Osteoarthritis and Cartilage 22 (2014) 1504–1510

Osteoarthritis and Cartilage

Subclinical deformities of the hip are significant predictors of radiographic osteoarthritis and joint replacement in women. A 20 year longitudinal cohort study

G.E.R. Thomas † *, A.J.R. Palmer †, R.N. Batra †, A. Kiran †, D. Hart ‡, T. Spector ‡, M.K. Javaid †, A. Judge †, D.W. Murray †, A.J. Carr †, N.K. Arden † §, S. Glyn-Jones †

† *Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, Oxford NIHR Musculoskeletal Biomedical Research Unit, Nuffield Orthopaedic Centre, University of Oxford, Windmill Road, Oxford OX3 7LD, UK*
‡ *Department of Twin Research & Genetic Epidemiology, King's College London, St Thomas' Hospital Campus, 3rd & 4th Floor South Wing Block D, Westminster Bridge Road, London SE1 7EH, UK*
§ *MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton General Hospital, Southampton SO16 6YD, UK*

ARTICLE INFO

Article history:
Received 2 January 2014
Accepted 28 June 2014

Keywords:
Osteoarthritis
Epidemiology
Hip osteoarthritis
Femoroacetabular impingement
Acetabular dysplasia

SUMMARY

Objective: Femoroacetabular Impingement (FAI) and Acetabular Dysplasia are common deformities, which have been implicated as a major cause of hip osteoarthritis (OA). We examined whether these subtle deformities of the hip are associated with the development of radiographic OA and total hip replacement (THR) in women.
Design: A population-based, longitudinal cohort of 1003 women underwent pelvis radiographs at years 2 and 20. Alpha Angle, Triangular Index Height, Lateral Centre Edge (LCE) angle and Extrusion Index were measured. An alpha angle of greater than 65° was defined as Cam-type FAI. Radiographic OA and the presence of a THR were then determined at 20 years.
Results: Cam-type FAI was significantly associated with the development of radiographic OA. Each degree increase in alpha angle above 65° was associated with an increase in risk of 5% (Odds Ratio (OR) 1.05 [95% confidence interval (CI) 1.01–1.09]) for radiographic OA and 4% (OR 1.04 [95% CI 1.00–1.08]) for THR. For Acetabular Dysplasia, each degree reduction in LCE angle below 28° was associated with an increase in risk of 13.0% (OR 0.87 [95% CI 0.78–0.96]) for radiographic OA and 18% (OR 0.82 [95% CI 0.75–0.89]) for THR.
Conclusions: This study demonstrates that Cam-type FAI and mild Acetabular Dysplasia are predictive of subsequent OA and THR in a large female population cohort. These are independent of age, BMI and joint space and significantly improve current predictive models of hip OA development.
© 2014 Published by Elsevier Ltd on behalf of Osteoarthritis Research Society International.

Introduction

Osteoarthritis (OA) of the hip is a common disease, with a cumulative prevalence of up to 27%[1–4]. The mortality adjusted lifetime risk of Total Hip Replacement (THR) at age 50 is 12%[5]. Losses of earnings due to disability and direct treatment costs have made OA and other rheumatic diseases among the most expensive of all items in any healthcare budget and a major burden to society. Health expenditure towards arthritis related care represents 2.5% of the United States' entire Gross Domestic Product[6]. Hip Replacement accounts for almost half of the hospitalization costs associated with OA[7], with over three hundred thousand THRs performed in the United States in 2011[8], which is projected to increase to five hundred and seventy four thousand by 2030[9].

Historically, 10% of hip OA has been termed secondary and attributed to major deformities of the hip, such as developmental acetabular dysplasia, Legg–Calvé–Perthes disease or slipped capital femoral epiphysis[10]. The remaining 90% of hip OA was termed 'primary' or 'idiopathic' and presumed some underlying abnormality of articular cartilage. For nearly 50 years authors have suggested some relationship between more subtle deformities of the

* Address correspondence and reprint requests to: G.E.R. Thomas, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, NIHR Musculoskeletal Biomedical Research Unit, Botnar Research Centre, Nuffield Orthopaedic Centre, University of Oxford, Windmill Road, Oxford OX3 7LD, UK. Tel: 44-1865-737902; Fax: 44-1865-227671.
E-mail address: geraint.thomas@ndorms.ox.ac.uk (G.E.R. Thomas).

http://dx.doi.org/10.1016/j.joca.2014.06.038
1063-4584/© 2014 Published by Elsevier Ltd on behalf of Osteoarthritis Research Society International.

proximal femur and/or acetabulum and subsequent development of OA of the hip[10–12]. More recently cross-sectional studies have supported this theory; although cannot prove causality[13]. These deformities can be broadly divided into milder forms of acetabular dysplasia, which results in a shallow hip socket, and Femoroacetabular Impingement (FAI), which describes morphological abnormalities of the femoral head–neck junction, acetabulum, or both[14]. Both can be quantified using measurements taken on plain radiographs. These deformities are thought to result in a focal mechanical overload of articular cartilage, leading to subsequent OA and joint replacement[14].

