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Impact of Surgery Timing on Functional Outcomes in Arthroscopic Anterior Cruciate Ligament Reconstruction

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ABSTRACT
The anterior cruciate ligament (ACL) is the primary stabilizer of the knee, and ACL tears are among the most common knee injuries worldwide. A complete ACL tear typically requires surgical intervention, with arthroscopic ACL reconstruction being the most widely used surgical technique. However, there is no consensus in the literature regarding the optimal timing for surgical reconstruction of the ACL. This study aimed to evaluate the functional outcomes of patients undergoing arthroscopic ACL reconstruction surgery at different time intervals: within 4 weeks of injury, between 4-8 weeks and between 8-12 weeks of injury. The objective was to determine the optimal timing for ACL reconstruction following the injury. This prospective observational study was conducted in the Department of Orthopedics at Vydehi Institute of Medical Sciences and Research Centre, between October 2018 and October 2020. Patients with ACL tears treated with arthroscopic ACL reconstruction using autologous semi tendinosus grafts were divided into three groups based on the duration since the injury: Group 1 (surgery within 4 weeks of injury), Group 2 (surgery between 4-8 weeks of injury) and Group 3 (surgery between 8-12 weeks of injury). Associated intraoperative lesions were documented and patients followed a standard ACL rehabilitation protocol. Functional outcomes were assessed using the International Knee Documentation Committee (IKDC) score and the Knee Society Score (KSS) at 6, 12 and 24 weeks post-surgery. Complications, if any, were noted during follow-ups. The results indicated no significant differences in the mean IKDC and KSS scores among the three groups. Statistical analysis revealed that the timing of arthroscopic ACL reconstruction within 12 weeks of injury did not significantly impact functional outcomes. Therefore, this study concludes that there is no optimal timing for ACL reconstruction surgery within the first 12 weeks post-injury to achieve superior functional outcomes.

INTRODUCTION

The anterior cruciate ligament (ACL) is the primary stabilizer of the knee during pivotal activities. Although the ACL was first described nearly 2000 years ago by Galen, its function and the consequences of its loss were not well understood until much later. The first documented case of an ACL tear was reported by Robert Adams in 1873 and the first ACL surgery was performed by Mayo Robson in 1895, followed by Grekow. Significant progress in ACL reconstruction began with Hey Groves, who between 1914 and 1920 initiated the use of autologous tissue for reconstruction, a technique resembling modern practices[1]. In the 1930s, Ivor Palmer wrote one of the first monographs on ACL injuries, advocating for primary suture repair[2]. Although this method often failed in athletes, Palmer laid the foundation for an aggressive surgical approach to ACL tears. Swedish surgeons like Jone, Macintosh and Erickson further advanced the field by favoring reconstruction with the patellar tendon over ligament repair, ushering in the modern phase of treatment. Macintosh pioneered extra-articular procedures, which proved effective in addressing anterolateral rotatory instability[3]. By the 1980s, grafting with the patellar tendon became the gold standard treatment, but during the 1990s, the semitendinosus graft gained popularity due to advancements in graft preparation and fixation techniques[4]. Over time, ACL injury treatment modalities have evolved significantly. Surgical interventions have progressed from open procedures requiring postoperative casting to minimally invasive arthroscopic procedures performed on an outpatient basis. Early arthroscopic techniques were primarily diagnostic, but their role expanded to include reconstruction[5]. In 1980, David Dandy performed the first arthroscopically assisted ACL reconstruction. Although technically complex, arthroscopic procedures offer numerous advantages, including reduced postoperative morbidity, faster recovery, better cosmesis and improved range of motion. ACL injuries are the most common ligament injuries of the knee, with surgical treatment often preferred for younger athletes and individuals with physically demanding occupations[6]. Surgery minimizes the risk of progressive degeneration, prevents long-term knee instability and restores joint stability. However, the optimal timing of surgery remains a subject of debate among surgeons[7]. Early surgical intervention has been shown to restore tibiofemoral stability and reduce the risk of further chondral and meniscal damage[8]. Delayed reconstruction, on the other hand, may lead to muscle atrophy and decreased strength, delaying early rehabilitation. Studies suggest that early ACL reconstruction, when combined with an emphasis on rehabilitation protocols and range-of-motion exercises, does not result in significant loss of motion[9]. This study aims to evaluate the functional outcomes of patients treated with arthroscopic ACL reconstruction surgery performed at different intervals following initial trauma. Specifically, it seeks to assess outcomes in three groups: surgeries conducted within 4 weeks of injury, between 4 and 8 weeks of injury and between 8 and 12 weeks of injury. Additionally, the study aims to compare the functional outcomes across these three groups using the International Knee Documentation Committee (IKDC) score and the Knee Society Score (KSS).

