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Painful Effect on Physical Function in Post Total Knee Arthroplasty Patients in Vietnam

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Abstract: *Studies in Vietnam support evidence that the number of Total Knee Arthroplasty (TKA) patients in some hospitals are around 40-70 cases each year. After TKA, patients improve the range of motion. However, the length of hospital stay and follow-up times in Viet Nam is too long. In addition, many factors affect the Physical function in post-TKA surgery, such as pain, psychology, wound status, stress and anxiety, nutrition care, and hygiene care.* ***Purpose****: This study aims to explore the effect of pain on physical function in post-TKA patients.* ***Methodology****: This study is applied to descriptive correlational research.* ***Results****: Pain Post-TKA was the most substantial factor impacting physical function with r = .605 (sig p<.001). However, there was no difference between patients who use three types of pain management methods to their physical function post-surgery.* ***Conclusion****: Pain post-TKA was a factor correlated to physical function in which Pain post-TKA was the most significant. However, pain management methods applied in this study combine different types of drugs to enhance the pharmacology dynamic and reduce the number of drugs used.*

Keywords *Painful Effect, Post Total Knee Arthroplasty, Pain Management.*

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I. Introduction

Total knee arthroplasty (TKA) is a popular surgery especially treated for Osteoarthritis (OA) in the orthopedic surgical field. It is conducted and widespread throughout the world to improve the quality of life of OA patients. The prevalence of TKA is increasing when people are getting older, reaching 10.38% for total knee replacement at eighty-year-old [1]. In Asia, the TKA population is estimated to double from 6.8% to 16.2% in 2040 [2]. In Vietnam, the incidence of knee osteoarthritis is around 23%, and most patients were aged 25 to 50, 14% in women and 5 % in men [3]. Studies in Vietnam support evidence that the number of TKA patients in some hospitals is around 40-70 cases each year [4, 5]. After TKA, patients improve the range of motion. However, the length of hospital stay and follow-up times in Viet Nam is too long, around 11-14 days and 24-26 months [4, 6, 7] compared to other countries as 4-7 days and six months [8, 9].

Physical function is one of the criteria to prove the success of TKA surgery. It is defined as "any bodily movement produced by skeletal muscles that result in energy expenditure" [10]. Physical function can also be described as the ability of a person to use their physical muscles and joint strength to do normal daily activities. There are many factors that affect the Physical function in post-TKA surgery, such as psychology [11], wound status [12], stress and anxiety [13, 14], nutrition care, and hygiene care [15]. Pain is one of the factors related to physical function [14]. Pain intensity was associated ($R^2 = 0.08$) with worse physical function as well [8].

II. Methodology

2.1 Aim of study

This study aims to explore painful factors that affect physical function in post-TKA patients.

2.2 Research question

What is the demography of post-TKA patients**?**

What are the painful factors that affect physical function in post-TKA patients**?**

2.3 Study design

This study adopted a descriptive correlational research design.

2.4 Setting

The study implements in Orthopedic Surgical Department in the Orthopedic Hospital in Ho Chi Minh City, Vietnam.

2.5 Population and sample

The patients after TKA surgery spent the normal recovery process at Orthopedic Surgical Department in the Orthopedic Hospital in Ho Chi Minh City from day 5 to day 7. On day 5, patients were explained and invited to participate in this research. On day 7, they were asked to answer the questionnaire, which focuses on their

personal information, Depression, Anxiety, and physical function. Comparing with other countries, the length of stay in Vietnam is longer than in other countries, around 4-6 days [9]. Therefore, assessing the factors and physical function at day 7 is the medium range to identify the recovery of patients.

Inclusion criteria:

+ Inpatients post TKA from day seven days
+ Patients >16 and < 70 years old who read and write Vietnamese
+ The patient voluntarily participated in the study.

