Anterior Cruciate Ligament Tears: Impact of Delayed Presentation on Intra-Articular Injuries

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BACKGROUND

Previous studies provide evidence that risk of meniscus and articular cartilage injury increase with time in the ACL deficient knee[1-14]. The purpose of this study is to examine what intra-articular injuries occur related to the cartilage and meniscus in the setting of chronic ACL deficiency.

METHODS

A cross-sectional cohort study was conducted using a retrospective chart review for all patients who sustained an ACL injury and underwent reconstruction from January 1, 2009 to May 14, 2015. Demographic variables were age, gender, and BMI. Additionally variables recorded were time from injury to surgery in months, presence of medial meniscus tear (MMT), lateral meniscus tear (LMT), medial femoral condyle (MFC) injury, lateral femoral condyle (LFC) injury, medial tibial plateau (MTP) injury, lateral tibial plateau (LTP) injury, patellofemoral (PF) injury, chondroplasty performed, and microfracture performed. Data was analyzed to determine the association between delay of surgery and cartilage or meniscus injury as well as gender, BMI, and age at the time of presentation.

RESULTS

Four hundred and ten subjects were included in this study. The average age was 27 ± 8.8 years (range of 14-59 years) with a median of 26 years old. More than half of the study participants (58.5%) had a BMI >25. The majority of the study population were male (70.5%). More than half of the study participants received surgery within the first 6 months of injury: 27.3% patients were treated within 3 months of injury, 23.6% between 3-6 months, 18% between 6-12 months, 24.1 % between 12-60 months, and 6.9% >60 months.

Demographic Risk Factors

Male gender and older age were significant predictive factors for delaying ACL surgery (P < .01). Male gender was significantly associated with a higher presence of LMT (P < .001) and LFC injury (P< .05). Males were 2.3 times more likely than females to have a LMT and 3.2 more times likely to have an LFC injury present at the time of surgery. The 40+ age group was significantly more likely to have an MFC injury (P < .01), MTP injury (P < .001), LTP injury (P < .01), and PF injury (P < .001) as compared to those <20 years old. The MTP and PF variables had the highest increase in likelihood in the 40+ age group with an OR of 25.0 and 24.0, respectively. They were also significantly less likely to have a LMT as compared to the < 20 years old age group. The 30 to < 40 years old age group was significantly more likely to have an MFC, LTP, and PF injury present at the time of surgery when compared to the < 20 years old age group. Patients with BMI >25 were significantly more likely to have an MFC injury (P< .05) (Table 1).

TABLE 1
Demographic Factors and Associated Meniscal and Chondral Injuries Identified in Surgery[a]

	BMI			Age (years)				Gender	
	<25	25 to <30	30+	<20	20 to < 30	30 to < 40	40+	Male	Female
MMT	69/138 (50.0)	98/167 (58.7)	46/73 (63.0) P= NS	39/77 (50.6)	101/187 (54.0)	64/104 (61.5)	27/40 (67.5) P=NS	166/288 (57.6)	66/121 (54.5) P=NS
LMT	75/138 (54.3)	98/167 (58.7)	49/73 (67.1) P=NS	49/77 (63.6)	119/188 (63.3)	58/104 (55.8)	15/40 (37.5) OR, 0.3 P <.05	187/289 (64.7) OR, 2.3	54/121 (44.6) P < .001
MFC Injury	25/138 (18.1)	53/167 (31.7) OR, 2.1	22/73 (30.1) OR, 1.9 P < .05	12/77 (15.6)	47/188 (25.0)	33/104 (31.7) OR, 2.5	19/40 (47.5) OR, 4.9 P< .01	72/289 (24.9)	40/121 (33) P = NS
LFC Injury	8/138 (5.8)	22/167 (13.2)	9/73 (12.3) P= NS	1/76 (1.3)	26/188 (13.8)	11/104 (10.6)	2/40 (5.0) P =NS	35/288 (12.1) OR, 3.2	5/121 (4.1) P < .05
MTP Injury	2/137 (1.5)	12/167 (7.2)	5/72 (6.9) P=NS	1/76 (1.3)	4/187 (2.1)	6/104 (5.8)	10/40 (25.0) OR, 25.0 P< .001	19/288 (6.6)	2/118 (1.7) P = NS
LTP Injury	13/138 (9.4)	20/167 (12.0)	11/73 (15.1) P=NS	2/76 (2.6)	18/188 (9.6)	19/104 (18.3) OR, 8.3	8/40 (20.0) OR, 9.2 P< .01	31/288 (10.8)	16/121 (13.2) P = NS
PF Injury	22/138 (15.9)	35/167 (21.0)	21/73 (28.8) P=NS	5/77 (6.5)	17/188 (9.0)	35/104 (33.7) OR, 7.3	25/40 (62.5) OR, 24.0 P<.001	55/289 (19)	27/121 (22.3) P = NS

[a]Values are expressed as n (%). P < .05 considered statistically significant. OR, odds ratio; NS, not significant. OR listed for groups significantly different from comparison group. Female gender was used as the comparison group for gender.

