Internet Promotion of Direct Anterior Approach Total Hip Arthroplasty by Members of the American Association of Hip and Knee Surgeons

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Introduction:
The Direct Anterior approach (DAA) in total hip arthroplasty (THA) is of significant interest to both patients and surgeons, largely due to intense marketing. This study addressed the question, ‘What is the level of promotion of DAA THA on the internet by American Association of Hip and Knee Surgeons (AAHKS) members?’

Methods:
An internet search was performed to identify surgeon-specific websites for each member of the AAHKS using the members’ full name and a previously published set of criteria. Each website was evaluated utilizing a questionnaire to systematically identify claims made regarding proposed DAA specific risks, benefits, as well as the presence/absence of supporting data.

Results:
We identified 1,855 qualified websites. The DAA was referenced on 22.8% (423/1,855) of these websites. Claims regarding DAA specific benefits included; less invasive/muscle sparing (46.3%), quicker recovery (45.2%), decreased pain (28.1%), decreased hospital stay (22.0%), and decreased dislocation risk (16.3%). Potential DAA risks including lateral femoral cutaneous nerve injury, peri-prosthetic/greater trochanteric fracture, and wound complication/hematoma were addressed on only 4.7%, 3.1%, and 1.7% of websites, respectively. Supporting peer-reviewed literature was identified on only 3.6% of DAA websites.

Conclusions:
Over one fifth of AAHKS members promoted the DAA on the internet. Member websites claimed DAA benefits such as faster recovery and decreased pain approximately nine times more frequently than any potential risk of the procedure (p < 0.001). While AAHKS policy does not regulate member marketing, it is the responsibility of all orthopaedic surgeons to disseminate accurate, validated information concerning the procedures we perform.
Introduction

Total hip arthroplasty (THA) is one of the most successful surgical procedures in orthopaedics, allowing patients with intractable pain and functional disability to return to higher levels of activity and experience an improved quality of life\(^1\)-\(^2\). Numerous long-term follow up studies have identified extremely high clinical success rates in terms of pain reduction, functional improvement, and satisfaction utilizing traditional approaches to the surgery. In an era of decreasing reimbursement and bundled payments, surgeons and hospital systems are increasingly motivated to search for techniques to further reduce recovery time, post-operative pain, and hospital stay, while maintaining the excellent outcomes and safety profile of traditional methods. The direct anterior approach (DAA) to THA has garnered significant attention in part due to claims that the approach is associated with less muscle damage and pain as well as accelerated recovery after hip arthroplasty\(^3\). Although there has been a surge in popularity and widespread adoption and promotion of DAA THA by surgeons, hospitals, and industry\(^2\), there are few studies which establish long-term clinically significant benefits, safety, and efficacy. Despite claims of superiority and significant marketing, several studies have been published raising concerns regarding nerve damage\(^4\)-\(^6\), muscle damage\(^7\),\(^8\), blood loss\(^9\), wound problems\(^10\), femoral failure\(^11\), and a technical learning curve\(^12\)-\(^14\).

The internet has become an important tool for patients to learn about their general medical conditions and orthopaedic concerns. Moreover, public perception of the importance of the internet as a source of health information has risen substantially\(^15\). Surgeon websites are an increasingly important venue to market skills and attract new patients. There is little regulatory oversight regarding the validity of claims made on these websites. As physicians, it is the responsibility of the each member of the American Association of Hip and Knee Surgeons (AAHKS) to endorse and promote accurate, validated information to our patients.
With this in mind, our study had a 2-fold purpose: (1) to evaluate the level of promotion of DAA THA available via internet sites associated with AAHKS members, and (2) analyze the extent of specific claims made regarding DAA THA risks and benefits, and support from peer-reviewed literature.

**Materials and Methods**

In January 2016, 1,673 active fellow members of AAHKS were identified using the AAHKS membership directory at [http://www.aahks.org](http://www.aahks.org). We subsequently performed an internet search for personalized websites associated with each AAHKS member. The search engine Google was used, with the physician’s name as the main keyword.

