Arthroscopic Debridement for Mucoid Degeneration of Anterior Cruciate Ligament - A Single Institution Experience from Nepal

Shrestha R,[1]Khadka SK,[2]Maharjan S,[1]Basi A,[2]Dahal A,[2] Chaudhary A,[2] Acharya SP,[3] Malla M[3]

[1]Department of Orthopedics and Traumatology, Dhulikhel Hospital, Kathmandu University Hospital, [2]Kathmandu University School of Medical Sciences, Dhulikhel, Kavre, Nepal.

[3]Kathmandu Medical College, Sinamangal, Kathmandu, Nepal.

Corresponding Author

Rohit Shrestha

Department of Orthopedics and Traumatology, Dhulikhel Hospital, Kathmandu University Hospital, Kathmandu University School of Medical Sciences, Dhulikhel, Kavre, Nepal.

E-mail: rohitshrestha@kusms.edu.np

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ABSTRACT

Background

Mucoid degeneration of anterior cruciate ligament is characterized by infiltration of mucoid-like material scattered throughout the anterior cruciate ligament substance. It is an uncommon condition, but previously, underdiagnosed or often misdiagnosed as an anterior cruciate ligament tear.

Objective

To present our early experiences with mucoid degeneration of anterior cruciate ligament in last five years in terms of clinical presentation and the outcomes of arthroscopic management.

Method

This was a retrospective descriptive cross-sectional study on patient who received arthroscopic debridement for mucoid degeneration of anterior cruciate ligament in Dhulikhel Hospital over five years period (2017 May to 2022 April). Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale that has been translated and validated to be used in local (Nepali) language and context was used for evaluation of outcome evaluation.

Result

Twenty-one patients of mean age 44.21 years, predominantly females (18), were managed in five years period. The mean Western Ontario and McMaster Universities Osteoarthritis Index score was 16.33±10.47 with a range of 0 to 36 (11.57 to 21.09 at 95% confidence interval). The mean Western Ontario and McMaster Universities Osteoarthritis Index score converted on a scale of 0 to 100 was 17. Thirteen patients had isolated Mucoid degeneration of anterior cruciate ligament whereas nine others had associated either meniscal tear or chondral lesions.

Conclusion

Mucoid degeneration of anterior cruciate ligament could be a cause of knee pain in middle-aged patients and arthroscopic debridement can improve the patient's symptoms and provide a good functional outcome.

KEY WORDS

Anterior cruciate ligament, Arthroscopy, Debridement, Mucoid degeneration, WOMAC

INTRODUCTION

Mucoid degeneration of anterior cruciate ligament (MD-ACL), first described in 1999 by Kumar et al. is characterized by infiltration of mucoid-like material (glycosaminoglycans) interspersed within the substance of ACL.[1] Based on Magnetic Resonance Imaging (MRI) findings, the prevalence of MD-ACL ranges from 1.8 to 5.3% with more prevalence in the elderly with degenerative knees; however, not all the cases are symptomatic.[2,3] It is an uncommon condition, but previously, it was underdiagnosed or often misdiagnosed as an ACL tear.[4-7]

The pathogenesis of mucoid degeneration is poorly understood and has disputed theories of origin such as synovial theory, traumatic theory, and degenerative theory.[1,8,9] Osteoarthritis is the most commonly associated condition with MD-ACL according to Hotchen et al.[10] MD-ACL may be a precursor of knee osteoarthritis (OA) but it could also be part of a general degenerative process of the knee.[3,11] Clinically, they are often asymptomatic and discovered incidentally during MRI or arthroscopy in patients with non-specific knee pain and restrictions in the normal range of movement of their knee joints.[12] MRI is the standard imaging modality for diagnosing MD-ACL.[3,13] The clinical presentation, other associated lesions, management options and outcome of arthroscopic debridement of MD-ACL are either poorly understood or less commonly diagnosed.[4]

In this study, we aim to present our early experiences with MD-ACL in last five years in terms of clinical presentation and the outcomes of arthroscopic management.

