Manipulation Under Anesthesia After Primary Total Knee Arthroplasty

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Stiffness after total knee arthroplasty (TKA) remains a frustrating complication for both patients and clinicians, affecting approximately 1.3-5.8% of patients undergoing TKA. Manipulation under anesthesia (MUA) with or without arthroscopic lysis of adhesions (LOA) remains the treatment of choice. We evaluated the outcomes of MUA or LOA following primary TKA and investigated the effect of patient demographic and perioperative variables on success or failure after each. METHODS:

This single-institution retrospective cohort study was performed on 654 patients (678 knees, 726 MUA/LOAs) who underwent an MUA with or without LOA after primary TKA between August 2016 and March 2024. This included 54 repeat interventions. Over 17,000 primary TKAs by 34 surgeons across 8 clinical sites at our institution were available for review. Any patients in the database who underwent MUA or LOA after primary TKA were included in the study. Exclusion criteria included revision TKA, previous incision and drainage, and neuromuscular disorders. Patient clinical history and demographics, perioperative variables, and postoperative outcomes were collected. Chi-squared and unpaired t-tests were used for categorical and continuous variables, respectively.

RESULTS:

Patients had an average follow-up of 263.8 ± 375.9 days. 605 patients underwent primary MUA and 67 primary LOA. Compared with LOA, MUA patients demonstrated higher rates of diabetes (22.5% vs 11.9%, *P*=0.046) but a similar incidence of cancer history and rheumatoid arthritis. MUA patients also demonstrated lower absolute values of knee flexion pre-TKA (111.2° vs 119.7°, *P*<0.001), preoperatively (84.8° vs 100.4°, *P*<0.001), intraoperatively (123.0° vs 129.4°, *P*<0.001) and postoperatively (106.1° vs 112.7°, *P*<0.001) but showed significantly greater gains in knee flexion at final follow-up (21.5° vs 13.0°) than LOA. For both MUA and LOA, nearly all gains in flexion were realized by the second postoperative visit at an average of 105.5 days. No differences in failures, including all-cause revision, failure to gain \geq 50% of flexion achieved intraoperatively, repeat MUA or LOA, or revision TKA for arthrofibrosis were observed.

While most patients (74.3%) underwent primary MUA/LOA <90 days after index TKA, MUA was consistently performed earlier than LOA (68.2 vs 165.2 days, P<0.001). 112 primary MUA and 61 primary LOA were performed >90 days after index TKA (Table 1). While MUA lost some effectiveness beyond 90 days, it was found to achieve similar gains in knee flexion (MUA 16.5° vs LOA 13.4°, P=0.239) with comparable complication profiles and was significantly less likely to lose flexion at final follow-up than LOA (2.9% vs 19.6%, P<0.001).

293 patients (40%) ultimately required repeat MUA/LOA, revision TKA for arthrofibrosis, or failed to gain \geq 50% of flexion achieved intraoperatively and were thus deemed unsuccessful. Compared with successful MUA/LOAs, those who had unsuccessful intervention were more likely to have a cruciate retaining implant (49% vs 35%, *P*<0.001), be slightly less healthy (Elixhauser Comorbidity Index 3.0 vs 2.5, *P*=0.009), and trended toward higher rates of current smokers (5.1% vs 8.5%, P=0.067). Patients who had unsuccessful intervention were more likely to have demonstrated loss of or no change in knee flexion at the first postoperative visit and failed to recover thereafter (Table 2).

DISCUSSION AND CONCLUSION:

We present the results of the largest single-institution study to date on the outcomes of MUA and LOA after primary TKA. MUA and LOA are reliable interventions for treating stiffness after primary TKA, achieving roughly 30° of knee flexion in successful cases and enjoy low complication rates. Patients undergoing MUA can be expected to have lower absolute knee flexion preoperatively and postoperatively but achieve greater gains in knee flexion than LOA. Consistent with available literature, MUA loses some effectiveness beyond 90 days after index TKA but supports similar results to LOA with less risk of loss of flexion and comparable complication profiles. Future directions will focus on evaluating patientreported outcome measures after MUA, the influence of community resources and socioeconomic status on outcomes after MUA/LOA, the utility of repeat MUA/LOAs, and the utility of revision component exchange for arthrofibrosis after failed MUA/LOA for arthrofibrosis.

