

MicroHip Total Hip Arthroplasty Technique by Direct Anterior Approach Without the Use of a Traction Table: 5-year results

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This article presents an update on the surgical technique of the tissue sparing direct anterior approach (DAA) to the hip joint, MicroHip™. The DAA is the only approach following an intermuscular and interneural tissue plane to the hip. This technique is performed in a lateral decubitus position on a normal operating table and the overall soft tissue damage is reduced as leg traction is not necessary. This enables the approach to be used as a routine procedure for all indications. Most of the instruments used for this procedure are standard; only the acetabular reamers and positioners are angulated and specifically designed. The angled instruments are especially useful when performing hip replacement in obese patients. To date we have performed over 2500 MicroHip operations at this author's institute. The complication rate is minimal for well-trained surgeons and our experiences to date show that the method we have developed allows us to operate reliably on virtually any patient. At 5 years, results with the MicroHip technique are significantly better compared with a standard lateral approach, even in terms of Harris Hip Score. Important factors such as length of hospital stay, level of pain, blood loss, and time-to-return to work can be reduced significantly. The MicroHip technique is being used by more and more clinics all over the world, and can be applied with success after suitable training. *Adv Venous Arterial Thrombos* 2011;1(2):52–5.

Since first publication of the direct anterior approach (DAA) technique over 5 years ago [1], surgery for total hip arthroplasty (THA) has changed around the globe. The MicroHip technique is unique, and when first introduced seemed “exotic” to many people, even though other existing approaches to the hip, such as those pioneered by Smith–Petersen and Hüter, are also anterior approaches. Awareness of the anterior approach has now completely changed. The MicroHip technique is becoming more and more popular [2], and many different DAA techniques have been published using different patient positions and technical methods, and different types of traction table.

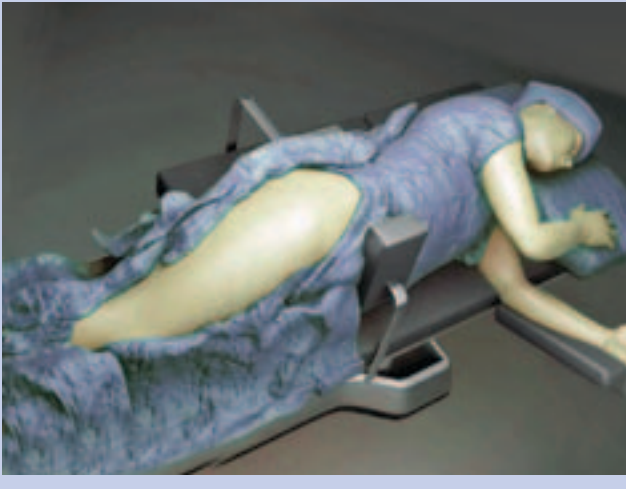
The purpose of this article is to provide an update on the MicroHip technique. This approach has evolved over the past few years as a consequence of the number of procedures performed (>2500 procedures at this author's institute alone).

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The postoperative and perioperative treatment regimens have also changed. One of the most important changes has been the introduction of oral anticoagulants for thrombosis prophylaxis.

Many people are unaware that the MicroHip approach can be easily extended without the use of a complete Smith–Petersen approach. If the skin incision is extended in a Z shape we stay within the same interval, with a greatly extended vision. Care must be taken with regard to the anterior circumflex artery, which needs to be ligated in the extended version of this approach. On the proximal end it is better to extend straight up to the iliac crest and not extend the incision too far ventrally, because the lateral cutaneous femoral nerve could then be damaged. In cases where a femoral crack needs to be dealt with, this is possible by using a wire from a standard incision. To treat a severe femoral fracture, it is easier to use an extended skin incision but then convert it into a lateral femoral approach by “jumping” over the iliotibial band (ITB).

Figure 1. The patient should be positioned in a lateral decubitus position. A strong support for the back of the patient is needed in order to prevent the pelvis from moving.



Patient selection

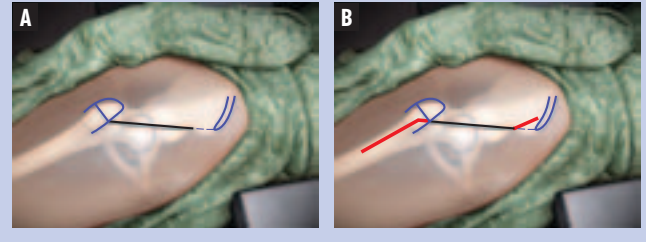
The DAA, or MicroHip, can be used in a wide range of indications, including in obese patients, and in all age groups. It is not implant-dependent so can be used for cement-free and cemented implants, although uncemented implants with a low shoulder profile such as the Corail® or TriLock® (DePuy) are the most suitable for this approach. When first using the MicroHip approach, patient selection is extremely important. It is key to build up an initial experience with simple cases, such as women with a normal body mass index (BMI) and a standard anatomy. It is recommended that the range of indications be gradually increased towards heavy muscular men with short femoral necks and varus hips. This is certainly the most difficult type of patient on which to perform THA using the MicroHip technique. There are no specific contraindications as long as the surgeon operates within his/her comfort zone.

