

Day Case Anterior Cruciate Ligament Reconstruction Surgery – A Study of Early Treatment Outcomes in a Regional Orthopaedic Centre

Abstract

Background: Day-case anterior cruciate ligament reconstruction has the potential benefit of reduced hospital stay and reduced cost of care. The goal of this preliminary report was to compare the outcome of day-case arthroscopic anterior cruciate ligament reconstruction with those of in-patient care in terms of pain control and short-term functional outcome. **Materials and Methods:** This was a prospective comparative study involving patients who had anterior cruciate ligament reconstruction performed in our unit between January 2019 to July 2021 for isolated anterior cruciate ligament rupture. The patients were offered the option of in-patient and day-case anterior cruciate ligament reconstruction. All cases were isolated anterior cruciate ligament ruptures with no other ligament injury. **Results:** A total of twenty-one day case and twenty-five in-patient anterior cruciate ligament reconstruction were managed during the period of the study. The median numeric pain scores at day 2 and 7 in the day case group was 8.0 (IQR=2.0) and 5.0 (IQR= 3.0) respectively and in-patient group was 7.0 (IQR= 1.5) and 4.0 (IQR= 2.0) respectively. The international knee documentation score (IKDC) at 6 months in the day case and in-patient groups were 68.6 (IQR= 9.3) and 67.2 (IQR= 25.0) respectively. The Mann-Whitney U test indicated that patients who had ACL reconstruction on in-patient care basis had statistically significant lower visual analogue scale pain scores on the second ($z=-2.58, P = 0.01$) and seventh ($z=-3.41 P = 0.001$) post-operative days compared to patients who had ACL reconstruction on day case basis. There was no statistically significant difference in the median IKDC scores of both groups at 6 months. The cost of care in the day case group was 40% lower than those of the in-patient group. **Conclusion:** Although the cost of care in the day case group appeared lower as compared to the in-patient group, the day case group had higher post-operative pain scores compared to the in-patient group. Although the post-operative functional scores were similar in both groups, this was not statistically significant

Keywords: Anterior cruciate ligament, day case, in-patient, outcome

Introduction

Arthroscopic anterior cruciate ligament (ACL) reconstruction is gradually becoming a common procedure in orthopaedic centres in the tropics. ACL reconstruction has traditionally required short stay hospitalization for adequate pain management and nursing care.^[1] However, advances in technology and improvements in technique have reduced operative time for ACL reconstruction and decreased the risk of post-operative complications.^[1] These changes make out-patient surgery a reasonable alternative for ACL reconstruction.

The improvement in anaesthetic techniques, postoperative pain management, operative technique and instrumentation in recent

years have lead to ACL reconstruction being performed more frequently as a day case.^[2] The major obstacles to day case surgeries include perceived compromise to safety, delay in diagnosis and treatment of complications,^[3] and reduction in patient satisfaction.^[4] Due to the advances in surgical and anaesthetic techniques immediate stability and mobility without compromise in safety or post-operative pain control is achievable.^[5]

The potential advantages of day case ACL surgery includes reduced economic cost, provision of more bed spaces for other orthopaedic cases as well as the patient being able to recover in a familiar and conducive home environment.^[6] Complications that may be associated with day case ACL surgery include: pain not controlled with

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How to cite this article: Babalola OR, Itakpe SE, Oladunjoye TO, Akpan JI, Madubueze CC, Koyejo T. Day case anterior cruciate ligament reconstruction surgery – A study of early treatment outcomes in a regional orthopaedic centre. J West Afr Coll Surg 2022;12:23-7.

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Received: 25-May-2022

Accepted: 22-Jun-2022

Published: 27-Aug-2022

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Access this article online

Website:

www.jwacs-jcoac.com

DOI: 10.4103/jwas.jwas_125_22

Quick Response Code:



analgesia, haemarthrosis, fever, deep vein thrombosis, cellulitis and septic arthritis.^[7] However, no study has been conducted in our sub-region to compare the early outcome of ACL reconstruction between day cases and inpatient care.

