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Role of Magnetic Resonance Imaging in Assessment of Anterior Cruciate Ligament Post-Grafting Cases in Terms of Graft Integrity and Complications

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ABSTRACT

Background: because of the high incidence of anterior cruciate ligament (ACL) injuries among the population, these have been the subject of many recent studies. It is the most commonly reconstructed ligament in the knee. Its clinical evaluation is difficult. MRI is reliably and accurately used to assess ACL-R complications.

Objective: this work is an attempt to spot light the diagnostic value of MR imaging in assessment of anterior cruciate ligament reconstruction graft for distinction of its various common complications.

Patients and methods: this prospective study was conducted on 50 patients with postoperative knee reconstruction of ACL. The study was done between the duration of (April 2014 to February 2019) in an MRI unit of a private radiology center. All cases were referred from the orthopedic department of New Cairo Hospital. **Results:** according to our results, 33 (66%) cases showed osteoarthritic changes, suggesting that the development of osteoarthritis is one of the common complications of ACL reconstruction, however it can't be considered the commonest complication as it can be explained by the associated risk factor as meniscal or chondral lesion. Thus osteoarthritic changes can be considered is one of the most common associated findings of ACL reconstruction and ACL reconstruction can be a risk factor for development of osteoarthritis.

Conclusion: MRI of the knee is indispensable and the preferred modality in evaluating the integrity of the ACL graft and can be reliably and accurately used in diagnosing complications associated with ACL reconstruction.

Keywords: MRI, ACL, CT.

INTRODUCTION

There has been an increase in the number of anterior cruciate ligament (ACL) reconstructions (ACL-R) over the past 25 years, likely attributed to the overall availability of surgeons capable of performing the procedure and the increased participation in sporting activities, which are prone to ACL injuries[1].

Although most patients treated with ACL reconstruction achieve excellent results, up to 15% of patients experience persistent instability and pain. Radiographs, computed tomography (CT), and magnetic resonance imaging (MRI) are all modalities used to evaluate ACL reconstructions. An understanding of the imaging appearance of normal ACL reconstruction and common causes of failure is therefore essential for the interpreting radiologist [2].

Multiple surgical procedures exist for ACL reconstruction; however, currently, the arthroscopically assisted technique is one of the most common surgical procedures performed to reconstruct this ligamen[3].

Autografts are considered the gold standard. Allograft constructs are occasionally used, but they are comparatively more prone to mechanical failure and are associated with increased synovitis and osteolysis. The two autografts commonly used for ACL reconstruction are patellar tendon and hamstring grafts [4].

ACL-R complications may be broadly characterized as those resulting in decreased range of motion (ROM), e.g., arthrofibrosis and impingement, and those resulting in increased laxity, i.e., graft disruption [5].

Causes of laxity include partial or complete tears of the graft, graft stretching/elongation and graft malplacement. Causes of decreased range of motion include roof impingement, arthrofibrosis and cyclops lesions, osteophyte formation, and mucoid degeneration of the graft. Additional complications include hard-ware complications and osteoarthritis [2].

AIM OF THE WORK

This work is an attempt to spot light on the diagnostic value of MR imaging in assessment of anterior cruciate ligament reconstruction graft for distinction of its various common complications.

PATIENTS AND METHODS

This prospective study was conducted on 50 patients with post operative knee reconstruction of ACL. The study was done between the duration of April 2014 and February 2019 in an MRI unit of a private radiology center in New Cairo Hospital. All cases were referred from the Orthopedic department of New Cairo Hospital.

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Written informed consent:

An approval of the study was obtained from Al- Azhar University academic and ethical committee. Every patient signed an informed written consent for acceptance of the operation.

All patients were subjected to:

1- Clinical history taking:-

- Name, age, sex, history of trauma, sport and previous operations.
- Symptoms and signs: including knee instability, loss of full knee extension or limited range of motion (ROM), knee pain, swelling or clicking, a new injury of the knee and infection.
- Timingand site of operation, type of operation (open or arthroscopic) and type of reconstruction graft.

