

## Surgical Approaches to the Hip Joint for Total Hip Arthroplasty - An Updated Review

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### Abstract

Primary Total hip arthroplasty (THA) remains a common and successful orthopaedic surgical procedure in today's time. There has been a constant evolution of surgical techniques and implant designing, for patients of end-stage hip arthritis undergoing THAs. The various approaches like the posterior approach (PA), direct lateral approach (DLA) or the direct anterior approach (DAA) for the hip are mostly used during THA. PA remains the most common approach for THA. PA THA to some extent being extensively used among arthroplasty surgeon has showed lesser evidences of intra-operative blood loss and lesser operative time. DLA remains the second most common approach to the hip during THA. Despite enough literature on the varied surgical approaches to hip joint during THA, the debate still continues, and there is no successful conclusion favouring one approach over the other. DAA-THA shows better short-term functional outcomes, early post-operative recovery, better pain relief, and lesser hospitalization duration when compared to the conventional PA for THA. Increased evidences of LCNT neuropraxia remains a significant disadvantage with DAA although it does not cause any functional derangement amongst these patients. DLA and PA, both are considered not to utilise an inter-muscular interval. While short external rotators and gluteus maximus are released or splitted in PA, Gluteus maximus and medius are released during DLA. Incidence of abductor muscle weakness has been noted to be as high as 4% to 20% with DLA THA. DAA is on the other hand utilises a true inter-muscular plane. Patient selection for this approach remains an important aspect to avoid post-operative wound complications. The use of intra-operative image guidance during prosthesis placement while performing DAA THA may result in better implant positioning and lesser incidences of post-operative dislocations or limb length discrepancies (LLD).

**Keywords:** Direct Anterior Approach; Total Hip Arthroplasty; Posterior Approach; Direct Lateral Approach

### Introduction

Primary Total hip arthroplasty (THA) remains a common and successful orthopaedic surgical procedure in today's time. There has been a constant evolution of surgical techniques and implant designing, for patients of end-stage hip arthritis undergoing THAs [1-3]. The various approaches like the posterior approach (PA), direct lateral approach (DLA) or the direct anterior approach (DAA) for the hip are mostly used during THA [4]. PA remains the most common approach for THA [5]. Despite enough literature on the varied surgical approaches to hip joint during THA, the debate still continues, and there is no successful conclusion favouring one approach over the other [6-10].

Hip surgeries specially THA, requires meticulous pre-operative surgical planning and the choice of exposure remains one of the most important part of this plan [11]. Ideally the choice of approach should be the one which is safe and easily reproducible for facilitating proper instrumentation without much devascularisation and soft tissue damage, thereby expediting early recovery and post-operative rehabilitation [11,12].

PA to the hip providing a similar to better surgical exposure compared to DAA, although is associated with increased post-surgical morbidity, but has remained the approach of choice with the surgeons since ages, in various parts of the world [4].

This review article aims at providing an updated and concise information regarding the various surgical approaches to the hip joint related to THA.

### Different approaches to the hip during THA

#### Posterior approach

Described for the first time 1874 by von Langenbeck, several versions of PA have been advocated, the modern PA most closely resembles the Moore's approach given in 1957 [13,14]. This approach has been popularised also as the "Southern" or "Moore" approach. Although the PA to the hip has been implicated to violate the posterior hip capsule and muscular structures, which may lead to increased evidences of post-operative hip dislocations, it is still considered to be the most common surgical approach used worldwide for THA [15]. There has been a constant debate regarding ideal approach for THA, and most commonly researchers have compared DAA with PA. However, the current evidence has not indicated any superiority of one surgical approach over the other one.

PA to some extent being extensively used among arthroplasty surgeon has showed lesser evidences of intra-operative blood loss and lesser operative time [7,16,17].

#### Direct lateral approach

McFarland and Osborne described this approach for the first time in 1954. Several versions of DLA have been utilise since then, however the latest version of DLA was popularized by Hardinge, in 1982 [18,19]. Often referred as the "Hardinge" or "Transgluteal" approach, DLA is the second most common surgical approach used worldwide for THA [15].

Because of this approach directly going through the gluteus medius, it is often implicated to cause post-operative abductor muscle weakness. However, the Cochrane systematic review by Jolles, *et al.* [20] included four quasi-randomised controlled studies involving 241 participants, could not determine any significant higher rate of Trendelenberg gait. Also, the primary outcome of this systematic review could not identify any higher rate of post-operative hip dislocations between either of the two groups of patients operated by DLA and PA. This study concluded higher risk of nerve injury or palsy with direct lateral approach. But when compared with PA the risk rate of sciatic nerve injury or palsy was not significantly high. This study was supported by another randomised controlled study by Rosenlund, *et al.* [21] who supported although the spatiotemporal parameters for gait analysis did not showed any significant difference between the PA group and DLA, the PA group showed a better hip flexor and abductor muscle strength at 12 months follow-up.

