Original Article

A retrospective analysis of risk factors for meniscal co-morbidities in anterior cruciate ligament injuries

Korula Mani Jacob, Anil Thomas Oommen

Abstract

Background: The association of meniscal cartilage injury with anterior cruciate ligament (ACL) injury is well documented in literature. The aim of this study was to examine the relative risk factors for meniscal pathology at the time of arthroscopic ACL reconstruction.
Materials and Methods: A review of the case records including both in-patient and out-patient charts of all patients who underwent arthroscopic ACL reconstruction during the preceding 3 years was performed by either of the authors. The relative incidences of associated meniscal pathologies were analyzed in correlation with age, side of injury, time to surgery, mode of injury, and gender as the risk factors. Statistical analysis was performed to obtain individual data correlation.
Results: A total of 192 patients underwent ACL reconstruction during the 3-year time frame. Of these, complete data sets were available for 129 patients. Analysis revealed that the only factor that was statistically significant in raising the risk of meniscal pathology was the time to surgery ($P = 0.001$). There was a significant increase in medial, lateral, and both meniscal tears noted in cases operated beyond 24 weeks. Further, the incidence of medial meniscal tears as well as lateral meniscal tears increased with delay in presentation for surgery ($P = 0.004$). Mode of injury, age at presentation, sex, and side were not significantly associated with an increased incidence of meniscal pathology.
Conclusion: The single factor that significantly affects incidence of meniscal co-morbidity in ACL injury is the delay in presentation (i.e. the time to surgery). The incidence of lateral meniscal tears as well as medial meniscal tears increased with delay in surgery. This should guide us toward recommending all patients irrespective of age, gender, or mode of injury to undergo early reconstruction, thereby reducing the likelihood of developing meniscal pathology.

Key words: Anterior cruciate ligament reconstruction, meniscal tear, time to surgery

Introduction

Anterior cruciate ligament (ACL) injury is often associated with meniscal pathology[1] These tears may occur during the initial traumatic event, or subsequently over time due to the altered biomechanics and the ongoing instability it causes. It has also been established that the standard of care for ACL injury is ligament reconstruction aiming to halt or minimize the number of instability episodes.[2] Intuitively then, the earlier we reconstruct, the fewer the meniscal tears we should encounter.[3,4] This intuition is what we sought to evaluate in our study.

The vast numbers of cases in western literature are primarily the result of sporting injuries.[5] In our series, however, we noted a high number of ACL injuries associated with road traffic accidents (RTAs) and occupational injuries. Since these are relatively high-velocity trauma as compared to sporting injuries, it is plausible that the profile of meniscal co-morbidity would differ.

Joseph *et al*. investigated the meniscal injuries in athletes versus non-athletes.[6] We examined the relative risk for meniscal pathology at the time of arthroscopic ACL reconstruction to document risk factor such as age, side of injury, time to surgery, mode of injury and gender in non-atheletes.

Materials and Methods

A retrospective chart audit was carried out on all patients who underwent arthroscopic ACL reconstruction during the

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preceding 3 years, performed by any one of the two authors. Both out-patient and in-patient records were audited and the operation notes were examined to produce the master table. The diagnosis of ACL injury was made primarily clinically, as was the suspicion of meniscal pathology. Due to time and financial constraints, magnetic resonance imaging (MRI) was not performed in all patients; however, MRIs were consulted whenever available. The relative incidence of associated medial/lateral/bi-meniscal pathologies (outcome variables) was analyzed in correlation with age, side of injury, time to surgery, mode of injury, and gender as risk factors (independent variables).

Statistical analysis

Time to surgery, age, side, mode of injury, and gender were analyzed independently against meniscal pathology which was the outcome variable. Analysis was performed using crosstab tabulation and Chi-square tests, obtaining Pearson's Chi-Square, likelihood ratio, and linear-by-linear association. *P* values of less than 0.05 were considered significant.

Results

The complete data sets were available for 129 patients (124 males and 5 females) out of the 192 patients who underwent ACL reconstruction. There was no statistically significant difference in the incidence of any meniscal pathology based on gender ($P = 0.975$).