After the initial search, we examined potential websites for 7 criteria: physician picture, biosketch, contact information, affiliations, specialty, certifications/education, and interests/research. If at least 4 of the 7 criteria were found on the web site, it was included in the study. Utilizing a modification of a previously published questionnaire (see appendix), each website was then evaluated for claims made regarding the DAA THA specific benefits, risks, and supporting literature. Study websites were further classified based on the U.S. region in which AAHKS Fellows practiced using the U.S. Census Bureau regions Midwest, Northeast, South, and West ([https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf](https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf)). If a surgeon was found to have three or more web sites which met inclusion criteria, the two web sites which met the greatest number of the 7 criteria were included in the analysis.

DAA THA information was often found on institutional websites linked peripherally to a physician’s primary website. Therefore, we made an effort to distinguish between claims made by a physician (direct claims) versus claims associated with the physician but endorsed by an institution (indirect claims). Claims found on the primary physician website or within 2 clicks away from the primary site are more likely to be interpreted by a patient as being endorsed by the surgeon and were included in the analysis. Claims and information linked more peripherally to the surgeon website were
not included in this analysis. Previously published reports\textsuperscript{16-18} set the precedent for this distinction, and it was used to minimize arbitrary evaluation of surgeon sites.

Results

Fifty (3.0\%) of the 1,673 members of AAHKS in our review did not have an internet presence. We identified 1,855 web sites associated with 1,623 AAHKS members for study inclusion. Study websites were classified as private practice/clinic (n = 979; 52.8\%), surgeon specific/personnel (n = 253; 13.6\%), university system/hospital (n = 257; 13.9\%), non-university hospital (n = 351; 18.9\%), and other (n = 15; 0.8\%). Other websites consisted of organizational directory, foundation/institute, and industry websites. Table 1 shows the breakdown of the 1,855 internet sites by U.S. region and territory. The largest number of internet sites reviewed (616; 33.2\%) were related to AAHKS Fellows from the Southern U.S., followed by the Midwest (444; 23.9\%), West (431; 23.2\%) and Northeast (359; 19.4\%) U.S. Five additional sites (0.3\%) were maintained by members in a U.S. territory.

Overall, the DAA was mentioned on 22.8\% (n = 423) of the 1,855 internet sites in our review. By comparison, the anterolateral (n = 43) and posterior (n = 87) approaches to THA were mentioned on 2.3\% and 4.7\% of sites, respectively ($X^2 = 520.5, p = 0.00001$). Figure 1 shows the proportion of internet sites mentioning the DAA by region and territory. Excluding U.S. territories due to low cell counts, the prevalence of internet mention of the DAA did not statistically differ by U.S. region ($X^2 = 2.200, p = 0.532$).

For internet sites on which the DAA was mentioned, Table 2 presents the proportion overall and by U.S. region that explained the DAA to hip replacement. Explanation of the DAA ranged from a low of 34.7\% in the South to a high of 47\% in the Northeast but did not statistically differ based on region ($p = 0.313$). Table 2 also presents the proportion of internet sites by region that promoted various benefits of the DAA. In general, few internet sites made a direct claim that the DAA approach was the best approach to THA, but sites associated with Western Fellow Members of AAHKS were significantly more
likely to do so than sites in other regions of the country (Table 2, $p = 0.006$). Internet mention of 12 specific benefits associated with the DAA did not statistically differ by region (Table 2, $p \geq 0.174$); but less tissue damage/minimally invasive/muscle sparing and faster recovery/earlier independence were the most frequently mentioned benefits (45% or more of all sites). The least frequently mentioned benefit was lower risk of revision (1 to 2% of sites).

Few internet sites referenced any DAA specific risks, and the proportion doing so did not vary by region (Table 2, $p \geq 0.103$). Overall, 4.7% of sites mentioned the risk of lateral femoral cutaneous nerve injury, 3.1% mentioned femoral or trochanter fracture, 1.7% mentioned hematoma and wound healing problems, and 0.7% mentioned increased radiation exposure. Citation of peer-reviewed literature in support of benefits and risks associated with the DAA was relatively rare, ranging from a low of 1.3% of Southern U.S. internet sites to a high of 7.2% of Northeast U.S. internet sites ($p = 0.068$) (Table 2).

