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**ANALYSIS OF KNEE INJURIES IN DIFFERENT  
SPORTS BY USING 3 T. M. RI TECHNIQUES IN  
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# Analysis of Knee Injuries in Different Sports by Using 3 T. M. RI Techniques in India

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**Abstract – Purpose:** MRI assessment of knee Injuries in different Sports.

**Procedure:** Forty patients of sports related knee pain, 10 each from Football, Basketball, Athletics and Judo were selected for the study. Patients were subjected to dedicated MR knee study and diagnosis were analysed.

**Result:** The study was conducted on forty patients complaining of Sports related knee pain, 10 each from Football, Basketball, Athletics and Judo. Regarding sex distribution, 10 patients (25%) were male, while 30 patients (75%) were female. Patients were subjected to dedicated MR knee study, 2 patients (5.0 %) had normal MRI findings and 38 patients (95%) showed abnormal MRI findings. Only 17 patients (44.7 %) were diagnosed with isolated injuries and 21 patients (55.2%) were diagnosed with combined injuries,

Among football players, 5 (50%) patients were diagnosed with only ACL injury, none diagnosed with only meniscus injury, 3 (30%) were diagnosed with ACL+ Meniscus injuries, 2 (20%) were diagnosed with complex knee injuries and no patient had normal MRI.

Among basketball players, 2 (20%) patients were diagnosed with only ACL injuries, 3 (30%) patients were diagnosed with only meniscal injuries, 4 (40 %) patients were diagnosed with ACL +Meniscus injuries, 1 (10%) patients were diagnosed with Complex injuries and no patient had normal MRI.

Among athletics, 2 (20%) patients were diagnosed with only ACL injuries, 1 (10%) were diagnosed with only meniscus injuries, 3 (30%) were diagnosed with ACL + Meniscus knee injuries, 3 (30 %) were diagnosed with complex injuries and 1 (10%) patient had normal MRI.

Among Judo players, 3 (30%) patients were diagnosed with only ACL injuries, 1 (10%) were diagnosed with only meniscus injuries, 1 (10%) were diagnosed with ACL + meniscus injuries, 4 (40%) were diagnosed with complex knee injuries and 1 (10%) patient had normal MRI.

**Conclusion:** MRI represents the optimal tool in the evaluation of the sports related knee injuries, which has been shown to be an accurate and non-invasive method of diagnosing ligament, meniscal, bony and muscular knee injuries. Prevalence of common injury in each sport was also analysed and correlated with mechanism of injury.

## INTRODUCTION:-

The knee is a major weight bearing joint that provides mobility and stability during physical activity as well as balance while standing(1). It is essential for competing in almost every sport, but it is also the most common site for injury in young athletes. Overall, knee injuries make up about 55% of all sports injuries. These injuries often lead to severe pain and disability(2)

Magnetic Resonance Imaging (MRI), with its multi-planar capabilities and excellent soft-tissue contrast, has established itself as the leading modality for non-invasive evaluation of the sports related knee injuries(3.) Magnetic resonance imaging is a well-accepted imaging modality in the diagnostic workup of patients with knee complaints and has largely replaced diagnostic arthroscopy for this purpose(4). It is regarded as the top imaging and diagnostics tool

for the knee joint as a result of its ability to evaluate a wide range of anatomy and pathology varying from ligamentous injuries to articular cartilage lesion. Imaging of the knee requires excellent contrast, high resolution and the ability to visualize very small structures, all of which can be provided by MR imaging. The development of advanced diagnostic MR imaging tools for the joints is of increased clinical importance as it has been recently shown that musculoskeletal imaging is a rapidly growing field in MR imaging applications(5)

Sprain occurs when one or more of your ligaments have been stretched, twisted or torn, usually as a result of excessive force being applied to a joint.

Strain occurs when the muscle has been stretched beyond its limits or it has been forced to contract too quickly.

**METHODS**

The total 40 subjects (10 from each game) for the present study were selected from Gargi College Athletics, Basketball, Judo Team and YMCA Greater Noida, Football Academy. The age of the patients were range from 15 years to 30 years with the mean age of 21.6, Table-1 & Figure -1

Regarding sex distribution, 10 patients (25%) were male, while 30 patients (75%) were female, Table -2 & Figure -2.

