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Original research

Association of rapidly destructive osteoarthritis of the hip with intra-articular steroid injections

Shane R. Hess, DO [a], Robert S. O'Connell, MD [b], Christopher P. Bednarz, BS [b], Andrew C. Waligora IV, MD [c], Gregory J. Golladay, MD [b,*], William A. Jiranek, MD [d]

[a] The CORE Institute, Phoenix, AZ, USA
[b] Department of Orthopaedic Surgery, Virginia Commonwealth University Medical Center, Richmond, VA, USA
[c] Greater Pittsburgh Orthopaedic Associates, Pittsburgh, PA, USA
[d] Duke University Medical Center, Durham, NC, USA

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ABSTRACT

Background: To assess the relationship between rapidly destructive osteoarthritis (RDOA) of the hip and intra-articular steroid injections.

Methods: Coding records from 2000 to 2013 were used to identify all subjects who had a fluoroscopy-guided intra-articular hip injection to treat pain associated with primary osteoarthritis. Radiographic measurements from preinjection and postinjection imaging were evaluated with Luquesne's classification of RDOA to determine diagnosis (greater than 50% joint space narrowing or greater than 2 mm of cartilage loss in 1 year with no other forms of destructive arthropathy). Demographic information, health characteristics, and number of injections were collected and analyzed as other potential explanatory variables. Patient outcome assessed by need for total hip arthroplasty (THA) after injection was also recorded.

Results: One hundred twenty-nine injection events met the inclusion criteria in a total of 109 patients. From this sample, 23 cases of RDOA were confirmed representing a 21% incidence of RDOA. Twenty-one of the patients (91%) with RDOA had a THA at a median time of 10.2 months (interquartile range: 6.5-11.2) compared with 27 (31%) of those without RDOA at a median time of 24.9 months (interquartile range: 15.3-65.3). Older patients, patients with more severe osteoarthritis, and patients who identified themselves as white were more likely to have a diagnosis of RDOA ($P = .008$; $P = .040$; $P = .009$, respectively).

Conclusions: The potential for RDOA and faster progression to THA raises questions about the use of intra-articular steroid injections for hip osteoarthritis and should be discussed with patients. Additional studies are needed to define a true relationship.

Introduction

Rapidly destructive osteoarthritis (RDOA) of the hip is a debilitating and rare condition that is not fully understood. It was first mentioned in 1957 by Forestier [1]. Several reports soon followed, describing similar conditions with different nomenclature [2]. However, it was Lequesne who provided the most complete and standardized definition of greater than 50% joint space narrowing or greater than 2 mm of cartilage loss in 1 year with no other forms of destructive arthropathy identified [3].

RDOA of the hip has classically been seen in elderly females with a higher Kellgren and Lawrence (KL) [4] score at initial presentation with a tendency for unilateral involvement [5,6]. However, the true incidence is unknown and may be as high as 16% [7]. Several risk factors leading to RDOA of the hip have been theorized including osteopenia and/or osteoporosis [8,9], inversion of the acetabular labrum [10,11], increased posterior pelvic tilt [12], idiopathic chondrolysis [13], intra-articular deposition of hydroxylapatite or pyrophosphate crystals [14-16], and intra-articular steroid

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* Corresponding author. 1200 E. Broad Street, PO Box 980153, Richmond, VA 23298-0153, USA. Tel.: +1 804 828 1308.
E-mail address: gregory.golladay@vcuhealth.org

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injections [17-19]. RDOA of the hip initially presents with subjective and radiographic findings of osteoarthritis [20]. However, the rapid radiographic progression is also associated with severe femoral head and acetabular destruction that may involve a more complicated reconstructive procedure characterized by significant acetabular bone loss, increased blood loss, longer operative times, and the need for special implants [7].

The evidence supporting intra-articular steroid injections for painful hip osteoarthritis is mixed. Intra-articular steroid injections have been suggested as an effective and cost-saving treatment for symptomatic management of hip osteoarthritis, no matter the severity [21]. Deshmukh et al [22] found these steroid injections to offer better pain relief in those with more advanced hip osteoarthritis. In contrast, however, McCabe et al [23] performed a systematic review of the literature and concluded that intra-articular steroid injections may produce short-term pain relief and lead to a slight improvement in function; however, the quality of evidence was poor.

Intra-articular steroids have previously been implicated with chondrolysis and have also been postulated as a potential cause for RDOA. With few reports in the literature, the purpose of this study is to determine if there is a relationship between RDOA of the hip and intra-articular steroid injections and to evaluate radiographic changes in the hip joint after steroid injections.