The aim of this study was to compare the early outcome of ACL reconstruction in terms of post-operative pain levels, incidence of post-operative complications and short-term functional outcome between day case and in-patient care among patients who had primary ACL reconstruction.

The post-operative pain levels were compared using the Numeric pain score which is a widely used subjective pain score. It ranges from 0 for no pain to 10 for maximum pain level.^[9]

The functional outcome was compared using the using the international knee documentation committee (IKDC) score, which is a validated outcome measure in accessing functional outcome following ACL reconstruction.^[10]

Our null hypothesis was that there was no statistically significant difference in post-operative pain levels between both groups; and also, that there was no statistically significant difference in the functional outcome at six months between day case ACL reconstruction (ACL R) group and in-patient ACL R group in our study population.

Materials and Methods

This was a prospective comparative study involving patients who had primary anterior cruciate ligament reconstruction performed in our unit between January 2019 to July 2021 for isolated anterior cruciate ligament reconstruction. ACL rupture was diagnosed clinically and confirmed on magnetic resonance imaging.

The eligible patients were offered a choice of either day case or in-patient ACL reconstruction. Those who opted for day case surgery were also advised on conditions to ensure they had appropriate care at home, which included the availability of a relative to offer supportive care at home and to have the contact of a member of the team for ease of advice on care. Cases of anterior cruciate ligament rupture seen during this period who had day case procedure were compared with those who had in patient care with regard to post-operative pain scores and international knee documentation (IKDC) score as primary outcome measures. The secondary outcome measure was the pattern of complications observed by the patient post-operatively. The inclusion criteria for day case surgery was similar to the criteria used by Krywulak *et al*^[8] in their study. The inclusion criteria for participants in the study included patients aged 15–50 years, primary anterior cruciate ligament (ACL) surgery and history of injury sustained of greater than 6 weeks duration. Additionally, for the day case group, proximity of home of residence to the hospital, having

the contact number of one of the physicians on the team in the event of a major complaint, having a close relative or caregiver to support the outpatient management for the first forty-eight hours after surgery and the absence of a major health condition requiring in-hospital care after surgery was required.

All surgeries were conducted by two specialist arthroscopy surgeons using similar technique. Anaesthesia was performed by different anaesthetists administering spinal anaesthesia with 3-5mls of 0.5% Bupivacaine. Regional anaesthesia has the advantage of smooth recovery, less likelihood of post-operative nausea reduction, and lower re-admission rates.^[5] Prophylactic Antibiotics was administered intravenously at induction of anaesthesia. Tourniquet was applied to the proximal thigh in all cases. Hamstring tendon was harvested in all cases as graft source. Arthroscopic reconstruction of the ACL was undertaken using either a tripled semitendinosus tendon or a four-stranded semitendinosus-gracilis graft using an anterior-medial working portal technique. Post-operatively, a hinged brace was applied fixed in 0° flexion for the first 2 weeks. Isometric quadriceps exercises were commenced on the second postoperative day in both groups. The patients were instructed to ambulate partial weight bearing on a pair of axillary crutches from the second day post-operation. Day case surgery patients were reviewed in the out-patient clinic on the second- or fourth-day post-operation. Patients were advised to proceed to full weight bearing from the second week post-operation. Wound stitches were removed at 14 days post operation.

Post-operative pain control protocol in the day case group comprised of parenteral NSAIDs and opioids within the first 12 hours of surgery and then oral NSAIDs (Diclofenac), opioids (Codeine + Paracetamol) and extended dose of prophylactic antibiotics (Cefuroxime) in the following seven days. Day cases were discharged home within the first 24 hours and had their first post-operative out-patient clinic visit between the second and fourth day post-operation. The in-patient group had parenteral NSAIDs (Diclofenac), Paracetamol and opioids (Pentazocine) over the first 48 hours and then oral antibiotics (cefuroxime) and analgesics like those of the day case group, to complete an identical number of days of these medications as in the day case group. The in-patient group were admitted for seven days and were subsequently discharged home for out-patient follow-up care. Rehabilitation protocol was identical in both groups.