#### Direct anterior approach

Improvement in technicalities for implant designing and instrumentation techniques have affected the overall survival of THA. Mostly now the focus in the field arthroplasty is targeted towards reducing hospital stay and early post-operative morbidity. Initially introduced

as Hueters' approach [22,23], DAA, owing to its minimally invasive nature and utilizing the inter-nervous and inter-muscular planes imparting lesser surrounding soft tissue damage has started gaining popularity among the arthroplasty surgeons [24-29]. The percentage of usage of DAA in THA has increased from 4% in 2001 - 2011 to 17% in 2012 - 2014 [30,31]. Mostly DAA is being considered with the use of sophisticated tools and modern fracture tables like Hana orthopaedic table, but in resource limited setups, this approach can be considered using normal orthopaedic table with conventional equipment. But, DAA has a steep learning curve and hence with growth, over a period of time, better implant positioning and lesser complications are experienced [32]. Despite this increase in popularity of DAA, high-quality evidence comparing it with more conventional approaches like PA is still lacking.

Recently, THA has become more common surgery among young patients for different hip pathologies. The increasing demand in this group of patients is not only dependant on functional improvement but also the early post-operative recovery and rehabilitation, lesser morbidity and minimally invasive nature of the surgical approach [33]. These, patient-directed goals along with the surgeon's constant search for a safe, and easily reproducible approach has made DAA an upcoming and demanding approach. A recent study by den Daas A., *et al.* [34] has also compared DAA with posterolateral (PA) or direct lateral approach cohort against patients operated by bilateral DAA THA. They identified that although the approaches like posterolateral or direct lateral as well the DAA yields similar functional outcomes, their patients preferred DAA as it has faster subjective post-operative recovery, less sleep disturbances and early mobilisation.

Better immediate post-operative recovery has been consistently noted according to the recent literature. The systematic review and meta-analysis by Wang, *et al.* [24] comparing 9 randomized clinical trials with a total of 754 THAs (DAA group = 377, PA group = 377) concluded that DAA was associated with early functional recovery and less pain scores. Another systematic review and meta-analysis by Jia, *et al.* [6] included 20 articles with a total of 7377 patients. Among these, 3728 and 3649 cases were in the DAA and PA groups, respectively. They concluded that DAA was comparatively better than PA in terms of functional recovery and early postoperative pain relief. Similarly, studies by Zawadsky, *et al.* and Cheng, *et al.* also compared the early outcomes of DAA against PA-THA and concluded that early functional outcome and post-surgical recovery is better in the DAA group [26,35].

Intra-operative fluoroscopic assistance is usually taken during performing THA by DAA, although most studies have revealed no differences in radiological parameters between PA and DAA [36].

### Complications

Higher occurrences of lateral femoral cutaneous nerve (LFCN) neuropraxia has been described in previous studies with the range around 3.4% to 81.1%, but it does not result in functional debilitation [6,37]. These neuropraxias are usually managed conservatively and the patients shows partial improvement in the first six months. Superior gluteal nerve (SGN) injury most commonly occurs during DLA due to the nerves' proximity to gluteus medius spilt utilised in this surgical approach [38]. It leads to temporary abductor muscle weakness which may be persistent in some rare cases. There are higher chances of wound complications when DAA is used in patients with a BMI more than 30 [39]. Also, Christensen, *et al.* [40] has concluded recently a higher percentages of wound complications with DAA as compared to PA. Dislocation rate for DAA has been noted to be 0.6% to 1.0% and 0.3% to 0.6% for DLA [41-44]. On the other hand it is in the range of 1.7% to 5.3% for PA [45-47]. Intra-operative femoral fractures were noted to be high with DAA (6%) over PA (0%) [48], but the recent meta-analysis by Higgins, *et al.* [7] showed no significant difference. DLA and PA, both are considered not to utilise an inter-muscular interval. While short external rotators and gluteus maximus are released or splitted in PA, Gluteus maximus and medius are released during DLA. Incidence of abductor muscle weakness has been noted to be as high as 4% to 20% with DLA THA [49]. DAA is on the other hand utilises a true inter-muscular plane. This has been supported by a recent study by Bergin, *et al.* [50] which stated a higher post-operative level of serum creatinine kinase among patients undergoing PA-THA compared to those by DAA.

### Conclusion

DAA-THA shows better short-term functional outcomes, early post-operative recovery, and better early pain relief when compared to the conventional PA or DLA for THA. Increased evidences of LCNT neuropraxia remains a significant disadvantage although it does not cause any functional derangement amongst these patients. The use of intra-operative image guidance during prosthesis placement in DAA, may result in better implant positioning and lesser incidences of post-operative dislocations or limb length discrepancies (LLD). It still remains the personal choice of the surgeon according to his practice and convenience, to utilise one definite surgical approach while performing THA.

### Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Nil.

### Informed Consent

Informed consent is not required for this review article.

### Ethics Approval

Ethics approval from the institutional ethics committee is not required for review article.

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