Hip arthroscopy utilization and reoperation rates in Ontario: a population-based analysis comparing different age cohorts

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Background: Older age (> 40 yr) and osteoarthritis are negative prognostic variables for hip arthroscopy, but their impact has not been quantified from a population standpoint. The purpose of this study was to perform a population-based analysis of hip arthroscopy utilization and associated 2- and 5-year reoperation rates and complications in different age cohorts.

Methods: Administrative databases from Ontario, Canada, were retrospectively reviewed to identify patients aged 18–60 years who underwent hip arthroscopy between 2006 and 2016. Patients were stratified into 2 cohorts: 18–39 and 40–60 years of age. Patients were followed for 2 and 5 years to capture the occurrence of subsequent surgery (repeat arthroscopy or total hip arthroplasty) and postoperative complications.

Results: A total of 1906 patients underwent hip arthroscopy, 818 (42.9%) of whom were aged 40–60 years. In the entire cohort, revision surgery occurred in 6.5% and 15.1% of cases at 2 and 5 years, respectively. Revision surgery rates were significantly higher among patients aged 40–60 years at 2 (10.8% v. 3.2%, $p < 0.001$) and 5 years (22.7% v. 8.2%, $p < 0.001$) than among those aged 18–39 years. Revision rates were higher among patients aged 50–60 years than among those aged 40–49 years at 2 years (14.3% v. 9.1%, $p = 0.027$). Complication rates did not differ between cohorts. Regression analysis revealed higher 2- and 5-year odds of secondary surgery in patients aged 40–49 years (odds ratio [OR] 2.68, 95% confidence interval [CI] 1.70–4.22; OR 2.82, 95% CI 1.87–4.25; $p < 0.001$), patients aged 50–60 years (OR 4.39, 95% CI 2.67–7.22; OR 3.44, 95% CI 2.11–5.62; $p < 0.001$) and those with osteoarthritis (OR 2.41, 95% CI 1.39–4.20; $p = 0.002$; OR 1.76, 95% CI 1.00–3.09; $p = 0.049$).

Conclusion: Revision surgery rates following hip arthroscopy are significantly higher among older patients and those with concomitant osteoarthritis. Although the data have limitations, they provide useful information to guide surgical decision-making.

Contexte : L’âge (> 40 ans) et l’arthrose sont des facteurs de pronostic défavorable de l’arthroscopie de la hanche, mais leur impact n’a pas été quantifié selon un angle populationnel. Le but de l’étude était d’effectuer une analyse de population du recours à l’arthroscopie de la hanche, et des taux connexes de réintervention et de complications à 2 et 5 ans, dans différentes cohortes d’âges.

Méthodes : Des bases de données administratives de l’Ontario, au Canada, ont été consultées rétrospectivement pour identifier des patients âgés de 18–60 ans ayant subi une arthroscopie de la hanche entre 2006 et 2016. Les patients ont été regroupés en 2 cohortes (18–39 ans et 40–60 ans). Ils ont été suivis pendant 2 et 5 ans pour établir l’incidence des chirurgies de révision (arthroscopie répétée ou arthroplastie totale de la hanche) et des complications postopératoires.

Résultats : Au total, 1906 patients ont subi une arthroscopie de la hanche, dont 818 (42,9 %) étaient âgés de 40–60 ans. Dans l’ensemble de la cohorte, une chirurgie de révision a eu lieu dans 6,5 % et 15,1 % des cas à 2 et 5 ans, respectivement. Les taux de révision chirurgicale étaient significativement plus élevés chez les patients âgés de 40–60 ans à 2 ans (10,8 % c. 3,2 %, $p < 0,001$) et à 5 ans (22,7 % c. 8,2 %, $p < 0,001$) que chez ceux âgés de 18–39 ans. Ils étaient aussi plus élevés chez les patients âgés de 50–60 ans que chez ceux âgés de 40–49 ans à 2 ans (14,3 % c. 9,1 %, $p = 0,027$). Les taux de complications ne différaient pas entre les cohortes. L’analyse de régression a révélé une probabilité plus élevée de chirurgie secondaire à 2 et 5 ans chez les patients âgés de 40–49 ans (rapport des cotes [RC] de 2,68, intervalle de confiance [IC] de 95 % 1,70–4,22; RC de 2,82, IC de 95 % 1,87–4,25; $p < 0. 001$), les patients âgés de 50–60 ans (RC de 4,39, IC de 95 % 2,67–7,22; RC de 3,44, IC de 95 % 2,11–5,62; $p < 0,001$) et ceux souffrant d’arthrose (RC de 2,41, IC de 95 % 1,39–4,20; $p = 0,002$; RC de 1,76, IC de 95 % 1,00–3,09; $p = 0,049$).

