■ THE HIP SOCIETY

A survey of Hip Society surgeons concerning the direct anterior approach total hip arthroplasty

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Aims

To establish whether there was a consensus among the members of the Hip Society (HS) on the role of direct anterior approach (DAA) contemporary primary total hip arthroplasty (THA).

Methods

An online survey was sent to all 112 active and senior members of the HS, to which 71 members responded. The survey was constructed to determine whether they believed that evidence-based medicine proves, in modern clinical practice, that the DAA has significant benefits compared to risks when contrasted with other approaches. In addition, they were asked if they currently used the DAA.

Results

While only 16.9% (12/71) of respondents had been trained in a generic anterior approach during residency, 49.3% (35/71) had used the DAA in their clinical practice in the past or were using it at the present time. Unexpectedly, 42.9% (15/35) of respondents who had used the DAA in the past had abandoned it by the time of this survey. Only 22.5% (16/71) of all respondents believed that evidence-based medicine proves that the DAA has significant benefits compared to risks in contrast to other approaches.

Conclusion

A comprehensive literature review found only three prospective randomized clinical trials (RCT) comparing the DAA with another approach with greater than one-year follow-up. Two showed minor benefits within the early postoperative period only, and one of those showed poorer mid-term results. Most of the published comparison studies with short follow-up show longer surgical times and greater blood loss for the DAA, and many three-month comparison studies show higher complication rates for the DAA using a proprietary traction table. The complications included problems with wound healing, lateral femoral cutaneous nerve injury, femoral component loosening, and femoral fractures. Because of the lack of evidence from RCTs showing superiority of the DAA over other approaches and reports of higher complications, the opinion of a large majority (77.5%; 55/71) of HS surgeons was that the DAA lacks sufficient evidence to warrant its use.

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Introduction

There are two main variations of the direct anterior approach (DAA) for total hip arthroplasty (THA); one that uses a traction table combined with intraoperative fluoroscopy and the other that uses a standard operating table without imaging. The traction table technique was popularized by Matta et al[1] and uses an 8 cm to 10 cm incision placed over the tensor fascia lata muscle with the patient in the supine position on a traction table (Hana Orthopaedic Table; Mizuho OSI, Union City, California, USA) with distraction of the operated leg through a boot with the pelvis stabilized against a pubic post. This procedure

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is purported to be minimally invasive by avoiding transection of muscles. The other DAA follows a similar anterior incision with the operated limb draped free.

Recent surveys of members of the American Association of Hip and Knee Surgeons (AAHKS) have shown that there is an increasing interest in using the DAA for primary THA. A survey by Berry and Ahbel[2] found that 40% of 596 respondents from a total of 929 members attending the 2018 AAHKS annual meeting used the DAA approach. One year later, an online survey to which 996 surgeons (44.3% of the 2,249 AAHKS membership) responded found that this proportion had increased to 56.2%.[3] Of the 560 DAA users in the most recent survey, 76% (392 respondents) stated that they had experienced an increase in their number of THA patients after switching from their previously preferred approach to the DAA, and the converse was true for non-DAA users (65.8%, 300/436). Shofoluwe et al[4] reported that 22.8% (423/1,855) of AAHKS surgeons or their hospitals promoted the DAA online. That study, and another,[5] found that many of the benefits attributed to the approach by these online advertisements were unsubstantiated and that risks of the procedure were greatly under-reported. A survey of THA patients by Trousdale et al[6] found that 29.7% (11 of the 37 who were aware of the DAA) were under the impression that a consensus existed among surgeons that the DAA procedure was the safest and most effective technique for THA. These recent studies illustrate a sharp increase in popularity of a technique for which there was little evidence-based data showing efficacy and safety. Although many short-term comparisons with other THA techniques have been published,[7-11] the majority of which report a high incidence of important complications, there are only three randomized controlled trials (RCTs) with follow-up greater than one year.[12-15] It is a concern, at least in the US, that the technique may have become popular on the basis of marketing without evidence of significant benefit.

The purpose of conducting the current survey was to determine whether a similar proportion of Hip Society (HS) members used the DAA THA technique compared with AAHKS members, and to explore whether the increase in patient demand and surgeon interest in the DAA has been driven by marketing rather than evidence-based medicine.

Methods

The research committee of the HS designed a 20-question online survey (Table I) that was emailed once to all 112 practicing members of the organization in January 2019.