Postoperative pain scores were self-assessed by the patients using a numeric pain score on the second- and seventh-day post-operation. The International Knee Documentation Committee (IKDC) score was determined at six months post-operation in both groups. The pain score and the IKDC score at 6 months were the primary outcome measures. The

secondary outcome measures included the incidence of post-spinal headaches, re-admission or review in the day case group, the incidence of post wound complications and knee joint sepsis on the operated side in both groups. The cost of care was also compared in both groups. Data analysis was performed using SPSS version 22 (IBM).

The bio-demographic details of patients in both groups were compared using descriptive statistics. Categorical variables were computed using median and interquartile range. The median numeric pain score and IKDC scores between both groups were compared using the Mann-Whitney U test. The level of statistical significance was taken as $P < 0.05$ at a confidence interval of 95%.

Results

A total of twenty-one-day case ACL reconstruction and twenty-five in-patient ACL reconstruction were managed during the period of the study. The sex ratio was 2.2:1 and 2.8:1 for the in-patient and day-case groups, respectively. The other bio-demographic characteristics of each group is as shown in Table 1.

The median numeric pain scores at the second and seventh day post-operation, as well as the median IKDC scores at six months between the groups are displayed in Table 2 below:

The overall complication rate for the day case group was 8 (38%) and 6 (24%) in the in-patient group. The common complications observed within the first week in the day case group included post-spinal headaches 4 (18%), paraesthesia in the lower limb 2 (9%) and significant knee pain 4 (18%). A day case patient needed in-patient care on the second post-operation day on account of persistent post-operative spinal headache, nausea and vomiting. The common early complications observed in the in-patient group was significant knee pain 4 (16%) and lower limb paraesthesia 2 (8%) within the first week. The overall cost of care for the in-patient group (N784 000) was 40% higher as compared to the day case group was (N560 000).

Discussion

Our study revealed that the day case group had relatively higher post-operative pain scores on the second and seventh post-operative days as compared to the in-patient group. Also, more complications were observed within the first week in the day case group as compared to the in-patient group. Post-spinal headache and significant knee pain were the commonest complications observed in the day case group. The one-week re-admission rate in the day case group was 4.8%. However, the mean cost of care in the day case group was 40% lower than the in-patient group.

The pain scores observed within the first week in some of the day case patients in our series suggests that post-operative pain control might be a challenge in day case ACL reconstruction. This may be related to the slower onset of action of an oral medication as compared to parenteral medications and the challenge a patient already discharged home as a day case may have with booster doses of analgesics particularly on occasions of break-through pain as compared to an in-patient in our environment. In a study by McHugh *et al*^[11] to evaluate patients' response to pain control in 102 patients on the second and fourth day following day surgery, they observed that a significant number of patients left the day case ward in pain (82%) with more (88%) experiencing pain at some time between days 2 and 4 postoperatively. 21% of the patients were also noted to experience very significant pain following discharge from hospital. These findings are comparable with findings in our study in which 18% of the day case group experienced significant pain within the first week post discharge home.

In another study, up to 60% of day case surgery patients were observed to suffer significant pain within the first 24 hours after discharge home with between 25–30% complaining of this same level of pain at the end of the first post-operative week.^[12-14] A more efficient approach to managing post-operative pain in day case patients was suggested in a study by Macleod *et al*^[14] in which 24 patients included in the study had analgesic pumps containing 0.2% Ropivacaine delivered at a rate of 2mls/hr over 48hr as post-

Table 1: Bio-demographic characteristics of the groups

| Median (IQR) | Age (yrs.) | Weight (Kg) | BMI (Kg/m ²) |
|--------------|-------------|-------------|--------------------------|
| In-Patient | 34.0 (15.5) | 81.0 (23.0) | 25.0(4) |
| Day Case | 24.0 (5.0) | 80.0 (22.5) | 26.9 (6.75) |
| P-value | | 0.75 | 0.84 |

