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Original article:

The pattern of anterior cruciate ligament reconstruction among soldiers in Tabuk City, Saudi Arabia

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Abstract:

Background and objectives: Anterior cruciate ligament injury (ACL) is common and affects the young age group. The study aimed to assess the pattern of ACL reconstruction among soldiers in Tabuk.

Subjects and Methods: This prospective study was conducted during the period 2004-2008, at the Orthopedics department in King Salman Military Hospital in Tabuk, Saudi Arabia. A structured questionnaire was used to report demographic factors, initial presentation, the underlying cause of the ligamental tear, rehabilitation, meniscal injuries, and the fitness for a military job. Lachman's test was used to assess the anterior translation of the tibia in relation to the femur, then a comparison between preoperative and postoperative course was conducted. The Statistical Package for Social Sciences (SPSS) was used for data analysis. All the participants signed written informed consent.

Results: There were 101 soldiers, age (29.88±4.90 years), the left knee was injured in 65.3%, the duration (24.94±29.84 months), rehabilitation before surgery was done in 60.4%, Lachman's and Pivot tests were positive in 89.1% and 88.1% respectively before reconstruction and were negative in all patients postoperatively. Seventy percent of patents returned to the military job, and rehabilitation before surgery was associated with better outcomes, P-value <0.001). No correlation was evident regarding other factors.

Conclusion: Sports injury was the commonest cause of ACL injury followed by parachuting, the majority of patients were able to return to the military job despite the late presentation to surgery, and rehabilitation before surgery was associated with good outcomes. Larger multi-center studies comparing various types of rehabilitation are needed.

Keywords: anterior cruciate ligament, reconstruction, soldiers, Saudi Arabia

Introduction:

Anterior cruciate ligament (ACL) injury accounts for 25-50% of a ligamentous knee injury and its poor capacity to heal (due to movement and synovial fluid prevention of fibrin-platelet stability) and could pose a clinical problem. Previously, the primary repair was in use (the torn ends of the ligament were sutured back together) with limited success and high failure rates. The failure is usually observed five and seven years after the operation due to progressive deterioration of knee joint laxity, and persistent

symptoms. The current gold standard management is ACL reconstruction with autograft from either the hamstrings or patella tendon with good results. However, the procedure is not without challenges including loss of proprioception and decreased hamstrings strength [1-3]. ACL reconstruction is one of the most common orthopedics procedures, in the US, 250,000 – 550,000 procedures are performed annually due to the increasing injury in this age group and the age group between 15 and 34 years [4]. Literature regarding the prevalence of ACL injury and reconstruction scarce in the Kingdom of Saudi Arabia, a thesis published in Riyadh, Saudi Arabia reported a high prevalence [5]. Repairing and preserving native tissue and negating the need for autograft could solve the troublesome donor site morbidity issues including pain, and sensory problems. [6]. ACL reconstruction although successful in restoring knee joint stability. However, the procedure is limited by short- and long-term complications including graft rupture, muscle weakness, and premature osteoarthritis. Thus, new methods of treatment are being explored [7]. The main purpose of this study was to assess the outcomes of ACL reconstruction among soldiers in King Salman Military Hospital in Tabuk City, Saudi Arabia.

Material and Methods:

This is a prospective cohort conducted over five years from the year 2004-2008. The study was conducted at the Orthopedics department in King Salman Military Hospital in Tabuk City, Saudi Arabia. Patients who underwent anterior cruciate ligament reconstruction were approached and followed for six months to assess their rehabilitation and if they were able to return to military duties. A structured questionnaire was used to report demographic factors, initial presentation (acute or chronic), the underlying cause of the ligamental tear, rehabilitation before and after surgery, site of the tear (right or left), and associated meniscal injuries. The length of time since injury and the time before surgery were also reported. The joints were assessed for ligament laxity, Quadriceps strength, joint line tenderness, and analgesia use. The following was reported during the operation: Meniscal repair, arrow or fast fix, tourniquet, rigid fix, endo button, and impingement and screw tips. The Lachman's test was used to assess the anterior translation of the tibia in relation to the femur, Lachman's test is the most sensitive and specific test for the diagnosis of ACL injury [8], Pivot shift was also used to assess ACL [9], and MacMurray was used to assessing the menisci. The diagnosis was confirmed clinically by the operating Surgeon and by the nuclear magnetic resonance of the involved joints. All the participants signed a written informed consent and the ethical committee of King Salman Military Hospital approved the research.

