RADIO-ULNAR INCONGRUENCE IN DOGS WITH ELBOW DYSPLASIA
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Key Points

3D-renderings of the radio-ulnar joint surface allow accurate diagnosis of radio-ulnar incongruence (RUI).\(^1\) Using this technique in 63 elbows with arthroscopically confirmed fragmented medial coronoid process (FCP) and no other obvious cartilage pathologies, positive RUI was documented at time of FPC diagnosis in 62% and negative RUI in 3%. Evaluating elbows for RUI in addition to arthroscopic treatment of FPC, may allow for better patient selection. In young dogs with RUI, re-establishing joint congruence may prevent accelerated cartilage wear and development of medial compartment syndrome.

Detection of RUI is problematic as plain radiography is not precise enough. Arthroscopy on the other hand is invasive and operator dependent, but arthroscopic detection of RUI has been shown to be highly accurate, at least in vitro.\(^2\)^\(^3\) 3D-renderings of the radio-ulnar joint surface allow for unobstructed inspection of the radio-ulnar transition.\(^1\) However, with a sensitivity of 0.86 and a specificity of 0.77, clinical application of this technique would still result in a significant number of false positive and false negative diagnoses. By fitting a sphere to the trochlea notch, negative (Fig. 1) as well as positive (Fig. 2) RUI become more easily distinguishable from a congruent joint (Fig. 3). When evaluated using an in vitro model of RUI, this improved technique reaches values of sensitivity and specificity of 0.92 and 0.94, with an inter observer reliability of $R^2 = 0.88$.

Evaluating RUI using the described sphere fitting technique in 63 consecutive elbows with arthroscopically confirmed FCP and no other visible cartilage lesions revealed joint congruence in only 35%. The majority of the joints showed positive RUI (41% +1mm, 17% +2mm, 3% +3mm). Only two joints (3%) were diagnosed having negative RUI (-1 mm). Most frequent breeds were Labrador Retriever, Golden Retriever, Rottweiler and Bernese Mountain Dog. Median age the day of diagnosis was 2 years (0.5 to 11.6 years). Amount of positive RUI was negatively correlated with age ($r = -0.42$; 95% CI: -0.60 to -0.19, $P = 0.0006$), meaning that older dogs tent to have congruent joints (Fig. 4).

The documentation of RUI in young dogs and a higher frequency of congruent joints in older dogs with FCP may lead to the preliminary hypothesis, that RUI is a risk factor for accelerated degeneration of the medial compartment. It seems to be unlikely that once a RUI is present only fragmentation of the medical coronoid process occurs without ongoing cartilage wear at the medial compartment. Being focused on both positive and negative RUI, as proposed by the “angular vector model”,\(^4\) the number of joints having negative RUI is surprisingly low. Therefore, when attempting to correct RUI in dysplastic elbows, negative RUI might be neglected. However, positive RUI has to be accepted in almost two out of three elbows with FCP alone.
Figure 1: Negative RUI (left elbow, medial view) documented by 3D image rendering of the radio-ulnar joint surface and a sphere fitted to the ulnar notch. When compared to a congruent joint (Fig. 3), negative RUI is characterized by overlapping of the sphere and the radial head.

Figure 2: Positive RUI (left elbow, medial view) documented by 3D image rendering of the radio-ulnar joint surface and a sphere fitted to the ulnar notch. When compared to a congruent joint (Fig. 3), positive RUI is characterized by a clear space between the sphere and the radial head.

Figure 3: Congruent joint (left elbow, cranio-medial view) documented by 3D image rendering of the radio-ulnar joint surface and a sphere fitted to the ulnar notch. When compared to incongruent joints (Fig. 1&2), absent RUI is characterized by a continuous contact between the sphere and the anconeal process, the distal edge of the trochlea notch and the caudal radial head.
Figure 4: Correlation of age and RUI. Amount of positive RUI was negatively correlated with age ($r = -0.42$; 95% CI: -0.60 to -0.19, $P = 0.0006$), meaning that older dogs tend to have congruent joints.