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The Timing of Total Hip Arthroplasty After Intraarticular Hip Injection Affects Postoperative Infection Risk

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A B S T R A C T

Background: The data regarding any association between preoperative intraarticular steroid injection and risk ofperiprosthetic joint infection (PJI) after total hip arthroplasty (THA) are conflicting. The goal of the present study is to evaluate the association of preoperative intraarticular hip injection before THA on the incidence of postoperative PJI.

Methods: A national database was queried for patients who underwent THA and those patients who underwent prior ipsilateral hip injection. Three cohorts were created: THA within 3 months of ipsilateral hip injection (n = 829), THA between 3 and 6 months after ipsilateral hip injection (n= 1379), and THA between 6 and 12months after ipsilateral hip injection (n=1160). A control group of THAwithout prior injectionwas created for comparison purposes (n=31,229). The rate of postoperative infectionwas compared between injection cohorts and controls.

Results: The incidence of infection after THA at 3 months (2.41%; odds ratio, 1.9; $P = .004$) and 6 months (3.74%; odds ratio, 1.5; $P < .019$) was significantly higher in the patients who underwent hip injection within 3months before THA comparedwith controls. Therewas no significant difference in infection rates in patients who underwent THA between 3 and 6months or 6 and 12months after ipsilateral hip injection compared with controls.

Conclusions: The present study demonstrates a significant increase in PJI in patients who underwent intraarticular hip injection within 3 months before THA. This association was not noted when THA was more than 3 months after injection.

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Intraarticular hip injections are often performed for both diagnostic and therapeutic purposes for patients with symptomatic hip osteoarthritis [1,2]. Injected intraarticular anesthetic agents allow the differentiation of intrinsic etiologies of hip pain from extrinsic sources of pain such as lumbar spine pathology [2–4]. Therapeutic hip injections for symptomatic osteoarthritis contain either steroid or viscosupplements to provide pain relief and may delay the need for arthroplasty [1,5–8]. These injections are generally regarded as effective and safe, but their use in the hip is much less frequent than in the knee because of the increased technical challenge of gaining access to the hip, which often requires the use of ultrasound or fluoroscopic guidance [2,6–10].

The data regarding the association between preoperative intraarticular steroid injection and risk of periprosthetic joint infection (PJI) after total hip arthroplasty (THA) are conflicting. At least 4 prior studies have not demonstrated any association between preoperative intraarticular steroid injection and PJI after THA [11–14]. Three reports have demonstrated higher rates of PJI in patients who had an intraarticular steroid injection in the hip before THA [15–17]. A central limitation to these existing studies is low patient numbers yielding insufficient power to detect differences in infection rates, as well as inconsistent and often long average time periods between injection and subsequent arthroplasty.

The goal of the present study is to use a national database to evaluate the association of preoperative intraarticular hip injection at various time intervals before THA on the incidence of postoperative PJI. Our hypothesis was that recent ipsilateral hip injection would be associated with increased PJI rates after THA.

Materials and Methods

The PearlDiver Patient Records Database (www.pearldiverinc.com, Fort Wayne, IN), an insurance-based database of patient records, was used for this study. The database contains procedural volumes, patient demographics, and average charge information for patients with *International Classification of Diseases, Ninth Revision* (*ICD-9*) diagnoses and procedures or Current Procedural Terminology (CPT) codes. All data are deidentified and anonymous, and were thus exempt from Institutional Review Board approval. The PearlDiver Data for the present study were derived from a Medicare-based database within PearlDiver.

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The Medicare database has more than 100 million individual patient records from 2005 to 2011.

The database was queried for THA using CPT 27130. Large joint injection was queried using CPT 20610. To assure that the injection was performed in the hip as opposed to other large joints such as the shoulder or knee, only patients with large joint injections performed for the following hip-related *ICD-9* diagnoses were included: *ICD-9*s 715.15, 715.25, 715.35, 715.95, 716.65, 716.85, 716.95, 718.05, 718.15, 718.85, 718.95, 719.45, 719.65, 719.85, and 719.95. The CPT codes were used in favor of *ICD-9* procedure codes to query for procedures because CPT modifiers were necessary to ascertain laterality. The resulting THA and hip injection cohorts were then divided into "left" and "right" cohorts using CPT modifiers for left and right. Records without laterality designation were excluded.

Patients who underwent THA after ipsilateral hip injection were then identified using Boolean coding within the database; this included patients who underwent left THA after left hip injection and those who underwent right THA after right hip injection. These study patients were then divided into 3 separate cohorts: THA within 3 months following ipsilateral hip injection, THA between 3 and 6 months after ipsilateral hip injection, and THA between 6 and 12 months after ipsilateral hip injection. A control group of THA was created for comparison purposes, which included all patients with a CPT for THA without any previous hip injection.