Results

The response rate for this survey was 63% (71 respondents). As the HS limits the number of active members to 100, and also has a separate senior member category for members who are 60 years old or more and still practicing, the numbers used for these results were small.

Discussion

Only 16.9% (12/71) of the respondents received training in their residency and/or fellowship in a generic anterior approach, in contrast to the large proportions who had been trained in posterior (88.7%; 63/71) and lateral (71.8%; 51) approaches. Applying the year 2005 as the inception date for the small incision THA technique,[1] only 5.6% (4/71) of the respondents had trained after small incision DAA surgery began to be adopted. However, the majority of respondents now use a small incision of 10 to 12 cm (80%; 57/71), but only 18.7% (12/64) measure the proposed incision prior to making it.

Almost half the respondents (35/71) had tried one of two DAA techniques for primary THA in the past or were currently using it, but it was of note that a considerable proportion (42.9%; 15/35) had abandoned the DAA after an estimated mean of 82 procedures (2 to 300), including five respondents who had used a proprietary (Hana) traction table. Just over half the HS respondents who perform the DAA at present (55%;11/20) use this traction table whereas 45% (9/20) present DAA-user respondents use a standard operating table. The proportions of HS members who began using the DAA technique to accommodate patients' requests and to prevent losing patients to other DAA surgeons were 48.5% (16/33) and 21.2% (7/33), respectively, in this survey.

It is a concern that only 22.5% of respondents (16/71) believed that evidence-based medicine proves significant benefits over risks for the DAA THA versus other approaches. Because the admission of new members to the Hip Society does not involve the member candidates' application for admittance but instead requires the initial proposal by two present members, is strictly dependent on the academic credentials of proposed candidates as well as several letters of recommendation, and is reviewed carefully by an admission committee, unlike the AAHKS (whose only academic qualification for membership is their being a fellow of the AAOS or certification by the American Board of Orthopaedic Surgery), the weight of the Hip Society survey opinion should be carefully considered.

Our survey indicates that 28.2% (20/71) of respondents perform some form of a DAA at the moment in a proportion of their primary THAs, including 15.4% (11/71) who use the Hana traction table technique. In 16 of the surgeons who had experience using a traction table, five (31.5%) had abandoned it. However, our survey did not establish with certainty why surgeons discontinued the DAA, but it may have reflected the long learning curve, difficulty in mastering a radically different approach from that in which they had been trained, or due to poorer results and/or more complications. Just under half of the respondents (46.8%; 15/32) who answered the learning curve question felt that it was between 50 and 100 or more cases were required to acquire competence. That estimate is considerable considering the fact that general orthopaedic surgeons may perform only 20 to 30 THAs per year, making the learning curve as long as five years for non-specialists.

The complexity of the DAA technique using a fracture table is evident from the following facts: it is an unfamiliar (for 83.1% of Hip Society surgeons) approach to the joint for most US or Canadian trained surgeons and when used, there is more difficulty in visualizing the upper femur than in other approaches because of the constraints associated with use of a fracture table instead of having the ability to manipulate the limb freely with other approaches as well as the other DAA technique.[1] The difficulty in visualization of the upper femur results in problems inserting the femoral component; in fact, the

Table I. Hip Society questionnaire with responses. The number of respondents for each question is shown.

