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FACULTEIT GENEESKUNDE EN LEVENSWETENSCHAPPEN  
*master in de revalidatiewetenschappen en de  
kinesitherapie*

## Masterproef

Functional outcome scores and complications following the direct anterior approach in total hip arthroplasty

Promotor :  
Prof. dr. Frank VANDENABEELE

Copromotor :  
Prof. dr. Annick TIMMERMANS

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Robin Goyens , Laurine Vinkesteyn

*Scriptie ingediend tot het behalen van de graad van master in de revalidatiewetenschappen en de kinesitherapie*

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First, we would like to thank Prof. Dr. Kristoff Corten for his guidance, availability and support while writing this thesis. Throughout the whole year he has made time in his busy schedule to receive us and answer all questions. He has also given us an opportunity to be part of a scientific publication based on this thesis.

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Next we want to thank Dr. Jens Vanbiervliet, who took the time to read our thesis and gave his advice on possible corrections concerning academic writing and content.

Although we mainly worked with Prof. Dr. Kristoff Corten, we would like to thank Prof. Dr. Frank Vandenaabeele for being available when necessary and giving advice on completing the last steps of this thesis.



## Research context

The second part of this master thesis is situated within orthopaedic medicine. We put the procedure of a total hip arthroplasty (THA) in a larger perspective but focus mainly on the direct anterior approach (DAA). Multiple subjects are addressed in this thesis. The goal is to discuss the procedure, functional outcome scores and complications after total hip arthroplasty through the DAA. This thesis is a retrospective observational cohort study. No comparison is made with different surgical approaches to perform a THA. The aim is to broaden the knowledge concerning the DAA and to compare our results with previous literature.

Different populations can refer to this thesis for evidence-based information regarding the direct anterior approach in total hip arthroplasty. Both patient and surgeon or scientist may benefit from this information. The research protocol is developed in collaboration with Prof. Dr. Kristoff Corten. As thesis students of the University of Hasselt, we took the responsibility to execute the practical aspect of this study.

It is a new study that is situated within the hospital Ziekenhuis Oost-Limburg (ZOL) in Genk. As a newly designed protocol it does not fit in a larger study project. The research method was fully completed by the students after clear guidelines about the study design were given.

Data-acquisition was mainly performed by both students. A list of all DAA procedures from April 2013 to December 2015 was given. This list was screened for inclusion and exclusion criteria. Patient demographics, outcomes and complications were documented by the students. Contact information was also acquired by this list. Contacting patients and obtaining data was done solely by the students. The data-acquisition of the online questionnaires was done by Dr. Dries Hens, founder of the online programme.

Both students had equal parts concerning the research method and data-acquisition.

The writing process was mainly executed by the students. If necessary, the promotor Prof. Dr. Kristoff Corten corrected the content of the work done by the students. Prof. Dr. Kristoff Corten was also available for any questions concerning data-acquisition of performed surgeries or the surgical process. Dr. Jens Vanbiervliet gave notes and corrections of the final draft (content and academic writing) in preparation of a future publication and wrote an abstract for the same purpose.



## Abstract

*Introduction:* The use of the direct anterior approach in total hip arthroplasty is increasingly popular. Recent literature reports a higher complication rate in the early postoperative phase. We believe this can be explained by the learning curve and the lack of standardization. The objective of this study was to report representative data following the initial learning curve.

*Participants:* 590 patients who received a total hip arthroplasty in a period between April 2013 and December 2015 operated by an experienced surgeon on a normal operating room table.

*Measurements:* The participants were retrospectively reviewed by two independent students at a minimum of one year postoperatively. Functional outcome scores, radiographic ingrowth and complication rate were recorded.

*Results:* The average modified Harris Hip Score (HHS) and Hip Disability & Osteoarthritis Outcome Score (HOOS) were respectively 92.93 and 89.04. Seven stems (1.04%) showed a radiolucent line in Gruen zone 1 which is considered a physiological sign for the cementless Corail® stem. One stem (0.15%) showed a radiolucent line in Gruen zone 7. Two cups (0.30%) showed radiolucent lines in Gruen zone 1 and 2. There were 2 (0.30%) intraoperative fractures. As important postoperative complications we report 1 dislocation (0.15%), 2 transient motor nerve dysfunctions (0.30%), 2 early infections (0.30%) and 1 late infection (0.15%).

*Conclusion:* This cohort demonstrated an overall low complication rate compared to recent literature. Therefore we can conclude that the direct anterior approach is a reliable technique in the hands of an experienced surgeon using a standardized protocol.



## Introduction

Total hip arthroplasty is used within orthopaedic surgery. THA is an effective procedure to restore hip function, relieve pain and increase quality of life (Yue, Kang, & Pei, 2015). There are many different surgical approaches to perform a THA. One of these is the DAA. It has recently been described as an increasingly popular technique. The DAA is a muscle sparing technique and is associated with early recovery and a lower dislocation rate. However, an increase in complication rates has also been reported (De Geest, Fennema, Lenaerts, & De Loore, 2015). As this approach is considered relatively new, the learning curve can have a negative effect on the outcomes. The technique appears to be constantly evolving and new instrumentation is regularly introduced. Therefore current practice often lacks standardization. The use of a fracture table is a recent development in the DAA procedure. However, it is associated with a higher complication rate compared to the use of a normal operating room (OR) table. The introduction of a standardised protocol is essential to improve reproducibility, especially during the learning curve (Corten, 2014).

