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Prevalence of radiographic hip osteoarthritis and its association with hip pain in Japanese men and women: the ROAD study

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SUMMARY

Objective: Although hip osteoarthritis (OA) is a major cause of hip pain and disability in elderly people, few epidemiologic studies have been performed. We investigated the prevalence of radiographic hip OA and its association with hip pain in Japanese men and women using a large-scale population of a nationwide cohort study, Research on Osteoarthritis/osteoporosis Against Disability (ROAD).
Methods: From the baseline survey of the ROAD study, 2975 participants (1043 men and 1932 women), aged 23–94 years (mean 70.2 years), living in urban, mountainous, and coastal communities were analyzed. The radiographic severity at both hips was determined by the Kellgren/Lawrence (K/L) grading system. Radiographic hip OA was defined as K/L $\geq$ 2, and severe radiographic hip OA as K/L $\geq$ 3.
Results: The crude prevalence of radiographic hip OA was 18.2% and 14.3% in men and women, respectively, that of severe radiographic hip OA was 1.34% and 2.54%, and that of symptomatic K/L $\geq$ 2 OA was 0.29% and 0.99%, respectively. The crude prevalence of hip OA, including severe OA, was not age-dependent in men or women. Male sex was a risk factor for radiographic hip OA, whereas female sex was a risk factor for severe radiographic hip OA and hip pain. Compared with K/L = 0/1, hip pain was significantly associated with K/L $\geq$ 3, but not with K/L = 2.
Conclusion: The present cross-sectional study revealed the prevalence of radiographic hip OA and severe hip OA in Japanese men and women. Hip pain was strongly associated with K/L $\geq$ 3.

Introduction

Hip osteoarthritis (OA) is a major public health issue causing chronic disability of elderly people in most developed countries[1,2]. Despite the urgent need for strategies to prevent and treat this condition, epidemiologic data on hip OA are sparse. The reported prevalence of radiographic hip OA differs considerably among previous population-based epidemiologic studies[1,3–8]. This may be due to limitations in sample size or variability in age, ethnicity, and radiologic acquisition. In particular, previous studies suggested that the prevalence of OA at other sites, such as the knee, differed among races. In addition, anthropometric measurements and environmental situations vary substantially in different countries. Thus findings in Caucasians cannot be applied to different ethnic groups. In Japan, our previous study in 1998 was the only population-based study to examine the prevalence of hip OA. With the aging population, there have been dramatic changes in number of elderly people; this aging may have affected the prevalence of hip OA. To the best of our knowledge, no population-based cohort studies for hip OA have been performed in Japan since our previous study.

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Hip pain is the principal clinical symptom of hip OA[9], but the reported prevalence of hip pain and symptomatic hip OA also differs among previous population-based epidemiologic studies[1,5–8]. In addition the impact of hip OA on pain remains controversial.

With the goal of establishing epidemiologic indices to evaluate clinical evidence for the development of disease-modifying treatment, we set up a large-scale nationwide cohort study for bone and joint disease called ROAD (Research on Osteoarthritis/osteoporosis Against Disability) in 2005. We have to date created a baseline database with detailed clinical and genetic information on three population-based cohorts in urban, mountainous, and coastal communities of Japan.

The objective of this study was to examine the prevalence of radiographic hip OA as well as hip pain and symptomatic hip OA by gender and age strata in Japanese men and women in a large-scale, population-based cohort from the ROAD study. We also examined the association of the severity of hip OA with the presence of hip pain.