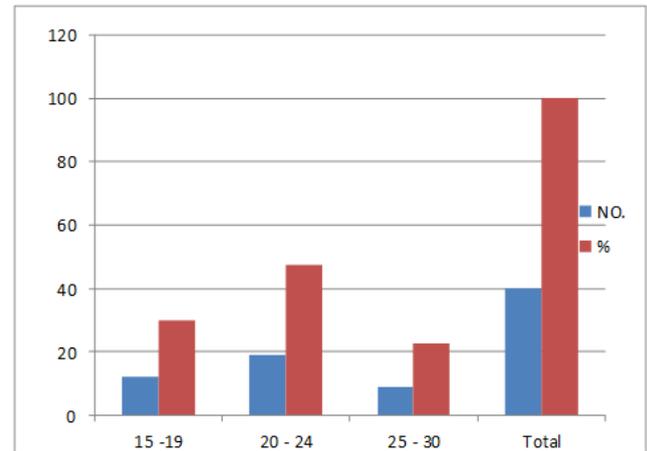
Patients were subjected to dedicated MR knee study. All patients in this study were examined using 3.0 – T MR at JAYPEE Hospital , Noida with dedicated knee coil using sequences as follows:

- Sagittal PDW (SPAIR); Sagittal T2W
- Coronal PDW (SPAIR); Coronal T1W
- Axial PDW( SPAIR); Axial T1W

**Table -1 Distribution of Patient According to Age**

| AGE          | PATIENT NO. | %          |
|--------------|-------------|------------|
| 15 - 19      | 12          | 30         |
| 20 - 24      | 19          | 47.5       |
| 25 - 30      | 9           | 22.5       |
| <b>TOTAL</b> | <b>40</b>   | <b>100</b> |

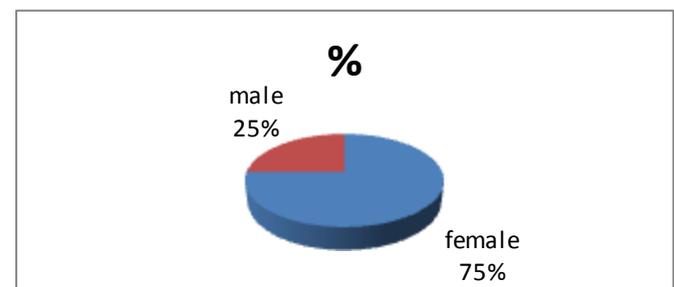
**Figure-1 Illustration of Patients According to Age**



**Table -2 Distribution of Patients According to Sex**

| SEX          | NO.       | %          |
|--------------|-----------|------------|
| MALE         | 10        | 25         |
| FEMALE       | 30        | 75         |
| <b>TOTAL</b> | <b>40</b> | <b>100</b> |

**Figure – 2 Illustration of Patients According to Sex**



**LIMITATIONS**

1. Study conducted on small sample size of 40 patients.
2. Symptomatic patients included in study but revealed normal MRI, were not confirmed with diagnostic arthroscopy.

**RESULTS**

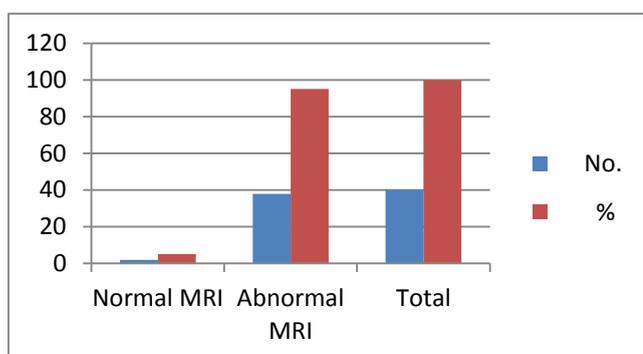
The study was conducted on forty patients, 10 each from Football, Basketball, Athletics and Judo complaining of Sports related knee pain, 2 patients (5.0 %) had normal MRI Findings and 38 patients

(95%) showed abnormal MRI findings. Table -3 & Figure -3

**Table 3. Patient According to MRI Findings.**

| MRI Finding  | Patient No. | %          |
|--------------|-------------|------------|
| Normal MRI   | 2           | 5          |
| Abnormal MRI | 38          | 95         |
| <b>Total</b> | <b>40</b>   | <b>100</b> |

