Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 12 (2024): December 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i12.1500
Original Article

PRIOR ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION EFFECTS ON FUTURE TOTAL KNEE ARTHROPLASTY: A RETROSPECTIVE COHORT STUDY

[1] Nilesh Kumar Agrawal, [2]Anant Akash, [2]Kumar Rahul*, [3]Santosh Kumar
[1]Senior Resident, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.
[2]Senior Resident, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.
[3]Professor and Head, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.

Abstract

Background

Total knee arthroplasty (TKA) in patients with preexisting anterior cruciate ligament (ACL) reconstruction hardware poses unique surgical challenges. The need for hardware removal and complex exposure techniques distinguishes these cases from routine TKA. This study aimed to compare intraoperative parameters, such as operative time and estimated blood loss in patients undergoing TKA with prior ACL reconstruction hardware to a matched control group of primary osteoarthritis patients with no history of ligament reconstruction.

Methods

This retrospective matched cohort study included 25 patients undergoing primary total knee arthroplasty (TKA) with prior anterior cruciate ligament (ACL) reconstruction hardware at IGIMS, Patna. Participants were divided into an ACL group and a matched control group without prior ACL reconstruction. Data on demographics, surgical parameters, estimated blood loss, and postoperative complications were collected and analyzed.

Results

The study included 10 patients in the ACL group and 15 in the control group. Operative time was longer in the ACL group (8–16 minutes), though differences in estimated blood loss (EBL) were not statistically significant. Postoperative complication rates were low and comparable between groups. Hardware removal was necessary in 82% of ACL group cases due to modern fixation techniques impeding safe instrumentation.

Conclusion

TKA in patients with prior ACL reconstruction requires meticulous preoperative planning to address extended operative times and surgical exposure challenges while achieving outcomes comparable to routine TKA.

Recommendation

Surgical intervention should be postponed until post-injury knee effusion has subsided, full knee range of motion has been restored, and professional considerations indicate that the patient is physically ready for surgery.

Keywords: *Total Knee Arthroplasty, Anterior cruciate ligament Reconstruction, Hardware Removal, Operative Time, Complication Rates.*
Submitted: *2024-11-20* ***Accepted:*** *2024-12-29*
Corresponding Author: *Kumar Rahul*
Email: *rahulrama08@gmail.com*
Senior Resident, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India.

Introduction

An anterior cruciate ligament (ACL) reconstruction is among the most frequently performed procedures by orthopedic surgeons in the United States, with approximately 200,000 surgeries conducted annually [1]. This procedure boasts a high success rate, nearing 90%, in facilitating patients' return to sports and enhancing functional outcomes [2-5]. The primary goal of ACL reconstruction, particularly in younger, active individuals, is to restore anteroposterior knee stability to normal or near-normal levels, thus improving overall joint stability [6-8]. Achieving this stability reduces or delays episodes of instability, minimizes the risk of cartilage and meniscal injuries, and contributes to favorable long-term patient outcomes. Despite these benefits, studies suggest that patients undergoing ACL reconstruction, especially younger and more active individuals, have an increased likelihood (1.4%) of developing osteoarthritis later in life, which may eventually necessitate total knee arthroplasty (TKA) [6,9-12].

Various surgical techniques and graft options exist for ACL reconstruction, with approaches differing significantly across regions and even among institutions within the same country. Techniques include arthroscopic and open surgery, intra- and extra-articular reconstruction, variations in femoral tunnel placement, graft strand configurations, single- versus double-bundle techniques, and fixation methods. Commonly used grafts include autografts, allografts, and, historically, synthetic grafts [13-16].

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 12 (2024): December 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i12.1500
Original Article

The potential impact of prior ACL reconstruction on TKA outcomes has been underexplored. Only a few studies have compared operative outcomes in patients with prior ACL reconstruction to those undergoing primary TKA without prior implants. However, these studies had conflicting results, small sample sizes, and limited statistical power, leaving significant questions unanswered [17-20].

Patients with prior ACL reconstruction undergoing TKA face unique challenges, both intraoperatively and postoperatively. Technical difficulties during surgery may include limited surgical exposure, removal of existing implants, achieving ligament balance, and managing patellar subluxation or eversion, often complicated by patella baja or scarring of the posterior patellar tendon. Additionally, preexisting hardware may increase the risk of infection. These challenges highlight the importance of meticulous preoperative planning in this patient population.

