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The New Surgical Technique to the Positioning of Hip Prosthetic Implants: The Medial-Inguinal Approach

Dr. Luca Lucente[1]

[1] Casa di Cura Nuova Itor

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Abstract

Introduction: True to the concept of Tissue Sparing Surgery, we invented this new surgical technique to reach the coxo-femoral joint by starting at the inguinal-medial region. Metthods: We performed total hip arthroplasty on 50 patients suffering from hip arthritis, and hemiarthroplasty with bipolar prostheses implants on 15 cases on medial fractures of femoral neck. Results: In our case study, operation time and blood loss were lower, there were no complications, and recovery time was incredibly fast. Discussion: We have invented a surgical process that allows for a safe, easy and fast replacement of the hip, and that spares the hip stabilizer muscles completely. Throughout the operation, the surgeon can view the acetabulum from the front, a view that is preferable to the one available with known techniques. There is no need for special equipment or special operating tables, and surgeons don?t face a steep learning curve when first introduced to the procedure. Since risks of dislocation are non-existent, the patient is allowed to lie in bed in any position. The procedure is preferable aesthetically, since any scarring is hidden from view in the inguinal folds of skin. Patients can resume walking immediately, using 2 Canadian crutches only for a few days. Conclusion: The authors think that, thanks to its low costs and ease of performance and replication, this technique offers nothing but advantages for the patient. Easier rehabilitation is another positive aspect. The procedure can be considered a valid alternative to other common surgical approaches. Metthods:We performed total hip arthroplasty on 50 patients suffering from hip arthritis, and hemiarthroplasty with bipolar prostheses implants on 15 cases on medial fractures of femoral neck.Results: In our case study, operation time and blood loss were lower, there were no complications, and recovery time was incredibly fast.Discussion: We have invented a surgical process that allows for a safe, easy and fast replacement of the hip, and that spares the hip stabilizer muscles completely. Throughout the operation, the surgeon can view the acetabulum from the front, a view that is preferable to the one available with known techniques. There is no need for special equipment or special operating tables, and surgeons don't face a steep learning curve when first introduced to the procedure. Since risks of dislocation are non-existent, the patient is allowed to lie in bed in any position.

Index terms— the medial-inguinal approach.the new surgical approach to the hip, innovation in hip surgery.
The New Surgical Technique to the Positioning of Hip Prosthetic Implants: The Medial-Inguinal Approach

1 I. Introduction

eaching the hip joints via the medial region is not a novelty. In 1908, Ludloff had hypothesized the procedure as a way to reduce congenital hip dislocation. In an article published in 1913, Ludloff described the access through the

medial region as a simple, fast, and safe way to carry out the tenotomy of the ileopsoas muscle that blocked the bloodless reduction of the femur head in the acetabulum. (1)(2) In later years, several authors took an interest to the procedure, and they each contributed certain modifications: Chiari in 1957, **??**altzer et al. in 1967 **??** Dorr in 1968 **??** Man et al. in 1971 **??** Ferguson in 1973(11) and **??**einstein et al. in 1979. All the above authors used this technique only in newborn patients for the sole purpose of performing ileopsoastenotomy. (6).

Since this technique is used in newborns, it must be a simple, fast, and non-invasive surgical procedure, with low risks of operating and postoperating complications. Hence, we devised the idea to go through the medial-inguinal area to implant a hip prosthetic. Starting from 2002, a technique via the medial region, similar to the one proposed by the authors and invented by Prof. Wolfram Thomas in collaboration with Dr. Lucente, was used to implant a hip prostheses. In the former procedure, however, the preparation of the femoral canal was complicated and impractical. In cadaver labs, we perfected the procedure of implanting a hip prostheses by working around the difficult preparation of the femoral canal. Thanks to this revised technique, the hip joint can be reached without cutting through any muscle, the amount of time necessary for the surgery is greatly reduced, and -most importantly -a clear view of the acetabulum is maintained. In comparison with other known hip surgical procedures, the entire circumference of the acetabulum is visible straight on. The complete view of the acetabulum and of the femoral canal allows us to position prosthetic components without error. Through this medial-inguinal access, we can perform hip resurfacing operation, implant a prosthetsesfor femoral neck conservation (metaphyseal fixation), or implant a standard prostheses with a diaphysiary-fixing stem. Our surgical technique does not require a specific instrument: traction bed, angled handles. Standard instruments are used to implant all three kinds of prostheses, and no special operating table is required. It is a true Tissue Sparing Surgery (TSS), since no muscles are severed. The only exception is the adductor longus tendon, which is sutured at the end of the surgery, permitting a fast and easy post-op recovery for the patient. Because the access to the hip joint is direct and no muscles are severed, there is reduced blood loss. Prostheses dislocation risks are null, and this allows an easier surgical process for the patient, because there is no need for lower limb divarication devices, toilets seat risers, or other special adaptations. Our goal was to offer surgical orthopedists a valid surgical alternative for implanting hip prostheses.