Pre-operative:

Rehabilitation was advised before surgery. However, only 40% were compliant. The procedures were explained to the patient in the clinic and the receiving area of the OR. After shaving off the site in the ward, Injection of Zinacef 750mg I/v was given one-hour pre-operative, general Anesthesia was done in 99%, while only 1% had spinal anesthesia. The patients were examined again clinically once anesthetized. Diagnostic arthroscopy was performed to confirm the ACL rupture and if any other pathology, one surgeon performed all surgeries.

Intra-operative:

A tourniquet was inflated for all procedures, a diagnostic scope was performed before harvesting of the graft, Semitendinosus and gracilis grafts were used as were rigid fix and endo button, the medial portal

was used for femoral tunneling, and a 2-3 cm vertical incision was used to harvest the graft, intra-operatively. In the present study, 2 patients suffered from extravasation of fluid to the calf muscles, and one patient femoral tunnel caved in, and an extended endo button was used.

Post-Operative

Same-day discharge or the next day with a brace and physiotherapy was started the same night, bed exercises and to mobilize on crutches, those with the meniscal repair were advised against weight-bearing for six weeks. All patients start daily rehabilitation for 6 weeks, where full ROM was the priority in the first 2 weeks, the following week's rehabilitation to continue for the following 6 months. The patients were seen in the clinic after 6 weeks, 3 months, and 6 months after surgery, and then they were re-evaluated for their fitness for military duties.

Ethical consideration:

The current project was approved by the ethical committee of the North West Armed Forces, Tabuk, Saudi Arabia (Re. 0001, dated 21/11/2008). All the participants signed written informed consent.

Data analysis:

The Statistical Package for Social Sciences (SPSS, version 20, New York) was used during the analysis of the collected data. Descriptive and summary statistics were performed to describe the study participants according to their different characteristics. Additionally, a binary logistic regression analysis was conducted to test the relationship between Lachman's test and various parameters. A-P value of<0.05 was considered to be significant.

Results:

The study included 101 patients with cruciate ligament repair, their ages ranged from 20-44 years with a mean of 29.88±4.90 years, the majority were chronic (98.1%), all the cases reported a twisting injury as a cause (sport in 60%, and parachuting injuries in 30%), the commonest presentation was the instability of the knee in 91.1% followed by locking of the knee in 31.1%, and pain in only 9.9%. The left knee was more commonly involved (65.3%), and meniscal tear was reported in 35.6%. In the present study, the length of time since injury was 24.94±29.84 months and the duration of injury before reconstruction was 7.95±6.93 months, ligament laxity was found in 80% versus 20% for preoperative and postoperative respectively, rehabilitation after surgery was done in 60.4%, Joint line tenderness was found in 63.4%, and the local block was done in 6.7%. Table 1 depicted the various characteristics and phases of the operation.

Lachman's test was positive in 89.1% versus % 00%, and the Pivot test was positive in 88.1% versus 0.0% for preoperative and postoperative courses respectively, while ligament laxity was observed in 80% vs. 20% for the preoperative and postoperative course. Table 2.

Only 20% came for follow-up after 6 weeks, 40% after three months, 30% came after 6 months, and 10% of patients did not show again. Table 3.

In the present study, a highly significant correlation was found between rehabilitation before surgery (Pearson correlation, 0.367, P-value=0.000), no correlation was evident regarding age ((Pearson correlation, 0.367, P-value=0.547), length of time since injury ((Pearson correlation, 0.110, P-value=0.277), and time before surgery (Pearson correlation, 0.025, P-value=0.802). Table 4.

