Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15124
DOI URL: http://dx.doi.org/10.21474/IJAR01/15124

RESEARCH ARTICLE

MUCOID DEGENERATION OF THE ANTERIOR CRUCIATE LIGAMENT: REVIEW OF THE LITERATURE

Achraf Bouizar El Mehdi Boumediane Brahim, Demnati Fahd, Idarrha Abdessalam, Achkoun Mohammed, Amine, Benhima Imad and Abkari

Manuscript Info

Manuscript History
Received: 31 May 2022
Final Accepted: 30 June 2022
Published: July 2022

Abstract

Background: The cases of mucoid degeneration initially described in the 1950s mainly concerned the cardiovascular system. In 1976 Ewing et al (24) reported the first case of mucoid degeneration of striated muscle in the limbs. In 1999 Kumar et al (2) described the first case of mucoid degeneration of the anterior cruciate ligament of the knee

Aims: to study the clinical and radiographic semiology of this pathology and the possible therapeutical alternatives.

Patients/Methods: Retrospective studies with a case series. The number of cases in each study is greater than or equal to 10 cases.And alldiagnosis of mucoid degeneration of the anterior cruciate ligament is authenticated by magnetic resonance imaging of the knee with Location of the lesion in the anterior cruciate ligament.

Results: Our search strategy yielded 42 articles. The abstracts were reviewed to identify articles appropriate for our study resulting in the identification of 18 articles. Ten studies were excluded because they had a limited number of cases (9 articles about one case and 1 article about 5 cases). Another article (17) was also excluded because it included a comparative study with control groups of patients with normal MRI and arthroscopy. Seven articles meeting the inclusion criteria were retained for the final analysis.

Conclusions: Mucoid degeneration of the anterior cruciate ligament of the knee is often misunderstood and confused with a partial rupture of the ACL. Its diagnosis must be suspected in front of a stereotyped clinical picture of unusual posterior knee pain and a limitation of flexion. The symptomatology sometimes takes atypical forms because of the frequently associated meniscal and cartilage lesions.

Introduction:-

Mucoid degeneration of the anterior cruciate ligament of the knee is a rare and poorly understood pathology. It is an infiltrating lesion also called hypertrophy or pseudo infiltrating cyst. It is different from but often confused with the synovial cyst of the anterior cruciate ligament.The publications, most of which are retrospective studies, are variable and heterogeneous combining the treatment of cystic and infiltrating lesions.

Corresponding Author:- Achraf Bouizar El Mehdi Boumediane Brahim

Patient And Methods:-

A work plan was established and specific objectives were set before conducting our research. Our aim was to study the clinical and radiographic signs of this pathology and the different operative techniques.

Inclusion criteria: Retrospective studies with a case series. The number of cases in each study is greater than or equal to 10 cases.The diagnosis of mucoid degeneration of the anterior cruciate ligament is authenticated by magnetic resonance imaging of the knee. Location of the lesion in the anterior cruciate ligament.

About the Search technique, he Medline search engine was used to search for articles published between 1999 and 2017. The keywords used were: Mucoid degeneration, mucoid hypertrophy, and anterior cruciate ligament. Studies presented as abstracts were not included in our final analysis. The reference list of each selected article was manually reviewed for additional articles.Our work is an analytical study. It does not include a statistical study. The data collected are presented in the form of graphs and tables.

Results:-

Our search strategy yielded 42 articles. The abstracts were reviewed to identify articles appropriate for our study resulting in the identification of 18 articles. Ten studies were excluded because they had a limited number of cases (9 articles about one case and 1 article about 5 cases). Another article (17) was also excluded because it included a comparative study with control groups of patients with normal MRI and arthroscopy. Seven articles meeting the inclusion criteria were retained for the final analysis.(Table 1)

Epidemiologic Results:

- The number of patients en each study (figure1)
- The average age in each study (Figure2)
- Gender distribution in each study: (Figure3)
- The average delay in months for each study: (Figure 4)

Clinical findings:

