



# THE EFFECT OF MINIMALLY INVASIVE AND STANDARD INCISION TOTAL HIP ARTHROPLASTY ON FUNCTIONAL MOBILITY IN THE ACUTE CARE SETTING: A SYSTEMATIC REVIEW



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## BACKGROUND & PURPOSE

### Introduction

An estimated 2.5 million Americans have undergone a total hip arthroplasty (THA).<sup>1</sup> Annually, 280,000 procedures are performed at a cost of more than 12 billion dollars.<sup>2</sup> Research from 2009 established Medicare as the primary payer (52.8%).<sup>1</sup> Since reimbursement influences hospital length of stay (LOS), Medicare provides hospitals with incentives for limiting patient's LOS.<sup>2</sup> This and other changes in health care coverage and reimbursement has also resulted in limited home health visits and outpatient services.<sup>3</sup> More importantly, it has generated more interest in smaller incisions and minimally invasive techniques with perceived post-operative benefits including: less pain, shorter LOS, quicker return to function, and better cosmetic appearance for those electing to have a THA.<sup>4-8</sup>

### Purpose

The purpose of this systematic review was to determine the differences in surgical technique (minimally invasive [MI] versus standard incision [SI]) and surgical approach (anterior versus posterior) on immediate post-operative functional outcomes of persons undergoing elective total THA.

### Methods

Databases used included: MEDLINE/PubMed, ProQuest: Health and Medical Complete, Nursing and Allied Health Source, Science Journal, ScienceDirect, and Google Scholar. Search terms utilized were “ (anterior or posterior or posterolateral) minimally invasive total hip arthroplasty AND functional outcomes AND randomized”. Inclusion criteria used were females and males > 25 years old, persons undergoing elective THA utilizing an anterior, posterior or anterolateral surgical approach, peer-reviewed articles between 2005 & September 2015, functional outcomes, and less than five days post-op. An article was excluded if it included any of the following: fractures, active infection or history of infection in the hip, history of malignancy, neurological deficits impacting lower extremity, THA revisions, same-day bilateral hip surgery, abstract, or non-randomized controlled trial. Two reviewers independently assessed each article for methodological quality and assigned each article PEDro scores.

Table 1. PEDro Scores

Authors	Year	1	2	3	4	5	6	7	8	9	10	Total
Bennett et al.	2006	Y	Y	N	Y	Y	Y	N	N	Y	Y	7/10
Dorr et al.	2007	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	9/10
Lawlor et al.	2005	Y	Y	N	Y	Y	Y	Y	N	Y	Y	8/10
Oganda et al.	2005	Y	N	Y	Y	Y	Y	Y	N	Y	Y	8/10
Repantis et al.	2015	Y	Y	Y	N	N	N	Y	Y	Y	Y	7/10
Average =											7.8	

## RESULTS

This systematic review included the following outcome measures:

### Assistive device

Two articles found conflicting results addressing the use of unilateral devices compared to bilateral devices. Lawlor et al.<sup>5</sup> found no significant differences between the two groups at the time of discharge with respect to ambulating with a device; however, Dorr et al.<sup>4</sup> found a significant difference between the two groups. Dorr et al.<sup>4</sup> stated a larger percent of the minimally invasive group were able to ambulate with a unilateral assistive device compared to the standard incision group.

### Gait assessment

Dorr et al.<sup>4</sup>, Lawlor et al.<sup>5</sup>, Bennett et al.<sup>6</sup>, and Ogonda et al.<sup>7</sup> found no significant differences in quality of gait (gait kinematics) or quantity of gait (distance ambulated).

### Stair assessment

Ogonda et al.<sup>7</sup> and Lawlor et al.<sup>5</sup> found no significant differences for ascending/descending four stairs.

### Pain

Four articles measured pain using the visual analog scale. Repantis et al.<sup>8</sup> and Dorr et al.<sup>4</sup> found a significant pain reduction in the MI versus SI postoperatively. In contrast, two articles, Lawlor et al.<sup>5</sup> and Oganda et al.<sup>7</sup>, found that there was no significant differences in pain scores postoperatively.

### LOS

Lawlor et al.<sup>5</sup> and Oganda et al.<sup>7</sup> found no significant differences in LOS; however, Dorr et al.<sup>4</sup> determined LOS was significantly shorter in the MI group

## CONCLUSION

This systematic review was inconclusive in determining differences between MI versus SI techniques or surgical approach on immediate postoperative functional recovery for patients undergoing THA.