MATERIALS AND METHODS

Materials: This prospective observational study was conducted at the Department of Orthopaedics at Vydehi Institute of Medical Sciences and Research Centre, between October 2018 and October 2020. It was a hospital-based study involving a total of 90 patients with ACL tears, selected using a convenient sampling method.

Inclusion Criteria:

- Patients aged 18 years or older with ACL injuries.

Exclusion Criteria:

- Injury duration exceeding 12 weeks.
- Associated medial collateral ligament (MCL) or lateral collateral ligament (LCL) injuries.
- Associated posterior cruciate ligament (PCL) injuries.
- Associated injuries to the opposite knee.
- Patients younger than 18 years of age.

Methods: Subjects with ACL tears were treated with arthroscopic ACL reconstruction using autologous semitendinosus grafts. Patients were grouped based on the duration of injury as follows:

- **Group 1:** Surgery performed within 4 weeks of injury.
- **Group 2:** Surgery performed between 4-8 weeks of injury.
- **Group 3:** Surgery performed between 8-12 weeks of injury.

Intraoperative observations, including associated lesions, were documented. Patients were advised to follow a standardized ACL rehabilitation protocol and were evaluated at 6, 12 and 24 weeks postoperatively. Functional outcomes were assessed using the **International Knee Documentation Committee (IKDC) score** and the **Knee Society Score (KSS)**. Any complications were noted during follow-up visits.

Statistical Analysis: Quantitative variables were presented as mean, standard deviation (SD) and confidence intervals. Qualitative variables were expressed as percentages. Associations between categorical variables were analyzed using the

chi-square test or Fisher's exact probability test. A p-value of <0.05 was considered statistically significant. Data were analyzed using SPSS software.

RESULTS AND DISCUSSIONS

Even though 90 patients were planned for the study initially, a total of 79 patients were taken up for study, 7 were lost to 3rd follow-up and finally, 72 subjects were included in our study. Among the 72 patients, 32 patients got operated within 4 weeks of injury, 20 were operated within 4-8 weeks of the injury and 20patients had got operated within 8-12 weeks of injury. A total of 72 patients had undergone arthroscopic ACL reconstruction and were followed up at 6, 12 and 24 weeks of injury and assessed using IKDC and KSS scores (Table 1).

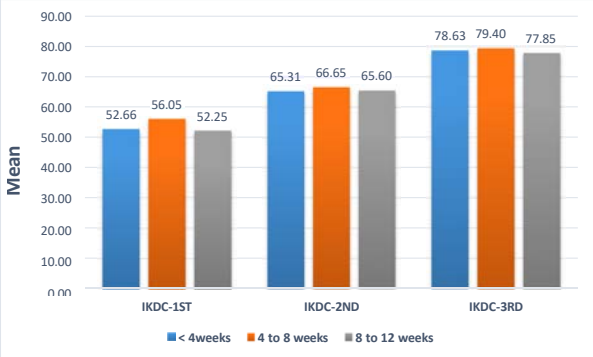

Fig. 1:Mean Values of the IKDC Score for Each Follow-Up Among the Groups

The mean values of IKDC scores in the 1st follow up of patients in the 1st group was 52.66 with an SD of 5.62. In the 2nd group, patients had a mean IKDC score of 56.05 and an SD of 7.49. The 3rd group of patients in their 1st follow up had a mean value of 52.25 and an SD of 6.93. All the 3 groups of patients in their 1st follow up had a similar mean value with 95% confidence interval. Hence the p-value obtained 0.12 is not significant. During the 2nd follow up in the 1st group of patients, the mean values of IKDC score obtained were 65.31 with an SD of 4.34. The 2nd group of patients had a mean value of 66.65 and SD of 6.78. The 3rd group of patients had a mean value of65.60 and an SD of 7.54. All the 3 groups of patients in their 2nd follow up had a similar mean value with 95% confidence interval the patients. The p-value obtained of 0.73 is not significant. Similarly, all the patients during their 3rd follow up were assessed by IKDC score. The 1st group of patients had a mean score of 78.63 and SD 4.67. The 2nd group of patients had a mean score of 79.40 with SD of 4.31. The 3rd group of patients had a mean score of 77.85 and SD 7.02. All the 3 group of patients in their 3rd follow up had a similar mean value with 95% confidence interval the patients. The p value obtained of 0.66 is not significant. These statistics indicate that there is no significant difference in the mean IKDC functional scores at different follow-ups as the progression in scores is similar in all the three groups (Table 2 and Fig. 1).