TABLE 2
Meniscus Tear Association with Chondral Injury in the Same Compartment

	Meniscus Tear	No Meniscus Tear
MFC	91/232 (39.2)	21/177 (11.9) P < .001, OR, 4.8
MTP	16/230 (6.9)	5/177 (2.8) P < .05, OR, 2.6
LFC	29/240 (12.1)	11/169 (6.5) P < .05, OR, 2.0
LTP	32/240 (13.3)	15/169 (8.9) P = NS

FIGURE 1
Time Groups versus Odds Ratio for Significantly Associated Injuries

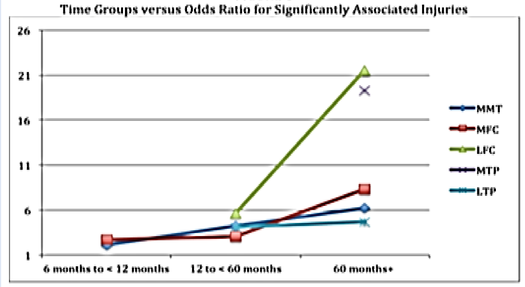

TABLE 3
Time from Injury and Associated Meniscal and Chondral Injuries[a]

	<3 months	3 to < 6 months	6 to < 12 months	12 to < 60 months	60 months +
MMT	46/111 (41.4)	43/95 (45.3)	44/73 (60.3) OR, 2.1	73/98 (74.5) OR, 4.2	23/28 (82.1) P < .001 OR, 6.2
LMT	68/111 (61.3)	59/96 (61.4)	43/73 (58.9)	53/98 (54.1)	16/28 (57.1) P =NS
MFC Injury	16/111 (14.4)	22/96 (23)	23/73 (31.5) OR, 2.7	33/98 (33.7) OR, 3.1	17/28 (60.7) P < .001 OR, 8.3
LFC Injury	3/110 (2.7)	6/96 (6.2)	5/73 (6.8)	15/98 (15.3) OR, 5.6	11/28 (39.3) P < .001 OR, 21.5
MTP Injury[b]	0/111 (0)	3/96 (3.1)	6/71 (8.4)	7/98 (7.1)	5/28 (17.8) P < .05 OR, 19.3
LTP Injury	5/110 (4.5)	8/96 (8.3)	8/73 (10.9)	18/98 (18.4) OR, 4.1	7/28 (25) P < .05 OR, 4.7
PF Injury	23/111 (20.7)	15/96 (15.6)	17/73 (23.3)	19/98 (19.4)	6/28 (21.4) P=NS

[a]Values are expressed as n (%). P < .05 considered statistically significant. OR, odds ratio; NS, not significant. OR listed for groups significantly different from comparison group.
[b]MTP comparison group was 0 to 6 months in order to have a sample size large enough for statistical tests.

RESULTS (CONT'D)

Meniscus Tear and Chondral Injury in Same Compartment

There was a significant correlation of MMT with MFC and MTP injury (P < .001, OR 4.8; P < .05, OR 2.6). There was also a significant correlation of LMT and LFC injury (P < .05, OR 2.0). Although there was a higher percentage of LTP when a LMT was present (13.3% vs. 8.9%), this was not statistically significant (Table 2).

Time to Surgery and Secondary Intra-articular Injuries

An increase in the presence of MMT was seen in longer delay to time of surgery (P < .001). When compared to the < 3 months group, the 6 to < 12 months group (OR 2.1), the 12 to < 60 months group (OR 4.2) and the 60 months or greater group (OR 6.2) were more likely to have a MMT. A similar trend was seen with MFC injury (P < .001) in the 6 to < 12 months group (OR 2.7), the 12 to < 60 months group (OR 3.1), and the 60 months or greater group (OR 8.3). Presence of LTP injury and LFC injury was also significantly increased with surgical delay, but this association did not occur until 12 to < 60 months. LFC was 5.6 times more likely to be present after a surgical delay of 12 to less than 60 months and 21.5 times more likely after a delay greater than 60 months when compared to the < 3 months group (P < .001). LTP was 4.1 times more likely to be present after a surgical delay of 12 to less than 60 months and 4.7 times more likely after a delay greater than 60 months when compared to the < 3 months group (P < .05). MTP injury was 19.3 times more likely to be present in the 60 months or greater surgical delay group when compared to the 0 to less than 6 months delay group (P < .05) (Table 3).

CONCLUSIONS

Delaying ACL surgery for 6 months or longer is associated with an increased presence of medial meniscus tears and chondral injury (MFC, LFC, and LTP), with increased incidence in longer delays. This data supports not delaying surgery more than 6 months following an ACL tear to prevent the incidence of secondary meniscus tears and articular cartilage injury. In addition, particular attention should be paid to those who are older age and male gender as they are at increased risk for worse cartilage and meniscus injury.

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