2 II. Materials and Methods

We implanted 50 full hip prostheses on patients suffering from hip arthritis and 15 biarticular prosthetics on medial fractures of the femoral neck. The majority of the patients were female (12 full prostheses on female patients, 8 on male patients; 10 biarticularprotheses on female patients, 5 on male patients). The average age of patients undergoing surgery for a full hip replacement was 68, withan Harris average equal to 65. while the average age for patients undergoing surgery for biarticular prosthetic implants was 80. Female patients underwent vaginal disinfection 3 days before surgery, the morning of surgery, and three days after surgery, with chlorhexidine or 10% betadine based products. One hour before operating time, all the patients underwent antibiotic prophylaxis and, unless otherwise noted, an intravenous inoculation of 1 gr. of tranexamic acid. Before sterilizing the operating field, all patients were scrubbed around the area of incision with a chlorhexidine or betadine based solution. We never resorted to draining, because blood loss was so low.

Post operation, we never utilized either devices to maintain the lower limbs spread, or toilet seat risers. Since the risk of dislocation is close to zero, patients were able to lie down in their preferred position right away, as long as the chosen position wasn't too extreme. With the exception of comorbidity cases, which mostly afflicted more elderly patients with femoral neck fractures, all other patients were able to walk a few hours after surgery. All patients went through a brief rehabilitation program. They were evaluated using the Harris Hip Score.

3 a) Surgical Technique

The patient is laid on their back on a standard operating table for lower limb abduction and hyperextension of the limb on which to operate. The waist is shifted so that the side requiring the operation lies next to the external edge. Articulated supports are then placed on the operating table to ensure the waist is perfectly aligned and cannot move at all. The lower limbs are abducted (Fig. **??**a), so that the operational surgeon can sit between them.The first assistant is positioned at the same side that required the surgery. Thesecond assistant flanks the side that does not require surgery. After having adequately prepped the operative field, the limb requiring the operation is flexed and abducted in "frog leg" position. The cutaneous incision circa 8 cm. long is curved and centered on the cutaneous projection of the adductor longus tendon, about 5 cm. from the inguinal fold (Fig. **??**b). The subcutaneous tissue is cut in order to reach the adductor longus tendon. The tendon is prepared according to its length. If it is clearly visible, suture strings are attached to it before severing it, so as to make suturing easier after the operation. In case the tendon is short, it is preferable to implant a metal or a riassorbible anchor where it intersects the ileopubic ramus so it can be fixed at the end of the operation. Retracting the pectineus muscle with a curved Hohmann retractor allows for access to the hip articular capsule. The pectineus muscle constitutes the bottom part of the triangle of Scarpa and retracting it affords protection of the femoral vascular nerve fascia. Before proceeding with the capsulotomy, the medial circumflex branch of the femoral artery is isolated, ligated, and sectioned. Prior to optional luxation of the femoral head, we proceed to the capsulotomy and the successive osteotomy of the femoral neck. Once it is exposed with Hohmann retractors, the surgeon can