Table 2: Outcome measures between the two groups

| Groups | Median (IQR) | Numeric pain score Day 2 | Numeric pain Score Day 7 | Pre-Operative IKDC Score | IKDC Score at 6 months | Range IKDC at 6 months |
|------------|--------------|--------------------------|--------------------------|--------------------------|------------------------|------------------------|
| In-patient | | 7.0 (1.5) | 4.0 (2.0) | 50.5 (18.8) | 67.2 (25.0) | 62–93 |
| Day Case | | 8.0 (2.0) | 5.0 (3.0) | 45.4 (23.3) | 68.6 (9.3) | 58–89 |
| p-value | | 0.01 | 0.01 | 0.639 | 0.80 | |

operative analgesia at home following day case anterior cruciate ligament (ACL) reconstruction. The average post-operative numeric pain score in the first 48 hours was 2.^[7] All patients were satisfied with their care no significant complications observed from the use of the pump. It is noteworthy that these analgesic pumps were managed with the help of a district nurse. The use of analgesic pumps in the management of post-operative pain on out-patient basis is not commonplace in our environment as it is especially important to monitor patients on this mode of care because the practice comes with potential complications of analgesic overdose with accompanying side effects.

With regards to the prevention of spinal headache in our practice location, the approach is to ensure the use a small (25G) bevelled spinal needle directed upwards along the fibres of the dura and to make as few attempts as possible when attempting to enter the subdural space, in a bid to reduce post-operative spinal headaches. Atraumatic size 24-27G needle with a diamond-shaped atraumatic tip and with fewer lumbar puncture attempts have been noted to be most effective in reducing the incidence of post-spinal headaches.^[15-19] The use of liberal oral fluid intake and bed rest which we also advise our patients to observe have not be noted to significantly reduce the incidence of post-spinal headaches.^[20,21]

The IKDC score is a validated outcome measure in accessing functional outcome following ACL reconstruction. The post-operative IKDC scores in our study revealed higher scores when compared to the pre-operative scores. Higher and better post-operative IKDC scores have been noted in younger individuals, among the male gender and individuals who return to sports after surgery.^[21] The values represented in our study were similar in both groups. The lack of statistical significance may be related to the sample size of our study. The cost of care was much lower in the day case group. This may be related to the shorter hospital stay that significantly cuts down on cost related to services be offered on in-patient basis such as nursing care, feeding and wound care.

Limitations

The study did not assess patients' satisfaction outcome as post operative pain alone may not be a deterrent to patient choosing this option of care. Another limitation was the small sample size

Conclusion

Although the cost of care appeared lower in the day case group as compared to the in-patient group, the day case group had higher post-operative pain scores compared to the in-patient group. Relatively more complications were noted in the day case than the in-patient group. There is need for more research to help improve on the available structure for post-operative pain management in day case ACL reconstruction in our study location.

Financial support and sponsorship

We declare that no funding was received for this study.

Conflicts of interest

There are no conflicts of interest.

Ethical approval

Ethical approval was obtained from the Health, Research and Ethics Committee of the National Orthopaedic Hospital, Igbobi, Lagos, Nigeria. Approval letter number is OH/90/C/IX.

Informed Consent

Informed consent was obtained from all participants before inclusion in the study. Their data was also handled in such a way as to maintain confidentiality. Participants were also informed of their rights to withdraw from the study at any time of their choosing.

Data

All our data is stored in a repository and is available on request.

Materials and/or code availability

Not applicable.