Surgical procedure

Positioning and incision placement

The patient should be positioned in a lateral decubitus position, with the posterior foot part of the table removed. A strong support for the back of the patient is needed in order to prevent the pelvis from moving (Figure 1). The surgeon should stand in front of the patient; it is critical to have good access to the femur. Specific landmarks are used for the incision – in the author's clinic, we draw a line from the middle of the anterior border of the greater trochanter to the anterior iliac crest. The distal 6–8 cm of this line are used for the incision (Figure 2A). As already mentioned, the length of the incision is not important. If the surgeon does not have a sufficient view, he or she can easily extend the standard incision (Figure 2B).

Figure 2. Incision placement. Specific landmarks are used for the incision. In the author's clinic, the distal 6–8 cm of a line drawn from the middle of the anterior border of the greater trochanter to the anterior iliac crest is used for the incision (A). If the surgeon does not have a sufficient view, he or she can easily extend the standard incision (B).



Superficial dissection

The subcutaneous tissue is dissected down to the level of the fascia. We can then access the border of the ITB, and the incision is placed on the very border of the ITB but 2–3 mm lateral to it, therefore within the ITB. This is for two reasons. Firstly, the border of the ITB is easier to suture when closing than the sometimes-fine fascia of the tensor muscle. Secondly, the superficial lateral nerve of the thigh can be avoided by proceeding with the blunt dissection of the tensor muscle from underneath the fascia.

The lateral cutaneous nerve may be close, but it always runs on the superficial side of the fascia. The first blunt retractor should be set on the lateral side of the femoral neck in order to move all of the musculature to the lateral side and give access to the femoral neck.

Deep dissection

The anterior neck is covered with a thin double layer of fascia containing the yellow fat pad in the middle. The reflected rectus tendon runs medially. A longitudinal incision of the superficial layer should be followed by a blunt dissection of the yellow fat pad, moving it medially together with the reflected rectus tendon and holding it in place with a second blunt retractor. The capsule should be incised in a T-shaped manner lateral to the insertion of the reflected rectus tendon; it is better to dissect the capsule from the intertrochanteric line in an inside-out technique to avoid the main branches of the circumflex artery (Figure 3). The ascending branch, which runs along the deeper surface of the tensor muscle, needs to be coagulated or ligated. The blunt retractors should be placed around the femoral neck and the osteotomy performed prior to dislocation of the femoral head. For dislocation, a corkscrew should be inserted into the lateral femoral neck and used to flip the femoral neck towards the surgeon. The corkscrew can then be repositioned into the longitudinal axis of the femoral neck and used to twist the head several times until it is completely loose. After removing the head there will be an excellent 360° view of the acetabulum, which can be further enhanced by adding a third double-bent

Figure 3. Capsular incision. The capsule should be incised in a T-shaped manner lateral to the insertion of the reflected rectus tendon.



Figure 4. Positioning for femoral access. A blunt retractor should be placed over the tip of the greater trochanter before the leg is dropped behind the table.



Hohmann retractor at the lateral insertion of the transverse acetabular ligament (TAL), so as to distalize the femur. The TAL, which is an important local landmark for controlling version of the cup, should be identified. When implanting the cup, surgeons should be aware that in the lateral decubitus position the pelvis tends to adduct and, combined with the impact of version on radiographical inclination, this means the surgeon should aim for an operative inclination of approximately 35° in order to achieve a 45° angle on the postoperative anteroposterior radiograph.

For preparation of the femur, a blunt retractor should be placed over the tip of the greater trochanter before the leg is dropped behind the table (**Figure 4**). With this retractor the tensor muscle can be flipped over the greater trochanter at the same time as the trochanter can be moved with the tip of the retractor medially in order to prevent the femur from impinging against the lateral acetabular rim. In standard hips, no specific release is needed. If the hip is very stiff, we first

perform a release of the posterior capsule followed by a release of the piriformis tendon and then a partial release of the tensor muscle from the anterior iliac crest.

Before broaching it should be ensured that a good overview of the femur is available in order to ascertain the correct entry point for the specific implant. The most common error is to start broaching in too medial a position so the broach will be in varus; this increases both the risk of undersizing and of cracking the calcar.

Deep repair and closure

After implantation, all that remains to be done is to close the capsule with a few stitches and a running suture to the fascia followed by skin closure. The procedure is then complete.

