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Comparative Analysis of Anterior and Posterior Approaches in Hip Replacement Surgery: Enhancing Patient Efficiency

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ABSTRACT

Hip replacement surgery, a significant orthopaedic intervention, is commonly undertaken to address hip pain stemming from aging or injury, particularly among elderly patients. The primary objective of this surgical procedure is to restore the patient's quality of life to its pre-operative state, enabling them to resume normal daily activities. Typically, the posterior approach has been the conventional surgical method for hip replacement, widely practiced both in Indonesia and globally. This evolving trend has sparked interest in comparing the effectiveness and outcomes of the anterior and posterior approaches, particularly concerning critical factors such as operating time, length of hospital stays, need for transfusion, and postoperative mobilization time. In pursuit of a comprehensive understanding, a study was conducted, focusing on patients who underwent hip replacement surgery at Siloam Kupang Hospital. The anterior approach was considered as the case group, while the posterior approach served as the control group. Surprisingly, the study did not identify any statistically significant differences in operating time and transfusion requirements between hip replacement surgeries utilizing the anterior approach and those employing the posterior approach. This suggests that, from a procedural standpoint, both approaches are comparable in terms of efficiency and blood management. However, when assessing postoperative outcomes, distinct trends emerged. The anterior approach demonstrated a notable advantage in terms of faster mobilization times, implying a quicker recovery and the potential for patients to regain their mobility sooner. On the other hand, the posterior approach exhibited a shorter hospital stay, suggesting a streamlined postoperative course. These findings contribute valuable insights to the ongoing discourse within the orthopaedic community regarding the merits of the anterior and posterior approaches in hip replacement surgery. As medical practices continue to evolve, such comparative studies play a pivotal role in refining surgical techniques and optimizing patient outcomes in the realm of orthopaedic interventions.

Keywords: Orthopaedic, Hip, Replacement, Surgery, Orthopaedic.

INTRODUCTION

Hip replacement surgery has become one of the most commonly performed orthopaedic surgeries in Indonesia. This surgery is commonly performed on patients with fractures of the femoral neck and patients with osteoarthritis. The aim of this surgery is to restore the patient's quality of life to normal. Patients are able to walk and perform daily activities without the help of others. For decades, the posterior approach (PA) has been the standard choice for hip replacement surgery. The posterior approach is used because we can see a wider surgical field that can be used to properly fix hip problems. In recent years, approaches have been invented that reduce muscle damage. Two commonly used approaches are the mini posterior approach (MPA) and the direct anterior approach (DAA). The MPA is a modification of the posterior approach. The surgeon performs the hip replacement through a small incision without cutting the abductor muscles, which are important for hip stability and walking [1, 3].

DAA is performed by making an incision 3-4 cm anterior to the hip and into the hip joint through the intermuscular space between the tensor fasciae latae and gluteus medius muscles laterally and the sartorius and rectus femoris muscles medially. The DAA is considered to be a purely intermuscular approach that can preserve the soft tissues around the hip joint (including the posterior capsule), thus maintaining joint stability [1]. In Japan, patients treated with the anterior approach can be discharged from hospital sooner and can use a standard operating table. DAA in Japan can reduce hospital costs while maintaining good clinical outcomes. These results are promising for other hospitals as there is no need to replace their standard operating table [4]. DAA performed in patients with femoral neck fractures was also safe and improved surgical outcomes compared to other approaches [5-6]. DAA is an emerging approach in hip replacement surgery as it offers several advantages during and after surgery. It has been reported in the literature to be superior due to preservation of the abductor and external rotator muscles, less blood loss, reduced risk of dislocation, faster recovery and less pain after surgery. Despite these advantages, DAA is still challenging even for experienced surgeons due to the longer operative time, longer learning curve and higher complication rate, especially when performed during the learning curve.6 As noted by de Steiger et al, the learning curve for anterior approach surgery is estimated to be more than 50 operations to reduce the risk of revision for complications such as femoral fracture and lateral femoral cutaneous nerve (LFCN) lesion [7, 8]. However, a meta-analysis by Peng L et al (2020) showed that there was no significant difference between the DAA and PA groups in incision length, length of stay (LOS), blood loss, transfusion rate or complication rate.

There were no significant differences between the two groups in functional outcomes such as VAS score at 12 months post-operatively or Harris Hip Score (HHS) at 3, 6 and 12 months post-operatively. There were no significant differences in radiographic outcomes [9-12].

METHODS

This study is a retrospective observational study using a case-control research design, where cases are patients operated on using the anterior approach and controls are patients operated on using the posterior approach. This study was conducted at Siloam Hospital Kupang, East Nusa Tenggara, Indonesia from June to July 2023. The population in this study were all patients who underwent hip joint replacement surgery from January 2022 to June 2023 and were registered in the Electronic Medical Record (EMR) of Siloam Kupang Hospital. The initial phase of the research involves collecting pertinent data from Siloam Kupang Hospital, specifically focusing on patients who underwent hip joint replacement surgery. This segmentation will Characteristics of respondents based on research variables categorize cases where the anterior approach was employed and controls where the posterior approach was utilized. This foundational step lays the groundwork for a comparative analysis between the two surgical approaches, aiming to discern potential variations in outcomes.