Internet mention of the DAA also was examined in relation to website classification. Of all DAA mentions on the internet ($n = 423$), 53.7% were made on private practice/clinic websites, 21.0% were made on surgeon specific/personnel websites, 15.1% were made on non-university hospital websites, 10.2% were made on university system/hospital websites, and none were made on websites classified as other ($X^2 = 36.067$, $p < 0.001$).

**Discussion**

Under the auspices of improved patient care and enhanced outcomes, novel techniques and designs are continuously being introduced in total joint arthroplasty, often with dubious levels of vetting and variable amounts of success. In recent years, minimally invasive surgery\(^{19}\), computer assisted surgery\(^{20}\), robotic assisted surgery\(^{21}\), increased modularity\(^{22}\), alternative bearings\(^{23-25}\), alternative approaches\(^{26}\), and alternative fixation\(^{27,28}\), have been rapidly adopted into mainstream practice, some with excellent results, and others with unexpected consequences.
The DAA to hip replacement has been widely marketed to patients with claims of improved stability, less muscle damage, and greater overall superiority compared to other surgical approaches for THA. In our study, over one fifth of AAHKS members promoted the DAA on the internet. Previous studies have documented that marketing has biased claims of superiority without reference to peer-reviewed literature. Personal computers provide open access to an abundant quantity of medical information via the internet, but the quality of information is often uncertain. The promise of quicker recovery, improved function, and less pain motivating many patients to seek out the DAA to THA may be tied to marketing which provides an incomplete picture of the risks and benefits associated.

Mohan et al evaluated online information regarding the DAA in THA in 2015, and found that most websites presented the DAA as “better” than other approaches, while only 35% described risks of the approach, concluding that websites provide a limited perspective and may be focused on attracting patients as opposed to accurate education. In our study, AAHKS member websites claimed DAA benefits such as faster recovery and decreased pain approximately nine times more frequently than any potential risk of the procedure (p < 0.001).

Recent studies evaluating the DAA have identified improved physical function for somewhere between 6 days and 3 months. In a randomized, prospective, controlled trial, Taunton et al found that patients receiving the DAA THA more rapidly discontinued the use of walking aids by 6 days, with little additional benefit identified when compared to a posterior approach. Rodriguez et al observed potential functional advantages early in recovery with a DAA cohort at 2 weeks, but cautioned that these results may not be generalizable in a low-volume practice or during a surgeon’s learning curve. In 2016, Graves et al found modestly improved physical function in a DAA cohort at 3 months, but later concluded that greater blood loss and transfusion rate may obviate this transient benefit. Our study found that over one fifth of AAHKS members promoted the DAA on the internet, with 45.2% of these sites claiming faster recovery/earlier independence, often without addressing the modest and transient
nature of this benefit. We identified claims such as shorter hospital stay (22.0%), less pain (28.1%), and
less tissue damage/minimally invasive (46.3%), which are not well substantiated in the scientific
literature. Additionally, these outcomes are arguably as dependent on the hospital system, surgeon
skill, and pain protocols and not necessarily specific to surgical approach alone.

While modest, early functional benefit of the DAA THA may be real, this should be juxtaposed with
recent literature which suggests that the approach is associated with increased peri-prosthetic
fracture, femoral loosening, early revision rates, and incisional wound healing problems. Warth et al.16 evaluated internet promotion of minimally invasive TKA by AAHKS members in 2007, and found
that only 8.4% of surgeon websites referenced this technique. Importantly, 25% of sites identified by
the study addressed MIS-specific risks in TKA. While the increased internet presence of AAHKS
members observed in the current study (22.8% v. 8.4%) is not surprising, the rarity with which well-
documented DAA-specific risks were acknowledged demonstrates a lack of transparency on websites
presumably endorsed by AAHKS surgeons.