Exclusion criteria

+ Patients <16 and > 70 years old
+ Patients with complications soon after surgery
+ Patients with communication or mental problems

2.6 Patients have other comorbidities Sample size

The estimated sample size based on the equal following the general sample size estimate for medical research [16]

$$n = Z^{2}_{(1-\alpha/2)} \frac{p(1-p)}{d^{2}}$$

n: estimated sample size.
α: statistically significant level in study α = 0.05.
Z (1-α/2), with alpha =0.05, Z =1.96
p: percentage of patients with TKA in Vietnam is 0.14 [3]
d: accuracy, with p=0.14 selected d=0.05
The estimated sample size in the study was n = 185 patients

2.7 Research variables

Pain management methods: The sedation procedure that patients were applied to reduce pain after the TKA. It was different depending on sedation guidelines and opinions of surgeons and anesthetists. In this study, pain management methods were the usual type variable with three groups follow the level of pain, group 1 used NSAIDs and non-opioid analgesic; group 2 combine non-opioid analgesic and Opioids; group 3 applied non-opioid analgesic combine NSAIDs and Opioids. In which non-opioid analgesic is used to combine with Opioids to enhance the pharmacology dynamic of drugs and reduce drug use [17]. The data was collected from the medical profile as follow

Table 1: The pain management methods of participants in this study

Group	Opioids	Non-opioids drugs	NSAID
Group 1		√	√
Group 2	√	√	
Group 3	√	√	√

Pain post-surgery: Conceptual definition is the level of how much the person feels pain or uncomfortable. It was the ratio type variables collected by using the pain scale. The higher number indicates a more level of pain. Following the group of TKA patients, pain intensity in this study considered as the pain occurred post-TKA, which related aspects of post-surgical recovery status, injury of knee joint, patella not resurfaced, malalignment of femoral, tibial, or patellar component, tendons failure or degeneration and it is an unexpected mechanism [18]. Therefore, the instrument to measure pain intensity in this population need to cover the degree of pain-relevant in some significant aspects of TKA like daily activities. Based on the literature review, the Numeric rating scale was the best scale used to assess the pain intensity of patients [19-21]. In this study, Surgical Pain Scale (SPS), a high construct validity, will be used to measure pain intensity post-operation [22]. Operationally, Pain intensity measured by SPS includes four questions asks about the level of pain on average (rate from 0 to10), pain in the status of resting, pain when doing activities, and the disturb of pain to person during the day and the most severe pain in the day. The SPS format shows in number representing a degree of pain, allowing the patient to self-assess and compare his or her pain level. The pain intensity score is the sum score of 4 questions compare to the maximum pain score of 40. The higher number of SPS indicates a severe pain degree.

Physical function: Physical function by conceptualization is considered the ability of a person to use their muscles and joint strength to adapt to do the usual daily activities post-TKA. Operationally, this variable was a ratio type collected by the revised KOOS- Activities of Daily Living (KOOS-ADL), one subscale of KOOS. The KOOS questionnaire was developed in the 1990s to assess patients' opinions about their knees and associated problems. Since 1998, the psychometric properties (KOOS)have been assessed in more than twenty

individual studies worldwide. KOOS-ADL is also used in knee OA patients 18-79 age with 15 items asking about the difficulty when doing daily activities in the last week. In this revised version, KOOS-ADL had 15 items which format in 4 Likert scales from 0-4 present for none, a mild, moderate, and severe level of complex function. It takes only 5 minutes to complete—the total score of KOOS-ADL calculated sum of 15 items. The minimum is 0, and the maximum is 60. A higher score indicated a lower physical function. KOOS- ADL has high test-retest reliability. In patients with a knee injury, ICCs for daily living subscale activities were 0.84-0.94 [10, 23]. The KOOS'ADL convergent and divergent construct validity have been determined compared to different subscales of SF-36 and the Lysholm knee scoring scale and WOMAC.

2.8 Research ethics

The ethical research board approved this study of the Orthopedic Hospital where the collecting data conducted. After that, the researcher ware referred to the patients. The information about the purpose of this study and the consent form were sent to patients by the researcher. When participants agreed to participate in the study, they signed the consent form to make sure they volunteered to join the study. Patients had all rights to refuse to participate, to stop involving in the study at any time, or refused to answer any questions without explanation. No physical examinations, no harmful or invasive procedures were conducted on patients in this study. All medical treatment and care for all participants by the registered nurses and doctors in the ward were routine care.