5-Year results

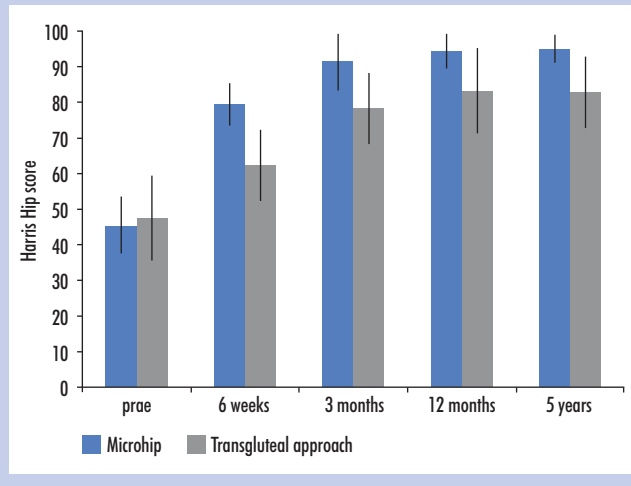
The 5-year results of MicroHip THA surgery, performed at the Orthopaedic Center Münsingen were compared with those of patients undergoing “conventional” (transgluteal approach) THA surgery. The comparison group was collect retrospectively from the same hospital and consultants. Initially, the study was to be single-blinded; however, because of the success of the technique, the study protocol was adapted and the prospective MicroHip group compared against a retrospective collective. The two groups of patients were comparable in terms of age and BMI. The thromboprophylaxis regimen was the same for both groups: low molecular-weight heparin (LMWH) was given up to day 4, and patients were then switched to warfarin using the standard protocol. Warfarin was continued for 3 months.

Results

In the MicroHip group, blood loss was decreased by 42% and hospital stay was reduced by 2.1 days (± 0.6 days) compared with the conventional surgery group, with no change in variables other than operative technique. Cup inclination was 45.6° ($\pm 3.4^\circ$) in the conventional surgery group and 44.8° ($\pm 3.7^\circ$) in the MicroHip group. The dislocation rate was lower in the MicroHip group (0.4% compared with 3.5% in the conventional surgery group).

Gait analysis (excluding patients with additional joint problems) showed no significant difference between the operated and the non-operated leg at 5 years in 98.8% of the MicroHip group. In addition, the Harris Hip score, which is a conservative scoring system, showed a significantly better result for those patients undergoing the MicroHip technique compared with those who underwent conventional surgery (**Figure 5**). The Harris Hip score for the MicroHip group was 91.35 (vs. 78.3 in the conventional surgery group) at 3 months and 94.43 (vs. 82.4 in the conventional surgery group) at 1 year. At 5 years, the difference in Harris Hip score remained significant between the two groups ($p < 0.001$).

Figure 5. Harris Hip Score for total hip arthroplasty using the MicroHip technique compared with the conventional approach.



Complications, VTE rates, and thromboprophylaxis

There was no superficial or deep infection in either group, despite a higher infection rate for smaller incisions being suggested in the literature. This shows that by handling the soft tissue with care, there is no increase in infection rate for surgical procedures using small incisions.

Neurological complications were more frequent in the conventional surgery group (four vs. none in the MicroHip group), with the majority being dysfunctions of the sciatic nerve. There were no significant neurological problems seen in the MicroHip group, and in particular there was no neuropraxis of the femoral nerve. This had been a cause for concern as the leg was taken into a hyperextended position for implantation of the femoral component, thereby applying tension to the femoral nerve.

A difference in thrombosis risk was noted between the groups. There were two pulmonary embolisms in the conventional surgery group versus none in the MicroHip group. There was one clinically relevant deep vein thrombosis in the MicroHip group compared with three in the conventional surgery group. We suggest the below factors contribute to a decrease in the risk of venous thromboembolism (VTE):

- Trauma of the soft tissue was much less in the MicroHip group. Despite the positioning on the operating table, hyperextension of the leg is a physiological position and therefore trauma to the blood vessels is less.
- Because of the tissue-sparing procedure, patients undergoing the MicroHip technique experience much lower levels of pain, rehabilitation is quick, and return to normal gait is achieved within a short time frame.

Approximately 1 year ago, the thromboprophylaxis regimen in this author's center was changed to rivaroxaban. The introduction of rivaroxaban thromboprophylaxis increased the efficiency of the unit because of its ease of application without the need for monitoring. A high patient volume coupled with a shorter hospital stay not only reduces costs but also increases patient safety. No difference in VTE rates with rivaroxaban compared with the LMWH/warfarin regimen have been observed, but this specific question has not yet been studied.

Conclusions

The main advantages of the MicroHip technique are avoidance of the hip deltoid in an internervous plane, therefore rehabilitation is quick and outcomes have been shown to be superior to a standard transgluteal approach, even after 5 years. In the lateral decubitus position hardly any release is needed, blood loss is minimized, and no specific tools such as an extension table are involved. Therefore, not only does the surgeon have an excellent view of the acetabulum and femur, he/she also has full control over the procedure. Analysis of the 5-year results using the MicroHip technique clearly show advantages of a soft-tissue-sparing DAA over a conventional standard lateral or transgluteal approach.

The MicroHip technique is, however, a completely different procedure from any standard approach, and thus requires specific training and education of surgeons in order to protect patients from unnecessary risks.

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Disclosures

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