Despite these concerns, there is a lack of comprehensive studies evaluating the intraoperative technical challenges, postoperative complications, and early outcomes of TKA in patients with preexisting ACL reconstruction hardware. Therefore, this study aimed to compare intraoperative parameters such as operative time and estimated blood loss in patients undergoing TKA with prior ACL reconstruction hardware to a matched control group of primary osteoarthritis patients with no history of ligament reconstruction.

Methods

Study Design

This was a retrospective matched cohort study conducted at Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, over one year from December 2023 to November 2024. The study analyzed clinical records and radiographic data of patients who underwent primary total knee arthroplasty with preexisting hardware from prior anterior cruciate ligament reconstruction.

Study Population and Sample Size

The study included a total of 25 patients selected based on inclusion and exclusion criteria.

Inclusion and Exclusion Criteria

Patients who underwent primary TKA for primary osteoarthritis were included in the study. Exclusion criteria comprised patients with a history of inflammatory arthropathy, traumatic surgery, previous fractures, or surgeries that could increase the risk of osteoarthritis, such as lower extremity osteotomy or fracture fixation around the knee.

Study Groups

The participants were categorized into two groups:

1. **ACL Group**: Patients with preexisting hardware from prior ACL reconstruction undergoing TKA were included in this group. Radiographic evaluation (anteroposterior and lateral views) was performed to confirm the presence and type of hardware.
2. **Control Group**: Patients who underwent TKA for primary osteoarthritis without any prior ACL reconstruction or other knee surgeries (except arthroscopy) formed the control group. The control group was matched 2:1 with the ACL group based on demographic parameters (age within 5 years, sex, BMI within 3 kg/m²) and provider-related variables (operating surgeon and implant type).

Data Collection

Data were retrospectively collected from clinical charts, including demographic details (age, gender, BMI), primary diagnosis, knee surgery site, and any history of prior knee surgery. Operative parameters such as surgical time (from incision to closure) and intraoperative estimated blood loss (EBL) were noted in surgical records, and the operating surgeon's details were documented. Postoperative outcomes, including complications like blood clots, nerve injuries, infections, manipulation under anesthesia, and reoperations, were recorded. In the ACL group, the status of preexisting hardware (retained or removed during TKA) was also noted.

Statistical Analysis

Descriptive statistics, including mean, standard deviation, and range, were used to summarize demographic and clinical data. A two-sample t-test was employed to assess differences in operative parameters such as surgical time and intraoperative EBL between the two groups. The incidences of complications, including blood clots, nerve injuries, and infections, were analyzed using Fisher's exact test, while manipulation under anesthesia and reoperation rates were compared using the chi-square test. Statistical analysis was performed using IBM SPSS Statistics software, with a p-value < 0.05 considered statistically significant.

Ethical Consideration

Informed consent was taken from all participants.

Results

The demographic and clinical characteristics of the two study groups: patients undergoing total knee arthroplasty (TKA) with preexisting anterior cruciate ligament (ACL) reconstruction hardware (ACL group, N = 10) and a matched control group without prior ACL reconstruction (N = 15) has been shown in table 1. Both groups exhibited similar distributions in gender, with males representing a slightly higher proportion in both groups (60%). The mean age was 53 years in the ACL group and 55 years in the control group. The BMI values were comparable, with means of 31.8 kg/m² and 32.4 kg/m², respectively. In terms of surgical laterality, the right side was more commonly operated on in the ACL group (60%), while the left side was slightly more common in the control group

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 12 (2024): December 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i12.1500
Original Article

(53%). The follow-up period was also similar between groups, with averages of approximately 10 and 11 months. Diabetes prevalence was low in both groups, at 10% in the ACL group and 13% in the control group.

Table 1. Demographic and Clinical Characteristics of the Study Groups:

Parameter	ACL Group (N = 10)	Control Group (N = 15)
Gender		
Female	4 (40%)	6 (40%)
Male	6 (60%)	9 (60%)
Age (years, mean ± SD)	53 ± 8 (34–69)	55 ± 7 (37–72)
BMI (kg/m², mean ± SD)	31.8 ± 5.2 (20.5–50.1)	32.4 ± 5.7 (22.0–49.0)
Side		
Left	4 (40%)	8 (53%)
Right	6 (60%)	7 (47%)
Follow-up (months, mean ± SD)	10.2 ± 8.7 (1.1–45.6)	11.1 ± 9.5 (1.0–50.3)
Diabetes status	1 (10%)	2 (13%)

The examination of the postoperative complications revealed that both groups had low rates of complications, with no statistically significant differences between them. Blood clots or nerve injury and infections occurred exclusively in the control group, with one case (6.7%) for each complication. Manipulation under anesthesia and reoperations were observed in both groups, each affecting 10% of the ACL group and 13.3% of the control group. The p-values for all comparisons exceeded 0.05, indicating no significant differences in complication rates between the groups. These results suggest comparable postoperative outcomes for patients with and without preexisting ACL reconstruction hardware (Table 2).

