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What Is the Role of Mental Health in Primary Total Knee Arthroplasty?

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Abstract

Background Psychological distress has been associated with inferior scores for pain after total knee arthroplasty (TKA). However, its relationships with scores and arthrofibrosis after TKA remain unclear.

Question/purposes The objectives of this study were (1) to assess patient-reported outcomes (PROs), including Knee Society (KS) scores, of those patients who developed arthrofibrosis and underwent manipulation and compare them with a control group; and (2) in patients with arthrofibrosis who underwent manipulation, to determine PROs and KS scores of those with psychological distress and those without it.

Methods During a 17-year period (August 1992 to October 2009), a total of 1952 TKAs were performed and included in our prospectively collected joint registry database; 1248 procedures had a postoperative followup of at least 2 years (mean, 5 years; range, 2–16 years). Among them, 57 knees (53 patients) developed arthrofibrosis and underwent manipulation under anesthesia after the index procedure. This group was compared with a matched group (by age, sex, race, and ethnicity) of 63 knees (58 patients) without arthrofibrosis. Demographics, preoperative and postoperative Quality of Well-Being scale (QWB-7), SF-36, WOMAC, and The KS knee and function scores were prospectively collected and retrospectively analyzed. Patients with < 52 points on the SF-36 Mental Component Summary subscale were considered in psychological distress for all comparisons. Active knee flexion and KS range of motion (ROM) were used as objective motion measures. Minimum followup was 2 years (mean, 5 years; range, 2–16 years).

Results Patients who developed arthrofibrosis had worse KS function scores before TKA than did patients in the nonarthrofibrosis control group (mean 27, SD 20.5 versus 37, SD 19.3; $p = 0.006$). Patients with arthrofibrosis and psychological distress, before TKA and when compared with patients with arthrofibrosis but without distress, had worse QWB-7 (0.490 versus 0.547; $p < 0.001$) and worse WOMAC stiffness (4.92, versus 3.22; $p = 0.005$), respectively. Postoperatively, patients with arthrofibrosis and distress also had worse QWB-7 (0.537 versus 0.627; $p = 0.002$).

Conclusions Patients with arthrofibrosis and psychological distress perceived themselves preoperatively as having worse knee and overall health status than those with

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Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.
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arthrofibrosis but without distress. In view of this, expectations after TKA should be particularly addressed in those patients with poor function and psychological distress. Further investigations, making use of tools specifically designed to ascertain depression, are warranted.

Level of Evidence Level III, prognostic study. See the Instructions for Authors for a complete description of levels of evidence.

Introduction

Psychological distress has been associated in many studies with inferior scores for pain and function after TKA [6, 7, 9, 16, 18, 20]. Understanding what factors contribute to poor results after TKA is particularly useful for surgeons and healthcare providers [15]. The presence of psychological distress has been found to be associated with an increased risk of symptomatic knee osteoarthritis [14]. In one study [3], preoperative psychological distress was observed in 32% of patients undergoing primary hip and knee arthroplasty (32 of 100). Worse preoperative and postoperative scores have been found in patients undergoing TKA with psychological distress (particularly depression) [18].

Although small numbers of patients have persistent postoperative knee dysfunction after surgery as a result of limited ROM, and arthrofibrosis after TKA is associated with lower knee scores and patient dissatisfaction [17, 18, 21], little is known regarding the possible associations between the presence of preoperative psychological distress and the development of arthrofibrosis after TKA. The relationships of patient-reported outcomes (PROs) in those patients with both arthrofibrosis and psychological distress to our knowledge have not been defined.

The objectives of this study were (1) to assess patient-reported outcomes, including Knee Society (KS) scores, of those patients who developed arthrofibrosis and underwent manipulation and compare them with a control group; and (2) in patients with arthrofibrosis who underwent manipulation, to determine PROs and KS scores of those with psychological distress and those without it.

Patients and Methods

Over a period of 17 years (August 1992 to October 2009), a total of 1952 TKAs were performed and included in our prospectively collected joint registry database; 1248 procedures had a postoperative followup of at least 2 years (mean, 5 years; range, 2–16 years). Among them, 57 knees (53 patients) developed arthrofibrosis and underwent manipulation under anesthesia (MUA) after the TKA.

