Early Manipulation under Anesthesia is Safe and Effective for the Management of Arthrofibrosis of the Knee after Arthroscopic Knee Ligament Reconstruction Surgery in Adolescent Patients

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INTRODUCTION:

Knee arthrofibrosis is an uncommon and dreaded complication following knee arthroscopy in adolescent patients. Management of arthrofibrosis can be challenging, and recent evidence suggests a stepwise approach that begins with diagnosis and treatment within the first 3 months after index surgery. However, few studies have reported on the safety and effectiveness of early (<3 months) manipulation under anesthesia (MUA) following knee arthroscopy in adolescent patients with arthrofibrosis. The purpose of this study is to evaluate the indications, complications and effectiveness associated with MUA for arthrofibrosis following common arthroscopic knee ligament reconstruction in adolescent patients. We hypothesize that patients who undergo early (<3 months) MUA will regain range of motion without the need for lysis of adhesions.

METHODS: A list of all ligamentous arthroscopic knee procedures between 2008-2021 was queried to identify patients who had undergone anterior cruciate ligament (ACL) reconstruction or medial patellofemoral reconstruction (MPFL). Patients who required MUA after index procedure were identified. Patients >18 years of age, revision cases, those who underwent lysis of adhesion without prior MUA, or staged multiligamentous knee reconstruction were excluded. Patients who met inclusion criteria were assessed for preoperative characteristics including age, body mass index, patient comorbidities, and associated injuries. Patellar height (Caton-Deschamps Index, CDI) was also assessed on lateral plain film radiographs. The primary outcome was the final ROM after MUA. Secondary outcomes were complications of MUA, including failure of MUA which was defined as the need for second MUA or lysis of adhesions.

RESULTS:

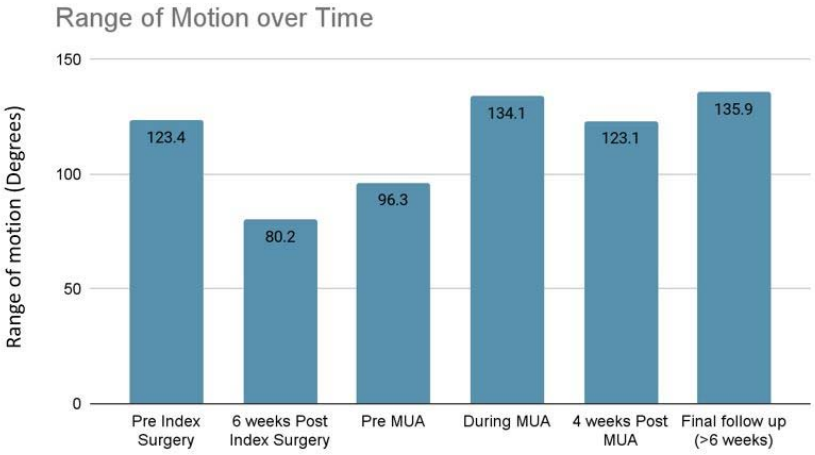
There were 940 ACL reconstructions and 1,267 MPFL reconstructions during the study period. Of these, 21 (2.2%) ACL patients and 22 (1.7%) underwent MUA for arthrofibrosis. After exclusion of patients, a sample of 25 (10 ACL and 15 MPFL) were included for analysis. The average age was 14.7±2.5, 52.0% were female and average BMI was 24.3±6.2Kg/m2. At the time of index surgery, most patients (64%) required concomitant procedures including meniscus debridement/repair, chondroplasty/microfracture, or osteochondral fixation. All patients were allowed to weight bear as tolerated in knee immobilizer after surgery and followed standard postoperative protocols with early physical therapy and periodic clinical follow up. Patients underwent MUA at a mean 63.7±18.9 days after index surgery. Median follow up was 8.4 months (IQR 4.7-16.1) after MUA.

Analysis of ROM demonstrated significant differences in ROM over time (Figure 1). ROM achieved during MUA was significantly greater compared to 6 weeks post index surgery ($p<0.001$) and Pre MUA ROM ($p<0.001$). ROM improvement slightly declined at 4 weeks after MUA, but subsequently increased significantly at >6 weeks after MUA ($p=0.002$). Patellar height (CDI) decreased between index surgery and MUA, but this did not reach statistical significance (1.16±0.23 vs 0.94±0.17, $p=0.304$).

Only two patients (8.0%) were considered to have failed MUA treatment based on the need for second MUA or subsequent lysis of adhesions. One patient who underwent MPFL required lysis of adhesion (LOA) 5 months after MUA for ROM 10-100. This patient had a grade II chondral injury in the medial patellar facet that underwent debridement at time of index surgery. Final ROM after LOA was 0-120. The other patient who failed MUA had undergone an all epiphyseal ACL reconstruction and lateral meniscus debridement. After the first MUA patient had ROM of 40-100 and underwent a repeat MUA with subsequent extension casting. Final ROM at 16 months was 2-140.

DISCUSSION AND CONCLUSION:

The findings of this study suggest the prompt recognition of knee arthrofibrosis after knee arthroscopy can be safely and successfully managed with early MUA in adolescent patients. Mean time to MUA after index surgery was approximately two months, well below the recommended three month threshold for MUA/LOA reported in the literature. There were no complications associated with MUA. ROM achieved during MUA is likely the maximum ROM that patients will achieve, however it may take over 6 weeks after MUA to determine ultimate improvement in ROM. Only two patients (8.0%) required subsequent interventions with LOA or repeat MUA. Concomitant procedures such as meniscus debridement/repair and cartilage preservation techniques were common in this MUA population and may increase the risk of arthrofibrosis after ligamentous arthroscopic surgery. Ongoing efforts will aim to better characterize patient and treatment specific characteristics to help develop treatment algorithms for the management of postoperative arthrofibrosis in adolescent patients. However, early intervention (<3 months) of knee arthrofibrosis with MUA is a safe and effective treatment to help patients regain their range of motion after common ligamentous reconstruction procedures in adolescent patients


Range of Motion over Time
Range of motion (Degrees)
150
100
50
0
123.4
80.2
96.3
134.1
123.1
135.9
Pre Index Surgery
6 weeks Post Index Surgery
Pre MUA
During MUA
4 weeks Post MUA
Final follow up (>6 weeks)