Improving day surgery rates of anterior cruciate ligament reconstruction surgery in surgical units not dedicated to performing day surgery

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Background and Aims

Current guidance advises that at least 90% of anterior cruciate ligament reconstructions are performed as day case operations. Same-day surgery rates achieved by surgical units have significant clinical and financial implications. The primary aim of this multi-centre study was to determine the rate of admission and causes for admissions in patients undergoing anterior cruciate ligament reconstruction.

Method

Patient documentations were studied for those who underwent an elective anterior cruciate ligament reconstruction between January 2015 and April 2019. Contributing factors related to admission length were investigated and included patient age, gender, body mass index (BMI), operating surgeon, operating hospital, American Society of Anaesthesiology (ASA) grade, and position of the patient on the operating list. Both univariate and multivariate analysis was conducted using the STATA/IC 16.1 statistical package.

Results

The day surgery rate of anterior cruciate ligament reconstructions were 52% (50/95). Patients positioned later on the operating list were more likely to be admitted post-operatively (OR – 4.49; p=0.002; 95% CI – 1.72-11.69) and this was the only factor associated with admission. A large majority of admitted patients (95.6%) were admitted without a clinical cause and were otherwise safe for same-day discharge.

Conclusions

The day surgery rate for ACL reconstruction remains low, despite an extremely low complication rate. Reconfiguration of the operating lists and positioning anterior cruciate ligament reconstructions earlier in the day will likely increase the same-day discharge rate and reduce associated costs.

Key words: Day surgery; Anterior cruciate ligament reconstruction; Operating list

Introduction

The British Association of Day Surgery (BADS) directory publishes surgery-specific discharging goals and advise that at least 90% of patients who undergo an anterior cruciate ligament (ACL) reconstruction should be discharged on the day of operation.[1] An ACL reconstruction has a very low surgical complication rate and patients do not routinely require hospital admission.[2] An outpatient ACL reconstruction care pathway was conducted with 222 patients without any short or long-term complications attributable to prompt discharge.[3] A prospective comparative study found that 98.6% of ACL patients discharged on the day of the operation did not have complications, significant post-operative pain or poor satisfaction.[4] In comparison to inpatients, day surgery did not increase post-operative complications, post-operative pain severity or compromise rehabilitation.[4,5,6,7] Patients undergoing ACL day surgery have reported higher overall satisfaction than inpatients, due to reduced admission time, prompt discharge to a familiar home environment and the ability to self-administer analgesia in a timely manner.[7,8,9]

Increasing day surgery rates, are in part secondary to advancements in anaesthesia conferring improved analgesic control. In patients undergoing a hamstring or patella tendon harvest, regional blocks (hamstring and adductor canal blocks) have demonstrated improved post-operative pain control and facilitate early discharge.[10,11]

From a financial perspective, ACL reconstructions performed as a day case procedure produce cost savings of up to 58% compared to inpatient surgery.[10] These savings are significant given the incidence of ACL injuries (14.5/100,000 per year in the Edinburgh Orthopaedic Trauma Unit) and the high cost of performing the procedure.[9,12] Additional advantages include reduced bed pressure, reduced hospital-acquired infection rate and lower waiting times.[7]

Despite the advantages, health boards fail to meet the target set out by BADS. A database analysis from NHS England containing 13,941 ACL reconstructions between 2008 and 2010 found that only 20% were performed as day cases.[2] Poor management and co-ordination between surgeons, anaesthetists and allied healthcare professionals were highlighted as contributing factors. Further causes include post-operative nausea and

vomiting (PONV), pain management concerns, anaesthetic complications and social issues such as difficulty acquiring home transport.

The aim of this study was to establish the same-day discharge rate of ACL reconstructions performed between January 2015 and April 2019 across three surgical units and to determine the causes of admissions. All three units were not dedicated day surgery facilities and the ACL patients were operated on surgical lists containing inpatients receiving other elective procedures. The secondary aim was to determine the reasons for admission in the patient cohort. In this study, day surgery was defined as discharge on the same day as the operation (not discharge within 24 hours of the operation) and is consistent with the definition of day surgery within the UK literature.