The clinical examination looked for the history of the affected knee, the delay of the symptoms before the first consultation, the notion of initial trauma, the site of the pain and the limitation of joint mobility the anterior laxity of the knee. The antecedents of the affected knee were mainly lateral and medial meniscectomies (Lintz (20), Cha (22) and Morice (21) performed meniscectomies in 9, 3 and 5 cases respectively), but also synovectomies (in 3 cases for Cha (22)) and removal of foreign bodies (in one case for Lintz (20) and one case for Cha (22)). The average duration of symptoms before consultation was variable: 6 months for Cha (22), 15.5 months for Lintz (20) and 21 months for Chudasama (19). The notion of an initial trauma triggering the symptomatology was found in the works of Lintz (20) (31% of cases), Makino (9) (40% of cases) and Mcintyre (10) (70% of cases). Knee pain was a constant reason for consultation, its posterior location radiating towards the popliteal fossa was the most frequent for Cha et al (22) (75%) and for Lintz et al (20) (80%), except for Chudasama et al (19) who found central knee pain in all cases, which occurred at the end of extension in 18 cases and at the end of flexion in 2 cases. The limitation of joint mobility varied according to the authors, and could affect the flexion sector (Lintz et al (20) found an average flexion of 97° in 48% of cases, Morice et al (21) found an average flexion of 118°, and Cha et al (22) found a flexion deficit in 36% of cases), or the extension sector (Chudasama et al (19) found an average extension deficit of 6°, and Cha et al (22) found an extension deficit in 56% of cases). Preoperatively, the Lachman test was hard-stopped in all the studies except for Chudasama et al (19), who found one-cross laxity in three cases, and Lintz et al (20), who found a delayed hard stop in one case. No knee instability was reported preoperatively in any of the studies.

Imaging findings:

All patients had the criteria for mucoid ACL degeneration described by Bergin et al (1) on MRI (Figure 5). The appearance of the ACL could be compared to "celery stalk", reflecting the dissociation of the ACL fibers by mucoid material. MRI was used to diagnose tibial and femoral intraosseous cysts (Table 2). MRI was also able to detect associated injuries such as meniscal and cartilage injuries (Table 3).

Sagittal sections allowed calculation of the Sagittal Notch Angle (SNA) (its normal value is 39.1° according to Cha et al (17)) which accounts for the inclination of the roof of the notch and the width of the ACL in relation to the

width of the notch: the intercondylar notch index (its normal value is 0.23 according to Cha et al (17)). Lintz (20) and Morice (21) showed a decrease in the ANS (31.2° for Lintz and 35.4° for Morice) and an increase in the intercondylar notch index (0.58 for Lintz and 0.56 for Morice).

Arthroscopic results:
All patients were operated under arthroscopic control. The description of the ACL appearance corresponded to the arthroscopic diagnostic criteria of Mcintyre (10) (Figure 6).The mucoid degeneration could affect the anteromedial or posterolateral bundle or both bundles at the same time (Table 4).Arthroscopic treatment according to all authors consisted of an "à la carte" partial (less than 50%) or total (greater than 50%) reduction resection of the ACL associated, if necessary, with an enlargement plasty of the notch (the roof and the axial face of the lateral condyle) to remove any impingement, except in the case of Makino et al (9), who performed a 50% resection of the ACL and an enlargement plasty of the notch in all cases (Table 5).The associated surgical procedures under arthroscopy mainly concerned the regularization of meniscal lesions found at the same time of surgery and considered symptomatic (Table 6).

Discussion:-

Mucoid degeneration of the anterior cruciate ligament is a not uncommon pathology that is often misunderstood. The term "mucoid degeneration" may lead to confusion with cystic lesions. The term "mucoid degeneration" would be more explicit according to Lintz et al (20). It is said to be present in 2 to 5% of MRI scans of the knee in current practice, and to occur more often in men aged 40 to 50 years, according to Bergin et al (1) and Salvati et al (15). The notion of initial trauma is found in some studies (9, 10 and 20), but other authors report none (18, 19, 21 and 22). This makes it possible to distinguish between two types of patients: the first are young, active and athletic, in whom a mechanism of damage to the ACL by true trauma (23) or by repeated microtrauma may lead to an early injury. The second group are older and have a progressive ACL injury with frequent concomitant degenerative meniscal lesions.

The clinical presentation is most often characterized by posterior knee pain in the popliteal fossa (20 and 22), of progressive onset, worsening with time, frequently associated with flexion limitation (20 and 21). The pain is attributable to the mass effect of the ACL in the posterior notch according to Kumar et al (2) and Hensen et al (5) or to incarceration of the pathological ACL in the posterior femorotibial compartment according to Hsu et al (6) and Kim et al (7). In some cases the pain is not typical, central to the knee (19) or in the medial, lateral, or femoropatellar compartments (20 and 22), in relation to associated meniscal and cartilage injuries.