Table 1. Basic characters among patient with anterior cruciate ligament repair

Character	No %
Age (range 20-44 years)	29.88±4.90
Presentation	
Acute	2 (1.9%)
Chronic	99 (98.1%)
Presenting complaint	
Instability of the joint	92 (91.1%)
Locking of the knee	12 (13.1%)
Pain	10 (9.9%)
Twisting injury	101 (100%)
Right	35 (34.7%)
Left	66 (65.3%)
Meniscal injury	36 (35.6%)
Cause of injury	
Sport	61 (60.4%)
Parachuting injury	30 (30%)
Length of time since injury (months)	24.94±29.84
The time before surgery (months)	7.95±6.93
Joint line tenderness	64 (63.4%)
Local block	7 (6.7%)
Tourniquet	101 (100%)
Meniscal repair	36 (35.6%)
Arrow or fast fix	36 (356.0%)
Endo button	(40%)
Rigid fix	(60%)

Table 2. Depicted a comparison of the pre-operative and post-operative course

Character	Preoperative	postoperative
Ligament laxity	80%	20.0%
Rehabilitation	40 (40.4%)	61 (60.4%)
Lachman's test	90 (89.1%)	0 (0.0%)
Pivot test	89 (88.1%)	0 (0.0%)

Table 3. Follow-up shades among the study group

Total drop out	10%
Followed for only six weeks	20%
Followed for only three months	40%
Followed for only six months	30%

Table 4. Pearson correlation of Lachman test to age, the time before surgery and rehabilitation before surgery

Character	Pearson correlation	P-value
Age	0.061	0.547
Length of time since injury	0.110	0.277
Time before surgery	0.025	0.802
Rehabilitation before surgery	0.367	<0.001

Discussion:

The current study showed that the majority of patients were able to return to the military job, the Lachman's and pivot tests were negative in all patients after surgery, with sub-optimal follow-up. In the current survey, the age of the patients was in similarity to Gao et al., 2019 [(10)]who reported similar findings. The predominance of males observed in this survey is in line with a previous study in the USA [(11)]. Gao and colleagues showed that the involved knee joint was the right in contradiction to the present findings in which the left knee was mostly involved. The time before surgery in the current study was longer than the time observed by Gao et al. (7.95±6.93 months vs. 21.6 days) which indicated that our patients seek surgery late which may affect the outcomes of the operation, a plausible explanation is that the majority of Gao sample were sportspeople who may seek medical care early. Besides, the long waiting list in our center may add to the delay before the operation. The causes of injury were a sport in 60% and parachuting in 30% supporting the results of a study conducted in Korea [(12)]. In the present cohort, Endo button and rigid fix were applied in all operations, previous studies reported excellent outcomes by using these techniques [(13, 14)] .The meniscal tear was reported in 35.6% in contradiction to Widener et al., 2015 [(15)] and colleague who reported a prevalence of 64.1%, locked knee was reported in 13.1% supporting a previous finding [(16)]. The relatively low rate of pain may be due to the chronicity at presentation. In the current study meniscal repair was conducted in only 35.6% in accordance with a previous randomized controlled study showing that abrasion and

trephination alone resulted in similar outcomes compared to surgical repair [17]. Previous randomized controlled trials [18, 19] showed that the adductor canal block and local infiltration analgesia give similar results after CLR (regarding the impact on postoperative pain scores and functional outcomes), in our sample analgesia was given in 6.7% of patients. In the current study, Lachman's test and Pivot shift were positive in 89.1% and 88.1% respectively in accordance with Ding et al. from China [20]. In the present study, no correlation was found between positive Lachman's test and age. These findings were in line with a study conducted in the USA. No correlation was found between the chronicity of injury and the time before surgery in contradiction to Magnussen et al., 2016 [21] while rehabilitation before surgery was found to be correlated with a positive Lachman's test in line with Mueffelsea et al., [22] . A similar study conducted in Pakistan (CHAUDHARY et al., [23] reported ligamental laxity in 10% in line with the present findings, the previous study was limited by using open reduction and screw fixation with a small sample size (30 patients). In the present study, 70% of patients returned military duty in line with Ahen et al.,[24]. Al Housni et al., from Oman reported similar findings [25], our outcomes might be better if the patients presented earlier for surgery (24.94±29.84 versus 13.6 months.), also, 50% continued playing sports even after the rupture of their ACL, which caused more damage to their knees.

