

Total hip arthroplasty through anterior minimal incision

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Abstract

Total hip arthroplasty through minimum anterior incision is a minimally invasive technique that allows access to the joint capsule without posting the skeletal muscle surrounding areas. Anterior surgical approach is advantageous because the hip joint is located closer to the front than the rear part of the limb. The surgical approach follows a internervous plane between superior and inferior gluteal nerves (in the side) and femoral nerve (medially), without involving the muscle removal. This technique provides good access, through the same incision, both to the acetabulum and the femur. It also allows better control of the acetabular cup, keeping the limb length, a decrease of dislocations rate and reduced post-operative precautions.

Key words: *total hip arthroplasty, anterior minimal incision, muscular tearing*

Rezumat

Artroplastia totală de șold prin incizia minimă anterioară este o tehnică minim invazivă ce permite atât accesul la capsula articulară fără detașarea de suprafețele osoase a musculaturii din vecinătate. Abordul chirurgical anterior este avantajos deoarece șoldul este o articulație situată mai aproape de partea anterioară decât posterioară a membrului. Abordul chirurgical urmează un plan internervos între nervii gluteali superior și inferior (în partea laterală) și nervul femural (în partea medială), fără a implica detașarea musculară. Această tehnică oferă un bun acces, prin aceeași incizie, atât la acetabul cât și la femur. De asemenea, permite un control îmbunătățit al cupei acetabulare, menținând lungimea membrului și o scădere a ratei dislocărilor, cu reducerea precauțiilor postoperatorii.

Cuvinte cheie: *artroplastie totală de șold, incizie minimă anterioară, dezinsertie musculară*

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Introduction

Since the first total hip arthroplasty with anterior minimally incision made in 1947 by Robert Judet at a hospital nearby Paris, this type of surgery became a milestone in the management of degenerative hips for elder and young patients as well. Many studies revealed the efficiency and advantages of this procedure, which recorded a success rate over 90% after 10 years of follow-up.

Judet used an anterior approach because:

- the hip is rather an anterior than a posterior joint, being closer to the anterior part of the pelvis;
- the anterior approach follows an internervous plane between the superior and inferior gluteal nerves lateral (tensor fascia lata muscle) and the femoral nerve medial (sartorius muscle);
- the approach exposes the hip without detachment of the muscular attachments [1].

The original table used in France by Judet was the Judet/Tasserit table. This table is no longer manufactured, which led to the design and production of the PROfx and HANA tables (makes simultaneously hip extension adduction and external rotation) which are improved surgical tools to assist with the procedure (Figure 1).



Figure 1. HANA table [9]

The total hip arthroplasty with lateral approach implies removal of gluteus minimus muscle and also a small part of gluteus medius muscle from the greater trochanter, fact that can cause a delay in the

rehabilitation process and also an incomplete healing process of the abductor muscles. Avoiding the postoperative dislocations is a goal for each surgeon so it is very important to spare the tensor fasciae latae and the gluteus maximus muscles which give stability to the hip and make the abduction, working as a „deltoid of the hip”. Using this procedure the spare of the „deltoid of the hip” is possible because the approach follows an intermuscular plane [2].

Surgical technique

The patient lies supine on the HANA table and the boots are attached to the table. The operative leg is placed in slight internal rotation to accentuate the bulge (convexity) of the tensor fasciae latae muscle, which is used as a landmark for the surgical incision. The normal incision starts 1 to 2 cm inferior and medial to the anterior superior iliac spine and measures 7 to 10 cm in length (Figure 2). For the normoponderal patients the convexity of the tensor fasciae latae muscle is placed at the middle of the incisions length. The incision offers a good access to the acetabulum, while the femoral access is give by the manoeuvres on the boots attached at the surgical table.



Figure 2. The incision and landmarks [2]

The dissection prefaced by palpation of the area, in the search for landmarks had proved to be more efficient. After the incision the muscle plane can be easily seen under the transparent fascia latae. Cobra retractors are placed along the incision to retract the sartorius and rectus femoris muscles in the medial part and the tensor fasciae latae muscle in the lateral part. The retractors expose the vascular circulation local system around the femoral neck. The vessels are clamped and cauterised and the joint is exposed through an incision along the femoral neck. This last incision facilitates the removal of degenerative tissue in the area.

Through the proximal part of the incision, the surgeon removes the anterior side of the acetabulum, then the nearby tissue and the connective parts between the femur and acetabulum are pulled out of place. Then a cork screw is placed in the femoral head followed by an external rotation induced to the limb, in surgeon try to dislocate the hip. This step eases the femoral head excision giving increase mobility to the proximal part of the femur.

Once the lower limb is external rotated (about 45°) the acetabulum is exposed, being ready for reaming. The reaming is done under direct vision using a proper reaming device which as at its end has an acetabular reamer, furthermore the quality of the reaming process and the future position of the prosthesis are checked through the images taken during the surgical procedure in the operating room. Also the length of the operated leg is verified during this step, as well as the comparison with the healthy one, so that possible length differences are immediately solved.