Conclusion : Les taux de chirurgie de révision à la suite d’une arthroscopie de la hanche sont considérablement plus élevés chez les patients plus âgés et ceux atteints d’une arthrose concomitante. Les données présentent des limites, mais elles offrent de l’information utile pour orienter la décision d’opérer ou non.

Hip arthroscopy utilization continues to increase, as does evidence that it improves patient-reported outcomes; however, a subset of patients require repeat surgical treatment.[1–5] Depending on the population, reoperation rates (including revision arthroscopy or conversion to total hip arthroplasty [THA]) have been as high as 15%–25%.[6–9] Efforts have recently focused on improving patient selection by identifying those with negative prognostic factors who are at higher risk of treatment failure.

In recent years, several negative prognostic factors have been identified. These have included increasing patient age (> 40 yr) and the presence of osteoarthritis (OA).[3,6,10,11] However, the extent to which these variables affect outcomes is unknown, and it is unclear if they should influence surgical decision-making. Specifically, their impact on survivorship of arthroscopy has not been clearly reported. Therefore, the purpose of this study was to perform a population-based analysis of the utilization of hip arthroscopy in Ontario, Canada (14.6 million residents), between 2006 and 2016, focusing on outcomes (2- and 5-yr reoperation rates) and complications among 2 age cohorts. Additionally, we aimed to identify patient-specific prognostic factors associated with reoperation. We hypothesized that increasing age and the presence of a diagnosis of OA would both serve as independent risk factors for subsequent surgery.

Methods

This was a retrospective, population-based cohort study, performed using administrative data sets accessed through ICES (www.ices.on.ca).

Inclusion and exclusion criteria and baseline variables

Ontario residents between 18 and 60 years of age who underwent hip arthroscopy from Apr. 1, 2006, to Mar. 31, 2016, were eligible for inclusion. We excluded patients with missing or invalid data for age or sex, those for whom a matching physician billing record was not available and those who had undergone prior hip surgery (arthroscopy before or after the observation period, open hip preservation procedures) (Appendix 1, available at www.canjsurg.ca/lookup/doi/10.1503/cjs.025020/tab-related-content).

We collected baseline variables including age, sex, income quintile and Charlson Comorbidity Index (CCI) score using a 2-year look-back period.[12] We also recorded laterality, a diagnosis of OA (using *International Statistical Classification of Diseases and Related Health Problems*, 10th revision [ICD-10] diagnostic codes for coxarthrosis [M160–M169]), rheumatoid arthritis or diabetes, same-day procedures, surgeon and institution annual volume, surgeon experience (years since medical school graduation) and the teaching status of the institution. Additionally, we collected data on the number of orthopedic and family physician visits each patient attended in the year before arthroscopy for our regression analysis.

Data sources

Data sources for this study included the Canadian Institute for Health Information's Discharge Abstract Database and Same Day Surgery (CIHI-DAD and CIHI-SDS), including hospital-based admissions for diagnostic and surgical procedures; the Ontario Health Insurance Plan (OHIP), containing physician fee-for-service billing requests for patient encounters and procedures; the Registered Persons Database (RPDB), for demographic information including age, sex and geographic location; the Ontario Rheumatoid Arthritis Dataset (ORAD); the Ontario Diabetes Database (ODD); and the ICES Physician Database (IPDB). Data sets were linked using unique, encoded identifiers. A full list of the codes used is provided in a supplemental table (Appendix 1).

