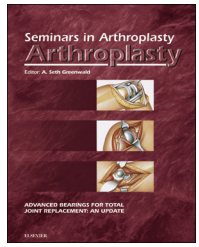
Seminars in Arthroplasty ▮ (2017) ▮▮▮–▮▮▮

Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/sart



The anterior approach: Better, faster, and cheaper—Affirms

*Alexander J. Tauchen, MD, and William G. Hamilton, MD**

Anderson Orthopaedic Research Institute, 2501 Parkers Lane, Alexandria, VA 22306

ARTICLE INFO

Keywords:
Total hip
Anterior approach

ABSTRACT

Total hip arthroplasty is among the most common procedures performed by orthopedic surgeons and there are many different surgical approaches that can be used. The direct anterior approach offers numerous benefits when compared to other surgical approaches. Some of these include an inter-muscular plane that avoids violating the abductors, minimal soft-tissue disruption, easy use of fluoroscopy with resultant improved component positioning, earlier functional recovery, and potential cost savings. While the procedure does have a learning curve and takes time to master, it is a safe approach for total hip arthroplasty that yields excellent clinical outcomes.

1. Introduction

Total hip arthroplasty (THA) is among the most common surgeries performed by orthopedic surgeons and there is a projected increased need in the near future [1]. While there are numerous surgical approaches described for this procedure, the direct anterior approach (DAA) offers benefits over other approaches. Originally described in 1883 in Germany by Heuter, the anterior approach was brought to the United States by Smith-Peterson in 1917 and used primarily in the treatment of hip dysplasia [2–4]. The procedure was further described by Keggi in 1980 and has since evolved to become today's DAA [5,6].

There has been a marked increase in use of the DAA for THA in the United States over the past several years [7] (Fig). The DAA offers numerous advantages not afforded by other approaches. The inter-muscular plane avoids violation of the abductor musculature and preserves the "hip deltoid," which is the gluteus maximus and tensor fascia lata. There is minimal disruption of the posterior stabilizing structures and the sciatic nerve is not endangered. There is less kinking of the vessels compared to the posterior approach, so there may be lesser risk for venous thromboembolism [8]. Supine positioning affords easier access to the patient for the anesthesiologist and facilitates the use of intra-operative fluoroscopy, which has been shown by multiple investigators to result in improved cup positioning compared to other approaches [9–13]. Perhaps most important to patients, the DAA results in improved short-term recovery and less need for assistive devices [11,14–24].

Critics of the DAA cite an unacceptably high complication rate and a steep learning curve associated with mastering the procedure [24–27]. Longer operative times, increased blood loss, increased wound complications, and an increased femoral fracture rate are among the cited complications of surgeons who have taken on the DAA. While any new surgery may have an associated learning curve, there is evidence to show that with the proper training, patient selection, and appropriate case volume, the DAA is very safe with a low complication rate [12,21,28].

2. Better/Faster

Since the DAA gained popularity around the mid-to-late 2000s, there has been endless debate over whether or not

* *Corresponding author*.
E-mail address: billhamilton@cox.net (W.G. Hamilton).

http://dx.doi.org/10.1053/j.sart.2017.03.005
1045-4527/

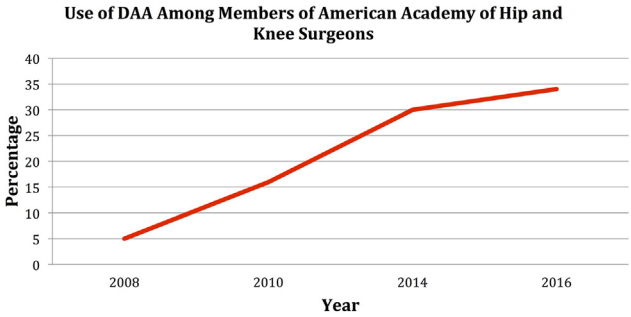


Figure – Use of DAA among members of American Academy of hip and knee surgoens.

the approach is in fact a "better" way to perform THA. "Better" can mean many different things to different people. Over the years, the DAA has received a remarkable amount of positive press on the Internet and in major newspapers such as *The Wall Street Journal*, *The New York Times*, and *The Washington Post*. As a result, patients increasingly request the DAA when they go to their orthopedic surgeon when it is time for a hip replacement. While Internet and news articles are often flawed and unscientific, there is now evidence to support the claim that the DAA is "better" by some measures compared to other approaches.