After acetabular cup insertion the traction on the leg is decreasing, while the external rotation is maintained for the femoral exposure, preparing the next phase: stem insertion. A hook is placed on the

posterior side of the femur, 1 cm distal from the lesser trochanter in order to maintain the limb in extension. The femur is then placed in hyperextension, external rotation (90°) and adduction through some manoeuvres made on the attached boot. The most useful femoral reaming systems are the broach only which use a matrix of broaching which does not interfere with ASIS and the soft tissues from the proximal part of the femur. The most used models from the femoral stems is **Corail stem** due to the ease in handling, preparing and insertion (Figure 3).

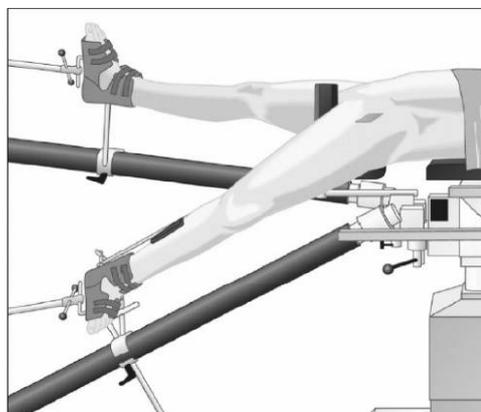


Figure 3. After releasing the traction, the inferior limb is lowered and rotated 90° externally [10]

The broaching screw has to enter near the medial cortex of the femoral shaft for increase stability, if not sure of the broaching direction, intraoperative images are recommended.

After the implants are inserted and dislocation reduced, the surgeon takes bilateral hip radiography, in order to compare and adjust the length of both lower limbs. If until this moment the surgeon did not use the imagistic method to check the position of the implants both stem (position in the medular canal) and acetabular cup, this step offers a quick review. The next phase is placing the final implants after some changes regarding implants position (if case), followed by checking through passive movement, the range of motion (ROM) of the new hip and the tension degree of the nearby soft tissues

(muscles, skin). In the end the suture of hypodermic tissue will take part using a resorbable sewing thread (wire) and for the skin, unresorbable wire will be used which will be removed after 14 postoperative days.

After the surgery the patient has no position and limits restriction, in addition he/she is advised to weight bear on the new hip and quit using the instruments for walking (walker, crutches) as soon as the symptoms allow it.

Table 1. Physiotherapy protocol

Phase (postoperative)	Goals	Physical exercise	Dosage
Phase I (week 1- 2)	<ul style="list-style-type: none"> - Pain and swelling control; - Range of motion maintenance for knee and ankle joint; - Strengthening calf and thigh muscles; - Gait recovery; 	Active movements of toes;	1 minute
		Plantar flexion (ankle)	2 sets X 10 repeats
		Dorsal flexion (ankle)	2 sets X 10 repeats
		Circle moves (ankle)	10 repeats each way
		Isometric contraction of thigh muscles from laying supine	2 sets X 10 contractions X 5 sec/contraction
		From supine: 10 – 15 cm from a wall, patient pushes the leg, maintaining the position (patient makes contact with the wall with the lateral part of the foot)	2 sets X 10 contractions X 5 sec/execution (5 seconds break between executions)
		with the lower limb held in extension, patient abducts and adducts the leg keeping the sore on the bed	2 sets X 10 repeats
		knee flexion, the sole is kept on the bed	2 sets X 10 repeats
		Sitting at the edge of the bed, patient extends the knee, maintaining the full extension	2 sets X 10 repeats X 5 seconds of keeping the extension
		Standing up near the bed From standing position: -heel raises; -hip flexion (knee 90° flexed)	10 repeats 2 sets X 20 repeats
Phase II (week 2 - 4)	<ul style="list-style-type: none"> Strengthening calf and thigh muscles; Balance and coordination recovery; Improving gait quality; 	Ciclying, using a high seat ergometric bicycle, minimal load (starting day 8 post operative the load increases one level/4 days).	2 sets X 10 repeats
		Gait on 30m with crutches first two days and without walking devices (starting day IV). Patient uses crutches on distances >50m.	15 minutes
		Cycling on the ergometric bicycle (load > level 2), after day 21 the load reaches medium level which is kept until the end of the phase. Continuing the exercises from previous phase.	15 minutes

		After suture removal (14 days postop) it is recommended aqua access. Patient does water exercises using ankle weights: hip flexion, extension, abduction, adduction. Walking, running and jump inside the water are allowed (1.50m). Until the end of this stage breast stroke is not recommended. On land, gait without walk devices is closely supervised. Standing on the operated limb, the patient tries to maintain his balance. (to increase the complexity the patient closes the eyes)	5 repeats X 30 seconds (break 1 - 2 minutes between repeats)
Phase III (week 4 - 6)	Strengthening calf and thigh muscles; Stability, balance and coordination improvement; Beginning specific activities;	standing: against the wall, the patient does squats until the knee reaches 90°	2 sets X 10 repeats
		heel raises on the operated limb;	2 sets X 20 repeats
		abduction, flexion, extension with the operated leg, having a weight on the ankle;	2 sets X 10 repeats for each type of exercise
		Cycling on the ergometric bicycle, the load above medium level.	15 minutes
		Standing on the operated limb, the patient tries to maintain his balance. (to increase the complexity the patient closes the eyes).	10 repeats X 30 seconds (break 2 minutes between repeats)

