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ORIGINAL RESEARCH

A COMPREHENSIVE ANALYSIS OF FOREARM FRACTURE PATTERNS IN CHILDREN AND THEIR MANAGEMENT

Biju Raveendran[1], Dr. Anvesh Gattu[2], Dheepak Kumar.A[3]

[1]Professor & HOD, Department of Orthopedics, Narayana Medical College & Hospital, Chintareddypalem, Nellore, AP, India

[2]Professor, Department of Orthopedics, Narayana Medical College &Hospital, Chintareddypalem,Nellore, AP, India

[3]Postgraduate Resident, Department of Orthopedics, Narayana Medical College & Hospital, Chintareddypalem, Nellore, AP, India

Corresponding Author:

Dr. Biju Raveendran, Professor & HOD, Department of Orthopedics, Narayana Medical College & Hospital, Chintareddypalem, Nellore, AP, India

ABSTRACT

Background: Every year, over 1 lakh ACL reconstructions are performed in the United States, and the number of surgical operations ranging from open to minimally invasive arthroscopic procedures is increasing globally. The present study's objective was to evaluate outcomes after anterior cruciate ligament surgery and structured rehabilitation with the IKDC, KOOS, and TAL scores.

Materials and Methods: This study objective to assess outcomes following anterior cruciate ligament restoration and structured rehabilitation utilizing the IKDC, KOOS, and TAL scores. Materials and methods: The current investigation was carried out in Narayana Medical College & Hospital and involved 30 surgical patients (Arthroscopic Anterior Cruciate Ligament reconstruction using hamstring graft and structural rehabilitation). For six months, structural rehabilitation was pursued. All cases were followed for two weeks, six weeks, ten weeks, sixteen weeks, and six months. The outcome was evaluated using the IKDC score, the KOOS score, and the Tegner activity level scale.

Results: The 30 individuals included 24 men and 6 women, according to the study. Subjects averaged 30. BMI averaged 25.04 kg/m2. 17 patients (Group A) underwent preoperative ACL exercises, while 13 did not (Group B) 14 patients had twisting injuries, 10 had sports injuries, and 6 underwent RTAs .At 2 weeks, 6 weeks, 10 weeks, 16 weeks, and 6 months, IKDC is statistically significant (p 0.001). At 2 weeks, 6 weeks, 10 weeks, 16 weeks, and 6 months, KOOS is statistically significant (p 0.001). At 10 weeks, 16 weeks, and 6 months, TAL is statistically significant (p 0.001).

Conclusion: There is a need for numerous studies that use patient- reported outcomes that reflect patients' most critical concerns, as well as more prospective longitudinal related research.
Keywords: IDKC, KOOS, TAL Score, ACL Reconstruction.

INTRODUCTION

The anterior cruciate ligament (ACL) tear has become one of the most common injuries in recent years, particularly in women's field sports where rotating is essential. The anterior cruciate ligament (ACL) is a ligament in the centre of the knee that controls knee stability as well as various motor functions and range of motion. When the ACL is torn, the knee and leg lose stability, and there is less dependence on the quadriceps, which weakens the leg.[1] ACL tears in athletes result in greater ground reaction forces, increased time to stabilisation, and decreased performance. This usually entails 6 months to a year of recovery time. Even after surgical reconstruction, knee joint mobility and proprioception may be altered, increasing the risk of articular cartilage deterioration and early-onset osteoporosis and, as a result, reducing quality of life. To limit the potential negative effects of the rebuilt ligament, pre-operative and post-operative rehabilitation techniques are performed. While surgical techniques have improved throughout time, pre-and post-operative healing approaches have yet to be studied on a global scale to determine the best way to improve post-reconstruction quality of life. Due to the lack of precise standards for ACL rupture care, it is difficult to choose between surgical and conservative treatment techniques for the benefit of the patient. Surgical surgery is the most commonly reported and favoured treatment for anterior cruciate ligament injuries by most orthopaedic surgeons.[2,3] Since the 1990s, arthroscopically assisted anterior cruciate ligament reconstruction has been the method of choice, and the bone-patellar tendon-bone (BTB) auto graft was initially the favoured graft for primary anterior cruciate ligament reconstruction. However, in recent years, there has been an increase in the use of triple hamstring auto grafts. Non-surgical treatment for an anterior cruciate ligament injury is becoming less common, particularly in recent years.[4,5] In patients with severe activity instability and/or repetitive give-way episodes, reconstructive surgery may improve short-term knee function.[6] There are few certainties concerning treatment and outcome after an anterior cruciate ligament injury, although the implications are likely to be severe, both in the short and long term. The general quality of articles assessing treatment and outcome following anterior cruciate ligament damage is poor, with few firm conclusions being drawn. Some subjects will almost certainly require surgical treatment to return to pre-injury activity, albeit the timing of return to vigorous activity may be critical.[7-9] Improvements in the quality of scientific publications, consideration of both short and long-term consequences for the individual, and the proper use of outcomes applicable to the assessment of both surgical and non-surgical treatments will all help us better understand the truth and consequences of anterior cruciate ligament injury. Surgery plays an important role in the patient's return to his or her pre-injury quality of life, but the goal of this study is to establish which recovery method or combination of ways following reconstruction surgery is most useful in long-term recovery.

