Minimally Invasive Anterior Approach for Total Hip Arthroplasty

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The literature, in general, makes numerous positive claims regarding minimally invasive total hip arthroplasty (THA), including the mini-incision anterior approach with a fracture table (MIAAFT THA): less soft tissue damage, shorter surgery time, less pain, quicker recovery and return to unassisted ambulation, and reduced risk of dislocation with early elimination of hip precautions1-14.

Most of the published reports regarding MIAAFT THA are produced by orthopaedic innovators who specialize in joint arthroplasty, not community-practice orthopaedists [1]. There is a clear discrepancy in the outcomes based on training and experience. This should not be confused with a lack of promise for the surgical technique itself.

Recent Report from Community-Practice Orthopaedists

In contrast to other published data2, 3, 15-20, a recent report by Woolson et al. presents the short-term results from a group of five community-practice orthopaedists using MIAAFT THA1. In a retrospective review of 231 patients (247 hip replacements) compared to innovator results, surgery time was twice as long, blood loss was twice as large, and major complication rate was six times as great4, 15. The main goal in changing from a conventional posterior approach was to reduce postoperative dislocations following total hip arthroplasty; the results regarding dislocation were very good with none reported for MIAAFT THA1. A serious flaw in this report, given that dislocation rates prior to implementing MIAAFT THA were not reported, is the difficulty in making any quantitative conclusions regarding the stated goal of reducing postoperative dislocations.

Four of the five surgeons trained by visiting one innovator surgeon and observing the procedure. The fifth surgeon did not observe the procedure with an innovator surgeon. None of the surgeons received formal cadaver or laboratory training before performing the procedure on patients1.

The final paragraph states: “The serious nature of the complications that occurred during this anterior approach study brings into question whether the procedure is actually minimally invasive for community practice surgeons. This procedure may not be safe in the hands of surgeons who do not specialize in hip arthroplasty unless extensive training in the technique is done before performing the procedure on patients1.”

Reported Results from Arthroplasty Innovators

There are two earlier reports on MIAAFT THA that focused primarily on the safety of the procedure, i.e. dislocation and complication rates. Siguièr et al. explored the possibility that mini-incision anterior approach increases dislocation rate in a study of 1037 primary total hip arthroplasties2. Their dislocation rate was 0.96%, this compares quite favorably with published dislocation rates for other surgical approaches ranging from 0.4% to 11% and with U.S. Medicare data reports of 3.9% in the first six months for primary THA2, 15, 21. Although standard radiographs were not sufficient to determine acetabular and femoral component positioning, the mini-incision anterior approach provides adequate patient positioning and it preserves muscular potential thus contributing to dynamic stabilization of the hip2. Memminger and Bombelli reported on the early results for 34 MIAAFT THA16. There were two incidents of transient thigh numbness, one greater trochanter fracture, and one femoral nerve palsy16. No dislocations were reported in this study16.

As innovators began to accumulate sufficient data on minimally invasive techniques, published studies included surgery time, blood loss, and length of hospital stay. In a report
by Matta et al., 494 primary MIAAFT THAs experienced three dislocations (0.61%), none of which required reoperation. The dislocations did not create an increase in dislocation rate compared to past experience. There were 14 intraoperative fractures (2.8%), including three ankle fractures early in the series in elderly, osteoporotic female patients. Average surgery time was 75 minutes, average blood loss was 350 mL, and average hospital stay was three days. Yerasimides & Matta reported on 657 primary MISAAFT THA performed between 1996 and 2005; average surgery time was 80 minutes, and the median hospital stay was 4 days. Their complication rate was 2.13% with 14 fractures, one deep infection, one femoral nerve palsy, and three (4.57%) early dislocations. Bradley presented the results for the first 100 cases performed using the MIAAFT THA technique. The first case performed required 210 minutes of surgery time, sometime between the fifteenth and twentieth patients; that declined to 70 minutes and remained steady throughout the rest of the series. Hospital stay was less than three days, compared to over five days for a conventional posterior approach. Few patients required intermediate care facilities, less than 20%, possibly due to the reduced soft tissue damage and the early weight-bearing ambulation allowed with MIAAFT THA. There were three complications requiring readmission (3%): one dislocation, one unstable acetabular component, and one superficial wound breakdown. There were three additional dislocations, none of them recurrent.

More recently, since 2007, there have been six studies reporting the outcomes of MIAAFT THA. Paillard et al. described good exposure with little trauma to soft tissues using MIAAFT THA, although there was no detailed description of patient outcomes. Patients experienced fast postoperative recovery with nearly all patients achieving full weight-bearing on the first day after surgery. Other positive results with MIAAFT THA included no hip limp and almost no risk of dislocation. Roué et al. looked at the influence of BMI in a group of 88 MIAAFT THA (87 patients); 41 patients had BMI less than 25 and the other 46 had BMI greater than or equal to 25. Although outcomes did not demonstrate an influence from BMI, bleeding and operative times were correlated to BMI. Basically, Roué et al. agree that it seems logical that BMI should make a difference, but their data does not support BMI as an exclusion variable in MIAAFT THA. Bal and Vallurupalli reported on the early outcomes of 100 consecutive patients. They concluded that MIAAFT THA, with soft tissue dissection being entirely within muscular planes, given proper surgeon training is safe and efficacious.