Table 1. Demographics and body mass index of the arthrofibrosis group and the group without arthrofibrosis (control)

Characteristic	Group		
	Arthrofibrosis	Control	p value
Age (years)	66	64	0.2
Sex			
Women	73%	81%	0.3
Men	27%	19%	
Race			
Black	11%	6%	0.4
White	89%	94%	
Ethnicity			
Hispanic	81%	81%	1.0
Non-Hispanic	19%	19%	
Body mass index (kg/m^2; mean)	31	30	0.3

During the period in question, the indications for MUA remained relatively constant; in general, MUA was recommended to patients who did not achieve at least 90° of flexion within 30 days, and we recommend the procedure be done within 6 weeks after the index surgery; MUAs in this series were performed following these indications and recommendations.

This group of patients was compared on the outcomes of interest with a control group of patients who were identified at random after matching for age, sex, race, and ethnicity; this group included 58 patients (63 knees) who did not develop arthrofibrosis after primary TKA. There were no differences on baseline patient demographics between the arthrofibrosis and the control groups (Table 1), which confirmed the efficacy of the matching procedure.

Outcomes of interest included demographics and the following preoperative and postoperative PROs: Quality of Well-Being scale (QWB-7) [13], SF-36 [2], and the WOMAC [4]. Clinical scores included the KS knee and function scores [12]. In addition, active knee flexion and the KS ROM were included. All data were prospectively collected in the joint registry database but they were retrospectively analyzed. To quantify psychological distress, most investigators have used a surrogate measure of general distress, either the Mental Health score or the Mental Component Summary (MCS) score of the SF-36 [16]. Patients with < 52 points on the SF-36 MCS were considered to be in psychological distress in this investigation. Those patients with arthrofibrosis and preoperative psychological distress (as measured by the SF-36 MCS) were compared on the preoperative and postoperative outcomes of interest with those patients with arthrofibrosis but without psychological distress.

Most patients were discharged to home within 3 to 4 days in the absence of complications. Patients were then

Table 2. Preoperative and postoperative comparisons between the group with arthrofibrosis and the group without arthrofibrosis (control) on patient-reported outcomes, knee scores, and ROM measures

Dependent variable	Preoperative				Postoperative			
	Arthrofibrosis, mean (SD)	Control, mean (SD)	p value	95% CI	Arthrofibrosis, mean (SD)	Control, mean (SD)	p value	95% CI
QWB-7 total	0.522 (0.05)	0.530 (0.06)	0.4	−0.02 to 0.01	0.587 (0.10)	0.609 (0.13)	0.3	−0.06 to 0.02
KS knee score	42.59 (22.9)	43.27 (23.7)	0.8	−9.2 to 7.8	81.18 (22.9)	86.58 (22.7)	0.2	−14.0 to 3.2
KS function score	26.84 (20.5)	37.06 (19.3)	0.006*	−17.4 to −3.0	51.30 (22.1)	59.76 (21.4)	0.04	−16.6 to −0.2
WOMAC stiffness	3.96 (2.3)	3.61 (2.2)	0.4	−0.4 to 1.1	1.23 (2.2)	0.56 (1.2)	0.04	0.01–1.3
WOMAC total	61.16 (18.2)	57.06 (15.8)	0.19	−2.1 to 10.3	17.00 (26.2)	7.22 (13.6)	0.01	2.0–17.4
Knee active flexion	102.39 (19.1)	102.44 (21.2)	0.9	−7.3 to 7.2	96.71 (17.3)	104.19 (16.1)	0.018	−13.6 to −1.2
KS ROM	103.07 (18.7)	104.92 (22.0)	0.6	−9.2 to 5.5	101.63 (21.5)	109.76 (17.0)	0.026	−15.2 to −0.9

* p value < 0.01 independent t-tests; CI = confidence interval; QWB-7 = Quality of Well-Being Index; KS = The Knee Society.

seen by the senior author (CJL) during the second and sixth postoperative weeks for staple removal and clinical evaluation. Outcomes of interest were assessed preoperatively and postoperatively at 3 months, 6 months, 1 year, and annually thereafter. All patients provided informed consent for this institutional review board-approved study. The minimum followup was 2 years (mean, 5 years; range, 2–16 years). Mean age was 65 years (range, 32–94 years).