The study limitations:

The current study included a relatively small sample and the fact that it was conducted at a single tertiary center, thus, generalization to the whole Kingdom of Saudi Arabia cannot be insured. Other limitations were the short period of follow-up and the backdated study period. Nevertheless, the study gave an insight into the situation in the whole Kingdom of Saudi Arabia due to the lack of similar studies.

Conclusion:

Sports injury was the commonest cause of ACL injury followed by parachuting, the patients presented late to surgery, most of the patients did not adhere to advising against sport following the operation, the majority of patients were able to return to the military job, the follow-up was sub-optimal.

Recommendations:

Further larger multi-center studies focusing on the different methods of rehabilitation are recommended.

Authors' contributions:

Dr. T.A, the concept, design, data collection and interpretation, and manuscript drafting, the author revised the manuscript and approved it before submission

References:

1. Mahapatra P, Horriat S, Anand BS. Anterior cruciate ligament repair - past, present, and future. J Exp Orthop. 2018;5(1):20. Published 2018 Jun 15. doi:10.1186/s40634-018-0136-6
2. Reider B. The Quest. The American journal of sports medicine. 2013;41(8):1747–1749.
3. Feagin JA, Jr, Curl WW. Isolated tear of the anterior cruciate ligament: 5-year follow-up study. Am J Sports Med. 1976;4(3):95–100.

4. Stewart BA, Momaya AM, Silverstein MD, Lintner D. The Cost-Effectiveness of Anterior Cruciate Ligament Reconstruction in Competitive Athletes. Am J Sports Med. 2017 Jan;45(1):23-33. doi: 10.1177/0363546516664719. Epub 2016 Sep 30. PMID: 27590175.
5. Alshewaier S. Developing a Standardised Preoperative Physiotherapy Programme to Improve the Outcomes of Patients Undergoing Anterior Cruciate Ligament Reconstruction in Riyadh (KSA). PhD thesis. Manchester Metropolitan University; 2016. https://e-space.mmu.ac.uk/617669/ last accessed January 9, 2021.
6. Andonovski A, Topuzovska S, Samardziski M, et al. The influence of anterior cruciate ligament remnant on postoperative clinical results in patients with remnant preserving anterior cruciate ligament reconstruction. Open Access Maced J Med Sci. 2017;5:624–629
7. Perrone GS, Proffen BL, Kiapour AM, Sieker JT, Fleming BC, Murray MM. Bench-to-bedside: Bridge-enhanced anterior cruciate ligament repair. J Orthop Res. 2017;35(12):2606-2612. doi:10.1002/jor.23632
8. Coffey R, Bordoni B. Lachman Test. [Updated 2020 Jul 31]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554415/
9. Vaudreuil NJ, Rothrauff BB, de Sa D, Musahl V. The Pivot Shift: Current Experimental Methodology and Clinical Utility for Anterior Cruciate Ligament Rupture and Associated Injury. Curr Rev Musculoskelet Med. 2019;12(1):41-49. doi:10.1007/s12178-019-09529-7
10. Gao S, Liu N. Zhongguo Xiu Fu Chong Jian Wai KeZaZhi. Arthroscopic anterior cruciate ligament reconstruction via tibial tunnel made by three-portal technique. Clinical trial. 2019;33(9):1083-1087. doi:10.7507/1002-1892.201905055
11. Leathers MP, Merz A, Wong J, Scott T, Wang JC, Hame SL. Trends and Demographics in Anterior Cruciate Ligament Reconstruction in the United States. J Knee Surg. 2015;28(5):390-394. doi:10.1055/s-0035-1544193
12. Ahn J, Choi B, Lee YS, Lee KW, Lee JW, Lee BK. The mechanism and cause of anterior cruciate ligament tear in the Korean military environment. Knee Surg Relat Res. 2019 Nov 28;31(1):13. doi: 10.1186/s43019-019-0015-1. PMID: 32660592; PMCID: PMC7219609
13. Ranjan R, Gaba S, Goel L, et al. In vivo comparison of a fixed loop (EndoButton CL) with an adjustable loop (TightRope RT) device for femoral fixation of the graft in ACL reconstruction: A prospective randomized study and a literature review. J Orthop Surg (Hong Kong). 2018;26(3):2309499018799787. doi:10.1177/2309499018799787
14. Fan H, Wang J, Fu Y, et al. A security evaluation of the Rigid-fix crosses pin system used for anterior cruciate ligament reconstruction in tibial fixation site. Int J ClinExp Med. 2014;7(11):4597-4606. Published 2014 Nov 15.
15. Widener DB, Wilson DJ, Galvin JW, Marchant BG, Arrington ED. The prevalence of meniscal tears in young athletes undergoing revision anterior cruciate ligament reconstruction. Arthroscopy. 2015;31(4):680-683. doi:10.1016/j.arthro.2014.10.006
16. Carmont MR, Gilbert RE, Marquis C, Mei-Dan O, Rees D. The diagnostic value of the stump impingement reflex sign for determining anterior cruciate ligament stump impingement as a cause of knee locking. Sports Med Arthrosc Rehabil Ther Technol. 2012;4(1):29. Published 2012 Aug 28. doi:10.1186/1758-2555-4-29
17. Liu X, Zhang H, Feng H, Hong L, Wang XS, Song GY. Is It Necessary to Repair Stable Ramp Lesions of the Medial Meniscus During Anterior Cruciate Ligament Reconstruction? A Prospective Randomized Controlled Trial. Am J Sports Med. 2017;45(5):1004-1011. doi:10.1177/0363546516682493