The aim of this study is to provide a recent update on the functional outcome scores and complications of the DAA in THA. We questioned (1) the intra-operative complication rate, (2) the postoperative complication rate and (3) the functional outcome scores and incidence of the so-called 'forgotten hip'.

Our hypothesis is that this study will show better results than what is found in recent literature.

## Materials and methods

Two physical therapy students of the University of Hasselt retrospectively screened medical records of DAA cases operated by Prof. Dr. K. Corten in Ziekenhuis Oost-Limburg (ZOL) in Genk from April 2013 to December 2015. All surgeries were performed on a normal OR table. The surgeon has surpassed the learning curve as he has solely been performing the DAA for years. Inclusion criteria were primary THA's with a minimum follow-up of 1 year.

Exclusion criteria were neurological or rheumatologic disease, total knee prosthesis, contralateral osteoarthritis or failed back surgery.

(1) To document the intra-operative complication rate, the operative reports of the included patients were screened.

(2) To document the post-operative complication rate, consultation reports were screened. Both intra- and post-operative complications were recorded and assessed according to the Clavien-Dindo Classification of Surgical Complications. Postoperative complications were divided into three categories: early-postoperative (<3 months), mid-postoperative (3-24 months) and late- postoperative (>24 months).

(3) Functional outcome scores were measured by the use of a questionnaire. These were sent after patients were contacted by telephone. The questionnaires were sent digitally. The software 'CuraeQuest' was used to send emails to the patients. This software tracks and analyses all data of the questionnaires. If the digital questionnaire was not filled in within the first 2 weeks, a reminder email was sent to the patient. An explanation of the informed consent was given by phone call. Patients could then decide if they wanted to participate in the study. The questionnaire consists of the modified Harris Hip Score (HHS), the Hip disability and Osteoarthritis Outcome Score (HOOS) and the Family and Friend Score as well as three specifically designed questions by the surgeon (attachment 1). Patients were only contacted for functional outcome score assessment if they had no complications. This was done to minimize biased data. The aim was to gather information on the primary placed hip. Another important outcome was the assessment of the so-called 'forgotten hip'. The forgotten hip was defined as (1) the absence of any subjective complaints of peri-articular pain and (2) the absence of any clinical periarticular tenderness. This was assessed through two means. Through (1) report of the surgeon during post-operative consultations and (2) as an item in the questionnaire. An assessment was also made whether the prosthesis had grown in correctly. This assessment was made by evaluating radiographic images of the prosthesis. The incidence of prostheses that had not grown in were then documented. All evaluated images came from patients without complications.

This study was approved by the ethical commission board of the UHasselt and ZOL Genk on 15th of November 2016, eudract/B-nr B13371201629795.

IBM® SPSS Statistics® was used to analyse demographics. Demographics at the time of operation were documented. Mean age and body mass index (BMI) between the complication- and the non-complication group were analysed using an independent samples t-test.

Surgical steps through a standardised protocol.

A description of the surgical procedure as described by Prof. Dr. Corten is made in the following section. This approach allows performing THA through the DAA in a supine position with merely 1 assistant helping on the ipsilateral side of the patient on a regular OR. Another advantage of the use of an OR table and the supine position is that assessment of intra- and extra-articular impingement and leg length difference is very easy due to the fact that both legs are free. The procedure is broken down into three main consecutive parts not including OR set-up and draping: (1) Incision and capsular exposure, (2) soft tissue release and (3) component insertion.

(1) An incision is made in the fascia innominata of the rectus femoris after opening the interval between sartorius, rectus femoris (medially) and the tensor fascia lata (TFL) (laterally). This is followed by a stepwise positioning of the retractors. A superior blunt retractor is put between the gluteus minimus and the superior capsule and is held by the assistant. Then an inferior blunt retractor is put over the medial surface of the femur, distal to the lesser trochanter and secured to the contralateral leg. A third retractor can be used to retract the TFL laterally. The fat pad over the capsule is removed to expose the anterior capsule. Next, the rectus femoris and iliocapsularis muscle (ICM) must be identified to set a protective boundary for the neurovascular structures. A small tipped retractor lifts the ICM of the capsule. This results in a safe working space between the ICM and the antero-superior capsule. Just distal of the anterior inferior iliac spine (AIIS) and towards the contralateral kidney, a curved 10mm tipped retractor is placed.