The use of these data was authorized under section 45 of Ontario's *Personal Health Information Protection Act*, which permits prescribed entities, such as ICES, to conduct research without review by a research ethics board; thus, patient consent was not required. Our reporting follows the guidelines of the Reporting of Studies Conducted using Observational Routinely-collected Health Data (RECORD) statement.[38]

Outcomes

Patients were followed for 2 years following arthroscopy to evaluate the need for revision surgery (Appendix 1). We additionally captured secondary surgery for up to 5 years for patients whose index procedure occurred before Apr. 1, 2013. Patients were considered to have received revision surgery only if their reoperation occurred more than 90 days after their initial surgery; reoperations within 90 days were considered to have been performed to address surgical complications. Event rates were reported for the entire cohort and for 2 defined age cohorts (18–39 and 40–60 yr). We further subcategorized the results, presenting rates for patients aged 40–49 and 50–60 years to highlight differences within the older age cohort.

Rates of postoperative complications, including major operative complications within 30 days, postoperative emergency department (ED) visits, orthopedic surgeon visits and readmission to hospital within 14 days, intensive care unit admission (during surgical admission), and reoperation within 90 days were collected.

Statistical analysis

Demographic information was summarized and reported for the overall cohort but also for the age-specific cohorts. Comparisons between age cohorts were performed using one-way analysis of variance for continuous variables and χ^2 tests for categorical or binary variables. Standardized differences were also calculated. A standardized difference greater than 0.10 can be interpreted as a potentially meaningful between-group difference.[13] We reported the number

Table 1. Baseline characteristics of patients undergoing hip arthroscopy between 2006 and 2016					
	No. (%) of patients*; age				
Characteristic	Overall *n* = 1906	18–39 yr *n* = 1088	40–60 yr *n* = 818	Standardized difference	*p* value
Age, yr, mean ± SD	36.70 ± 10.92	28.84 ± 6.68	47.16 ± 5.19		
Male sex	841 (44.1)	512 (47.1)	329 (40.2)	0.14	0.003
Income quintile†					
1 (lowest)	253 (13.3)	166 (15.3)	87 (10.6)	0.14	0.049
2	309 (16.2)	180 (16.5)	129 (15.8)	0.02	
3	367 (19.3)	201 (18.5)	166 (20.3)	0.05	
4	468 (24.6)	262 (24.1)	206 (25.2)	0.03	
5 (highest)	504 (26.4)	275 (25.3)	229 (28.0)	0.06	
Charlson Comorbidity Index score†					
0	1860 (97.6)	1073 (98.6)	787 (96.2)	0.15	0.003
1	34 (1.8)	≤ 15	≤ 25	0.1	
2	≤ 10	≤ 5	7 (0.9)	NR	
≥ 3	≤ 5	0 (0.0)	≤ 5	NR	
Rheumatoid arthritis†	≤ 20	≤ 5	14 (1.7)	NR	0.006
Osteoarthritis	123 (6.5)	39 (3.6)	84 (10.3)	0.27	< 0.001
Diabetes	66 (3.5)	25 (2.3)	41 (5.0)	0.15	0.001
No. of preoperative orthopedic surgeon visits					
0	478 (25.1)	281 (25.8)	197 (24.1)	0.04	0.07
1	575 (30.2)	342 (31.4)	233 (28.5)	0.06	
2	432 (22.7)	248 (22.8)	184 (22.5)	0.01	
≥ 3	421 (22.1)	217 (19.9)	204 (24.9)	0.12	
No. of family physician visits					
0	119 (6.2)	65 (6.0)	54 (6.6)	0.03	0.40
1	183 (9.6)	115 (10.6)	68 (8.3)	0.08	
2	209 (11.0)	117 (10.8)	92 (11.2)	0.02	
≥ 3	1395 (73.2)	791 (72.7)	604 (73.8)	0.03	
Teaching hospital	1589 (83.4)	901 (82.8)	688 (84.1)	0.03	0.45
Institution annual volume	58.30 ± 31.55	58.38 ± 31.19	58.21 ± 32.03	0.01	0.91
Surgeon annual volume	71.64 ± 64.28	70.53 ± 59.01	73.11 ± 70.72	0.04	0.39
Surgeon experience, yr	14.66 ± 4.75	14.86 ± 4.75	14.39 ± 4.74	0.1	0.032

NR = not reported; SD = standard deviation.
*Unless indicated otherwise.
†Data not shown for groups with small numbers of patients.

of hip arthroscopies per year over the study period, stratified by sex and age cohorts.