There are several limitations to the current study. The internet is a dynamic entity, and in
perusing thousands of websites over the course of just a few months, we provide a snapshot in time
which has the potential to change significantly. We would argue that such promotion will continue to
increase, and may be underreported by the current evaluation, as it does not incorporate promotion by
generalist or sports medicine physicians who may be utilizing and marketing the technique. Of note, it
is likely that a substantial number of surgeons are not intimately involved in the content or quality of
information which may be present on their website. In addition, it should be noted that surgeons are
more likely to specifically address DAA specific risks and benefits in the clinical setting when counselling
a patient pre-operatively.

The current study demonstrates that internet marketing of DAA THA preferentially highlights
several potential benefits of the approach, many of which are scientifically unproven, and often without
acknowledging well documented DAA specific risks. While the direct anterior approach is certainly a viable option in THA, internet marketing paints an incomplete picture for public consumption which may give potential patients a false perception of superiority of the DAA THA over traditional approaches. While AAHKS policy does not regulate member marketing, it is the responsibility of all orthopaedic surgeons to disseminate accurate, validated information concerning the procedures we perform.
Table 1: Number of Fellow Members and Internet Sites, Overall and by U.S. Region/Territory

<table>
<thead>
<tr>
<th>Region/Territory</th>
<th>No. of Fellow Members</th>
<th>No. of Websites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>1625</td>
<td>1855</td>
</tr>
<tr>
<td>Midwest Region</td>
<td>381</td>
<td>444</td>
</tr>
<tr>
<td>Northeast Region</td>
<td>339</td>
<td>359</td>
</tr>
<tr>
<td>South Region</td>
<td>551</td>
<td>616</td>
</tr>
<tr>
<td>West Region</td>
<td>349</td>
<td>431</td>
</tr>
<tr>
<td>U.S. Territory</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 1
Table 2: Benefits and Risks Provided on Internet Sites that Mentioned the Direct Anterior Approach, Overall and by U.S. Region

