Does Arthrodesis of the First Metatarso-Phalangeal Joint Correct the Intermetatarsal M1M2 Angle? Analysis of Continuous Series of 208 Arthrodesis Plate-Osteosyntheses

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Introduction/Purpose: MTP-1 arthrodesis allows effective correction of both inter-metatarsal M1M2 and M1P1 angles. Undercorrection of wide M1M2 angle after MTP-1 arthrodesis causes persistently wide forefoot, metatarsalgia and unaesthetic gap between first and second toes. In severe deformities, Rippstein recommended supplementary first metatarsal osteotomy or cuneo-metatarsal arthrodesis.

The present study sought to investigate correction of inter-metatarsal M1M2 angle after MTP-1 arthrodesis according to aetiology and pre-operative deformity severity.

Methods: A prospective continuous series (June 2007- March 2011) included 208 patients: 48% severe hallux valgus and/or osteoarthritis, 18% hallux rigidus, 16% rheumatoid osteoarthritis, 13% revision, 5% hallux varus; mean age, 62.4±9.9 years (19-87 years). All patients were operated on by a single senior surgeon with the same technique: articular surface reaming (cup-ball), osteosynthesis with titanium anatomical plate (Fyxis-Biotech) and the same rehabilitation procedure. Pre- and post-operative hallux positions were analysed on antero-posterior and lateral weightbearing views. M1M2 and M1P1 were measured according to American Orthopaedic Foot and Ankle Society guidelines.

Results: Mean follow-up was 18.6±12.4 months; fusion rate, 97%; 5% plate removal. Mean M1P1 angle was 33.8±19.7° (-45° to 67°) preoperatively, and 13.4±5.3° (0-32°) at follow-up; M1M2, 14.2±5.4° (0° to 26°) and 6.5±2.3° (0-12°) respectively. M1M2 angle was < 15° in 97 patients, 15-19° in 78 and ≥20° in 33 preoperatively, and respectively 5.8±2.1° (0-10°), 6.7±2.2° (0-10°) and 8.1±2.4° (3-12°) at follow-up. No significant differences were observed according to aetiology. M1M2 angle was >10° in only 2 patients (0.9%) associated with cuneometatarsal osteoarthritis. Improvement increased with severity of preoperative M1M2 angle (p < 0.05). However, mean postoperative M1M2 angle in the severe group was nevertheless wider than in the moderate group.
Conclusion: MTP1-arthrodesis corrected M1M2 angle even in severe deformity, of whatever aetiology, in agreement with the literature, whereas Rippstein recently recommended supplementary M1 osteotomy or C1M1 arthrodesis for preoperative M1M2 angle >10°. Pydah correlated preoperative and postoperative intermetatarsal angle with a regression line, without recommending any secondary procedure to improve M1M2 angle.

In severe increased preoperative M1M2 angle, we do not recommend associating systematic C1M1 arthrodesis or basal metatarsal osteotomy to MTP-1 arthrodesis, but suggest that additional basal metatarsal osteotomy or C1M1 fusion might be required only in exceptional associated degenerative C1M1 joint.

<table>
<thead>
<tr>
<th>Population</th>
<th>M1M2 &lt;15°</th>
<th>15° ≤ M1M2 &lt;20°</th>
<th>M1M2 ≥20°</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>97</td>
<td>78</td>
<td>33</td>
</tr>
<tr>
<td>Pre-operative</td>
<td>9.5° ±3.5 (0-14)</td>
<td>16.8° ±1.4 (15-19)</td>
<td>22.0° ±2.1 (20°-26°)</td>
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<tr>
<td>At FU</td>
<td>5.8° ±2.1 (0°-10°)</td>
<td>6.7° ±2.3 (0°-12°)</td>
<td>8.0° ±2.3 (3°-12°)</td>
</tr>
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