(2) The soft tissue release consists of three steps: (a) antero-superior capsulectomy and femoral head removal, (b) inferior capsular release and (c) superior soft tissue release. (a) The first step is to excise the superior part of the capsule enough to obtain a good view of the femoral head as well as removing any possible obstructions when dislocating the head after the neck osteotomy. Next, to protect the greater and lesser trochanter during the osteotomy, the retractors must be placed intra-articularly. A corkscrew is then screwed into the superior part of the femoral head, facing away from the lateral side to avoid obstruction during the neck osteotomy. Then, the neck osteotomy is performed from the base of the neck superiorly to one centimeter (cm) proximal to the lesser trochanter distally. Usually the osteotomy is

located approximately five millimetres (mm) medial to the intertrochanteric ridge but as the direction and position of the neck cut should be determined preoperatively during templating as it is case dependent. The femoral head is extracted after the neck cut by levering the osteotomy on the calcar in the direction of the incision. (b) As the inferior capsule restricts anterior femoral elevation, it is released from the calcar in slight external rotation (lazy figure-of-four position). If the surgeon can easily palpate the base of the lesser trochanter, the release has been completed. (c) A bone hook is placed into the calcar and the femur is pulled antero-laterally, away from the pelvis. The trochanter fossa now faces the surgeon and allows for a clear view on the superior soft tissues. The most anterior capsular insertion is incised without touching the tendinous parts of the gluteus minimus. The capsule is then peeled off the inner surface under direct pull on the femur towards an antero-lateral direction. The superior capsule from the inner surface, the superior margin of the greater trochanter and the conjoint tendon of the obturator internus from the superior margin and inner surface of the greater trochanter are released in the above mentioned sequence. The fat pad underneath the gluteus is then visible. The surgeon is now able to palpate the bold spot at the lateral side of the greater trochanter. The femur should then be easily lifted out by manual traction and without hyperextension of the leg. The surgeon is in control of forces applied and can therefore control unexpectedly high forces on the operated leg. Three parameters for a successful release are a visible fat pad, a palpable bold surface of the superior trochanter and a tip that will be easily elevated beyond the acetabular rim. This femoral elevation is maintained by a double-pronged retractor that is placed between the TFL-glutei and the trochanter near the bold spot. Adduction and external rotation can then be performed.

(3) First the acetabulum is prepared. A posterior retractor is secured at the postero-superior acetabular rim and opposite to the anterior retractor. The postero-inferior capsule is retracted and this retractor is positioned just posterior to the transverse acetabular ligament (TAL) and fixed to the ipsilateral leg. The acetabulum is then reamed with an offset- or straight reamer. The surgeon aims for 15°-20° of anteversion and 40°-45° of inclination, parallel to the TAL. Next the femur is prepared. Femoral elevation is achieved as mentioned above. The retractor is always parallel to the body axis of the patient and in line with the fibres of the TFL thus preventing TFL damage. This retractor is held by the assistant caudal of the surgeon. The anterior retractor is removed. Then, a double-prong retractor at the posterior cortex and

proximal from the lesser trochanter retracts the medial structure and is secured to the contralateral side of the table. The preparation of the femoral canal is next. Adduction of the leg is of utmost importance as it puts the femoral axis in line with the incision. Femoral perforation can be induced by the following: (I) Lateral perforation: by an introduction with a steep angled tip from anterior to posterior, (II) posterior perforation: by an oblique introduction with too much adduction and (III) thinning of the antero-inferior cortex with risk of fissure: because of too much antetorsion. The surgeon stands at the cranial side of the hip in line to the femoral axis and a box osteotomy is then used. A blunt and slightly curved canal finder is inserted at the calcar in the canal with slight tabs. The rasp handle which is pushed towards the floor assures for good valgus position of rasp and stem. The final rasp is seated and a trial neck is assembled. The head is then put on the neck and the hip is reduced. The hip is now checked for stability, leg length (Galeazzi test) and impingement (external rotation-extension and internal rotation-adduction-flexion). After introducing the final components, the fascia of the TFL is closed by running sutures Vicryl 1 and a drain is left intra-articularly. Patients can be fully mobilised one day post-operatively and don't have any restriction but deep flexion beyond 90° during the first 6 weeks. (Corten, 2014)

## Results

*Patient demographics.* 725 Medicals records of patients operated from April 2013 to December 2015 were screened. 590 patients met the inclusion criteria. Demographics are shown in Table 1. The population consists of 300 women and 290 men with a mean age of 60.8 years (range 17y-92y) and a mean BMI of 26.9 (range 15.3kg/m<sup>2</sup>-46.3kg/m<sup>2</sup>). 673 DAA procedures were performed of which 215 left hip procedures, 292 right hip procedures and 83 bilateral procedures.

All complications were assessed according to the Clavien-Dindo Classification of Surgical Complications and are shown in Table 2 and 3.

*Intraoperative complications.* There were 2 intraoperative complications (0.30%). One hip (0.15%) had a femur fracture. This was converted to a cemented prosthesis. Another hip (0.15%) had a fracture of the lesser trochanter and required a reoperation.