MATERIALS & METHODS

Source of information: This study included 30 patients between the ages of 18 and 60 who were admitted to Narayana Medical College & Hospital.

Sample size: This study comprised thirty patients who were diagnosed with ACL damage.

The study's design: Prospective cohort study.

Duration of the research: The research lasted two years. (2019-2021) after obtaining informed consent, about 30 patients with ACL injury hospitalised to Narayana Medical College Hospital were included in this study. A thorough history and clinical examination were performed. Diagnosis was confirmed using routine clinical tests as well as Magnetic Resonance Imaging (MRI) (Sigma HDxT- GE 1.5 Tesla) USA, performed in this hospital or elsewhere. Patients who had an established ACL damage (partial or total) were scheduled for ACL restoration using a remnant-preserving method. The repaired ACL was functionally evaluated utilising the IKDC, Lysholm-Tegner, and KOOS scores.

Inclusion Criteria: Patients between the ages of 18 and 60 who have an isolated ACL injury (acute and chronic).

- Associated Meniscal injury
- Injury to the medial collateral ligament (grade 1,2)
- Injury to the lateral collateral ligament (grade 1,2)

Criteria for Exclusion

- Patients having Posterior Cruciate Ligament (PCL) damage.
- Injury to the medial collateral ligament (grade 3)
- Injury to the lateral collateral ligament (grade 3)
- ACL re-injury patients
- Patients having periarticular fractures.
- Patients who have an ipsilateral lower limb fracture.
- Patient is unwilling to follow post-operative instructions.

Data Analysis: The patients were divided into two groups: Group A (those who completed the preoperative ACL protocol exercises) and Group B (those who did not) (patients who did not do any preoperative exercises). Pre-operative data was examined using clinical tests such as the Lachman test, Anterior Drawer test, Pivot shift, X-ray Knee, MRI Knee, IKDC score, Lysholm-Tegner score, and KOOS scoring. BMI and pretreatment Vitamin D levels were also measured. The patients were followed up with after 6 months, with an average follow-up of 9 months (range 6–16 months). The Anterior Drawer test, Lachman test, and Pivot-shift test were performed post-operatively to verify joint stability. The IKDC, Lysholm-Tegner, and KOOS scores were used for subjective evaluation. Proprioception was tested for the functional assessment using Joint Position Sense (JPS), TTDPM- Threshold to Detection of Passive Motion, Proprioception Test A and B, Single Leg Standing Test, and Wobble Board Test. We used both JPS and TTDPM measurement techniques to assess static (JPS) and dynamic (TTDPM) proprioception at the same time.

CLIA was used to assess plasma Vitamin D (25-OH D2 and D3), and the reference range was determined by the National Institute of Standards and Technology (NIST) as deficient at 20 ng/ml, insufficient at 30 ng/ml, and desired at > 30 ng/ml (103).