have a complete frontal view of the acetabulum's circumference (Fig. **??**a). We continue with the preparation of the acetabulum with standard acetabular frese and we position the acetabulum and the test insert (Fig. **??**b). In order to prepare the femoral canal, we hyperextend the femur by lowering the operating table's lower limb support base about 20 degrees. Then, with the aid of a hook inserted into the femoral canal and with a distalizing maneuver, we shift the greater trochanter from the acetabular border. At this point, the lower limb is moved from the operating table support base to a sterile sack previously prepared with canvases during the set-up of the operating field. By now, the femoral canal is widely exposed and the positioning of the test femoral stem and head can be prepped with ease (Fig. **??**a,b). We reduce the prostheses and its test components; we raise the operating table's lower limb support base to the same height of the counter-lateral support base; we place both legs in neutral position to monitor metrics and perform all the movements needed to measure the functionality and stability of the prosthetic implant (Fig. **??**a). Once these trials are completed, we remove the test parts and implant the actual prosthetic by following the same steps as above. If the capsule has been preserved, we proceed to perform capsulorrhaphy; if not, we proceed directly to the tenorrhaphy of the adductor longus and then, to the suturing first the subcutaneous, then the cutaneous, plane. All that is required is a light compressive dressing. Before being brought back to recovery, the patient undergoes a standing X-ray exam of the operated hip.

4 III. Results

We obtained operational times of 60 minutes, with a minimum of 45 minutes and a maximum of 90 minutes. Obviously times became lower the further we went along the learning curve. Blood loss is extremely low, 200 cc. average, and such that there is no need for a transfusion. We encountered no prostheses dislocations, aseptic or septic mobilization of the prosthetic implant, or vascular and/or nervous damage. Moreover, we observed no ossification and thromboembolic events. Only in one case did a patient develop a lymphangitis of the operated limb, but it was treated pharmacologically. There was only one case of delayed healing of the surgical wound due to a superficial infection treated with surgical toilette and prescribed antibiotics. This complication occurred in an elderly female patient who underwent a procedure for a fractured femoral neck. For several days she wore her diaper and due to Alzheimer's disease she had poor compliance. All patients, except those with a comorbidity that delayed a speedy recovery, were able to walk a few hours after surgery. Two days after the operation, they were able to move autonomously with or without Canadian crutches, depending on their level of compliance. Thirty days after the operation, the most collaborative and motivated patients gave us a Harris Hip Score of an average of 93.

5 IV. Discussion

By combining the concept of Tissue Sparing Surgery with the need for an easy, safe, and fast procedure, we began studying a new surgical approach that provides the most direct way possible to the hip joint. We began by referencing Ludloff's studies from the early 1900s. He proposed a surgical procedure that would reach the hip through the inguinal-medial area. His technique, which has undergone changes over the years, is still the most widely used today to reduce the femoral head in the acetabular cavity in newborn patients who suffer from congenital hip dislocation. This technique has been proven to be conservative, risk-free, easily carried out and feasible in short operating times. **??**4-6-11) In the early 2000s, after taking such characteristics into account, together with Prof. Wolfram we started looking for a new surgical path to implant hip prostheses. **??**3-5-8). We abstained from this technique, however, because the preparation of the femoral canal and the subsequent implant of a femoral stem were particularly difficult. Following numerous anatomical studies in cadaver labs, we made the necessary changes to the procedure in order to make it appropriate for implanting hip prostheses. It is truly a Tissue Sparing Surgery, because no muscle or tendon is sacrificed except the adductor longus tendon, which is sutured at the end of the operation. The adductor's action is not nullified thanks to the fact the adductor longus and brevis are not cut. It is an extremely safe technique because the medial circumflex femoral artery is the only anatomical structure that we need to watch out for and this is done first, by ligating it and then sectioning it. For our purposes, this is irrelevant, since the artery supplies blood exclusively to the femoral head. Having sectioned the adductor longus tendon and prepped it for a post-op suture, reaching the hip joint is fast. We divaricate the pectineus muscle and then arrive at the articular capsule in less time than other known surgeries. Even the closing of the operational site is much quicker, because -once we sutured the adductor longus tendon -we only had the subcutaneous and cutaneous levels to suture.