*Postoperative complications.* There were 59 postoperative complications (8.77%). 10 Early-postoperative complications (1.49%), 48 mid-postoperative complications (7.13%) and 1 late-postoperative complication (0.15%). All postoperative complications are described in Table 3. Early-postoperatively (<3 months) there was 1 (0.15%) dislocation. There was also 1 (0.15%) misaligned liner that required a reoperation. There were 3 (0.45%) hematomas. Two of the hematomas healed spontaneously. One required drainage. There was 1 (0.15%) leg-length discrepancy noted early postoperatively. This was caused by instability during the operation. One (0.15%) impingement was noted. It was an extra-articular impingement that required a reoperation. There were 2 (0.30%) transient motor nerve dysfunctions. Both of the Nervus Peroneus.

Mid-postoperatively (3-24 months) there were 2 (0.30%) infections. Both infections required a reoperation. There were also 2 (0.30%) reports of stem loosening, both requiring a reoperation. There were 3 (0.45%) heterotopic ossifications, 2 of which required a reoperation. 37 (5.50%) cases of tendinitis were noted. There were 28 cases (4.16%) of psoas tendinitis, 2 cases (0.30%) of adductor tendinitis, 6 cases (0.89%) of gluteus medius tendinitis and 1 case (0.15%) of tensor fascia latae (TFL) tendinitis. Two (0.30%) psoas releases were necessary in order to treat them. There was 1 (0.15%) case of leg-length discrepancy. It was self-reported by a patient and needed a reoperation. There was 1 (0.15%) periprosthetic fracture mid postoperatively. It required a reoperation.

Late-postoperatively (>24 months) there was 1 (0.15%) infection. It caused a loosening of the socket and required a reoperation. All reoperations are shown in Table 4.

#### *Functional outcome scores.*

321 questionnaires were sent digitally to patients without complications after contacting the patient. 254 patients completed the questionnaire (Figure 1).

#### *Forgotten hip.*

According to the online questionnaires, 92 (17.55%) patients without complications always have a forgotten hip, 126 (24.06%) patients sometimes have a forgotten hip and 36 (6.87%) never have a forgotten hip.

According to data obtained from assessing the post-operative surgeon reports, 149 (28.44%) patients without complications have a forgotten hip.

#### *Pain in groin.*

79 (15.08%) patients have pain in their groin. 36 (6.87%) have pain in their left groin and 43 (8.21%) have pain in their right groin.

HOOS.

The Hip Disability and Osteoarthritis Outcome Score (HOOS) is divided into 5 subsections (pain, symptoms, ADL, sport/recreation and QOL). The average score for HOOS pain is 89.04. The average Symptoms score is 82.39. The average ADL score is 90.68. The average Sport/recreation score is 76.85. The average QOL score is 81.74.

HHS.

The modified Harris Hip Score is divided into 2 subsections (pain and function). The average Pain score is 88.61 and the average Function score is 92.93.

Radiographic evaluation.

In 8 (1.19%) hips the stem showed signs of fibrous ingrowth in Zone 1 or 7. Two cups (0.30%) showed radiolucent lines in Gruen zone 1 and 2. Both students and surgeon went over the images to check the ingrowth of the prosthesis.

## Discussion

This retrospective observational study summarizes the functional outcome scores and complications following the direct anterior approach in total hip arthroplasty performed by an experienced surgeon. The DAA is a muscle sparing technique and is said to be associated with a higher complication rate and a lower dislocation rate (Barrett, Turner, & Leopold, 2013; De Geest, Fennema, Lenaerts, & De Loore, 2015). This retrospective study offers an update on the complications after a THA through the DAA. By measuring the functional outcome scores through a questionnaire there is an insight in the opinion and feelings of the patient. The intraoperative complication rate is smaller than the one percent the surgeon strives for (Corten, 2014). This is also a lower complication rate compared to Spaans, van den Hout, and Bolder (2012) and De Geest, Vansintjan, and De Loore (2013). The low intra-operative complication rate is highly likely due to the experience of the surgeon. The postoperative complication rate compared to one study (Tsukada & Wakui, 2015), is high. The observed postoperative complication rate is lower compared to the study of De Geest et al. (2013). However, the high postoperative complication rate is due to observed tendinitises. Without including the tendinitises, the postoperative complication rate would be 3.86%. Tendinitis is

seen as a complication in this study due to the discomfort it brings to the patient. This can be debated to be a worthy complication whilst the tendinitis is not due to the surgeon, but due to the activities of the patient after surgery. Most of the tendinitises in this study were due to physiotherapy and open chain exercises (mainly straight leg raising) shortly after surgery. This causes many problems for the patient and is therefore seen as a complication. The overall low complication rate can be explained by the surgeon's expertise, the use of a standardised protocol and the use of a regular OR table. The surgeon believes there are better outcomes using a normal operating table compared to a traction table (Corten, 2014). Horne and Olson (2011) states that the dislocation and fracture rate using a regular OR table is lower than when using a fracture table.

The functional outcomes of this study are equal to those found in recent literature (Barrett et al., 2013; Rodriguez et al., 2014). There is a possible non-response bias concerning the questionnaire. Many patients could not be reached because of the digital nature of the questionnaire. Many patients do not have computers and could therefore not participate in the questionnaire.

