Relevance to Musculoskeletal Conditions. Silicone arthroplasty is used to treat metacarpophalangeal pain and deformity in patients with rheumatoid arthritis. This study was performed to evaluate metacarpophalangeal mechanics after joint replacement.

INTRODUCTION. Since the introduction of silicone finger joint replacements in the early 1960’s, resorption arthroplasty has become the most common treatment for metacarpophalangeal (MCP) joint pain and deformity in the rheumatoid hand. MCP joint replacement reduces pain and ulnar drift, increases range of motion, and improves cosmesis (4).

Ideally, MCP replacements should restore normal finger joint mechanics. Implant center of rotation (ICR) should approximate the ICR of the intact joint to functionally balance the flexor and extensor tendon forces (2). In addition, implant pistoning should be minimized to reduce the risk of bone erosion and the release of particulate wear debris that can lead to silicone synovitis (2).

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Implant pistoning was most pronounced with the Swanson implant, which moved 2.40 ± 0.97 mm over the full range of motion. The Avanta and DePuy implants piston significantly less than the Swanson implant (1.05 ± 0.45 mm and 0.69 ± 0.31 mm, respectively). Total excursion of the flexor tendons for the intact MCPs (from 15 extension to 85 flexion) was significantly greater than that for the three implants (Table 1). Extensor tendon excursion was also greater before implantation, though the differences were not significant. Correspondingly, the tendon moment arms were reduced slightly with joint replacement.

Table 1. Total tendon excursions and average moment arm lengths for full range of motion (15 Extension to 85 Flexion)

<table>
<thead>
<tr>
<th>MCP Joint</th>
<th>Flexor Tendon Moment Arm (mm)</th>
<th>Extensor Tendon Moment Arm (mm)</th>
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</thead>
<tbody>
<tr>
<td>Swanson (n=10)</td>
<td>19.4 ± 1.1</td>
<td>11.3 ± 0.9</td>
</tr>
<tr>
<td>Avanta (n=10)</td>
<td>17.6 ± 2.3</td>
<td>9.8 ± 1.8</td>
</tr>
<tr>
<td>Neuflex (n=10)</td>
<td>17.6 ± 2.1</td>
<td>10.6 ± 1.8</td>
</tr>
</tbody>
</table>

Note: (µ ± σ); Different from Intact at p < 0.05

DISCUSSION. Silicone arthroplasty altered MCP joint mechanics in a controlled laboratory setting using anatomic specimens free of articular pathology. The ICRs of the MCP joint replacements we tested were shifted dorsally or proximally relative to the ICR of the intact MCP joint.

Because there was some similarity in the ICR shifts for all implants, we hypothesized that the ICR shifts were similar for all implants.

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