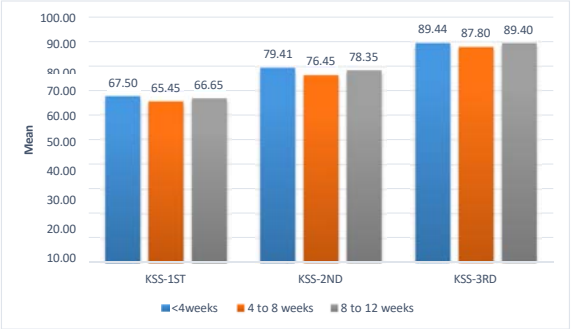

Fig. 2:The Mean KSS Scores of Each Group During the 3Follow-Ups

The above (table 3 and fig. 2) shows the mean values of the KSS score for each group during the follow-ups. The mean values of KSS scores in the 1st group of patients during their 1st follow up was 67.50 with an SD of 7.05. The 2nd group of patients in their 1st follow up had a mean IKDC score of 65.45 and an SD of 6.81. The 3rd group of patients in their 1st follow up had a mean value of 66.65 and an SD of 8.31. All the 3 groups of patients in their 1st follow up had a similar mean value with 95% confidence interval. Hence the p-value obtained 0.62 is not significant. During the 2nd follow up in the 1st group of patients the mean values of KSS score obtained were 79.41 with an SD of 5.41. The 2nd group of patients had a mean value of 76.45 and SD of 6.22. The 3rd group of patients had a mean value of78.35 and an SD of 8.29. All the 3 groups of patients in their 2nd follow up had a similar mean value with 95% confidence interval the patients. The p value obtained of 0.29 is not significant. The patients during their 3rd follow up were assessed similarly. The 1st group of patients had a mean score of 89.44 SD 3.97. The 2nd group of patients had a mean score of 87.80 with SD of 5.34. The 3rd group of patients had a mean score of 89.40 and SD 4.38. All the 3 group of patients in their 3rd follow up had a similar mean value with 95% confidence interval the patients. The p value obtained of 0.39 is not significant. These above statistics shows that there is no significant difference in the mean KSS functional scores at different follow-ups as the progression in scores is similar in all the three groups. The above (table 4) shows comparison between the groups over different follow up periods. In the 1st group of patients during the 1st follow up the mean IKDC score for the patients was 52.66 and SD of 5.62. In the 2nd follow up the mean were 65.31 with SD of 4.34. During the 3rd follow up

78.63 was the mean and 4.67 was the SD. The above analysis shows a significant improvement in the mean score during the follow-ups the p-value obtained was 0.00 which is highly significant. Among the group 2 patients, in the 1st follow up the mean IKDC score was 56.05 with an SD of 7.49. 2nd follow up mean was 66.65 with SD of 6.78. 3rd follow up the mean was found to be 79.40 and an SD of 4.31. Overall the p-value of 0.00 shows high significance. Next in the group 3 patients, in the 1st follow up the mean was 52.25 and an SD of 6.93, in 2nd follow up mean of 65.60 and SD of 7.54 was noted. 3rd follow-up shows 77.85 mean score an SD of 7.02. The final p-value of 0.00 shows high significance. Basically, the table depicts the improvement in the IKDC functional scores over different follow-up periods. Hence the progression in the mean scores shows significance. In the 1st group of patients during the 1st follow up the mean KSS score for the patients was 67.50 and SD of 7.05. In the 2nd follow up the mean were 79.41 with SD of 5.41. During the 3rd follow up, 89.44 was the mean and 3.97 was the SD. The above analysis shows a significant improvement in the mean score during the follow-ups the p-value obtained was 0.00 which is highly significant. Among the group 2 patients during 1st follow up, the mean KSS score was 65.45 with an SD of 6.81. 2nd follow up mean was 76.45 with SD of 6.22. 3rd follow up the mean was found to be 87.80 and an SD of 5.34. Overall, the p-value of 0.00 shows high significance. Next in the group 3 patients during the 1st follow up, the mean was 66.65 and an SD of 8.31, in 2nd follow up mean of 78.35 and SD of 8.29 was noted. 3rd follow- up shows 89.40 mean score an SD of 4.38. The final p-value of 0.00 shows high significance. Overall, the table shows the improvement in the KSS functional scores over different follow-up periods. Hence the progression in the mean scores is of significance (Table 5).