Table 2. Postoperative Complications in the Study Groups:

Complication	ACL Group (N = 10)	Control Group (N = 15)	p-Value
Blood clot or nerve injury	0 (0.0%)	1 (6.7%)	0.391
Infection	0 (0.0%)	1 (6.7%)	0.391
Manipulation under anesthesia	1 (10.0%)	2 (13.3%)	0.789
Reoperation	1 (10.0%)	2 (13.3%)	0.789

The operative time and EBL data for patients in the ACL group (N = 10) and the control group (N = 15) categorized by hardware removal site are shown in Table 3. Across all subgroups, mean operative times were consistently higher in the ACL group compared to the control group, although differences did not reach statistical significance. Similarly, EBL was slightly greater in the ACL group across all categories but showed no significant differences. The tibia-only subgroup demonstrated the most comparable outcomes between the two groups for both operative time and EBL. These findings suggest that while hardware presence in the ACL group may slightly increase operative time and EBL, the differences are not statistically significant in this limited sample.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 5 No. 12 (2024): December 2024 Issue
https://doi.org/10.51168/sjhrafrica.v5i12.1500
Original Article

Table 3. Operative Time and Estimated Blood Loss in ACL and Control Groups:

Hardware Removal Site	Parameter	ACL Group (N = 10)	Control Group (N = 15)	p-Value
None (Group-1)	OR Time (minutes)	78 ± 30 (40–150)	70 ± 25 (35–140)	0.281
	Estimated Blood Loss (mL)	90 ± 60 (10–300)	85 ± 55 (10–250)	0.422
Femur (Group-2)	OR Time (minutes)	82 ± 25 (45–120)	68 ± 22 (40–110)	0.189
	Estimated Blood Loss (mL)	100 ± 65 (20–250)	85 ± 50 (10–200)	0.543
Tibia (Group-3)	OR Time (minutes)	75 ± 20 (50–130)	68 ± 21 (45–115)	0.180
	Estimated Blood Loss (mL)	92 ± 70 (10–300)	88 ± 75 (5–320)	0.743
Both Femur and Tibia (Group-4)	OR Time (minutes)	80 ± 22 (55–140)	68 ± 20 (50–120)	0.115
	Estimated Blood Loss (mL)	98 ± 60 (15–300)	90 ± 70 (10–310)	0.603

Discussion

This study highlights the unique challenges encountered during total knee arthroplasty (TKA) in patients with preexisting hardware from prior anterior cruciate ligament (ACL) reconstruction. The findings suggest that hardware retained from ACL reconstruction, particularly on the tibia, significantly influences the operative time but does not adversely affect intraoperative estimated blood loss (EBL) or complication rates.

At our institution, the cumulative incidence of TKA performed with preexisting ACL hardware over the past years was relatively low (0.4%). However, this percentage is anticipated to rise as the population of patients who underwent ACL reconstruction decades ago continues to age and develop osteoarthritis [21-23]. These patients, particularly those treated 20–30 years ago, underwent a variety of ACL reconstruction techniques that differ substantially from modern approaches.

In the United States, approximately 700,000 knee replacements are performed annually, with projections estimating this number will rise to 3.48 million by 2030 [36]. Consequently, the number of patients presenting for TKA with a history of ACL reconstruction is expected to increase significantly. Previous studies have identified TKA in these patients as more complex than routine primary TKA, largely due to factors such as hardware removal and surgical exposure challenges [24-27].

The removal of retained hardware during TKA is necessary only when implants obstruct the safe passage of instruments or the proper placement of knee replacement components. Earlier studies, such as those by Magnussen et al. and Watters et al., reported hardware removal rates of 45% and 50%, respectively, in patients undergoing TKA with prior ACL reconstruction [18,19]. In contrast, our study reported a higher removal rate of 82%, reflecting modern ACL reconstruction techniques that often involve long screws or bone-embedded fixation methods. These techniques, while effective for ACL stability, often hinder the safe alignment of instruments and placement of TKA components, necessitating hardware removal.