MRI of the knee allows the diagnosis of mucoid degeneration to be made by showing a celeriated appearance of the ACL. On coronal and sagittal sections and in T1 and T2 sequences, the ACL appears hypertrophic, increased in volume and hypersignal in T1 and T2 but retains normal fiber orientation as shown by Bergin et al (1). However, in practice and in the literature, this pathology is often confused with the diagnosis of partial rupture of the ACL. Indeed, Mcintyre et al (10) showed that 6 out of 10 cases were interpreted as a partial ACL rupture. Cha et al (17) quantified ACL hypertrophy and notch narrowing on MRI by showing an increase in the intercondylar notch index and a decrease in the sagittal notch angle compared with a group of healthy patients. This finding has been proven in the work of Lintz et al (20) and Morice et al (21). MRI can also detect associated lesions. Intraosseous tibial and femoral cysts are found in the work of several authors (9, 18, 20 and 21). Makino et al (9) showed that this association, present in 77% of cases, helped in the diagnosis of mucoid degeneration of the ACL, thus avoiding the erroneous diagnosis of ACL rupture. Meniscal and cartilage lesions, which are among the most common associated lesions in the affected knee, are considered by Lintz et al (20) to be factors with a poor prognosis, especially if these lesions require surgery and the patient's age is greater than 50 years.

Arthroscopic treatment of mucoid degeneration of the ACL by partial resection of the ACL has been adapted by several authors: Lintz et al (20) in 12 cases and Makino et al (9), Cha et al (22), Chudasama et al (19) and Morice et al (21) in all cases. Chudasama et al (19) resected the affected ACL bundle (posterolateral bundle in 18 cases and anteromedial bundle in 12 cases) and preserved the healthy bundle, whereas Morice et al (21) proposed a more economical plasty by circular debridement of the most bulging area using a thermofrequency probe. Lintz et al (20) performed a total and subtotal resection on 17 knees. The notch reduction plasty was performed in all cases by Makino et al (9), in some cases by Lintz (20), chudasama (19) and Cha (22) and in no case by Morice et al (21).

The clinical results were sedation of the pain and improvement of the joint mobility in all the works. No recurrence of the pathology was observed by the different authors, whatever the type of resection. Furthermore, Lintz (20) and Mcintyre (10) showed that postoperative laxity, which is mostly asymptomatic, can evolve over time towards an increase in anterior laxity and lead to instability. Mcintyre et al (10) reported a case of atraumatic ACL rupture at one year postoperatively and Lintz et al (20) performed ACL reconstruction for two patients at 2 and 5 years postoperatively.

Conclusion:-

Mucoid degeneration of the anterior cruciate ligament of the knee is often misunderstood and confused with a partial rupture of the ACL. Its diagnosis must be suspected in front of a stereotyped clinical picture of unusual posterior knee pain and a limitation of flexion. The symptomatology sometimes takes atypical forms because of the frequently associated meniscal and cartilage lesions. MRI and arthroscopy confirm the diagnosis. Partial resection of the ACL under arthroscopy is the most economical and the most suitable because of the absence of recurrence. Regardless of the extent of ACL resection, the development of postoperative laxity may evolve over time into knee instability leading to secondary ACL reconstruction, hence the need to warn the most active patients of the risk involved prior to any surgery.

Conflicts of interest

The authors declare no conflict of interest

Authors' contributions

Achraf bouizar: authorship, work design, data acquisition, interpretation of data for work, writing and bibliographies
Elmehdiboumediane: co-author, writing, data acquisition, bibliographies
Brahimdemnati: co-author, writing, data acquisition, bibliographies
Fahd idarrha: co-author, writing, data acquisition, bibliographies
Abdesselamachkoun:co-authoring, critical review, editing and evaluation
Mohammed Amine Benhima: co-authoring, critical review, editing and evaluation
Imad abkari: co-authoring, critical review, editing and evaluation

Tables and Figures

Table 1:- Characteristics of each study.

years	Autors	Journals	number of patients
2001	McIntyre et al (10)	Skeletal Radiol.	10
2010	Lintz et al (20)	Revue chir. Orth.	27
2010	Makino et al (9)	Knee Surg. Sport Trau.	10
2012	Matrawy et al (18)	The Egyptian J.Radio.	32
2012	Chudasama et al (19)	Indian J. Orthop.	20
2013	Cha et al (22)	Knee Surg. Sport Trau.	66
2013	Morice et al (21)	Revue chir. Orth.	21

Table 2:- Intraosseous cysts (KO) found in each series.

