24 hours stay after hip replacement

Implementation of a patient-centered time-based fast-track program

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Background and purpose — The length of stay after total hip arthroplasty has been reduced to 2–4 days after implementing fast-track surgery. We investigated whether a new time-based patient-centered primary direct anterior approach (DAA) total hip arthroplasty (THA) treatment protocol in a specialized clinic, with a planned length of stay of about 24 hours, could be achieved in all patients or only in a selected group of patients.

Patients and methods — We analyzed prospectively collected data in a cohort of 378 consecutive patients who underwent a primary direct anterior THA as a patient-centered time-based procedure between March 1, 2012 and December 31, 2015. Patients with complicated medical comorbidity and those over the age of 85 were excluded from the study. The average length of stay was recorded and all complications, re-admissions, and reoperations were registered and analyzed. The primary outcome measures were length of stay and complication rate, at discharge and 90 days postoperatively.

Results — The average length of stay for all patients was 26 hours. All patients were discharged from the clinic on the day after the operation and were able to continue their recovery at home or in a rehabilitation facility. The overall complication rate within 3 months of surgery was 6%. The 3-month re-admission rate and the 3-month reoperation rate were both 2%.

Interpretation — Performing a time-based, patient-centered fast-track program for DAA total hip arthroplasty can result in a standardized length of stay of about 24 hours and a high level of patient satisfaction with few complications, re-admissions, and reoperations.

The introduction of joint care programs and fast-track protocols has reduced the length of stay (LOS) for total hip and total knee arthroplasty over the last decades to 2–4 days (Kehlet and Wilmore 2005, Husted et al. 2008, Glassou et al. 2014, den Hartog et al. 2015). The standardization of minimally invasive operation techniques such as the direct anterior approach (DAA), in combination with evidence-based fast-track care principles, has reduced LOS further without compromising patient safety (Pilot et al. 2006, den Hartog et al. 2013, 2015).

We investigated whether all patients under the age of 85 without severe comorbidity could be treated for DAA THA in a new specialized patient-centered, time-based 24-hour LOS program after being given intensive preoperative information and motivation (Holm et al. 2010, Vanhaecht, et al. 2010). We also examined the early operative outcomes for this group regarding the amount of perioperative and postoperative complications, re-admissions, and reoperations.

Patients and methods

We reviewed the prospectively collected data in a cohort of 378 consecutive elective patients with ASA classification I, II, or stable III who underwent a primary direct anterior THA as a 24-hour hospital stay procedure. In 2012, a time-based fast-track surgery protocol was initiated in a specialized hip clinic with dedicated staff and a uniform approach to giving the patients evidence-based care. The direct anterior THA was performed exclusively, with implantation of identical uncemented implants in all patients except 6, who required a cemented stem. The uncemented femoral and acetabular com-

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Table 1. Patient characteristics

		All	Male	Female
Sex distribution		n = 378	33%	67%
Mean age (range)		65 (27–85)	63 (27–85)	66 (38–83)
Mean BMI (range)		25 (18–37)	26 (18–35)	24 (18–37)
ASA score	I	49%	48%	49%
	II	49%	51%	49%
	III	2%	1%	2%
Proportion with primary OA		97%	99%	96%

Table 2. Elements of the time-based fast-track protocol

Written and oral information on a LOS of 24 hours by the surgeon.
Preoperative education and information by the surgeon.
Standardized general anesthesia combined with local infiltration.
Standardized pain medication protocol (pre-, peri-, and postoperatively).
Standardized operation technique with traction table.
Opioid medication only upon request during recovery and at home.
No drains.
No urinary catheters.
Start mobilization 3 hours postoperatively.
Anti-thrombotic prophylaxis over 10 days (Fraxiparine (nadroparin), 0.4 mL = 3,800 IE)
Time-based discharge 1 day postoperatively after fulfilling discharge criteria.
Mobilization without restrictions and no physiotherapy protocol for the first 14 days.
Stimulation to be active with or without crutches.
Telephone control by the surgeon 3 days postoperatively.

ponents consisted of a Trinity cup, a MetaFix stem, a cross-linked polyethylene or polyethylene liner, and a cobalt chrome or ceramic 32-mm head (Corin Group, Cirencester, UK). All procedures were performed by a single surgeon between March 1, 2012 and December 31, 2015 using a direct anterior Hueter approach with a positioning table (AMIS mobile leg positioner).

