Technical Note

Muscle sparing anterior approach to the hip

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Abstract: The anterior approach to the hip is a muscle-sparing approach where no muscles are cut. Muscle splitting approaches, such as the direct lateral approach, anterolateral approach, or the posterior approaches require the cutting and detachment of soft tissues. The anterior approach, on the other hand, utilizes the interval between the rectus femoris muscle and tensor fasciae latae to access the hip joint. Potential benefits of the anterior approach include reduced soft tissue trauma, improved early outcomes and speed of recovery, comparable component position, and decreased dislocation rate.

Keywords: Direct anterior; hip; muscle sparing

Received: 15 December 2016; Accepted: 22 March 2017; Published: 02 May 2017.

doi: 10.21037/aoj.2017.04.03

View this article at: http://dx.doi.org/10.21037/aoj.2017.04.03

Introduction

The anterior approach is a muscle-sparing approach where no muscles are cut. Muscle splitting approaches, such as the direct lateral approach, anterolateral approach, or the posterior approaches require the cutting and detachment of soft tissues. The anterior approach, on the other hand, utilizes the interval between the rectus femoris muscle and tensor fasciae latae to access the hip joint. Advocates of this muscle sparing and intra-nervous approach suggest reduced soft tissue trauma (1-3), improved early outcomes and speed of recovery (4-7), and comparable component position (5,8) and decreased dislocation rate (9).

Reduced soft tissue trauma

Muscle sparing approaches potentially cause less soft tissue damage. Several studies (1-3) demonstrate decreases in biochemical markers of muscle damage and inflammation. Bergin *et al.* (1) prospectively analyzed biochemical markers of muscle damage and inflammation in patients treated with minimally invasive THA with an anterior (n=29) or posterior approach (n=28). Serum creatine kinase (CK), C-reactive protein (CRP), interleukin-6 (IL-6), interleukin-1 beta (IL-1β) and tumor necrosis factor-alpha (TNF-α) levels were measured preoperatively, in the post anesthesia care unit, and on postoperative days 1 and 2. They found that the levels of inflammatory markers were slightly decreased in the direct anterior approach group as compared to the posterior approach group. However, the rise in CK level in the posterior approach group was 5.5 times higher than that in the anterior approach group in the post anesthesia care unit [mean difference, 150.3 units/L (95% CI: 70.4 to 230.2); P<0.05] and nearly twice as high cumulatively [mean difference 205.0 units/L (95% CI: –46.7 to 656.8); P<0.05]. They felt this objective measurement of muscle damage and inflammation demonstrated less muscle damage with the anterior THA approach when compared with the posterior approach.

In an investigational study, Pilot *et al.* (2) evaluated specific indicators of muscle recovery in the early recovery period by comparing a mini-incision anterior approach (n=10) with the standard posterolateral approach (n=10) for a THA. They found no difference with inflammation as measured by IL-6 levels, no difference with muscle damage as measured by heart type fatty acid binding protein, and no difference in hemoglobin levels. They postulated that there were no significant negative outcomes in terms of muscle recovery with minimally invasive surgery.

Poehling-Monaghan *et al.* (3) compared the serum markers in 50 patients with the direct anterior approach and 50 patients with the mini-posterior group. Serum

markers measured included hemoglobin, hematocrit, myoglobin, CK, CRP, IL-6, and TNF-α were collected at the preoperative clinic visit and on postoperative days 1 and 2 and compared by operative details, in-hospital complications, therapy progress, pain scores, and functional results from a milestone diary. The serum markers did not predict early pain/function after THA approaches. Lesser elevations in myoglobin, CK, CRP, and IL-6 were found after the direct anterior THA. However, that difference was not clinically meaningful. In theory, decreased muscle damage can lead to improved early outcomes and increase the speed of recovery.

Improved early outcomes and speed of recovery

Regardless of approach, post-operative rehabilitation protocols for all THAs have become more aggressive. Multiple studies (4-7,10) suggest improved early outcomes and speed of recovery with the anterior approach.