	KO Tibiaux	KO Fémoraux
Lintz et al	5	1
Makino et al	6	-
Matrawy et al	15	4
Morice et al	2	3

Table 3:- Associated lesions found in each work.

	Lintz	Makino	Chudasama	Cha
Lésions méniscales	21	4	5	33
Ménisque médial	16	-	4	-
Ménisque latéral	5	-	1	-
Lésionscartilagineuses	32	-	6	56

Table 4:- Location of mucoid degeneration in the ACL.

	Lintz	Chudasama	Cha	Morice
FaisceauAntéromédial	1	2	-	1
FaisceauPostérolatéral	1	18	21	-
Les deux faisceaux	27	-	47	22

Table 5:- Types of surgical procedures performed under arthroscopy.

	Lintz	Makino	Chudasama	Cha	Morice
Partial resection	12	10	20	68	23
Total resection	17	-	-	-	-
Plastie of the nutch	2	10	6	7	-

Table 6:- Associated surgical procedures (Meniscectomies).

	Lintz	**Chudasama**	**Cha**	**Morice**
Méniscectomies	11	4	30	3
M. Interne	9	3	-	-
M. Externe	2	1	-	-

Figure 1:- The number of patients in each study.

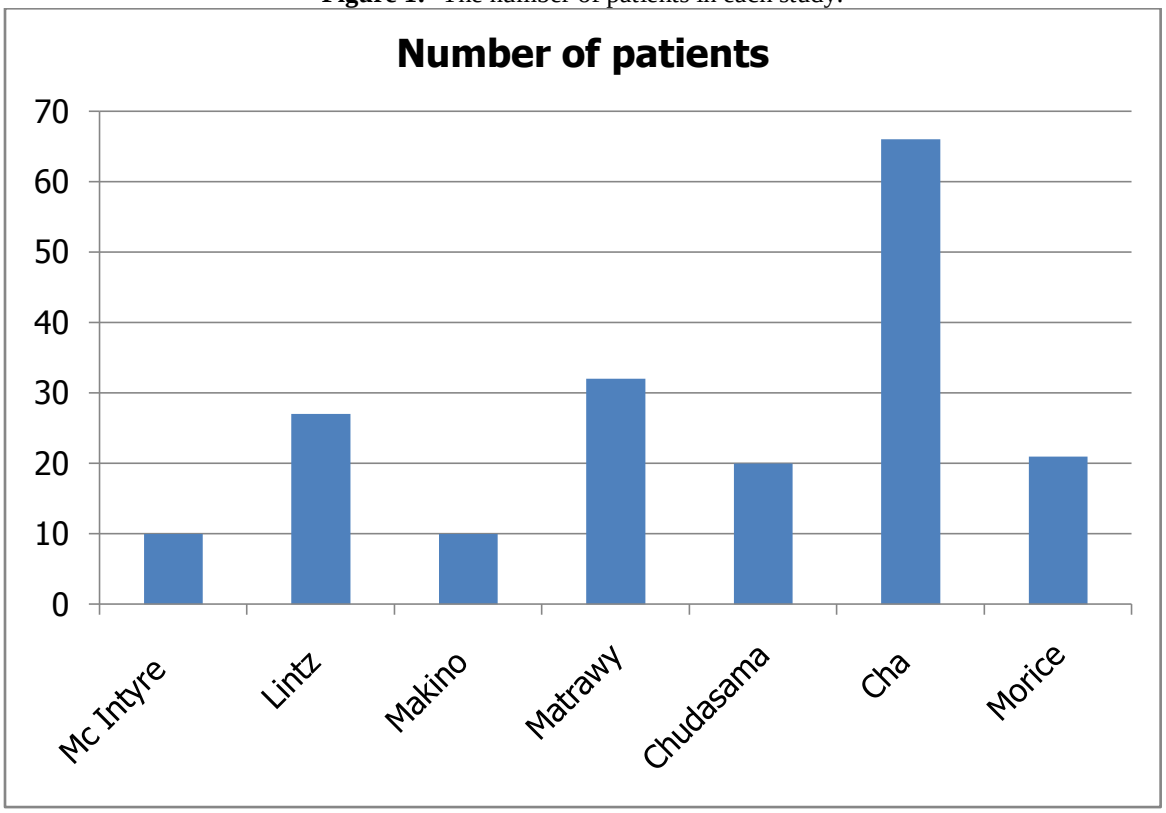

Figure 2:- The average age in each study:

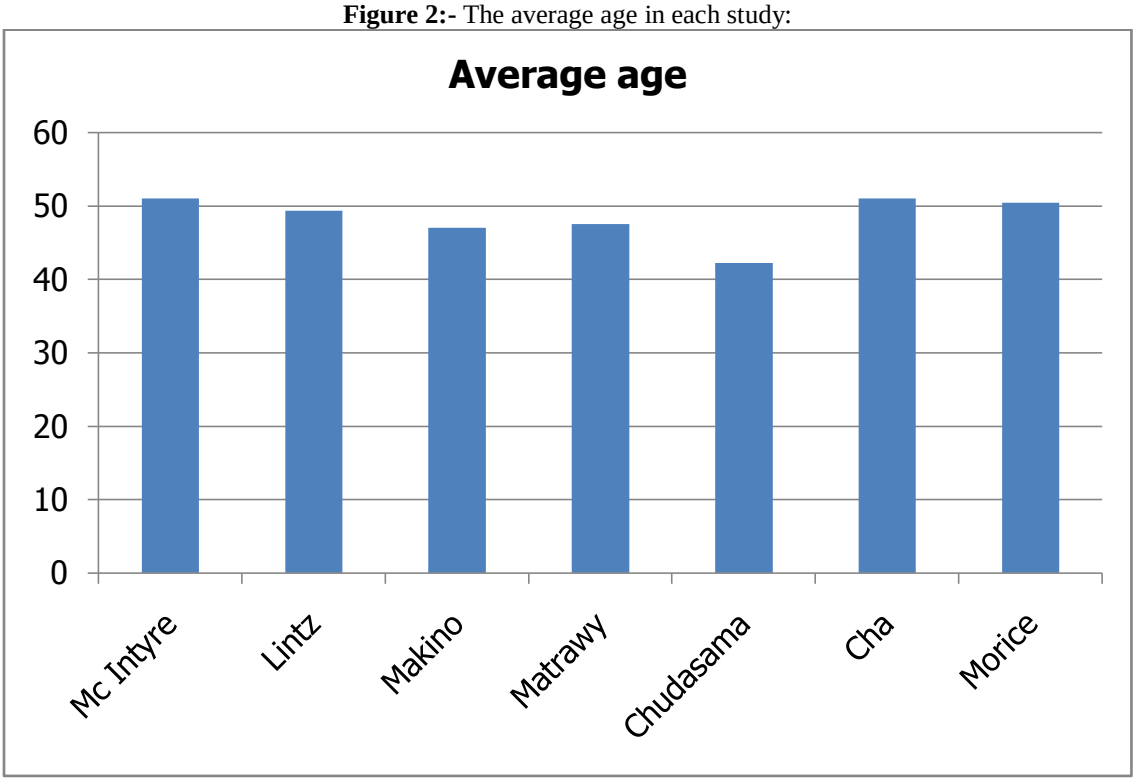

Figure 3:- Gender distribution in each study.