TTDPM-The TTDPM study was performed using continuous passive motion (CPM) produced by QAL Medical, Orth agility, Germany. Before the test, the beginning angle of the knee joint with CPM and speed of motion were modified to the desired value using a goniometer and a stopwatch. During the test, patients' vision and hearing were turned off. The knee joint angle with CPM was set at 30° and gradually increased to 0.5°/s in the direction of extension. A stopwatch was used by an examiner to time when patients identified the initial angle shift. The TTDPM test was performed twice, and a full session was performed three times to produce a mean value for normal and operated knees.The foot was well cushioned and padded all around to retain the ankle in a neutral position and to decrease cutaneous sensations.

RESULTS

Before surgery, each of the thirty patients underwent examinations based on the Lysholm-Tegner scoring system, the IKDC scoring system, and ligament laxity tests. An evaluation of proprioception was carried out, and its results were correlated with the patients' post-operative IKDC, KOOS, and Lysholm-Tegner scores as well as their ligament laxity tests.[8,9]
Out of the total of thirty subjects, there were a total of 24 male and six female participants. It was found that the subjects had an average age of 30.8. It was determined that the average body mass index (BMI) was 25.04 kg/m2. 17 of these patients went through preoperative ACL exercises (Group A), while the remaining 13 patients did not go through preoperative ACL exercises (Group B). There were a total of 30 patients in this study. [Table 1]
We found that 10 patients had sports injuries, 14 patients had twisting injuries, and 6 patients had been injured in a road traffic accident (RTA) while we were conducting the assessment of the mode of injury. [Table 2]
We discovered that 11 patients (36.67 percent) had an isolated ACL tear, 7 patients (23.33 percent) had an ACL tear along with a tear to the lateral meniscus, 6 patients (20 percent) had an ACL tear along with a tear to the medial meniscus, and 6 patients (20 percent) had an ACL tear along with tears to both menisci. [Table 4] We also evaluated the TTDPM in both groups and found that the patients in Group A, who had preoperative ACL exercises, had significantly better results than those in Group B, who had not [Table 5]. We evaluated vitamin D levels prior to surgery as well as six months after the procedure. [Table 6] The pre-operative mean value of vitamin D was 12.56, while the post-operative mean value of vitamin D was 15.6041. Although the patients were not given any vitamin D supplements, we found that their levels were significantly higher after the operation. This finding was quite interesting. It might have something to do with patients' being more active after they've had surgery. The IKDC, KOOS, and Lysholm-Tegner scores were preoperatively computed based on the answers to predetermined questions and the points awarded for each of those answers. A paired t test was used to make the comparison between the preoperative and postoperative scores. [Table 8] The pre-operative mean score on the Lysholm-Tegner scale for these individuals was 49.9.

Table 1- Groups Frequency

	Frequency	Per cent	Valid Percent	Cumulative Percent
Pre-Operative exercises- Group A	17	56.3	56.3	56.3
No Pre-Operative exercises-Group B	13	43.8	43.8	100.0
Total	32	100.0	100.0	

Table 2- Mode of Injury

	Frequency	Percent	Valid Percent	Cumulative Percent
A	14	46.9	46.9	46.9
B	10	34.4	34.4	81.3
C	6	18.8	18.8	100.0
Total	32	100.0	100.0	

A- TWISTING INJURY
B- SPORTS INJURY
C- RTA

Table 3 – Duration -Gap between surgery and injury (Weeks)

	Frequency	Percent	Valid Percent	Cumulative Percent
<= 3 Weeks	4	15.6	15.6	15.6
>3 Weeks	26	84.4	84.4	100.0
Total	32	100.0	100.0	

Table 4 – Diagnosis

	Frequency	Percent	Valid Percent	Cumulative Percent
1	11	36.67	36.67	36.5
2	7	23.33	23.33	58.7
3	6	20	20	80.5
4	6	20	20	100.0
Total	30	100.0	100.0	

ACL ACL+ MM ACL+LM
ACL+ MM+ LM GRAPH 3

Table 5 – Comparing TTDPM on CPM at 30 Degrees in Bothgroups Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
AFFECTED LIMB CPM	Equal variances assumed	1.478	.234	-2.805	30	.009	-.25944	.09248	-.44831	-.07058
	Equal variances not assumed			-2.961	29.084	.006	-.25944	.08762	-.43863	-.08026