FAI and acetabular dysplasia are prevalent and are common in patients with established OA of the hip, with concomitant hip malformations seen in 36.6% of women and 71.0% of men with hip OA[13]. However, it is not known whether these malformations pre-date or are a result of the OA pathogenic process. Though temporal sequence alone does not prove causality, when combined with the potential mechanism by which impingement or increased contact stress may lead to cartilage damage the likelihood of a causal relationship increases. If the radiographic measurements of mild acetabular dysplasia and FAI are predictive of developing hip OA, they may represent targets for preventative strategies and treatment. Surgical interventions, such as osteotomy and osteochondroplasty have already been developed for these conditions, though their treatment efficacy is unproven. Pharmaceutical and physical treatments may also become available in the near future[15]. Such interventions may ultimately reduce the burden of end-stage hip OA and THR.

The aim of this study was to determine whether subtle deformities of the hip are associated with the development of radiographic OA and end-stage OA (defined by THR) in a population based prospective cohort. To date, no studies have been able to assess the role of hip morphology in the development of structural change and THR in a population cohort without disease at baseline, making this a unique project. Our hypothesis was that a causal relationship exists between subtle deformities of the hip and subsequent OA.

Methods

Study participants

The Chingford 1000 Women Study is a population-based cohort of 1003 women living in the UK. In 1989, women registered at a general practice in London of the age range 44–67 years (mean 54.2) were invited to participate in a study assessing musculoskeletal disease, with yearly clinic visits; morphometric, clinical, biologic, and radiographic measurements were obtained at these visits. Standardised supine Anterio-Posterior (AP) pelvis radiographs were taken at years 2, 8 and 20. The local ethics committee approved the study and written consent was obtained from each woman (Outer North East London Research Ethics Committee (formerly Barking & Havering and Waltham Forest RECs), LREC (R&WF) 96). Figure 1 shows flow of participants from the recruitment of the cohort to the final study populations.

Exclusions

Exclusion criteria were applied to ensure that year 2 radiographs were of a minimum acceptable standard. Twenty individuals were excluded due to poor radiograph quality. Poor radiograph quality was a subjective exclusion criterion applied by the principal investigator when a radiograph was either grossly over- or under-exposed to the extent that constituent anatomic landmarks were not visible for the purposes of analysis. Five hip joints (three individuals) were excluded because they already had a THR *in situ*. Five hip joints (five individuals) were excluded because it had a dynamic hip screw *in situ*, indicating previous femoral neck fracture. Seventy-two hip joints (36 individuals) were excluded because they had excessive rotation (measured using Obturator Foramen Index, reference range 0.7–1.4) or tilt (measured according to the distance between the sacrococcygeal joint and the pubic symphysis)[16]. A total of 119 hips in 61 individuals were excluded. Baseline characteristics of those excluded from analysis were not significantly different from those included in the analysis.

Radiographic assessment of morphology

Hip morphology was analysed using a validated software package called HipMorf 2.0[17]. We used two radiological measurements for Acetabular dysplasia and Pincer-type FAI; the Lateral Centre Edge (LCE) angle[18] and Extrusion Index[19,20]. LCE measures acetabular coverage of the femoral head and Extrusion Index measures the proportion of femoral head located within the acetabulum. A low LCE indicates acetabular dysplasia, while a high LCE is indicative of Pincer-type FAI. The converse is true with respect to Extrusion

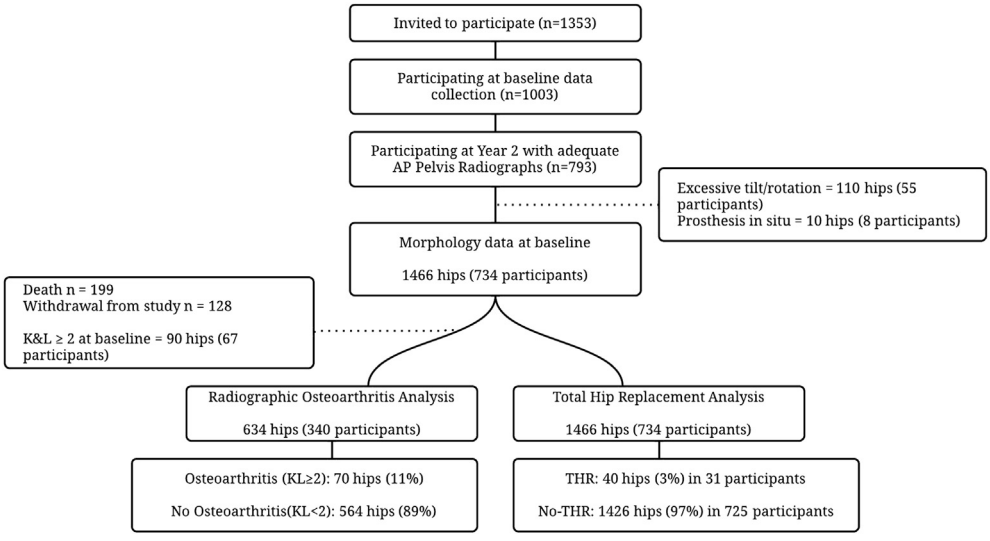

Fig. 1. Flow diagram summarising selection for inclusion and analyses.

Download English Version:

https://daneshyari.com/en/article/6125385

Download Persian Version:

https://daneshyari.com/article/6125385

Daneshyari.com