Exclusion criteria (contraindications to MRI examination)**:** includes:

- Implanted biological devices (e.g., pacemakers, cochlear implants, CNS clips).
- History of claustrophobia or severe anxiety.
- Presence of metallic screws (produce artifacts, and affect tunnel position visualization).

2- Imaging:

All patients were subjected to the following MRI examination:

Conventional MRI:

Closed (1.5-T) magnet was used (GE optima 360w, USA). Patients were supine and the knees were positioned in near full extension, and an 8-channel high-definition surface coil was applied. The ACL is optimally imaged using multiple planes.

The ACL coronal view was obtained in the plane parallel to the course of the femoral inter-condylar roof based on the conventional sagittal image and the ACL sagittal image was obtained in the plane parallel to the medial border of the lateral femoral condyle on the orthogonal coronal image.

Additional sequences were added for some cases:

Sagittal oblique T2-weighted fast relaxation fast spin-echo (2500-3000/88, echotrain length of eight, two signals acquired, 500 x 300 matrix) and coronal intermediate-weighted fat-suppressed (2380/80, echotrain length of eight, two signals acquired, 512x 256 matrix).

Limitations of study include: the coexistance of meniscal injury with ACL tear, such knee injuries affect the accuracy of survey. It is difficult to find patients with solitary ACL where the additional injuries seemed to be distributed in the cases. Other limitations are patellar and hamstring tendon grafts that could not be compared to each other, because the fixation techniques differed. Another onewas the lack of a second-look arthroscopy in most of cases, as the knees were stable and grafts were intact in MRI, thus not all cases were arthroscopy revision candidates.

The MR images were interpreted and the following findings were recorded:

A. Basic findings:

1. Continuity and signal intensity of the ACL graft in sagittal T2 WI, oblique sagittal T2 WI and coronal proton density fat-suppressed and STIR images; intact grafts appear as either of low or intermediate signal intensity on short echo time images. On T2-weighted images, there may be intermediate signal intensity within the graft, but there should be no area isointense relative to fluid that traverses the full thickness of an intact graft. Signal intensity of the graft was graded as low when (similar to the posterior cruciate ligament), intermediate when (similar to the articular cartilage), and high when (similar to subcutaneous fat).
2. Position of the femoral and tibial bone tunnels on sagittal and oblique sagittal MR images graded into four zones (I-IV).
3. ACL complications including cystic degeneration, signs of laxity or stretching, signs of infection and hard-ware related complications.
4. Signal intensity and amount of periligamentous tissue between and around the ligamentous graft for assessment of arthrofibrosis/cyclops development on sagittal T1 WI, sagittal T2 WI and oblique sagittal T2 WI.
5. Amount of fluid in the knee joint on sagittal proton density fat-suppressed and axial T2 images was graded as minor, moderate or marked effusion.
6. Artifacts from the metallic fixation devices.

B. Ancillary findings:

They include status of the collateral ligaments, menisci and patellar tendon, 2ry signs of ACL tear and osteoarthritis.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc, Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- Independent-samples t-test of significance was used when comparing between two means.
- Chi-square (x^2) test of significance was used in order to compare proportions between two qualitative parameters.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. The p-value was considered significant as the following:
- Probability (P-value)
  - P-value <0.05 was considered significant.
  - P-value <0.001 was considered as highly significant.
  - P-value >0.05 was considered insignificant.

RESULTS

The study included 50 patients with anterior cruciate ligament reconstruction, that comprised 2 (4%) females and 48 (96%) males (**Table 1**), with a range of (19-51 years) & mean age of (30.62 years +/- 8.111 SD) (**Table 2** and **3**).