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Midwest Region</th>
<th>Northeast Region</th>
<th>South Region</th>
<th>West Region</th>
<th>X²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of sites that mentioned the DAA</td>
<td>423</td>
<td>91</td>
<td>83</td>
<td>150</td>
<td>99</td>
<td>2.200</td>
<td>0.532</td>
</tr>
<tr>
<td>DAA explained</td>
<td>38.3</td>
<td>37.4</td>
<td>47.0</td>
<td>34.7</td>
<td>37.4</td>
<td>3.559</td>
<td>0.313</td>
</tr>
<tr>
<td>Benefits Claimed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct claim that DAA is best approach</td>
<td>1.9</td>
<td>0.0</td>
<td>1.2</td>
<td>0.7</td>
<td>6.1</td>
<td>12.452</td>
<td>0.006</td>
</tr>
<tr>
<td>Less tissue damage/minimally invasive/muscle sparing</td>
<td>46.3</td>
<td>46.2</td>
<td>42.2</td>
<td>48.7</td>
<td>46.5</td>
<td>0.909</td>
<td>0.823</td>
</tr>
<tr>
<td>Less blood loss</td>
<td>6.9</td>
<td>4.4</td>
<td>8.4</td>
<td>6.0</td>
<td>9.1</td>
<td>2.133</td>
<td>0.545</td>
</tr>
<tr>
<td>Less pain</td>
<td>28.1</td>
<td>30.8</td>
<td>26.5</td>
<td>26.7</td>
<td>29.3</td>
<td>0.647</td>
<td>0.886</td>
</tr>
<tr>
<td>Less medication</td>
<td>3.1</td>
<td>0.0</td>
<td>4.8</td>
<td>3.3</td>
<td>4.0</td>
<td>4.080</td>
<td>0.253</td>
</tr>
<tr>
<td>Faster recovery/Earlier independence</td>
<td>45.2</td>
<td>39.6</td>
<td>44.6</td>
<td>44.7</td>
<td>51.5</td>
<td>2.793</td>
<td>0.425</td>
</tr>
<tr>
<td>Better mobility/range of motion outcomes</td>
<td>12.1</td>
<td>15.4</td>
<td>14.5</td>
<td>7.3</td>
<td>14.1</td>
<td>4.964</td>
<td>0.174</td>
</tr>
<tr>
<td>Shorter surgery time</td>
<td>3.6</td>
<td>3.3</td>
<td>2.4</td>
<td>3.3</td>
<td>5.1</td>
<td>1.005</td>
<td>0.800</td>
</tr>
<tr>
<td>Shorter hospital stay</td>
<td>22.0</td>
<td>18.7</td>
<td>25.3</td>
<td>22.7</td>
<td>21.2</td>
<td>1.186</td>
<td>0.756</td>
</tr>
<tr>
<td>Safer/fewer complications</td>
<td>5.4</td>
<td>3.3</td>
<td>6.0</td>
<td>4.7</td>
<td>8.1</td>
<td>2.385</td>
<td>0.496</td>
</tr>
<tr>
<td>Lower dislocation risk</td>
<td>16.3</td>
<td>20.9</td>
<td>20.5</td>
<td>14.7</td>
<td>11.1</td>
<td>4.707</td>
<td>0.195</td>
</tr>
<tr>
<td>Lower revision risk</td>
<td>1.4</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>2.0</td>
<td>0.358</td>
<td>0.949</td>
</tr>
<tr>
<td>Less likely to have leg length discrepancy</td>
<td>7.8</td>
<td>6.6</td>
<td>7.2</td>
<td>10.7</td>
<td>5.1</td>
<td>2.976</td>
<td>0.395</td>
</tr>
<tr>
<td>Risks Mentioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral femoral cutaneous nerve injury</td>
<td>4.7</td>
<td>2.2</td>
<td>7.2</td>
<td>4.0</td>
<td>6.1</td>
<td>3.013</td>
<td>0.390</td>
</tr>
<tr>
<td>Femoral or trochanter fracture</td>
<td>3.1</td>
<td>0.0</td>
<td>6.0</td>
<td>2.7</td>
<td>4.0</td>
<td>5.706</td>
<td>0.127</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1.7</td>
<td>0.0</td>
<td>2.4</td>
<td>0.7</td>
<td>4.0</td>
<td>6.184</td>
<td>0.103</td>
</tr>
<tr>
<td>Wound healing problems</td>
<td>1.7</td>
<td>0.0</td>
<td>2.4</td>
<td>1.3</td>
<td>3.0</td>
<td>3.068</td>
<td>0.381</td>
</tr>
<tr>
<td>Increased radiation exposure</td>
<td>0.7</td>
<td>0.0</td>
<td>1.2</td>
<td>0.7</td>
<td>1.0</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Peer review literature cited to support benefits/risks?</td>
<td>3.6</td>
<td>5.5</td>
<td>7.2</td>
<td>1.3</td>
<td>2.0</td>
<td>7.123</td>
<td>0.068</td>
</tr>
</tbody>
</table>

* χ² approximation invalid due to multiple cells with expected counts less than 5
Appendix

Each study website was evaluated for information regarding the DAA to THA with the following questionnaire:

1. Was the DAA mentioned
2. If yes, was the DAA explained
3. Was a direct claim made that the DAA was the best approach for hip replacement
4. Were the following benefits associated with the DAA mentioned:
   a. Less tissue damage/minimally invasive/muscle sparing
   b. Less blood loss
   c. Less pain
   d. Less medication
   e. Faster recovery/earlier independence
   f. Better mobility/range of motion outcomes
   g. Shorter surgery time
   h. Shorter hospital stay
   i. Safer/fewer complications
   j. Lower dislocation risk
   k. Lower revision risk
   l. Less likely to have leg length discrepancy
5. Were the following risks associated with the DAA mentioned:
   a. Lateral femoral cutaneous nerve injury
   b. Femoral or trochanter fracture
   c. Hematoma
   d. Wound healing problems
   e. Increased radiation exposure
6. Was peer-reviewed literature cited to support mentioned benefits and risks
Bibliography


Figure 1 Legend:

Regional breakdown of percent of websites mentioning Direct Anterior Approach to THA on the internet.