A multivariable logistic regression model was used to evaluate the association between chosen predictors and secondary surgery, adjusting for patient age, sex, OA and surgeon experience and surgeon annual volume. All statistical analyses were performed using SAS Enterprise Guide version 7.15 (SAS Institute), with an α set at 0.05.

Results

Demographic characteristics

We identified 1906 patients who underwent hip arthroscopy during the observation period. Of those, 818 (42.9%) were between the ages of 40 and 60 years and 1088 (57.1%) were between the ages of 18 and 39 years.

The mean age of the entire cohort was 36.70 (standard deviation [SD] 10.92) years (Table 1). A total of 841 patients (44.1%) were men. There was a significantly greater proportion of women in the cohort of patients aged 40–60 years than in the cohort of patients aged 18–39 years (59.8% v. 52.9%, $p = 0.003$, standardized difference 0.14). There was a significantly larger proportion of patients in the lowest income quintile in the younger cohort than in the older cohort (15.3% v. 10.6%, $p = 0.049$, standardized difference 0.14). Overall, there was a notable difference in the distribution of patients across income quintiles, with the majority of patients being in the higher income quintiles (51.0% in the top 2 quintiles v. 29.5% in the bottom 2 quintiles).

There was a difference in the CCI score between the cohorts: there was a smaller proportion of patients with a score of 0 in the cohort of patients aged 40–60 years than in the cohort of patients aged 18–39 years (96.2% v. 98.6%, $p = 0.003$, standardized difference 0.15).