METHODS

This was a descriptive cross-sectional study conducted among patients who received arthroscopic debridement for MD-ACL in Dhulikhel Hospital over five years period (2017 May to 2022 April). The diagnosis of the cases was based on the clinical and MRI evaluation. Ethical clearance was received from the Institutional Review Committee, Kathmandu University School of Medical Sciences (IRC number: 234/22).

Patient's demographic profiles, clinical features, MRI findings, and operative findings were studied. All patients received knee arthroscopies with standard anterolateral and anteromedial portals. MD-ACL was debrided until healthy-looking shiny ACL fibers remains and the notch was well decompressed. Postoperative rehabilitation included muscle strengthening exercises, knee range of motion and weight bearing as tolerated. Patients were discharged when they were confident about physiotherapy protocols and surgical wounds were fine. They were followed up routienly at out patient department and functional outcome was evaluated at the latest follow up which should be at least one year from the operation.

The functional outcome analysis was done with the use of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale that has been translated and validated to be used in the local (Nepali) language and context.[14,15] The WOMAC measures five items for pain (score range 0-20), two for stiffness (score range 0-8), and seventeen for functional limitation (score range 0-68).[16] This scale can have scores between 0 to 96, however, conversion to percentage gives a better understanding in the scale of 0 to 100 which was used in the current study. Higher scores indicate worse pain, stiffness, and functional limitations. Excellent, good, fair and poor outcome are defined as scores: 0 to 20, 21 to 40, 41 to 60 and 61 to 96 respectively.[15] A research assistant, not involved in the study, volunteered to evaluate follow-up patients for evaluation of functional outcome. Statistical Package for the Social Sciences (SPSS version 16.0) was used for data management and analysis. The categorical data were expressed in number and percentage while continuous data were presented in mean and standard deviation as appropriate.

RESULTS

Twenty-one patients were managed with arthroscopic debridement for MD-ACL and all of them were available for final follow-up at an average of 1.42 years (one to three years). All patients improved symptomatically, except three patients who had some knee pain post-operatively (cases no. 6, 15 and 16). The mean WOMAC score was 16.33 ± 10.47 with a range of 0 to 36 (11.57 to 21.09 at a 95% confidence interval). The mean WOMAC score converted on a scale of 0 to 100 was 17. Excellent outcome was seen in 16 patients (11 patients had isolated MD-ACL while five had associated lesions). Five patients had good outcome (two patients had isolated MD-ACL while three had associated lesions). Subgroup analysis for outcome among patient with isolated MD-ACL showed 11 (84.62%) patients had excellent and two (15.38%) had good outcome.

The mean age of the study population was 44.21 years ranging from 27 to 53 years. There were 18 females and three males. The right knee was involved in 11 patients while the left knee was involved in ten patients; none had bilateral knee involvement in our series (Table 1). The plain X-ray of the involved knee was normal in all the patients. On MRI, isolated MD-ACL was noted among 13 patients; while MD-ACL along with associated meniscal lesions (root or body-post horn tear) were seen among six others, and chondral lesions were noted in two patients. Associated lesions were managed appropriately (Table 2).

All the patients had vague knee pain, especially at the terminal flexion. All of them had failed a trial of conservative management of atleast six month. Postoperative period was uneventful for all of the patients. One person (case no. 13) needed almost near total debridement of ACL for