Following data collection, a thorough examination of the completeness of medical records ensues. The objective here is to ensure the availability of comprehensive information required for the research. Any gaps or inadequacies in the records are identified, and subsequent measures are implemented to address and rectify these discrepancies. Subsequently, the total sampling technique is employed to select research subjects who meet the predefined inclusion and exclusion criteria. This method aims to provide a representative and unbiased sample, ensuring that the findings can be extrapolated to the broader population of patients who undergo hip joint replacement surgery at Siloam Kupang Hospital.

The collected data will be processed, analysed and interpreted to test the hypothesis using the application by data, namely IBM SPSS Statistic 20 and for this study the researcher uses a significance value, namely $p < 0.05$, indicating that there is a significant relationship between the independent variable and the dependent variable. If the $p > 0.05$ value indicates that there is no significant relationship between the independent variable and the dependent variable

RESULTS

In table 1, the age range of patients who underwent hip replacement surgery with the anterior approach at Siloam Kupang General Hospital was between 20 and 87 years, with an average age of 60 years. For patients who underwent surgery with the posterior approach, the age range was between 22 and 88 years, with an average age of 68 years. The average operating time for the anterior approach was 128.3 minutes, slightly higher than the posterior approach with 127.1 minutes. Patients who underwent surgery with the anterior approach had a longer average hospital stay of 6.2 days compared to 5.4 days for the posterior approach. However, the patients who had surgery with the anterior approach had a faster average time for mobilization after surgery, taking 6.1 days, compared to 11 days for the posterior approach. The majority of patients in both approaches were older individuals who had experienced trauma.

Table 2 above shows that there were many cases of patients who arrived late (neglected), namely 14 patients in the anterior approach and 13 patients in the posterior approach. The time from injury to surgery varied. In the posterior approach the time of occurrence was between 1 to 8 months. Whereas in the anterior approach it ranged from 1 month to 11 years.

Table 1: Characteristics of Respondents

Variable	Approach	Mean	Std. Deviation	Minimum	Maximum	Shapiro-Wilk	P-value of Shapiro-Wilk
Age	anterior	59.409	19.262	20.000	87.000	0.913	0.056
	posterior	67.182	14.152	26.000	88.000	0.851	< .001
Operation Time (minutes)	anterior	128.364	39.618	70.000	222.000	0.954	0.383
	posterior	127.152	55.702	70.000	381.000	0.714	< .001
Length of Stay (days)	anterior	6.227	1.152	4.000	9.000	0.891	0.019
	posterior	5.455	1.034	3.000	8.000	0.881	0.002
Mobilisation Time	anterior	6.136	1.167	4.000	9.000	0.906	0.039
	posterior	11.091	2.962	6.000	15.000	0.905	0.007
Haemorrhage (cc)	anterior	245.455	247.804	100.000	1.300.000	0.446	< .001
	posterior	234.848	88.816	150.000	600.000	0.733	< .001
Event/Pain Time (Days)	anterior	614.091	985.868	2.000	3.993.000	0.638	< .001

Table 2: Case Distribution

Approach	New Trauma (<1 month)	Neglected (>1 month)	Avascular Necrosis	OA	Ankylosing
Anterior	8	14	1	1	2
Posterior	20	13	1	0	0
Total	28	27	2	1	2

Hip replacement surgery approach by gender

Table 3: Frequency distribution of hip replacement surgery approaches by gender

Approach	Gender	Frequency	Percentage
anterior	Male	10	45.455
	Female	12	54545
	Total	22	100.000
posterior	Male	9	27.273
	Female	24	72.727
	Total	33	100.000

The results of the data presented in table 3, obtained that patients who performed hip replacement surgery were mostly female (anterior: 54% and posterior: 72.7%).

The results of the data presented in table 4, obtained most of the patients who performed hip replacement surgery with anterior approach were bipolar D hemiarthroplasty surgery (31.8%) compared to Total Hip Arthroplasty D (13.6%). In addition, in patients who performed surgery with posterior Most of the types of bipolar hemiarthroplasty S (57.5%).

Approach to hip replacement surgery by type of surgery

Table 4: Frequency distribution of hip replacement surgery approaches by type of surgery

Approach	Type of Operation	Frequency	Percentage
anterior	Total Hip Arthroplasty D	3	13.636
	Total Hip Arthroplasty S	6	27.273
	hemiarthroplasty bipolar D	7	31.818
	hemiarthroplasty bipolar S	6	27.273
	Total	22	100.000
posterior	Total Hip Arthroplasty D	0	0.000
	Total Hip Arthroplasty S	0	0.000
	hemiarthroplasty bipolar D	14	42.424
	hemiarthroplasty bipolar S	19	57.576
	Total	33	100.000

Approach to hip replacement surgery based on the number of blood transfusion bags

Table 5: Frequency distribution of hip replacement surgery approaches by number of blood transfusion bags

Approach	Tranfusion (bag)	Frequency	Percentage
erior	0	12	54.545
	1	6	27.273
	2	4	18.182
	Total	22	100.000
Posterior	0	19	57.576
	1	7	21.212
	2	7	21.212
	Total	33	100.000

The results of the study presented in table 5, found that most patients who performed hip replacement surgery with anterior approach at Siloam Kupang General Hospital did not need additional blood transfusion during surgery (54.5%) compared to posterior approach patients.