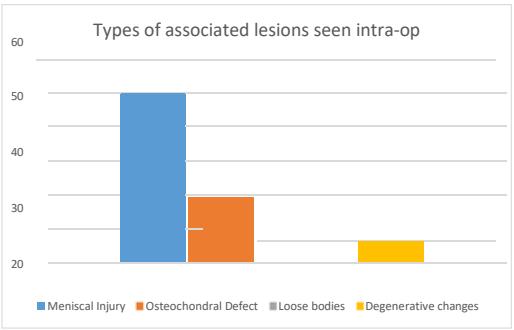

Fig. 3:Graph Showing Number of Patients Who were Noticed to Have an Associated Lesion Intra-Operatively

Intra operatively, any associated lesions noticed in arthroscopy were noted down. Among the 72 patients, 50 patients were noted to have one or both meniscal injuries intra-operatively. 18 patients had osteochondral defects at the femoral condyles, one patient underwent arthroscopic BMAC and fibrin sealant injection to the knee for the same one month later. 2 patients had cartilaginous loose bodies and 6 patients had degenerative changes of the cartilage. During the follow ups, 11 patients were noticed to have persisting stiffness at the next follow-up, they were advised to strictly follow the post-op rehab protocol. 2 patients had to be readmitted for physiotherapy under supervision. None of the patients in our study had developed infection or graft failure (Fig. 3).

This study analyzed 79 patients who underwent arthroscopic ACL reconstruction within 12 weeks of injury. Seven patients were lost to the third follow-up, leaving 72 patients for final analysis. These patients were categorized into three groups based on the timing of surgery: within 4 weeks, between 4-8 weeks, and between 8-12 weeks post-injury. The primary objective was to evaluate the functional outcomes in these groups and determine the optimal timing for ACL reconstruction surgery. The results revealed no statistically significant differences in the International Knee Documentation Committee (IKDC) and Knee Society Score (KSS) during the first, second and third follow-ups among the three groups. This indicates that the timing of surgery within 12 weeks of injury does not significantly influence functional outcomes. Previous studies have reported varying results regarding the timing of ACL reconstruction. Mayr HO et al. observed complications like knee stiffness and arthrofibrosis in patients who underwent very early or significantly delayed surgery[10]. Similarly, Wasilewski *et al.* found that patients operated on within 1 month had poorer outcomes due to joint inflammation, while those in the subacute group (1-6 months) showed better results due to preoperative rehabilitation. However, their findings on KT-1000 scores were consistent with the results of this study[11]. Chodavarapu *et al.* reported a significant improvement in IKDC scores from <40 preoperatively to 50-60 postoperatively, which aligns with the outcomes of the first follow-up in this study[12]. Ferguson *et al.* observed statistically significant improvements on the Tegner activity scale with early surgery (<3 weeks) but noted that the difference was not clinically significant[13]. Marcacci *et al.* found no statistical difference in IKDC and Lysholm scores between patients treated within 15 days and those treated after 90 days, although early surgery showed quicker recovery[14]. Further supporting these findings, Smith *et al.,* in a systematic review, found no significant differences in IKDC scores between early (mean 3 weeks) and delayed (mean 6 weeks) ACL reconstructions[15]. Similarly, Bottoni *et al.* reported comparable Lysholm scores in patients

Table 1: Distribution of Total Number of Cases

	Groups	No. of cases	Percentage
1	<4weeks	32	44.4
2	4-8 weeks	20	27.8
3	8-12weeks	20	27.8
	Total	72	100.0

