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SYSTEMATIC REVIEWS

Persistent post-surgical pain and neuropathic pain after total knee replacement

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Abstract

AIM: To study the prevalence of persistent post-surgical pain (PPSP) and neuropathic pain (NP) after total knee replacement (TKR).

METHODS: MEDLINE and Embase databases were searched for articles published until December 2014 in English language. Published articles were included if they referred to pain that lasts at least 3 mo after primary TKR for knee osteoarthritis, and measured pain with pain specific instruments. Studies that referred to pain caused by septic reasons and implant malalignment were excluded. Both prospective and retrospective studies were included and only 14 studies that match the inclusion criteria were selected for this review.

RESULTS: The included studies were characterized by the heterogeneity on the scales used to measure pain and pre-operative factors related to PPSP and NP. The reported prevalence of PPSP and NP seems to be relatively high, but it varies among different studies. There is also evidence that the prevalence of post-surgical pain is related to the scale used for pain measurement. The prevalence of PPSP is ranging at 6 mo from 16% to 39% and at 12 mo from 13.1% to 23% and even 38% of the patients. The prevalence of NP at 6 mo post-operatively is ranging from 5.2% to

13%. Pre-operative factors related to the development of PPSP also differ, including emotional functioning, such as depression and pain catastrophizing, number of comorbidities, pain problems elsewhere and operations in knees with early grade of osteoarthritis.

CONCLUSION: No firm conclusions can be reached regarding the prevalence of PPSP and NP and the related factors due to the heterogeneity of the studies.

Key words: Total knee replacement; Pain; Chronic pain; Neuropathic pain; Post-operative pain; Persistent post-surgical pain

Core tip: Persistent post-surgical pain (PPSP) is reported in a significant proportion of patients after total knee replacement. This proportion varies between the different studies and different factors have been implicated including the instrument used to measure pain. It is also obvious that in some of these patients the pain is neuropathic (NP) in origin or the NP pain coexists. Nevertheless, due to the heterogeneity of the studies, mainly on the scales used to assess pain and preoperative factors, we are unable to reach firm conclusions concerning the prevalence, and the risk factors of PPSP pain after total knee replacement. Additional studies focused on the prevalence and risk factors related to PPSP are needed.

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INTRODUCTION

Total knee replacement (TKR) is a treatment of knee osteoarthritis to alleviate pain symptoms and improve mobility and physical functioning when other conservative treatments have failed[1-3]. It is a very common and successful procedure since 1970s for late stage osteoarthritis and there is a continuously increasing number in demand for primary TKR performed worldwide each year[4,5]. However, not all patients are satisfied after TKR. Pain after TKR is stronger determinant of satisfaction than function[6]. An unfavorable pain outcome was seen in at least 8.0% and up to 26.5% of patients[7] and contribute to functional disability after TKR[6,8-10].

Apart from the post-surgical pain that is a result of a specific cause, some patients suffer from a persistent post-surgical pain (PPSP) with no specific origin that represents an important cause for patients' dissatisfaction. Although the cause of PPSP is not known, it seems that some of the patients with PPSP after TKR suffer from neuropathic pain (NP)[11]. The International Association for the Study of Pain (IASP) defines: (1) as PPSP the pain that is being developed after surgery and exists beyond the time for normal healing and is present for at least 3-6 mo[12]; and (2) NP is also defined by the IASP as the pain caused by a lesion or a disease of the somatosensory nervous system (IASP website, http://www.iasp-pain.org/)[13]. A wide variety of scores–tools have been used in order to assess the outcome postoperatively. Almost all scores or instruments -either objective (clinician-based)[14] or subjective (patient-reported)[15] or disease specific[3,16] - being used for the study of the outcome, function and satisfaction after TKR, include some kind of pain assessment[17]. However, a standard definition of pain severity at follow-up considered a difficult issue to be applied and the need to improve assessment and measurement of musculoskeletal pain in the clinical setting is recognized[18].

The purpose of this study is to present a review of the existing literature concerning the existence of PPSP and NP after TKR for at least 3 mo, including studies with main purpose the prevalence of the PPSP and NP after TKR using pain-specific instruments and not through other scores or instruments measuring functional outcome.

