angle (°) | 20.33 ± 3.68 | 18.76 ± 3.50 | −1.56 | <0.0001\*\*\*\* | 23.50 ± 1.15 | 18.83 ± 0.99 | −4.67 | <0.0001\*\*\*\* | 1.08 ± 0.12 | 1.09 ± 0.10 | +0.02 | 0.41 |
| Z Angle (°) | 66.13 ± 5.69 | 69.59 ± 5.41 | +3.45 | <0.0001\*\*\*\* | 61.29 ± 1.83 | 67.72 ± 1.67 | +6.43 | <0.0001\*\*\*\* | 68.48 ± 7.35 | 68.81 ± 7.25 | +0.33 | 0.70 |

Abbreviations: OLp-A (mm), Occlusal Line Perpendicular to A Point; Id-Pog-MP (°), Infradentale-Pogonion-Mandibular Plane Angle; OLp-Co (mm), Occlusal Line Perpendicular to Condylion; ms-OLp (mm), Maxillary Molar Position to Occlusal Line Perpendicular; mi-OLp (mm), Mandibular Molar Position to Occlusal Line Perpendicular; Molar Relation (mm), Difference between the Mesial Contact Points of Maxillary and Mandibular First Molars to the Occlusal Line Perpendicular; Lower Lip to E-Plane (mm), Distance from Lower Lip to Esthetic Plane; Upper Lip to E-Plane (mm), Distance from Upper Lip to Esthetic Plane; B-B’ (mm), Distance between B Point and Soft Tissue B Point; Pog-Pog’ (mm), Distance between Pogonion and Soft Tissue Pogonion; Gn-Gn’ (mm), Distance between Gnathion and Soft Tissue Gnathion; Me-Me’ (mm), Distance between Menton and Soft Tissue Menton; Soft Tissue Chin (mm²), Area of Soft Tissue Chin; Nasolabial Angle (°), Angle between Columella, Subnasale, and Upper Lip; G’-Sn-Pog’ (°), Glabella-Subnasale-Soft tissue Pogonion Angle; G’-Pog’ Perpendicular (mm), Perpendicular Distance from Soft Tissue Pogonion to Vertical Line through Soft Tissue Glabella; Sn-Gn’-C (°), Subnasale- Soft tissue Gnathion -Cervical Point Angle; H-Angle (°), Angle between Soft Tissue Pogonion and lip superioris with NPog; Z Angle (°), Angle formed by the intersection of Frankfort horizontal (FH) plane and a line connecting the soft-tissue chin (Pog’) and the most protrusive lip point.

a:\**p <* 0.05; \*\**p <* 0.01; \*\*\**p <* 0.001; \*\*\*\**p <* 0.0001.

b:C, Control group; TB, Twin Block group; MA, Mandibular advancement group.