REFERENCES

1. Elgafy H, Elsafty M. Day case arthroscopic anterior cruciate ligament reconstruction. *J R Coll Surg Edinb* 1998;43:336-8.
2. Talwalkar S, Kambhampati S, De Villiers D, Booth R, Stevenson AL. Day case anterior cruciate ligament reconstruction: A study of 51 consecutive patients. *Acta Orthop Belg* 2005;71: 309-14.
3. Ferrari D, Lopes TJA, França PFA, Azevedo FM, Pappas E. Outpatient versus inpatient anterior cruciate ligament reconstruction: A systematic review with meta-analysis. *Knee* 2017;24:197-206.
4. Khan T, Jackson WF, Beard DJ, Marfin A, Ahmad M, Spacie R, *et al.* The use of standard operating procedures in day case anterior cruciate ligament reconstruction. *Knee* 2012;19:464-8.
5. Shaw AD, DiBartolo G, Clatworthy M. Daystay hamstring Acl reconstruction performed under regional anaesthesia. *Knee* 2005;12:271-3.
6. De Beule J, Vandenneucker H, Claes S, Bellemans J. Can anterior cruciate ligament reconstruction be performed routinely in day clinic? *Acta Orthop Belg* 2014;80:391-6.
7. Andrés-Cano P, Godino M, Vides M, Guerado E. Postoperative complications of anterior cruciate ligament reconstruction after ambulatory surgery. *Rev Esp Cir Ortop Traumatol* 2015;59: 157-64.
8. Krywulak SA, Mohtadi NG, Russell ML, Sasyniuk TM. Patient satisfaction with inpatient versus outpatient reconstruction of the anterior cruciate ligament: A randomized clinical trial. *Can J Surg* 2005;48:201-6.
9. Visual Analogue Scale - Physiopedia [Internet]. Available from: https://www.physio-pedia.com/Visual_Analogue_Scale. [Last accessed on 2021 May 9].

10. Hefti E, Müller W, Jakob RP, Stäubli HU. Evaluation of knee ligament injuries with the IKDC form. *Knee Surgery, Sport Traumatol Arthrosc* 1993;1:226-34.
11. Macleod A, Redfern DRM. Day case anterior cruciate ligament reconstruction surgery – continuous infusion of local anaesthetic. Abstract from Proceedings of the British Orthopaedic Association meeting. 2018;85B(Supp II).
12. Townsend R, Cox F. Standardised analgesia packs after day case orthopaedic surgery. *J Perioper Pract* 2007;17:340-6.
13. Watt-Watson J, Chung F, Chan VW, McGillion M. Pain management following discharge after ambulatory same-day surgery. *J Nurs Manag* 2004;12:153-61.
14. Pavlin DJ, Chen C, Penaloza DA, Buckley FP. A survey of pain and other symptoms that affect the recovery process after discharge from an ambulatory surgery unit. *Journal of Clinical Anesthesia* 2004;16:200-6.
15. Ahmed SV, Jayawarna C, Jude E. Post lumbar puncture headache: Diagnosis and management. *Postgrad Med J* 2006;82:713-6.
16. Dieterich M, Perkin GD. Post lumbar puncture headache syndrome. In: Brandt T, Caplan LR, Dichland J, *et al.*, editors. *Neurologic Disorders: Course and Treatment*. San Diego, CA: Academic Press; 1996. p. 59-63.
17. Carson D, Serpell M. Choosing the best needle for diagnostic lumbar puncture. *Neurology* 1996;47:33-7.
18. Lybecker H, Møller JT, May O, Nielsen HK. Incidence and prediction of postdural puncture headache. A prospective study of 1021 spinal anaesthetics. *Anesth Analg* 1990;70:389-94.
19. Helpert S, Preston R. Postdural puncture headache and spinal needle design. Meta analyses. *Anaesthesiology* 1994;81:1376-838.
20. Evans RW, Armon C, Frohman EM, Goodin DS. Assessment: Prevention of post-lumbar puncture headaches: Report of the therapeutics and technology assessment subcommittee of the American Academy of Neurology. *Neurology* 2000;55:909-14.
21. Teece S, Crawford I. Best evidence topic report. Gastric lavage in aspirin and non-steroidal anti-inflammatory drug overdose. *Emerg Med J* 2004;21:591-2.