Outcomes of Direct Anterior versus Posterior Approaches in Total Hip Arthroplasty: A Systematic Review

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Disclosures: There were no reported conflicts of interest with this study.

Background

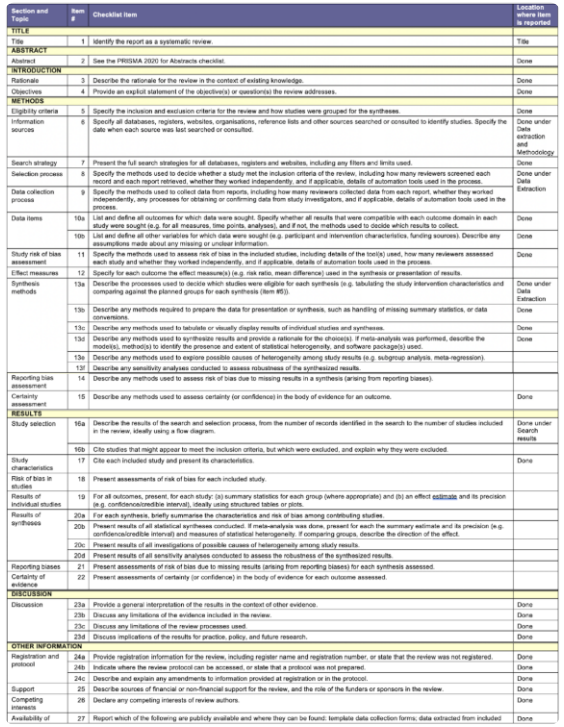
- Direct Anterior Approach (DAA) has been progressively becoming the gold standard in Total Hip Arthroplasty. Most joint surgeons in the state of Colorado utilize DAA.
- DAA vs. Posterior Approach (PA) is an age- old debate in orthopedics. Choosing one approach over the other comes down to surgeon preference.
- There is a vast body of literature on DAA vs. PA, However, most of this literature has been based on complications of the procedure. This study first **confirmed existing evidence for specific complications of DAA and PA**, and then sought to extrapolate patient reported outcomes comparing the two procedures.
- Commonly Referenced **Complication**s for each procedure are as follows
- **Posterior Approach;** Posterior Dislocation.
- **Anterior Approach:** Lateral Femoral Cutaneous Nerve Syndrome
- The current body of literature on the **lacks studies that include patient reported outcomes** of DAA vs. PA. The lack of studies incorporating **patient reported outcomes for justifying DAA over PA** encouraged us to explore this area.

Purpose/ Hypothesis

- **Purpose:** The purpose of this study was to evaluate the current literature that directly compares the DAA to PA in Total Hip Arthroplasty, with a particular focus on **patient reported outcomes (PROMS)**.
- The study also aims to highlight the limitations and complications associated with each approach.
- **Hypothesis:** DAA and PA are comparable regarding overall patient complications, success rates, and PROMS.

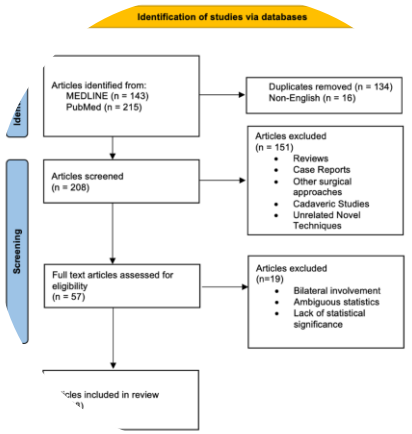
Methods

- Study protocol was registered with PROSPERO (ID:CRD42024538589)
- The study was conducted following PRISMA guidelines.
- **Comprehensive Search:** Comprehensive Search of MEDLINE and PubMed databases was performed to locate studies comparing DAA and PA in THA.. The Boolean search string employed included ((hip arthroplasty) OR (hip replacement)) AND (anterior approach) AND (posterior approach) AND (complication*).
- **Eligibility Criteria:**
- **Inclusion:** RCTs, non RCTs, Prospective and Retrospective Cohort Studies, Case Control Studies.
- **Excluded:** Other Systematic Reviews, case reports
- **Data Collection:** Data was collected systematically, capturing study demographics, PROMS, and statistically significant outcomes. Articles were cross referenced by authors ZH and AL and then a final check for suitability of the literature used for the study was made by MB.



Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Done
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Done
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Done
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Done
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Done under Data extraction and Methodology
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Done
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Done under Data Extraction
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Done
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Done
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Done
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Done
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Done under Data Extraction
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Done
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Done
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Done
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Done
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Done under Search results
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	
Study characteristics	17	Cite each included study and present its characteristics.	Done
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Done
	23b	Discuss any limitations of the evidence included in the review.	Done
	23c	Discuss any limitations of the review processes used.	Done
	23d	Discuss implications of the results for practice, policy, and future research.	Done
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Done
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Done
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Done
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Done
Competing interests	26	Declare any competing interests of review authors.	Done
Availability of	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included	Done

Title	Authors	Study Design	Number of Patients	DAA number	PA number	Follow up Period
Functional outcome of direct anterior versus posterior approach in total hip arthroplasty: a propensity-matched Asian study.	Loh et al.	Retrospective Cohort Study With Propensity Scoring Match	106	53	53	6 and 24 months
Fewer Hip Dislocations With Anterior Total Hip Arthroplasty for Displaced Femoral Neck Fracture.	Haller et al.	Retrospective Cohort Study	76	54	22	12-12 months
Does the direct anterior approach allow earlier recovery of walking following total hip arthroplasty? A randomized prospective trial using accelerometry.	Bon et al.	Prospective Randomized Controlled Trial	100	50	50	3 months
Direct Anterior Versus Posterior Approach for Total Hip Arthroplasty Performed for Displaced Femoral Neck Fractures.	Shah et al.	Retrospective Cohort Study	709	268	441	3-12 months
Comparison Between the Direct Anterior and Posterior Approaches for Total Hip Arthroplasty Performed for Femoral Neck Fracture.	Cichos et al.	Retrospective Cohort Study	143	44	99	3-12 months
The direct anterior approach without traction table: How does it compare with the posterior approach? - A prospective non-randomised trial.	Goyal et al.	Prospective Non-Randomized Study	80	40	40	12-24 months
The Effect of Surgical Approach and Femoral Prosthesis Type on Revision Rates Following Total Hip Arthroplasty: An Analysis of the Most Commonly Utilized Cementless Stems.	Hoskins et al.	Retrospective Cohort Study	48,716	22,840	25,876	4 years
Early Rate of Revision of Total Hip Arthroplasty Related to Surgical Approach: An Analysis of 122,345 Primary Total Hip Arthroplasties.	Hoskins et al.	Retrospective Cohort Study	97,877	32,086	65,791	3-6 months
Direct Anterior Approach: Risk Factor for Early Femoral Failure of Cementless Total Hip Arthroplasty: A Multicenter Study.	Meneghini et al.	Retrospective Cohort Study	73	57	16	5 years
The Impact of Surgical Approach on 90-Day Prosthetic Joint Infection After Total Hip Replacement - A Population-Based, Propensity Score-Matched Cohort Study.	Wernecke et al.	Retrospective Cohort Study	38,174	12,605	25,569	90 days
Direct Anterior Approach Total Hip Arthroplasty Is Associated With Reduced 1-Year Mortality and Surgical Complications After Femoral Neck Fracture.	Cichos et al.	Retrospective Cohort Study	545	348	197	3-12 months
Early Practice All-Cause Complications for Fellowship-Trained Anterior Hip Surgeons Are Not Increased When Compared to "Gold Standard" Experienced Posterior Approach Surgeons.	Wilson et al.	Retrospective Comparative Cohort Study	1200	600	600	120 days
Does Surgical Approach Influence the Natural History of the Unstable Total Hip Arthroplasty?	Dion et al.	Retospective Consecutive Case Series	56	20	36	6 months
Intraoperative Complications and Early Return to the Operating Room in Total Hip Arthroplasty Performed Through the Direct Anterior and Posterior Approaches. An Institutional Experience of Surgeons After Their Learning Curve.	Bendich et al.	Retrospective Matched Cohort Study	4,696	2348	2348	12 months
Anterior Revision Hip Arthroplasty is Associated With Higher Wound Complications but Fewer Dislocations Compared to Posterior Revision Hip Surgery.	Kurkis et al.	Retrospective Cohort Study	290	99	191	Minimum 90 days
A Comparison of Risk of Dislocation and Cause-Specific Revision Between Direct Anterior and Posterior Approach Following Elective Cementless Total Hip Arthroplasty.	Charney et al.	Retrospective Cohort Study	38,399	6,428	31,971	90 days-6 years
Prospective, Randomized Study of Direct Anterior Approach vs Posterolateral Approach Total Hip Arthroplasty: A Concise 5-Year Follow-Up Evaluation.	Barrett et al.	Prospective Randomized Controlled Trial	87	43	44	6 weeks-5 years
In-Hospital Morbidity and Postoperative Revisions After Direct Anterior vs Posterior Total Hip Arthroplasty.	Ponzio et al.	Retrospective Cohort Study	4,538	289	4,249	Minimum 4 years
Trochanteric Bursitis Following Primary Total Hip Arthroplasty: Incidence, Predictors, and Treatment.	Shemesh et al.	Retrospective Cohort Study	990	377	613	Minimum 1 year
Comparison of Wound Complications and Deep Infections With Direct Anterior and Posterior Approaches in Obese Hip Arthroplasty Patients.	Purcell et al.	Retrospective Cohort Study	4,651	2,424	2,227	Minimum 1 year
No Difference in Dislocation Seen in Anterior Vs Posterior Approach Total Hip Arthroplasty.	Maratt et al.	Retrospective Cohort Study With Propensity Scoring Match	11,112	2,156	8,956	90 days
High Risk of Wound Complications Following Direct Anterior Total Hip Arthroplasty in Obese				716	3,040	2 weeks-13 months
The effect of surgical approach on early complications of total hip arthroplasty.	Tay et al.	Retrospective Cohort Study	1,819	949	870	N/A
The direct anterior approach for simultaneous bilateral total hip arthroplasty: a short-term efficacy analysis.	Chen et al.	Retrospective Cohort Study	89	46	43	1-12 months
Functional and clinical outcomes following anterior hip replacement: a 5-year comparative study versus posterior approach.	Balasubramaniam et al.	Retrospective Cohort Study	92	50	42	12 months