Table 2: Mean Score Comparison of IKDC Scoring Between the Groups

Groups	Follow ups	N	Mean	Std. Deviation	95%Confidence Interval for Mean		ANOVA p-value	
				Lower Bound	Upper Bound			
IKDC-1ST	<4weeks	32	52.66	5.62	50.63	54.68	0.118	NS
	4-8 weeks	20	56.05	7.49	52.54	59.56		
	8-12 weeks	20	52.25	6.93	49.01	55.49		
	Total	72	53.49	6.65	51.92	55.05		
IKDC-2ND	<4weeks	32	65.31	4.34	63.75	66.88	0.73	NS
	4-8 weeks	20	66.65	6.78	63.47	69.83		
	8-12 weeks	20	65.60	7.54	62.07	69.13		
	Total	72	65.76	6.01	64.35	67.18		
IKDC-3RD	<4weeks	32	78.63	4.67	76.94	80.31	0.66	NS
	4-8 weeks	20	79.40	4.31	77.38	81.42		
	8-12 weeks	20	77.85	7.02	74.56	81.14		
	Total	72	78.63	5.29	77.38	79.87		

Table 3: Mean Values Comparison of KSS Scoring Between the Groups

Follow ups	Groups	N	Mean	Std. Deviation	95% Confidence Interval for Mean		ANOVA p-value	
					Lower Bound	Upper Bound		
KSS-1ST	<4 weeks	32	67.50	7.05	64.96	70.04	0.62	NS
	4-8 weeks	20	65.45	6.81	62.26	68.64		
	8-12 weeks	20	66.65	8.31	62.76	70.54		
	Total	72	66.69	7.30	64.98	68.41		
KSS-2ND	<4weeks	32	79.41	5.41	77.46	81.36	0.29	NS
	4-8 weeks	20	76.45	6.22	73.54	79.36		
	8-12 weeks	20	78.35	8.29	74.47	82.23		
	Total	72	78.29	6.56	76.75	79.83		
KSS-3RD	<4weeks	32	89.44	3.97	88.01	90.87	0.39	NS
	4-8 weeks	20	87.80	5.34	85.30	90.30		
	8-12 weeks	20	89.40	4.38	87.35	91.45		
	Total	72	88.97	4.49	87.92	90.03		

Table 4: Comparing Mean Values of IKDC Scores During Follow-Ups Among Different Groups

Groups	Follow ups	N	Mean	Std. Deviation	95% Confidence Interval for Mean		Repeated measures ANOVA p-value	
					Lower Bound	Upper Bound		
<4weeks	IKDC-1ST	32	52.66	5.62	50.63	54.68	0.00	HS
	IKDC-2ND	32	65.31	4.34	63.75	66.88		
	IKDC-3RD	32	78.63	4.67	76.94	80.31		
4-8 weeks	IKDC-1ST	20	56.05	7.49	52.54	59.56	0.00	HS
	IKDC-2ND	20	66.65	6.78	63.47	69.83		
	IKDC-3RD	20	79.40	4.31	77.38	81.42		
8-12 weeks	IKDC-1ST	20	52.25	6.93	49.01	55.49	0.00	HS
	IKDC-2ND	20	65.60	7.54	62.07	69.13		
	IKDC-3RD	20	77.85	7.02	74.56	81.14		

Table 5: Comparison of KSS Scores During Follow Up, within the Group Over Different Time Periods

Groups	Follow ups	N	Mean	Std. Deviation	95% Confidence Interval for Mean		Repeated measures ANOVA p-value	
					Lower Bound	Upper Bound		
<4weeks	KSS-1ST	32	67.50	7.05	64.96	70.04	0.00	HS
	KSS-2ND	32	79.41	5.41	77.46	81.36		
	KSS-3RD	32	89.44	3.97	88.01	90.87		
4-8 weeks	KSS-1ST	20	65.45	6.81	62.26	68.64	0.00	HS
	KSS-2ND	20	76.45	6.22	73.54	79.36		
	KSS-3RD	20	87.80	5.34	85.30	90.30		
8-12 weeks	KSS-1ST	20	66.65	8.31	62.76	70.54	0.00	HS
	KSS-2ND	20	78.35	8.29	74.47	82.23		
	KSS-3RD	20	89.40	4.38	87.35	91.45		

operated on immediately (<21 days) and after 6 weeks, emphasizing that early ACL reconstruction does not compromise range of motion when paired with proper rehabilitation protocols. Regarding associated lesions, 69.44% of patients in this study had meniscal injuries, consistent with the findings of Hagino T *et al.*, who reported a 72.7% incidence of meniscal tears in acute ACL injuries[16]. Sgaglione *et al.* highlighted better outcomes for patients operated on within 3 weeks due to fewer chronic cartilage and meniscal damages[17]. However, the prolonged rehabilitation for chronic cases aligns with this study's findings of delayed recovery in such patients. None of the patients in this study experienced significant postoperative complications like infection, graft failure, or implant failure. However, 11 patients had persistent stiffness during follow-ups and 2 required supervised physiotherapy. The most common associated

intraoperative findings were meniscal injuries, followed by osteochondral defects.