Sariali et al. conducted a prospective study of 1764 MIAAFT THA investigating the incidence of dislocation after using the Heuter approach. There were 27 (1.5%) dislocations with the following factors correlating to those dislocations: male gender, high BMI, osteonecrosis, low femoral head diameter, high bleeding, and low postoperative range of motion. Berend et al. reported on the outcomes for 207 MIAAFT THA: operative time was 69 minutes, average blood loss was 155 mL, and there were eight complications, none of which were dislocations. Most patients, 79%, were discharged directly to home instead of extended care facilities. At six-week follow-up, Harris Hip Score was 80 points and Lower Extremity Activity Scale was 8.6. Matta et al., one of the most experienced groups regarding MIAAFT THA, detailed the perioperative complications, cost and return to independent function for 294 THA. The average operative time per hip was 69 minutes, average blood loss was 289 mL, average length of hospital stay was four days, and average days to ambulation was 17 days. There have been no revisions, no significant wear, no loosening, and no osteolysis to date. There were 4 direct surgical complications including one femoral nerve palsy, one dislocation, and one calcar crack. Using the MIAAFT THA procedure, there have been no deep infections and no recurrent dislocations.

Conclusions

It is clear from the bulk of published studies that any surgeon using MIAAFT THA benefits from extensive training. The need for extensive training in new surgical techniques is not unique to MIAAFT THA. Public desire for minimally invasive surgery certainly drives the change over to such procedures, but they should be approached with great caution. The advantages to MIAAFT THA are attainable in experienced hands: less soft tissue damage, reduced surgery time, fewer dislocations, early elimination of hip precautions and faster return to function are desirable to all.

The early experience, ‘learning curve’ and technical complications of the modified Smith-Peterson anterior approach are emphasized. Given the consistently reported 95% to 98% success rate of conventional hip arthroplasty it is imperative to make any change with foresight and then to document the consequence of that change. Surgical technique should not dictate implant choice. This report sheds light on the very early result of a change only to the surgical approach to total hip arthroplasty. Woolson et al. state that “training and experience are crucial to successfully performing this minimally invasive surgical technique, so there is a learning curve for the surgeon and...
the team. But one can always start with a regular incision length and decrease it when getting familiar with the approach.

Many orthopaedists are using procedures and technologies not available during their formal residency training. AAOS encourages practicing orthopaedic surgeons to obtain certain CME credits annually and encourages attendance at cadaver and bio-skills laboratory centers such as that established in Chicago and other locations, as well as encouraging communications between peers and visits to innovators to learn new concepts and learn how to safely use new techniques and technologies.

The recent article from Woolson et al. does not answer the question “should community-hospital orthopaedists use MIAAFT THA,” although some may interpret their article as an example or reason why community-hospital orthopaedists should not use MIAAFT THA. The question is not “should this technique be used,” the question is “how should this technique be introduced and implemented?”

### Advantages of MIAAFT THA compared to conventional THA

- Good access to acetabulum and femur through one incision
- Preservation of hip muscular attachments and the hip deltoid
- Improved control of acetabular cup position and leg length
- Hip dislocation precautions not needed postop
- Improved ability to perform bilateral THA because no need to redrape and reposition patient
- Allows placement of cemented and cementless femoral stems
- Can be used in all patients regardless of BMI

### Disadvantages of MIAAFT THA compared to conventional THA

- Definite learning curve
- Quick success requires training and preceptorship

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**Table 1: Complications using the mini-incision anterior approach with fracture table for total hip arthroplasty.**

<table>
<thead>
<tr>
<th></th>
<th>MIAAFT THA</th>
<th>Complications</th>
<th></th>
<th>Dislocations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>rate</td>
<td>%</td>
<td></td>
<td>rate</td>
</tr>
<tr>
<td>Berend et al.³</td>
<td>258</td>
<td>8</td>
<td>3.10%</td>
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<tr>
<td>Bradley¹⁸</td>
<td>102</td>
<td>6</td>
<td>5.88%</td>
<td>4</td>
</tr>
<tr>
<td>Mast et al.²⁰</td>
<td>294</td>
<td>4</td>
<td>1.36%</td>
<td>1</td>
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<tr>
<td>Matta et al.¹⁵</td>
<td>494</td>
<td>20</td>
<td>4.05%</td>
<td>3</td>
</tr>
<tr>
<td>Memminger &amp; Bombelli¹⁶</td>
<td>34</td>
<td>4</td>
<td>11.76%</td>
<td>0</td>
</tr>
<tr>
<td>Sariali et al.¹⁹</td>
<td>1764</td>
<td>27</td>
<td>1.53%</td>
<td>27</td>
</tr>
<tr>
<td>Siguier et al.²</td>
<td>1037</td>
<td>21</td>
<td>2.03%</td>
<td>10</td>
</tr>
<tr>
<td>Yerasimides &amp; Matta¹⁷</td>
<td>657</td>
<td>19</td>
<td>2.9%</td>
<td>3</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td>4640</td>
<td>109</td>
<td>2.35%</td>
<td>48</td>
</tr>
<tr>
<td>Woolson et al.¹</td>
<td>247</td>
<td>39</td>
<td>15.79%</td>
<td>0</td>
</tr>
</tbody>
</table>
References


17. Yerasimides JG, Matta JM: Primary total hip arthroplasty with a minimally invasive anterior approach. Sem Arthrop, 16: 186-190, 2005


25. http://www.aaos.org/about/about.asp