

Since the detection of elbow incongruity in the mid 1980's, the condition has been related to the possible etiopathogenesis of elbow dysplasia and the prognosis after treatment of elbow dysplasia. The exact impact of elbow incongruity on the development of elbow dysplasia remains currently unknown, but it is supposed by most authors to be a major causing factor. On the other hand, the presence of elbow incongruity at the time of treatment of elbow dysplasia is believed to aggravate the clinical outcome. Accurate detection and recognition of elbow incongruity is thus important for future treatment and prognosis.

Elbow incongruity is the term to describe a bad alignment of the joint surfaces of the elbow. Two features define incongruity of the elbow: an abnormal shape of the ulnar trochlear notch and a step between the radius and ulna, caused by either a short radius or a short ulna. It has been suggested that both an elliptical trochlear notch and a step can cause increased local pressure within the joint, resulting in loose fragments at different locations: ununited anconeal process (UAP), fragmented medial coronoid process (FCP) or osteochondritis dissecans of the humeral condyle (OCD). These lesions are classified under the term 'elbow dysplasia' and are the most frequent causes of front leg lameness in fast growing dogs of middle to large breeds. Although several radiographic features are described to diagnose incongruity, the scoring of incongruity is believed to be biased as there is currently no objective method to measure the degree of incongruity. Because superposition is avoided, CT is suggested as a standard technique to measure incongruity. Arthroscopy on the other hand, allows the direct visualisation of the intra-articular structures and their abnormalities. Information on both techniques was published only recently. Several surgical techniques have been proposed to restore joint congruity. The most frequently applied technique is an ulnar osteotomy, but because of possible complications, other techniques are being developed. Reports evaluating the long term results of the different somewhat invasive techniques are not yet available.

The value of radiography to detect elbow incongruity in clinical cases is discussed. Recent literature based on experimentally created radio-ulnar step in cadavers states that radiography is not sensitive enough to diagnose elbow incongruity. In these studies, a minimal step of 2mm is needed to come to a definitive conclusion. The limitation of these studies is that only the radio-ulnar step is assessed without taking in account the other signs

of elbow incongruity described by Wind. Our study was based on clinical cases with different degrees of incongruity based on CT. Four readers scored 38 elbows varying from normal to severely incongruent. They were asked to assess not only the radio-ulnar step, but also the width and shape of the humero-ulnar and humero-radial joint space on different projections. Based on those findings, the joints were classified as congruent or incongruent. As a result, a mean sensitivity of 88.79% and a mean specificity of 94.44% for incongruity detection were found, indicating that radiography is more sensitive to diagnose elbow incongruity than is currently believed. When a joint was considered incongruent, the readers were asked to grade the incongruity. Correct radiographic grading of the incongruity is difficult due to superimposition and positioning variation. In conclusion, radiography can be used to differentiate between congruent and incongruent joints, but is insufficient to correctly grade elbow incongruity.

To identify lesions that can help in the diagnosis of severe elbow incongruity, both a CT and arthroscopy study were performed. First the CT findings typically seen in severe elbow incongruity were described. This clinical study used client owned dogs with elbow lameness and purpose bred dogs as a control group. The CT features of 32 severely incongruent joints with concomitant FCP were compared with those of 32 congruent elbow joints affected with FCP and 10 normal joints. Several features and measurements were recorded on transverse slices and sagittal and dorsal reconstructions. In the severely incongruent elbow joints, a radio-ulnar step and locally enlarged joint spaces were visible on each CT plane. Additional features mostly seen in severely incongruent elbows were a pseudocystic lesion at the radio-ulnar transition and fragmentation of the axial border of the medial coronoid incisure, although a limited number of congruent FCP joints also showed these features. This might be explained by the presence of chronic inflammation due to degenerative joint disease.

The arthroscopic features of 32 severely incongruent joints with concomitant FCP were compared with those of 32 congruent elbow joints affected with FCP and 10 normal joints. A radio-ulnar step of 3 mm or more on radiographs and computer tomography (CT) was the selection criterion for a severely incongruent joint. The intra-articular structures were visually assessed at various sites within the joint. The regions of interest were: the radio-ulnar transition, the humero-radial and humero-ulnar joint space, the trochlear notch, primary and secondary lesions of the medial coronoid process and the radial head.

Incongruent joints showed a radio-ulnar step, cartilage changes in the centre of the trochlear notch, an irregular radio-ulnar transition, and an abnormal surface of the radial head. A fragmented medial coronoid process was present in every pathologic joint. Arthroscopy allowed the detection of several features that were signs or consequences of severe elbow incongruity or the accompanying inflammation.

Finally, the long term results of the arthroscopic treatment of fragmented medial coronoid process in severely incongruent were investigated. In literature, many techniques were described to resolve radio-ulnar incongruity. Most of those techniques imply an osteotomy of either the radius or the ulna to reduce the radio-ulnar step inside the joint. The owners of 18 dogs (32 joints) were contacted for a telephone questionnaire and invited to present their dog at the university hospital for a clinical and radiographic follow up. The telephone questionnaire revealed that all dogs but one showed either no lameness or only lameness after heavy exercise. Of the 8 dogs that returned to the hospital, all had an increase in osteoarthritis. Clinical results were similar to previous reports on osteotomy techniques. Although this study is based on a fairly small group of dogs and results should be interpreted with caution, it can be concluded that arthroscopic treatment of the fragmented medial coronoid process without correction of the incongruity is a valuable alternative for more invasive corrective osteotomies for treatment of elbows suffering from severe elbow incongruity.

In conclusion, radiographic diagnosis of elbow incongruity has proven to be better feasible than what would have been expected, based on in vitro studies. Correct grading of elbow incongruity remains difficult on radiography. Severe cases of elbow incongruity showed some typical bone and cartilage abnormalities on CT and on arthroscopy that might help in the diagnosis. Further research is needed to determine whether these changes also occur in milder forms of incongruity. Long term follow up demonstrated that arthroscopic removal of fragmented part of the medial coronoid process in severely incongruent joints results in an acceptable clinical outcome. A future comparative study with corrective osteotomies may lead to the optimal treatment plan in case of elbow incongruity.