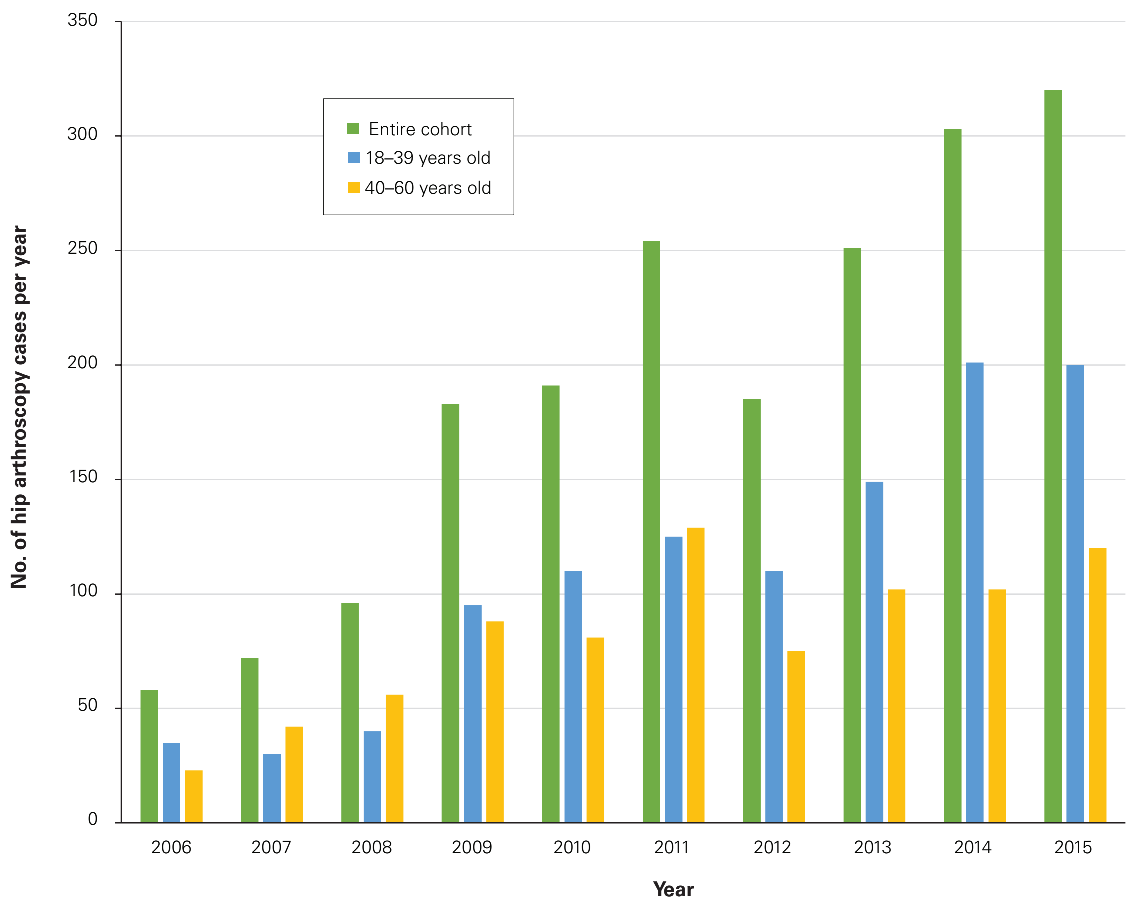

Fig. 1. Number of hip arthroscopy cases performed per year for the entire cohort and for patients aged 18–39 and 40–60 years.

Table 2. Outcomes for revision surgery at 2 and 5 years, by sex and age

Outcome	No. (%) of patients;* sex or age				
		Sex		Age	
	Overall *n* = 1906†	Male *n* = 841†	Female *n* = 1065†	18–39 yr *n* = 1088†	40–60 yr *n* = 818†
Secondary surgery	123 (6.5)	46 (5.5)	77 (7.2)	35 (3.2)	88 (10.8)
2-year follow-up					
Repeat hip arthroscopy	35 (1.8)	10 (1.2)	25 (2.3)	25 (2.3)	10 (1.2)
Total hip arthroplasty	88 (4.6)	36 (4.3)	52 (4.9)	10 (0.9)	78 (9.5)
5-yr follow-up†	156/1033 (15.1)	68/447 (15.2)	88/586 (15.0)	44/539 (8.2)	112/494 (22.7)
Repeat hip arthroscopy	42 (4.1)	14 (3.1)	28 (4.8)	30 (5.6)	12 (2.4)
Total hip arthroplasty	114 (11.0)	54 (12.1)	60 (10.2)	14 (2.6)	100 (20.2)
Postoperative event (cumulative)	129 (6.8)	65 (7.7)	64 (6.0)	74 (6.8)	55 (6.7)
Major complication	12 (0.6)	≤ 10	≤ 5	6 (0.6)	6 (0.7)
Emergency department visit	89 (4.7)	41 (4.9)	48 (4.5)	54 (5.0)	35 (4.3)
Readmission to hospital	38 (2.0)	18 (2.1)	20 (1.9)	18 (1.7)	20 (2.4)
Intensive care unit admission‡	≤ 5	≤ 5	0 (0.0)	≤ 5	≤ 5
Reoperation‡	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5
No. of orthopedic surgeon visits					
Mean ± SD	0.41 ± 0.55	0.44 ± 0.57	0.38 ± 0.52	0.44 ± 0.56	0.37 ± 0.53
Median (IQR)	0 (0–1)	0 (0–1)	0 (0–1)	0 (0–1)	0 (0–1)

IQR = interquartile range; SD = standard deviation.
*Unless indicated otherwise.
†The number of patients eligible for secondary surgery at 5-year follow-up in each group was lower than the total number of patients in that group; the denominators are shown.
‡Data not shown for groups with 5 or fewer patients.

Table 3. Outcomes for revision surgery at 2 and 5 years within the 40- to 60-year-old cohort

Outcome	No. (%) of patients;* age 40–49 yr *n* = 559†	50–60 yr *n* =259†
Secondary surgery	51 (9.1)	37 (14.3)
2-year follow-up		
Repeat hip arthroscopy	10 (1.8)	0 (0.0)
Total hip arthroplasty	41 (7.3)	37 (14.3)
5-year follow-up†	73/340 (21.5)	39/154 (25.3)
Repeat hip arthroscopy	12 (3.5)	0 (0.0)
Total hip arthroplasty	61 (17.9)	39 (25.3)
Postoperative event (cumulative)	32 (5.7)	23 (8.9)
Major complication	≤ 5	≤ 5
Emergency department visit	20 (3.6)	15 (5.8)
Readmission to hospital	12 (2.1)	8 (3.1)
Intensive care unit admission	≤ 5	0 (0.0)
Reoperation	0 (0.0)	≤ 5
No. of orthopedic surgeon visits		
Mean ± SD	0.38 ± 0.53	0.35 ± 0.52
Median (IQR)	0 (0–1)	0 (0–1)

IQR = interquartile range; SD = standard deviation.
*Unless indicated otherwise.
†The number of patients eligible for secondary surgery at 5-year follow-up in each group was lower than the total number of patients in that group; the denominators are shown.