Question	Respondents
What is the setting of your practice? n (%)	**71**
Private	19 (26.7)
Multispecialty clinic	3 (4.2)
Academic	49 (69.0)
How many years have you been in practice? Mean yrs (range)	**25.3 (9 to 49)**
In what year did you finish training? (range)	**1970 to 2010**
What surgical approaches were you trained in? n (%)	**71**
Posterior	63 (88.7)
Lateral	51 (71.8)
Anterior	12 (16.9)
How many THAs do you perform each year? Mean (range)	**240 (30 to 500)**
Do you make a 10 to 12 cm incision? n (%)	**71**
Yes	57 (80.2)
No	14 (19.7)
Do you or did you ever perform the DAA? n (%)	**71**
Yes	35 (49.3)
No	36 (50.7)
Do you believe that evidence-based medicine proves significant benefits over risks of DAA versus other approaches? n (%)	**71**
Yes	16 (22.5)
No	55 (77.5)
Do you perform outpatient THA? n (%)	**71**
Yes	27 (38.0)
No	44 (61.9)
Do you measure your incision before making it? n (%)	**64**
Yes	12 (18.7)
No	52 (8.3)
Did you abandon the DAA after trying it? n (%)	**35**
Yes	15 (42.9)
No	20 (57.1)
Did/do you use a Hana table? n (%)	**20**
Yes	16 (80)
No	4 (20)
What percentage of your primary THAs are done by the DAA? n (%)	**20**
90% to 100%	9 (45)
75% to 80%	2 (10)
30% to 60%	4 (20)
< 20%	5 (25)
What percentage of your THAs are outpatients? n (%)	**63**
100%	0 (0.0)
50% to 60%	6 (9.5)
1% to 30%	29 (46.0)
0%	28 (44.5)
How many DAA cases did you perform before abandoning that approach? Mean (range)	**82 (2 to 300)**
Abandoned the DAA after 50 or fewer cases, n	**11/15**
Why did you begin using the DAA? n (%)*	**33**
Facilitate quicker functional recovery	20 (60.6)
Reduce dislocation rate	11 (33.3)
Accommodate patient requests	16 (48.5)
Prevent losing patients to DAA surgeons	7 (21.2)
What do you estimate the number of cases to be for the DAA learning curve? n (%)	**32**
> 100 cases	10 (31.5)
50 to 99 cases	5 (15.6)
< 50 cases	17 (53.1)
What are the most common contraindications to doing the DAA? n (%)*	**37**
Muscular patient	18 (48.6)
High BMI	20 (54.1)
None	14 (37.8)

*Respondents could choose more than one answer.
BMI, body mass index; DAA, direct anterior approach; THA, total hip arthroplasty.

innovator of the technique routinely uses a trochanteric hook that is inserted through soft tissue under the proximal femur and is then attached to a manually operated crank attached to the Hana table through a hole made through the sterile drapes to elevate the proximal femur out of the depths of the wound. In some cases, the innovator recommends the release of short external rotator tendon(s) if the trochanteric hook does not provide adequate elevation of the proximal femur. The release of posterior muscles would, of course, invalidate the claim that no muscles are cut. This fracture table technique also requires the use of fluoroscopy, necessitating shielding of the patient and surgeon in order to guide implant insertion and, especially, to measure leg lengths intraoperatively, since the operated extremity is locked into the Hana table outrigger preventing a simple side-by-side comparison of the length of operated limb to the contralateral one.

There are reports of higher complication rates for the DAA including reoperation for wound complications,[16,17] early failure from femoral loosening,[18-20] and injury to the lateral femoral cutaneous nerve,[10,21] which has a reported incidence in two studies ranging from 37% to 83%. Several studies comparing the DAA with the posterior approach (PA) have found that the DAA has longer operating times and higher blood loss.[10,12,22]

The fact that a large proportion of the HS surgeons who had tried the DAA, all of whom have a high level of surgical expertise in THA, abandoned the technique, for reasons including its complexity, a higher complication rate, or a negative risk/benefit analysis compared to other approaches, suggests surgeons with low volume practices would have greater difficulties learning this approach. This was also the case for another previously tried anterior 'minimally invasive' THA technique that was introduced in the early 2000s called the two-incision THA. This technique was promoted by a major implant company that established a dedicated learning centre for training surgeons in this new technique. Surgeons who completed training in the new two-incision technique were listed on the company's website and these surgeon trainees supplied data regarding the learning curve and complication rate of 851 procedures that was reported in 2004.[23] These two-incision THA data included a femoral fracture or perforation rate of 3% and a femoral neck or calcar fracture rate of 4% with a nerve injury incidence of 3.2%.

Currently DePuy Synthes (Raynham, Massachusetts, USA) is active in promoting the DAA THA using the traction table

with the company website stating that 11,000 surgeons have been trained in the DAA Hana table technique.[24] Regrettably, no early outcome study by Depuy-Synthes has been published to document the learning curve and the complication rate for trainees undertaking the DAA in their practices. A previous study reported the early results of six community surgeons who had changed to the DAA for all of their primary THAs after visiting the innovator on one occasion to observe the several DAA procedures.[25] The in-hospital data on 247 consecutive DAA patients who underwent THA using the Hana table over two years revealed disquieting findings. The mean surgical time was 2.7 hours with a mean intraoperative blood loss of 858 ml. The incidence of intraoperative femoral fracture and major complications (including 16 femoral shaft or trochanteric fractures, two deep PJIs requiring Girdlestone resection arthroplasties, two peroneal nerve injuries, and three immediate reoperations for leg length discrepancies) was 6.5% and 9%, respectively. The study concluded that insufficient training in the DAA is likely to produce inferior results when compared with the results reported by the high-volume innovator. Two other large single institution studies have revealed that the risks of complications, including prosthetic joint infection, after an anterior approach THA were increased markedly over other non-anterior approaches.[8,9]

