Contents lists available at ScienceDirect

Journal of Clinical Orthopaedics and Trauma

journal homepage: www.elsevier.com/locate/jcot

Prevalence of concomitant knee injuries associated with anterior cruciate ligament tear in kabaddi and football players

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ARTICLE INFO

Article history:

Received 8 April 2020

Received in revised form

15 May 2020

Accepted 28 May 2020

Available online 6 June 2020

Keywords:

Meniscal tear

Chondral damage

Football

Kabaddi

ABSTRACT

Background: There is little literature available about the type of sports and concomitant knee injury.**The purpose of the study:** To help in better prediction of concomitant knee injuries in football and kabaddi players.**Material method:** Five hundred and seventeen male athletes [Football (n = 226) and Kabaddi players (n = 291)] aged between 16 and 35 years were enrolled in the study. These were categorized into five groups depending upon the time interval between injury and surgery (0–3 months, 3–6 months, 6–9 months, 9–12 months, 12–18 months and 18–24 months). Meniscal and chondral damage present at the time of ACL reconstruction was documented.**Results:** The overall incidence of meniscal tear was more in kabaddi players (220/291) as compared to football players (144/226; p = 0.003). The incidence of both menisci tear was more in kabaddi as compared to football (p = 0.02). Incidence of lateral meniscus tear (147/291) in kabaddi was more as compared to football (84/226; p = 0.002). The incidence of condylar damage was comparable in both groups. Medial femoral condyle was more commonly injured in both the sports irrespective of time frame.**Conclusion:** The chances of meniscus injuries were more in kabaddi players compared to football players in ACL deficient knee. The time interval between injury and surgery had a direct correlation with meniscus and chondral injuries.**Level of evidence:** Level III, retrospective study.

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1. Introduction

Anterior cruciate ligament (ACL) tear is a common sports injury¹ and it can occur with or without meniscal tear or chondral damage. Effect of age and duration of injury (DOI) on ACL associated concomitant knee injuries are extensively studied.^{2–4} The incidence of these concomitant knee injuries rises with increase in time interval between injury and surgery.⁵ Previous studies have suggested that lateral meniscus tears are more common in acute injuries; whereas, medial meniscus injuries are more common in chronic ACL tear.^{5–7} Presences of these concomitant knee injuries are responsible for poor functional outcome in ACL reconstructed (ACLR) patients.^{8–11} Thus, it is important to recognize the risk

factors for meniscal and chondral injuries that occur in conjunction with ACL tear.

In India, kabaddi and football are the two sports, which are responsible for majority of ACL injuries.^{12,13} The correlation of these sports with meniscal and chondral damage in different time frames is not very well studied. The objective of this study was to help in prediction of meniscal and chondral damage in specific time frame in these two sports. It was hypothesized that medial compartment injuries would increase with an increase in DOI in both the sports and overall incidence of concomitant knee injuries would be more in kabaddi players as compared to football players.

2. Material and methods

The data for the present study was gathered retrospectively from the hospital medical records. 517 athletes who underwent primary ACLR from the year 2014–2019 were evaluated. Most of the patients had complete ACL tear (n = 508), only few patients had

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partial ACL tear (7 in football and 2 in kabaddi). In these patients new ACL was reconstructed preserving native ACL. Both professional and recreational players who were injured while playing football ($n = 226$) or kabaddi ($n = 291$), were included in the study. Older athletes reported to have more risk of meniscal tear and chondral damage in ACL deficient knees,¹⁴ therefore to remove bias, patients aged more than 35 years were not included in the study. Female athletes, skeletally immature patients and athletes who were previously operated on the same knee or had another ligamentous injury were excluded from the study.

Patients were divided into 6 groups (0–3 months, 3–6 months, 6–9 months, 9–12 months, 12–18 months, >18 months) depending upon the duration between time of injury and surgery.¹⁵ In a case of ACL associated meniscal tear, side (medial or lateral) and site of meniscal (anterior horn/body/posterior horn) injury was documented. In a case of a chondral lesion, side [medial femoral condyle (MFC) or lateral femoral condyle (LFC)] and severity (Outerbridge classification) of chondral damage was documented. The chondral damage was divided into two groups depending upon the severity – high grade (grade 3 and 4) and low grade (grade 2 and 1). All patients underwent similar rehabilitation protocols irrespective of the presence or absence of meniscal or chondral damage. Data was analyzed using SPSS software and Chi-square test was used to evaluate the effect of type of sports and DOI on the occurrence of meniscal and chondral injuries. The quantitative variables were expressed in terms of mean and standard deviation. Student unpaired *t*-test was used to compare quantitative variable.

