Risk Factors for Developing Arthrofibrosis following Anterior Cruciate Ligament Reconstruction in Pediatric Patients

Jordan Murphy[1], Caleb Lavigne, Alec Rush, MD, Albert Martin Pendleton
[1]Atlanta Medical Center

INTRODUCTION:

Arthrofibrosis is a fibrotic joint disorder that begins as an inflammatory reaction to injury, surgery, or infection resulting in restricted joint motion and pain. Risk factors currently associated with the development of postoperative arthrofibrosis include female sex, type of graft utilized, and quicker time to reconstruction. These patients have typically benefitted from manipulation under anesthesia or arthroscopic lysis of adhesions. In pediatric patients who have an anterior cruciate ligament (ACL) reconstruction, there have been multiple studies describing the rates of arthrofibrosis, the association with female sex, concomitant procedures performed and type of graft utilized. The purpose of this study is to determine the rate of arthrofibrosis in pediatric patients who previously underwent ACL reconstruction as well as attempt to identify additional risk factors.

METHODS:

This is a retrospective chart review looking at patients less than or equal to 18 years old who underwent ACL reconstruction by a single surgeon between 2013 and 2023. Data collection included name, age at time of surgery, zip code, BMI/weight, ACL reconstruction technique including graft type, concomitant meniscal or ligamentous pathology, whether it was a revision ACL, use of a Dynasplint, need for revision surgery for arthroscopic lysis of adhesions vs. manipulation under anesthesia. Descriptive statistics are reported as means and standard deviations for continuous variables and as frequencies and percentages for categorical variables. Univariate analysis and multivariable analysis was performed for means of comparisons, with a p-value <0.05 being considered statistically significant. IRB approval was obtained prior to the onset of this study.

RESULTS:

A total of 618 patients 18 years old or younger were identified after undergoing ACL reconstruction and included in this study. Twenty (3.24%) of patients required reoperation for development of arthrofibrosis. There were no significant differences in terms of demographic data between the two cohorts when comparing age, side of injury, gender, BMI, weight, or time to final follow up. Average time to reoperation was 232.6±122.6 days. Patients requiring reoperation for arthrofibrosis were statistically more likely to have used a Dynasplint preoperatively (60% vs. 2.84%, p <0.001), as well as have worse knee flexion (124.6±8.3 vs. 129.1±6.5; p = 0.003) and extension (5±8.5 vs. 0.4±2.3; p <0.001) on final clinical exam. Graft type did not have a significant impact on arthrofibrosis rates. The use of an all inside technique was associated with a higher rate of arthrofibrosis, however, this difference was not found to be statistically significant (70% vs. 51.7%, p = 0.1065). There were no significant findings in terms of associated injuries (i.e., meniscal or other ligamentous pathology) with rate of arthrofibrosis. Postoperative superficial wound infection dehiscence was associated with development of arthrofibrosis (10% vs. 1%, p < 0.001).

DISCUSSION AND CONCLUSION:

Arthrofibrosis is an uncommon complication following ACL reconstruction, often times requiring reoperation. Despite interventions aimed at improving range of motion in these patients, final flexion and extension remains significantly decreased. There is no association between demographics, graft type, or concomitant knee pathology with development of arthrofibrosis. Postoperative wound dehiscence and the secondary requirement of immobilization while the wound heals was associated with a higher rate of developing arthrofibrosis.

		Pediatric ACL Patients Who Developed Arthrofibrosis	Pediatric ACL Patients Without Arthrofibrosis	*p-value*
Age		15.8±2.5	15.42±1.93	*0.3919*
Extremity	*Right*	11 (55%)	307 (51.3%)	*0.7474*
	Left	9 (45%)	291 (48.7%)	
Gender	*Male*	8 (40%)	339 (56.7%)	*0.1393*
	Female	12 (60%)	259 (43.3%)	
BMI		29.02±6.6	26.59±6.28	*0.4482*
Weight		181.32±57.46	168.49±46.11	*0.2374*
Final Follow up (months)		11.48±6.68	8.97±6.45	*0.0882*
Final Flexion (°)		124.57±8.27	129.07±6.47	***0.0033***
Final Extension (°)		5±8.51	0.41±2.25	***<0.001***

Graft Type	Pediatric ACL Patients Who Developed Arthrofibrosis	Pediatric ACL Patients Without Arthrofibrosis	*p-value*
Quadriceps	16 (80%)	474 (79.3%)	*0.9363*
Iliotibial Band	1 (5%)	31 (5.2%)	*0.9708*
Hamstring	2 (10%)	70 (11.7%)	*0.8150*
Hamstring with supplementation	0 (0%)	11 (1.8%)	*0.5408*
Patellar Tendon	0 (0%)	7 (1.2%)	*0.4589*
Allograft	0 (0%)	16 (2.7%)	*0.6265*

	Pediatric ACL Patients Who Developed Arthrofibrosis	Pediatric ACL Patients Without Arthrofibrosis	*p-value*
Meniscal Injury	13 (65%)	315 (52.7%)	*0.2773*
Ligamentous Injury	1 (5%)	18 (3.0%)	*0.6109*
PLC Repair	0 (0%)	6 (1.0%)	*0.6529*
MCL Repair	1 (5%)	12 (2.0%)	*0.3579*
PCL injury	0 (0%)	5 (0.8%)	*0.6816*