Table (1): Gender distribution in the studied patients

Sex		
	N	%
Male	48	96.00
Female	2	4.00
Total	50	100.00

Table (2): Distribution of the patients according to the age

Descriptive Statistics				
	Range	Mean	±	SD
Age	1 9 - 5 1	30.62 0	±	8.111

Table (3): Distribution of the age groups in the studied patients

Age groups		
	N	%
<30 Years	24	48.00
30-40 Years	18	36.00
>40 Years	8	16.00
Total	50	100.00

Among the 50 cases of arthroscopic ACL reconstruction 46(92%) patients had hamstring tendon autograft and 4 (8 %) patients had Bone-patellar tendon-Bone autograft (**Table 4**).

Table (4): Distribution of the patients according to the type of the ACL graft

The type of the ACL graft		
	N	%
Hamstring tendon autograft	46	92.00
Bone-patellar tendon-Bone autograft	4	8.00
Total	50	100.00

The estimated postoperative period had a range of (6-180 months) & mean period of (34.14 months +/- 33.95) (**Table 5**).

Table (5):Descriptive Statistics according to the post-operative period in the studied patients

Descriptive Statistics				
	Range	Mean	±	SD
ACLR (Months)	6 - 180	34.140	±	33.959

In 31 (62%) cases the femoral bone tunnel was located in zone IV (the optimal zone) while 19 (38%) cases were malpositioned femoral bone tunnels; all are too far anteriorly located (14 in zone III, 4 in zone II and one in zone I), (**Table 6**).

Table (6): Distribution of the patients according to the femoral bone tunnel placement

Femoral tunnel zone		
	N	%
I	1	2.00
II	4	8.00
III	14	28.00
IV	31	62.00
Total	50	100.00

In 32 (64%) cases the tibial bone tunnel was located in zone II (the optimal zone), while 18 (36%) cases showed malpositionedtibial bone tunnel where 14 (28%) cases were too far anterior (zone I) and 4 (8%) cases too far posterior (zone III), (**Table7**).

Table (7): Distribution of the patients according to the tibial bone tunnel placement

Tibial tunnel zone		
	N	%
I	14	28.00
II	32	64.00
III	4	8.00
IV	0	0.00
Total	50	100.00

MRI findings:

a. The main MRI findings:

Out of the fifty studied patients 14 (28%) cases showed an intact continuous graft; 9 (18%) cases showed homogeneous, low signal intensity on the T2-weighted and STIR images, while 5 (10%) cases showed mild focal (parallel to the graft fibers) intermediate to high T2-weighted and STIR signal intensity (one of them was asymptomatic); where they could not be considered an abnormal signal owing to the revascularization process as these patients presented in the first year postoperatively.

Diffuse or focal increased signal (parallel to the graft fibers) in the region of the ACL graft on the T2-weighted, STIR and fat suppressed PD-weighted images was found in all cases (22%) of the full-thickness tears, all cases (12%) of partial-thickness tears and the 7 (14%) impingement cases and 11 (22 %) cases of that diagnosed with stretching/laxity.

Total graft fiber disruption was apparent in 11 (22%) knees representing full thickness graft tear, while partial discontinuation and/or thinning of the graft fibers was seen in 6 (12%) patients (**Table 9**).

Twenty two (44%) studied patients showed one or more of the 2ry signs of ACL graft tear including anterior tibial translation, PCL buckling, positive PCL line sign, uncovering of the posterior horn of the lateral meniscus and pivot-shift–type marrow edema.

Sixteen (32%) cases had an arthrofibrosis/cyclops lesion, this include 2 cases of arthrofibrosis seen as an ill defined area of low signal within the interchondylar notch anterior and posterior to the graft. 14 cases of Cyclops appeared as well-circumscribed nodules anterior to the distal portion of the ACL graft demonstrating hypointense to intermediate signal intensity on T1-weighted images, variable signal intensity on PD and as a heterogeneous but predominantly of low signal intensity nodule on the T2-weighted images being well differentiated from high-signal-intensity joint fluid within the interchondylar notch (**Table 9**).

Graft impingement was evident in 7 (14%) cases with too-anterior tibial tunnels, the graft showed posterior bowing due to impingement against the top of the notch with high signal intensity in T2, STIR and fat suppressed PD images seen in the anterior two thirds of the graft.

