

Fast-track pathway for reduction of dislocated hip arthroplasty reduces surgical delay and length of stay

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Background and purpose — Dislocation is one of the most common complications following hip arthroplasty. Delay until reduction leads to pain for the patient, and may increase the risk of complications. We investigated the safety aspect of a fast-track pathway for dislocated hip arthroplasties and evaluated its effect on surgical delay and length of stay (LOS).

Patients and methods — 402 consecutive and unselected dislocations (253 patients) were admitted at our institution between May 10, 2010 and September 31, 2013. The fast-track pathway for early reduction was introduced on January 9, 2011. Fast-track patients with a suspected dislocation (with no radiographic verification) were moved directly to the post-anesthesia care unit and then straight to the operating room. Dislocation was confirmed under fluoroscopy with reduction under general anesthesia. Surgical delay (in hours), LOS (in hours), perioperative complications, and complications during the hospital stay were recorded. Dislocation status for fast-track patients (confirmed or unconfirmed by fluoroscopy) was also recorded.

Results — Both surgical delay (2.5 h vs. 4.1 h; $p < 0.001$) and LOS (26 h vs. 31 h; $p < 0.05$) were less in patients admitted through the fast-track pathway than in patients on regular pathway. Perioperative complications (1.6% vs. 3.7%) and complications during the hospital stay (11% vs. 15%) were also less, but not statistically significantly so. Only 1 patient admitted through fast-track pathway had a fracture instead of a dislocation; all the other fast-track patients with suspected dislocation actually had dislocations.

Interpretation — The fast-track pathway for reduction of dislocated hip arthroplasty results in less surgical delay and in reduced LOS, without increasing perioperative complications or complications during the patient's stay.

Dislocation is one of the most common complications following hip arthroplasty, with reported incidences ranging from less than 1% to over 15%, and with higher rates reported after revision arthroplasty and arthroplasty performed for proximal femoral fracture (Phillips et al. 2003, Khatod et al. 2006, Patel et al. 2007). Delay before reduction prolongs pain and discomfort, and may result in sciatic palsy due to traction or hematoma. Reduction as soon as possible after diagnosis is therefore recommended (Zahar et al. 2013).

In recent years, much attention has been paid to optimizing logistics in elective (Husted et al. 2012) and acute orthopedic surgery (Pedersen et al. 2008, Palm et al. 2012). In particular, reduced surgical delay for hip fracture patients has been a priority, as it reduces the mortality risk (Shiga et al. 2008, Daugaard et al. 2012). While surgical delay has been investigated for other groups of fracture patients (Streubel et al. 2011, Menendez and Ring 2014), there have not been any similar investigations regarding reduction in surgical delay for dislocated arthroplasties, except comparing reduction at the emergency department to admission and reduction in theater (Frymann et al. 2005, Gagg et al. 2009, Lawrey et al. 2012).

We investigated whether a fast-track approach to dislocated hip arthroplasty and hemiarthroplasty (1) reduces surgical delay, (2) reduces length of stay, and (3) is safe regarding in-hospital and perioperative complications.

Patients and methods

We identified 479 consecutive, unselected patients who were scheduled to undergo a reduction of a dislocated hip arthroplasty at our institution between May 10, 2010 and September 31, 2013. All types of hip arthroplasties, including total hip arthroplasty (THA) and hemiarthroplasty, were included. 35

Table 1. Demographics

	Regular pathway	Fast-track pathway	p-value
Age, median (IQR)	76 (66–83)	78 (69–83)	0.1
Sex, n (%)			
Male	68 (32)	49 (26)	0.2
Female	146 (68)	139 (74)	
ASA score, n (%)			
1	20 (10)	10 (5)	0.4
2	147 (69)	138 (73)	
3	46 (22)	38 (20)	
4	1 (0)	2 (1)	
Arthroplasty type, n (%)			
THA	194 (91)	166 (88)	0.4
Hemiarthroplasty	20 (9)	22 (12)	
Reduction type, n (%)			
Closed	212 (99)	187 (100)	0.6
Open	2 (1)	1 (0)	

cases were missing some or all of the relevant data, while 42 cases occurred while the patient was already admitted to the hospital, thus leaving 402 patients for analysis. More female patients (71%) than male patients (29%) with dislocations were admitted. Mean age was 75 years. 90% of the patients had a THA, while 10% had a hemiarthroplasty (Table 1).

Patients admitted through the standard pathway were examined by a doctor in the emergency room (ER) and then transported to the radiology department for examination if dislocation was suspected. If dislocation was radiographically confirmed, the patient was admitted to the hospital, transferred to the orthopedic ward, and prepared for surgery. The dislocation was reduced in the OR (operating room) under general anesthesia (GA).

The fast-track pathway for early reduction was introduced on January 9, 2011. Fast-track patients with clinically suspected dislocation (shortening and internal or external rotation of the hip, and no history of falling or direct trauma) were examined by a nurse in the ER and moved directly to the post-anesthesia care unit (PACU) and then straight to the OR, bypassing radiographic examination. Dislocation was confirmed under fluoroscopy in the OR and reduction took place under GA. All the patients (both in the fast-track pathway and the regular pathway) were transferred to the radiology department for confirmation of reduction, and then to the orthopedic ward for mobilization and discharge (Figure 1).