Restructuring of surgical lists, technological developments in surgical equipment and improved efficiency of clinical pathways are associated with improved day surgery rates. It was hypothesized that scheduling a patient's ACL reconstruction earlier in the day would improve the day surgery rate.[1] Earlier surgery would correspond to a longer post-operative period for physiotherapy assessment, medical review and discharge planning. It would permit medical staff additional time to manage complications such as PONV and significant post-operative pain.

Method

2.1 Population cohort

Data were collected retrospectively using a regional database of ACL reconstructions containing all patients who underwent an ACL reconstruction between January 2015 and April 2019. The ACL reconstructions were performed in three units (one tertiary unit and two secondary units) and by a total of eight consultant orthopaedic surgeons. The patient's operation slot was assigned according to elective operating lists, each comprised of various other elective orthopaedic operations. Since the surgical units were not dedicated day surgery units, post-operatively, all patients were assessed in the recovery room before being transferred to a general orthopaedic elective ward until discharge. Patients who received emergency ACL operations were excluded from the analysis.

2.2 Data

Prior to data collection, an application was made to the regional 'Information Governance Service' and ethical approval was granted by the Data Protection Officer. Following this, all data were collected retrospectively using the following electronic databases: 'Clinical Portal', Electronic Discharge Documents (EDDs), theatre operating lists and anaesthetic preassessment documents. Patients were tracked between electronic record systems using a unique patient identifier called a 'Community Health Index' (CHI) number and the data from each patient was documented on a secure electronic database.

For each patient, the following variables were collected: patient age, gender, body mass index (BMI), operating surgeon, operating hospital, American Society of Anaesthesiology (ASA) score (an assessment of overall fitness), length of admission, and position of the patient on the operating list. Electronic documents from the

databases were used to establish the rate of short-term surgical complications during admission and any additional operations performed on the same knee during the same arthroscopy (e.g. meniscal repair and posterior cruciate ligament reconstruction).

2.3 Data analysis

The patients were split into two groups: those discharged on the day of operation and those admitted post-operatively. The listed variables were compared between the admitted and discharged patient groups. All variables were assumed to be non-parametric and as such patient age, BMI, ASA score and operating list position were compared using the Mann-Whitney U test and for all variables, a two-tailed p-value was generated. During analysis, the absolute and relative operating list position were considered - the relative list position determined the list position relative to the list length to account for variation in list length. Chi-squared tests were used to compare patient gender, the likelihood of undergoing an additional procedure, surgical units and individual orthopaedic consultant surgeons between the admission and discharge groups. Multivariate logistic regression analysis was used to assess the association of patient admission with the following variables: age ≥26 years (median age), male gender, BMI ≥25 kg/m^2, additional procedures performed and absolute operating list position ≥3. A second regression analysis was repeated with the 'relative operating list position ≥0.5', in place of the 'absolute operating list position ≥3' variable. All statistical tests were carried out using the Stata/IC 16.1 statistical software package.

Results

Ninety-five patients met the inclusion criteria (69% male; median age, 26 years). Forty-nine patients (51.6%) were discharged on the same day of surgery and the remaining 46 patients (48.4%) were admitted overnight and discharged the following day. Of those admitted, two patients (4.0%) had a clinical reason for admission; one patient had significant post-operative pain and one patient had a large amount of wound discharge. The remaining 44 patients (96%) were admitted without a reason stated for admission. Patient characteristics are displayed in Table 1 and variables are compared between groups.

The median absolute operating list position for the discharge and admission group was 1 and 2, respectively (p=0.016). The median relative operating list position for the discharge group and admission group was 0.40 and 0.63, respectively (p=0.0023). There was no significant difference in the rate of discharge between the three surgical units (p=0.56) or between the eight consultant orthopaedic surgeons (p=0.63).