Table 6- Comparing Vitamin D Preop and Postop Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
VIT D preop	12.560	28	5.85250	1.22178	.001
VIT D postop	15.6041	28	7.57059	1.61949	

Table 7- Comparing IKDC, Koos and T-L Scores Preop Andpostop Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
IKDC pre op	39.5431	30	12.8861	2.4521	<0.001
IKDC post op	79.0231	30	7.9021	1.9834	
T-L pre op	49.9023	30	15.6733	2.3422	<0.001
T-L post op	86.8723	30	9.1123	1.9232	
KOOS pre op	55.8902	30	18.2311	3.02241	<0.001
KOOS post op	89.0453	30	8.5531	1.3065	

Table 8- Comparing TTDPM on CPM with Amount of Damage

Diagnosis	N	Mean	Std. Deviation	p-value
1	12	1.42	0.38	0.7761
2	7	1.32	0.31	
3	7	1.88	0.34	
4	6	1.58	0.26	

Total	30	1.55	0.32	

Table 9- Comparing TTDPM with BMI Group Statistics

	BMI Group	N	Mean	Std. Deviation	Std. Error Mean	Sig.(2-tailed)
Affected	< 25	16	1.323	0.25579	.06922	0.012
LIMB CPM						
	> = 25	15	1.933	0.29482	.06055	0.016
Unaffected LIMB CPM	< 25	16	1.776	0.15556	.04521	0.540
	> = 25	14	1.2440	0.15612	.02951	0.509

However, the mean Lysholm-Tegner score improved to 86.87 with a standard deviation of 15.67 after surgery. With a p value of 0.001, the comparison of pre-op and post-op Lysholm-Tegner scores was statistically significant. Similarly, the International Knee Documentation Committee (IKDC) scores were calculated before and after surgery and compared using the Paired t test. Preoperatively, the mean IKDC score was 39.54. The mean post-operative IKDC score was 79.02, with a standard deviation of 12.88. The difference in IKDC scores before and after surgery was statistically significant, with a p value of 0.001. Similarly, pre- and post-operative KOOS scores were calculated and compared using the Paired t test. Preoperatively, the mean KOOS score was 55.89.

The mean post-operative KOOS score was 89.04, with a standard deviation of18.23. With a p value of 0.001, the comparison of pre-op and post-op KOOS scores was statistically significant. These scores were significantly higher postoperatively because the joint's stability was restored and proprioception improved which improved activities of daily living and allowed them to return to work. TTDPM values were also compared in groups with isolated ACL tears and those with meniscal injuries (Table 9). We discovered that it was not significant (p-value 0.76) due to the fact that the menisci has fewer mechanoreceptors than the ACL. TTDPM did not differ significantly between patients with normal BMI and those who were overweight, though TTDPM was higher in patients with BMI 25. The correlation between BMI and postoperative IKDC, KOOS, and Lysholm Tegner Score was not significant.

DISCUSSION

The IKDC, KOOS, and TAL are PRO measures that are increasingly being used to evaluate outcomes following ACL reconstruction surgery. The current study was designed to evaluate the outcome of anterior cruciate ligament reconstruction and structured rehabilitation.[9-12] IKDC and KOOS were statistically significant at 2 weeks, 6 weeks, 10 weeks, 16 weeks, and 6 months (p 0.001). TAL was statistically significant at 10 weeks, 16 weeks, and 6 months (p 0.001). The choice of PRO measures should be guided by the study's objectives and target population.[14,15] According to Abioye et al,[16] less than half (40%) of patients returned to their preinjury sport level, with the most common reasons for not returning to sports being a