CONCLUSIONS

In conclusion, this study found no significant differences in mean functional outcomes among the three groups, indicating that there is no optimal timing for ACL reconstruction surgery within the first 3 months post-injury.

REFERENCES

1. Clayton, R.A.E. and C.M. Court-Brown, 2008. The epidemiology of musculoskeletal tendinous and ligamentous injuries. Injury, 39: 1338-1344.
2. Palmer, I,. 1938. On the injuries to the ligament of the knee joint. A clinical study. Acta chir. scand., Vol.
3. Schindler, O.S., 2012. Surgery for anterior cruciate ligament deficiency: A historical perspective. Knee Surg., Sports Traumatology, Arthroscopy, 20: 5-47.
4. Meighan, A.A.S., J.F. Keating and E. Will, 2003. Outcome after reconstruction of the anterior cruciate ligament in athletic patients. British Editorial Society of Bone and Joint Surgery, The J. Bone Joint Surg. Br. volume, 85: 521-524.
5. Chambat, P., C. Guier, B. Sonnery-Cottet, J.M. Fayard and M. Thaunat, 2013. The evolution of ACL reconstruction over the last fifty years. Int. Orthop.s, 37: 181-186.
6. Amis, A. and G. Dawkins, 1991. Functional anatomy of the anterior cruciate ligament. Fibre bundle actions related to ligament replacements and injuries. The J. Bone Joint Surg.. Br. volume, 73: 260-267.
7. Gaidhani, R.H. and G. Balasubramaniam., 2021. An epidemiological review of pancreatic cancer with special reference to India. Indi. J. Medi. Sci., 29: 188-193.
8. Bottoni, C.R., T.R. Liddell, T.J. Trainor, D.M. Freccero and K.K. Lindell, 2008. Postoperative Range of Motion following Anterior Cruciate Ligament Reconstruction Using Autograft Hamstrings. The Am. J. Sports Med., 36: 656-662.
9. Asif, S. and D. Choon, 2005. Midterm Results of Cemented Press Fit Condylar Sigma Total Knee Arthroplasty System. J. Orthop. Surg., 13: 280-284.
10. Mayr, H.O., T.G. Weig and W. Plitz, 2004. Arthrofibrosis following ACL reconstruction? reasons and outcome. Arch. Orthop. Trauma Surg., 124: 518-522.
11. Wasilewski, S.A., D.J. Covall and S. Cohen, 1993. Effect of surgical timing on recovery and associated injuries after anterior cruciate ligament reconstruction. The Am. J. Sports Med., 21: 338-342.
12. Chodavarapu, L.M., A.H.K.S. , K.K.K. Kumar, C. Patnala and H. Yadoji, 2017. Analysis of functional outcome of anterior cruciate ligament reconstruction using quadruple hamstring graft. Int. J. Res. Orthop.s, Vol. 3 .10.18203/issn. 2455-4510.intjresorthop20172872.
13. Ferguson, D., A. Palmer, S. Khan, U. Oduoza and H. Atkinson, 2019. Early or delayed anterior cruciate ligament reconstruction: Is one superior? A systematic review and meta-analysis. Eur. J. Orthop. Surg. And Traumatology, 29: 1277-1289.
14. Marcacci, M., S. Zaffagnini, F. Iacono, M.P. Neri and A. Petitto, 1995. Early Versus Late Reconstruction for Anterior Cruciate Ligament Rupture. The Am. J. Sports Med., 23: 690-693.
15. Smith, T.O., L. Davies and C.B. Hing, 2010. Early versus delayed surgery for anterior cruciate ligament reconstruction: A systematic review and meta-analysis. Knee Surg., Sports Traumatology, Arthroscopy, 18: 304-311.
16. Hagino, T., S. Ochiai, S. Senga, T. Yamashita, M. Wako, T. Ando and H. Haro, 2015. Meniscal tears associated with anterior cruciate ligament injury. Arch. Orthop. Trauma Surg., 135: 1701-1706.
17. Sgaglione, N.A., W.D. Pizzo, J.M. Fox and M.J. Friedman, 1993. Arthroscopically assisted anterior cruciate ligament reconstruction with the pes anserine tendons. The Am. J. Sports Med., 21: 249-256.