Data: Complications and PROMS

Patient Reported Outcomes

HHS

Authors	significant differnce (p<0.05)
Haller et al.	no
Bon et al.	no
Goyal et al.	yes
Barrett et al.	no
Metzger et al.	no
Culliton et al.	no
Soza et al.	yes
Nambiar et al.	yes
Moerenhort et al.	no
Zhang et al.	no
Chen et al.	yes
Balasubramania m et al.	yes

VAS

Authors	significant differnce (p<0.05)
Haller et al.	no
Goyal et al.	yes
Soza et al.	no
Nambiar et al.	no
Moerenhort et al.	no
Malek et al.	no
Chen et al.	yes

SF12

Authors	significant differnce (p<0.05)
Bon et al.	no
Goyal et al.	no
Culliton et al.	no
Balasubramania m et al.	no

OHS

Authors	significant differnce (p<0.05)
Loh et al.	yes
Nambiar et al.	no
Malek et al.	no

WOMAC

Authors	significant differnce (p<0.05)
Loh et al.	yes
Culliton et al.	no
Nambiar et al.	no

Incidence of Urinary Incontenance

Authors	significant differnce (p<0.05)
Baba et al.	yes

RAND-36

Authors	significant differnce (p<0.05)
Loh et al.	no
Graves et al.	no

EQ-5D-5L

Authors	significant differnce (p<0.05)
Haller et al.	no
Nambiar et al.	no

FJS-12

Authors	significant differnce (p<0.05)
Zhang et al.	yes

UCLA

Authors	significant differnce (p<0.05)
Graves et al.	no

Postel-Merle-d'Aubigné

Authors	significant differnce (p<0.05)
Bon et al.	no

Patient Reported Outcomes: Assessed based on reported measures such as "Harris Hip Score" (HHS) and VAS for pain.

The PROMS that were assessed in each study were organized and extrapolated for statistical significance.