We identified 392 patients with a diagnosis of arthritis, osteonecrosis, or dysplasia. We excluded 14 patients preoperatively, 8 of whom were over 85 years old and 6 others who could possibly have needed more systemic medical care, leaving 378 (Table 1). After preoperative screening, the anesthesiologist classified these 6 patients as ASA 3, and they were treated in other hospitals with intensive care units. 304 patients underwent unilateral THA and 74 patients had bilateral THA. All the patients had an identical preoperative, perioperative, and postoperative time-based fast-track procedure including a multimodal opioid-sparing pain treatment regimen in combination with early full weight bearing mobilization (starting 3 hours postoperatively) and short deep-vein thrombosis prophylaxis (Husted et al. 2010, Jorgensen et al. 2013) (Table 2). Tranexamic acid (TXA) was infused as an intravenous bolus of 1,000 mg at induction, and 500 mg was given intravenously 6 and 12 hours postoperatively.

When we started this program, the thrombosis prophylaxis consisted of the oral anticoagulant Rivaroxaban (Xarelto), which was stopped immediately after an acute massive bleeding during a reintervention. We continued with low-molecular-weight heparin (LMWH) (Fraxiparine (nadroparin), 0.4 mL = 3,800 IE) starting 5–7 h after surgery and continuing until 10 days postoperatively. The daily repetitive subcutaneous injections of LMWH at home were performed by the patients themselves or their relations.

The postoperative principles of a time-based fast-track treatment were followed, where an intended discharge time of 24 hours was set, taking into account that the functional discharge criteria had to be fulfilled. All the patients were able to walk more than 30 meters with or without crutches, to climb stairs, to go to the toilet independently, to get into and out of bed, and to dress independently apart from putting on their own socks and shoes. There were no restrictions in postoperative mobilization or aftercare, except hip flexion of more than 120 degrees. A physiotherapy regimen postoperatively was not regarded as being standard, but this was used in selected patients with hip contractures, gait problems with limping, or a general lack of confidence.

The pain score was registered with a visual analog scale (VAS) 1, 2, and 3 hours postoperatively, before and after mobilization, in the evening of the day of operation, in the morning on the day after operation, and at discharge. Patient satisfaction was assessed using a numeric rating scale (NRS) where 10 represented the highest degree of satisfaction.

Sufficient pain treatment with preoperative loading (meloxicam, 15 mg, 2 days preoperatively) was given together with an opioid-sparing multimodal oral postoperative analgesic regime consisting of paracetamol (3–4 × 1,000 mg) in combination with meloxicam (15 mg, for 14 days) and local infiltration anesthesia during operation. The rescue analgesic at home was tramadol.

LOS was measured in hours from the time of admission on the day of operation until the time of discharge on the day after. From 0800 hours on the day after surgery, all the patients were checked against the discharge criteria every hour until discharge. All complications, re-admissions, and reoperations were registered and analyzed.

Results

The study group of 378 patients—126 males and 252 females—had an average age of 65.3 (27–85) years. 1 patient was lost to follow-up. The main indication for the operation was primary osteoarthritis (OA). Other diagnoses were avascular necrosis and development disorders. Mean body mass index (BMI) was 25. ASA score I or II was the most frequent ASA classification. The average duration of the operation was approximately 1 hour, with an average blood loss of 330 mL. No blood transfusions were needed for primary THA. 1 patient required a blood transfusion during revision surgery.