A logistic regression was conducted with the following binary variables: patient age ≥26 years, male gender, BMI ≥25 kg/m^2, additional procedures performed and the absolute position ≥ 3 on the operating list (appendix 1). All admitted patients had an ASA score of 1 and this variable was excluded from the model. Being positioned third or later on the operating list was the only significant variable in this model that was associated with admission (OR – 4.49; p=0.002; 95% CI – 1.72-11.69). In the second regression, being placed in the middle position or later (relative position ≥0.5) was the only variable associated with patient admission (OR – 3.77; p=0.003; 95% CI – 1.57-9.06).

Discussion

Fifty-one percent of patients were discharged on the same day of surgery. This is significantly below the target set by BADS (90%). An overnight stay in hospital costs approximately £300, and our results would indicate that there is significant potential for savings granted the same-day discharge rate improves. Of those admitted, only 4.3% were admitted with a clinical explanation. [2] Furthermore, the rate of PONV or post-operative pain was extremely low in the present patient cohort and consistent with the literature. [4]

Patients positioned last on the operating list were over five times more likely to be admitted than those positioned earlier. Late operating list position demonstrated a strong association with hospital admission, and this relationship persisted once adjusting for variation in list length. A late arrival time to the ward post-operatively allocates less time to plan for safe discharge. In our surgical unit, post-operative physiotherapy consultation, medical review and discharge planning including optimising discharge medications and arranging transport are required prior to discharge. Other discharge criteria include, successful voiding of urine, managing oral intake and a minimum of a four-hour observation period post-anaesthetic. If the discharge criteria are not met then patient over-night admission is deemed necessary, despite the patient being medically fit for same day discharge. [13,14,15]

Reconfiguration of the operating lists and prioritising day surgery cases early in the day where possible could improve the same-day discharge rate. Locally, the operating lists were made up of a mixture of patients undergoing ACL surgery and joint replacement orthopaedic procedures. The joint replacement procedures were frequently positioned earlier than ACL reconstructions. Patients receiving hip and knee replacements are invariably admitted for overnight stay and do not require an early operation to facilitate same-day discharge. These patients can be placed later the operating list to free up list space earlier in the day for day-surgery cases.

Locally the ACL patients were not managed within dedicated day surgery units or on a dedicated day surgery operating list, but instead the ACL patients were managed according to a standard lower limb inpatient pathway. Management of each patient as a 'day case' was not the default management and a streamlined day surgery pathway was not adopted.[7] The integrated structure between day cases and inpatients reduces the emphasis on same-day discharge and the need to meet the discharge target.[13] This was the case across all three surgical units and could explain the low same-day discharge rates across the region. A dedicated day surgery list would help differentiate day surgery patients from the inpatient care pathway and promote the fulfilment of the day case discharge criteria.

Patient expectations and their pre-operative perceptions of post-operative recovery and pain management were not explored in this study. These are recognised concerns regarding the discharge of ACL reconstruction patients and are likely contributing factors.[7] Managing patient expectations begins pre-operatively through the provision of relevant information and giving patients sufficient time to make informed decisions.[14] Thorough patient counselling in clinic can manage these expectations and prepare patients for day surgery.

The results of this study are limited by the small patient cohort and the biases of a retrospective study. A larger cohort would help identify a possible relationship with factors such as age, BMI, comorbidities and additional surgery. For example, it is reasonable to suspect that patients undergoing additional procedures such as a posterior cruciate reconstruction have a greater risk of surgical complications or significant post-operative pain. Despite the sample size, the significant finding should prompt surgical units that are not dedicated day surgical units to reconfigure their elective operating lists to improve same-day discharge.

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Figure legends

Table 1. Overview of patients

Appendix 1. Multi-variate logistic regression of variables associated with hospital admission (including absolute list position)

Appendix 2. Multi-variate logistic regression of variables associated with hospital admission (including relative list position)