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Non-traumatic primary and secondary osteoarthritis of the distal radioulnar joint

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Abstract

A retrospective radiographic study was conducted to determine the prevalence and severity of non-traumatic primary and secondary osteoarthritis of the distal radioulnar joint in a group of 718 patients. Non-traumatic primary and secondary osteoarthritis was found in 77 patients (11%) with a mean age of 63 years. In 34 cases it was bilateral. Mild signs of osteoarthritis were present in 53, moderate in 17 and severe in seven patients. The prevalence of primary osteoarthritis was 8.2% and 2.5% had secondary non-traumatic osteoarthritis. The prevalence and severity of the osteoarthritis were similar in women and men. Ulnar wrist pain was associated with osteoarthritis of the distal radioulnar joint in 13% of patients with mild, 35% with moderate and 43% with severe radiological degeneration.

Level of evidence: IV

Keywords

Osteoarthritis, distal radioulnar joint, prevalence, staging

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Introduction

Arthritis of the distal radioulnar joint can be primary or secondary to inflammatory, congenital or post-traumatic conditions. Not much information is available about the prevalence of non-traumatic degenerative changes of the distal radioulnar joint. In a cross-sectional study from Japan (Katayama et al., 2013), 12% of patients had primary osteoarthritis and the prevalence was 13% in a European study with patients over 50 years old (Hollevoet et al., 2006). Radiographic abnormalities in the distal radioulnar joint developed in 78% of patients with rheumatoid arthritis (Leak et al., 2003).

An important complication of osteoarthritis of the distal radioulnar joint is extensor tendon rupture (Yamazaki et al., 2008). Patients may also complain of ulnar wrist pain, loss of grip strength and stiffness. Symptoms may be worse when there is instability of the distal ulna or other conditions that can cause ulnar wrist pain, such as ulnocarpal impaction, tendonitis and lesions of the triangular fibrocartilaginous complex or lunotriquetral ligament (Sachar, 2012). Arthritis of the distal radioulnar joint could also be a radiological finding without much clinical importance and the majority of patients may be asymptomatic.

The aim of the present study was to find out how many patients who visited our hospital had radiological signs of non-traumatic primary or secondary osteoarthritis of the distal radioulnar joint and at what stage. Whether it was present in one or in both wrists and more frequent in women was also investigated. It was noted how many patients with osteoarthritis of the distal radioulnar joint complained of ulnar wrist pain.

Methods

A retrospective radiographic study to determine the prevalence of osteoarthritis of the distal radioulnar joint was conducted on bilateral wrist radiographs of

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1013 skeletally mature patients who visited the orthopaedic department between 2013 and 2017. Patients seen by the senior author (N.H.) routinely have radiographs of both sides if they need a radiograph of one wrist for any reason. Information about age, gender, trauma, disease and surgical treatment was retrieved from the electronic patient files. Two hundred and ninety-five patients who had radiographs for a recent or acute fracture of the distal radius and/or ulna were excluded and the prevalence of osteoarthritis of the distal radioulnar joint was determined in 718 patients. Six hundred and ninety-four of the included patients had conditions such as tendinopathy, ganglions or other tumours, contusion, arthritis of the wrist or trapeziometacarpal joint, avascular necrosis of a carpal bone, ligament injury, ulnocarpal impingement or wrist pain with unknown aetiology. Twenty-four patients had fractures of the hand or carpus. Patients with osteoarthritis of the distal radioulnar joint associated with a previous fracture or dislocation of the radius or ulna were considered to have post-traumatic arthritis.

The presence of osteoarthritis was determined on posteroanterior and occasionally on lateral radiographs of both wrists if the ulnar head was not totally obscured by the radius. Radiographs were available in the electronic patient files with the Picture Archiving Communication System (PACS). It was determined whether it was in one or in both wrists.

We used the following radiological features to consider evidence of osteoarthritis according to Kellgren and Lawrence (1957): osteophytes; periarticular ossicles; narrowing of joint cartilage with sclerosis; pseudocystic areas; or altered shape of the bone ends. However, the different stages of osteoarthritis of the distal radioulnar joint were not described in the article by Kellgren and Lawrence (1957) and therefore we used our own classification system. The condition of the distal radioulnar joint was classified into four grades: Grade 0, no osteoarthritis; Grade 1, mild osteoarthritis with one or several small osteophytes with a size ranging between 1 and 2 mm (situated proximally or distally on the ulnar head, or on the edges of the sigmoid notch) and/or focal joint space narrowing, usually in the proximal part of the distal radioulnar joint (Figure 1); Grade 2, moderate osteoarthritis with osteophytes >2 mm and/or joint space narrowing in more than one-third of the length of the sigmoid notch, possibly with subchondral sclerosis and loose bodies (periarticular ossicles) (Figure 2); Grade 3, severe osteoarthritis with osteophytes >2 mm and complete joint space narrowing between the ulnar head and sigmoid notch, subchondral sclerosis and possibly loose bodies or subchondral cysts (Figure 3). The size of the osteophytes was measured in millimetres with the distance measuring tool in the PACS.

Figure 1. Wrists with Grade 1 osteoarthritis of the distal radioulnar joint.