Table 3. Process parameters

	All n = 378	Male n = 126	Female n = 252
Duration of surgery, min [a]	59 (35–135)	65 (42–135)	56 (35–105)
Blood loss, mL [a]	329 (100–1,200)	385 (100–1,200)	301 (100–850)
VAS pain score, [a]			
intake	6.5 (2–9)	5.8 (2–9)	6.8 (3–9)
discharge	2.4 (0–7)	2.3 (0–6)	2.5 (0–7)
LOS, hours [a]	25.6 (23–28)	25.2 (23–27)	25.7 (23–28)
90-day re-admission, n (%)	8 (2)	5 (4)	3 (1)
90-day reoperation, n (%)	6 (2)	3 (2)	3 (1)
Rescue drug, n (%)	34 (9)	7 (6)	27 (11)
Physiotherapy postop., n (%)	160 (42)	47 (37)	113 (45)
Patient satisfaction	9.7	9.8	9.7

[a] mean (range)

Table 4. Complications within 90 days of primary THA in 23 of the 378 patients

	n
Lateral femoral cutaneous nerve injury (of which temporary)	7 (6)
Wound hematoma	5
Dislocation	2
Superficial infection	2
Subsidence	1
Deep infection	1
Femoral fracture	1
Femoral perforation	1
Calcar fissure	1
Inlay loosening	1
DVT	1
Total	23 (6%)

The mean VAS pain score went from 6.5 preoperatively to 2.4 at discharge. All patients managed to leave the department after 26 (23–28) hours postoperatively (Table 3). 98% of the patients were discharged and returned to their own home for further rehabilitation, but some patients who lived alone went to family members or a nursing home for up to 5 days.

The average satisfaction score at 2 and 6 weeks postoperatively for all patients were both 9.7 out of a maximum of 10. After discharge, 9% of the patients needed a supplementary rescue drug (tramadol) to control the pain.

2 intraoperative complications occurred (0.6%) (Table 4). A fracture of the proximal calcar occurred, which was treated successfully by cerclage wiring, and a femoral perforation occurred which was not diagnosed intraoperatively and required reoperation after the postoperative radiographs. This patient suffered a massive bleeding during his reoperation, caused by the use of an oral anticoagulant (rivaroxaban, 10 mg), and needed an allogenic blood transfusion. After this event, we changed the thromboprophylaxis. We observed one femoral mid-shaft fracture, which needed revision with cerclage wiring 16 days postoperatively. We did not observe trochanteric avulsion or acetabular fractures. 2 patients had a dislocation of their prosthesis 10 and 21 days (respectively) after surgery and underwent a closed reduction (Table 4). Re-dislocation did not occur. 1 patient presented with a traumatic subsidence of the stem with subluxation on the 26th day postoperatively, and was reoperated. Another patient was operatively revised after an implant failure with dislocation of an acetabular asymmetrical liner. There were 3 postoperative infections (0.8%). 2 patients with wound problems were treated successfully with antibiotics for 6 weeks. 1 patient developed a deep infection that required 2-stage revision. 1 heavily smoking patient was diagnosed with a deep venous thrombosis (DVT) and could be treated nonoperatively. We did not find any non-surgical complications such as pulmonary embolism (PE), pneumonia, myocardial infarction, postoperative delerium, or cerebrovascular accident.

The first post-discharge control by telephone, which was carried out on the third postoperative day, did not reveal any medical complications; nor did the first physical control 14 days postoperatively.

7 patients were re-admitted (2%) and 5 patients (1.3%) required a surgical reintervention within the first 3 months after. 9% of the patients required tramadol as a rescue drug postoperatively. Physiotherapy was started on request 2 weeks postoperatively in 42% of the cohort, to improve function and mobility postoperatively.