The surgeon has a better view of the acetabulum because he or she can look at its entire circumference straight on. This allows for an easy preparation of the acetabulum and avoids poor positioning of the prostheses. The same goes for the femur. In fact, we never needed X-rays during operations.

This is a versatile procedure that, thanks to the excellent surgical view, allows surgeons to implant all commercially available prostheses: resurfacing, femoral neck conservation, and diaphysiary-fixing stem. The procedure's only contraindication is ankylosis, and we advise against resorting to it with patients who have a BMI value ? 32.

Managing patients in the ward is simple. Immediately after surgery, patients can lie in their preferred position,

as long as it isn't extreme. They will not need lower limb spreading devices, nor will they need toilet seat risers, and genital hygiene is particularly easy.

Compared with other known surgical techniques that cut through hip stabilizing muscles, patients sense a much better stability right away. For this reason, they use Canadian crutches for much less time, and their rehab is easy and short. Another praiseworthy aspect is the low cost of this new surgical procedure for implanting prostheses. It does not require specific operating tables or tools, and is much less demanding, technically speaking, than the anterior access. All that is required is a standard operating table and a base kit of tools for prosthetic surgery. With this technique, surgeons can implant all types of hip prosthetics commercially available, contributing to considerable savings for the prosthetics industry. From a surgical point of view, it is an easy technique that is easily replicated with a short learning curve. The last advantage is aesthetic, particularly appreciated by young, female patients, because the scar is about 8 cm. and is practically invisible, since it is hidden in between inguinal skin folds. (Fig. **??**b).

6 V. Conclusion

The authors believe that the inguinal-medial approach is a perfect example of Tissue Sparing Surgery. Because of its lack of complications inside and outside the operating room and because of the reduced hospital and recovery time for patients, the procedure lowers the social costs of hip replacement surgery. Always in the concept of tissue sparing surgery, patients operated with this technique, not having suffered damage to the muscles which stabilize the hip, will be able to deal with a possible revision surgery with considerably higher results than those who are subjected to a first prosthetic implant through a lateral or postero-lateral access. While not being a replacement for other existing techniques, this procedure is an extremely advantageous alternateve for surgeons and especially for younger patients. [1]

Figure 1:

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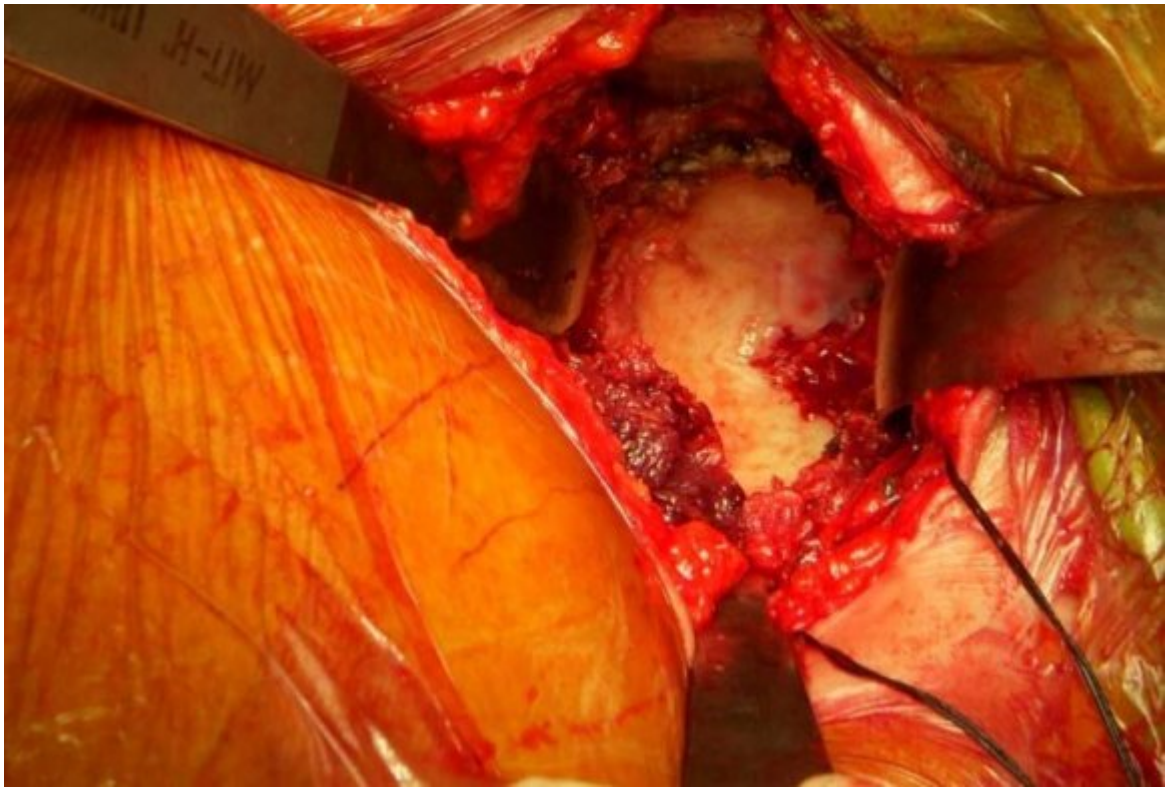