	MUA	MUA + LOA	P-value		
	Demo	graphics			
n	112	61			
Age (years)	64.8±9.1	64.3 ± 10.2	N.S.		
Interval between Primary TKA and MUA/LOA (days)	119.9 ± 53.0	174.8±77.2	<0.001		
Absolute Knee Flexion (degrees)					
Pre-MUA/LOA	91.2 ± 11.7	101.6 ± 16.8	<0.001		
Intraoperative	121.7 ± 10.9	129.8 ± 12.7	<0.001		
1 st Postop Visit (~2.5 weeks)	103.8 ± 14.5	103.4 ± 13.2	N.S.		
2 nd Postop Visit (~12 weeks)	108.9 ± 13.7	114.1 ± 14.8	0.007		
Final Follow-up (~7 months)	107.6 ± 13.2	114.1 ± 15.9	0.010		
	∆ Knee Fle	xion (degrees)			
1# Postop Visit (~2.5 weeks)	13.1 ± 11.6	2.0 ± 14.0	<0.001		
2 nd Postop Visit (~12 weeks)	15.2 ± 11.1	13.4 ± 16.4	N.S.		
Final Follow-up (~7 months)	16.5 ± 11.5	13.4 ± 17.6	N.S.		
Lost flexion?	3 (2.9%)	11 (19.6%)	<0.001		
Gained flexion?	88 (84.3%)	43 (78.8%)	N.S.		
Flexion Unchanged?	13 (12.7%)	2 (3.6%)	N.S.		

	Successful MUA/LOA	Unsuccessful MUA/LOA	P-value
	Demogra	phics	
n	433	293	
Age (years)	62.94 ± 9.21	63.42 ± 9.33	N.S.
Interval between Primary TKA and MUA/LOA (days)	85.7 ± 70.5	89.1 ± 110.5	N.S.
ECI	2.5 ± 2.22	2.97 ± 2.64	0.009
Implant Type			
Cruciate Retaining	34.95%	49.32%	<0.001
Posterior Stabilized	47.45%	32.99%	<0.001
	Absolute Knee Fle	xion (degrees)	
Pre-MUA/LOA	85.9 ± 15.5	87.9 ± 15.5	N.S.
Intraoperative	123.3 ± 8.6	123.4 ± 11.3	N.S.
1st Postop Visit (~3 weeks)	103.1 ± 13.2	95.5 ± 14.5	<0.001
2nd Postop Visit (~15 weeks)	110.2 ± 11.5	96.7 ± 14.6	<0.001
Final Follow-up (~9 months)	114.7 ± 9.3	95.0 ± 14.3	<0.001
	∆ Knee Flexior	n (degrees)	
1ª Postap Visit (~3 weeks)	17.9 ± 14.0	7.6 ± 12.6	<0.001
Lost flexion?	21 (5.5%)	50 (17.4%)	<0.001
Gained flexion?	341 (88.6%)	193 (67.2%)	<0.001
Flexion Unchanged?	23 (6.0%)	44 (15.3%)	<0.001
2 nd Postop Visit (~15 weeks)	25.2 ± 14.1	8.5 ± 12.8	<0.001
Lost flexion?	6 (1.8%)	31 (15.9%)	<0.001
Gained flexion?	322 (96.7%)	138 (70.8%)	<0.001
Flexion Unchanged?	5 (1.5%)	26 (13.3%)	<0.001
Final Follow-up (~9 months)	29.3 ± 14.6	7.1 ± 11.8	< 0.001
Lost flexion?	6 (1.5%)	48 (16.6%)	<0.001
Gained flexion?	382 (97.7%)	199 (68.6%)	<0.001
Elexing Unchanged?	2 (0.8%)	43 (14 8%)	<0.001