Factors Associated with Meniscal Repair versus Partial Meniscectomy in Children and Adolescents from 2012 to 2022

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Meniscus injuries are common in children and adolescents, and surgical treatment usually involves meniscus repair (MR) or partial meniscectomy (PM). The meniscus is an important stabilizer of the knee, and thus preserving it when possible is preferred. While some factors such as injury characteristics and tear pattern typically dictate the decision to proceed with MR as opposed to PM, there may be additional factors that influence treatment decisions.

It has been shown that socioeconomic status, race, and gender, amongst other factors, impact the treatment for knee injuries. However, there is less evidence to support the identification of factors that contribute to the increased rate of MR, particularly over the past decade. The aim of this study was to investigate the association of patient- and facility-level factors with the decision to proceed with MR as opposed to PM in pediatric patients in New York State.

Patients under the age of 18 years old who underwent PM (CPT: 29880, 29881), MR (CPT: 29882, 29883), or anterior cruciate ligament reconstruction (ACLR) (CPT: 29888) in New York State between 2012 and 2022 were identified utilizing the Statewide Planning and Research Cooperative System (SPARCS) database. Multivariable mixed-effects logistic regression models, with a random effect at the facility level, were estimated to investigate the association between the surgical management option and patient, socioeconomic, and payor factors. The facility volume was defined by the quartile of the number of operations performed by a facility in a given year. Patient level variables included gender, age, race, ethnicity, Elixhauser comorbidities, and whether or not a concomitant ACL injury was present. ZIP code based socioeconomic variables from the American Community Survey and Rural-Urban Commuting Area Codes included median estimated household income, education level of bachelor's degree or higher, urban status, and percent without health insurance coverage.

RESULTS:

From 2012 to 2022, there were a total of 17,676 patients identified, 5,940 (33.6%) who underwent MR and 11,736 (66.4%) who underwent PM. The patient population consisted of 43.5% girls and 56.5% boys. Non-Hispanic white patients comprised 59.6% of the total patient population. Of patients undergoing concomitant ACLR, 56.1% had MR. The average age of pediatric patients undergoing PM was 15.5 (SD: 13.7, 17.3) years compared to 15.2 (SD: 13.3, 17.0) years for MR patients.

At the patient level, there were no associations of gender, ethnicity, Elixhauser comorbidities, or primary payor with the odds of MR. At the ZIP code level, percent bachelor's degree, median estimated household income, and patient urbanicity were not associated with odds of MR. Additionally, facility volume was not associated with odds of MR.

Having a concomitant ACLR procedure significantly increased the odds of MR (OR 2.21, CI [2.05, 2.38], p<0.001). Relative to non-Hispanic white patients, non-Hispanic Black patients had lower odds of MR, with odds of 0.87 (CI [0.76, 0.99], p<0.05). The odds of MR significantly decreased as the patient age increased. Relative to children ages 14 and younger, the odds were 0.75 (CI [0.67, 0.84], p<0.001) for age 15, 0.66 (CI [0.60, 0.74], p<0.001) for age 16, and 0.59 (CI [0.53, 0.65], p<0.001) for age 17.

Within a patient's ZIP code, the percent of the population without health insurance coverage was associated with lower odds of MR (OR 0.988, CI [0.976, 0.999], p<0.05). Over the ten-year period, the odds of MR began significantly increasing in 2016, with odds of 1.35 (CI [1.13, 1.62], p<0.01) relative to 2012, and continued to increase each year reaching an odds of 2.61 (CI [2.16, 3.16], p<0.001) in 2022.

DISCUSSION AND CONCLUSION:

This study identified patient and socioeconomic level factors that may have contributed to a surgeon's decision to perform MR instead of PM between 2012 and 2022 amongst pediatric patients. Patients with concomitant ACLR demonstrated an increased odds of undergoing a MR, while non-Hispanic Black patients and older adolescent patients had lower odds of undergoing MR. Gender, ethnicity, comorbidities, primary payor, facility volume, as well as ZIP code level factors including percent bachelor's degree and higher, median estimated household income, and patient urbanicity did not impact the odds of MR.

The underlying reasons for these findings have not been fully explored. It is possible that minority patients may not have access to the same level of care, or have a delayed initial presentation to care after injury. Ultimately, it is important to

identify vulnerable patient level factors and communities at risk for disparate care following meniscus injury and subsequent management thereof. Future work should seek to further investigate this.