Seventy five patients sustained sports-related ACL injuries, 33 were associated with RTAs, and 21 had non-sports, non-RTA trauma-like falls from heights, tripping down stairs, etc. There was no statistically significant difference in the incidence of any meniscal pathology based on mode of injury ($P = 0.902$). Fifty two patients had left knee injuries and 77 had right knee injuries. Again, there was no statistically significant difference in the incidence of any meniscal pathology based on side of injury ($P = 0.019$).

Age at presentation was classified to convert the continuous variable of age into a categorical variable. Overall, the mean age of the patients at presentation was 30.62 ± 9.5 years. The age groups represented were: ≤19 years ($n = 13$), 20–29 years ($n = 52$), 30–39 years ($n = 38$), and ≥40 years ($n = 26$). We found no statistically significant difference in the incidence of any meniscal pathology based on age at presentation ($P = 0.388$).

Likewise, with time to surgery (TTS), we converted the continuous variable TTS into a categorical variable. The TTS time frames used were <6 weeks ($n = 6$), 6–24 weeks ($n = 39$), and >25 weeks ($n = 81$). We analyzed the outcome variable initially to include only two groups – meniscal tear present (+) or absent (−) [Table 1]. The findings revealed that there was a statistically significant correlation between TTS and incidence of meniscal tear ($P < 0.001$) [Figure 1].

Sub-analysis was performed looking at medial ($n = 25$), lateral ($n = 50$), and bi-meniscal tears ($n = 34$) as separate outcome variables within the meniscal tear present (+) group. Significantly, only 17 patients did not have meniscal tears With increasing duration, there was a statistically significant increase noted in the incidence of medial as well as lateral meniscal pathology ($P = 0.004$) [Figure 2, Table 2].

Table 1: Time to surgery vs. meniscal pathology

		Meniscus tear		Total
		Positive (m+)	Negative (m−)	
Time to surgery in weeks				
<6 weeks	n =	3	3	6
	%	50.0%	50.0%	100.0%
6–24 weeks	n =	29	10	39
	%	74.4%	25.6%	100.0%
>25 weeks	n =	77	4	81
	%	95.1%	4.9%	100.0%
Total	n =	109	17	126
	%	86.5%	13.5%	100.0%

Chi-square tests

	Value	df	Asymp. sig. (two-sided)
Pearson Chi-square	16.861	2	0.000
Likelihood ratio	15.115	2	0.001
Linear-by-linear association	16.687	1	
N of valid cases	126		0.000

Table 2: Subgroup analysis of TTS vs. medial, lateral, and bi-meniscal pathology

		Meniscus				Total
		l	m	m and l	No injury	
Time to surgery weeks rec						
<6 weeks	n =	0	2	1	3	6
	%	0.0%	33.3%	16.7%	50.0%	100.0%
6–24 weeks	n =	9	10	10	10	39
	%	23.1%	25.6%	25.6%	25.6%	100.0%
>25 weeks	n =	16	38	23	4	81
	%	19.8%	46.9%	28.4%	4.9%	100.0%
Total	n =	25	50	34	17	126
	%	19.8%	39.7%	27.0%	13.5%	100.0%

Chi-square tests

	Value	Df	Asymp. sig. (two-sided)
Pearson Chi-square	19.371[a]	6	0.004
Likelihood ratio	18.887	6	0.004
Linear-by-linear association	8.134	1	0.004
No of valid cases	126		

[a]Four cells (33.3%) have expected count less than 5. The minimum expected count is 81

Discussion

This study is the first to our understanding in the general Indian population, looking specifically at the relationship of time to surgery with the type of meniscal pathology.