Fourteen (28%) cases of our studied patients displayed signs related to ACL graft stretching/laxity where 9 (18%) showed short assumed graft course with posterior bowing owing to the too-anteriorly misplaced femoral tunnels and 5 (10%) displayed lax graft fibers with anterior tibial translation. All the fourteen patients elicited increased signal intensity in T2, STIR and fat suppressed PD images.

Cystic degeneration of the graft was reported in the form of fluid signal most appreciated in T2-weighted and STIR images, it was noted in 7 (14%) symptomatic cases; 2 (4%) were involving the femoral tunnel, 3 (6%) were affecting the tibial tunnel and 2 (4%) were seen in both tunnels. Mucoid degeneration of the graft was demonstrated in 3 (6%) symptomatic cases, that was obvious in T2-weighted and STIR images as an intracanalicular fluid between intact but splayed graft fibers where all were associated with cystic tunnel extension.

Only one (2%) symptomatic case in our study displayed typical signs of septic arthritis; intracanalicular fluid signal, surrounding bone marrow edema with femoral sinus formation, subcutaneous collection and multiple popliteal lymphadenopathy with full thickness graft tear.

One (2%) of the studied cases showed hardware-related complication where an anterior tibial migration of fixating screw which was seen in both sagittal and axial images (**Table 8**).

Table (8): Distribution of the main MRI findings in the studied patients

MRI findings		
	N	%
Full thickness tear	11	22.00
Partial thickness tear	6	12.00
Stretching/laxity	14	28.00
Impingement	7	14.00
Arthrofibrosis/Cyclops lesion	16	32.00
Mucoid Degeneration	3	6.00
Cystic degeneration	7	14.00
Septic arthritis	1	2.00
Fixation Site Complications	1	2.00
Intact ACL graft	14	28.00

b. Ancillary MRI findings:

A total 33 (66%) cases showed medial meniscus pathology;20 (40%) patients were associated with medial meniscus tear and 13 (26%) cases with medial meniscus degeneration. 6 (12%) cases with lateral meniscus tear, and 7 (14%) cases with lateral meniscus degeneration were observed, all were symptomatic patients (**Table 9**).

Table (9): Distribution of the ancillary MRI findings in the studied cases

Ancillary findings		
	N	%
Torn MM	20	40.00
Torn LM	6	12.00
Degenerated MM	13	26.00
Degenerated LM	7	14.00
Minor effusion	28	56.00
Moderate effusion	12	24.00
Marked effusion	3	6.00
Mild OA	19	38.00
Moderate OA	8	16.00
Advanced OA	6	12.00
MCL sprain	2	4.00
LCL sprain	1	2.00
2ry signs of ACL tear	22	44.00
Patellar tendinosis	3	6.00

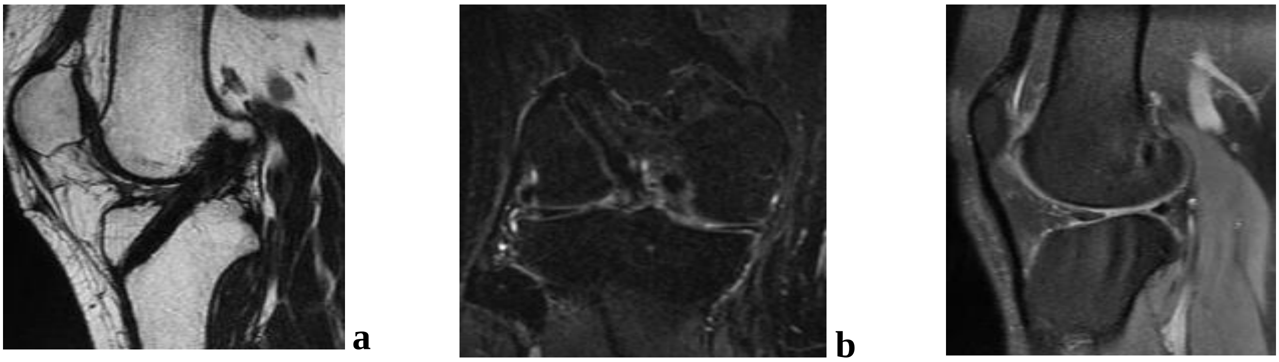
Axial T2-weighted, sagittal T2 and PD as well as coronal STIR images showed minor joint effusion in 28 (56%) knees, moderate in 12 (24%) cases and marked joint effusion was visible in 3(6%) cases.

