

Facilitated preoperative temporal summation of pain associates with postsurgical pain after total knee arthroplasty

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INTRODUCTION: Quantitative sensory testing (QST) is an objective method to investigate the functional states of the somatosensory system by evaluating thresholds or responses to standardized stimuli. The conventional laboratory-based QST tools were too complicated, training necessary and time consuming, and hence, it has not become a popular pain assessment for routine clinical applications. To solve this problem, we have recently developed a simple bedside tool kit (QuantiPain) for evaluating QST parameters. Among several QST parameters, we focused on temporal summation of pain (TSP), in this study. Enhanced TSP suggests enhancement of the dorsal horn neuron and reflected pain hypersensitivity. The purpose of this study was to predict acute to chronic postsurgical pain after total knee arthroplasty (TKA) by using preoperative TSP.

METHODS: The subjects were 50 knees in 48 patients undergoing primary TKA for knee osteoarthritis at our hospital. All patients don't have component coronal malalignment greater than 3 degrees, psychiatric disorders and leg pain due to spinal diseases. Pain visual analog scale (VAS) during walking and at rest was assessed preoperatively and at 2 days, 7 days, 14 days, 3 months and 6 months postoperatively. Preoperative TSP was evaluated by 10 consecutive stimuli by using pinprick on the same sites of tibialis anterior muscle using QuantiPain. The TSP was calculated as the difference in the pain VAS between the first and the last stimuli. We defined abnormal TSP group on the basis of a z score threshold of greater than 1.96 in healthy individuals. The values are represented as: mean (standard deviation [SD]).

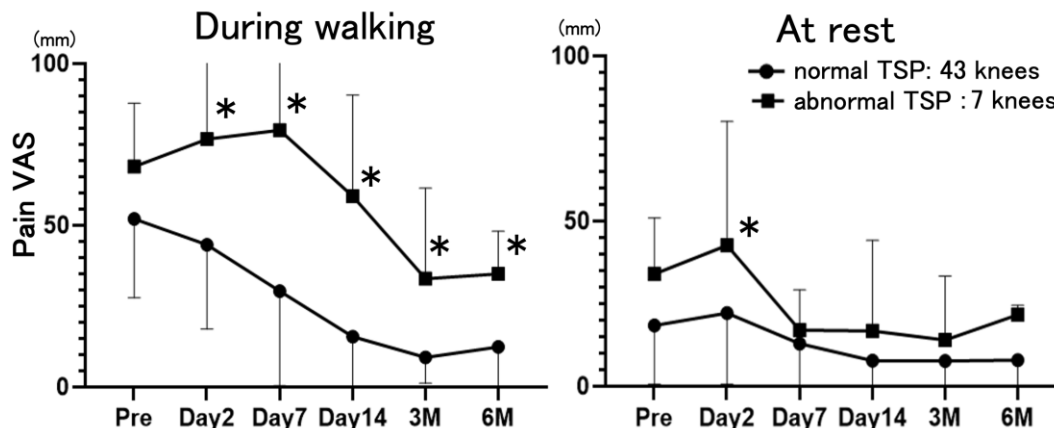
RESULTS SECTION: The preoperative pain VAS during walking was 54 ± 23 mm and that at rest was 21 ± 20 mm. The preoperative TSP was 27 ± 23 mm and 7 knees showed abnormal TSP. The preoperative TSP showed a positive correlation with pain VAS during walking preoperatively and at 2 days to 6 months postoperatively. That also showed a positive correlation with pain VAS at rest at 3 to 6 months postoperatively (Figure 1). Furthermore, compared with TSP normal group, abnormal TSP group had significantly higher pain VAS during walking at 2 days to 6 months postoperatively and higher pain VAS at rest at 2 days postoperatively (Figure 2).

DISCUSSION: In this study, enhanced preoperative TSP was associated with higher postoperative pain VAS. The prevalence of chronic postsurgical pain (CPSP) after TKA has been reported to be 9-34%, which is not small and a significant problem. If patients have enhanced TSP preoperatively, we could possibly prevent CPSP by adding special perioperative interventions such as preoperative rehabilitation and pain neuroscience education and postoperative multimodal analgesia for acute postoperative pain.

SIGNIFICANCE/CLINICAL RELEVANCE: Preoperative TSP assessment using Quantipain could predict the risk of chronic postsurgical pain after TKA.

	During walking		At rest	
	r	p-value	r	p-value
Pre-op	0.34	0.02	0.23	0.11
Post-op 2 days	0.34	0.047*	0.19	0.29
7 days	0.35	0.009*	0.24	0.08
14 days	0.38	0.009*	0.18	0.21
3 months	0.40	0.006*	0.29	0.049*
6 months	0.33	0.03*	0.38	0.01*

(Figure 1) Correlations between pre-op TSP and pain VAS
r: Spearman's rank correlation coefficient *: p<0.05



(Figure 2) Difference of the time course of postsurgical pain (normal vs abnormal TSP)
Two-way ANOVA followed by Turkey's HSD test
*: p<0.05 vs. normal TSP group