MATERIALS AND METHODS

Literature search

MEDLINE and Embase databases were searched for articles published until December 2014. The keywords "TKR", "total knee arthroplasty", "chronic postoperative pain", "NP" and synonyms were used to maximize the efficiency of the search. Both prospective and retrospective studies were included.

Inclusion and exclusion criteria

Published articles were included only if they referred to pain that lasts at least 3 mo after primary TKR and if the main reason of TKR was knee OA. Studies were excluded if they were abstracts, case studies, reviews, editorials and if they referred to pain caused by septic reasons and implant malalignment. Studies that assessed a mixed cohort of patients (*e.g.*, knee and hip replacement patients) were included in the review and only data relevant to the TKR patients were extracted. Studies in other language than English were excluded.

A total of 112 articles were found. Only 14 studies that match the inclusion criteria and measured pain with pain specific instruments were selected for this review.

RESULTS

PPSP after TKR (Table 1)

Studies: We identified 5 prospective[19-23], and 3 retrospective[9,24,25] studies. Three of the studies found to have as primary aim the documentation of the existence and the prevalence of PPSP after TKR[19,20,25], while another

Table 1 Total knee replacement and chronic (persistent) post-surgical pain

Ref.	Design/patients	Aim of the study	Scores-scales	Follow-up	Pain	Factors
Brander *et al*[19]	Prospective *n* = 116	To describe the natural history of pain after TKR To identify factors predicting excessive post-surgical pain	VAS and other measures of patient health	Pre-op. Post-op.: (1) 1 mo; (2) 3 mo; (3) 6 mo; and (4) 12 mo	Pre-op.: 72.3% Post op.: (1) 44.4%; (2) 22.6%; (3) 18.4%; and (4) 13.1%, respectively	Factors related with post-op pain at 12 mo (1) Pre-operative pain; and (2) Pre-operative depression and anxiety
Forsythe *et al*[20]	Prospective *n* = 55	To document: the prospective pain experience following TKR To determine if: (1) comorbidities; (2) preoperative pain; or (3) preoperative pain catastrophizing scores are predictors of chronic pain after TKR	MPQ PCS	Pre-op. Post-op.: (1) 3 mo; (2) 12 mo; and (3) 24 mo	Significant reduction only between pre-op and 3-mo post-op values. After 3-mo pain had reached a plateau Pain catastrophizing scores didn't show any significant differences	Predictive of chronic postoperative pain: (1) No. of comorbidities; and (2) Pre-operative pain catastrophizing scores
Ritter *et al*[24]	Retrospective *n* = 7326	To quantify the effect of sex on the clinical outcome and survivorship of a specific TKR (AGC, Biomet, Warsaw, Ind)	KSS PS FS	Clinical scores: Throughout 5 yr Survival data: Up to 17 yr	Pain after TKR was less for men but there was no statistically significant difference between men and women	Improvement after TKR is similar for men and women No significant difference in post-operative pain between men and women
Wylde *et al*[9]	Retrospective *n* = 632	To assess the (1) prevalence; (2) severity; (3) sensory qualities; and (4) postoperative determinants of persistent pain after primary THR and TKR	WOMAC Pain Scale SFMPQ pD-Q Two-item Patient Health Questionnaire (PHQ-2)	Median: 41 mo Range: 34-49 mo	Persistent post-surgical pain (PPSP): 44% Severe-extreme PPSP: 15% Constant PPSP: 5% Likely neuropathic pain: 6%	Significant and independent postoperative determinants of number of PPSP: (1) No. of pain problems elsewhere; and (2) The presence of major depression
Polkowski *et al*[23]	Prospective *n* = 309	To explore the relationship between early-grade preoperative OA with pain and dissatisfaction after TKR	Group A: Pain after TKR Group B: Consecutive series of 100 TKR's performed the same period by the same surgeon Group C: Asymptomatic TKR Group D: Symptomatic TKR performed the same period	1-5 yr	Early-grade OA pre-op: Group A: 49% Group B: 5% Group C: 6% Group D: 10%.	A high percentage of patients referred for unexplained pain after TKR had early-grade OA pre-operatively
Noiseux *et al*[21]	Prospective *n* = 215	To discover whether any preoperative assessment could predict high pain scores and functional limitations postoperatively	Pain Intensity rating: NRS QST Anxiety Form of the State Trait Anxiety Inventory GDS PCS	Pre-op. Post-op.: 6 mo	Moderate to severe pain At rest: Pre-op.: 17% Post-op.: 5% With range-of-motion: Pre-op.: 52% Post-op.: 16%	Significant predictors (for moderate or severe TKR pain with knee motion after 6 mo): (1) Severe preoperative knee pain with range-of motion; and (2) Anxiety
Pérez-Prieto *et al*[22]	Prospective *n* = 716 Depressed: *n* = 200	To evaluate quality of life, function, pain and satisfaction outcomes in patients, with and without depression, undergoing TKR	GDS KSS Medical Outcomes Study 36-Item Short Form Health (SF-36) MCS VAS	12 mo	Depressed patients reported significant higher pain scores than non-depressed patients pre- and post-operatively Net changes (postoperative - preoperative): No significant difference	Depression leads to (1) Poorer preoperative and postoperative scores in all but the mental domains; and (2) But similar net score changes (improvement) with a high rate of patient satisfaction

W-Dahl *et al*[25]	Non-depressed: *n* = 516 retrospective	To evaluate how the instruments used to measure pain affected the number of patients who reported no relief of pain or worse pain, and the relative effect of potential risk factors	Osteoarthritis Outcome Score (KOOS) VAS EQ-5D	Pre-operatively 1 year post-operatively	No pain relief: 10.1% Only KOOS pain: 25% Only VAS knee pain: 52% Both: 23%	The observed proportion of patients with unchanged or worse pain one year after TKR differed depending on the method of pain measurement used Risk factors for no pain relief are: (1) less pre-operative pain; and (2) higher degree of anxiety Charnley category C was a risk factor for unchanged or worse pain as measured by the VAS but not for the KOOS

OA: Osteoarthritis; TKR: Total knee replacement; Pre-op: Preoperatively; Post-op: Postoperatively; PPSP: Persistent post-surgical pain; VAS: Visual Analogue Scale; EQ-5D: Euro-Qol 5 Dimension; MCS: Mental Composite Score; KSS: Knee Society Score; GDS: Geriatric Depression Scale; PCS: Pain Catastrophizing Scale; QST Quantitative Sensory Testing; NRS: Numerical Rating Scale; SFMPQ: Short-Form McGill Pain Questionnaire; pD-Q: PainDETECT Questionnaire; WOMAC: Western Ontario and McMaster Universities Index of Osteoarthritis; FS: Function score; PS: Pain score; KSS: Knee Society knee score; MPQ: McGill Pain Questionnaire.

one assessed PPSP retrospectively in patients after both TKR and THR[9].

Factors-variables related to PPSP: Multiple variables have been considered to play an important role at persistent postoperative pain. At times, different aspects of risk factors have been examined. In these studies, preoperative factors that were examined were comorbidities[20], preoperative pain[19,20] and pain catastrophizing scores[20,21]. But only one study found to quantify the effect of sex on postoperative pain outcomes[24] while another one assessed the relationship of PPSP and the Grade of knee osteoarthritis according to the scale of Kellgren and Lawrence[23]. Quality of life, pain and satisfaction were measured in depressed and non-depressed patients to identify differences that might exist in the scores[22].

Pain scales or scores: Pain intensity mainly was measured using validated patient reported measures of pain, the most common were the Visual Analogue Scale (VAS)[19,25] which is a well evaluated tool, the McGill pain questionnaire (MpQ)[9,20], the Knee Society Score[22,24] and the Numerical Rating Scale (NRS)[21].

To cover the influence of psychological factors on TKR outcomes Pain Catastrophizing Scale (PCS) was used to measure pain catastrophizing[20,21], while the Two-item Patient Health Questionnaire (PHQ-2)[9], Geriatric Depression Scale[21,22], Medical Outcomes Study 36-Item Short Form Health, Mental Composite Score[22] and Anxiety Form of the State Trait Anxiety Inventory (STAI)[21] were used to measure depression and anxiety.

A recent study[25] evaluated the tools that used to measure pain intensity, Knee injury and Osteoarthritis Outcome Score (KOOS) and VAS and how they affect the pain outcomes.

Pain assessment times and post-operative follow-up: At the most of the studies there was a continuous follow-up. Assessments took place preoperatively[19-21,25] and postoperatively at 1 mo[19], 3 mo[19,20], 6 mo[19,21], 12 mo[19,22,23,25] and up to 1 year postoperatively[19,22,23,25].

Prevalence of pain: A significant reduction of pain after TKR was observed between preoperative scores and postoperative scores; from 72% to 44%[19]. A further reduction was observed up to 3 mo postoperatively where pain reached a plateau[20].

At 6 mo post-operatively, pain at movements was found in 16% of patients[21] while pain at rest was significantly reduced in 5% of the patients.[21]. Others found PPSP in 18.4% of the patients at 6 mo[19]. PPSP has been reported at 1 year post-operatively in 13.1% of the patients[19] while in another study, 44% of the patients reported to had PPSP at a mean of 4 years after TKR[9].

Interestingly, in one study where the same patients were tested using two different scales at one year post-operatively, the prevalence of PPSP was different; in 25% of the patients using the KOOS and in 52% using the VAS[25].

Factors related to PPSP: Preoperative factors that affected pain scores were depression scores[9,19], affecting both preoperative and postoperative pain scores[22], early grade

of osteoarthritis[23], number of comorbidities[20] and pain problems elsewhere[9]. Gender didn't seemed to affect postoperative outcomes at all[24]. A high correlation was found between preoperative pain catastrophizing scores and the existence of PPSP and its intensity[20]. Which is in accordance with other reviews that is referred that patient's pain catastrophizing might play an important role in chronic pain intensity[26,27].

NP after TKR (Table 2)

Studies: The existence and prevalence of NP have been reported by a small number of studies[9,28,29]. Three prospective studies[9,28,29] with the study population ranged from 77 to 120 patients, and 1 retrospective study[9] with a number of 632 patients were designed for this purpose. However, other studies that aimed to evaluate specific treatments for NP recorded its prevalence too[30].

Pain scales or scores: Scores, initially were used to establish the existence of pain in some of these studies. These scores were MpQ[9,28], VAS[29] and NRS[30].

Additionally, NP was assessed by painDetect Questionnaire (PD-Q)[9,29], Leeds Assessment of Neuropathic Symptoms and Signs scale[30] and MpQ[28]. The contribution of depression's and anxiety's presence and severity to the existence of NP were examined. PHQ-2[9], Beck Depression Inventory (BDI)[28], the Hospital Anxiety and Depression score[29] and the STAI[28] were used for this purpose.

Pain assessment times and post-operative follow-up: Pain assessment at these studies took place preoperatively[29,30] and postoperatively at 3-5 d[29], 6 wk[29], 1 mo[28], at 3, 6 and 9 mo[28-30] and up to 1 year postoperatively[9,29].

NP prevalence: A high correlation was found between VAS pain scores and NP at 3 mo, 1 year and 3 years post-op[29]. Six weeks postoperatively a peak at the graph was observed with 27% having possible and 8% of the patients having likely NP. At 3 mo that proportion reduced to 19% with possible and 4% with likely NP[29].

Buvanendran *et al*[30], identified a rate of NP of 5% at 6 mo postoperatively, while in another study[28] was found 13% of the patients having Complex Regional Pain Syndrome after TKR at both 3 and 6 mo. It is reported that at mean 4 years after TKR 6% of the patients have pain of likely neuropathic origin[9,29]. The use of perioperative pregabalin reduced the incidence of NP at 0%, while placebo pregabalin didn't seem to reduce NP[30].

Studies including TKR patients concerning the existence, prevalence and etiology of NP (Table 3)

Studies: A retrospective study assessed the existence and the preoperative predictors of NP in 632 TKR patients and 662 THR patients[9], and two prospective studies in 100 TKR patients and 89 patients after breast surgery[31,32]. Another prospective study, also examined the relationship between postoperative trajectories and NP, in 112 TKR and UKR patients[33].

Pain scales or scores: Scores that used to assess NP were PD-Q[9] and Diagnosing Neuropathic 4[31-33]. Shortform McGill Pain Questionnaire[9], NRS[31,33] and Brief Pain Inventory[32] were used to define the existence of pain postoperatively.

Factors studied: Preoperative factors of NP that were examined were depression[9,31,32], anxiety[31,33], pain catastrophizing[31,33], cognitive and emotional functioning[32]. Depression was assessed with PHQ-2[9] and 13-item BDI[31,32]. Spielberger STAI and PCS were used to assess anxiety and pain catastrophizing[31,33]. Cognitive functioning was assessed with Trail-Making Test A + B, Rey-Osterrieth Complex Figure-copy and immediate recall, Coping Strategies Questionnaire and Brief Version of the Survey of Pain Attitudes[32].

Pain assessment times and post-operative follow-up: Assessments took place preoperatively[9,31-33], 2 d postoperatively[31,32], at day 1 to 8[33], 3 mo[31,33], 6 mo, 12 mo[32] and 3 to 4 years postoperatively[9].

Factors: Acute postoperative pain [31], cognitive functioning, pain coping[32], emotional functioning[9,32] and problems of pain elsewhere[9] found to be predictors of PPSP and NP.

Prevalence: Seventy five percent of the patients seemed to have NP preoperatively, according to Attal *et al*[32], 2014, while in another study NP seemed to appear on 30.7% of the patients[31]. At 3 mo postoperatively, NP ranged between 11%[33] and 42.2%[31] of the patients. Six and 12 mo postoperatively patients with NP reduced at 32% and 26%, respectively[32]. At 3 to 4 years postoperatively only 6% of TKR patients had NP[9].

DISCUSSION

The number of the 14 studies that used pain-specific instruments to measure pain after TKR is small and studies that approach and record NP after TKR are much less.

According to these studies, a significant proportion of patients have persistent post-operative pain for years after TKR and part of these patients suffer from pain of neuropathic origin.

Factors found to be related to persistent postoperative pain after TKR include emotional functioning such as depression and pain catastrophizing, number of comorbidities and pain problems elsewhere and operations in knees with early grade of osteoarthritis.

Nevertheless, due to the heterogeneity of the studies, mainly on the scales used to assess pain and

Table 2 Total knee replacement and neuropathic pain

Ref.	Design	No. of patients	Aim of the study	Scores-scales	Follow-up	Pain	Factors
Harden *et al*[28]	Prospective	77	Preoperative emotional distress and pain intensity and would predict the occurrence of signs and symptoms of CRPS following TKR	CRPS: IASP criteria (signs/symptoms) Beck Depression Inventory State Trait Anxiety Inventory McGill Pain Questionnaire-Short Form	Pre-op. Post-op.: (1) 1 mo; (2) 3 mo; and (3) 6 mo	1 mo: 21.0% 3 mo: 13.0% 6 mo: 12.7%	CRPS-like phenomena: (1) In a significant number of patients after TKR; and (2) No association with significantly greater complaints of postoperative pain Prediction by preoperative distress and pain: Modest utility
Buvanendran *et al*[30]	Prospective	Control: 120 Pregabalin: 120	To examine if perioperative treatment with pregabalin, would reduce the incidence of postsurgical NP	11-point NRS LANS scale Osteoarthritis Outcome Score–Physical function Short-form (KOOS-PS)	Pre-op. Post-op.: (1) 3 mo; and (2) 6 mo	Study group: 0% Placebo group: (1) 3 mo: 8.7%; (2) 6 mo: 5.2%	Perioperative pregabalin administration reduces the incidence of chronic NP after TKR In the doses tested, it is associated with a higher risk of early postoperative sedation and confusion
Wylde *et al*[9]	Retrospective	632	To assess: (1) prevalence; (2) severity; (3) sensory qualities; and (4) postoperative determinants of persistent pain after primary THR and TKR	WOMAC Pain Scale SF-MPQ PainDETECT Questionnaire Two-item PHQ-2	Median: 41 mo Range: 34-49 mo	Persistent postsurgical pain (PPSP): 44% Severe-extreme PPSP: 15% Constant PPSP: 5% Likely NP: 6%	Significant and independent postoperative determinants of number of PPSP: (1) No. of pain problems elsewhere; and (2) The presence of major depression
Phillips *et al*[29]	Prospective	94	To record the prevalence of pain and NP To establish predictive factors that could be used to identify patients who were likely to have high levels of pain or NP	VAS HADS score pD-Q score OKS	Pre-op. Post-op.: (1) 3-5 d; (2) 6 wk; (3) 3 mo; (4) 6 mo; (5) 9 mo; (6) 1 yr; and (7) 46 mo	VAS (value) Pre-op.: 5.8 Post-op.: (1) 3-5 d: 4.5; (2) 6 wk: 3.2; (3) 3 mo: 2.4; (4) 6 mo: 2.0; (5) 9 mo: 1.7; (6) 1 yr: 1.5; and (7) 46 mo: 2.0 Frequency (%) VAS moderate-severe/painDETECT possible -likely Pre-op.: 41-50/5-1 Post-op.: (1) 3-5 d: 47-19/5-3; (2) 6 wk: 39-9/27-8; (3) 3 mo: 21-10/19-4; (4) 6 mo: 16-6/17-3; (5) 9 mo: 16-4/13-6; (6) 1 yr: 14-3/9-2; and (7) 46 mo: 15-7/7-6	High correlation between the mean VAS scores for pain and the mean painDETECT scores at 3 mo, 1 yr and 3 yr post-operatively No correlation between the pre-operative scores and any post-operative scores at any time point NP is an underestimated problem in patients after TKR

CRPS: Complex regional pain syndrome; NP: Neuropathic pain; Pre-op: Preoperatively; Post-op: Postoperatively; LANS: Leeds Assessment of Neuropathic Symptoms and Signs; NRS: Numerical Rating Scale; WOMAC: Western Ontario and McMaster Universities Index of Osteoarthritis; SF-MPQ: Short-Form McGill Pain Questionnaire; PHQ-2: Patient Health Questionnaire; VAS: Visual Analogue Score; HADS: Hospital Anxiety and Depression; pD-Q: PainDETECT; OKS: Oxford Knee score.

Table 3 Studies including total knee replacement patients concerning the prevalence and etiology of neuropathic pain

Ref.	Design	No. of patients	Aim of the study	Scores-scales	Follow-up	Pain	Factors
Wylde *et al*[9]	Retrospective	632	To assess: (1) prevalence; (2) severity; (3) sensory qualities; and (4) postoperative determinants of persistent pain after primary THR and TKR	Western Ontario and McMaster Universities Index of Osteoarthritis Pain Scale Short-Form McGill Pain Questionnaire PainDETECT Questionnaire Two-item Patient Health Questionnaire	Median: 41 mo Range: 34-49 mo	PPSP: 44% Severe-extreme PPSP: 15% Constant PPSP: 5% Likely NP: 6%	Significant and independent postoperative determinants of number of PPSP: (1) No. of pain problems elsewhere; and (2) The presence of major depression
Masselin-Dubois *et al*[31]	Prospective	TKR patients: 89 breast cancer surgery patients: 100	To assess the predictive value of: (1) Anxiety; (2) Depression; (3) Pain catastrophizing; and (4) Baseline pain intensity for chronic post-surgical pain. The existence of neuropathic pain	BPI NRS Neuropathic Pain Diagnostic Questionnaire (DN4) Spielberger STAI 13-item BDI PCS	Pre-op. Post-op: (1) 2 d (2) 3 mo	TKR patients: (1) Pre-op: 84% at least moderate pain (2) 2 d: 46.9%; and (3) 3 mo: 50.6% Neuropathic pain TKR patients: (1) Pre-op: 30.7% (2) 3 mo: 42.2%	Regardless the type of surgery, state anxiety, pain catastrophizing (especially pain magnification) and acute post-surgical pain are predictive of persistent post-surgical pain Acute post-surgical pain was also predictive of NP pain. Baseline pain intensity, trait anxiety and depression had no independent impact on post-surgical pain (considering low baseline scores for depression in this study)
Lavand' homme *et al*[33]	Prospective	TKR and UKR patients: 120	To examine the relationship between postoperative pain trajectories and persistent pain, specifically neuropathic pain.	NRS Neuropathic Pain Diagnostic Questionnaire (DN4) PCS Spielberger STAI for Adults	Pre-op. Post-op: (1) Day 1 to day 8; (2) 3 mo	At 3 mo post-op: (1) 42% patients were pain free (2) 47% patients with persistent pain without NP pain; and (3) 11% patients with persistent pain involving neuropathic component	Patients with neuropathic pain displayed higher pain scores, particularly during mobilization No differences found among pain trajectories for pain at rest
Attal *et al*[32]	Prospective	TKR patients: 89 breast cancer surgery patients: 100	If: (1) cognitive functioning (2) emotional functioning and pain coping are predictors of persistent post-surgical pain and neuropathic pain	BPI Neuropathic Pain Diagnostic Questionnaire (DN4) TMT A TMT B ROCF-copy ROCF-immediate recall BDI Spielberger STAI CSQ Brief Version of the SOPA-B	Pre-op: (1) 1 mo; and (2) 1 d Post-op: (1) 2 d; (2) 6 mo, 12 mo	TKR patients (1) Pre-op: 84%; (2) 6 mo: 39%; and (3) 12 mo: 38% Neuropathic pain TKR patients: (1) Pre-op: 75 patients; (2) 6 mo: 32 patients; and (3) 12 mo: 26 patients	Cognitive functioning, emotional functioning and pain coping made an independent contribution to the prevalence and severity of persistent post-surgical pain, as well as its neuropathic quality. Results at ROCF-copy and ROCF-immediate recall test seemed to be predictors of pain with neuropathic nature

PPSP: Persistent postsurgical pain; BPI: Brief Pain Inventory; NRS: Numerical Rating Scale; STAI: State-Trait Anxiety Inventory; PCS: Pain Catastrophizing Scale; BDI: Beck Depression Inventory; TMT A: Trail-Making Test A; ROCF-copy: Rey-Osterrieth Complex Figure-copy; ROCF-immediate recall: Rey-Osterrieth Complex Figure-immediate recall; CSQ: Coping Strategies Questionnaire; SOPA-B: Survey of Pain Attitudes.

preoperative factors, we are unable to reach firm conclusions concerning the prevalence, and the risk factors of persistent post-operative pain after TKR. Additional studies focused on the prevalence and risk factors related to persistent postoperative pain are needed.

COMMENTS

Background

Persistent-post-surgical pain of unknown origin and neuropathic pain (NP) is considered a major underestimated problem for patients and for clinicians too. There are several studies that measure pain with a wide variety of scores-tools.

Research frontiers

According to our acknowledgment this is the first review that analyses the prevalence of both persistent post-surgical pain (PPSP) and NP after total knee replacement (TKR), while pain is measured only with pain-specific instruments. Risk factors that might play an important role in the prediction and the prevalence of persistent postoperative pain were also analyzed.

Innovations and breakthroughs

PPSP measured by pain- specific instruments only by a few studies. From this review, it is obvious that post-surgical pain and NP exists in a significant

proportion of patients, for years after TKR. Risk factors that might affect its prevalence and its intensity, found to be emotional functioning, such as depression and pain catastrophizing, number of comorbidities and early grade of osteoarthritis.

Application

Although it became recognizable the existence and the prevalence of PPSP and NP after TKR, these studies did not lead us to firm conclusions. There was mainly heterogeneity on the scales used to measured pain. Thus, further studies concerning the prevalence of PPSP and NP and their risk factors are needed, with pain-specific instruments.

Terminology

PPSP is the pain that is being developed after surgery, exists beyond the time for normal healing and is present for at least 3-6 mo. NP is defined as the pain caused by a lesion or a disease of the somatosensory nervous system.

Peer-review

This is a nice review article concerning postoperative knee pain after total knee arthroplasty.

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