Figure 2. Wrists with Grade 2 osteoarthritis of the distal radioulnar joint.

Figure 3. Wrists with Grade 3 osteoarthritis of the distal radioulnar joint.

The interrater reliability of the grading system for osteoarthritis classification was calculated with the intraclass correlation coefficient (ICC) between four raters on 20 posteroanterior radiographs of the wrist. The intrarater reliability was also calculated with the ICC by the same four raters who classified the same radiographs in a different order after an interval of 1 week.

Two authors (S.B. and N.H.) looked for the presence of osteoarthritis of the distal radioulnar joint and classified the severity. In case of doubt or difference, an agreement was made about the grade of

osteoarthritis. If patients had osteoarthritis with a different grade in both wrists, they were classified according to the wrist with the higher grade.

It was noted whether patients with non-traumatic osteoarthritis of the distal radioulnar joint had rheumatoid arthritis or other systemic arthritic conditions or a history of septic arthritis. It was also recorded whether calcium pyrophosphate dihydrate crystals deposits were visible on the posteroanterior wrist radiographs between the distal ulna and carpus.

Whether there was a difference between men and women in prevalence, mean age and severity of osteoarthritis was also studied. It was noted whether it was recorded in the medical files that patients complained of ulnar wrist pain at the time radiographs were taken and if this was influenced by the severity of the osteoarthritis.

This study was approved by the ethical committee of our hospital.

Statistical methods

The difference in mean age between women and men with non-traumatic osteoarthritis of the distal radioulnar joint was analysed with the Mann–Witney *U*-test. The chi-squared test was used to investigate the difference in severity of osteoarthritis between women and men and to find out whether ulnar wrist pain was influenced by the grade of osteoarthritis.

Results

The final number of patients included in the study was 718. The mean and median ages were both 45 years (range15–88). Sixty per cent were female. Radiological signs of osteoarthritis in the distal radioulnar joint were present in one or both wrists in 88 patients. Eleven of these patients had post-traumatic osteoarthritis and were excluded from the final total. Four patients with bilateral osteoarthritis had a history of a unilateral trauma of the radius or ulna, only the uninjured wrists were included in the study.

In total, 77 (11%) of the 718 patients had non-traumatic arthritis of the distal radioulnar joint in at least one wrist and were included in the analysis. The mean and median age was 63 years (range 25–86). Unilateral osteoarthritis affected 19 right and 24 left wrists; in 34 patients it was bilateral. Table 1 shows in how many patients and wrists osteoarthritis of Grade 1, 2 and 3 was found. Patients with bilateral osteoarthritis did not always have the same stage in both wrists and the distribution is presented in Table 2. In 15 patients chondrocalcinosis was present in the area of the triangular fibrocartilaginous complex. Of those, one had rheumatoid arthritis and another haemochromatosis. The prevalence of primary osteoarthritis was 8.2% and of secondary non-traumatic osteoarthritis 2.5%.

Forty-one of the 77 patients were male. The mean ages of men with osteoarthritis was 61 and of women

Table 2. Distribution of the severity of osteoarthritis in the distal radioulnar joint in patients with bilateral involvement.

	Number of patients
Grade 1 in both wrists	19
Grade 2 in both wrists	1
Grade 3 in both wrists	1
Grade 1 in one and Grade 2 in the other wrist	9
Grade 1 in one and Grade 3 in the other wrist	1
Grade 2 in one and Grade 3 in the other wrist	3
Total	34

Table 1. Number of patients with primary and secondary non-traumatic osteoarthritis of the distal radioulnar joint and the number of wrists with the different grades of osteoarthritis or excluded from the study.

	Number of patients (number of wrists)	Number of wrists according to the grade of osteoarthritis
Primary osteoarthritis	59 (85)	Grade 0, 30; Grade 1, 66; Grade 2, 16; Grade 3, 3; excluded, 3
Osteoarthritis with chondrocalcinosis and no other condition	13 (19)	Grade 0, 7; Grade 1, 14; Grade 2, 2; Grade 3, 3
Rheumatoid arthritis	2 (2)	Grade 0, 1; Grade 1, 1; Grade 2, 1; excluded, 1
Haemochromatosis	1 (1)	Grade 0 and 3
Haemochromatosis + gout	1 (2)	Grade 2 and 3
Gout	1 (2)	Grade 1 and 2
Total	77 (111)	

65 years. The difference was not significant ($p = 0.34$). The number of women and men with the grades of osteoarthritis is shown in Table 3. Men had more Grade 2 and 3 wrists than women, but the difference was not significant ($p = 0.24$).

In the medical files of the 77 patients it was reported that 16 had ulnar wrist pain at the time radiographs were taken. There were no patients with bilateral ulnar wrist pain and no cases with extensor tendon ruptures. Ulnar wrist pain was more frequently associated with osteoarthritis of Grades 2 and 3 than with Grade 1 (Table 3). The difference was significant ($p = 0.047$).

The ICC for interrater agreement was 0.91. The ICC for intrarater reliability was 0.91 for the first, 0.84 for the second, 0.91 for the third and 0.86 for the fourth rater. ICC values below 0.2 represent poor agreement, between 0.2 and 0.39 fair, between 0.4 and 0.59 moderate, between 0.60 and 0.79 good and over 0.8 strong agreement.

