

# **EFFECTS OF LOW-INTENSITY PULSED ULTRASOUND ON PAIN AND RECOVERY OF RANGE OF MOTION AFTER TOTAL KNEE ARTHROPLASTY: PRELIMINARY STUDY**

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# INTRODUCTION

- Pain and decreased knee mobility after total knee arthroplasty (TKA). (Vuorenmaa et al. 2008)
- Cryotherapy: the use of cryotherapy following TKA is still inconclusive. (Thacoor et al. 2018, Chughtai et al. 2017)
- Only one study: low-intensity pulsed ultrasound in combination with cryotherapy → relieve inflammation, improve range of motion (ROM) and joint function of patients with TKA. (Kang et al. 2014)



## Research questions

- In post-TKA patients, is the use of low-intensity pulsed ultrasound as an adjunct to conventional physiotherapy yields better outcomes on recovery of pain and knee ROM compared to conventional physiotherapy alone?
- Is there a relationship between the recovery of knee ROM and pain following the combined intervention?

# METHODOLOGY

**Study design:**  
Assessor-blinded  
quasi-experimental  
study

## **Intervention**

- ❑ Pulsed-ultrasound: 3MHz, 1:4, 0.2 Wcm<sup>2</sup>, 5 min
  - First-week: 4 times
  - Further 2 weeks: 1x/week
- ❑ Conventional physiotherapy
  - First-week: 4 times
  - Further 3 weeks: 1x/week

**Experimental group:** Pulsed ultrasound-added conventional physiotherapy (n=10) (mean age = 66.40 ± 9.14 years)

**Control group:** Conventional physiotherapy (n=10) (mean age = 66.40 ± 5.62 years)

## Flow chart of the study

**Setting:** UKM Medical Centre

Screening for eligibility

### **Included**

- Aged 50-80 years
- Will undergo TKA surgery due to knee OA
- Able to walk and climb up and down stair

### **Excluded**

- Contraindication to pulsed ultrasound
- Has coexisting or history of disease which might limit the physical function

Post-operative day 2

- Screening for eligibility after surgery
- Baseline: **Pain** – Visual Analogue Scale(VAS)  
**Active knee ROM** – Goniometer

### **Excluded**

- Has TKA complication(s)

**Alternate allocation**

Assessment:

Week 1

Week 4

**Data analysis:** Mixed model ANOVA  
Spearman's rho

# FINDINGS AND DISCUSSION

Table 1:  
Time effect

Outcome: Mean (SD)	Baseline (n=20)	Week 1 (n=20)	Week 4 (n=20)	P-value
Pain	4.25 (2.36)	3.80 (1.61)	2.77 (1.64)	0.042*
Active knee flexion (°)	47.90 (20.36)	75.52 (19.85)	96.08 (12.46)	0.000**

Table 2:  
Group effect

Outcome: Mean (95% CI)	Experimental group (n=10)	Control group (n=10)	P-value
Pain	3.03 (2.22 – 3.83)	4.19 (3.38 – 4.99)	0.047*
Active knee flexion (°)	80.75 (72.67 – 88.84)	65.59 (57.50 – 73.67)	0.012*

❑ Consistent with previous study by Kang et al. (2014) relating to ROM.

- did not examine the effect of low-intensity pulsed ultrasound on pain.

\*P<0.05; \*\*P<0.001

Table 3:  
Interaction effect

Outcome: Mean (SD)	Baseline		Week 1		Week 4		P-value
	Experimental (n=10)	Control (n=10)	Experimental (n=10)	Control (n=10)	Experimental (n=10)	Control (n=10)	
Pain	4.00 (2.94)	4.50 (1.72)	3.20 (1.48)	4.40 (1.58)	1.88 (1.61)	3.66 (1.16)	0.452
Active knee flexion (°)	53.00 (17.19)	42.80 (22.84)	84.30 (19.56)	66.75 (16.66)	104.96 (9.91)	87.21(7.38)	0.611

Table 4: Correlation		
	Pain	P-value
Active knee flexion	-0.166	0.646

❑ Inconsistent with previous studies (Kocic et al. 2015 & Park et al. 2007)

- examined the relationship between ROM and pain but not on the effects of low-intensity pulsed ultrasound.

**Limitation**

- Non-randomized control trial
- Small sample size

- The combined intervention demonstrated more promising results in pain alleviation and recovery of knee motion following TKA.

**Possible impact  
of the research  
outcome**

Fills the gaps in knowledge relating the benefits of including pulsed ultrasound with low intensity into conventional physiotherapy for patients with TKA

Our results suggest low-intensity pulsed ultrasound as a possible adjunct modality to the acute physiotherapy management in enhancing the recovery following TKA.

# REFERENCES

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