The demographics of the control cohort and 3 study cohorts were recorded as provided by the database and compared. The average Charlson Comorbidity Index (CCI) and standard deviation for each cohort were calculated by the database and compared. The CCI provides a balanced summary of the patients' medical comorbidity burden to allow comparison between cohorts and includes such medical problems as history of myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic pulmonary disease, connective tissue disease, peptic ulcer disease, liver disease, diabetes, renal disease, cancer, and human immunodeficiency virus. Postoperative PJI was characterized by either a diagnosis of or procedure for either wound or deep infection within 3 or 6 months after THA using the following codes: *ICD-9*s 996.66, 996.67, 996.69, 998.51, and 998.59 and CPTs 20005 and 27030.

Statistical comparisons of cohort demographics and postoperative complications were completed with Pearson χ^2 analysis. An independent-sample *t* test was used to compare the average CCI between cohorts. Odds ratios (ORs) were calculated with respective 95% confidence intervals (CIs). For all statistical comparisons, $P < .05$ was considered significant. SPSS version 21 for Macintosh (IBM, Armonk, NY) was used for all statistical calculations.

Results

A total of 34,597 unique patients who underwent THA were included in the study. This included 31,229 patients in the control cohort, 829 who underwent THA within 3 months after hip injection, 1379 who underwent THA between 3 and 6 months after hip injection, and 1160 patients who underwent THA between 6 and 12 months after hip injection. Demographics of each cohort, including gender, age group, and CCI, are presented in Table 1. There were no significant differences in age group distribution, smoking status, or CCI between the 0- to 3-month cohort and controls. The gender distribution was similar between cohorts; however, there was a slight but statistically significant higher percentage of female patients in the 0- to 3-month cohort compared with controls ($P = .023$).

The incidence of postoperative complications within 3 and 6 months after THA for each cohort is presented in Table 2, and the associated statistical comparisons are in Table 3. The incidence of infection after THA at 3 months (2.41%; OR, 1.9; 95% CI, 1.2-3.0; $P = .004$) and 6 months (3.74%; OR, 1.5; 95% CI, 1.1-2.2; $P < .019$) was significantly higher in the patients who underwent hip injection within 3 months before THA compared with controls. There was no significant difference in infection rates in patients who underwent THA between 3 and 6 months or 6 and 12 months after ipsilateral hip injection compared with controls.

Discussion

Periprosthetic joint infection is a devastating complication following THA that leads to substantial morbidity. A recent meta-analysis estimates the rate of surgical site infection to be 2.5% and the rate of deep PJI to be 0.9% after THA [18]. There has been concern regarding the relationship between preoperative intraarticular hip steroid injections and postoperative PJI after THA, although existing studies have provided conflicting conclusions [11,12,15–17,19,20]. Most meta-analyses combine THA and total knee arthroplasty to obtain adequate power, which adds to confusion of this topic [19,21]. In the present study, we used a national database to demonstrate a significant increase in postoperative PJI in patients who underwent ipsilateral intraarticular hip injection within 3 months before THA. This association was not noted when THA was more than 3 months after injection.

Several prior studies have investigated this topic for THA but are limited by inadequate power as well as inconsistent and often long average time periods between injection and subsequent arthroplasty. At least 4 prior studies have not demonstrated any association between preoperative intraarticular steroid injection and PJI after THA [11–14]. Chitre et al [11] evaluated 36 patients who underwent THA an average of 18 months (range, 4-50 months) after injection. The authors reported no infections in their series. Meermans et al [12] compared 175 patients who underwent intraarticular steroid hip injection within 1 year before THA with a control cohort. The authors reported no difference in superficial or deep infection between groups at average 71-month follow-up. Sreekumar et al [13] compared 68 patients who underwent injection at an average of 14 months before THA with a control group of 136 THA and found no difference in postoperative infection. Sankar et al [14] also found no infections in 40 patients who underwent steroid injections an average of 6.2 months before THA.

Several studies, however, have demonstrated higher rates of PJI in patients who underwent an intraarticular steroid injection in the hip before THA [15–17]. Kaspar and de V de Beer [15] matched 40 patients

Table 1
Cohort Characteristics.

	0-3 mo		3-6 mo		6-12 mo		Control		Statistical Analysis
Total No.	829		1379		1160		31,229		*P*: 0-3 mo vs Control
	n	(%)	n	(%)	n	(%)	n	(%)	
Female	541	(65.3%)	911	(66.1%)	771	(66.5%)	19,140	(61.3%)	.023
Male	288	(34.7%)	468	(33.9%)	389	(33.5%)	12,089	(38.7%)	
Age <65	70	(8.4%)	105	(7.6%)	85	(7.3%)	2979	(9.5%)	.317
Age 65-79	555	(66.9%)	944	(68.5%)	758	(65.3%)	20,838	(66.7%)	.923
Age ≥80	204	(24.6%)	330	(23.9%)	317	(27.3%)	7412	(23.7%)	.588
Smoker	104	(12.5%)	191	(13.9%)	167	(14.4%)	4551	(14.6%)	.113
	Average	(SD)	Average	(SD)	Average	(SD)	Average	(SD)	
CCI	8.5	(7.3)	9.0	(6.7)	9.0	(6.2)	8.2	(6.2)	.300