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The Relationship Between Knee Arthroscopy and Arthroplasty in Patients Under 65 Years of Age

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ABSTRACT

A private payer database was used to examine the incidence and rates of knee arthroscopy in patients less than 65 years of age and the subsequent risk of knee arthroplasty. Time to event analysis was performed using the Kaplan–Meier method; also, Cox regression analysis was used to evaluate the relative risk of subsequent knee arthroplasty for arthroscopic patients. Overall, 247,034 knee arthroscopies, done for injury or arthropathy, were identified between 2004 and 2009. Within 1-year of arthroscopy, 2.2% of arthropathy patients and 0.9% of injury patients underwent a knee arthroplasty. These increased to 5.2% and 2.4% at 5-years, respectively. The risk of arthroplasty following arthroscopy increased significantly with age. Further study is warranted to examine the benefit of arthroscopy in younger patients with OA.

Osteoarthritis (OA) is a common condition that has necessitated the use of treatments ranging from conservative measures such as oral medications and physical therapy to surgery. Arthroscopy is a commonly performed orthopedic procedure, and it is being used in the treatment of OA [1,2]. As a minimally invasive surgery with a perceived low risk, arthroscopic debridement or partial meniscectomy has been used as a temporizing alternative to arthroplasty. As the prevalence of arthroscopy has increased, so too has the interest in its outcomes, as there is currently no conclusive evidence in the literature that arthroscopy cures or arrests osteoarthritis [1–21].

To the best of our knowledge, at least two randomized trials have failed to demonstrate that arthroscopy has a clear benefit in the treatment of OA. Moseley et al performed a randomized, placebo controlled trial, comparing arthroscopic lavage, arthroscopic debridement, and a placebo procedure in efficacy of pain relief and functional improvement. The results showed that no arthroscopic group, at any point, reported less pain or better function than the placebo, with uniformly similar outcomes between groups[14]. Kirkley et al also performed a randomized controlled trial comparing optimized physical and medical therapy of OA with arthroscopic treatment, in addition to optimized physical and medical therapy, in patients over the age of 18. They found a slight benefit to arthroscopy in patient outcome scores at 3 months; however, there was no difference in patient outcome scores at any other time point including final follow-up at 2 years[2].

On the other hand, Johanson et al studied patients older than 65 years of age who underwent arthroscopy to determine the yearly risk of total knee arthroplasty (TKA) over a ten-year period. Using Medicare claims data between 1997 and 2006, they found that 10.2% of patients over the age of 65 who underwent arthroscopy for OA required a TKA within 1 year. Furthermore, only 32.5% underwent a TKA by 9 years post-arthroscopy. Therefore, they concluded that, with the increasing rates of knee arthroscopy and the low rate of failure, there might be some benefit to performing arthroscopy in patients over the age of 65 [10].

Given that the current literature has not been conclusive in showing a clear benefit, arthroscopy continues to be used for patients with arthropathy. Therefore, we planned to study patients less than 65 years of age, using a private payer database, to determine the five-year rate of knee arthroplasty following arthroscopy.

The purpose of the current study is to determine the risk of knee arthroplasty in patients under the age of 65 who have undergone an arthroscopic procedure for arthropathy or injury. Using the incidence and rate of knee arthroscopy, we determined the yearly risk of patients requiring knee arthroplasty in a five year period post-arthroscopy. Failure was defined by arthroplasty being needed within one year of the arthroscopic procedure. Our hypothesis was that the risk of knee arthroplasty in patients aged less than 65 years who had undergone arthroscopy would be small.

Materials and Methods

The PearlDiver Private Payer Database, comprised of patient data billed to private payer sources, was used retrospectively to identify

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patients less than 65 years of age who underwent a knee arthroscopy between 2004 and 2009. Procedures were identified using relevant Current Procedural Terminology-4 codes (Table 1). The diagnoses were based on the recorded International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis codes when the arthroscopy was performed. These diagnoses included arthropathy associated with local or systemic disease or injury-related codes such as derangement, tears, and sprains (Table 2). Patients who were diagnosed with both arthropathy and injury codes were considered as arthropathy patients. Prevalence of knee arthroscopy as a function of diagnostic category (arthropathy vs. injury) was also evaluated.

The estimated patient population was based on PearlDiver national population estimates of patients younger than 65 years old with an arthroscopic procedure. By following the growth rates within both the PearlDiver Private Payer data set and the CMS Standard Analytical File, the U.S. volumes for years prior to 2008 were derived. U.S. volumes for 2009 were based on actual growth of private pay procedure volumes.