Table 4. Comparison of outcome rates for secondary surgery between sex and age cohorts

Outcome	*p* value; comparison groups Men v. women	18–39 v. 40–60 yr	40–49 v. 50–60 yr
2-yr follow-up*	0.12	< 0.001	0.027
Repeat hip arthroscopy	0.06	0.08	0.03
Total hip arthroplasty	0.53	< 0.001	0.002
5-yr follow-up*	0.93	< 0.001	0.34
Repeat hip arthroscopy	0.18	0.011	0.018
Total hip arthroplasty	0.35	< 0.001	0.06

*All secondary surgeries (repeat hip arthroscopy and total hip arthroplasty) at this time point.

More patients aged 40–60 years had a diagnosis of hip OA than in the younger cohort (10.3% v. 3.6%, $p < 0.001$). Additionally, there was a higher rate of diabetes (5.0% v. 2.3%, $p = 0.001$) in the older cohort.

There were no significant differences in the number of preoperative orthopedic surgeon visits ($p = 0.07$) and family physician visits ($p = 0.40$) between the 2 cohorts. There were also no significant differences in the proportion of cases performed in teaching hospitals, nor were there differences in institutional or annual surgeon volumes. Surgeon experience differed between cohorts, with the surgeons of patients in the younger cohort having more clinical experience than those of patients in the older cohort, although the difference was small (14.86 [SD 4.75] yr v. 14.39 [SD 4.74] yr, $p = 0.03$).

Outcomes

The number of arthroscopy cases per year increased significantly over the observation period (fiscal year linear trend, $p < 0.001$), by 470% (Figure 1). Outcome rates at 2 and 5 years are presented in Table 2, along with a comparison of the rates for revision arthroscopy versus conversion to THA. For the entire cohort, 6.5% of patients had had revision surgery at 2 years and 15.1% at 5 years (Table 2). The rates of revision surgery for the cohort of patients aged 40–60 years and its 2 subgroups (40–49 and 50–60 yr) are presented in Table 3.

There were no significant differences in reoperation rates between the sexes (Table 4). Comparing the age cohorts, rates of revision surgery were significantly higher in patients aged 40–60 years than in those aged 18–39 years at both 2 (10.8% v. 3.2%, $p < 0.001$) and 5 years (22.7% v. 8.2%, $p < 0.001$). Further comparisons between subgroups within the cohort of patients aged 40–60 years demonstrated significantly higher rates of reoperation for patients aged 50–60 years than for those aged 40–49 years at 2-year follow-up (14.3% v. 9.1%, $p = 0.027$), while rates between these subgroups equalized at 5-year follow-up (25.3% v. 21.5%; $p = 0.34$).

Overall, complication rates were similar in the 2 cohorts, with 6 patients per cohort experiencing a major complication (0.6% and 0.7%, respectively; $p = 0.77$). Major complications included acute renal failure, new-onset hemodialysis, sepsis, blood transfusion, atrial fibrillation or flutter, shock, stroke, pneumonia, myocardial infarction, cardiac or respiratory arrest, coma, extended ventilator use, venous thromboembolism and unplanned return to the operating room. The younger cohort had 54 acute postoperative ED visits (5%), whereas the older cohort had 35 visits (4.3%; $p = 0.51$). Readmission rates were also comparable, with 18 (1.7%) in the younger cohort and 20 (2.4%) in the older cohort ($p = 0.25$). Both groups had 5 or fewer postoperative intensive care unit admissions or acute reoperations within 90 days. Finally, the number of postoperative visits to their orthopedic specialist was comparable between the cohorts (Table 2).