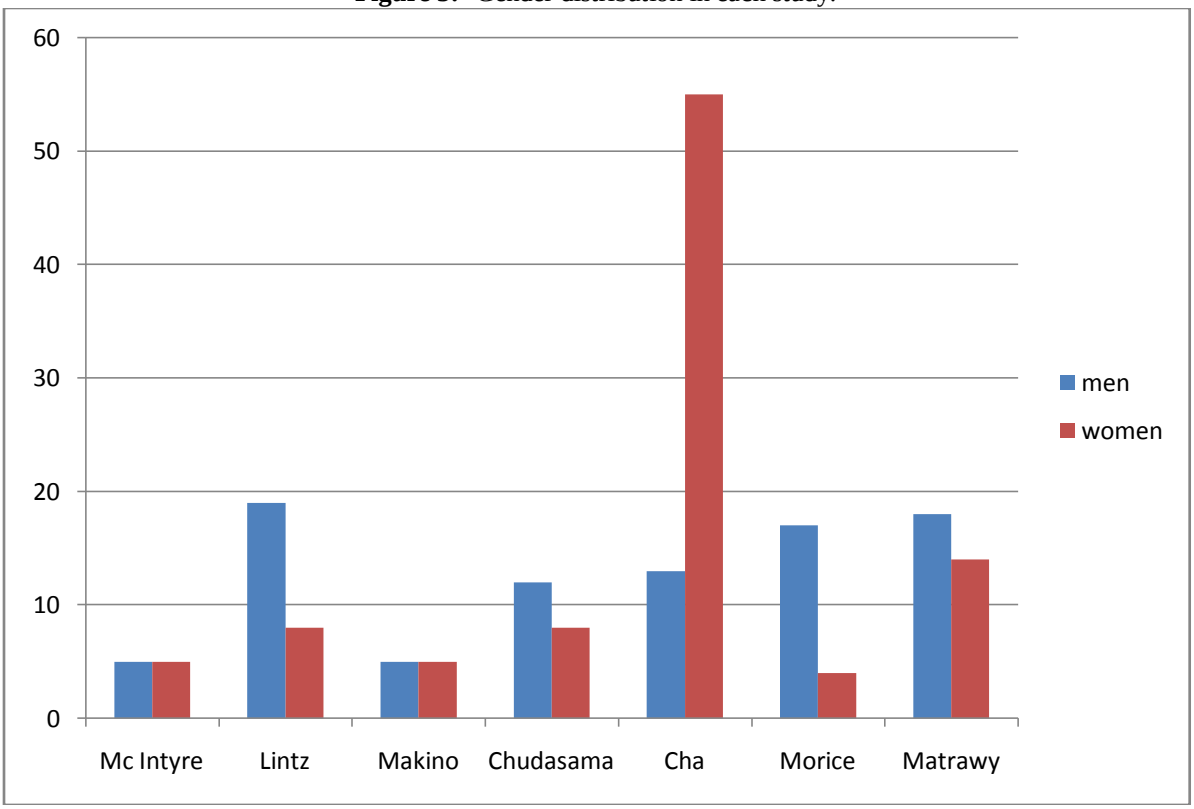

Figure 4:- The average delay in months for each study.

