Direct anterior approach to THR: what it is and what it is not

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I distinctly remember attending conferences during residency in the early 1990s where the issue of operative approach to hip replacement was debated. At that point, the main debate was between the posterior approach and the Hardinge approach and its modifications. Each had been widely used for over 10 years, and a solid body of knowledge was developing. The Hardinge approach provided a dislocation rate of 0.3%, but a longer recovery, and a 10% rate of limp at the end of a year [1]. The posterior approach had a faster recovery, but a dislocation rate of 2%–4%. The discussion was open, and seemingly free of emotional content, because the debate was among colleagues, who were free to make decisions based on their experience and their reading of the literature.

Fast forward 20 years and the landscape has changed. Implant companies have created media campaigns to inform the public about their “options” in taking advantage of “advances” in joint replacement, thereby creating consumer demand for their product. And patients seem to want this. Company funded programs have evolved to help teach these presumably “better” approaches to surgeons (in full disclosure, I submit that I have been a faculty member in, and thus benefitted financially from these programs). The tacit understanding given to patients is that surgeons that do not choose to use these approaches are not participating in the latest “advances” available. This difference has led to the emotionally charged exchanges that are currently common regarding approach to total hip replacement.

To this point I would like to review the information that forms the basis for our opinion of the Direct Anterior Approach (DAA). First, I must point out that the technique is still in evolution. I have attended and viewed a number of courses on DAA, where the local anatomy was not properly described, and potentially not properly understood by the faculty. Recent dissections by Leunig and by our center, presented as scientific exhibits at the 2013 AAOS Annual Meeting [2] demonstrate that in most cases, adequate femoral exposure requires the release of the conjoined tendon insertion on the inner aspect of the trochanter (where a number of instructional videos suggest only capsule is being released), and in 10% of cases a release of the piriformis in order to fully mobilize the femur. As such, the claim that “We don’t cut any muscles or tendons” is inaccurate and misleading. That having been stated, the volume of muscle damage compared with the gluteus minimus and medius via Hardinge, or all the rotators, the quadratus and maximus via the posterior approach, is clearly diminished with DAA. Bergin et al attempted to quantify this presumption, demonstrating diminished serum levels of creatinine kinase in DAA [3]. The idea that the DAA is less invasive should not be in question. The ramifications and compromises inherent in this approach should be.

Dislocation is an important issue with etiologic roots in soft tissue tension, implant position, and soft tissue healing regardless of approach. The dislocation rate with DAA is certainly not zero. Sariali reported a 1.5% dislocation rate, while Keggi, Masonis, and Matta report dislocation rates of 2.5%, 0.3%, and 0.6%, respectively [4–7]. Each of these reports represents the evolution of technique at the respective centers, including optimization of implant position and soft tissue tension, and the use of fluoroscopic guidance in 2 of the 4 reports.

We have presented the results of our learning curve, showing a higher dislocation rate in the first 100 DAA hips (2 hips) compared with the last 300 posterior hips (1 hip). This

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was a learning curve issue, as the ideal socket position may be related to the chosen surgical approach. Judgment in positioning the implant was gained through provocative testing in external rotation in full extension and mild hyperextension. We have had no further dislocations in the subsequent 800 hips, but there is no free lunch, and the payment here is in groin pain. As our socket anteversion migrated downwards, our prevalence of groin pain increased. Small amounts of anterior implant overhang may be more noticeable and clinically relevant when the integrity of anterior capsule is affected by the exposure and may manifest as irritation of the psoas tendon. Sizing also has an effect on the overhang. As such, the implant sizing decision has evolved to seek near complete bony coverage anteriorly, while minimizing overhang posteriorly to prevent impingement. The evolution of the socket position in our center is demonstrated in Fig. 1.

A brief internet search will yield numerous claims of shortened recovery with DAA. There remains a dearth of level 1 and 2 studies on the issue. Studies comparing DAA with the modifications of the Hardinge demonstrate an advantage [8]. Our recently published level 2 study comparing DAA with the posterior approach demonstrated objective and consistent benefits in early mobility, but most findings were equalized by 2 weeks post op, and by 6 weeks post op there was no measurable differences between the groups [7]. In addition, we have presented data on early recovery of muscle strength, showing DAA patients may have early flexion weakness, and posterior approach patients may have external rotation weakness, most of which resolves by 6 months [9]. Finally,

gait analysis at 6 months follow-up from our center failed to demonstrate a difference [10].

Our objective findings on the differences between the approaches are small and short lived. However, having traversed the learning process, and continuing to modify and improve the technique at our center has allowed us to make specific gains. The use of fluoroscopy has created a marked improvement in our precision in implant sizing and placement [11]. It also serves as a teaching aide, as we insist our residents and fellows use internal landmarks for implant placement, and encourage them to predict what the fluoro image will look like before taking it. Our technique does not utilize a special table, and as such we are able to assess the leg lengths by direct comparison, much the way we would do it in the office. This gives confidence at the end of every case that we know exactly what we achieved by clinical and radiographic evaluation. Finally, because of our provocative testing, we can discharge patients without dislocation precautions, which many patients consider a great relief.

The biggest concern with the approach is the learning curve. Numerous authors have discussed the prevalence of early complications during transition [12–15]. For an established surgeon, learning this approach from scratch is a major investment of time and energy. During the early cases, there will be a clear decline in quality of the arthroplasty in comparison with the approach that was previously being performed. The margin of error may be smaller, as numerous vascular, tendonous, and neural structures are nearby in harm's way. As such, individual surgeons with a broader bell curve of execution may be less successful with DAA. In the best of hands, lateral femoral cutaneous nerve (LFCN) injury is a reality. Goulding et al reported 81% LFCN neuropraxia with no functional limitations [16]. We tell our patients to expect numbness as part of the process of hip replacement, not unlike the lateral knee numbness our patients experience after knee arthroplasty. We have had 3 cases out of 700 who have been bothered with persistent dysesthesias that required additional surgery to address the problem, with mixed results. The issue of groin pain remains a real one. Although our study did not demonstrate a statistical difference, it may have been underpowered to do so [7]. Focus on assuring anterior coverage of the implant by bone has diminished the issue at our center. Finally, DAA without a table is best performed with 2 surgical assistants, which may not be a reality in many environments.

In summary, the DAA provides some advantages, and poses some challenges. It remains nothing but a means to an end. I still occasionally perform surgery through the posterior approach, and it is fun to go home. Young, active patients will generally recover well regardless of approach, and my resurfacing patients remind me of this routinely. More objective data will be generated as our experience grows and the techniques continue to evolve. Our residents who have

Fig. 1 Evolution of cup sizing and acetabular cup version through learning curve

been exposed to the approach since the beginning of their training adapt to it as readily as the posterior approach, and most continue to use it after fellowship. Yet, if I were to have a hip replacement today, I would personally focus more on choosing the surgeon, and trust her or his judgment as to the approach.

Compliance with Ethics Guidelines

Conflict of Interest Dr Rodriguez serves as a consultant to Depuy, Smith Nephew, Exactec, and Medacta, and participates as faculty in Direct Anterior Approach Courses. Dr Cooper serves as a consultant to Smith Nephew. Dr Robinson has no conflicts.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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