**Figure 3. Illustration of Patients according to MRI findings.**



**Table 4 Distribution of Patients (%) According to Sports and Type of Knee Injuries.**

| Type of Injuries | Football  | Basketball | Athletics | Judo      |
|------------------|-----------|------------|-----------|-----------|
| Only ACL         | 5 (50%)   | 2 (20%)    | 2(20%)    | 3 (30%)   |
| Only Meniscus    | 0         | 3 (30%)    | 1(10%)    | 1 (10%)   |
| ACL+ Meniscus    | 3 (30%)   | 4 (40%)    | 3(30%)    | 1 (10%)   |
| Complex injuries | 2 (20%)   | 1 (10%)    | 3(30%)    | 4 (40%)   |
| No injury        | 0         | 0          | 1(10%)    | 1 (10%)   |
| <b>Total</b>     | <b>10</b> | <b>10</b>  | <b>10</b> | <b>10</b> |

**Fig 4. Illustration of Patients (%) According to Sports and Type of Knee Injuries.**

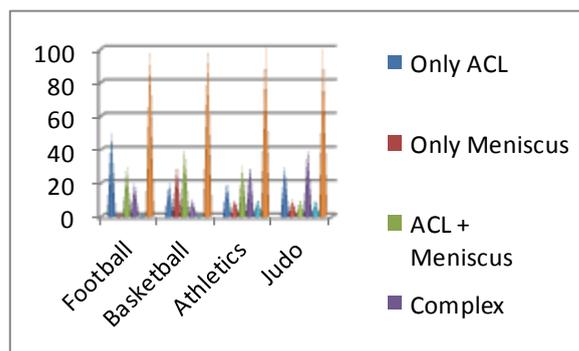


Table -4 illustrate details type of knee injuries in patients according to selected sports. 10 patients from each football, basketball, judo and athletics were studied:

In the football players, 5 (50%) patients were diagnosed with only ACL injury, none diagnosed with only meniscus injury, 3 (30%) were diagnosed with ACL+ Meniscus injuries, 2 (20%) were diagnosed with complex knee injuries and no patient had normal MRI.

In the basketball players, 2 (20%) patients were diagnosed with only ACL injuries, 3 (30%) patients were diagnosed with only meniscal injuries, 4 (40%) patients were diagnosed with ACL +Meniscus injuries, 1 (10%) patients were diagnosed with Complex injuries and no patient had normal MRI.

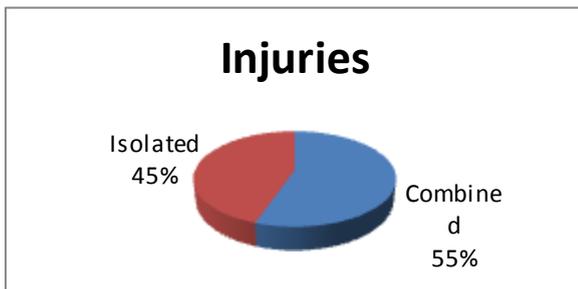
In the athletics, 2 (20%) patients were diagnosed with only ACL injuries, 1 (10%) were diagnosed with only meniscus injuries, 3 (30%) were diagnosed with ACL + Meniscus knee injuries, 3 (30%) were diagnosed with complex injuries and 1 (10%) patient had normal MRI.

In Judo players, 3 (30%) patients were diagnosed with only ACL injuries, 1 (10%) were diagnosed with only meniscus injuries, 1 (10%) were diagnosed with ACL + meniscus injuries, 4 (40%) were diagnosed with complex knee injuries and 1 (10%) patient had normal MRI.

**Table 5 Distribution of Patients According to Type of Injury.**

| Injury            | No.       | %          |
|-------------------|-----------|------------|
| Isolated injury   | 17        | 44.7       |
| Combined injuries | 21        | 55.3       |
| <b>Total</b>      | <b>38</b> | <b>100</b> |

**Fig. 5 Illustration of Patients (%) According to Type of Injury**



Only 17 patients (44.7 %) were diagnosed with isolated injuries and 21 patients (55.2%) were diagnosed with combined injuries, table 5 and figure 5.

**DISCUSSION**

MRI of the knee joint has become a reliable tool in the detection of sports related knee injuries. Injuries to menisci and cruciate ligaments can be diagnosed on MRI with a high degree of sensitivity and specificity, but accuracy of MRI decreases in patients with multiple injuries.(6)

Although arthroscopy has been considered the gold standard in diagnosis of meniscal and ligament injuries MRI remains a reliable, non-invasive modality, which can reduce the use of diagnostic arthroscopy.