33 (66%) cases showed osteoarthritic changes: mild osteoarthritic changes were observed in 19 (38%) cases, moderate changes in 8 (16%) patients and advanced osteoarthritic changes in 6 (12%) cases.

Two studied cases showed associated medial collateral ligament sprain (4%), only one cases (2%) demonstrated lateral collateral ligament sprain, also 3 (6%) cases demonstrated patellar tendinosis

Illustrative cases

CASE 1



a b c

Figure (1): A 25 years old male patient coming with pain and limited ROM of 2 months duration with history of ACL and meniscal repair 1 yr ago. a. Sagittal T2– oblique frFSE (2500/88), b. coronal STIR (3773/29) andc. Sagittal PD–FatSat (2394/30) demonstrate homogeneous low signal intensity throughout the ACL graft. B. and c. show the optimal position of the femoral bone tunnel while a. shows the optimal position of the tibial tunnel.

Diagnosis: Intact anterior cruciate ligament graft.

CASE 2

a b c

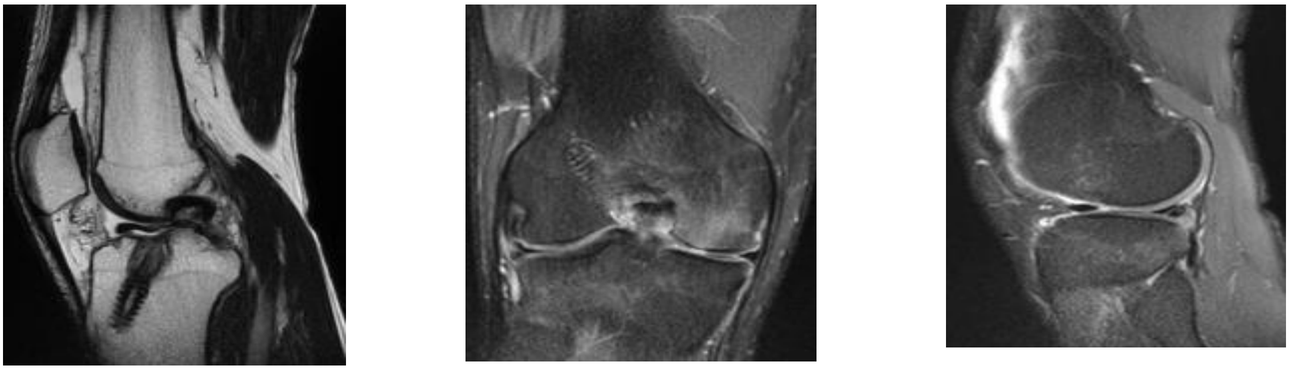
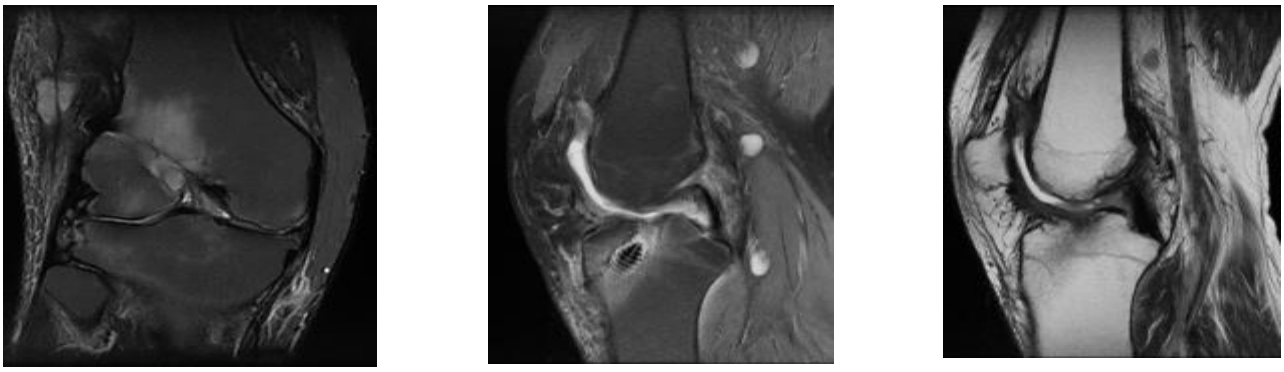