Statistical Analysis

We determined differences between the arthrofibrosis and control groups in the QWB-7, WOMAC, KS knee and function scores, active knee flexion, and KS ROM before and after surgery using independent t-tests. Within the arthrofibrosis group, independent t-tests were used to determine if there were differences between psychologically distressed individuals and nondistressed individuals on PROs, knee scores, and objective motion measures. All statistical analyses were performed using the SPSS Software (Version 16.0; IBM Corp, Armonk, NY, USA). A p value < 0.01 was considered significant.

Results

Preoperatively and before the index surgery, patients who developed arthrofibrosis who underwent MUA had worse KS function scores than did patients in the nonarthrofibrosis control group (mean 27, SD 20.5 versus 37, SD 19.3; 95% confidence interval, −17.4 to −3.0; p = 0.006). Postoperatively and after MUA, in the same comparison, there were no differences between the groups (Table 2).

Regarding comparisons between the arthrofibrosis group with psychological distress and the group with arthrofibrosis but without psychological distress, preoperatively and before the index surgery, patients with arthrofibrosis and psychological distress had worse QWB-7 scores (mean 0.490, SD 0.04 versus 0.547, SD 0.05; 95% confidence interval, −0.08 to −0.03; $p < 0.001$) and worse WOMAC stiffness scores (mean 4.92, SD 2.1 versus 3.22, SD 2.1; 95% confidence interval, 0.53–2.8; p = 0.005), respectively. Postoperatively and after the MUA, patients with arthrofibrosis and psychological distress had significantly worse QWB-7 than those patients with arthrofibrosis but without psychological distress (mean 0.537, SD 0.09 versus 0.627, SD 0.10; 95% confidence interval, −0.14 to −0.03; p = 0.002, respectively) (Table 3).

Discussion

Psychological disorders are fairly prevalent worldwide (5%–25%) with up to 6.6% of the population in the United States experiencing a major depressive disorder in any given year [11]. It has been shown that up to one-third of the patients who undergo an elective TKA are under psychological distress [3, 11, 16, 19]. Psychological distress (in particular depression) among patients who undergo TKA seems to lead to poorer preoperative and postoperative scores [18]. The literature is scarce regarding the possible associations between the presence of preoperative psychological distress and the development of arthrofibrosis after TKA and it is not conclusive concerning the PROs in this particular subgroup of patients [18]. As a consequence, the purposes of this investigation were (1) to assess PROs (including knee scores) of those patients who developed arthrofibrosis and underwent manipulation and compare them with a control group without arthrofibrosis; and (2) among patients with arthrofibrosis who underwent manipulation, to determine the PROs/knee scores of those with psychological distress and those without it.

Our results should be interpreted in light of several limitations. First, we evaluated a sample that underwent surgery in a specific Hispanic-predominated population in

Table 3. Preoperative and postoperative comparisons between patients with arthrofibrosis and psychological distress and those patients with arthrofibrosis but without psychological distress (distressed versus nondistressed)

Dependent variable	Preoperative				Postoperative			
	Distressed, mean (SD)	Nondistressed, mean (SD)	p value	95% CI	Distressed, mean (SD)	Nondistressed, mean (SD)	p value	95% CI
QWB-7 total	0.490 (0.04)	0.547 (0.05)	< 0.001*	−0.08 to −0.03	0.537 (0.09)	0.627 (0.10)	0.002*	−0.14 to −0.03
KS knee score	41.00 (22.7)	43.78 (23.4)	0.6	−15.3 to 9.7	80.32 (22.3)	81.86 (23.8)	0.8	−14.8 to 11.7
KS function score	19.40 (18.5)	32.66 (20.3)	0.014	−23.7 to −2.7	50.00 (24.4)	52.32 (20.6)	0.7	−15.1 to 10.5
WOMAC stiffness	4.92 (2.1)	3.22 (2.1)	0.005*	0.53–2.8	1.52 (2.2)	1.0 (2.1)	0.3	−0.66 to 1.7
WOMAC total	66.96 (17.0)	56.81 (18.0)	0.038	0.59–19.6	20.64 (27.5)	14.16 (25.2)	0.3	−7.5 to 20.5
Knee active flexion	102.68 (16.4)	102.16 (21.3)	0.9	−9.8 to 10.8	96.23 (18.4)	97.07 (16.8)	0.8	−10.7 to −10.9
KS ROM	105.40 (15.6)	101.25 (21.0)	0.4	−5.9 to 14.2	102.73 (21.0)	100.83 (22.2)	0.7	−10.3 to 14.1

