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Longitudinal Postoperative Course of Pain and Dysfunction Following Total Knee Arthroplasty

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Abstract

Objectives—While the majority of patients undergoing Total Knee Arthroplasty report substantial improvement in pain and function, a significant subset experience persistent post-surgical pain and dysfunction. Better understanding of the longitudinal postoperative course is needed, including the association between patient status following physical rehabilitation at 6 weeks post-TKA, to six month outcomes. This study aims to described the postoperative course of TKA and examine variables associated with change in pain and functioning between 6 weeks and 6 months post-TKA.

Methods—In this longitudinal study of 223 participants, assessments of analgesic intake, depression, anxiety, pain catastrophizing, dysfunction, resting and range of motion (ROM) pain, and pain sensitivity were completed at 6 weeks post-TKA. Analgesic intake, pain ratings and dysfunction data were also collected at 6 months post-TKA. Pain and dysfunction ratings were divided into none-mild and moderate–severe categories.

Results—Between 6 weeks and 6 months post-TKA, 75% of the sample stayed in the same pain category, 20% improved, and 5% worsened. In terms of functional changes between 6 weeks and 6 months, 65% of the sample stayed in the same functional category, while 31% improved, and 5% worsened.

Discussion—These findings demonstrate that the majority of patients' pain and functioning remains stable between 6 weeks and 6 months post-TKA. However, a notable subset continues to

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improve or worsen in pain and functioning and the current study identifies variables associated with these changes.

Keywords

persistent postsurgical pain knee arthroplasty

Introduction

Total Knee Arthroplasty (TKA) is a prevalent procedure for patients with advanced osteoarthritis of the knee. As of 2010, approximately 2.5 million Americans underwent TKA [1]. As a result of increased prevalence of obesity and increased acceptance of surgical safety, these numbers are expected to increase substantially by 2020 [2]. Unfortunately, about 1 in 5 patients are dissatisfied following TKA [3] and approximately 20% of TKA patients report persistent pain following surgery [4]. Dissatisfaction following TKA is associated with both knee-related pain and dysfunction [3, 5–7]. Further, dissatisfaction at 3-months post-TKA predicts minimal improvement or worsening outcomes 12-months post-TKA [6].

Increased understanding of the longitudinal postoperative course following TKA could result in better understanding of how some patients develop poor long-term outcomes. Six weeks after surgery, when intensive physical therapy rehabilitation has been completed, improvements in pain can be detected [8]. Further, the first six weeks post-TKA is an important period of time during which, for most patients, pain decreases while functioning and quality of life increase. By 6 weeks post-TKA, quality of life is similar to that prior to surgery, suggesting that the acute impact of surgery has leveled out by this point in time for most patients [9]. Since initial improvement is expected by six weeks post-TKA, this may be an opportune time to assess for early indicators of longer-term outcomes.

We therefore examined the course of pain and functioning between 6 weeks and 6 months post-TKA and examined relationships between demographic and clinical variables (at 6 weeks post-TKA) and change in pain and function between 6 weeks and 6 months post-TKA. This study aimed to answer the following research questions: 1. How do levels of pain and functioning change between 6 weeks and 6 months post-TKA? and 2. What are the relationships between changes in pain and function between 6 weeks and 6 months and relevant demographic and clinical variables?

Methods

Design

This study employed a longitudinal design. Participants were initially recruited prior to TKA as part of a large randomized control trial (RCT) of transcutaneous electrical nerve stimulation (TENS) efficacy following TKA (TANK study: [10]). Sample size was calculated based on the parent study [10]; the current study provides a secondary analysis (which is appropriately powered for the statistics utilized). Data were collected preoperatively (demographics), at 6 weeks and 6 months post-TKA as part of the RCT. This

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study was approved by the local Institutional Review Board and participants completed informed consent procedures.

Participants

Participants were English speaking patients, aged 30 years or older, with osteoarthritis who received unilateral TKA and provided data preoperatively and at 6 weeks and 6 months post TKA. Exclusion criteria included: stroke/central nervous system disease or mental illness, unable to understand tests/measures, receiving treatment for chronic pain other than knee OA, sensory impairment, permanently or indefinitely wheelchair bound, TENS use in the last 5 years, a condition that precluded TENS use, and current incarceration (for further details see [10]).