Figure (2): A 26 years old male patient coming with knee pain, swelling and instability after trauma of 2 days duration with history of ACL repair 2 yrs ago. A: Sagittal T2–frFSE (2989/87), b: Coronal PD–FatSat (2349/37) and c: Sagittal PD–FatSat (2101/34). a: demonstrate the lack of graft continuity with buckling of PCL, positive PCL sign, high signal intensity of the intra-canalicular segment and sagging of graft fibers in the IC notch. B: absent graft in the IC notch, c: increased bone marrow signal intensity (pivot shift marrow contusion). Note the anterior tibial translation of 5.4mm.

Diagnosis: Full thickness ACL graft tear.

CASE 3



a b c

Figure (3): A 33 years old male patient who underwent ACL and meniscal repair 1 yr ago with abscess drainage twice since following the operation, coming with current swelling, instability and pain of two weeks duration. A. Coronal STIR (4095/47), b. sagittal PD–FatSat (2530/33) and c. sagittal T2–frFSE images. a: demonstrate the high signal intensity of the femoral tunnel segment of graft with surrounding fluid signal, femoral bone marrow edema and subcutaneous fluid collection at the lateral aspect of knee, b. shows multiple enlarged popliteal LNs, c. shows the and lack of graft continuity and resorption of graft fibers in the IC notch.

Diagnosis: Septic arthritis with full thickness graft tear.

CASE 4

a b c

Figure (4): A 35 years old male patient with ACL-R 2 years ago, complains of pain one and half months ago. a. sagittal PD–FatSat (2404/33), b. sagittal T2–frFSE and c. coronal STIR (4095/47) images. A and b. show the cystic lesions interdigitating between the graft fibers. C. demonstrates the cystic lesion adjacent to the graft within the tibial tunnel with resulting expansion of the tunnel and surrounding reactive marrow edema.
Diagnosis: Mucoid degeneration of the graft with tibial tunnel cyst.

DISCUSSION

Most patients who have undergone primary ACL reconstrustion report good to excellent outcomes with regard to stability and return to pre-injury activity level. However, poor outcomes after primary ACL reconstruction can generally be classified into one or more of the following categories; Loss of motion, persistent pain, postoperative complications, extensor mechanism dysfunction and recurrent instability. One of the most common etiologies of recurrent instability is graft failure. The indications for evaluating ACL reconstructions with MRI include (a) failure of ACL reconstruction to stabilize the knee, (b) postoperative re-injury to the knee, (c) postoperative stiffness especially extension loss (flexion contracture) and (d) preparation for revision of a failed ACL reconstruction, all of which aid the surgeon in preoperative planning [(6)].

Early failures, those that occur within the first 6 months, often are secondary to poor surgical technique, failure of graft incorporation, or errors in rehabilitation. Late failures, those that occur more than 1 year after surgery, likely are related to new trauma and graft tearing [(7)].

The statistical analysis of the cases included in our study according to the MRI features revealed that:-

Leathers *et al.*[(8)] observed a statistically significant male predominance of ACL reconstructions in their male-to-female incidence ratio of 2.03, similar results were also noted by **Mall *et al.***[(9)]. **Sayampanathan *et al.***[(10)] noted that the mean age at ACL reconstruction was 29.4 years. A study conducted by **Nordenvall *et al.***[(11)] in Sweden revealed that the mean age of their study population of ACL reconstruction patients was 32.3 years (SD: 13.3).