lack of trust in the knee (28%) and fear of sustaining a new injury (24 percent). In the current study, patients' inability to return to pre-injury sports levels was attributed primarily to a lack of psychological readiness. At the time of the follow-up, more than 59.1 percent of patients had not returned to their pre-injury sports due to fear of re-injury or graft rupture. Although no statistically significant differences in the rate of return to play were found between the RP and NRP groups in the crude analysis, the RP technique demonstrated a higher return to the preinjury sports level than the NRP technique, with an adjusted odds ratio of 3.01. Lee *et al*, Using an arthrometer, we discovered that patients with preserved remnants had significantly better anterior knee stability than those without. Although we were unable to determine whether the difference in remnant volume affected these two sets of results, our findings suggested that preserving 75% of a remnant contributed to anterior stability.[17] Georgoulis A.D et al observed in their study, that ACL graft rupture was found in 8 of 183 patients (4.3 percent), 1 (1.1 percent) in group 1 and 7 (7.1 percent) in group 2. Regression analysis revealed that the only significant predictor of graft rupture was nonpreservation of the remnant (odds ratio, 11.2; 95 percent CI, 1.1-94.5). Mechanoreceptors were found 3 years after injury in patients with an ACL remnant adapted to the PC.[18] This study had several limitations. First, the 2-year follow-up period was insufficient, despite the fact that Salmon et al reported that ACL graft ruptures occurred in 39 of 675 patients (6%) at a median 20 months (95 percent CI, 15-25 months) after the index surgery. Yuji Takazawa and others. A longer- term follow-up could reveal additional clinical findings. Second, several surgeons made intraoperative observations during reconstruction involving remnant preservation. However, all of the surgeons in this study had at least ten years of experience as a knee surgery specialist at the same hospital. Third, our definition of the ability to preserve the remnant was not completely objective, and there was inherent selection bias in dividing the patients into two groups. It was difficult to quantify objectively, but this could have influenced the rerupture rate. Future research should assess the quality and quantity of the remnant before surgery. Fourth, we did not collect functional outcome scores. However, the postoperative Tegner score changes on return to sport activity in both groups were 0.5 points or less. Nonetheless, the rate of graft rupture was lower in the remnant-preserving group. Finally, in analysing the function and morphology of the remnant, we did not consider proprioception or the graft remodelling process.[19]

According to the current study results, there were 24 male and 6 female subjects out of a total of 30. The subjects' average age was 30.8 years. The average BMI was calculated to be 25.04 kg/m2. Out of these 30 patients, 17 underwent preoperative ACL exercises (Group A), while 13 did not (Group B) [Table 1].We found that 14 patients had twisting injuries, 10 had sports injuries, and 6 had Road Traffic Accidents (RTA). [Table 2]

The Present study found that 11(36.67) patients had an isolated ACL tear, 7(23.33%) patients had ACL with lateral meniscus tear, 6(20%) patients had ACL with medial meniscus tear, and 6 (20%) patients had ACL with both meniscal tears. [Table 4] Patients who have undergone ACL reconstruction have fewer symptoms and disabilities than the general population of articular cartilage repair patients. Non-athletes' outcomes following ACL surgical reconstruction were evaluated in this study. IKDC is statistically significant at 2 weeks, 6 weeks, 10 weeks, 16 weeks, and 6 months (p 0.001). KOOS is statistically significant at 2 weeks, 6 weeks, 10 weeks, 16 weeks, and 6 months (p 0.001). TAL is

statistically significant at 10 weeks, 16 weeks, and 6 months (p 0.001). These findings are consistent with previous studies on reconstructed ACL injuries conducted by several authors. One patient experienced anterior knee pain that was relieved by physiotherapy and oral analgesics. One patient had a superficial infection that was treated with antibiotics, and another had hardware prominence (at the tibial post) that was removed 6 months later. Other complications reported in the literature include infection, bacterial arthritis of the knee, embolus of the popliteal artery, and a fatal pulmonary embolism. There may also be complaints at the transplant harvest site, such as a patella fracture and localised pressure pain.[19,20] In the first 5 years after ACL reconstruction surgery, 6% of patients experienced secondary ACL rupture, with sports intensity being the most critical predictor, especially in the first year. Following an ACL rupture, there is a high risk of knee damage.[19] The risk of knee osteoarthritis is tenfold within 10 to 15 years of the initial trauma. In our study, no such complication was discovered. However, because our study was short-term and the sample size was small, the results may differ in larger sample size and long-term follow-up. Each individual knee instability treatment aims to restore the joint's homeostasis as much as possible. This will allow each patient to resume their previous activities before the ACL tear. At the moment, it is unclear which individual will benefit the most from the operative or conservative treatment. According to this study, an ACL reconstruction is an exemplary operation for knee stabilisation. Vitamin E and C are two other supplements studied to improve muscle mass after ACL reconstruction. A study on the effects of Vitamin E and C on muscle inflammatory response and strength after ACL reconstruction surgery was published in 2011. (Barker et. al., p. 114). The study explains the effects of Vitamin E and C on muscular dysfunction and atrophy in relation to inflammatory cytokines and antioxidants in the blood (Barker et al., 2011).[21]

