



Dedicated peri-operative pathway improved day case discharge rate for anterior cruciate ligament reconstructions

J. W. G. Ng¹ · C. Smith¹ · K. Ilo¹ · S. Beavis¹ · L. Terry¹ · F. Ali¹ · J. Chandrasenan¹

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Abstract

The authors proposed that a well-developed peri-operative pathway for anterior cruciate ligament (ACL) reconstructions improve day case discharge rate with high patient satisfaction. A prospective observational study was undertaken at a district general hospital in UK between August 2017 and April 2018. A dedicated multidisciplinary peri-operative pathway was developed and introduced in January 2018. All primary ACL reconstructions using hamstring grafts in adult patients were included. Primary outcome measure was day case discharge and secondary outcome measures were visual analogue score for pain (VASP), nausea and vomiting scale (NVS), patient satisfaction and 30-day readmission. Patients who underwent surgery before and after introduction of the pathway were in group 1 and group 2, respectively. There were 19 and 22 patients each in group 1 and 2. Age and gender were similar in both groups. Day case discharge rate was significantly better in group 2 (68.4% vs 95.5%, $p=0.02$). There were no significant differences in VASP or NVS on day 0, 1 or 3. Patient satisfaction rates were better in group 2 (85.7% vs 100%, $p=0.13$). There were no readmissions in both groups. The VASP on day 1 and day 3 post-operatively was significantly better in those who were discharged on the same day (66.8 vs 41.3, $p=0.02$; 60.5 vs 34.9, $p=0.03$). A well-developed dedicated peri-operative pathway improved day case discharge rate for ACL reconstructions. The pathway was safe and had a higher patient satisfaction rate.

Keywords ACLR pathway · ACL reconstruction · Anterior cruciate ligament reconstruction · Day case ACL reconstruction

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✉ J. W. G. Ng
jimmyng@nhs.net

C. Smith
clivesmith1@nhs.net

K. Ilo
kevinilo@doctors.org.uk

S. Beavis
sarah.beavis@nhs.net

L. Terry
louiseterry1@nhs.net

F. Ali
fazalali@nhs.net

J. Chandrasenan
jeevan.chandrasenan4@nhs.net

Introduction

Anterior cruciate ligament (ACL) rupture is one of the most common sporting injuries requiring surgical reconstruction. It takes at least 9–12 months of rehabilitation post-reconstruction to return to sports. Despite improvement in surgical techniques, less than 50% of athletes return to pre-injury level at 12 months [1].

Day case ACL reconstructions (ACLR) are becoming increasingly common in the UK [2–5]. In the USA, majority of them are performed as a day case procedure. Although several centres in the UK [2–5] have had success with day case ACLR, there are concerns about patient's pain control in the immediate post-operative period and possible suboptimal patient experience and satisfaction. As a result, some surgeons advocate overnight stay for pain control and physiotherapy the following day, but this incurs significantly higher costs to the hospital.

Therefore, we propose that a well-developed dedicated peri-operative pathway would improve patient education, manage patient expectations, support patients in the

¹ Department of Trauma and Orthopaedics, Chesterfield Royal Hospital, Chesterfield Rd, Calow, Chesterfield S44 5BL, UK

immediate post-operative period after discharge and optimise post-operative pain. This would lead to patients being discharged safely on the day of surgery, with adequate pain control and improved patient experience and satisfaction.

This study was a quality improvement project aim to examine the effect of our dedicated peri-operative pathway for ACLR (ACLR pathway).

Methods

A prospective observational study was undertaken from August 2017 to April 2018. The patients were divided into two groups. Group 1 underwent surgery before introduction of the ACLR pathway (1 August 2017–5 January 2018), and group 2 underwent surgery after introduction of the ACLR pathway (8 January–30 April 2018). All patients above the age of 18 who had ACLR were included. Patients with multi-ligament injuries were excluded. All ACLR were performed or directly supervised by two consultant knee surgeons. The primary outcome was day case discharge rate and secondary outcomes were visual analogue scale for pain (VASP; 0–100), nausea and vomiting scale (NVS; 0–3), 30-day readmission rate and patient satisfaction.

VASP and NVS were measured on the day of surgery prior to discharge (day 0), day 1 and day 3 post-operatively. Patient satisfaction was measured using an online questionnaire (Fig. 1). All statistical analysis was performed using PRISM.

Results

There were 19 patients in group 1 and 22 patients in group 2. There was no difference in patient demographics between two groups. Day case discharge rate following ACLR improved from 68.4% in group 1 to 95.5% in group 2 ($p=0.02$) (Table 1).

VASP were 47.1, 44.6 and 40.1 on day 0, 1 and 3 in group 1, and they were similar in group 2 (49.3, 47 and 38.7). There were also no differences in NVS between the two groups (0.82, 0.29, 0.24 vs 0.82, 0.41, 0.41) (Table 1). However, VASP and NVS were better in patients who were successfully discharged on the day of surgery (Table 2).

There was no readmission in both groups.

Overall, patient satisfaction was high in both groups, but it has improved following introduction of ACLR pathway (85.7% vs 100%, $p=0.13$) (Fig. 2). 79% of patients in group 1 and 100% of patients in group 2 said they would have the surgery as day case again ($p=0.08$) (Fig. 3). Group 2 were more likely to recommend their treatment to a family or friend. (8.3 vs 8.9, $p=0.78$) Group 2 had also rated higher for most of the aspects of care as part of ACLR pathway (Table 3).

Discussion

This ACLR pathway was developed locally by orthopaedic surgeons, anaesthetists, senior musculoskeletal physiotherapist, nursing staff and management staff.

All patients with acute ligamentous soft tissue knee injury would undergo immediate rehabilitation with physiotherapy whilst waiting for their MRI scan for diagnosis. Patient is entered onto the ACLR pathway once the diagnosis is confirmed on MRI scan.

There are three phases of the ACLR pathway: (1) pre-operative, (2) peri-operative and (3) post-operative and rehabilitation. Pre-operative phase includes physiotherapy, ACL school and pre-op assessment. Peri-operative phase starts when they are admitted on the day of surgery until they are discharged on the same day. Post-operative phase starts after discharge to 2 weeks post-operatively. Rehabilitation phase starts after the second post-operative week. These are summarised in Fig. 4.

Pre-operative physiotherapy is essential to regain range of movement of the knee and to improve muscle strength. This would reduce the risk of arthrofibrosis and accelerate the rehabilitation post-operatively [6, 7].

There has been huge success in the utilisation of ‘the hip and knee school’ to improve patient outcomes and satisfaction in lower limb arthroplasty [8]. ACL school aimed to achieve the same effect by providing patient education and managing expectations. ACL school would take place 1 week prior to the day of surgery, and patients would also be trained to use crutches. This would remove the necessity of a review by the physiotherapist post-operatively (which had been a cause of failure to discharge previously).

We have chosen to use a combination of femoral nerve block, local anaesthetic infiltration around surgical wounds and hamstring graft site, and cryotherapy/compression

Fig. 1 Patient satisfaction survey

1. Are you satisfied with the overall treatment you have received?

Extremely satisfied
 Satisfied
 Neither satisfied or dissatisfied
 Dissatisfied
 Extremely dissatisfied

2. You were well informed about the surgery and rehabilitation process.

Strongly disagree
 Disagree
 Neither agree nor disagree
 Agree
 Strongly agree

3. If you were to have this surgery again, would you be happy to have it done as a day case?

Yes
 No

4. How likely is it that you would recommend to have this surgery performed at Chesterfield Royal Hospital NHS Foundation Trust to a friend or colleague?

Not at all likely
Extremely likely

0	1	2	3	4	5	6	7	8	9	10
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5. Please rate the following aspects of your treatment.

	Very poor	Poor	Average	Good	Very good
Information given to you before the operation	<input type="radio"/>				
Physiotherapy after the injury but before your operation	<input type="radio"/>				
Anaesthetics	<input type="radio"/>				
Post surgery on Holywell (day case ward)	<input type="radio"/>				
Rehabilitation after surgery	<input type="radio"/>				

Any comments

Table 1 Results

	All patients	Group 1	Group 2	Statistical test
Age	31.9	32.5	31.4	Mann–Whitney U, $p=0.74$
Gender (M:F)	28:13	13:6	15:7	–
Day case discharge	82.9%	68.4%	95.5%	Chi square, $p=0.02$
VASP day 0	48.2	47.1	49.3	Mann–Whitney U, $p=0.76$
VASP day 1	45.8	44.6	47	Mann–Whitney U, $p=0.85$
VASP day 3	39.4	40.1	38.7	Mann–Whitney U, $p=0.88$
NVS day 0	0.82	0.82	0.82	Mann–Whitney U, $p=0.91$
NVS day 1	0.36	0.29	0.41	Mann–Whitney U, $p=0.36$
NVS day 3	0.32	0.24	0.41	Mann–Whitney U, $p=0.46$
Readmission	0	0	0	–

Table 2 VAS for pain and nausea and vomiting scale based on success in day case discharge

	Successful discharge	Unsuccessful discharge	Statistical test
VASP day 0	45.8	59.3	t test, $p=0.27$
VASP day 1	41.3	66.8	t test, $p=0.02$
VASP day 3	34.9	60.5	t test, $p=0.03$
NVS day 0	0.75	1.17	Mann–Whitney U, $p=0.35$
NVS day 1	0.25	0.83	Mann–Whitney U, $p=0.04$
NVS day 3	0.25	0.67	Mann–Whitney U, $p=0.10$

bandage to achieve optimum pain relief [9]. A meta-analysis by Secrist et al. [9] has shown these interventions to be effective. A standardised anaesthetic regime was also used to optimise analgesia, reduce the use of opiates and reduce the risk of post-operative nausea and vomiting. All patients were given paracetamol, ibuprofen, domperidone and ranitidine pre-operatively on the day of surgery unless contraindicated. Intraoperatively, they were given fentanyl, dexamethasone and ondansetron.

Patients were given an extension knee splint for the first 24 h to aid mobility. This is followed up by an early outpatient physiotherapy review to identify any early problem and

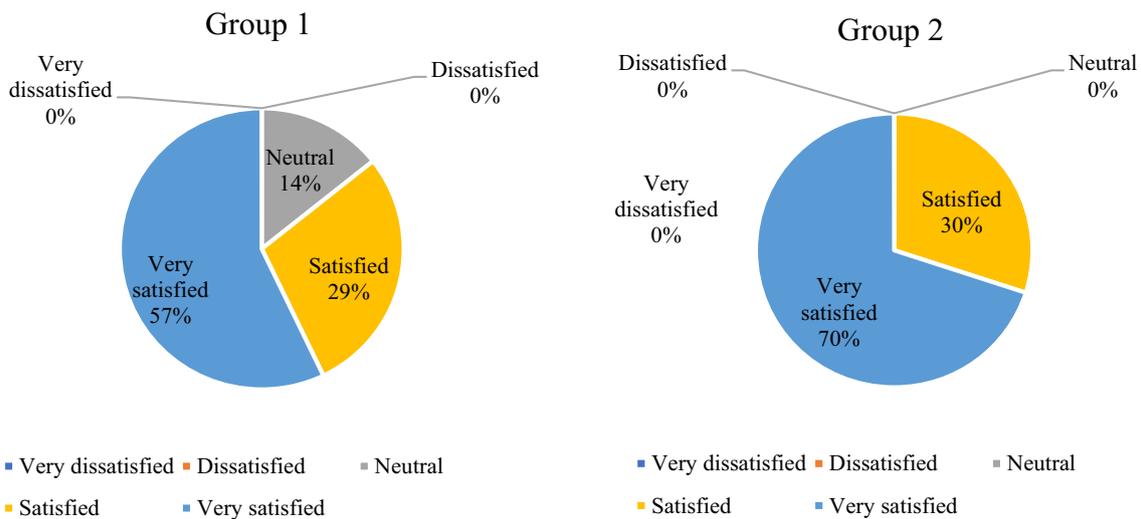


Fig. 2 Are you satisfied with the overall treatment you have received?

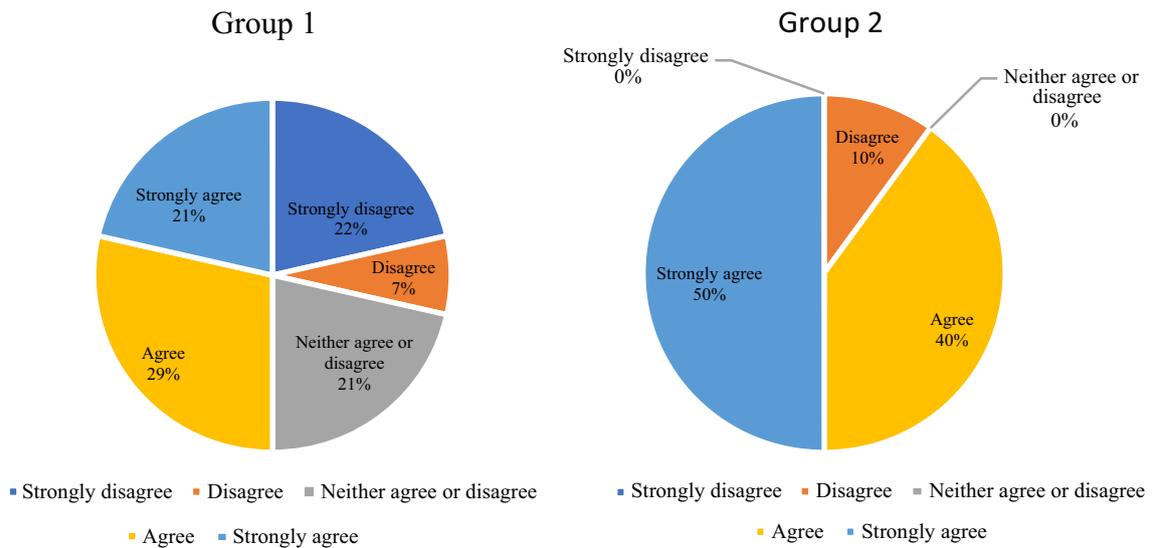


Fig. 3 You were well informed about the surgery and rehabilitation process

Table 3 Percentage of patients rated ‘good’ or ‘very good’ in individual aspects of pathway

	Group 1 (%)	Group 2 (%)	
Information given to you before the operation	78.6	90	Chi square, $p=0.46$
Physiotherapy after the injury but before your operation	64.3	90	Chi square, $p=0.15$
Anaesthetics	85.6	90	Chi square, $p=0.75$
Post-surgery on Holywell (day case ward)	92.9	90	Chi square, $p=0.8$
Rehabilitation after surgery	71.4	80	Chi square, $p=0.63$

Pre-operative

- Physiotherapy to a pain free functional level with full range of movement
- ACL school for patient education and manage patient expectation
- Patient information leaflet
- Routine pre-operative assessment including assessment and consenting process by consultant orthopaedic surgeon

Peri-operative (incuding intra-operative)

- Routine peri-operative checks as per local policy and confirmation of consent
- Anaesthetic assessment and explanation to patient
- General anaesthesia with regional femoral nerve block
- Cryotherapy compression bandage
- Knee extension splint for 24 hours

Post-operative and rehabilitation

- Regular oral analgesia
- Reviewed by physiotherapist within 3 days post-operatively
- Accelerated rehabilitation

Fig. 4 ACLR pathway

provide support to the patient. Patient would then undergo an accelerated ACL reconstruction rehabilitation regime.

Conclusion

In conclusion, a dedicated peri-operative ACLR pathway, which is developed by a multidisciplinary team can improve day case discharge rate following ACLR. It is also safe and has high patient satisfaction. The pathway must also consider logistical issues which may be specific to the institution.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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