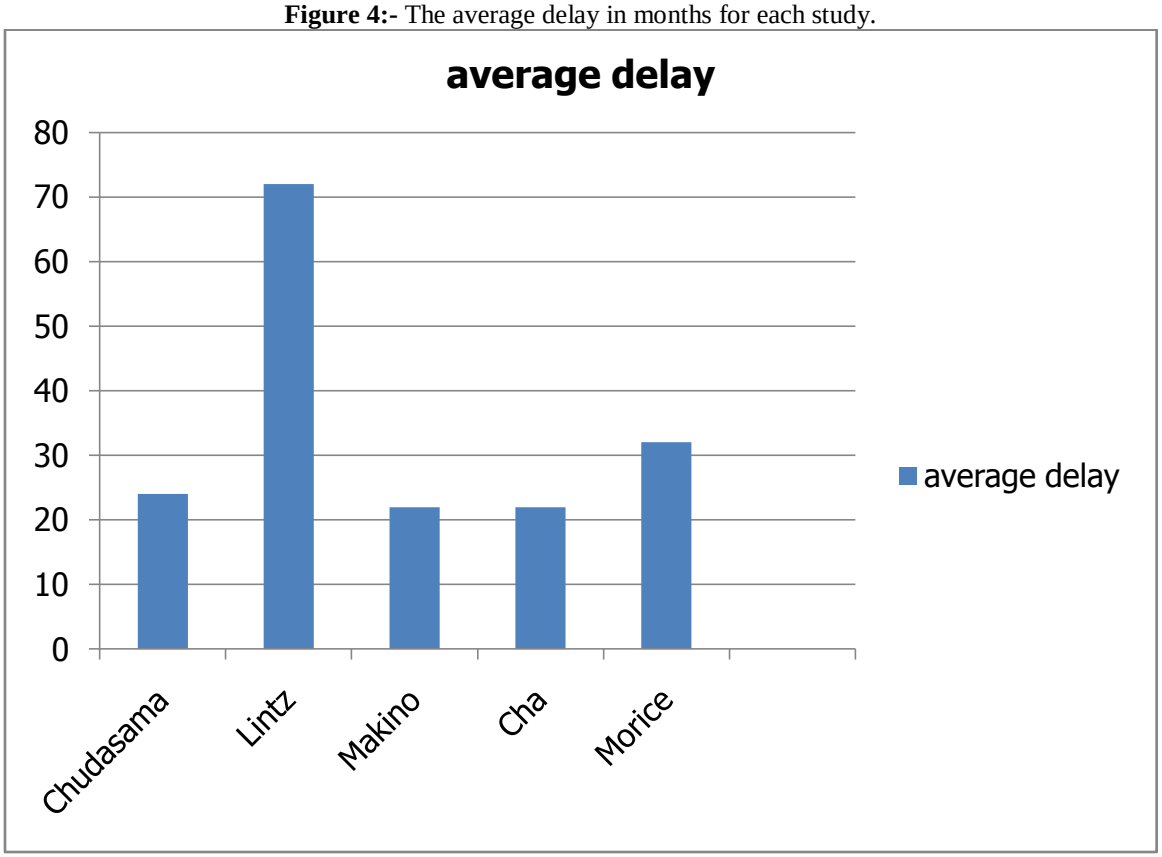

Figure 5:- MRI appearance: mucoid degeneration of the ACL, "celeri branches" sign. a : Sagittal sections and b: Coronal section. (20).

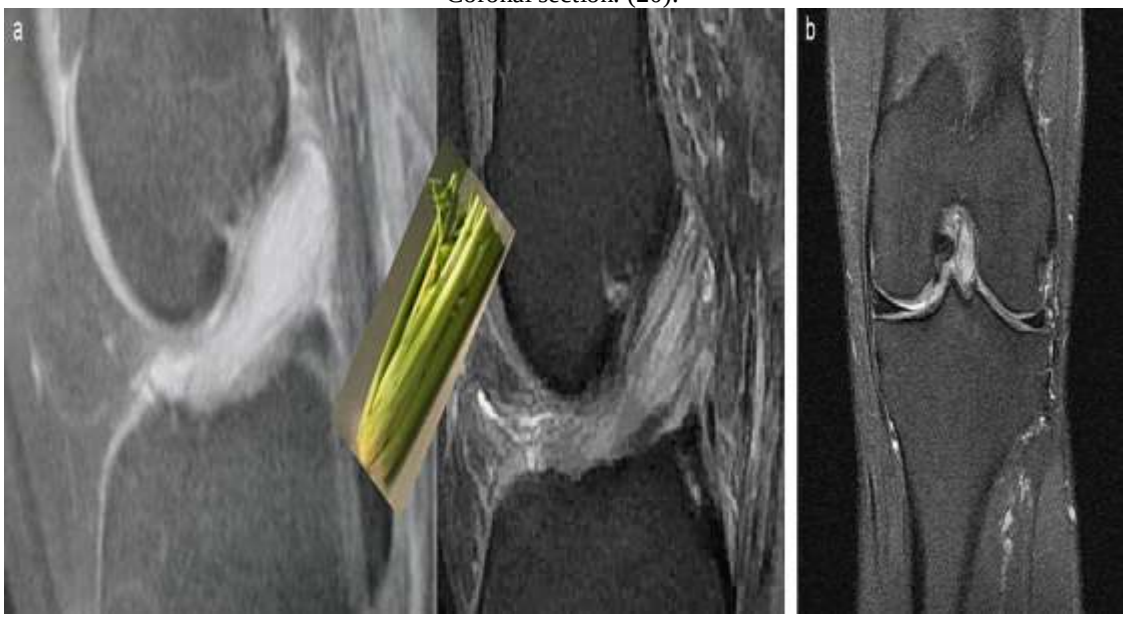

Figure 6:- Arthroscopic view of mucoid degeneration of the ACL. Hypertrophic ACL occupies the entire notch, the synovium is absent and the fibers are continuous. (21).