Zairul – nizam et al. Studied patients with knee injuries and concluded that the MRI is very sensitive in diagnosing meniscus and ligaments injuries(7)

Nikolaou et al. Studied 46 patients and concluded that the diagnostic power of MRI in knee injuries was substantially more than physical examination.(8)

However, in other studies there were some contradictory findings, amd husudhan e al. In the UK studied 109 injuries knee. In their study the physical examinations. With the exception of meniscus tears, were superior to MRI results. (9)

Major causes for the difference in the results were related to different skill level of personnel involved in

MRI interpretation, and clinical examination. The difference in the technique used for the MRI is of importance. Studies has shown that if the examination is performed by a skill technician, the results will be accurate. (10)

Some authors reported that specific imaging sequences improve the sensitivity and specificity for detecting meniscal and ligament tears. ( 11 ).

The value of our work is that we studied incidence of knee injuries in each sport separately. Identifying the technical factors of the game behind the motion that causes such injuries can help us devise ways to prevent them.

Total 40 subjects were selected between the age group of 15- 30 years. The mean age of the selected sample was 21.6 years. Maximum injuries were found in age group 20 – 24 years.

Male and female percentage of the total patients is represented in table 2. 10 (25%) male and 30 (75%) were females of the total patients. Source of selected sample includes only female institute which may be responsible for M: F ratio 1: 3.

MRI findings were represented in table 3 which shows that 2 (5%) patients had normal MRI and 38 (95%) were diagnosed with abnormal MRI findings.

Details of type of knee injuries in patients according to selected sports has been illustrated in table 4. 10 patients from each football, basketball, judo and athletics were studied:

In the football nearly 50 % of patients were diagnosed with only ACL injuries on knee MRI. Intense physical and technical skill required, running, kicking and twisting movements cause increased incidence of ACL injuries. Sharp change in direction, landing wrong from a jump, or blunt force to the knee can cause sudden injury to ligament. The incident usually needs to happen at speed. Muscle weakness or incoordination predispose to a ligament sprain or tear. (12).

In the basketball nearly 40 % patients were diagnosed with ACL + meniscus knee injuries. Pivoting, rebounding, running and jumping on hard basketball court surface increases the incidence of injuries. Basketball requires extensive stop and go and cutting manoeuvres which can put the ligaments and menisci of the knee at risk. Injury to the collateral ligament is also common following a blow to the outside of the knee and is often treated with ice, and bracing with gradual return to activity. An injury to the anterior cruciate ligament is a more serious injury and can occur with an abrupt change in direction and landing for the jump.(13)

It indicates that ACL + Meniscus and Complex injuries are found more common in athletes because athletics consists running, jumping and throwing which require vigorous physical movements. This would create acute pressure on knee joint which bears whole body weight. For most athletes, speed and quickness are essential to a winning season. An athlete must be agile and quickly change position running from one direction to the next. Some athletes go head to head and exert tremendous amounts of energy trying to push back, pull, or take down the opposing player. Marathon and cross country runners endure the repetitive stress of running incredible distances. Athletes place very high demands on their knees and dramatically increase the risk of injury at not only the present but well after the athlete stops competing.(14)

Complex knee injuries were found to be more common in judo. It is a combative sports, need physical contact and require placing of body weight, this all would result in pressure on the knee joint to control body during physical contact and struggle. Knee injuries are the most common injury in judo due to repeated falling and constant physical contact. (15)

Due to complex nature of physical motion, combined injuries ( 55.3 %) were more common than isolated injuries (44.7 %).

**Case 1**



Sagittal PD SPAIR image demonstrating complete tear of fibres of anterior cruciate ligament, moderate intra-articular joint effusion also noted.

**Case 2**



Coronal PD SPAIR images showing complex injuries - horizontal tear in posterior horn of medial meniscus and sprain of medial collateral ligament.

**Case 3**



Coronal PD SPAIR images revealing complex injuries with partial tear in medial collateral ligament, bony contusion and marrow edema at medial femoral condyle.

Case 4



Sagittal PD SPAIR images showing isolated injury – oblique tear in posterior horn of medial meniscus and mild joint effusion.

**CONCLUSION**

1. Isolated ACL injuries were more common in football players.
2. Meniscal injuries were seen more frequently in basketball players.
3. Athletics and Judo students show increased frequency of complex injuries.
4. MRI is a sensitive modality for diagnosis of knee injuries.

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