* p value < 0.01 independent t-tests; CI = confidence interval; QWB-7 = Quality of Well-Being Index; KS = The Knee Society.

south Florida, USA; for this reason, results might not be generalizable to other populations. In addition, some of the results found in our study might have been subjected to sampling error as a result of the relatively small numbers of knees. Second, in an effort to adjust for as many confounding factors as possible, we compared the arthrofibrosis group with a control group matched by age, sex, race, and ethnicity. However, we did not adjust for other factors such as quadriceps strength, level of education, socioeconomic status, or medical comorbidities [9–11, 14]. Third, the KS score is not an independent endpoint from ROM, because that score does include a component related to ROM. However, that is a small part of the overall score, and we believe this issue does not preclude its use, because the KS score measures numerous items apart from ROM. Finally, we were not able to ascertain the exact number of patients to whom MUA was recommended although we think this number is very low, if any. However, because psychological distress might have influenced the decision to undergo manipulation, this circumstance represents another limitation. Again, we do not think that a substantial number of patients declined MUA as a result of their psychological distress, because this is not a frequent occurrence in this practice. Consequently, we do not think that this limitation was likely to have materially influenced the results.

We found that the arthrofibrosis group had a worse mean preoperative (before the index surgery) KS function score than did the group without arthrofibrosis (control). This is consistent with previous reports of patients' preoperative scores serving as predictors of knee stiffness after TKA [1, 17]. Postoperatively and after manipulation, we found that patients with arthrofibrosis did not have significant differences in the same comparison, a result that is not in agreement with previous investigations [10, 21].

Preoperatively and before the index surgery, patients with arthrofibrosis and psychological distress had lower QWB-7 and WOMAC stiffness than did patients with arthrofibrosis but without psychological distress. This finding was sustained postoperatively and after manipulation for the QWB-7. Similar results have been reported by others, in that patients with poor mental health usually perceive themselves as having a worse clinical state [15, 18, 19]. In our study population, it occurred that patients with arthrofibrosis and psychological distress had similar KS scores and active knee flexion and ROM when compared with patients with arthrofibrosis but without psychological distress; however, these distressed patients perceived themselves in a worse clinical state. This highlights the complexity behind these sorts of outcomes after TKA, because the clinician might perceive that the patient had a satisfactory outcome when the patient in fact perceives his or her results as not being satisfactory. It has been proposed that the perception of pain in knee osteoarthritis is influenced by factors that go beyond the severity of anatomic osteoarthritic changes [8, 14]. This same principle has been proposed in TKA, in which psychological distress (including depression) has been associated with worse preoperative and postoperative PROs [15, 18]. Notwithstanding, it is worth mentioning that in a delta change done between the preoperative and postoperative SF-36 MCS scores, patients classified preoperatively as being psychologically distressed had a substantial improvement (14.24 and 12.59, respectively), whereas patients who were psychologically nondistressed had a slight loss (−2.25 and −4.94, respectively). Several authors [5, 7, 16, 18] have noted an improvement in the mental health of patients undergoing TKA hypothesizing that pain before surgery might lead to depression and thus undergoing knee arthroplasty would improve depression and pain. However, further studies are warranted to support such a hypothesis.

In conclusion, patients who developed arthrofibrosis had worse preoperative KS function than patients without

postoperative arthrofibrosis. Compared with patients with arthrofibrosis but without psychological distress, those patients with arthrofibrosis and psychological distress perceived themselves as having worse quality of well-being and more stiffness before the surgical intervention and their worse quality of well-being perception was sustained after surgery. Expectations after TKA should be particularly addressed in those patients with poor function and psychological distress. Further investigations, making use of tools specifically designed to ascertain depression, are warranted.

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