Figure 2:

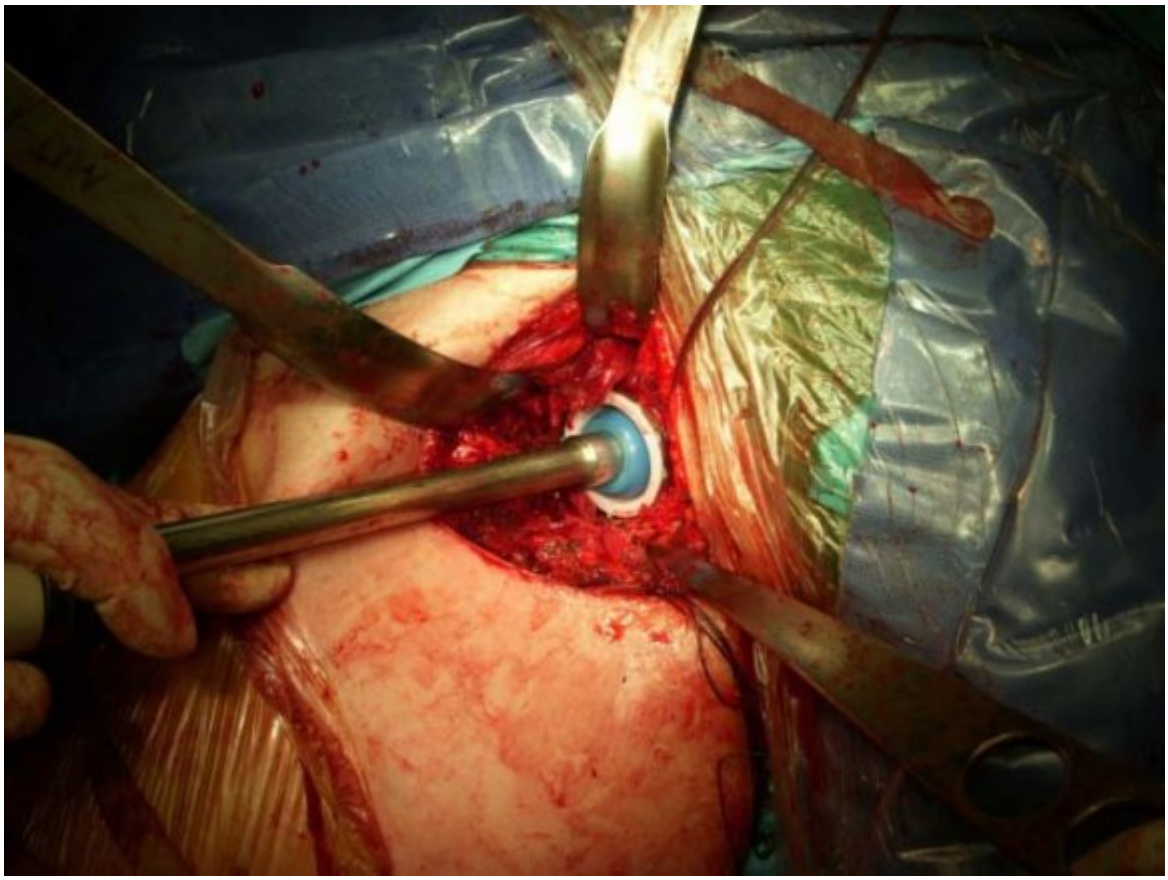

Figure 3: K

Figure 4: Fig. 4a

