Exploring the Age-Dependent Risk of Total Knee Arthroplasty Following Partial Meniscectomy- A Retrospective Database Analysis

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INTRODUCTION:

Partial meniscectomy is a common procedure performed on both younger and older patients who have failed conservative treatment and exhibit mechanical symptoms. Older patients, in particular, may undergo this procedure as part of managing a meniscus tear, which can be associated with the arthritic process leading to end-stage osteoarthritis and the need for total knee arthroplasty (TKA). This study aims to answer the following questions: (1) What is the incidence of conversion to TKA at 1 year, 2 years, 5 years, and 10 years post-partial meniscectomy across different age groups? (2) Is What is the age-dependent risk of conversion to TKA following partial meniscectomy?

METHODS:

A retrospective analysis was conducted using the Pearldiver database, which contains records of over 42 million inpatient and outpatient cases. Since the data is deidentified, ethical board approval was not required. Using CPT codes, patients presenting with meniscectomies for the first time (CPT-29881, CPT-29880) were queried, excluding those with concurrent claims for ACL (CPT-29888), PCL (CPT-29889), meniscus repair (CPT-29882/29883), abrasion chondroplasty (CPT-29877), synovectomy (CPT-29876), loose body removal (CPT-29874), microfracture (CPT-29879), allograft OATS (CPT-27415), ACI (CPT-27412), PLC reconstruction (CPT-27427), and MCL reconstruction (CPT-27428), as well as patients with rheumatoid arthritis (ICD 9-714.0). Patients were followed for 1, 2, 5, and 10 years, and claims of TKA following meniscectomy within the specified periods were isolated. Using Pearldiver's laterality bucket claims to match the laterality were ensured. Patient records were stratified into 10-year age groups, ranging from under 20 to over 80 years, and TKA claims occurring after meniscectomy claims were filtered. The primary outcome included the incidence of TKA following meniscectomies within 1, 2, 5, and 10 years. The secondary outcome included identifying age as a risk factor associated with TKA. Given the wide variation in age cohort sizes, proportions of the population were matched, and a regression analysis was conducted to determine if having a claim of TKA within 10 years of a meniscectomy was associated with a particular age cohort. The 21-30 years age group was used as the reference group, and adjustments were made for gender, ECI score, insurance coverage, geographical region, mean family income, and an associated claim of obesity.

RESULTS:

The data indicates a progressively increasing rate of TKA over time following a meniscectomy. At 1 year post-meniscectomy, the conversion rate to TKA was 3.17%. This rate increased to 4.85% at 2 years, 6.46% at 5 years, and 6.73% at 10 years (Table. 1). The data shows that the risk of conversion to TKA increases with age. The age group 21-30 years served as the reference group. Each increasing age group had dramatically larger odds of undergoing TKA compared with prior younger age group. The 31-40 years age group had an odds ratio (OR) of 7.30 (95% CI: 4.66, 11.44; $p < 0.05$), 41-50 years OR 25.70 (95% CI: 16.5. 39.8; $p < 0.05$), 51-60 years age group OR 43.95 (95% CI 28.3, 68.1; $p < 0.05$), 61-70 years age group OR 55.52 (95% CI: 35.7, 86.1; $p < 0.05$), with 71-80 years age group peaking with an OR of 63.85 (95% CI: 42.3, 102.56; $p < 0.05$). Even in the oldest age group (>80 years), the risk remained significantly elevated with an OR of 45.19 (95% CI: 29.37, 73.73; $p < 0.05$).

DISCUSSION AND CONCLUSION:

The study reveals that the risk of conversion to TKA following partial meniscectomy increases over time, with a conversion rate of 6.73% at 10 years. This risk is significantly higher in older age groups, peaking in the 71-80 years cohort (OR: 63.85, $p < 0.05$), and remains substantial even in those over 80 years (OR: 45.19, $p < 0.05$). While these findings identify associations rather than causal relationships, it is important to underscore the need for age-specific counseling and arthroplasty risk for patients undergoing meniscectomy.

Table 1. Risk of conversion to TKA following prior meniscectomy based on year of follow-ups

Year of Follow-up	Total Menisectomies	Total TKA following Menisectomies	Percentage conversion to TKA (%)
1 Year	592,832	18,811	3.17%
2 Years	599,957	29,091	4.85%
5 Years	602,856	38,939	6.46%
10 Years	602,962	40,576	6.73%

Table 2. Age-associated risk of conversion to TKA within 10 years of undergoing meniscectomy

Age group (years)	Menisectomies (n)	TKA (n)	Risk Percentage (%)	Odds Ratio [Confidence Interval]	P-value
<21	14,288	0	0	-	
21-30	21,680	23	0.11	**Reference**	
31-40	43,832	469	1.07	7.30 [4.66, 11.44]	<0.05
41-50	124,606	4,948	3.97	25.70 [16.5, 39.89]	<0.05
51-60	244,693	15,728	6.43	43.95 [28.34, 68.18]	<0.05
61-70	230,426	17,135	7.44	55.52 [35.79, 86.12]	<0.05
71-80	110,491	8,603	7.79	63.85 [42.3, 102.56]	<0.05
>80	19,250	656	3.41	45.19 [29.37, 73.73]	<0.05