The prevalence of a forgotten hip was also evaluated in the questionnaire. Few studies have focused on the presence of this phenomenon. Apart from the functional outcome scores measured by the questionnaire, radiographic images were evaluated to see if there were radiolucent lines around the stem or cup in order to assess for correct ingrowth. No radiolucent lines were relevant and none needed re-operation.

A limitation of this study is the non-standardised or non-objective manner of interpreting the postoperative reports on tendinitis-like pain. Both students discussed whether the symptoms documented in the reports were severe enough to be called a complication based on the discomfort of the patient. The students discussed these reports when there was no clear diagnosis of a tendinitis. Therefore the inclusion or exclusion of tendinitises was done in a rather subjective manner. Another limitation is the relative short follow-up period. We believe that a minimum of 1 year follow-up is short. Tsukada and Wakui (2015) and Reichert et al. (2015) report a minimum follow up of 4.1 years and 3.3 year respectively. However this follow-up period is rather high or comparable to the studies of De Geest et al. (2013), Poehling-Monaghan, Kamath, Taunton, and Pagnano (2015), Rodriguez et al. (2014) and Zawadsky, Paulus, Murray, and Johansen (2014). A sample size of 590 patients is relatively high compared to other studies (Bhargava, Goytia, Jones, & Hungerford, 2010; Hallert, Li, Brismar, & Lindgren,



2012; Pogliacomi et al., 2012). Therefore the sample size is considered to be a strength of this study. A forgotten hip is a good way for the surgeon to see if his work has been performed correctly and if the quality of life of the patient has improved. It is the ideal scenario for both patient and surgeon. The documentation of the prevalence of forgotten hips can also be seen as a strength as this has not been documented before. Also the documentation of tendinitis considered a strength of this study as it provides opportunities for further research concerning the cause, prevalence and treatment. Future research is necessary to gather more standardised results concerning the complications and functional outcomes after a THA through the DAA. We advise to include information on tendinitises and forgotten hips and to develop a standardised manner to obtain this data in future research.

## Conclusion

This study gives an answer to the research questions. It provides a decent summary concerning the intra- and postoperative complications and functional outcomes following the DAA in THA. The hypothesis of this study was correct. This cohort demonstrated an overall low complication rate compared to recent literature. Therefore we can conclude that the direct anterior approach is a reliable technique in the hands of an experienced surgeon using a standardised protocol.

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## Appendix

Table 1: Patient demographics

<b>Patients (n=590)</b>		
Women	300	p=0.024
Men	290	
Mean Age (years) (SD)(range)	60.8 (12.7) (17-92)	
Complication group	57.2 (24-82) (13.4)	
Non complication group	61.1 (17-92) (12.6)	
THA DAA		p=0.527
Left	215	
Right	292	
Bilateral	83	
Total hips	673	
Mean BMI (kg/m <sup>2</sup> ) (SD)(range)	26.9 (4.3) (15.3-46.3)	
Complication group	26.5 (4.3) (18.2-32.9)	
Non complication group	27.0 (4.3) (15.3-46.3)	
Diagnosis	512	
Primary osteoarthritis	29	
Secondary Osteoarthritis	19	
Avascular Necrosis	1	
Epiphysiolysis	1	
Fracture	1	
Cartilage defect	1	
Cartilage laesion acetabulum	1	
Posterior impingement	1	
Pincer impingement	24	
Missing data		

SD: Standard Deviation

Table 2: Intra- and postoperative complications

<b>Complications</b>	<b>N (%)</b>
<b>Intra-operative</b>	<b>2 (0.30)</b>
Fractures	2 (0.30)
Lesser trochanter	1 (0.15)
Femur	1 (0.15)
<b>Post-operative</b>	<b>59 (8.77)</b>
<i>Early postoperative (&lt;3m)</i>	<i>10 (1.63)</i>
Dislocation	1 (0.15)
Liner exchange	1 (0.15)
Hematoma	3 (0.45)
LLD	2 (0.30)
Impingement	1 (0.15)
Transient motor nerve dysfunction	2 (0.30)
<i>Mid postoperative (3-24m)</i>	<i>48 (7.13)</i>
Infection	2 (0.30)
Stem loosening	2 (0.30)
Heterotopic ossification	3 (0.45)
Impingement	2 (0.30)
Tendinitis	37 (5.50)
Psoas	28 (4.16)
Adductors	2 (0.30)
Gluteus medius	6 (0.89)
TFL <sup>1</sup>	1 (0.15)
LLD	1 (0.15)
Fracture	1 (0.15)
<i>Late postoperative (&gt;24m)</i>	<i>1 (0.15)</i>
Infection	1 (0.15)

<sup>o</sup>Leg-length discrepancy

<sup>1</sup>Tensor Fascia Latae

Table 3: Overview of complications according to the Clavien-Dindo Classification of Surgical Complications

<b>Clavien-Dindo Classification of Surgical Complications</b>	<b>N (%)</b>
Total procedures	673
Grade 1	23 (3.42)
Grade 2	24 (3.57)
Grade 3	14 (2.08)
Total complications	61 (9.06)