Prognostic factors for revision surgery

Multivariable regression analysis was used to determine prognostic factors for revision surgery (Table 5). Compared with patients aged 18–39 years, those aged 40–49 years had significantly higher odds of secondary surgery at both 2 years (odds ratio [OR] 2.68, 95% confidence interval [CI] 1.70–4.22, $p < 0.001$) and 5 years (OR 2.82, 95% CI 1.87–4.25, $p < 0.001$) (Table 5). Similarly, patients aged 50–60 years had significantly higher odds of secondary surgery at both 2 years (OR 4.39, 95% CI 2.67–7.22, $p < 0.001$) and 5 years (OR 3.44 95% CI 2.11–5.62, $p < 0.001$) than those aged 18–39 years (Table 5).

Table 5. Results from post hoc regression model predicting secondary surgery within 2 and 5 years for the full cohort

Covariate	2-year follow-up OR (95% CI)	2-year follow-up *p* value	5-year follow-up OR (95% CI)	5-year follow-up *p* value
Age				
40–49 v. 19–39 yr	2.68 (1.70–4.22)	< 0.001	2.82 (1.87–4.25)	< 0.001
50–60 v. 19–39 yr	4.39 (2.67–7.22)	< 0.001	3.44 (2.11–5.62)	< 0.001
Sex (male v. female)	0.77 (0.52–1.15)	0.20	1.05 (0.73–1.51)	0.79
Osteoarthritis	2.41 (1.39–4.20)	0.002	1.76 (1.00–3.09)	0.049
Surgeon years of experience	1.01 (0.97–1.05)	0.68	1.00 (0.96–1.04)	0.82
Surgeon annual volume	1.00 (0.99–1.00)	0.18	1.00 (1.00–1.00)	0.99

CI = confidence interval; OR = odds ratio.

In addition to age, a concomitant diagnosis of OA was associated with higher odds of requiring secondary surgery at both 2 years (OR 2.41, 95% CI 1.39–4.20, $p = 0.002$) and 5 years (OR 1.76, 95% CI 1.00–3.09, $p = 0.049$) (Table 5). Patient sex, surgeon experience and surgeon annual volume were not found to be significant (Table 5).

Discussion

Hip arthroscopy utilization rates in Ontario increased significantly from 2006 to 2016, irrespective of patient age. Among 1906 patients identified, the cumulative reoperation rates were 6.5% and 15.1% at 2 and 5 years. More interestingly, the reoperation rate among patients aged 40–60 years was 10.8% and 22.7% at 2 and 5 years, demonstrating that they had a significantly higher risk than patients aged 18–39 years (3.2% and 8.2%, respectively). Regression analyses identified that increasing age and a diagnosis of OA both significantly increased the odds of requiring revision surgery.

We identified a 470% increase in annual hip arthroscopy volumes over the 10-year study period, which is 1 of the first population-based reports of volume trends for this procedure in Canada. The trends in utilization are comparable to those reported in multiple population-based studies in the United States, with rates increasing as much as 750% in New York State over 15 years.[14]

We identified similar increases in procedural utilization in both age cohorts. Similar to other studies, arthroscopy rates among patients aged 40 years and older continue to increase.[15,16] In fact, Sing and colleagues found that patients aged 40–49 years had the highest incidence of arthroscopic procedures.[16] Additionally, they found that patients aged 50–59 years had a higher procedural incidence than those aged 20–29 years, despite a high rate of conversion to THA within 2 years (17.1%).[16] These trends are concerning; it appears that there is poor knowledge translation from studies reporting increasing age as a negative prognostic factor for arthroscopy, the first of which was published as early as 2011.[9,17–20] These results also appear to be in contrast to the practice of high-volume arthroscopists, as reported by Schairer and colleagues.[21] In their study, they noted that higher-volume surgeons (> 164 cases/yr) tended to operate on younger patients (average age 31.7 yr v. 36.2 and 37.9 yr for lower-volume tiers), reflecting improved patient selection.[21]

Reoperation rates for the entire hip arthroscopy cohort (6.5% at 2 yr, 15.1% at 5 yr) were consistent with those reported in other large database studies. Harris and colleagues reported a 6.3% reoperation rate at an average of 16 months from their review of 92 studies including more than 6000 patients.[22] Degen and colleagues reported higher early failure, or reoperation, rates (13% at 1.7 yr) for a cohort analysis of patients from New York State, but they noted comparable reoperation rates at 5 years (19.3%).[23] Ten-year failure (reoperation) rates were estimated to be 25.1% in this study.