In a prospective randomized kinematics study, Mayr *et al.* (4) compared a traditional anterolateral approach (n=17) with a minimally invasive direct anterior approach (n=16). They noted that the minimally invasive direct anterior patients improved in a larger number of gait parameters than patients receiving the traditional anterolateral approach. The direct anterior group showed improvement in cadence, stride time and length, walking speed, hip flexion at foot contact, maximum hip flexion in swing and hip total range of motion in the sagittal and coronal planes. The majority of improvements occurred between 6 and 12 weeks post-operatively.

Sibia *et al.* (10) evaluated 2,698 total hip replacements (1,457 direct anterior *vs.* 1,241 posterolateral) performed by five surgeons between January 2010 and June 2015. Patients in the direct anterior group had a shorter length of stay (2.3 *vs.* 2.7 days, P<0.001) and a larger proportion of patients were discharged to home (79.0% *vs.* 68.7%, P<0.001). The direct anterior group also had better Harris Hip Scores at 3- to 6-month follow-up.

Nakata *et al.* (5) compared the direct anterior approach (n=99) to the mini-posterior approach (n=96). They found a more rapid recovery in hip function and gait ability with the direct anterior approach. Patients in the direct anterior group obtained a single-leg stance of more than 5 seconds by 16.6 days (P=0.0004), a 50-m walking time of 52.3 seconds (P=0.017), and also showed improvement in the use of assistive walking aids (P=0.031) at 3 weeks postoperatively.

Klausmeier *et al.* (6) compared the short-term recovery of hip strength and motion between the anterior and anterolateral THA approaches with a control group. Hip abductor strength was lower in both of the THA groups when compared with the control group preoperatively, at 6 weeks, and at 16 weeks. The anterior approach had improved gait velocity and peak flexor moment at 6 weeks. However, they observed no differences between the two approaches for most of the isometric strength and dynamic gait measures at 6 or 16 weeks. They concluded that neither approach provided faster recovery.

In a prospective randomized study, Restrepo *et al.* (7) compared a single incision modified Smith-Peterson approach with a direct lateral approach. All the patients received the same postoperative protocol. They found that at the up to 1-year follow-up, the direct anterior group demonstrated significantly better improvement in both the mental and physical health dimensions of Short Form-36 and Western Ontario McMaster Osteoarthritis Index compared with direct lateral approach group. At 2 years follow-up, the results in both groups were the same.

Comparable component position and low dislocation rate

Dislocations are a leading early complication after THA, and surgical approach and implant positioning are factors that influence THA stability. Dislocations in anterior hip approaches are low (0.6%; 95% CI: 0.4–0.9%) (9).

Matta *et al.* (8) evaluated a series of 494 consecutive THAs done through a single, tissue sparing anterior approach. Radiographic analysis showed an average abduction angle of 42°, with 96% in the range of 35° to 50° abduction. The average cup anteversion was 19° with 93% within the target range of 10° to 25°. Three patients had dislocations for an overall dislocation rate of 0.61%. They felt that the anterior technique allowed accurate and reproducible component positioning and leg-length restoration and did not increase the rate of hip dislocation.

Nakata *et al.* (5) compared 99 direct anterior hips with 96 mini-posterior hips. They found that 99% of the cups in the direct anterior group and 91% in the mini-posterior group had been implanted within the safe zone (P=0.008).

De Geest *et al.* (9) did a systematic review of the published literature to evaluate cumulative risk incidence of intra- and post-operative complications. They found that dislocations from anterior THA approaches are low (0.6%; 95% CI: 0.4–0.9%). Bhandari *et al.* (11) conducted

a mutli-center observational study of THA done with the anterior approach and reported that eight of 1,277 hips (0.6%) suffered dislocations. The anterior muscle sparing approach allows for reproducible component positioning and a corresponding low dislocation rate.

Conclusions

Muscle-sparing anterior approaches provide a safe and potentially less traumatic approach to THA that can lead to rapid recovery.

Acknowledgments

Funding: None.

Footnote

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/aoj.2017.04.03). CCY serves as an unpaid Associate Editor of *Annals of Joint* from Dec 2016 to Dec 2018. The other author has no conflicts of interest to declare.

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doi: 10.21037/aoj.2017.04.03
Cite this article as: Daines BK, Yang CC. Muscle sparing anterior approach to the hip. Ann Joint 2017;2:13.