Table 4: Reoperations

<b>Re-operations</b>	<b>Number (%)</b>
<i>Total</i>	<i>14 (2.08)</i>
<i>Early re-operations</i>	<i>5 (0.74)</i>
Liner exchange	1 (0.15)
Surinfection postoperative hematoma	2 (0.30)
Leg-Length discrepancy	1 (0.15)
Fracture lesser trochanter	1 (0.15)
<i>Late re-operations</i>	<i>9 (1.34)</i>
Infection	1 (0.15)
Heterotopic ossification	2 (0.30)
Extra-articular impingement	2 (0.30)
Loosening stem	2 (0.30)
Psoas release	2 (0.30)

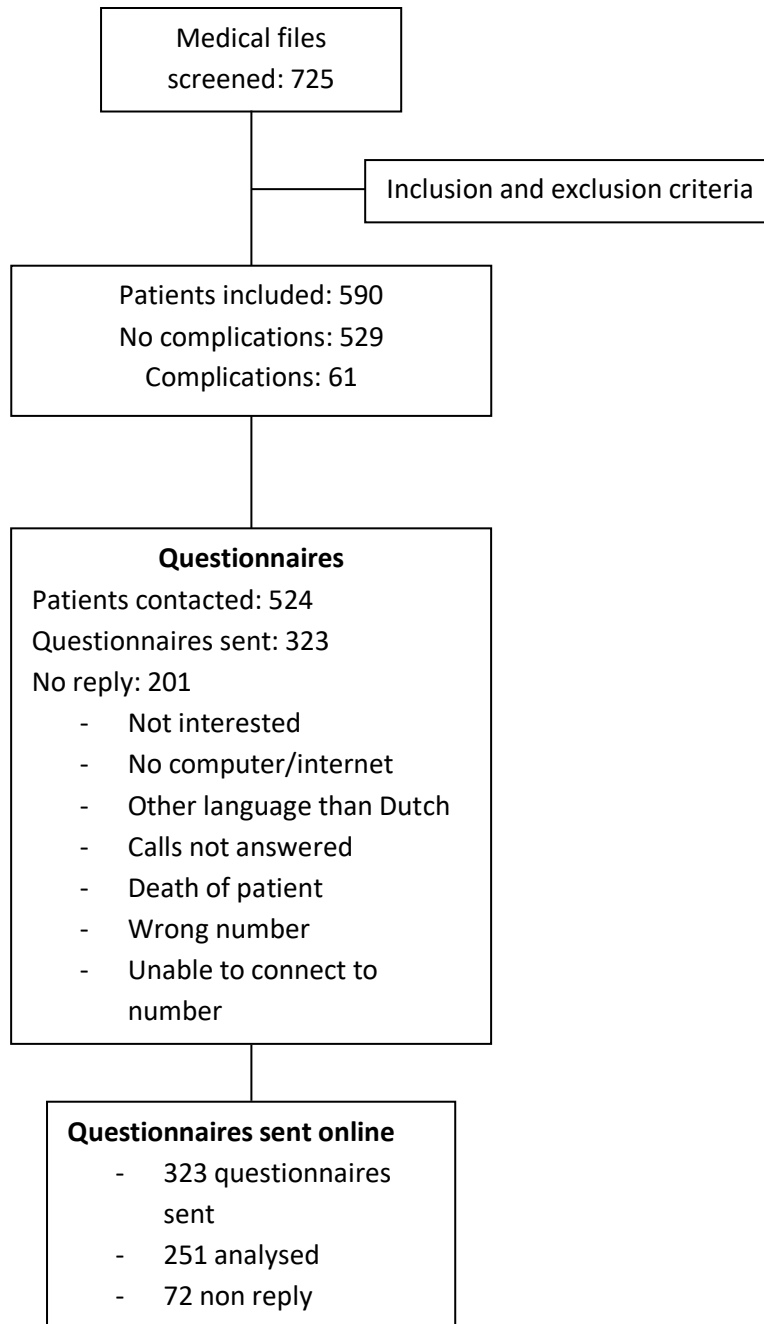


Figure 1: Flow-chart

*Attachment 1: Questionnaire*

Beste patiënt ,

**U bent nu enkele jaren na de ingreep.** Wij zouden u graag vragen om de **volgende vragenlijst goed in te vullen.** Deze nemen ongeveer 10 minuten van uw tijd in beslag.

Deze informatie is voor ons van cruciaal belang om gedetailleerd **te begrijpen hoe uw functionaliteit na de operatie geëvolueerd is** en wij danken u bij voorbaat voor uw ondersteuning en hulp.

Prof Dr.Corten

Er zijn 23 vragen in deze enquête.

Heeft u pijn in de liesregio aan de linker heup?

- Ja
- Neen

Heeft u pijn in de liesregio aan de rechter heup?

- Ja
- Neen

Heeft u wat men noemen een 'forgotten hip', namelijk dat u eigenlijk niet meer het gevoel heeft dat u een operatie heeft ondergaan?