This was a randomised controlled prospective study in which patients were treated by a single surgeon at a single centre, implying that there was consistency in surgical technique and implant use throughout the study. These are the study's strengths. Our study had a small sample size and short- term follow-up, so results may differ in a larger sample size and long-term follow-up.

CONCLUSION

The IKDC, KOOS, and TAL are PRO measures that are increasingly being used to assess outcomes following ACL reconstruction surgery. The current study was designed to evaluate the outcome of anterior cruciate ligament reconstruction and structured rehabilitation. IKDC and KOOS were statistically significant at 2 weeks, 6 weeks, 10 weeks, 16 weeks, and 6 months (p 0.001). TAL was statistically significant at 10 weeks, 16 weeks, and 6 months (p 0.001). The choice of PRO measures should be guided by the study's objectives and target population. More research is needed to assess the effect of the postoperative process and to evaluate these findings in terms of clinical and functional outcome prediction as well as long-term health prognostics. Other comparative studies have confirmed that the clinical outcomes of ACL repair are comparable to those of ACL reconstruction. Although the present study found no significant differences in objective knee laxity between ACL repair with internal bracing and anatomic single-bundle reconstruction, we did notice some complications in the ACL repair group.

REFERENCES

1. Sim, K., Rahardja, R., Zhu, M., & Young, S. W. (2022). Optimal Graft Choice in Athletic Patients with Anterior Cruciate Ligament Injuries: Review and Clinical Insights. Open Access Journal of Sports Medicine, 13, 55-67.
2. Webster, K. E., & Hewett, T. E. Return to Sport after Anterior Cruciate Ligament Reconstruction: Criteria-Based Rehabilitation and Return to Sport Testing. Advances in Knee Ligament and Knee Preservation Surgery, 83-93.
3. Meredith, S. J., Rauer, T., Chmielewski, T. L., Fink, C., Diermeier, T., Rothrauff, B. B., & Wilk, K. (2020). Return to sport after anterior cruciate ligament injury: Panther Symposium ACL Injury Return to Sport Consensus Group. Orthopaedic journal of sports medicine, 8(6), 2325967120930829.
4. Gokeler, A., Dingenen, B., & Hewett, T. E. (2022). Rehabilitation and Return to Sport Testing After Anterior Cruciate Ligament Reconstruction: Where Are We in 2022?. Arthroscopy, sports medicine, and rehabilitation, 4(1), e77-e82.
5. Fukuda, H., Ogura, T., Asai, S., Omodani, T., Takahashi, T., Yamaura, I., & Takahashi, K. (2022). Bone-patellar tendon–bone autograft maturation is superior to double-bundle hamstring tendon autograft maturation following anatomical anterior cruciate ligament reconstruction. Knee Surgery, Sports Traumatology, Arthroscopy, 30(5), 1661-1671.
6. Patra, S. K., Nanda, S. N., Patro, B. P., Sahu, N. K., Mohnaty, C. R., & Jain, M. (2022). Early Accelerated versus Delayed Conservative Rehabilitation Protocol after Anterior Cruciate Ligament Reconstruction: A Prospective Randomized Trial. Revista Brasileira de Ortopedia, 57, 429-436.
7. McCadden, A., Akelman, M., Traven, S. A., Woolf, S. K., Xerogeanes, J. W., & Slone, H. S. (2021). Quadriceps tendon autograft is an effective alternative graft for posterior cruciate ligament reconstruction in isolated or multiligament injuries: a systematic review. Journal of ISAKOS, 6(4), 220- 225.
8. No, S. (2018). An Anatomical Study of Gracilis Muscle & Its Role in Clinical Reconstruction Surgeries. Int J Anat Res, 6(1.3), 5049-53.
9. Roberts IV, J., Ness, B., Cleland, J., Puzzitiello, R., Marinch, M., Wright, A., & Salzler, M. (2022). Operative management for anterior cruciate ligament injury in patients over 40 year's old yields increased clinical outcome: A systematic review. Arthroscopy: The Journal of Arthroscopic & Related Surgery. S0749-8063.
10. Searle, H., Asopa, V., Coleman, S., & McDermott, I. (2020). The results of meniscal allograft transplantation surgery: what is success? BMC Musculoskeletal Disorders, 21(1), 1-9.
11. Danieli, M. V., Guerreiro, J. P. F., Queiroz, A. O., da Rosa Pereira, H., & Cataneo, D. C. (2021). Leucocyte-poor-platelet-rich plasma intra-operative injection in chondral knee injuries improves patient's outcomes. A prospective randomized trial. International Orthopaedics, 45(2), 463-471.
12. SinghK, Singh V.(2020) Outcome Assessment after Anterior Cruciate Ligament Reconstruction among Non-athletes 7(10), J1-J5.
13. Mattiassich, G., Ortmaier, R., Kindermann, H., Barthofer, J., Vasvary, I., Kulnik, S. T., & Leister, I. (2021). Clinical and radiological results after Internal Brace suture versus