Discussion

In the present study the prevalence of primary osteoarthritis was 8.2% and 11% if patients with secondary non-traumatic arthritis were also included. This is less than reported by Katayama et al. (2013) who found the prevalence of primary osteoarthritis to be 12% in a cross-sectional study with 1128 individuals. Thirteen per cent of patients more than 50 years old had osteoarthritis in a radiographic study with 248 patients who had a distal radius fracture in the contralateral wrist (Hollevoet et al., 2006) and 20% in a cadaver study with 30 elderly persons with a mean age of 77 years (range 58–94) (Fortems et al., 1994). The highest prevalence of radiographic abnormalities, 78%, was found in a study of patients with rheumatoid arthritis (Leak et al., 2003). In that study, radioulnar joint changes were classified into: mild, erosions with slight joint space narrowing; moderate, marked erosions with flattening and narrowing of the joint space; and severe, loss of joint space, marked deformity and scalloping. Of the 96 patients with rheumatoid arthritis, late radiographic involvement of the distal radioulnar joint was present in 75. In 24 patients lesions were graded as mild, in 16 moderate and in 35 severe. The severity of osteoarthritis was not determined in the studies of Katayama et al. (2013), Fortems et al. (1994) and Hollevoet et al. (2006).

Table 3. Number of patients with mild, moderate and severe osteoarthritis of the distal radioulnar joint, male/female ratio and number of patients with ulnar wrist pain.

	Number of patients (number of wrists)	M/F ratio	Ulnar wrist pain *n* (%)
Grade 1 (mild)	53 (82)	25/28	7 (13)
Grade 2 (moderate)	17 (21)	12/5	6 (35)
Grade 3 (severe)	7 (8)	4/3	3 (43)
Total	77 (111)		

In the present study, calcium pyrophosphate dehydrate crystal deposits were seen on radiographs in 20% of patients with osteoarthritis of the distal radioulnar joint. In a previous study, the prevalence of osteoarthritis of the distal radioulnar joint was not significantly higher in 152 wrists with calcium pyrophosphate dehydrate crystal deposition compared with an age- and gender-matched group of 156 patients without calcium crystals (Donich et al., 2000). In the group with crystals, eight patients (5%) had osteoarthritis and there were four (2.5%) in the control group. In nine out of 11 patients with non-traumatic osteoarthritis of the distal radioulnar joint who underwent surgery, calcium pyrophosphate dehydrate crystal deposits were found in the synovial tissue during histopathological examination (Couturier and Alnot, 2002).

The aetiopathogenesis of osteoarthritis of the trapeziometacarpal and distal radioulnar joints may be different. Sodha et al. (2005) noted that osteoarthritis of the trapeziometacarpal joint was more common in women than in men and the joints of women were more seriously affected. In the present series, osteoarthritis of the distal radioulnar joint with complete joint destruction was uncommon and men tended to have more advanced osteoarthritis than women.

Eighty-seven per cent of patients with Grade 1 osteoarthritis, 65% with Grade 2 and 57% with Grade 3 were asymptomatic. The exact percentage of patients with ulnar wrist pain caused by osteoarthritis of the distal radioulnar joint could not be determined in this study. Ulnar wrist pain is complex and may be caused by several disorders. The number of patients with symptomatic osteoarthritis of the distal radioulnar joint is probably very low, especially with Grade 1 osteoarthritis.

The study has several limitations. It is not certain that all information retrospectively retrieved from the medical files was correct about the medical history, associated systemic joint diseases, trauma and symptoms. The severity of joint space narrowing or cartilage loss may be much better assessed by computed tomography or magnetic resonance imaging, but a large series of patients with bilateral scans is difficult to obtain. Development of osteoarthritis of the distal radioulnar joint may be influenced by instability of the distal ulna and this was not

addressed in the present study. The presence of calcium pyrophosphate dehydrate crystal deposits was only determined on radiographs and may be higher if a histopathological examination was done. It was also not investigated whether one type of ulnar variance (e.g. positive, neutral or negative) was more frequently present in wrists with radiological signs of osteoarthritis of the distal radioulnar joint. In a previous study, osteoarthritis of the distal radioulnar joint was not more frequent in wrists with a positive ulnar variance (Hollevoet et al., 2006). In the study of Katayama et al. (2013), osteoarthritis was more frequent in patients with an ulna-plus, but the influence of a positive ulnar variance was determined not only on osteoarthritis of the distal radioulnar joint, but also on osteoarthritis of the ulnocarpal joint. The present study did not investigate whether the orientation of the sigmoid notch played a role. Previously it has been found that a proximally orientated sigmoid notch may be more frequently associated with degenerative signs in the distal radioulnar joint (Hollevoet et al., 2006).

The clinical relevance of this study is that primary osteoarthritis of the distal radioulnar joint has a prevalence around 8%. In about half of the cases it is present in both wrists. It tends to affect men more frequently than women and it is associated with ulnar wrist pain in about half of the cases with advanced osteoarthritis.

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