References:-

1. Bergin D, Morisson WB, Carrino JA, Nallamshetty SN, BartolozziAR.(2004) Anteriorcruciate ligament ganglia and mucoide degeneration: coexistence and clinical correlation. Am J Roentgenol;182:1283—7.
2. Kumar A, Bickerstaff DR, Grimwood JS, Suvarna SK. (1999) Mucoid cystic degeneration of the cruciate ligament. J Bone Joint SurgBr;81:304—5.
3. Fealy S, Kenter K, Dines JS, Warren RF (2001) Mucoid degeneration of the anterior cruciate ligament. Arthroscopy 17(9):E37
4. Fernandes JL, Viana SL, Mendonca JL, Freitas FM, Bezerra AS, Lima GA, Matos VL, Cunha NF, Martins RR, Freitas RM (2008) Mucoiddegenerationoftheanteriorcruciateligament: magneticresonanceimagingfindingsof an underdiagnosedentity. Acta Radiol 49(1):75–79
5. Hensen JJ, Coerkamp EG, Bloem JL, De Schepper AM (2007) Mucoid degeneration of the anterior cruciate ligament. Jbr-Btr 90(3):192–193.
6. Hsu CJ, Wang SC, Fong YC, Huang CY, Chiang IP, Hsu HC (2006) Mucoid degeneration of the anterior cruciate ligament. J Chin MedAssoc 69(9):449–452.
7. Kim TH, Lee DH, Lee SH, Kim JM, Kim CW, Bin SI (2008) Arthroscopic treatment of mucoid hypertrophy of the anterior cruciate ligament. Arthroscopy 24(6):642–649.
8. Lancaster TF, Kirby AB, Beall DP, Wolff JD, Wu DH (2004). Mucoid degeneration of the anterior cruciate ligament: a case report. J Okla State MedAssoc 97(8):326–328
9. Makino A, Pascual-Garrido C, Rolon A, Isola M, Muscolo DL (2010) Mucoid degeneration of the anterior cruciate ligament: MRI, clinical, intraoperative, and histological findings. KneeSurg Sports TraumatolArthrosc 19:408-411.
10. McIntyre J, Moelleken S, Tirman P (2001) Mucoid degeneration of the anterior cruciate ligament mistaken for ligamentous tears. SkeletalRadiol 30(6):312–315.
11. Melloni P, Valls R, Yuguero M, Saez A (2004) Mucoid degeneration of the anterior cruciate ligament with erosion of the lateral femoral condyle. SkeletalRadiol 33(6):359–362.
12. Motmans R, Verheyden F (2008) Mucoid degeneration of the anterior cruciate ligament. KneeSurg Sports TraumatolArthrosc 17(7):737–740.
13. Narvekar A, Gajjar S (2004) Mucoid degeneration of the anterior cruciate ligament. Arthroscopy 20(2):141–146.
14. Nishimori M, Sumen Y, Sakaridani K (2004) Mucoiddegenerationoftheanteriorcruciateligament—a reportoftwocases. MagnReson Imaging 22(9):1325–1328.

15. Salvati F, Rossi F, Limbucci N, Pistoia ML, Barile A, MasciocchiC (2008) Mucoid metaplastic-degeneration of anterior cruciate ligament. J Sports MedPhys Fitness 48(4):483–487.
16. Lintz F, Pyjol N, Boisrenoult P, Bargoin K, Beauflis P, Dejour D (2011) Anterior cruciate ligament mucoid degeneration: A review of the littrature and management guidelines. KneeSurg. Sport Traumatol. Arthrose 19:1326-1333.
17. Cha J H, Lee S H, Shin M J,Choi B K, Bin SI (2008) Relationship between mucoid hypertrophy of the anterior cruciate ligament and morphologic change of the intercondylar notch: MRI and arthroscopy correlation. SkeletalRadiol. 37: 821-826.
18. Matrawy K A, El NekeidyA M, Al-Dawody A (2012) Mucoid degeneration of anterior cruciate ligament: frequently under-diagnosed entity in MRI. The Egyptian J. Radio. And Nuclear Medecine 43, 227-233.
19. Chudasama C H, Chudasama V C, Prabhakar M M (2012) Arthroscopic management of mucoid degeneration of anterior cruciate ligament. Indian J. orthop. 46(5):561-565.
20. Lintz F, Pujol N, Dejour D, Boisrenoult P, Beaufils P (2010) Dégénérescence mucoide du ligament croisé antérieur : présentation et résultats à moyen termede la résection arthroscopique.Revue Chir. Orthop. Trauma.96 : 467-473.
21. Morice A, Coupry A, Lintz F, Robert H (2013) Plastie de reduction de la dégénérescence mucoide du ligament croisé antérieur: résultats cliniques et laximétriques : à propos de 23 cas.Revue Chir. Orthop. Trauma 99, 579-583.
22. Cha J R, LeeC C, Cho S D, Youm Y S, Young K H (2013) Symptomatic mucoid degeneration of the anterior cruciate ligament. Knee Surg. Sport Traumatol. Arthrose 21: 658-663.
23. Kakutani K, Yoshiya S, Matsui N, Yamamoto T, Kurosaka M. (2003) Intraligamentousganglioncystoftheanteriorcruciateligamentafter a traumaticevent.Arthroscopy, 19:1019-22.
24. Ewing SL, Rosai J (1974) Basophilic (Mucoid) degeneration of skeletal muscle. ArchPathol 97(1): 60-62.