The following parameters were recorded: surgical delay (hours from admission in the ER until reduction), LOS (hours from admission in the ER until discharge), intraoperative complications (fracture, failed dislocation, other) and in-hospital complications (cardiac, pulmonary, thromboembolic, nerve damage, re-dislocation, other) from patient charts. Dislocation status for fast-track patients (confirmed or unconfirmed by fluoroscopy) was recorded from surgical charts. Only time until the first reduction attempt (whether successful or unsuccessful) was used in our analysis of surgical delay.

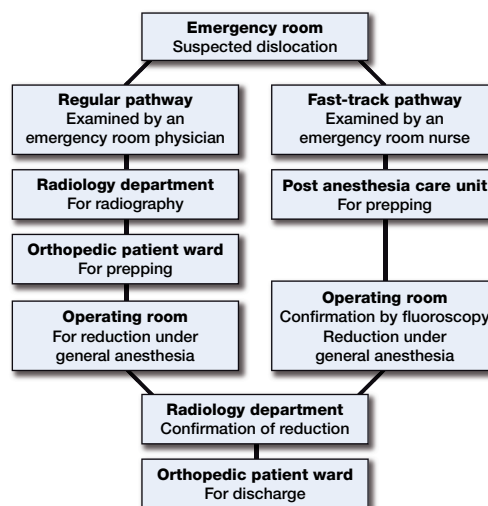


Figure 1. The regular pathway and fast-track pathway for reduction of a suspected dislocated hip arthroplasty.

Statistics

Mean values with standard deviation (SD) are given for normally distributed data, while median values with interquartile range (IQR) are given for non-normally distributed data. Mann-Whitney U-test was used to compare continuous non-parametric variables and chi-square test was used to compare categorical variables. SPSS version 21 was used for all statistical analyses.

Ethics Committee consent was not required for this trial.

Results

214 cases were admitted through the standard pathway and 188 cases were admitted through the fast-track pathway. Cases admitted through the standard and fast-track pathways were comparable regarding age, sex, ASA score, type of arthroplasty, and type of reduction.

80% of the patients who were scheduled for reduction of a dislocated hip arthroplasty (214 of 269) were admitted through the fast-track pathway after its introduction on January 9, 2011. Surgical delay was reduced by 1.6 h and LOS was reduced by 4.6 h (Table 2). Intraoperative complications occurred in 3.7% of cases admitted through the standard pathway and in 1.6% of cases admitted through the fast-track pathway (Table 3). Of the 8 failed reductions in the standard pathway cohort, 7 cases were reduced open and 1 case had a successful closed reduction on the following day.

In-hospital complications occurred in 15% and 11% of cases admitted through standard and fast-track pathways, respectively (Table 3). 1 of the 188 cases received through the fast-track pathway had a fracture and no dislocation; the rest of the cases had dislocations.

Table 2. Length of stay and surgical delay for all patients. Values are median (IQR)

	Regular pathway	Fast-track pathway	p-value
Surgical delay ^a	4.1 (2.8–6.8)	2.5 (1.5–3.7)	< 0.001
Length of stay ^b	31 (23–60)	26 (19–52)	0.03

^a Surgical delay was defined as hours from examination in the ER until start of surgery.
^b Length of stay was defined as hours from examination in the ER until discharge.

Table 3. Complications as identified in patient records. Values are number (percentage)

	Regular pathway (n = 214)	Fast-track pathway (n = 188)	p-value
Intraoperative complications			
None	206 (96)	185 (98)	0.2
Fracture	0 (0)	1 (0)	
Failed reduction	8 (4)	2 (1)	
In-hospital complications			
None	181 (85)	167 (89)	0.1
Pulmonary ^a	1 (0)	1 (0)	
Cardiac ^b	2 (1)	4 (2)	
Thromboembolic ^c	2 (1)	0 (0)	
Nerve damage ^d	1 (0)	0 (0)	
Re-dislocation ^e	7 (3)	10 (5)	
Other ^f	20 (9)	6 (3)	

^a Pulmonary includes edema and pneumonia.
^b Cardiac includes acute coronary event, atrial fibrillation, etc.
^c Thromboembolic includes deep vein thrombosis and pulmonary embolism.
^d Nerve damage: ischial nerve damage after reduction.
^e Re-dislocation: re-dislocation while still admitted.
^f Other: urinary tract infections, delirium, and psychosis.

Discussion

In this retrospective, comparative cohort study, we found that the fast-track pathway for reduction of dislocated hip arthroplasty resulted in less surgical delay and reduced LOS compared to the standard pathway, without increasing intraoperative or in-hospital complications.