The evidence-based proof of superiority of the DAA compared with other approaches is very limited. There is only one published mid-term (five-year follow-up) RCT,[13] involving 43 patients having a DAA THA using a traction table compared with 44 patients having a posterolateral approach (PA) THA that followed up previous one-year findings of the same patient cohorts.[12] The study showed a few initial functional benefits attributable to the DAA that disappeared after three months. These benefits comprised a shorter length of stay (2.3 days vs 3.0 days) and a higher percentage of DAA patients who had the ability to walk unlimited distances and climb stairs normally at six weeks. Although DAA patients had significantly less pain postoperatively on the first day, this improvement in the mean VAS pain score (1 to 10 point scale) was 4.0 versus 4.5, but this difference is not clinically important.[26] At the one-year follow-up, three (6.9%) DAA patients had groin pain or severe hip pain in contrast to no problem with pain in any PA patient. At five years, there were no differences in hip scores, survivorship or component loosening between cohorts. Importantly, the initial one-year study[12] demonstrated a considerably longer mean surgical time increased by 24% and twice the mean blood loss for the DAA compared with the PA. Considering the fact that there is only one mid-term RCT comparing the DAA using a fracture table to another approach at the present time[12,13] and that this study demonstrated small benefits prior to three months postoperatively with more patients having pain at one year, the rapid increase in the number of AAHKS surgeons using this more complicated technique, therefore, must be based on patient request or marketing rather than hard evidence of clinical superiority and safety over other techniques. It should also be noted that this RCT may have been underpowered and that the DAA cohort was dissimilar to the PA cohort with a significantly larger proportion of male DAA patients (67% vs 43%, $p = 0.031$). Also, this single RCT[12,13] cited was performed by a surgeon who had considerable prior experience with the Hana table technique (100 THAs) so those results obtained cannot be compared directly to the outcomes of surgeons with limited exposure to the technique.

For DAA technique without using a traction table, there are only two medium-term RCTs. One study compared a small incision DAA to a standard incision direct lateral (DL) over five years,[14] and the other was a multicenter trial comparing an anterolateral approach to either a DL or a posterolateral, with all three groups being treated through a small incision with a minimum follow-up of two years.[15] The five-year trial found less pain and better functional results in the first eight weeks for the DAA group, but at five years the DAA group had a 14% revision rate compared with no revisions in the DL cohort. The multicentre study showed no superiority of the small incision anterolateral approach over the other approaches from patient-reported data, and no clinical differences at two years.

Reduction of the dislocation risk by choosing to perform a DAA THA was considered a significant advantage of the DAA over a posterior approach when the technique was popularized in 2005. Matta[1] reported a dislocation rate of 0.6% (3/494). Unfortunately, the same number of patients (3/494) sustained the complication of an ankle fracture following the DAA, a complication, presumably caused by extreme rotation of the ankle boot on the Hana table. A reduction in the dislocation rate may have been the reason that many surgeons began using the DAA in 2005; however, since the advent of cross-linked polyethylene enabling the use of larger femoral heads in primary THA, the dislocation risk from the posterior approach has been greatly reduced.[27]

In order to provide adequate informed consent for patients undergoing THA who are considering the DAA, they should be provided with the results of the controlled studies that have compared the risk/benefit analyses of the DAA THA procedure with other conventional approaches[12–15] rather than relying on internet advertising of short-term benefits or anecdotal recommendations. Surgeon or hospital sponsored marketing of the DAA THA in order to increase their THA volume, however, is a practice likely found only in the US or other countries without a national health service, where a surgeon's or hospital's reimbursement is linked directly to the number of THA cases they perform.

Take home message

- Patients who request the DAA for their primary THA should have access to evidence-based data comparing the DAA to other approaches for unbiased informed consent rather than relying on internet advertisements.

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