the all-inside reconstruction technique in anterior cruciate ligament tears 12 to 18 months after index surgery. Sportverletzung Sportschaden, 35(02), 103-114.

14. Szwedowski, D.; Paczesny, Ł.; Zabrzy ´nski, J.; Gagat, M.; Domzalski, M.; Huri, G.; ˙ Widuchowski, W. The Comparison of Clinical Result between Primary Repair of the Anterior Cruciate Ligament with Additional Internal Bracing and Anatomic Single Bundle Reconstruction—A Retrospective Study. J. Clin. Med. 2021, 10, 3948. https://doi.org/10.3390/ jcm10173948.
15. Desouza, C., Krishnamurthy, S., Nandivada, N., Kale, A., & Gaurav, A. International Journal of Orthopaedics Research.3 (3).9-12.
16. Abioye, A. I., Odesanya, M. O., Abioye, A. I., & Ibrahim, N. A. (2015). Physical activity and risk of gastric cancer: a meta-analysis of observational studies. British journal of sports medicine, 49(4), 224- 229.
17. Lee, B. I., Kwon, S. W., Kim, J. B., Choi, H. S., & Min, K. D. (2008). Comparison of clinical results according to amount of preserved remnant in arthroscopic anterior cruciate ligament reconstruction using quadrupled hamstring graft. Arthroscopy: The Journal of Arthroscopic & Related Surgery, 24(5), 560-568.
18. Georgoulis, A. D., Pappa, L., Moebius, U., Malamou-Mitsi, V., Pappa, S., Papageorgiou, C. O., & Soucacos, P. N. (2001). The presence of proprioceptive mechanoreceptors in the remnants of the ruptured ACL as a possible source of re-innervation of the ACL autograft. Knee Surgery, Sports Traumatology, Arthroscopy, 9(6), 364-368.
19. Salmon, L., Russell, V., Musgrove, T., Pinczewski, L., & Refshauge, K. (2005). Incidence and risk factors for graft rupture and contralateral rupture after anterior cruciate ligament
20. Reconstruction. Arthroscopy: The Journal of Arthroscopic & Related Surgery, 21(8), 948-957.
21. Takazawa, Y., Ikeda, H., Kawasaki, T., Ishijima, M., Kubota, M., Saita, Y., & Kaneko, K. (2013). ACL reconstruction preserving the ACL remnant achieves good clinical outcomes and can reduce subsequent graft rupture. Orthopaedic journal of sports medicine, 1(4), 2325967113505076.
22. Barker, T., & Traber, M. G. (2011). Does Vitamin E and C Supplementation Improve the Recovery From Anterior Cruciate Ligament Surgery? Journal of Evidence-Based Complementary & Alternative Medicine, 16(2), 114-128.