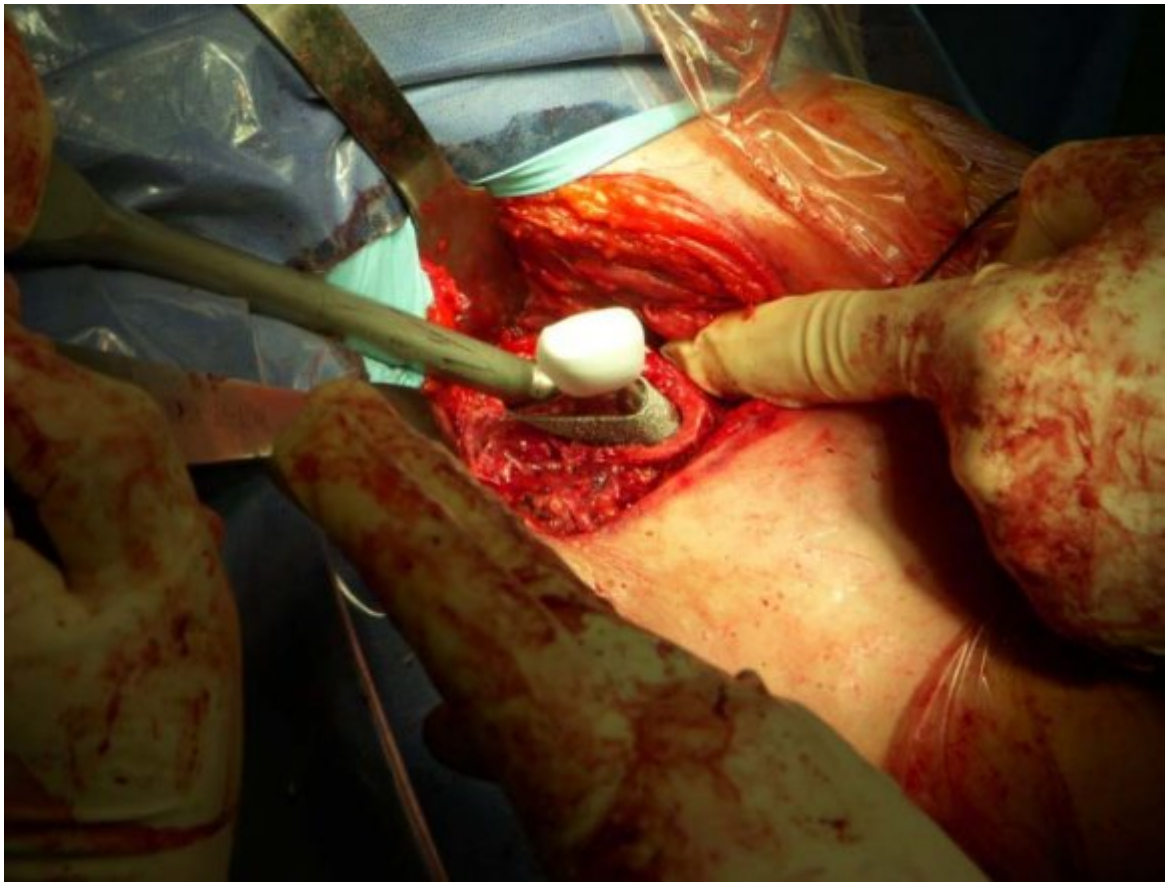

Figure 5: Fig. 4b

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