III. Results

Demographic data of the participants

Overall, participants consisted of over 80% middle and old patients compared to 8.9% for young patients. The youngest patient in this study was 28 years old, and the oldest was 68 years old. Only one-third of participants were male, and others were female. Among all patients, over half of them were overweight, 7.3% obesity, whereas 33.5% were standard. Most of the patients applied Opioids + non-opioid analgesic method at 52.4%, while there were 33.5% patients pain-managed with Opioids + NSAIDs + non-opioid analgesic and 14.1% of them used NSAIDs+ non-opioids analgesic.

Almost all patients Post-TKA in this study mainly displayed a moderate level with 60.3%. The mild and severe pain levels took only 18%, and there was only four-person (2%) who reported that they were not painful. As a consequence of the reduction of physical function, the highest level was mild with 60.7%, continuously was the moderate level with 33.3%, and regular physical function with 6.3%. No patient expressed severe mal physical function in this study—the result of these statistical numbers presented in table 2 below.

Table 2. The characteristic of the patients

Characteristic		**Frequency**	
		n	%
Age			
	16-29 (Young)	17	8.9
	30-49 (Middle)	85	44.5
	50-69 (Old)	89	46.6
Gender			
	Male	46	24.1
	Female	145	75.9
BMI			
	18-22(Normal)	63	33.0
	23-26 (Overweight)	97	50.8
	27-30 (Obesity)	31	16.2
Pain Method			
	NSAIDs+ non-opiods anagelsic	27	14.1
	Opioids+ non-opioids anagelsic	100	52.4
	Opioids + NSAIDs + non-opioid anagelsic	64	33.5
Post-TKA pain			
	None (0 scores)	4	2.1
	Mild pain (4-9 score)	24	18.8
	Moderate (11-29 score)	117	60.3
	Severe (30-40 score)	36	18.8
Physical function			
	None (0-15 score)	12	6.3
	Mild (16-30 score)	116	60.7

Moderate (31-45 score)	63	33.3
Severe (46-60 score)	0	0

N=191

Correlation between Pain post-TKA to Physical function

Consider to the assumption how to test the Correlation between independent and dependent variables, the Parametric Distribution test using Skewness and Kurtosis and Q-Q Plot applied for continuous variables such as Post-TKA Pain, Physical Function. The most commonly used critical values are ± 2.58 (.01 significance level) and ± 1.96, corresponding to a .05 error level [24]. For Skewness, the values presented in each variable were for Post-TKA pain and -.252 for Physical function. Regarding the Kurtosis test, the values were -.762, -.797 for Post-TKA pain and Physical function, respectively. Thus, all continuous variables in this study existed Skewness and Kurtosis values not exceed +/- 1.96, proving the normal distribution.

The statistic test also showed the description of all continuous variables in this study with Post-TKA pain Mean 21.35 (SD 10.12), whereas Physical function was the highest Mean score of 26.75 (SD 6.46). The statistical number presented in table 3

Table 3. The distribution of variables Pain post-TKA and Physical Function

Aspects	Mean	Standard Deviation	Skewness	Kurtosis	Range
Pain post-TKA	21.35	10.12	-.355	-.762	0-40
Physical Function	26.75	6.46	-.252	-.797	0-60
N (Listwise) = 191					

The Pearson correlation (2-tailed) test had shown this Correlation's findings. The result presented that Pain post-TKA was a factor correlated to the impairment of physical function after patients overcame the TKA surgery. Pain Post-TKA was the most substantial factor impacting physical function with r = .605 (sig p<.001). The results showed in table 4 below:

Table 4. Pearson correlation between Pain post-TKA to Physical function

	Pain post-TKA	Physical function
Pain post-TKA	1	
Sig(2-tailed)		
Physical function	.605**	1
Sig(2-tailed)	.000	

** Correlation is significant at the .01 level

Kruskal-Wallis analysis for Pain management methods and Physical function.