Discussion

The introduction of different fast-track protocols for primary THA reduces the length of stay without compromising patient safety, as described in various other studies (Kehlet 1997, Pilot et al. 2006, Mahomed et al. 2008, Barbieri et al. 2009). In general, LOS is influenced by ASA score, age, sex, psychological factors, and the time taken until first mobilization (Husted et al. 2006, 2010, 2011, 2012). In the present, study the LOS was reduced to approximately 24 hours. After we implemented a time-based fast-track protocol in 2012, and after excluding 14 patients preoperatively, this was obtained in all patients without there being any outliers. The implementation of this 24-hour time-based treatment procedure for DAA primary THA had both logistical and clinical implications. More time is required to fully inform and educate the patients, including management of patients' expectations regarding a short stay of 24 hours (Andersen et al. 2009a). After the patients had been given extensive information and motivation to reduce the anxiety, every patient in the study group could be discharged after approximately 24 hours with full satisfaction.

It is well known that patient satisfaction is related to a patient-friendly environment and short LOS (Husted et al. 2008, Larsen et al. 2008, den Hartog et al. 2013). All the patients in this group fulfilled the discharge criteria and could

walk with full weight bearing, with or without 1 or 2 crutches. This result could be explained by the strong commitment of all patients to their treatment. In fact, the patients had chosen this kind of treatment and needed practically no further motivation to follow the time-based rules to fulfill the discharge criteria. In an interview 6 weeks after the operation, however, patients over 80 stated that they would not have minded staying another day in the clinic. Pain is not a limiting factor for early mobilization, and did not have a predominant role.

Our findings of overall complications for fast-track DAA THA in a 24-hour pathway are in accordance with the results of other fast-track primary anterior THA studies (De Geest et al. 2013, den Hartog et al. 2015). The re-admission rate and the reoperation rate within the first 3 months after surgery were slightly different to those described in other studies (Husted et al 2008, 2010, Spaans et al. 2012, De Geest et al 2013). The total reoperation rate for DAA THA in our study was 1.3%, and was less than reported in other studies with a fast-track protocol (Bender et al. 2009, Husted et al. 2010, Spaans et al. 2012). Yet, the reasons for re-admission were practically the same (den Hartog et al. 2015). In our study, only one femoral mid-shaft fracture and one calcar fissure occurred, which are said to be typical for this minimally invasive DAA (Spaans et al. 2012, De Geest et al. 2013). We must mention that all operations were carried out by an experienced surgeon. It is well known that the anterior approach does have a high early complication rate and needs a learning curve of more than 100 cases (D'Arrigio et al. 2009, Spaans et al. 2012). Our results demonstrate that this kind of fast-track program with a LOS of 24 hours is safe, and that this time-based patient-centered program appears to be in line with other fast-track THA—and does not compromise the quality of treatment or patient satisfaction (Larsen et al. 2008). In our cohort, we found only 1 DVT as a non-surgical complication. We could not detect cardiovascular-related complications, PE, cerebrovascular accident, or any other adverse events that have been described to occur in the early days after surgery with increasing patient age (Pulido et al. 2008, Aynardi et al. 2009). It should be pointed out that the perioperative organizational issues together with the extensive preoperative patient information to implement and carry out the time-based fast-track pathway does demand a lot of clinical and organizational effort by everyone concerned. Fast-track treatment does improve patient outcome and reduces morbidity and mortality. We believe that for the majority of cases, this kind of focused care is suitable and completely safe. Whether or not it can be performed on a routine basis requires further research. Age over 80 could be an overall limiting factor. Patient selection could come into play if the main goal is a fixed time-based discharge after 24 hours. Patients should receive the best available treatment, which requires optimized logistics that allow for earlier discharge—resulting in the highest degree of patient satisfaction, as seen in other studies (Brunenberg et al 2005, Andersen et al. 2009b).

To our knowledge, this study is the first in which all patients could be treated within a period of 24 hours. Time-based DAA for primary THA, standardized patient-centered care in a specialized clinical hip unit with a dedicated staff, and a uniform approach can result in a safe reduction in LOS without increasing the complication rate—and also give a higher degree of patient satisfaction.

YvdE and FvdE wrote the manuscript. All the authors contributed to the study design, data collection, data analysis, interpretation of the findings, and critical revision of the manuscript.

No competing interests declared.

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