Analysis Requirement

Before hypothesis testing is carried out, it is necessary to test the analysis requirements. The requirement test in this study is the normality test. This normality test aims to determine whether the distribution of data in the sample group used is normally distributed or not. The normality test in this study uses the Shapiro Wilk normality The error rate used is 5% or 0.05. The basis for deciding whether or not a data is normal in this study is if the significance value or Asymp. Sig. 2 tailed is greater than 0.05 then the data is normally distributed. Conversely, if the significance value is smaller than 0.05, the data is not normally distributed.

Table 6: Normality test

Variable	Approach	Statistical Value	p
Operation Time (minutes)	anterior	0.954	0.383
	posterior	0.714	0.001
Length of Stay (days)	anterior	0.891	0.019
	posterior	0.881	0.002
Mobilisation Time	anterior	0.906	0.039
	posterior	0.905	0.007
Tranfusion (bag)	anterior	0.738	0.001
	posterior	0.710	0.001

The results of the normality test of the research data obtained that the variables of surgery time, length of stay in the

hospital, the need for transfusion and time for mobilisation after surgery showed a distribution of data that was not normally distributed.

Comparative analysis

Based on the normality test conducted, the data shows no normal distribution. Then hypothesis testing can be carried out. Hypothesis testing in this study using the Mann-Whitney test

Table 7: Comparison test analysis results

variable	Statistic	df	p	95% Confident interval	
				Lower	Upper
Operation Time (minutes)	385.500	53	0.705	-15.000	29.000
Length of Stay (days)	513.500	53	0.007	6.950×10^{-6}	1.000
Mobilisation Time	59.000	53	0.001	-7.000	-4.000
Tranfusion (bag)	367.000	53	0.946	-2.593×10^{-5}	4.259×10^{-5}

According to the findings in table 7, the p-value analysis indicates that the length of hospital stay and mobilization time variables reject Ho or accept Ha ($p < 0.05$), while the operating time and need for transfusion variables fall within the acceptance area of Ho ($p > 0.05$). Therefore, it can be concluded that the anterior approach in hip replacement surgery does not result in reduced operating time compared to the posterior approach at Siloam Kupang General Hospital. However, the posterior approach does lead to a shorter hospital stay compared to the anterior approach in patients at the same hospital. Additionally, the anterior approach results in quicker mobilization after surgery compared to the posterior approach. Finally, there is no significant difference in the need for transfusion between the anterior and posterior approaches in hip replacement surgery at Siloam Kupang General Hospital.

DISCUSSION

This study examines joint replacement surgeries in younger patients, specifically those aged between 20-33 years, due to various reasons such as fractures, old dislocations of the pelvic region, avascular necrosis, and ankylosing of the hip joint. The study concludes that operating at a young age may require additional surgeries in the future if the implant gets damaged. The study found that both the anterior and posterior approaches had similar operating times and transfusion requirements. However, the posterior approach had a slightly faster operating time, while the anterior approach was associated with faster rehabilitation, higher functional scores, and shorter hospital stays. It was also observed that patients with neglected trauma cases required more time for surgery and had increased bleeding, leading to a need for blood transfusions [12-14]. The high number of neglected cases was due to geographical challenges in accessing orthopaedic surgeons. Delayed consultations with orthopaedic surgeons were also caused by traditional beliefs and a preference for traditional medicine. The anterior approach offers faster mobility and easier leg length measurement, while the posterior approach can sometimes result in lateral femoral cutaneous nerve injury. The hospital stay duration was less than seven days on average, except for two cases where complications and comorbidities extended the stays [15-17].

This text emphasises the significance of physiotherapy in the early rehabilitation of patients who have undergone total hip arthroplasty (THA). Postoperative rehabilitation aims to reduce pain, prevent complications, restore mobility, strength and flexibility, and train patients to safely perform daily activities. After undergoing the direct anterior approach (DAA) procedure, it is recommended to avoid certain movements for at least 6 weeks to protect the healing muscles and anterior capsule [18]. The study discussed in the text outlines the authors' initial experience with the anterior approach to hip joint surgery and concludes that it is a safe option with a faster patient mobilization time. Overall, the text emphasizes the importance of physiotherapy in the ward during treatment and highlights the benefits of the minimally invasive DAA technique.

CONCLUSION

The study concludes that there was no significant difference in operative time and transfusion requirements between hip replacement surgeries using the anterior and posterior approaches. However, mobilization time was faster with the anterior approach. Additionally, the hospital length of stay was longer for pelvic replacement using the anterior approach compared to the posterior approach.

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Conflict of Interests

There is no conflict of interests found during this study

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