Subjects and methods

The ROAD study is a nationwide prospective study of bone and joint diseases (with osteoarthritis and osteoporosis as the representative bone and joint diseases) constituting population-based cohorts established in several communities in Japan. As a detailed profile of the ROAD study has already been described elsewhere[10–12], a brief summary is provided here. From 2005 to 2007, we created a baseline database that included clinical and genetic information for 3040 inhabitants (1061 men, 1979 women) in the age range of 23–95 years (mean 70.6 years), recruited from listings of resident registrations in three communities: an urban region in Itabashi, Tokyo, with a population of 529,400/32 km^2 with 0.1, 25, and 75% of jobs in the primary industry (agriculture, forestry, fishing, and mining), the secondary industry (manufacturing and construction), and the tertiary industry (service industry), respectively, and residents ≥65 years constituted 19.1% of the population; a mountainous region in Hidakagawa, Wakayama, with a population of 11,300/330 km^2 with 29, 24, and 47% of jobs in the three industries above, and 30.5% were ≥65 years; and a coastal region in Taiji, Wakayama, with a population of 3500/6 km^2 with 13, 18, and 69% of jobs in the three industries, and those ≥65 years accounted for 34.9% of the total. Participants in the urban region were recruited from a cohort study[13] in which the participants were randomly drawn from the Itabashi-ward residents register database, and the response rate in the age groups of ≥60 years was 75.6%. Participants in the mountainous and coastal regions were recruited from listings of resident registration and the response rates in the age group of ≥40 years were 57.3% and 33.1%, respectively. However, those inhabitants aged <60 years in the urban region and <40 years in the mountainous and coastal regions who were interested in participating in the study were invited to be examined. The inclusion criteria, apart from residence in the communities mentioned above, were the ability to walk to the survey site, report data, and understand and sign an informed consent form. All participants provided written informed consent, and the study was conducted with the approval of the ethics committees of the University of Tokyo and the Tokyo Metropolitan Geriatric Medical Center.

Participants completed an interviewer-administered questionnaire of 400 items that included lifestyle information such as smoking habits, alcohol consumption, family history, medical history, and previous hip injury history. Anthropometric measurements included height and weight, from which the body mass index (BMI) (weight [kg]/height [m^2]) was calculated. Furthermore, all participants were interviewed by well-experienced orthopedists regarding pain in both hips, who asked “Have you experienced right hip pain on most days in the past month, in addition to now?” and “Have you experienced left hip pain on most days in the past month, in addition to now?” Subjects who answered “yes” were defined as having hip pain. We defined an individual as having hip pain if at least one of the hip joints was affected.

Radiographic assessment

All participants underwent radiographic examination of both hips using an anteroposterior view with weight-bearing and feet internally rotated. Fluoroscopic guidance with a horizontal anteroposterior X-ray beam was used to properly visualize the joint space. Hip radiographs at baseline were read without knowledge of the participant's clinical status by a single, well-experienced orthopedist (TI), and the Kellgren/Lawrence (K/L) grade was defined using the K/L radiographic atlas for overall hip radiographic grades[14]. In the K/L grading system, radiographs are scored from grade 0 to grade 4, with higher grades being associated with more severe OA. To evaluate intraobserver variability of K/L grading, 100 randomly selected radiographs of the hip were scored by the same observer more than 1 month after the first reading. One hundred other radiographs were also scored by two experienced orthopedic surgeons (TI and SM) using the same atlas for interobserver variability. The intra- and intervariabilities evaluated for K/L grade (0–4) were confirmed by kappa analysis to be sufficient for assessment ($\kappa = 0.87$ and $\kappa = 0.85$, respectively).

Radiographic hip OA was defined as a K/L radiographic severity grade ≥2 (i.e., presence of at least probable joint space narrowing [JSN] in either the superolateral or superomedial hip joint, as well as presence of an osteophyte) and severe radiographic hip OA was defined as K/L ≥ 3. We defined an individual as having radiographic hip OA if at least one of the hip joints was affected. In addition, symptomatic hip OA was defined as having hip pain with corresponding radiographic OA in the same hip. Prevalence of total prevalence of hip OA (%) = (total number of subjects who were diagnosed as radiographic hip OA/total subjects who participated in the X-ray examination) × 100.

Individuals who had undergone a total hip arthroplasty (THA) were defined as having severe radiographic hip OA in that joint ($n = 13$ subjects; 18 hips). However at the time of analysis of the association with hip pain, we excluded all subjects who had undergone a THA.

Statistical analysis

Odds ratios (ORs) and 95% confidence intervals (95% CIs) are provided. Differences of age and BMI between men and women were examined by non-paired *t*-test. Differences in age, height, weight, and BMI among the urban, mountainous, and coastal communities were determined using one-way analysis of covariance and Tukey's honestly significant difference test. We used the chi square test to compare the prevalence of radiographic hip OA between men and women. Association of prevalence with age was determined by logistic-regression analysis after adjustment for BMI. Association of the variables such as age, BMI, gender, and community with radiographic hip OA was evaluated by multivariate logistic-regression analysis. Logistic-regression analyses were used to estimate OR and the associated 95% CI of K/L = 2 and K/L ≥ 3 hip OA for pain compared with K/L = 0/1 after adjustment for age, BMI, and community. Data analyses were performed using SAS version 11.0 (SAS Institute Inc., Cary, NC).