Measures

Demographic and Medical Variables—Participants provided demographic information preoperatively including: Sex, age, marital status, racial background, and education level. OA grade (Kellgren and Lawrence scale) was determined from the medical record.

Medication use—Participants recorded postoperative opioid and non-opioid analgesic medication use. At six weeks postoperatively, participants provided doses of opioid and non-opioid medications taken the hour prior to assessment and at 6 months post-TKA, participants provided opioid and non-opioid medications and dosages taken per day.

Pain Intensity (Resting and Range of Motion)—*Pain Intensity (Resting and Range of Motion)* was measured using a 21-point numeric rating scale (0–20 NRS) where 0 represents “no pain” and 20 represents “the most intense pain imaginable”. The 21-point NRS was used based on data that it is comparable to the 0–10 scale [11], provides a greater range of possible responses which increases sensitivity to change and reduces tool failures (e.g. circling 2 numbers or marking between numbers that is not interpretable accurately). The NRS was used to assess pain at rest and during active flexion and extension of the knee. Resting pain was assessed first, while participants were seated. Participants were given a laminated version of the pain scale to look at and asked to give a number that best described the intensity of pain they were experiencing. For pain during active extension of the knee, participants lay flat on an examination table with a rolled towel placed under the ankle of the surgical knee and straightened their leg as far as possible by pressing the knee down toward the exam table. Participants were asked to rate their pain during maximum extension while looking at the laminated pain scale. Pain during active flexion was assessed by participants bending their surgical knee as far as possible while keeping their foot flat on the exam table. Participants were asked to rate their pain during maximum flexion while looking at the laminated pain scale. Range of motion (ROM) pain was determined by averaging their flexion and extension pain ratings. Participants were defined as having moderate to severe ROM pain of their surgical knee if their average ROM pain was between 8–20 on the 21-point scale (equivalent to 4–10 on a 0–10 scale, based on standard cut offs in the literature) and none-mild pain if their average ROM pain was between 0–7 on the 21 point scale [12, 13].

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Function (Dysfunction—*Function (Dysfunction)* was assessed using the Knee Injury and Osteoarthritis Outcome Score (KOOS), which is a self-report measure of knee-related problems [14]. The KOOS subscale: Function in Daily Living (KOOS ADL) was used to assess dysfunction. This KOOS ADL sub-scale has demonstrated good psychometric properties when used with patients with knee OA including internal consistency (αs = 0.78–0.97) and reliability (Inter-class correlations = 0.84–0.94) [15]. The KOOS has also demonstrated responsiveness in patients with knee OA following TKA [16]. Participants were defined as having moderate to severe dysfunction if their KOOS ADL Scale was < 75 [17].

Anxiety—*Anxiety* was assessed using the Trait scale of the State-Trait Anxiety Inventory (STAI). This scale has twenty statements, rated on a 4-point scale from “almost never” to almost always” [18]. The Trait Anxiety scale assesses how participants respond to stressful stimuli in their environment. This widely used measure has strong psychometric properties [19] and it has been used in other studies of post-TKA patients [20].

Depression—*Depression* was assessed using the Geriatric Depression Scale. This measure is a 5-item depression screening tool; endorsing 2 or more items screens positive. This measure has demonstrated good inter-rater reliability (kappa = 0.81 – 0.88), sensitivity (0.94 – 0.97), and specificity (0.81 – 0.85: [21, 22].

Pain Catastrophizing—*Pain Catastrophizing* was assessed with the Pain Catastrophizing Scale (PCS) [23]. The PCS is a 13-item self-report measure that produces a total score and three subscale scores: Rumination (tendency to repetitively think of negative emotional experience), Magnification (effects of one’s experiences are intensified), and Helplessness (passive submission to the painful stimuli). The PCS has good internal consistency (α = 0.87) and has been used to predict post-surgical pain [24].

Pain Sensitivity (Quantitative Sensory Testing)

Heat Pain Thresholds (HPT): Heat Pain Thresholds (HPT) were assessed using a computer-controlled TSA-II Neurosensory Analyzer (Medoc, Israel) and a Peltier thermode, size 16 X 16 mm. The thermode was placed against the participant’s skin at 35°C, with the temperature rising 1°C/s to a maximum of 52°C. Participants pressed a button to indicate when the heat was first perceived as painful. HPTs were conducted on the surgical knee and contralateral tibia.

Pressure Pain Thresholds (PPT): Pressure Pain Thresholds (PPT) were assessed using a hand-held pressure algometer (Somedic AB, Farsta, Sweden) with a $1cm^2$ probe applied at 40kPa/S perpendicularly to the participant’s skin. Participants pressed a button when the pressure was first perceived as painful (this was the PPT). PPTs were assessed on the surgical and contralateral tibia.

HPT and PPT measurements were performed on the surgical knee on three sites, using a standardized template for placement. The template was centered on the patellar midline incision. Three sites were identified 4 centimeters medial to the patellar midline incision, each site was 4 cm apart from one another, running in a line parallel to the patellar midline

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incision. The standardized template for the anterior tibialis muscle was placed on the tibial crest and three sites were marked 2 cm lateral to the tibial crest of the non-surgical leg. The three sites ran vertically next to the tibial crest and were each 4 cm apart from one another. The average of the 3 scores was used as a final value for pain sensitivity at the surgical knee and tibia (see Rakel et al, 2014 for further details on how outliers were identified and averages determined). The pain sensitivity variables were included for examination in relation to pain severity.

Data Collection Protocol

Participants provided demographic data preoperatively. At six-weeks and six-months post-TKA, participants completed survey measures including report of opioid and other analgesic medication use, and were asked to rate their pain on a 0 to 20 NRS at rest (seated) and during active flexion and extension of the surgical knee, then a research assistant conducted the QST measures.

Data Analyses

All continuous variables were checked for normality and subsequent analyses chosen accordingly. Descriptive statistics for demographic, six week, and six month post-TKA variables were presented as percentages for categorical variables, and mean ± SD or median (25^{th}–75^{th} percentile) for continuous variables.

Research question 1, (How do levels of pain and functioning change between 6 weeks and 6 months post-TKA?) was investigated by determining the number of participants with no pain (NRS = 0), mild pain (NRS > 0 – 7), moderate pain (NRS > 7 – 14), and severe pain (NRS > 14) at 6 weeks and 6 months post-TKA and by determining the percentage of participants with none-mild dysfunction (KOOS ADLs ≥ 75) and those with moderate–severe dysfunction (KOOS ADLs < 75) at 6 weeks and 6 months post-TKA. The following change categories were calculated: improved (from moderate-severe pain or dysfunction at 6 weeks to none-mild pain or dysfunction at 6 months), worsened (from none-mild pain or dysfunction at 6 weeks to moderate-severe pain or dysfunction at 6 months), remained stable/none-mild at both (none-mild pain or dysfunction at both time points), and remained stable/moderate-severe at both (moderate-severe pain or dysfunction at both time points). Percentages of participants who improved, remained stable, or worsened in pain and function between time points were then calculated.

For research question 2, (What are the relationships between changes in pain and function between 6 weeks and 6 months and relevant demographic and clinical variables?), continuous variables were calculated for change in pain and dysfunction. For pain, 6 month ROM pain was subtracted from 6 week ROM pain and for dysfunction, 6 week dysfunction was subtracted from 6 month dysfunction. As such, positive change scores for both pain and dysfunction indicted improvement. Univariate analyses were calculated between the demographic and 6 week clinical variables and the change variables (pain and dysfunction). All analyses assessing demographic and 6 week clinical variables associated with change in pain, adjusted for 6 week ROM pain and parallel analyses for change in dysfunction, adjusted for 6 week dysfunction. Correlation and ANCOVA analyses were used depending

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on the type of data. Variables that were significant in univariate analyses at $p < .05$, were entered into multivariate linear regression analyses. Separate models were run for change in pain and for change in functioning, controlling for 6 week pain and 6 week functioning (respectively).

Results

A total of 223 participants completed measures preoperatively, 6 weeks and 6 months post-TKA. At both post-operative time points, some participants had missing data on specific measures; these participants were maintained in the study and simply excluded from the analyses for which that variable was missing (see Table 1 for the *n* of each measure). The mean age of the sample was 62 years (*SD* = 9.2), the sample was 56% female, 69% were married or cohabiting, and the mean BMI was 34.7 (*SD* = 7.1). At 6 weeks post-TKA, mean ROM pain was 5.42 *(SD* = 4.20), and mean KOOS ADLs was 75 (*SD* = 15). The median anxiety score at 6 weeks post TKA was 28 (IQR: 23 – 35), 15% of the sample screened positive for depression, and the median pain catastrophizing score = 3 (IQR: 1–9). Median PPTs were 261.17 (IQR: 196.83 – 350.17) for the surgical knee and 316.33 (IQR: 247.33 – 450.58) for the contralateral tibia. Mean HPTs were 43.27 (*SD* = 3.08) for the surgical knee and 43.95 (*SD* = 2.78) for the contralateral tibia. At six-months post-TKA, 16% of the sample had moderate to severe ROM pain (as reported previously [13]), 23% of the sample had moderate to severe dysfunction (< 75 on KOOS ADLs), and 10% of the sample had both moderate to severe ROM pain and dysfunction.

Research Question 1: Pain change across time points

Between 6 weeks and 6 months post-TKA, 75% of the sample stayed in the same pain category (64% reported none-mild pain at both time points and 11% reported moderate to severe pain at both time points) 20% improved, and 5% worsened. See table 2 for variability within each change category and figure 1 for changes across time between no pain, mild, moderate, and severe pain categories.

Function change across time points

Between 6 weeks and 6 months, 65% of the sample stayed in the same category: 47% reported none-mild dysfunction at both time points (≥ 75 on KOOS ADLs) and 18% reported moderate-severe dysfunction at both time points (< 75 on KOOS ADLs). A further 30% improved (moving from moderate-severe dysfunction, to none-mild dysfunction) and 5% worsened (moving from none-mild dysfunction to moderate-severe dysfunction categories) between 6 weeks and 6 months post-TKA (see table 2 and figure 2).

Research Question 2: Variables associated with change in pain between 6 weeks and 6 months post-TKA

Univariate analyses identified that 6 week anxiety ($r = -.20$, $p < .05$) and 6 week pain catastrophizing ($r = -.24$, $p < .05$) were significantly associated with change in pain when adjusting for 6 week ROM pain. See table 3 for further details on all non-significant findings.

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A multiple linear regression model controlling for 6 week ROM pain, found that both 6 week anxiety and pain catastrophizing each accounted for a significant amount of unique variance in change in pain (between 6 weeks and 6 months). The full model was significant: F (3, 183) = 38.81, $p < .05$, adjusted $R^2 = 0.38$ (See table 4 for individual beta weights). Of note however, the first step (including only 6 week ROM pain) produced an adjusted $R^2 = 0.32$, indicating that the addition of both anxiety and pain catastrophizing to the model only accounted for an additional 6% of variance. Overall, findings indicate that higher levels of anxiety and pain catastrophizing were associated with less improvement and that higher levels of 6 week ROM pain severity were associated with greater improvement (this was likely an artifact of a greater possible range of change scores available to those with higher pain at 6 weeks post-TKA and the previously discussed findings that fewer participants worsened during this time period then improved).

Variables associated with change in dysfunction between 6 weeks and 6 months post-TKA

When adjusting for 6 week dysfunction, univariate analyses identified that the following variables were significantly associated with change in dysfunction between 6 weeks and 6 months: sex ($F = 32.64$, $p < .05$), depression screen ($F = 19.48$, $p < .05$), anxiety ($r = -.22$, $p < .05$), and pain catastrophizing ($r = -.31$, $p < .05$). See table 3 for further details on all non-significant findings.

A multiple linear regression model controlling for 6 week dysfunction, found that sex, depression, and pain catastrophizing, but not anxiety, each accounted for a significant amount of unique variance in change in dysfunction (between 6 weeks and 6 months). The full model was significant: $F(5, 204) = 16.28$, $p < .05$, adjusted $R^2 = 0.27$ (See table 5 for individual beta weights). The first step (including only 6 week dysfunction) produced an adjusted $R^2 = 0.13$, so the additional variables in the second step accounted for an additional 14% of the variance in change in dysfunction. Overall, findings indicate that male sex (mean change for males = 5.13, $SD = 17.00$; mean change for females = 10.69, $SD = 12.40$), higher levels of pain catastrophizing, and positive depression screen (mean change for positive depression screen = 2.70, $SD = 24.85$ and for negative screen = 9.23, $SD = 12.06$) were associated with less functional improvement. Further, higher 6 week dysfunction was associated with greater improvement, which was likely an artifact of a greater possible range of change scores available to those with higher dysfunction at 6 weeks post-TKA.

Discussion

This study examined the longitudinal postoperative course following TKA. Findings suggest that the majority of patients' pain remained relatively stable from 6 weeks post-TKA to 6 months post-TKA, suggesting that 6 weeks post-TKA is an opportune time point to assess for early indicators of chronic pain. There is still, however, a significant subset (20%) of patients whose pain continued to improve after 6 weeks post-TKA. The current study helps identify these patients, suggesting that higher anxiety and pain catastrophizing 6-weeks post-TKA is associated with less improvement in pain by 6 months post-TKA. This is consistent with previous findings that pre-operative anxiety and pain catastrophizing predict postoperative pain severity [4, 13, 25, 26]. Function appeared to be somewhat more variable

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then pain from 6 weeks post-TKA, with nearly one-third (31%) of the sample continuing to improve by 6 months post-TKA. This fits with previous findings which suggest that functioning can continue to improve for at least 2 years post-TKA [27].

Multiple variables were identified that impact the trajectory of change in functioning between 6 weeks and 6 months post-TKA. Male sex, pain catastrophizing, and positive depression screen were significantly related to less improvement. These findings fit with previous findings that pre-operative depression is associated with less functional improvement 2 years post-TKA [28] and lower function scores 5 years post-TKA [29]. This is also consistent with findings that greater preoperative pain catastrophizing is associated with worse functional outcomes 6 weeks post-TKA [30]. Male sex as a risk factor for dysfunction fits with Kauppila et al.'s (2011) finding that males had smaller improvements in function compared to females following TKA [31]. However, previous research has also identified female sex as a risk factor for persistent post-TKA pain [25, 32]. This discrepancy emphasizes the importance of investigating how variables relate differently to pain and functional outcomes following TKA.

The current study did not find pain sensitivity related to pain change trajectories between 6 weeks and 6 months post-TKA. While recent pain sensitivity literature has identified that measures of central sensitization (widespread hyperalgesia and temporal summation) impact postoperative outcomes [33, 34], the current study suggests that pain sensitivity (local and widespread hyperalgesia) 6 weeks post-TKA does not relate to changes in pain between 6 weeks and 6 months post-TKA.

This study was not without limitations. The sample was primarily Caucasian, which may limit the generalizability of findings [35]. In addition, the measure of depression utilized was a screen rather than a full diagnostic assessment. Finally, larger samples are needed to disentangle whether the same variables impact improvement compared to worsening during this postoperative time period.

In conclusion, the current findings suggest that the majority of patients stay in the same pain and functioning categories between six weeks and six months post-TKA; however, a notable subset continued to improve while only a few participants worsened in this timeframe. Further, with the exception of pain catastrophizing, different variables were associated with change in pain then were associated with change in functioning.

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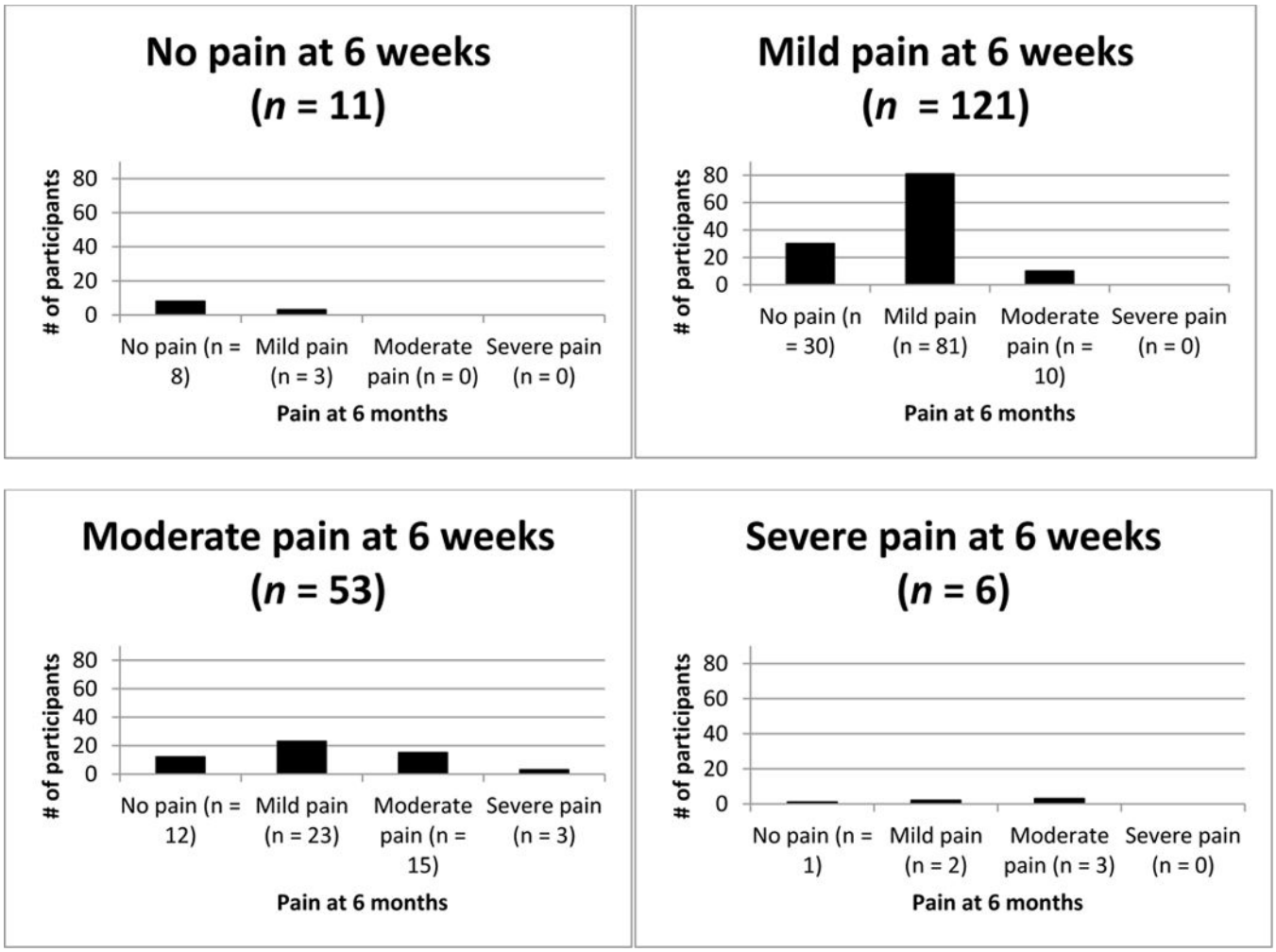

Figure 1.
Range of motion pain severity between 6 weeks and 6 months post-TKA.

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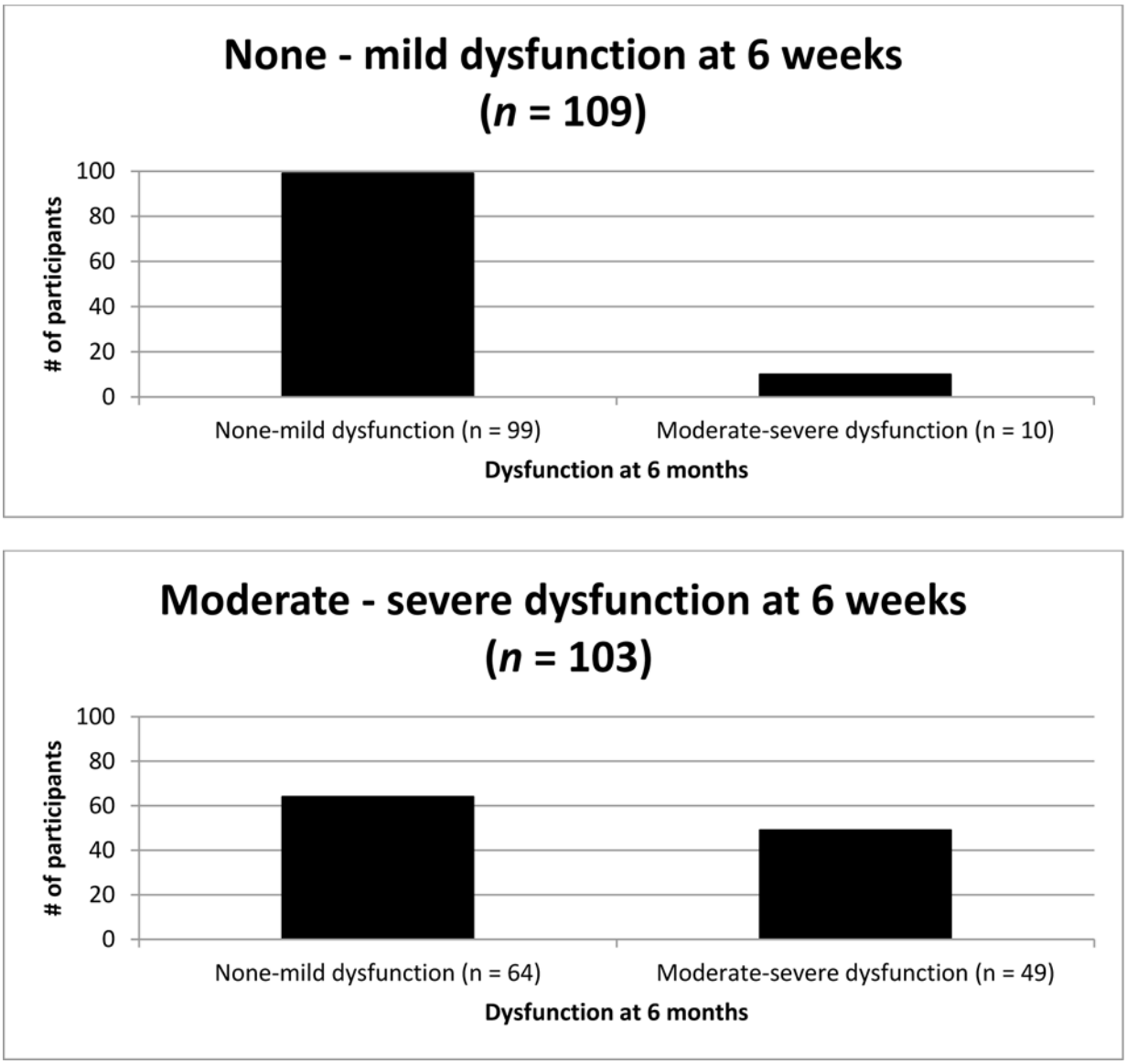

Figure 2.
Dysfunction between 6 weeks and 6 months post-TKA.

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Table 1

Sample Description (N = 223).

Variable	Mean (SD) or Median [IQR] or count (%)
Sex (Male)	98 (44%)
Preoperative age	61.62 (9.18)
Preoperative BMI	34.65 (7.14)
Married or Co-habiting	144 (69%) (*n* = 208)
Racial background (Caucasian)	207 (93%)
Education	(*n* = 207)
Some high school/high school graduate	65 (31%)
Some college	61 (30%)
College graduate/Post graduate education	81 (39%)
OA grade	
2	4 (2%)
3	60 (27%)
4	159 (71%)
6 weeks post-TKA	
Opioid dose: hour prior to testing	0.16 [0.00 – 1.44]
Non-opioid analgesic: hour prior to testing	77.67 [3.33 – 176.67]
Resting pain	1.00 [0.00 – 3.00] (*n* = 216)
Range of Motion pain (moderate – severe)	66 (31%) (*n* = 216)
Dysfunction (moderate – severe)	106 (49%) (*n* = 217)
Depression (screened positive)	33 (15%) (*n* = 222)
Anxiety	28.00 [23.00 – 35.00] (*n* = 221)
Pain Catastrophizing	3.00 [1.00 – 9.00] (*n* = 220)
Pressure Pain Threshold (PPT) surgical knee	261.17 [196.83 – 350.17] (*n* = 220)
PPT contralateral tibia	316.33 [247.33 – 450.58] (*n* = 218)
Heat Pain Threshold (HPT) surgical knee	43.27 (3.08) (*n* = 180)
HPT contralateral tibia	43.95 (2.78) (*n* = 179)
6 months post-TKA	
Opioid mg/day	0.00 [0.00 – 0.00] (*n* = 222)
Non-opioid mg/day	0.00 [0.00 – 975.00] (*n* = 222)
Range of Motion pain (moderate – severe)	31 (16%) (*n* = 191)
Dysfunction (moderate – severe)	49 (23%) (*n* = 212)

Where no *n* is indicated it is equal to 223.

SD = Standard deviation; IQR = Interquartile Range

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Table 2

Pain and dysfunction change between 6 weeks and 6 months post-TKA (positive scores indicate improvement).

	None-mild pain (≤ 7) at both time points	Worsened (none-mild pain to mod-severe pain)	Mod-severe pain (> 7) at both time points	Improved (mod – severe pain to none-mild pain)
n (%)	122 (64%)	10 (5%)	21 (11%)	38 (20%)
Mean change score (SD)	1.12 (2.23)	−5.65 (2.94)	1.19 (4.30)	7.80 (2.62)
Minimum	−5.50	−11.50	−11.00	3.50
Maximum	6.50	−2.00	7.50	17.00

	None-mild dysfunction (≥75) at both time points	Worsened (none-mild dysfunction to mod-severe dysfunction)	Mod-severe dysfunction (<75) at both time points	Improved (mod – severe dysfunction to none-mild dysfunction)
n (%)	99 (47%)	10 (5%)	39 (18%)	64 (30%)
Mean change score(SD)	6.14 (7.53)	−28.08 (22.45)	2.21 (12.20)	20.87 (9.20)
Minimum	−16.10	−83.80	−38.20	3.00
Maximum	23.30	−4.40	22.10	45.50

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Table 3

Association of demographic and clinical variables to change in movement pain (adjusted for 6 week movement pain) and to change in dysfunction (adjusted for 6 week dysfunction).

	Pain	Change	Dysfunction	Change
Variable	**Correlation (*r*) *or* ANCOVA (*F*)**	***p* value**	**Correlation (*r*) *or* ANCOVA (*F*)**	***p* value**
Sex	$F = 1.97$	0.16	$F = 32.64^{*}$	0.01
Age	$r = 0.06$	0.46	$r = 0.07$	0.34
6 weeks post-TKA				
Opioid dose hour prior to testing	$r = 0.08$	0.34	$r = 0.14$	0.07
Non-Opioid dose hour prior to testing	$r = -0.10$	0.21	$r = 0.07$	0.36
Range of motion pain	—	—	$r = -0.12$	0.09
Depression – positive screen	$F = 0.28$	0.60	$F = 19.48^{*}$	0.00
Anxiety	$r = -0.20^{*}$	0.02	$r = -0.22^{*}$	0.00
Pain Catastrophizing	$r = -0.24^{*}$	0.01	$r = -0.31^{*}$	0.00
Dysfunction (KOOS ADLs)	$r = -0.16$	0.06	—	—
PPT surgical knee	$r = 0.02$	0.78	—	—
PPT contralateral tibia	$r = -0.09$	0.30	—	—
HPT surgical knee	$r = -0.04$	0.65	—	—
HPT contralateral tibia	$r = 0.01$	0.86	—	—
6 months post-TKA				
Opioid mgs per day	$r = -0.06$	0.45	$r = -0.10$	0.22
Non-opioid mgs per day	$r = -0.04$	0.64	$r = -0.06$	0.44

$^{*}p < .05$

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Table 4

Multivariate linear regression model: Change in pain between 6 weeks and 6 months.

Variable and Step	***β***	***p* - value**
Step 1		
Range of motion (ROM) pain	0.57*	0.00
$F(1, 185) =$	86.61, $p = .00$,	Adjusted $R^2 = 0.32$
Step 2		
ROM pain	0.64*	0.00
Anxiety	−0.15*	0.02
Pain Catastrophizing	−0.18*	0.01
$F(3, 183) =$	38.81, $p = .00$,	Adjusted $R^2 = 0.38$

* $p < .05$

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Table 5

Multivariate linear regression model: Change in dysfunction between 6 weeks and 6 months.

Variable and Step		β	p - value
Step 1			
Dysfunction		−0.37*	0.00
	$F(1, 208) =$	32.38, $p =.00$,	Adjusted $R^2 = 0.13$
Step 2			
Dysfunction at 6 weeks		−0.50*	0.00
Sex		0.19*	0.00
Depression		−0.20*	0.01
Anxiety		−0.11	0.13
Pain Catastrophizing		−0.16*	0.02
	$F(1, 208) =$	16.28, $p =.00$,	Adjusted $R^2 = 0.27$

* $p < .05$