Concordant results were found in our study; where there is significant male predominance as 48 males (96%) and 2 female cases (4%).Most of our cases: 42 patients (84%) were <40 years old where 24 of them (48%) below 30 years old with an age range of (19-51 years) & mean age of (30.62 years) with +/- (8.111) SD.

In our study, diffuse or focal increased signal (parallel to the graft fibers) in the region of the ACL graft on the T2- weighted, STIR and fat suppressed PD-weighted images was found in all 11 (22%) cases of the full-thickness tears, all 6 cases (12%) of partial-thickness tears and the 7 (14%) impingement cases and 11 (22 %) cases of that diagnosed with stretching/laxity. 5 (10%) cases with intact graft fibers showed also intermediate signal intensity the T2-weighted, STIR and fat suppressed PD-weighted images however could not be considered an abnormal finding taking into consideration the revascularization process as these patients presented in the first year postoperatively.

Kamel *et al.*[(6)] believed that ACL graft discontinuity, focal thinning and presence of any intact ACL graft fibers were better assessed in the coronal plane than in the sagittal plane. They noticed that complete discontinuous graft on both sagittal and coronal planes increased specificity to 100% in the diagnosisof a full thickness graft tear. **Kupczik *et al.***[(12)] also showed that as compared with previous studies, complete ACL graft discontinuity was the most valuable primary sign in the diagnosis of full thickness graft tear having high specificity (91%) in discriminating full thickness graft tear from intact graft. However it has low specificity (58.8%) in discriminating full thickness tear from partial thickness tear. They stated that focal thinning of ACL graft with presence of any intact fibers was a more valuable sign in discriminating partial graft tear from intact graft than in discriminating partial ACL graft tear from full thickness tear.

Our results showed that 11 (22%) cases diagnosed with full thickness tear; complete graft discontinuity was noticed in both coronal and sagittal images. 6 (12%) case of our patients were diagnosed as partial thickness graft discontinuitywith presence of some intact fibers as well as focal graft fiber thinning in both coronal and sagittal images.

Adalany *et al.*[13] found that tibial bony tunnels were malpositioned and were anterior to the Blumensaat line in 69%, they found that the main cause for complete graft disruption was malpositioning of the tibial or femoral tunnels, where most of the patients (98%) who are suffering from complete, partial graft tear or impinged graft had malpositioning of either the tibial or the femoral tunnels. These findings are correlated with the study of **Bryan *et al.*[14]**. **Kulczycka *et al.*[15]** suggested that the adequate positioning of the tibial tunnel is considered as an important factor that prevents impingement of the ACL graft and non-isotropic positioning of the bony tunnel causes the graft to be subjected to abnormal stress during the movement of the knee joint and spontaneous rupture may occur.

This is in agreement with our study. We found that tibial bony tunnels were anteriorly malpositioned (zone I) in 14 (28%) cases, the impingement was noticed in 7 (14%) cases additionally this abnormal position of the tibial tunnels causes the graft to be subjected to complete graft tear in the other 7 (14%) cases. Also, there were 14 (28%) of the included patients showing ACL graft stretching/laxity, 12 (24%) showed malpositioned anteriorly located femoral tunnels (zone I, II, III) while only 2 (4%) patients showed posterior tibial tunnels (zone III). 7 (14%) cases of the included patients represents the impingement cases where all showed an intermediate or high signal on PD-fat suppressed images with too anterior tibial tunnels (zone I).

Hagino *et al.*[16] and **Leathers *et al.*[8]** have shown that 30% to 60% of primary anterior cruciate ligament (ACL) tears are associated with meniscal or chondral injury and that lateral meniscal tears are more common than medial meniscal tears.Injuries to the meniscal and chondral structures seen at the time of ACL reconstruction are common. **Lohmander *et al.*[17]** stated that isolated ACL injuries are uncommon. Associated injuries to the menisci, other ligaments, joint cartilage, and subchondral or cancellous bone tend to occur when a patient sustains an ACL tear.