Focusing on the cohort of patients aged 40–60 years, we were able to specifically report risks of THA conversion at 2 years (9.5%) and 5 years (20.2%). Interestingly, the rate of THA conversion at 2 years was substantially lower in our cohort for both the subgroup aged 40–49 years (7.3% v. 16%) and the subgroup aged 50–59 years (14.3% v. 25.9%) compared with the results reported from a combined registry of California and Florida state patients.[24] However, other cohort studies reporting on patients 50 years of age and older identified similarly high 2-year THA conversion rates of 16%,[25] 17.1%[16] and 17.3%.[18] The unique aspect of our study is the ability to provide a risk of THA conversion at 5 years, found to be 17.9% for those aged 40–49 years and 25.3% for those aged 50–59 years. This information is helpful for having an informed conversation with patients about anticipated benefits and the potential need for reoperation.

Major postoperative complication rates (0.7%) were similar to those reported by Harris and colleagues and Cventanovich and colleagues.[22,26] Our readmission rate was found to be 2%, which was higher than that reported using National Surgical Quality Improvement Program (NSQIP) registry data in the United States (0.5%)[26] and National Health Services data from the United Kingdom (0.5%).[27] A unique aspect of this study is the reported rate of ED visits, found to be 4.7%. This relatively high rate of health care–seeking behaviour exposes a potential area for improved patient education or the need for improved access to outpatient surgical clinics to improve care for these patients and avoid unnecessary ED visits.

Finally, our regression model identified that age and OA were associated with an increased risk of reoperation. While this information has previously been reported,[6,10,20,28,29] these results better quantify the impact of these factors from a population-based cohort in a publicly funded single-payer health care system. Of all factors, we found that a diagnosis of OA most significantly contributed to the risk of reoperation and THA conversion.

Overall, the results from this study are helpful as they provide further information on quantifiable risk of reoperation for patients undergoing hip arthroscopy. They may also aid in patient selection, where younger patients without OA are likely to have lower rates of reoperation and improved longevity of their results. With advancements in the field of arthroplasty, specifically improved implant design and durability, we might better serve patients with risk factors for failure of arthroscopy by providing an early definitive THA rather than extending our surgical indications to inappropriate patients. Future research should focus on the efficacy of hip arthroscopy in this cohort compared with sham surgery, as well as definitive THA.

Limitations

There are several limitations for this study. First, it is an administrative database study, which introduces the risk of coding error. A potential concern is that the diagnosis of OA may only be reflective of the more severe cases, and therefore the strength of association with risk of reoperation may be overestimated. Additionally, there is a lack of information on procedural details so it is unclear how these may affect procedural durability and reoperation rates. For example, there are reports of improved outcomes and durability with labral repair or refixation compared with débridement,[30–32] which could be a confounding factor in this study. Continuing on this point, data collection was from 2006 to 2016; the study did not include data from more recent years that may reflect improved surgical instrumentation to facilitate labral preservation. However, if we had included recent data we would not have been able to calculate 2- and 5-year survivorship. Future studies are necessary to address changes in survivorship between different observation periods. Additionally, septic arthritis cases were not specifically excluded and may have contributed to a minor increase in failure rates. A further limitation was that complication data did not include minor complications diagnosed in an outpatient clinical setting, and thus we may have underestimated true complication rates. Follow-up was also limited to 5 years, which may be insufficient to gauge the durability of hip arthroscopy. Further, as alluded to above, patient-reported outcome measures were not available and results cannot be extrapolated to predict clinical success or improvement in outcome scores. Lastly, the reason for revision surgery was also not available from the CIHI databases. As a whole, large-scale databases need to be improved to allow for the collection of more granular data on a case-by-case basis, to ensure that the conclusions derived from these largely powered studies remain clinically relevant.

Conclusion

This study provides useful information on the cumulative and age-specific reoperation rates, including secondary arthroscopy and THA, in a small population of patients from a publicly funded health care system. The rate of secondary procedures increased with advancing age and concomitant OA. These population-based data have several limitations but provide helpful information to guide surgical decision-making.

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