- Ja, altijd
- Ja, meestal
- Nee, nooit

1. PIJN : Duidt 1 antwoord aan dat het beste bij uw situatie past

- Ten gevolge van de pijn aan mijn heup kan ik geen enkele dagelijkse activiteit meer vervullen of ben ik bedgebonden.
- Ten gevolge van de pijn aan mijn heup heb ik toch wel een ernstige beperking in mijn dagelijkse activiteiten. Maar toch kan ik nog enkele activiteiten uitvoeren.
- Ik heb aan mijn heup een matige pijn welke draagbaar is, maar ik voel ze wel. Ik kan het meeste van mijn dagelijkse werk doen, maar heb toch soms pijnstillers nodig. Deze pijnstillers zijn toch sterker dan bv. Dafalgan of een ontstekingsremmer
- Ik heb een vage last in mijn heup, een milde pijn welke mij vooral opspeelt wanneer ik een abnormale activiteit doe. Soms neem ik voor deze pijn een Dafalgan of een ontstekingsremmer.
- Ik voel mijn heupgewricht soms wel onder de vorm van een vage last maar ik kan elke activiteit doen zonder enige pijnmedicatie.
- Ik heb geen enkele pijn.

2.MANKEN: Duidt 1 antwoord aan dat het beste bij uw situatie past

- Ik mank erg. Hierdoor kan ik nauwelijks stappen.
- Ik mank matig.



- Ik mank slechts zeer licht.
- Ik mank niet.

3. ONDERSTEUNING: Duidt 1 antwoord aan dat het beste bij uw situatie past

- Ik kan niet gaan.
- Ik heb 2 krukken nodig want zonder kan ik niet gaan.
- Ik gebruik 2 wandelstokken om te kunnen gaan.
- Ik gebruik een kruk.
- Een gebruik een wandelstok het merendeel van de tijd, ook voor kortere afstanden.
- Ik gebruik enkel een wandelstok voor langere afstanden.
- Ik heb geen ondersteuning nodig om te kunnen gaan.

4. WANDELAFSTAND: Duidt 1 antwoord aan dat het beste bij uw situatie past

- Ik kan enkel gaan van een bed tot een stoel.
- Enkel binnenshuis.
- Ik kan 2-3km of ongeveer 30 minuten wandelen.
- Ik kan tot 6 km wandelen of ongeveer 60 minuten aan één stuk.
- Mijn wandelafstand is ongelimiteerd.

5. TRAPPEN: Duidt 1 antwoord aan dat het beste bij uw situatie past .

- Ik ben niet in staat trappen te doen.
- Ik kan trappen doen maar met zeer veel moeite.
- Ik kan de trappen normaal doen maar moet de trapleuning gebruiken.
- Ik kan de trappen ook doen zonder de trapleuning te gebruiken.

6. Activiteiten: schoenen aandoen Duidt 1 antwoord aan dat het beste past bij uw situatie

- Ik kan mijn veters niet binden.
- Ik kan mijn veters binden maar met moeite.
- Ik heb geen enkel probleem om mijn schoenen aan te doen.

7. OPENBAAR VERVOER: Duidt 1 antwoord aan dat het beste bij uw situatie past

- Ik kan de bus niet nemen omwille van heuplast.
- Ik kan elke vorm van openbaar vervoer nemen.

8. ZITTEN: Duidt 1 antwoord aan dat het beste bij uw situatie past

- Ik kan niet op een stoel zitten zonder last.
- Ik kan enkel op een stoel zitten die wat hoger is en dan nog maar voor maximaal een halfuurtje.
- Ik kan op eender welke stoel zitten voor minstens een uur.

**1.Symptomen:** Denkt u bij het beantwoorden van deze vragen aan symptomen en problemen van uw heup **gedurende de afgelopen week.**

Heeft u een knarsend gevoel in uw heup, klikkende of andere geluiden van uw heup gehoord?

- Nooit
- Zelden

- Soms
- Vaak
- Voortdurend

Heeft u moeite om uw benen ver uit elkaar te bewegen?

- Nooit
- Zelden
- Soms
- Vaak
- Voortdurend

Heeft u moeite met grote stappen maken?

- Nooit
- Zelden
- Soms
- Vaak
- Voortdurend

**2. Stijfheid:** Onderstaande vragen betreffen de gewrichtsstijfheid die u hebt ervaren in de heup **gedurende de afgelopen week**. Met stijfheid bedoelen we het gevoel dat uw gewricht minder soepel beweegt.

Hoe ernstig was de gewrichtsstijfheid van de heup 's morgens direct na het wakker worden?

- Geen
- Gering
- Matig
- Veel
- Erg veel

Hoe ernstig was de gewrichtsstijfheid van de heup later op de dag, na zitten, liggen of rusten?

- Geen
- Gering
- Matig
- Veel
- Erg veel

**3. PIJN:**

Hoe vaak heeft u pijn aan uw heup?