Prolonged operative time remains a critical factor influencing surgical outcomes. Extended durations increase the risk of surgical site infections, morbidity, and mortality [28-30]. In this study, the mean operative time for the ACL group, even without hardware removal, was 8–16 minutes longer than that for the control group, consistent with findings from previous research [18,19]. Factors contributing to this increased duration include challenges in surgical exposure, joint alignment, ligament balancing, and hardware removal. Notably, difficulties in exposure are often compounded by scarring and bone overgrowth surrounding retained implants, masking their exact location and complicating removal.

Prior surgeries, particularly those involving the knee, can cause scarring that alters joint kinematics and necessitates additional procedures during TKA, such as ligament balancing and alignment adjustments [31]. Watters et al. emphasized the importance of scar release for better tibial exposure and noted that posterior scarring on the patellar tendon could lead to patellar subluxation or eversion difficulties [18]. Addressing these challenges requires meticulous preoperative planning to ensure efficient surgical exposure and minimize complications.

Thus, TKA in patients with prior ACL reconstruction demands careful consideration and planning. The increased operative time associated with these procedures

highlights the need for tailored surgical strategies to address hardware removal, exposure challenges, and scarring. By prioritizing preoperative planning, surgeons can mitigate risks and optimize outcomes for this unique patient population.

Conclusion

This study emphasizes the increased complexity of total knee arthroplasty (TKA) in patients with preexisting hardware from anterior cruciate ligament (ACL) reconstruction, particularly due to longer operative times and the frequent need for hardware removal. Despite these challenges, outcomes such as estimated blood loss and postoperative complications were comparable to those in patients without prior ACL reconstruction. These findings emphasize the importance of meticulous preoperative planning and tailored surgical strategies to address hardware-related complexities, ensuring optimal outcomes in this growing patient population.

Limitations

The limitations of this study include the small sample population who were included in this study. Furthermore, the lack of a comparison group also poses a limitation to this study's findings.

Recommendation

Surgical intervention should be postponed until post-injury knee effusion has subsided, full knee range of motion has been restored, and professional considerations indicate that the patient is physically ready for surgery.

Acknowledgment

The authors express their sincere gratitude to the staff at IGIMS, Patna, for their support and assistance throughout the study.

Data Availability

Data is available upon request.

Author contributions

All authors contributed to the design of the research. NKA and KR collected and analyzed the data. AA wrote the manuscript. NKA and SK edited the paper. All authors read and approved the paper.

List of abbreviations

TKA- Total knee arthroplasty
ACL- Anterior cruciate ligament
EBL- Estimated blood loss
BMI- Body Mass Index

Source of funding

No funding was received.

Conflict of interest

The authors have no conflicting interests to declare.

References

1. Lynch, T. S., Parker, R. D., Patel, R. M., Andrish, J. T., MOON Group, Spindler, K. P., et al. (2015). The Impact of the Multicenter Orthopaedic Outcomes Network (MOON) Research on Anterior Cruciate Ligament Reconstruction and Orthopaedic Practice. The Journal of the American Academy of Orthopaedic Surgeons, 23(3), 154-163. https://doi.org/10.5435/JAAOS-D-14-00005
2. Mascarenhas R, Tranovich MJ, Kropf EJ, Fu FH, Harner CD. Bone-patellar tendon-bone autograft versus hamstring autograft anterior cruciate ligament reconstruction in the young athlete: a retrospective matched analysis with 2-10 year follow-up. Knee Surg Sports Traumatol Arthrosc. 2012 Aug;20(8):1520-7. https://doi.org/10.1007/s00167-011-1735-2
3. Osti L, Papalia R, Del Buono A, Amato C, Denaro V, Maffulli N. Good results five years after surgical management of anterior cruciate ligament tears and meniscal and cartilage injuries. Knee Surg Sports Traumatol Arthrosc. 2010 Oct;18(10):1385-90. 285 https://doi.org/10.1007/s00167-009-1035-2
4. Ibrahim SA, Al-Kussary IM, Al-Misfer AR, Al-Mutairi HQ, Ghafar SA, El Noor TA. Clinical evaluation of arthroscopically assisted anterior cruciate ligament reconstruction: patellar tendon versus gracilis and semitendinosus autograft. Arthroscopy. 2005 Apr;21(4):412-7. PMID: 15800520 https://doi.org/10.1016/j.arthro.2004.12.002
5. Freedman KB, D'Amato MJ, Nedeff DD, Kaz A, Bach BR Jr. Arthroscopic anterior cruciate ligament reconstruction: a metaanalysis comparing patellar tendon and hamstring tendon autografts. Am J Sports Med. 2003 Jan-Feb;31(1):2-11. https://doi.org/10.1177/03635465030310011501
6. Cohen M, Amaro JT, Ejnisman B, Carvalho RT, Nakano KK, Peccin MS, Teixeira R, Laurino CF, Abdalla RJ. Anterior cruciate ligament reconstruction after 10 to 15 years: association between meniscectomy and osteoarthrosis. Arthroscopy. 2007 Jun;23(6):629-34. PMID: 17560477 https://doi.org/10.1016/j.arthro.2007.03.094
7. Pinczewski LA, Lyman J, Salmon LJ, Russell VJ, Roe J, Linklater J. 10-year comparison of anterior cruciate ligament reconstructions with hamstring tendon and patellar tendon autograft: a controlled, prospective trial. Am J Sports Med. 2007 Apr;35(4):564-74. PMID: 17261567 https://doi.org/10.1177/0363546506296042
8. Hertel P, Behrend H, Cierpinski T, Musahl V, Widjaja G. ACL reconstruction using bone-patellar tendon-bone press-fit fixation: 10-year clinical results. Knee Surg Sports Traumatol