For Gender and Pain methods, which are the nominal variables, the nonparametric test Kruskal-Wallis was used to analyze the impact of sub-group in each variable on physical function. Regarding the Gender variable, the result showed a non-significant with p=.073(p>.05) in the Kruskal-Wallis. This statistical result told that the Pain methods, the Kruskal-Wallis test's result was p=.548 (p>.05), reported no difference between the group of patients using three types of pain management methods to their physical function post-surgery.

IV. Discussion

Discussing the result findings of demographic data

Discussing gender, the participants in this study had the ratio one/third between male and female. The partial is the same as other studies in Vietnam [4, 6]. The explanation for this might come from the social aspects; Vietnamese female was commonly housework, farmer, or worker who have to do heavy work for a long time which might cause the Osteoarthritis. Besides that, one risk behavior mostly seen in Vietnamese women is that they usually do housework like washing dishes and washing clothes by sitting (without the chair). In addition, the nutrition and calcium support or health promotion/health checkups were still low in Vietnamese women.

The age of applied TKA almost existed in the middle (44,5%) and old (46.6%) among 191 patients. These findings were not in congruence with the results of other research in Thong Nhat and Medicine and Pharmacy University Hospitals in which the mean score of age usually 68 years old among 45-48 participants [4, 6]. Assumptions for this result depended on the Orthopedic Hospital was the biggest Orthopedic center in the South of Vietnam, where responses treatment for half residents of the countries. Besides, convenient sampling

methods focus on three months in the same hospital, leading to an increase in middle age groups among participants. Moreover, considering the age that patients could be implemented TKA, in Vietnam was not over 68, in the opposite, it was 80 in other countries [8, 25]. It brings the thought that health promotion program in the Vietnamese population was not working effectively to prevent and cure for Osteoarthritis. Patients occurred the disease in middle age and suffered the TKA early to impact their quality of life. It was also seen that the quality of treatment and care were not adapting yet for the old group >69 people.

As regards BMI, the participants almost fifty percentage at BMI=23-26 which rank on the overweight level. Thus, overweight was a causing factor of Osteoarthritis. However, it still not a careful concern for most of the Vietnamese people.

Findings of pain management methods, the Orthopedic Hospital applied multi-methods for pain management, and it was flexible to follow the patient's situation. Result showed that 14.1 % applied group 1(non-opioid analgesic + NSAIDs), 52.4% used group 2 (Opioids + non-opioid analgesic) and 33.5% took group 3 (non-opioid analgesic + Opioids+ NSAIDs). Group 1 and group 2 applied for mild and moderate pain, and group 3 applied for serious pain post-TKA. The result showed that participants in this study applied the multi-model drug management in which Opioids were mostly used. It considered that pain post-TKA was a serious problem that required more attention from surgeons and anesthetists. In this study, the pain management methods met the pain management direction recommended by the Vietnamese Anesthesia Association in Vietnam. However, Opioids drugs used protocol need to study more in this group of patients.

The Correlation of Pain post-TKA to Physical function post-TKA

Pain Post-TKA level in this study correlated to Physical function with r =.605 (sig p<.001) congruence with r=.800 in the research of Robbin et al. l, (2014). It also proved that Pain Post-TKA was the most predictor of Physical function. The higher score of pain implied lower than physical function. Although the participants in this study applied multi-model pain management methods, pain post-TKA still existed as a significant problem in caring for these patients.

V. Conclusion

This study focuses on finding out the related factor to physical function post-TKA seven days. The result showed that Pain post-TKA was a factor correlated to physical function in which Pain post-TKA was the most significant. However, pain management methods applied in this study combine different types of drugs to enhance the pharmacology dynamic and reduce the number of drugs used. However, it seems that the pain management model for TKA needs a combination of both pharmacology and non-pharmacology methods. The physical function of TKA patients did not only depend on the effectiveness of the TKA surgery but relevant aspects related to pain in post-TKA.

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