Review

Due to frequent loosening having as a cause low exposure of femur, the question of how the femur should be exposed for femoral stem insertion appeared when the anterior approach to hip joint replacement gained renewed interest. Two different concepts have developed that differ from each other regarding the use of the trauma table.

In 1980, Light and Keggi [3] reported good results of cemented total hip replacement in a group of 104 patients operated on through a single-incision anterior approach, without the use of a trauma table. Femoral exposure was achieved using a hook introduced from the anterior side into the calcar femorale through which the femur was raised anteriorly and rotated externally prior to posterior capsular release.

In 2001, Castelain [4] described the technique of femoral exposure according to Judet's recommendations using the trauma table for prosthetic treatment of femoral neck fractures and

Siguier et al. [5] described insertion of a partial head resurfacing prosthesis in the treatment of avascular necrosis of the femoral head.

In 2003, Kennon et al. [5] reported their 30-year experience with the anterior single-incision approach and concluded that trauma table (Judet/Tasserit table or PROfx/HANA table) and modular stems are to be favored because of their superior handling when using this technique, especially in reducing the need for extensive soft tissue dissection.

In conclusion, femoral visualization and stem insertion by the use of the traction table was excellent in all the operated cases [6]. Any type of femoral stem, ranging from cementless conventional anatomical stems to straight tapered stems, but also cemented stems, may be implanted using this anterior approach.

Advantages [7]

- for the patient

- less intraoperative tissue trauma and blood loss;
- patients with a big BMI can be operated;
- less pain and pain medication;
- small scar after surgery;
- method uses normal mechanics of hip;
- faster rehabilitation and return to normal activities;
- small postoperative dislocation rate and less precautions;
- quick discharge and less visits to the doctor;
- patient can use normal seat for toilet;
- patient does not need high heels;
- patient can have bilateral THA (total hip arthroplasty);

- for the surgeon

- surgical approach which spares „deltoids hip”;
- good visibility for acetabulum and femoral components;
- early hip stability;
- one incision;
- patients with a big BMI can be operated;
- small postoperative dislocation rate;
- few postoperative complications;
- credit for the surgeon;
- surgeon can adjust intraoperative lower limb length;
- surgeon can make bilateral THA.

- for the hospital

- few days of hospital days for one patient ⇒ more patients;
- less time spent in the operating room ⇒ more surgeries;
- increase success rate;
- increase patient confidence in hospital care.

Disadvantages

Contraindications in this method include anterior acetabular fractures, pelvis abnormality, posterior acetabulum defects, cases in which the approach must be posterior. Also there can occur intraoperative complications that can include femoral shaft fractures, small and greater trochanter fractures and ankle fractures [8]. An obvious disadvantage of this method is the need in having a special surgical table and specific out fit.

Conclusion

This method uses one minimally invasive incision through anterior approach and provides the best combination in exposure, simplicity, security, consistency and tissue sparing against any other method for primary total hip arthroplasty (2). The dissection follows intermuscular plane without removing or cutting any muscle and also placing the patient supine ease anesthesiologist work, being a natural position for the patient.

Anterior approach is good for all the patients whom need a total hip arthroplasty, as well the small intraoperative blood loss, less postoperative pain, faster rehabilitation, small scar and few time spent in the operative room gives this type of surgery a strong advantage against the classical procedure. The most difficult cases are those in obese patients, but surgical approach ease the way through the joint.

Once learned this technique that spares soft tissue, appeared to be more accessible than other minimal incision techniques and can be done by many surgeons with good results and a low rate of complications, although learning the method implies a lot of concentration.

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Aspects regarding the different and individualized approaching in the juvenile handball

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Abstract

The way through the top in the performance sport is a long and mostly very slow way. The great performances can be obtained only by the individuals with special physical and psychical qualities. Beside those, an important role is played by the trainer`s proficiency, the level of organizing and the objectives of the sports club. The beginning of this way is represented by the way in which the children and the juniors`s trainers succeed in the exploiting their potential, transforming them in top sportsmen. An unproper approaching could lead to the waste of some talents. The training in handball is addressed to some groups which usually are very heterogenous and implies a proper work. The different and individualized approaching represent indispensable work methods for the instructing of the handball teams. The trainers could reach this through a very strict planning of the trainings in order to imply a great diversity of means, with very clear individual tasks.

Key words: *training, performance, talent, differnt approaching, individualized approaching.*

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