Clinical implications of radiological findings associated with Radial Head Replacement. A long-term follow up study

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ABSTRACT

Background: Radial head replacement (RHR) is indicated in comminuted fractures, specially those associated with elbow or forearm instability. Despite satisfactory long-term clinical outcomes, some patients present with concerning radiographic findings. The aim of this study was to compare the long-term radiological results of two RHR designs and to correlate them to clinical findings.

Methods: One hundred thirty-four patients (54 men and 80 women, mean age of 54 ± 17 years) who received a RHR (84 spacer design, 50 anatomic model) in the context of acute elbow instability were prospectively followed for a mean of 88 months. Radiological analysis included detection of technical implantation errors (poor position and inappropriate choice of implant size), lucent lines, stress shielding, heterotopic ossifications and degenerative changes using simple X-ray. These finding were correlated to clinical outcomes according to the MEPS, Oxford, and DASH scores.

Results: Radiographically, technical errors, including overstuffing, malrotation and inadequate cortical contact, were more prevalent in patients with an anatomic RHR (17 vs 7, $p<0.001$). These findings were related to greater pain ($p=0.04$) and worse DASH scores ($p=0.03$). Radiolucent lines were present in 58 spacer RHR (69%), being complete in 31 patients, with only half of them being progressive. Twelve anatomic RHR (24%) showed radiolucencies, being complete and progressive in all of them. Complete lucent lines were not always associated with worse clinical outcomes. Stress-shielding was found in 22 anatomic RHR (44%), with no relation to clinical outcomes. Twelve patients with a spacer and 5 with an anatomic implant showed heterotopic bone around the radial neck that was significantly associated to greater rotational stiffness ($p<0.001$). Implant oversizing and loosening were the most common causes leading to implant removal of the anatomic design, with significant differences with respect to the spacer (8 vs 4, $p=0.02$).

Conclusion: Anatomic RHR has a high risk of radiographic technical mistakes that correlate to poorer clinical outcomes. Compared to the spacer RHR, they have also a higher rate of radiographic changes leading to revision surgery, mainly due to overstuffing and loosening.

Keywords: Radial head replacement; lucent lines; overstuffing; radial head fracture; heterotopic ossification.