One of the main claims made about the DAA is that it results in earlier functional recovery, a claim now supported in the literature. Nakata et al. [11] demonstrated that when compared to a mini-posterior approach (MPA), the DAA resulted in a statistically significant decrease in the use of walking aids by 3 weeks post-operatively. Zawadsky et al. [14] showed a similar finding of less use of assistive devices at 6 weeks when comparing DAA to MPA. When compared to the MPA and standard posterior approach (PA), DAA patients voluntarily discontinued use of their assistive devices an average of 6–10 days earlier [18,22]. Rodriguez et al. [15] reported improved early functional recovery when comparing DAA to PA as measured with a timed up and go (TUG) test as well as the motor component of the Funtional Independence Measure (M-FIM). Parvizi et al. [16] showed similar results in their series with the TUG test and also showed faster gait speed when comparing DAA to direct lateral (DL). Restrepo et al. [29] also compared the DAA to DL and demonstrated improved functional outcomes in the DAA group for up to one year following surgery. Barrett et al. [19] demonstrated that more DAA patients were climbing stairs normally and walking unlimited distances at 6 weeks post-operatively than PA patients. Berend et al. [20] reported significantly higher Harris hip scores and higher lower-extremity activity scale scores at 6 weeks for DAA patients versus minimally invasive direct lateral (MDL) approach patients. A recent meta-analysis by den Hartog et al. [21] that included 64 studies found strong evidence for faster post-operative recovery and less need for assistive devices with DAA. There is no shortage of evidence that early functional recovery is better with the DAA compared to other surgical approaches.

In addition to earlier functional recovery, there is also evidence to support the claim that DAA patients may have less pain following surgery. Barrett et al. [19] demonstrated lower Visual Analog Scale (VAS) pain scores on post-operative day one when comparing DAA to PA. There may be a greater decrease in VAS scores when comparing pre-operative scores to post-operative scores for the DAA [22]. Zawadsky et al. [14] reported significantly lower VAS scores at 2 weeks post-operatively when comparing DAA to PA as well as lower narcotic pain medicine requirements at 2 weeks and 6 weeks.

While earlier short-term functional recovery and lower pain scores are substantial benefits to the patient, there are advantages of the DAA for the surgeon as well. One of the main advantages is that the supine positioning easily facilitates the use of intra-operative fluoroscopy to confirm cup position and limb length [6]. Cup position is critical to the success of a THA as improper cup position may lead to dislocation and/or early component wear [9,30].

Hamilton et al. compared cup abduction and anteversion angles between DAA using fluoroscopy and standard PA and found that DAA with intra-operative fluoroscopy allowed more accurate and consistent cup placement. It also eliminated cups with abduction angles $>55^{\circ}$ that were seen in some PA hips [9]. Multiple other studies have confirmed that the use of intra-operative fluoroscopy leads to more accurate and more consistent cup placement [10,12,13]. While fluoroscopy provides clear advantages, it does require time to learn how to use it properly. Improper interpretation of the data provided by fluoroscopy can lead to malpositioned cups.

Likely related to less disruption of the "hip deltoid" and posterior stabilizing structures, dislocation rates have been shown to be lower following DAA THA when compared to PA. Higgins et al. performed a systemic review and meta-analysis of DAA versus PA for THA that included 17 studies and over 2300 patients. Among their findings was that DAA hips were significantly less likely to dislocate in comparison to PA hips [31].

3. Cheaper

A major focus of current research in all areas of medicine is cost. Healthcare costs are rising and there is a great deal of research going into how to contain costs. One way to decrease costs is to decrease the length of inpatient stay following surgical procedures. There is evidence that DAA patients spend less time in the hospital post-operatively on average compared to other approaches [14,16,22,23,31,32]. Petis et al. [33] conducted an analysis of in-hospital costs (intra-operative plus hospital stay) and found that the DAA was significantly less expensive when compared to the PA and DL.

While shorter length of stay and intra-operative costs are major areas where money can be saved, there are other potential possibilities. Parvizi et al. [16] reported that greater than two-thirds of their DAA patients did not require any physical therapy following discharge from the hospital. The cost savings from decreased use ancillary services following surgery may be substantial. In addition, these authors found a faster return to work for DAA patients compared to DL patients, which has its own positive economic implications.

Critics of the DAA cite an increased complication rate compared to other surgical approaches, most commonly during the time when a surgeon is first adopting the procedure, that may lead to increased overall costs [24,25,34].