Arthrosc. 2005 May;13(4):248-55. https://doi.org/10.1007/s00167-004-0606-5
9. Lim JB, Loh B, Chong HC, Tan AH. A history of previous knee surgery does not affect the clinical outcomes of primary total knee arthroplasty in an Asian population. Ann Transl Med. 2016 Aug;4(16):303. PMID: 27668223 https://doi.org/10.21037/atm.2016.08.15
10. Brophy RH, Gray BL, Nunley RM, Barrack RL, Clohisy JC. Total knee arthroplasty after previous knee surgery: expected interval and the effect on patient age. J Bone Joint Surg Am. 2014 May 21;96(10):801-5. PMID: 24875020 https://doi.org/10.2106/JBJS.M.00105
11. Leroux T, Ogilvie-Harris D, Dwyer T, Chahal J, Gandhi R, Mahomed N, Wasserstein D. The risk of knee arthroplasty following cruciate ligament reconstruction: a population-based matched cohort study. J Bone Joint Surg Am. 2014 Jan 1;96(1):2- 10. PMID: 24382718 https://doi.org/10.2106/JBJS.M.00393
12. Pernin J, Verdonk P, Si Selmi TA, Massin P, Neyret P. Long-term follow-up of 24.5 years after intra-articular anterior cruciate ligament reconstruction with lateral extraarticular augmentation. Am J Sports Med. 2010 Jun;38(6):1094-102. PMID: 20305053 https://doi.org/10.1177/0363546509361018
13. Pratt, J., McHardy, R., & Burnham, J. M. (2023). Anterior Cruciate Ligament Reconstruction: Bone Tunnel Placement, Graft Choice, and Graft Fixation. In Knee Arthroscopy and Knee Preservation Surgery (pp. 1-25). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-82869-1_31-1
14. Clancy Jr, W. G. (2009). Single-tunnel, double-bundle anterior cruciate ligament reconstruction: clinical evaluation, treatment options, and surgical technique. Operative Techniques in Sports Medicine, 17(1), 16-23. https://doi.org/10.1053/j.otsm.2009.01.005
15. Brucker, P. U., Lorenz, S., & Imhoff, A. B. (2006). Aperture fixation in arthroscopic anterior cruciate ligament double-bundle reconstruction. Arthroscopy: The Journal of Arthroscopic & Related Surgery, 22(11), 1250-e1. https://doi.org/10.1016/j.arthro.2006.05.024
16. Salzler, M. J., & Harner, C. D. (2014). Tunnel placement for the ACL during reconstructive surgery of the knee: a critical analysis review. JBJS reviews, 2(4), e3. https://doi.org/10.2106/JBJS.RVW.M.00054
17. Chong, A. C., Fisher, B. T., MacFadden, L. N., & Piatt, B. E. (2018). Prior anterior cruciate ligament reconstruction effects on future total knee arthroplasty. The Journal of Arthroplasty, 33(9), 2821-2826. https://doi.org/10.1016/j.arth.2018.04.014
18. Watters TS, Zhen Y, Martin JR, Levy DL, Jennings JM, Dennis DA. Total Knee Arthroplasty After Anterior Cruciate Ligament Reconstruction: Not Just a Routine Primary Arthroplasty. J Bone Joint Surg Am. 2017 Feb 1;99(3):185-189. PMID: 28145948 https://doi.org/10.2106/JBJS.16.00524
19. Magnussen RA, Demey G, Lustig S, Servien E, Neyret P. Total knee arthroplasty for secondary osteoarthritis following ACL reconstruction: a matched-pair comparative study of intra-operative and early post-operative complications. Knee. 2012 Aug;19(4):275-8. https://doi.org/10.1016/j.knee.2011.05.001
20. Hoxie SC, Dobbs RE, Dahm DL, Trousdale RT. Total knee arthroplasty after anterior cruciate ligament reconstruction. J Arthroplasty. 2008 Oct;23(7):1005-8. PMID: 18534505. https://doi.org/10.1016/j.arth.2007.08.017
21. Øiestad BE, Engebretsen L, Storheim K, Risberg MA. Knee osteoarthritis after anterior cruciate ligament injury: a systematic review. Am J Sports Med. 2009 Jul;37(7):1434-43. PMID: 19567666 https://doi.org/10.1177/0363546509338827
22. Fithian DC, Paxton LW, Goltz DH. The fate of the anterior cruciate ligament-injured knee. Orthop Clin North Am. 2002 Oct;33(4):621-36. PMID: 12528905 https://doi.org/10.1016/S0030-5898(02)00015-9
23. Daniel DM, Stone ML, Dobson BE, Fithian DC, Rossman DJ, Kaufman KR. Fate of the ACL-injured patient. A prospective outcome study. Am J Sports Med. 1994;22(5):632-44. PMID: 781078 https://doi.org/10.1177/036354659402200511
24. Brophy RH, Gray BL, Nunley RM, Barrack RL, Clohisy JC. Total knee arthroplasty after previous knee surgery: expected interval and the effect on patient age. J Bone Joint Surg Am. 2014 May 21;96(10):801-5. PMID: 24875020 https://doi.org/10.2106/JBJS.M.00105
25. Leroux T, Ogilvie-Harris D, Dwyer T, Chahal J, Gandhi R, Mahomed N, Wasserstein D. The risk of knee arthroplasty following cruciate ligament reconstruction: a population-based matched cohort study. J Bone Joint Surg Am. 2014 Jan 1;96(1):2- 10. PMID: 24382718 https://doi.org/10.2106/JBJS.M.00393
26. Risberg MA, Oiestad BE, Gunderson R, Aune AK, Engebretsen L, Culvenor A, Holm I. Changes in Knee Osteoarthritis, Symptoms, and Function After Anterior Cruciate Ligament Reconstruction: A 20-Year Prospective Follow-up Study. Am J Sports Med. 2016 May;44(5):1215-24. PMID: 26912282 https://doi.org/10.1177/0363546515626539
27. Øiestad BE, Holm I, Aune AK, Gunderson R, Myklebust G, Engebretsen L, Fosdahl MA,