- Nooit
- Elke maand
- Elke week
- Elke dag
- Altijd

4. PIJN: Welke mate van heuppijn heeft u de afgelopen week ervaren tijdens de volgende activiteiten?

Uw bovenbeen zo ver mogelijk naar achteren strekken

- Geen
- Gering
- Matig
- Veel
- Erg veel

Uw knie zo ver mogelijk naar de borst brengen

- Geen
- Gering
- Matig
- Veel
- Erg veel

Lopen op een vlakke ondergrond

- Geen
- Gering
- Matig
- Veel
- Erg veel

Trap oplopen of aflopen

- Geen
- Gering
- Matig
- Veel
- Erg veel

's Nachts in bed

- Geen
- Gering
- Matig
- Veel
- Erg veel

Zitten of liggen

- Geen
- Gering
- Matig
- Veel
- Erg veel

Rechtop staan

- Geen
- Gering
- Matig
- Veel
- Erg veel

Lopen op een harde ondergrond (asfalt, beton etc.)

- Geen
- Gering
- Matig
- Veel
- Erg veel

Lopen op een oneffen ondergrond

- Geen
- Gering
- Matig
- Veel
- Erg veel

**5. Functioneren in het dagelijks leven:** Onderstaande vragen gaan over uw dagelijks functioneren. Wilt u voor elk van de onderstaande activiteiten aangeven **hoeveel moeite u de afgelopen week** heeft ervaren tijdens deze activiteiten vanwege uw heup.

Trap aflopen

- Geen
- Gering
- Matig
- Veel
- Erg veel

Trap oplopen

- Geen
- Gering
- Matig
- Veel
- Erg veel

Opstaan vanuit een stoel

- Geen
- Gering
- Matig
- Veel
- Erg veel

Staan

- Geen
- Gering
- Matig
- Veel
- Erg veel

Bukken naar de grond/iets oppakken van de grond

- Geen
- Gering
- Matig
- Veel
- Erg veel

Lopen op een vlakke ondergrond

- Geen
- Gering
- Matig
- Veel
- Erg veel

Instappen/uitstappen uit een auto

- Geen
- Gering
- Matig
- Veel
- Erg veel

Winkelen

- Geen
- Gering
- Matig
- Veel
- Erg veel

Sokken/kousen aantrekken

- Geen
- Gering
- Matig
- Veel
- Erg veel

Opstaan vanuit bed

- Geen
- Gering

- Matig
- Veel
- Erg veel

Sokken/kousen uittrekken

- Geen
- Gering
- Matig
- Veel
- Erg veel

In bed liggen

- Geen
- Gering
- Matig
- Veel
- Erg veel

In/uit bad gaan

- Geen
- Gering
- Matig
- Veel
- Erg veel

Zitten

- Geen
- Gering
- Matig
- Veel
- Erg veel

Gaan zitten/opstaan van het toilet

- Geen
- Gering
- Matig
- Veel
- Erg veel

Zware huishoudelijke activiteiten (zware dozen tillen, de vloer schrobben etc.)

- Geen
- Gering
- Matig
- Veel
- Erg veel

Lichte huishoudelijke werkzaamheden (koken, stoffen etc.)

- Geen
- Gering
- Matig
- Veel
- Erg veel

**6.Functioneren in vrije tijd en sport:** De volgende vragen gaan over uw lichamelijke gesteldheid tijdens recreatieve/ sportieve activiteiten. Geef aan hoeveel moeite u heeft ervaren op grond van uw heupklachten in **de afgelopen week** bij de volgende activiteiten.

Op uw hurken zitten

- Geen
- Gering
- Matig
- Veel
- Erg veel

Hardlopen

- Geen
- Gering
- Matig
- Veel
- Erg veel

Draaien op een belast been

- Geen
- Gering
- Matig
- Veel
- Erg veel

Op een oneffen ondergrond lopen

- Geen
- Gering
- Matig
- Veel
- Erg veel

**7. KWALITEIT VAN LEVEN:**

Hoe vaak wordt u aan uw heup herinnerd?

- Nooit
- Elke maand
- Elke week
- Elke dag

- Altijd

**7.1 KWALITEIT VAN LEVEN:** Heeft u uw manier van leven veranderd om uw heup te ontzien?

- Totaal niet
- Iets
- Matig
- Grotendeels
- Totaal

**7.2 KWALITEIT VAN LEVEN:** In welke mate kunt u op uw heup **vertrouwen**?

- Totaal
- Grotendeels
- Matig
- Weinig
- Totaal niet

**7.3 KWALITEIT VAN LEVEN:** Hoe groot zijn uw problemen met de heup in het algemeen?

- Geen
- Gering
- Matig
- Veel
- Erg veel

Hoe is uw **algemeen dagelijkse functioneren** veranderd sinds de operatie aan uw heup?

- Erg veel verslechterd
- Veel verslechterd
- Beetje verslechterd
- Niet veranderd
- Veel verbeterd
- Erg veel verbeterd

Zou u **dit ziekenhuis aanbevelen** bij familie en/of vrienden?

- Zeker wel
- Waarschijnlijk
- Waarschijnlijk niet
- Zeker niet



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**Functional outcome scores and complications following the direct anterior approach in total hip arthroplasty**

Richting: **master in de revalidatiewetenschappen en de kinesitherapie-revalidatiewetenschappen en kinesitherapie bij musculoskeletale aandoeningen**

Jaar: **2017**

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