### Limitations

- Lack of articles which utilized standardized testing or standardized functional outcomes for the different surgical approaches.
- Only one article evaluated the impact of the anterior surgical approach on functional outcomes
- Difficulty performing a double-blind randomized research study in the acute care setting.

### Future Research

- Evaluation of the MI technique in the acute care setting, specifically for the anterior surgical approach.
- Allow for the inclusion of retrospective studies and non-randomized control trial research in the acute care setting as part of the systematic review.

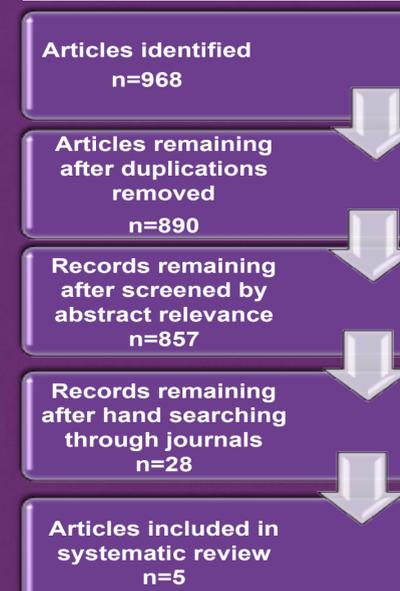
### Clinical Relevance

THA utilizing muscle sparing approaches, such as minimal incision technique or anterior surgical approach have not been shown to provide immediate postoperative benefits; however, the anterior approach may have clinical benefits of reduced pain. Pain may negatively affect quality of gait during the acute five day postoperative period regardless of technique or approach. Therefore, it appears that in the immediate days following surgery, surgical approach and invasiveness of technique does not impact functional mobility.

Table 2. Study Characteristics

Authors	Year	Objective Measures
Bennett et al.	2006	Observational Gait Analysis
Dorr et al.	2007	Visual Analog Scale Observational Gait Analysis
Lawlor et al.	2005	Timed Stair Climbing Test Visual Analog Scale
Oganda et al.	2005	10 Meter Walk Test Timed Stair Climbing Test Visual Analog Scale
Repantis et al.	2015	Visual Analog Scale

Figure 1. Prisma



## REFERENCES

1. 2.5 Million Americans Living with an Artificial Hip, 4.7 Million with an Artificial Knee. American Association of Orthopaedic Surgeon website. <http://newsroom.aaos.org/media-resources/Press-releases/25-million-americans-living-with-an-artificial-hip-47-million-with-an-artificial-knee.html>. Updated March 14, 2014. Accessed October 13, 2015
2. Cram P, Lu X, Kaboli PJ, et al. Clinical characteristics and outcomes of medicare patients undergoing total hip arthroplasty, 1991-2008. *Jama*. 2011; 305(15): 1560-1567.
3. APTA Comments on Essential Health Benefits Submitted To Institute of Medicine (IOM). American Physical Therapy Association. [http://www.apta.org/uploadedFiles/APTAorg/Advocacy/Federal/Health\\_Care\\_Reform/Comments/EssentialHealthBenefitsPackage\\_120710.pdf](http://www.apta.org/uploadedFiles/APTAorg/Advocacy/Federal/Health_Care_Reform/Comments/EssentialHealthBenefitsPackage_120710.pdf). Updated 2012. Accessed on October 13, 2015.
4. Dorr LD, Maheshwari AV, Long WT, Wan Z, Sirianni LE. Early pain relief and function after posterior minimally invasive and conventional total hip arthroplasty: A prospective, randomized, blinded study. *J Bone Joint Surg AM*. 2007; 89(6):1153 - 60.
5. Lawlor M, Humphreys P, Beverland D, et al. Comparison of early postoperative functional levels following total hip replacement using minimally invasive versus standard incisions. A prospective randomized blinded trial. *Clinical Rehabilitation* [serial online]. 2005; 19(5):465-474.
6. Bennett D, Ogonda L, Elliot D, Humphreys L, Beverland DE. Comparison of gait kinematics in patients receiving minimally invasive and traditional hip replacement surgery: a prospective blinded study. *Gait Post*. 2006; 23(3):374-82.
7. Ogonda L, Wilson R, Archbold P, Lawlor M, Humphreys P, O'Brien S. A minimal-incision technique in total hip arthroplasty does not improve early postoperative outcome - A prospective, randomized, controlled trial. *The J of Bone and Jt Surg*. 2005; 87(4):701 - 10.
8. Repantis T, Bouras T, Korovessis P. Comparison of minimally invasive approach versus conventional anterolateral approach for total hip arthroplasty: a randomized controlled trial. *Eur J Orthop Surg Traumatol*. 2015; 25:111-116.