It is evident that the incidence of meniscal pathology is independent of gender, age at presentation, mode of injury, and side of injury. However, there is a definite correlation between the time to surgery and incidence of meniscal pathology, specifically but not limited to medial meniscal pathology. There have been numerous studies in the past documenting similar findings.[3,4,7-11] Meniscal tears were seen in almost 87% of the patients in this study. This is similar to the 81% rate reported by Yuksel *et al*.[12] and 73% reported by Tandogan *et al*.[13] The incidence of meniscal tears seen in the acute cases (50%) was also comparable to that reported by Orfaly *et al*. (40%).[14] Many of the previous studies reported fairly constant levels of lateral meniscal tears over time with increasing medial meniscal tears.[3,7,13,15] However, in our series, there was a steady rise in the incidence of both medial as well as lateral meniscal tears. This goes against the standard teaching that lateral meniscal tears occur during the index trauma, whereas medial meniscal tears occur with repeated instability episodes.[15,16] It would lead on from here that earlier the ligament reconstruction is performed, fewer the instability episodes to which the knee would be subjected, reducing the meniscal co-morbidity and the burden thereof. This line of reasoning suggesting reconstruction as early as possible is echoed by Jomha *et al*.[17]

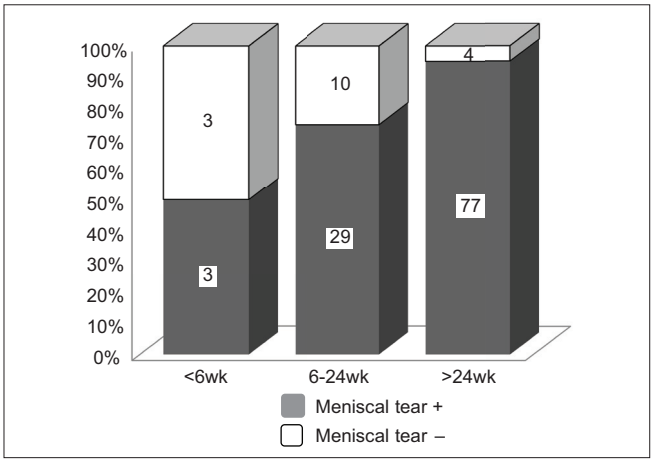

Figure 1: Bar diagram showing increase in the incidence of meniscal tears noted with increasing delay between injury and surgery

The limitation of this study is the relatively small sample size as compared to some recent studies.[16] However, the study group was relatively homogenous, and since the decision to operate was a collective one, there was no selection bias on the part of the surgeon.

Conclusion

Time to surgery is statistically significantly associated with increased incidence of meniscal pathology. In the non-atheletic Indian population, it would appear that delay in surgery increases the incidence of medial as well as lateral meniscal tears found at surgery, which does not correlate with established western teaching. Age at presentation, gender, mode of injury, and side of injury are not significant factors in predicting meniscal co-morbidity. Further study with a larger sample size in the same population will help to further crystallize these findings.

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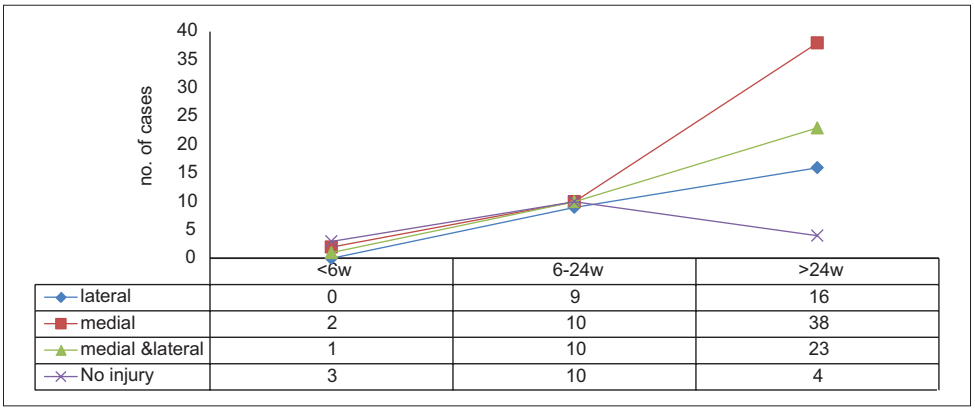

	<6w	6-24w	>24w
lateral	0	9	16
medial	2	10	38
medial &lateral	1	10	23
No injury	3	10	4

Figure 2: Sub-analysis of incidence of medial, lateral, and bi-meniscal pathology independently with time

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