Table 1. Patient profile and functional outcome

Case No.	Hosp. No.	Age	Sex	Side	Associated lesion	WOMAC : Sub-score and total			
						Pain	Stiffness	Functional limitation	Score over 96
1	700131	33	M	R	Isolated	3	0	12	15
2	585941	32	F	L	Isolated	3	0	13	16
3	768488	31	F	L	Isolated	3	2	14	19
4	828007	52	F	L	Root	4	1	26	31
5	852687	50	F	R	Isolated	3	0	9	12
6	6035	53	M	R	Cartilage	5	3	28	36
7	882792	43	F	R	MM	0	0	1	1
8	77038137	50	F	R	Isolated	4	1	6	11
9	664620	53	F	L	Isolated	2	0	6	8
10	802071	50	F	L	Isolated	0	0	0	0
11	442770	42	F	L	Isolated	2	0	2	4
12	7705467	51	F	L	MM	3	0	8	11
13	77054031	32	M	L	Isolated	2	1	13	16
14	77050611	35	F	R	Isolated	3	1	12	16
15	7704357	53	F	L	Isolated	6	2	23	31
16	78037346	55	F	R	Isolated	5	0	24	29
17	77029849	46	F	L	Root	3	1	28	32
18	78076305	43	F	R	Root	2	0	7	9
19	78019666	40	F	R	Cartilage	3	0	19	22
20	883464	27	F	R	Isolated	3	0	13	16
21	846337	42	F	R	MM	1	0	7	8
				Score out of 96		2.86	0.57	12.90	16.33
				Converted Score out of 100		2.98	0.6	13.43	17

Isolated = Isolated MD ACL only
Root = Associated Root tear
MM = Associated Medial Meniscus tear
Cartilage = Associated Cartilage lesion

Table 2. Intra operative findings and its respective management

Associated lesions	Management
Isolated MD-ACL : 13	Debridement
Meniscal lesions : 6	
-Root tears : 3	Root repair
-Body or horn tear : 3	Meniscus debridement
Chondral lesions : 2	Micro-fractures

complete clearence of mucoid material. At one and a half years of follow-up, he had clinical instability however he was carrying out his activities of daily living and he refused ACL reconstruction. Another gentleman (case no. 6) who had a persistent knee pain and the highest WOMAC score of 36, had an associated chondral defect (micro-fracture done).

DISCUSSION

The etiology of MD-ACL is not clearly understood however there are various theories that speculate its origin.[3,19-21] The degenerative theory is one popular theory among many others because much of the literature has found MD-ACL in association with other degenerative conditions.[3,6,7,22-25] In terms of demographic profile, our findings are in agreement with most of the recent literature. Kim et al. found 95% of their study population were females, similarly, Srivastava et al. and Cha et al. had more than 70% and Khanna et al. and Ventura et al. had more than 60% females in their studies.[3,6,17,22,23] This is consistent with 84% of female participants in our series.

Dull pain was a common presentation however current literature was divided regarding the position that aggravates the pain, and also the need for notchplasty addition to debridement.[4] Most common clinical presentation is posterior knee pain and restriction of knee

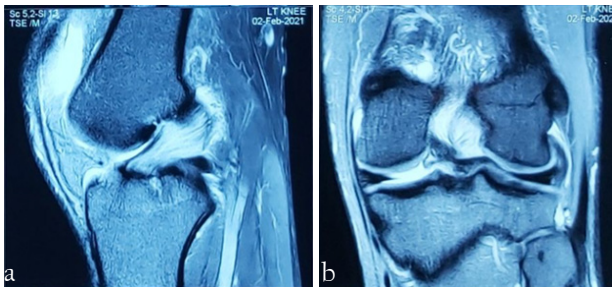

Figure 1a,b. MRI (sagittal and coronal PD images) showing a "celery-stalk" sign suggestive of MD-ACL

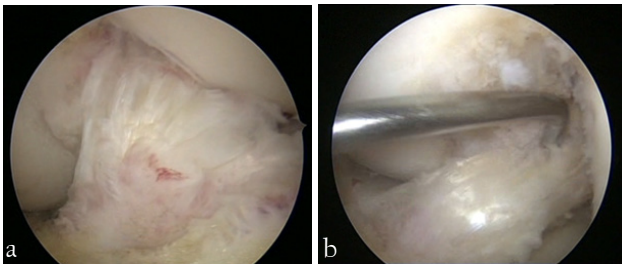

Figure 2a,b. Arthroscopic view of MD-ACL before and after debridement.