Several studies have found that increased surgical delay for hip fractures is associated with increased mortality (Shiga et al. 2008, Daugaard et al. 2012), while others have not (Holt et al. 2008, Verbeek et al. 2008, Lund et al. 2014). This has resulted in several national guidelines recommending early surgery (NICE guidelines 2011, Mak et al. 2010). To our knowledge, there have been no studies investigating the effect of surgical delay on mortality and morbidity for patients with dislocated arthroplasty. Even so, early reduction is recommended, to minimize the risk of neurological and vascular complications—and also pain and discomfort for the patient

(Zahar et al. 2013). Several authors have therefore proposed immediate reduction in the ER under sedation (Frymann et al. 2005, Gagg et al. 2009, Lawrey et al. 2012). However, sedation in the ER can lead to “oversedation” and airway obstruction, and has a lower success rate than reduction under general anesthesia in the OR (Frymann et al. 2005; Dela Cruz et al. 2014). In the present study, we found a mean surgical delay of 2.5 h for fast-track cases, which is comparable to surgical delay times achieved for hip arthroplasty reduction in the ER reported by several authors (Frymann et al. 2005; Gagg et al. 2009; Lawrey et al. 2012). Surgical delay for both the fast-track pathway cases and the regular pathway cases in our study was shorter than what has been reported previously for surgical delay until reduction in the OR (Frymann et al. 2005, Wan et al. 2008, Gagg et al. 2009). We believe that the fast-track setup with reduction under general anesthesia in OR provides optimal conditions for reduction, as it allows airway control, relaxation to aid in reduction, and the possibility of open reduction if such is required.

The fast-track concept was initially introduced for elective surgery, and it is currently widely used in knee and hip arthroplasty (Husted 2012). Several studies have shown that it reduces LOS without leading to increased rates of complication, mortality, or morbidity, while increasing patient satisfaction (Husted et al. 2008, 2012). Similar results have been reported by Pedersen et al. (2008), who showed an optimized program for hip fracture patients to reduce both LOS and in-hospital complications postoperatively. Few studies have investigated LOS following a dislocated hip arthroplasty (Lawrey et al. 2012, Frymann et al. 2005). This is possibly due to the large variation in logistic setup between different institutions: some dislocations are reduced in the ER, while others are admitted to the hospital and reduced in the OR under general anesthesia. The LOS following the fast-track pathway for reduction of a dislocated hip arthroplasty reported in our study was shorter than the LOS reported by Lawrey et al. (2012) for patients reduced in the OR, and it was similar to the LOS for dislocations reduced by orthopedic service doctors in the ER.

One study found that there were substantial financial costs associated with dislocation of hip arthroplasties, with most of the costs being due to the hospital stay and nursing (Sanchez-Sotelo et al. 2006). Hence, further economic analysis might reveal possible financial benefits of the fast-track pathway for reduction of dislocated hip arthroplasties in departments that traditionally reduce dislocated arthroplasty in the OR.

It is important to emphasize that a fast-track pathway for reduction of a dislocated arthroplasty is a concept involving optimized logistics, rather than being a single treatment method. Minimization of LOS is not a primary goal in itself, but rather a positive consequence of optimized logistics and patient treatment. Safety aspects of such pathways must always be evaluated, and patient safety given high priority. The rates of successful closed reduction in the present study were high; they were comparable to OR reduction rates

reported by Lawrey et al. (2012), higher than ER reduction rates reported by Lawrey et al. (2012), and higher than reduction rates reported by Gagg et al. (2009). We found that in-hospital complication rates were similar in cases admitted through both pathways, suggesting that early reduction does not increase the rate of in-hospital complications.

Patients received through the fast-track pathway bypass the radiology department, thus allowing the possibility of a hip fracture being clinically mistaken for a dislocation. To minimize any potentially negative consequences, dislocations are confirmed under fluoroscopy in the OR before general anaesthesia. If a fracture is present, the patient is prepared for fracture surgery, which is then performed as soon as logistics allow. In our study, only 1 out of 188 fast-track dislocations had a fracture instead of a dislocation. The remainder all had dislocations, suggesting that the criteria for entering the fast-track pathway are sufficiently precise.

The main weakness of the present study was the retrospective design: some intraoperative and in-hospital complications could possibly have been neglected in the patient records. The main changes in the fast-track pathway compared to the regular pathway in our study was replacement of radiographic examination in the radiology department with fluoroscopy in the OR and preparation of the patient in the post-anaesthesia care unit rather than in the orthopedic patient ward. Thus, the fast-track approach that we describe may not be applicable to all other departments, especially those where reduction of dislocated hip arthroplasty takes place in the ER. We did not investigate mortality rates or re-admission rates. However, as this was an unselected and consecutive patient cohort, and treatment following reduction was identical for both fast-track and standard pathways, it is unlikely that re-admission rates would have been affected for cases admitted through the fast-track pathway.

In summary, a fast-track pathway for reduction of dislocated hip arthroplasties results in less surgical delay and reduced LOS without any increase in intraoperative or in-hospital complications. Future studies, preferably large prospective cohort studies, should include data on mortality, re-admissions, and patient satisfaction.

KG, AT, and HH wrote the protocol; all the authors revised it; KG and FW undertook all gathering of data; KG, HP, AT, and HH performed and evaluated all the statistical analyses. KG wrote the first draft of the manuscript; HH revised it; all the authors revised the draft and approved the final version. All the authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analyses.

No competing interests declared.

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