Material and methods

This retrospective cohort trial was approved by the local institutional review board. Following institutional review board's approval, the radiology department provided a comprehensive list of all hip injections between the years of 2000 and 2013. This resulted in 1953 events that were reviewed by the authors; however, only 129 (6.6%) were hip injections that met our inclusion criteria (Fig. 1). To be included in this study, patients required, at a minimum, radiographs within 6 months before and 1 year after the injection. Injections must have contained a steroid mixture and been injected into the femoroacetabular joint for diagnostic and or therapeutic purposes under fluoroscopic guidance. The active steroid medication was 1 mL of triamcinolone with a concentration of 40 mg/mL. Those with a diagnosis of post-traumatic osteoarthritis, inflammatory arthritis, osteonecrosis, who were undergoing infection workup, and who received previous hip surgery (including arthroscopy) were excluded from the group.

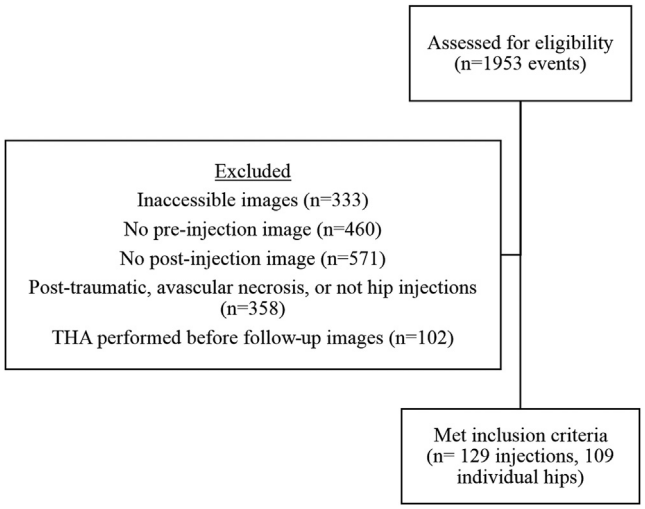

Figure 1. Flowchart for patient selection process.

The primary outcomes of this study were the diagnosis of RDOA of the hip (Fig. 2a and b) and the occurrence of total hip arthroplasty (THA). RDOA of the hip was confirmed by progressive loss of cartilage (greater than 2 mm or 50% joint space narrowing) over a 12-month period or less. The time (months) between first injection and RDOA diagnosis and the time (months) between first injection and THA were considered as a secondary outcome.

Demographic information and health characteristics, including age at injection (years), sex (male, female), race (white, non-white), and body mass index (BMI; kg/m^2) were collected as potential explanatory variables. The number of injections after the first was included to determine if there was an additive effect.

Trained study personnel reviewed preinjection radiographs to measure the lateral center edge angle (LCEA), KL score of osteoarthritis [4], and joint space in millimeters. LCEA was measured according to Clohisy et al [24]. The KL score ranges from 0 to 4, with higher scores indicating more severe osteoarthritis. The joint space was measured at the narrowest aspect of the weight-bearing dome (anywhere along the sourcil) in all cases for consistency. Post-injection images were also analyzed for loss of joint space. Those cases identified as having RDOA of the hip were reviewed by the study personnel to ensure diagnosis consensus.

Statistical analysis

All study variables were summarized by means and standard deviations or frequencies and proportions. Medians and interquartile ranges were used to summarize the time from first injection to the diagnosis of RDOA (as defined as date of last image) as measured by a Kaplan–Meier survival curve. Simple logistic regression models were used to assess the marginal relationship between each of the demographic, injury, and health characteristics with RDOA status and arthroplasty. RDOA of the hip diagnosis was considered as a predictor of arthroplasty. Multivariable models for each outcome were constructed with each explanatory variable that had a corresponding *P*-value from the marginal models that was <.25. Sensitivity analyses were performed using both the time from first injection until diagnosis of RDOA and the time from first injection until arthroplasty. A time-varying covariate method was used to assess the proportional hazards assumption. The statistical software SAS, version 9.4 (Cary, NC) was used for all statistical methods.

Results

One hundred twenty-nine injection events met the inclusion criteria in a total of 109 patients. Intra-articular injection composition and other summaries are reported in Tables 1 and 2. Overall, 23 patients (21%) had an RDOA diagnosis and 48 (44%) had a THA. Twenty-one of the patients (91%) with RDOA had a THA and 27 (31%) of those without RDOA had a THA (Table 3). The median time until THA can bee seen in Table 3.

The marginal relationships between each of the demographic, injury, and health characteristics with RDOA status are reported in the upper portion of Table 4. Older patients, patients with more severe osteoarthritis (based on KL score), and patients who identified themselves as white were more likely to have a diagnosis of RDOA ($P = .008$; $P = .040$; $P = .009$, respectively). Gender was not associated with an RDOA diagnosis, and no relationship was observed between RDOA status and the occurrence of more than one injection in the same joint, LCEA, and BMI. Similar results were observed in the multivariable model. Self-identified race (white) (odds ratio [OR] = 6.24, 95% confidence interval (CI): 1.58-24.7), patients with higher KL scores (OR = 1.75, 95% CI: 1.04-2.93), and age (OR = 1.30, 95% CI: 1.02-1.65) had higher odds of an RDOA