3. Results

Five-hundred and seventeen patients (226 football players and 291 kabaddi players) who had undergone primary ACLR were evaluated in the present study. The mean age of football and kabaddi players was 23.76 ± 4.21 years and 24.12 ± 4.81 years respectively ($p = \text{n.s.}$). In the football cohort, 130 patients had an injury to the non-dominant limb and 96 patients had an injury to the dominant limb. In the kabaddi cohort, 163 patients had an injury to the non-dominant limb and 128 patients had an injury to the dominant limb. The mean time from injury to surgery was 5.79 ± 5.8 months in football players and 6.4 ± 5.9 months in kabaddi players (n.s.).

3.1. Meniscal injury

70% (364/517) of the patients had meniscal injury. Out of 517 athletes, 133 (25.7%) had medial meniscus tear, 137 (26.4%) had lateral meniscus and 94 (18%) had both menisci tear. Athletes injured while playing kabaddi (220/291; 76%) were more likely to have meniscal tear as compared to those who were injured while playing football (144/226; 64%; $p = 0.003$). The incidence of both menisci tear was also more in athletes who were injured while playing kabaddi (63/291; 22%) as compared to football (31/226; 14%; $p = 0.02$). The lateral meniscus was also more prone to injury in kabaddi players ((147/291 vs. 84/226; $p = 0.002$). However, in specific time frames, the incidence of medial (Fig. 1), as well as lateral meniscus tear (Fig. 2), was comparable in both football and kabaddi players. Posterior horn of meniscus was most commonly involved in both the sports (Table 2).

3.2. Chondral injury

Half of the patients in this study had chondral damage (259/517; 50%). The incidence of MFC and LFC damage was 35% (181/517) and 8% (44/517) respectively with 7% (34) of athletes had injury to both condyle. The injury to MFC was more common than LFC

irrespective of the time frame in both the sports (Tables 1 and 3; $p < 0.001$). In kabaddi, 103/291 (35%) patients had MFC damage, 27/291 (9%) patients had LFC damage and 24/291 (8%) patients had both condyles damage. In football, 78/226 (35%) had MFC, 17/226 (8%) had LFC damage and 10/226 (4%) patients had both condyles damage.

3.3. Duration of injury

Patients with a surgical delay of >18 months were more likely to have high-grade chondral injuries (Table 4). Nearly 2/3rd of patients had high-grade chondral injuries if surgery was delayed for >18 months. Rate of chondral damage increased significantly from 38% in patients undergoing ACLR in <6 months to 86% for those who had DOI >12 months ($p < 0.001$).

4. Discussion

In the present study, the incidence of overall meniscal tear, lateral meniscus tear, and both menisci tears were observed to be more in the players who were injured while playing kabaddi in comparison to those who were injured while playing football. Previously also, it was reported that lateral meniscus tear was more common in kabaddi players as compared to football players.¹⁶ As football and kabaddi are two different kinds of sports, it was anticipated to have different patterns of concomitant knee injuries in these sports. Football is mainly a pivoting sport whereas kabaddi is mainly a contact sport; therefore mechanism and force of injury in these sports would be different. Twisting of the knee in football players and scissor grip in kabaddi players is the most common reported mode of injury.¹⁷ Different kind of forces acting on knee at the time of injury is the possible explanation for difference in pattern of injury. However, there is a need for video analysis study to in order to understand the exact mechanism of injury in these two sports. Bruce et al. in their study documented that meniscal tear in football players was almost 3 times higher in the medial compartment as compared to lateral compartment.¹⁸ However, in present study, the incidence of meniscal tear was comparable in both compartments in football as well as in kabaddi (n.s.).

The incidence of concomitant injuries was observed to be progressively increasing with delay in surgery in both football and kabaddi players. It was observed that if surgery was delayed for >18 months then the incidence of both menisci tear was 6 times higher in kabaddi players and 7 times higher in football players. This implies that not only the incidence of medial meniscus as well as lateral meniscus tear increases with delay in surgery. This result is in accordance with previously published studies.^{19–21} However, Sri Ram et al. observed that incidence of lateral meniscus tear doesn't change with the increase in the duration of injury.²²

Previously, it was reported that in acute ACL tear, incidence of lateral meniscus tear was more as compared to medial meniscus tear.^{19,21} However, some studies did not observe higher incidence of lateral meniscal tear in acute ACL tear.^{23,24} In present study also, no such correlation between acute injury and lateral meniscus tear was observed.