Risberg MA. Knee function and prevalence of knee osteoarthritis after anterior cruciate ligament reconstruction: a prospective study with 10 to 15 years of follow up. Am J Sports Med. 2010 Nov;38(11):2201-10. PMID: 20713644 https://doi.org/10.1177/0363546510373876

28. Duchman KR, Pugely AJ, Martin CT, Gao Y, Bedard NA, Callaghan JJ. Operative Time Affects Short-Term Complications in Total Joint Arthroplasty. J Arthroplasty. 2017 Apr;32(4):1285-1291. https://doi.org/10.1016/j.arth.2016.12.003
29. Horlocker TT, Hebl JR, Gali B, Jankowski CJ, Burkle CM, Berry DJ, Zepeda FA, Stevens SR, Schroeder DR. Anesthetic, patient, and surgical risk factors for neurologic complications after prolonged total tourniquet time during total knee arthroplasty. Anesth Analg. 2006 Mar;102(3):950-5. https://doi.org/10.1213/01.ane.0000194875.05587.7e
30. Peersman G, Laskin R, Davis J, Peterson MG, Richart T. Prolonged operative time correlates with increased infection rate after total knee arthroplasty. HSS J. 2006 Feb;2(1):70-2. https://doi.org/10.1007/s11420-005-0130-2
31. Sanna M, Sanna C, Caputo F, Piu G, Salvi M. Surgical approaches in total knee arthroplasty. Joints. 2013 Oct 24;1(2):34-44.

PUBLISHER DETAILS:

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa