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ORIGINAL STUDY

Can anterior cruciate ligament reconstruction be performed routinely in day clinic ?

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Anterior cruciate ligament reconstruction is performed as an outpatient procedure in selected cases. Whether it can be safely performed on a routine basis in day clinic remains unclear. Our hypothesis was that routinely performing outpatient anterior cruciate ligament reconstruction would be equally safe as compared to inpatient procedures.

A cohort of 355 patients who underwent outpatient primary reconstruction was analysed at an average follow-up of 3.8 years.

Four patients (1.1%) could not be discharged or were readmitted within 24 hours. The 1-month readmission rate was 1.4%.

The overall complication rate was 12.1% (43 cases) of which 4.2% (15 patients) occurred within the first 30 days.

Performing anterior cruciate ligament reconstructions routinely in day clinic is associated with almost negligible readmission rates and has similar complication rates as for standard in-hospital anterior cruciate ligament reconstructions. Outpatient anterior cruciate ligament reconstructions can therefore be safely performed without specific preoperative patient selection protocols.

Keywords : outpatient ; ACL reconstruction ; complication ; readmission.

INTRODUCTION

Continued improvements in anaesthetic and surgical techniques have made it possible to perform anterior cruciate ligament (ACL) reconstruction as an outpatient procedure (*8,10,11,17*). The advantages of performing ACL surgery in day clinic are the reduced economic cost as well as the possibility for the patient to recover in his familiar home environment. In addition, the practice of concentrating ACL reconstructions in a day clinic creates extra room for standard orthopaedic admissions, and frees the surgical and hospital staff from the labour-intensive daily tasks associated with the care process during the first postoperative day(s) (*12*).

The strategy to routinely schedule patients for ACL reconstruction as day case procedures is obviously only possible in a well-organized setting with respect to both in-hospital as well as home care follow-up. Such requires an important organizational effort both from the orthopaedic staff as well as the post-discharge care providers. The recent introduction of joint care tracks in orthopaedics has allowed the orthopaedic community to gain insight and develop such pathways, first for knee and hip replacement, but today also for an increasing number of other orthopaedic procedures (*3,20,21,22*).

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As a result of this, some hospitals have now started systematically scheduling ACL reconstructions as day case procedures. Unfortunately however no data today exist whether such practice is equally safe for the patient as compared to traditional inpatient ACL reconstruction. It was the purpose of this study to investigate this. Our hypothesis was that ACL reconstruction routinely performed in day clinic without overnight stay would be equally safe as compared to inpatient ACL reconstruction, leading to comparable readmission as well as complication rates.

MATERIALS AND METHODS

Patient population

A cohort of 355 consecutively treated patients who underwent primary ACL reconstruction in day clinic at our institution was analysed. No prior selection of ACL patients amenable for day case surgery was performed, since it has been the routine practice in our institution to perform ACL reconstruction exclusively as day case surgery since 2005. All cases were operated between January 2007 and December 2011 and were obtained through our institutional database which was prospectively organized. IRB and ethical commission approval for the study was obtained.

Only patients with an isolated ACL reconstruction, with or without meniscal and/or chondral arthroscopic repair, were included in the study. Forty-two patients (12%) had a concomitant meniscal suturing, 97 cases (27%) a partial meniscectomy, and 16 patients (5%) a microfracture procedure for a full thickness condylar cartilage injury. Patients, who underwent a concomitant extra-articular procedure, such as osteotomy or a multiligamentar procedure, were excluded from our analysis.

The study population was composed of 225 males and 130 females with an average patient age of 31 years (yrs.) at the moment of surgery (range 14-60 yrs.). There were 323 patients with an American Society of Anaesthesiologists score (ASA score) of 1 and 32 patients with an ASA score of 2, which was the highest score found in our database. This reflects a population with minor risks of anaesthesia related complications (Table I). The average follow-up was 3.8 years. Perioperative and long term complications during this time window were extracted from our patient records, as well as readmission rates and its reasons.

Table I. — Demographic data

	Number of patients
Age range : (mean age : 31 years)	
< 20 yrs.	55
≥ 20 < 30 yrs.	119
≥ 30 < 40 yrs.	87
≥ 40 < 50 yrs.	79
≥ 50 yrs.	15
Sex :	
Male	225
Female	130
ASA-score :	
ASA-score 1	323
ASA-score 2	32

Surgical procedure

All operations were conducted at the surgical day care of a university teaching institution centre by one of two experienced surgeon staff members with over 10 year experience in ACL reconstruction. All patients received an arthroscopic ACL reconstruction using quadruple hamstring autografts (double semitendinosus + double gracilis). An endobutton suspensory fixation was used on the femoral side and an interference screw fixation with back-up staple on the tibial side *(4)*. A tourniquet was always applied.

There were 254 patients (72%) who underwent general anaesthesia, 82 patients (23%) received spinal anaesthesia and 12 patients (3%) underwent a combined spinal and epidural anaesthesia.

All patients received a standard protocol of multimodal analgesia, consisting of 30 mg ketoralac IV at induction, intra-articular injection of 15 ml lidocaïne hydrochloride with adrenaline through both portals after closure, and 15 cc lidocaïne hydrochloride without adrenaline (Linisol® 2%) at the tibial incision. Immediately postoperative a stepwise algorithm of analgesia was used depending on the patient's needs, and consisting of piritramide 2 mg IV immediately postoperative (Dipidolor®), tramadol 50 mg per orally, and paracetamol 1 gr per orally.

Antibiotic prophylaxis consisted of cefazoline 2 gr IV at the start of induction, followed by clindamycin 3 × 600 mg daily for 5 days. Thromboembolic prophylaxis was only administered in case of specific risk factors and consisted of 40 mg enoxaparine starting the evening

Table II. — Complications

Complication	Number of patients	Complication ratio (%)	Readmission
Symptomatic DVT	3	0.8	1
Symptomatic PE	2	0.6	1
Septic arthritis	1	0.3	1
Wound complications	3	0.8	2
Haemarthrosis requiring an aspiration	8	2.3	1
Cyclops lesion	13	3.7	13
Arthrofibrosis requiring intervention under anesthesia	4	1.1	4
Stress fracture	1	0.3	0
Graft Rerupture	8	2.3	8
Total	43	12.1 = overall complication rate	30 + 1 patient needing readmission only because of pain

of the first postoperative day. Immediately after surgery a compressive ice bandage was applied for the first 24-48 hours. A hinge brace was applied fixed in 10° flexion for the first 3 weeks, and subsequently 2 more weeks with the hinge free between 10° and 90°. Range of motion exercises and extension postures in 0° were started after 3 days. Isometric and closed chain muscular strengthening exercises were started as soon as the pain was tolerable. The patient was instructed to use crutches the first days and to proceed to full weight bearing as tolerated.

All patients had been scheduled and operated in the morning program (before 1 PM) and were discharged the same evening before 6.30 PM. Instructions to leave the surgical dressings unchanged as long as they remained dry were given to the patient. A first postoperative check-up visit was routinely scheduled at day 5, at which the surgical dressing was changed.

The patient was instructed to have the wound re-checked and the stitches removed at 2 weeks postoperative. Further follow-up visits to the clinic were systematically performed at 5 weeks, and every 3 months thereafter until full recovery.

RESULTS

In Table II a summary of all readmissions and complications is shown.

The overall complication rate was 12.1% (43 cases) of which 4.2% (15 patients) occurred in the perioperative setting within the first 30 days and 7.9% (28 patients) after this period.

The overall readmission rate was 9.8%.

Readmissions for problems in the immediate postoperative setting and which might have been avoided in case the patient had been treated through standard hospitalization occurred in five cases (1.4%).

There were no anaesthesia related problems. No patient had to stay overnight for reasons related to postoperative vomiting or nausea or urine retention.

However two patients suffered from excessive pain, from which one caused by a bleeding five days after surgery. Also one patient had a severe allergic reaction caused by the induction of the anaesthesia. This operation had to be delayed to a later date, but was still performed in day care without any other incidents.

Two patients developed a deep venous thrombosis (DVT) at 7-10 days postoperatively, one of them in combination with a pulmonary embolism (PE). One other case was diagnosed with a PE as well. Both PE patients were readmitted for anticoagulant treatment. One of those patients developed a secondary haemarthrosis occurred to this anticoagulation treatment.

One patient developed a septic arthritis six weeks after the ACL reconstruction for which an arthroscopic irrigation and synovectomy was performed. Two years later this patient underwent an arthroscopic nettoyage with excision of medial and notch osteophytes. Two patients developed wound

problems, of which one had to be readmitted because of an erysipelas infection which was treated with IV antibiotics.

Eight patients (2.3%) developed a significant postoperative haemarthrosis that required aspiration. One patient developed a hematoma over the pes anserinus which had to be aspirated. This puncture was positive for coagulase negative staphylococci, so the knee was drained in day care. The culture of this drainage was however sterile.

Thirteen patients (3.7%) were re-operated for persistent extension deficit to remove the scar nodule anterior of the anterior cruciate ligament after a mean time-interval of ten months after surgery. Four patients (1.1%) suffered from a flexion contracture. Three of them needed a mobilization procedure under anaesthesia. One of those needed an additional arthroscopic anterior interval release with removal of the peri- and infrapatellar fibrotic tissue.

Eight patients (2.3%) re-ruptured their graft. In two patients the re-rupture occurred without any traumatic incident. The mean occurrence time of their re-rupture was 15 months.

One patient was diagnosed with a stress fracture of the posteromedial side of the tibial plateau, which was treated conservatively.

A number of patients developed minor complications. Seven patients experienced a zone of hypoesthesia, from which six in the area of the infrapatellar nerve and one developed a neurinome which was however not severe enough to operate. Also there were some meniscus related complications such as a granulomatous reaction on a fastfix wire (one patient), persisting pain (two patients), and a recurrence of a meniscal tear (five patients). One patient developed a tendinopathy of the patellar tendon and another patient developed a popliteus tendinopathy during the revalidation.

Hospital readmissions

A total of 4 patients (1.1%) could not be discharged the same day or were readmitted within 24 hours. Three of those patients were hospitalized overnight because of pain which could not be controlled with oral medication. One other patient was discharged from the day clinic but returned to the hospital the same evening of his operation because of severe pain. The total readmission rate at 1 month without counting in the failed day cases was 1.4%. One patient needed to be readmitted because of severe pain caused by a significant haemarthrosis five days after surgery and the two patients with a DVT were readmitted to the hospital respectively at 7 and 10 days postoperatively. Also a patient with an erysipelas infection was readmitted six days after his ACL reconstruction. The overall readmission rate including all patients needing an extra procedure under anaesthesia as well as all hospitalizations was 9.8% (Table III).

DISCUSSION

The hypothesis of our study was that ACL reconstruction routinely performed in day clinic without overnight stay would be equally safe as compared to inpatient ACL reconstruction, with comparable readmission as well as complication rates. Our data support this hypothesis.

In our study no specific preoperative patient selection protocol for determining whether the patient would be amenable for day case surgery or not, is performed. Only 4 patients (1.1%) could not be discharged the same day or were readmitted within 24 hours. At 1 month the total readmission rate was as low as 1.4%.

Our overall complication rate was 12.1% (43 cases), which is comparable to published data on complication rates after standard inpatient ACL reconstruction (*9,13,14,16*) or comparable to other series with selective outpatient ACL reconstruction (*7,8,15*).

Curran *et al*, reported a total complication rate of 7.7% for ACL reconstruction as an outpatient procedure (*7*). Their mean follow-up time of 10 months was significant shorter as our average patient follow-up of 45 months (*7*).

Table III. — Readmissions

Readmission	
Failed day case	1.1%
30-day readmission rate	1.4%
Overall readmission rate	9.8%

Haug *et al*, studying outpatient ACL reconstructions with extended stay, obtained an overall complication rate of 20% at an average follow-up period of 17 months (*15*). Tierny *et al* found a very low overall complication rate of 3.6% at 10 months mean follow-up (*19*).

In our study group we noted a 30-day readmission rate of 1.4%, which is about the same as reported for standard inpatient ACL reconstructions (*9*). Jameson *et al* analysed prospectively collected data from ACL reconstructions between 2008 and 2010 (*9*). They wanted to list information on outcome and adverse events after ACL reconstruction, based on the fact that there already is such information about arthroplasties available (*9*). Almost everyone was discharged from the hospital within four days and there was a day case rate of 20% (*9*).

Lyman *et al* noted a 90-day readmission rate of 2.3% in a study population with over 50% inpatient and 50% outpatient procedures (*14*). In a study population with only outpatient ACL reconstructions Elgafy *et al* reported a 90-day readmission rate of 6% (*8*).

The failed day case rate that was observed in other studies on outpatient ACL reconstructions ranges from 2.5% (*12*) to 4% (*17*), 8% (*10*) and 20% (*11*). Our rate of 1.1% compares favourably to those data, despite the fact that in our series no formal patient selection protocol was used for selecting day case candidate patients versus patients that could be more suited towards hospitalization.

Because of our relatively large mean follow-up of 45 months, we also had the ability to investigate the appearance of other long-term complications, such as flexion or extension contractures (cyclops lesions) and graft failures. Four patients (1.1%) developed an arthrofibrotic knee and thirteen patients (3.7%) developed a cyclops lesion. Cha *et al* (*5*) reported the occurrence of a cyclops lesion in 4.76% and Bach *et al* (*2*) with a two to four month follow-up time, had 3 patients of their study population of 62 with an extension deficit. These results are comparable to our study.

The overall re-rupture rate in our cohort was 2.3%, which compares favourably with the mean cumulative ACL failure rate of 11.9% (range 3.2% to 27%), described by Crawford *et al* (*6*) in their systematic review.

Aglietti *et al* reported a graft failure rate of 10% (*1*), while Crawford *et al* reported a graft rupture rate of 6.2% (*6*) and the Cochrane review of Tiamklang *et al* (*18*) reported a 1.41% graft failure rate, when results from the double bundle and single bundle technique are combined. Tiamklang *et al* also reported a traumatic re-rupture rate of 5.37% for single bundle reconstructions and 0.83% for double bundle reconstructions (*18*). In our cohort 6 patients (1.7%) re-ruptured their graft, caused by a prior trauma.

Despite the clear answer to the test hypothesis, our study has a number of limitations. The most important shortcoming is that no control group was available. Ideally our hypothesis should be examined in a prospective randomized and controlled trial with day case patients in one arm and hospitalized patients in the other arm. We however question if this could be possible without bias. It is our opinion that only patients for whom the option of day case versus inpatient surgery would not be considered as important in their mind, would step into such trial. Many patients however would prefer either one of both, when given them the opportunity of both. We therefore believe that the set-up of a trial as described above would per definition include an inevitable bias towards patient recruitment. Secondly, we acknowledge that our results are the consequence of many organizational, paramedical as well as medical factors specific to our institution and modus operandi. Our results may therefore not be generalizable for every hospital or institution, since the slightest deviation in the process could alter the outcome with respect to the studied end variables.

In our patient group the test hypothesis of the study however could be clearly supported.

As a conclusion we therefore believe that performing ACL reconstruction routinely in a day clinic setting is associated with almost negligible readmission rates and has similar complication rates as for standard in-hospital ACL reconstruction. ACL reconstruction can therefore be safely performed in day clinic without specific preoperative patient selection protocols.

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