Statistical Methods

All patients were longitudinally followed to evaluate the need for arthroplasty (total or unicondylar knee arthroplasty) within one year following arthroscopy. Patients who underwent arthroscopy in 2004 were followed longitudinally for 5 years. Overall time-to-event analysis was performed using the Kaplan–Meier method. Total knee arthroplasty (TKA) and unicondylar knee arthroplasty (UKA) were identified using Current Procedural Terminology-4 codes 27447 and 27446, respectively. Cox regression analysis was also used to evaluate the relative risk of subsequent knee arthroplasty for arthroscopy patients in whom injury was diagnosed compared with those in whom arthropathy was diagnosed. The Cox regression analyses were adjusted for age, gender, geographic region, and comorbidity.

Results

Overall, 365, 771 knee arthroscopy patients were identified from the 2004–2009 PearlDiver Private Payer Database using the CPT codes listed in Table 1, which extrapolated to approximately 3.66 million knee arthroscopy patients over the study period. The private payer sample increased 26.9% from 52,385 (645,938 extrapolated) in 2004 to 66,452 (677,052 extrapolated) in 2009.

Of the 365,771 arthroscopies identified, 247,034 underwent arthroscopy for the specific *ICD-9* codes listed in Table 2 (159,975 arthropathy and 87,059 injury patients).

The demographics for arthropathy and injury patients were comparable, with the exception of gender. The gender distribution favored males with 52.4% of arthropathy patients and 58.6% of injury patients being male. The highest level of prevalence was between the ages of 45 and 64 years, with 59.6% of arthropathy patients and 57.7% of injury patients being within this age group. The greatest proportion of arthroscopies was performed in the South (46.2%), compared with the Midwest (25.2%), West (16.5%), and Northeast (12.1%) (Table 3).

By the end of 2009, 4.1% of the patients with five-year follow-up subsequently underwent an arthroplasty. Most (87.6%) of the patients who required arthroplasty had a total knee arthroplasty (TKA), regardless of diagnosis. From the Kaplan–Meier analysis, 2.2% of arthropathy patients and 0.9% of injury patients underwent arthroplasty at 1 year after the index arthroscopy procedure. When longitudinally followed based on diagnosis, patients who had five year follow-up results corresponded to 5.2% of those diagnosed with arthropathy and 2.4% of those diagnosed with injury required arthroplasty (Fig. 1). Patients who underwent arthroscopy associated with injury had a lower risk of requiring subsequent arthroplasty. At one-year follow-up, 0.8% of injury patients had received a TKA compared to 1.9% of arthropathy patients. At five-year follow-up, 2.1% of injury patients had received a TKA compared to 4.5% of arthropathy patients (Fig. 2).

Results were similar for patients with UKA at follow-up. At one-year follow-up, 0.1% of injury patients received UKA compared to 0.3% of arthropathy patients. At the five-year follow-up, 0.3% had received UKA compared to 0.7% of arthropathy patients (Fig. 3).

The rate of arthroplasty following arthroscopy increased with age. Of the patients with 5-year follow-up, no arthroplasty occurred following arthroscopy in patients under the age of 25. Only 0.2% of patients between the age of 25 and 45 required an arthroplasty at

Table 1
CPT-4 Codes for Arthroscopy Procedures.

Description	Codes
Arthroscopy	29867, 29870, 2971, 29873, 29874, 29884
Arthroscopy, synovectomy	29875, 29876
Arthroscopy, chondroplasty	29877, 29879
Arthroscopy, with menisectomy	29880, 29881
Arthroscopy, with meniscal repair	29882, 29883

Table 2
Diagnosis Groups and ICD-9 Codes.

Category	Description	Codes
Arthropathy		
	Diffuse disease of connective tissue	710.x
	Crystal arthropathies	712.16, 712.26, 712.36, 712,86, 712.96
	Arthropathy associated with other disorders (endocrine, respiratory, and other inflammatory polyarthropathies)	713.x
	Rheumatoid arthritis and other inflammatory polyarthropathies	714.x
	Osteoarthritis	715.16, 715.26, 715.3, 715.96
	Unspecified arthropathies	716.x6
	Other disorders of synovium, tendon, and bursa	727.00, 727.51, 727.83
	Osteochondritis dissecans	732.7
	Other unspecified disorders of joint (hemarthrosis, effusion, others)	719.x6
Injury		
	Internal derangement of knee	717.x
	Other derangement of joint (contracture, dislocation, others)	718.26, 718.36, 718.46, 718.56, 718.76, 718.86

Table 3
Arthroscopy Patient Demographics.

Procedures	Arthropathy	Injury	Total
No. Arthroscopy	159,975	87,059	247,034
Gender			
Female	47.6%	41.4%	45.4%
Age			
<25	11.5%	10.8%	11.2%
25–44	28.8%	31.0%	29.6%
45–64	59.6%	57.7%	58.9%
Region			
Midwest	25.2%	25.4%	25.2%
Northeast	12.1%	11.4%	11.9%
South	46.2%	42.8%	45.0%
West	16.5%	20.4%	17.9%