If there was a statistically significant difference **between DAA and PA for each respective PROM** (p<.05) it was noted in our results.

For example: "In Loh et al. functional outcomes scores using **WOMAC pain and OHS**, DAA had better scores at 6 months and 2 years."

Results

- **Results:** 38 studies were included in the systematic review.
- ***Key Findings:***
- **Dislocation: 9** studies reported **significantly higher rate of dislocation in PA** compared to DAA. **7** studies found **no significant difference.**
- **Infection: 10** studies analyzed **infection rates with mixed results- 1** reported higher **infection rate in PA**, with **5** finding **no significant difference.**
- **Revision: 15** studies discussed hip revisions. **6** showed **higher revision rates for PA. 5** showed **higher revision rates for DAA.**
- **Patient Reported Outcomes:** 16 studies discussed PROMS related to satisfaction and pain. **8 found no significant difference** between DAA and PA. **7 reported DAA was superior**.
- **3 studies reported shorter hospital stays for DAA.**

Discussion

- **Significance:** This research confirms many of the existing propositions about the utility of DAA or PA for THA. The study extrapolated that there was evidence for Posterior Approach being associated with posterior dislocation (10 of 15 studies focusing on dislocation reported a **statistically significant increase in dislocation rates associated with the PA**) and DAA being associated with shorter hospital stay and higher success rates.
- **Patient reported outcomes** were an important addition to the body of work on this topic because they have been an under-explored aspect of comparing DAA vs. PA and our results indicated that In various studies, Patient reported outcomes also favor DAA. **Studies assessing hip satisfaction and functional outcomes in Total Hip Arthroplasty**, comparing the Direct Anterior Approach (DAA) and the Posterior Approach (PA). **Sixteen focused on these parameters, with the majority indicating better outcomes for the DAA group.**
- Goyal et al. and Chen et al. reported **higher Harris hip scores and lower pain scores in the DAA group** at various time points post-operation.
- For Example; **Harris Hip Score** was the most reported PROM with **5 of 12 study outcomes favoring DAA** over PA. No difference was reported in 7.
- This review also examined various **studies assessing hip satisfaction and functional outcomes in Total Hip Arthroplasty**, comparing the Direct Anterior Approach (DAA) and the Posterior Approach (PA). **Sixteen focused on these parameters, with the majority indicating better outcomes for the DAA group.**
- **3 of the 4 studies looking at hospital stay** reported DAA having a shorter postoperative hospital stay.

Clinical Significance

- The clinical significance of this study is that data can be extrapolated to suggest **DAA as a favorable method for Total Hip Arthroplasty**.
- **Patient reported outcomes** and **patient satisfaction scores** highlighted in this study can be used by surgeons towards explaining why a direct anterior approach is favorable for Total Hip Arthroplasty.
- Important to keep in mind that many studies reported **no statistical significance between DAA and PA for complications and or PROMS**. The final decision for choosing the procedure will largely be determined by where the surgeon trained and his comfortability with each approach. (**limitation**)

Conclusion

- After analyzing patient reported outcomes and the complications associated with each approach, the current body of work supported that stigmas associated with each of the approaches were in fact evidenced. Our analysis of patient reported outcomes underscores the importance of a **patient centered perspective in surgical decision making**.
- **Historical complications** associated with the procedures persist, such **as posterior dislocation for PA**. However, this review indicates that these complication rates were less profound than would be expected. Many well cited articles on the topic support that there may be insignificant differences between complications associated with each procedure, which supports that there may not be an "ideal approach" to THA and **that surgeon preference will continue to be the most important determining factor for the method of approach chosen**. Although the Direct Anterior Approach has been increasingly supported as the "best method" by the orthopedics community, the direct anterior approach has numerous complications that it continues to be associated with. Most notably, these complications include **infection and cutaneous nerve pathology**.
- **Future Research** on this topic should include Regional Specificity for DAA vs. PA.
- DAA is known to be more popular in Colorado, as well as across the U.S. There is a lack of research quantifying this data and determining **the exact number of practicing joint surgeons in each region that are using DAA vs. PA**. This information would be very beneficial when considering the assumption that DAA is more common in today's practice.

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