18. Stebler K, Martin R, Kirkham KR, Lambert J, De Sede A, Albrecht E. Adductor canal block versus local infiltration analgesia for postoperative pain after anterior cruciate ligament reconstruction: a single centre randomised controlled triple-blinded trial. Br J Anaesth. 2019;123(2):e343-e349. doi:10.1016/j.bja.2019.04.053
19. Ambrosoli AL, Guzzetti L, Severgnini P, et al. Postoperative analgesia and early functional recovery after day-case anterior cruciate ligament reconstruction: a randomized trial on local anesthetic delivery methods for continuous infusion adductor canal block. Minerva Anestesiol. 2019;85(9):962-970. doi:10.23736/S0375-9393.19.13474-8
20. Ding Y, Zhang Y, Jia H, Gu D, Chen L.Mid-term effectiveness of arthroscopic anterior cruciate ligament reconstruction combined with meniscus allograft transplantation. Zhongguo Xiu Fu Chong Jian Wai KeZaZhi. 2019;33(9):1071-1076. doi:10.7507/1002-1892.201904006
21. Magnussen RA, Reinke EK, Huston LJ; MOON Group, Hewett TE, Spindler KP. Factors Associated With High-Grade Lachman, Pivot Shift, and Anterior Drawer at the Time of Anterior Cruciate Ligament Reconstruction. Arthroscopy. 2016;32(6):1080-1085. doi:10.1016/j.arthro.2015.11.018
22. Meuffels DE, Poldervaart MT, Diercks RL, et al. Guideline on anterior cruciate ligament injury. ActaOrthop. 2012;83(4):379-386. doi:10.3109/17453674.2012.704563
23. CHAUDHARY, Muhammad Nadeem; HAFEEZ, Sohail; ASLAM, Memoona. Anterior cruciate ligament avulsion injuries in military soldiers: a tertiary care experience. Pakistan Armed Forces Medical Journal, 2018, 68.5: 1378-81.
24. Al Housni H S, Al Ghaithi, A K, Al Shukaili A H, Al Abri F M, Al Kalbani S S. Return to full military activities post anterior cruciate ligament reconstruction. Journal of Musculoskeletal Surgery and Research 2019;3(4): 346.
25. Al Housni H S, Al Ghaithi, A K, Al Shukaili A H, Al Abri F M, Al Kalbani S S. Return to full military activities post anterior cruciate ligament reconstruction. *Journal of Musculoskeletal Surgery and Research* 2019;*3*(4): 346.