A total 33 (66%) cases showed medial meniscus lesions; 20 (40%) patients were associated with medial meniscus tear and 13 (26%) cases with medial meniscus degeneration. 6 (12%) cases with lateral meniscus tear, and 7 (14%) cases with lateral meniscus degeneration were observed, all were symptomatic patients.

According to **Bolog *et al.*[18],** the second common cause of impaired knee extension after the graft impingement is the presence of localized arthrofibrosis“ cyclops lesion”. It appearsin1–10%of patientswithACLreconstruction and represents a focal fibrosis situated anterior to the distal portion of the ACL graft, often in the midline of the joint space. **Facchetti *et al.*[19]** showed that the prevalence of cyclops lesions detected by MRI is approximately 25% of the patients with ACL reconstruction, which is higher than previously estimated. They found that it develops withinthe first 6 months after surgery.In our study; 16 (32%) cases had an arthrofibrosis/cyclops lesion, this include 2 cases of diffuse arthrofibrosis and 14 cases of Cyclops lesionthat was noticed as a heterogeneous but predominantly of low signal intensity nodule on the T2-weighted images being well differentiated from high-signal-intensity joint fluid within the interchondylar notch.

Septic arthritis is arare complication after ACL reconstruction, Dayan et al, 2015 stated that the septic arthritis after ACL-R has a cumulative incidence of 0.1% to 0.9%. Where in **Meyer *et al.*[20]** septic arthritisit was less than 0.5% of patients.

The commonest post ACL reconstruction complication in our study is the arthrofibrosis/cyclops lesion being noticed in 16 (32%) cases of the studied patients. The instability was the commonest specific presentaion seen in 12 (44.68%) of cases, the 2nd most common complication is the graft stretching/laxity where it was observed in 14 (28%) cases. This was explained by the concomitant presence of cyclops lesion in some of the cases with ACL graft tear. The least common complications were the septic arthritis and hardware-related complications where they were seen in one case each representing only 2% of our studied cases. This hardware-related complication was anterior displacement of the tibial screw.

Zappia *et al.*[21] stated that ACL reconstruction may in fact be a risk factor for osteoarthritis as a long-term complication, 2 to 15 years after surgery. This is presumably due to alteration of normal biomechanics leading to compression of articular cartilage and the risk factors for developing osteoarthritis after ACL reconstruction include meniscal injury and age > 25 years at the time of surgery.

Paschos[22] stated that ACL tear is associated with an increased risk for OA development. This risk increases remarkably when an associated meniscal or chondral lesion is present and although the ACL reconstruction potentially restores knee stability and appears to reduce the risk of OA, but it cannot fully eliminate the increased risk. The initial impact of injury at the time of ACL tear could explain the association between OA and ACL tear.

According to our results, 33 (66%) cases showed osteoarthritic changes, suggesting that the development of osteoarthritis is one of the common complications of ACL reconstruction, however it can’t be considered the commonest complication as it can be explained by the associated risk factor as meniscal or chondral lesion. Thus osteoarthritic changes can be considered is one of the most common associated findings of ACL reconstruction and ACL reconstruction can be a risk factor for development of osteoarthritis.

CONCLUSION

MRI of the knee is indispensable and the preferred modality in evaluating the integrity of the ACL graft and can be reliably and accurately used in diagnosing complications associated with ACL reconstruction. Therefore, it is incumbent on radiologists to be familiar with the different complications that may be encountered after ACL reconstruction.

RECOMMENDATION

MRI of the knee is a non invasive procedure that can be reliably and accurately used in diagnosing of complications associated with ACL reconstruction. The sagittal or coronal oblique images can increase the accuracy however the PD- fat-sat and T2 sagittal and coronal STIR images can be give satisfactory results enough for accurate diagnosis. To visualize bone edema and soft tissues, STIR sequence is useful because it show less pronounced artifacts than fat-sat sequences. The bone canal widening would be better assessed with CT.

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