flexion.[21,26] It has been postulated that posterior pain is due to posterior cruciate ligament and posterior capsule mechanical impingement.[3,27] According to Fealy et al, the pain during knee flexion is due to intratendinous nociceptor irritation.[9] All the patients in our study had unilateral knee involvement which is consistent with other studies where most cases presented unilaterally.[18] There was no history of trauma in any of the patients. The MRI findings include intact, thickened, ill-defined ACL with an increased intraligamentous signal.[3] However, the most characteristic findings is the "Celery stalk" appearance.[28] Given the lack of knowledge, misdiagnosis as a tear is possible both clinically and on MRI.[28]

Oral analgesia along with physiotherapy is recommended for conservative management.[10] Arthroscopic debridement of the mucinous materials from the ACL by surgery and arthroscopy, with or without notchplasty is the preferred course of management in patients who are unresponsive to conservative management.[5,7,29] The other known management techniques include radiofrequency ablation (RFA), ultrasound-guided decompression and Computed Tomography (CT) guided aspiration.[30-32] In our study, all the patients were managed conservatively for at least six months before undergoing arthroscopic debridement. The arthroscopy findings include an intact, hypertrophied ACL with yellowish degenerative lesion interspersed within fibers.[3] During arthroscopy, our findings were consistent with current literature, as we observed about one-third of cases were associated with a meniscal tear and about 10% with chondral lesions.[33] However, this association does not prove for cause-and-effect relation.

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale is one of many common patient reported tools that is used to assess the functional status (outcome) of the knee.[14,15] Other commonly used scales are Lysholm, International Knee Documentation Committee (IKDC), Knee injury and Osteoarthritis Outcome Score (KOOS) and Visual Analogue Score (VAS). We used WOMAC as this tool has been translated and validated in the Nepali context and permission has been obtained from the authors to use this tool in our study.[14] Our study showed a good outcome with ACL debridement without notchplasty (Table 1). The outcome was similar to previous studies with good/excellent outcome with arthroscopic management (Table 3).

Table 3. Literatures reviews

Author	Year	Study Design	Tools	Outcome
Sweed et al.[4]	2021	Systemic Review	Lysholm, IKDC, KOOS, VAS	Good after Debridement
Ventura et al.[6]	2018	Retrospective	VAS, IKDC, Tenger Lysholm	Improved patient satisfaction and function
Vaishya et al.[13]	2017	Review article		Recommended debridement
Khanna et al.[17]	2016	Prospective	VAS, IKDC	Arthroscopic debridement – Excellent functional result
Pandey et al.[5]	2014	Prospective	Lysholm	Excellent at short term
Morice et al.[7]	2013	Retrospective	KOOS, IKDC	Subjective improvement
Lintz et al.[18]	2010	Retrospective cohort	IKDC, KOOS	Arthroscopic resection – Good subjective results

Post debridement, anterior laxity of the knee may be found in some cases.[23] One patient in our study had objective instability post-operation. He did not have any difficulties performing activities of daily living, so, he refused ACL reconstruction at this time, and he is still on follow up. Three patients in our study had increased post operative pain which could be attributed could be attributed to chondral damage and degenerative changes as all of them were more than 50 years. The functional limitation (to carry out activities of daily living) could be attributed to other age-related factor for example, cases no. 15 and 16 complained of chronic back pain which limited their functional abilities despite having fewer problems at their knees.

A retrospective study design and a smaller study population are the limitations of the current study. A multicentric, prospective study with larger sample and longer follow-up should be a way ahead.

CONCLUSION

Mucoid degeneration of Anterior Cruciate ligament could be a cause of knee pain in middle-aged patients with no obvious instability. Arthroscopic debridement can improve the patient's symptoms and provide good functional outcome; however associated conditions must be evaluated and managed appropriately.

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