The ideal timing for ACLR surgery is still a topic of debate.^{25–27} Some studies suggested that incidence of concomitant knee injuries increases only if surgery was delayed for >6 months.^{28–30} Whereas, some suggested that ACLR should be done early to prevent concomitant injuries.^{23,31–33} In present study, the incidence of concomitant knee injuries was progressively increasing after 3 months of injury. Papastergiou et al. reported that surgical delay of >3 months was associated with increased incidence of medial meniscus tear.³⁴ According to the American Academy of Orthopaedic Surgeons (AAOS), surgery should be performed within 5

Fig. 1. Comparison of medial meniscal tear in football and kabaddi in relation to the DOI.

Fig. 2. Comparison of lateral meniscal tear in football and kabaddi in relation to the DOI.

Table 1

Prevalence of concomitant knee injuries in ACL deficient in Kabaddi in relation to time from injury.

Kabaddi (n = 291)	Medial meniscus	Lateral meniscus	Both meniscus	MFC	LFC	Both condyle
0–3 months; n = 102	23.5%(24)	30%(31)	11%(10)	30%(30)	5%(5)	2%(2)
3–6 months; n = 65	25%(16)	32%(21)	20%(13)	32%(21)	8%(5)	8%(5)
6–9 months; n = 34	29%(10)	35%(12)	15%(5)	29%(10)	12%(4)	6%(2)
9–12 months; n = 46	26%(12)	28%(13)	28%(13)	48%(22)	17%(8)	11%(5)
12–18 months; n = 22	27%(6)	18%(4)	41%(9)	50%(11)	13%(3)	13%(3)
>18 months; n = 22	22%(5)	14%(3)	59%(13)	40%(9)	9%(2)	32%(7)

months of the injury to minimize the risk of concomitant knee injuries.³⁵ In this study, both incidence and severity of chondral damage were observed to be rising with delay in surgery. The results are in line with previous studies which reported that delay in ACLR is associated with high incidence of chondral damage.^{36–38}

Kabaddi is mainly a contact sport. With the recent gain in popularity of this sport, number of kabaddi players suffering from ACL injury has also increased. There are not many studies that compared these two sports in terms of concomitant knee injuries.

The results of this study will be helpful in the counselling and better prediction of concomitant knee injuries in players undergoing ACLR. Also, this study can be helpful in understanding of mechanism of injury in kabaddi players.

We were unable to study the impact of type of sports and duration of injury on treatment of meniscus tear; as due to financial issues all patients were not able to afford meniscal repair. Therefore, partial meniscectomy was done in such patients.

Table 2

Comparison of two sports depending upon the site and side of meniscal tear.

	Kabaadi		Football	
	Medial meniscus	Lateral meniscus	Medial meniscus	Lateral meniscus
Anterior horn	7% (9)	5% (7)	3% (3)	6% (5)
body	13% (18)	18% (27)	8% (7)	12% (10)
Posterior horn	33% (45)	36% (53)	35% (32)	35% (29)
Anterior horn + body	12% (16)	17% (25)	20% (18)	20% (17)
Body + posterior horn	31% (43)	21% (31)	32% (29)	25% (21)
Complete tear	4% (5)	3% (4)	2% (2)	2% (2)

Table 3

Prevalence of concomitant knee injuries in ACL deficient in Football in relation to time from injury.

Football (n = 226)	Medial meniscus	Lateral meniscus	Both meniscus	MFC	LFC	Both condyle
0–3 months; n = 92	21% (21)	25% (23)	6% (5)	27% (25)	6.5% (6)	1% (1)
3–6 months; n = 53	24.5% (13)	30% (16)	7% (3)	28% (15)	7% (4)	2% (1)
6–9 months; n = 29	34.5% (10)	24% (7)	14% (4)	48% (14)	10% (3)	3% (1)
9–12 months; n = 19	26% (5)	16% (3)	31% (6)	47% (9)	5% (1)	5% (1)
12–18 months; n = 17	35% (6)	12% (2)	35% (6)	47% (8)	6% (1)	12% (2)
>18 months; n = 16	31.5% (5)	19% (2)	44% (7)	44% (7)	12.5% (2)	25% (4)

Table 4

Effect of delay in surgery on the severity of chondral damage.

	High-grade chondral injuries	Low-grade chondral injuries	p-value
0–3 months n = 194	30 (15%)	39 (20%)	0.2
3–6 months n = 118	23 (19%)	28 (24%)	0.4
6–9 months n = 63	14 (22%)	20 (32%)	0.2
9–12 months n = 65	20 (31%)	26 (40%)	0.3
12–18 months n = 39	18 (46%)	10 (26%)	0.06
>18 months n = 38	25 (66%)	13 (34%)	0.006

5. Conclusion

The chances of meniscus injuries were more in kabaddi players as compared to football players in ACL deficient knee. The time interval between injury and surgery had a direct correlation with meniscus and chondral injuries.

Declaration of competing interest

Authors had no conflict of interest to declare.

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