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Review Article

Total Knee Arthroplasty in Patients with Concomitant Low Back Pain, Its Effects on Pain, Functional Outcomes and Satisfaction, a Narrative Review

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Abstract

The request for total knee arthroplasty (TKA) is increasingly being raised and imposes an enormous burden on the healthcare system. Most subjects represent symptomatic concomitant low back pain (LBP) at baseline, interfering with functional outcomes with little or no improvement in mental health following TKA. Orthopedics should notify the patients suffering from concomitant LBP about the likelihood of unfavorable recovery. The authors describe the functional outcomes and satisfaction following TKA in patients suffering from concomitant LBP.

Keywords: Knee; Arthroplasty; Low Back Pain; Joints

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Background

Total knee arthroplasty (TKA) is an advanced surgery and a gold-standard treatment for severe stages of osteoarthritis (OA). OA is a common condition that may be present in older patients. Both knee OA and spondylosis are common presentations in older people (1-3). Therefore, the patient candidate for TKA with severe OA often has concomitant radicular or local low back pain (LBP) (4, 5).

In the United States (US), 500000 TKA and 200000 lumbar fusions are performed annually (6, 7). Predictably, remaining concomitant lumbar pain could worsen the functional outcomes and patients' satisfaction following TKA. It is still controversial among orthopedic surgeons to address whether the spine or knee first. Here, the authors narrated related studies about concomitant knee and lumbar pain in patients who were candidates for TKA.

Back Pain in Knee OA

About 92% of patients with advanced knee OA undergoing TKA are over 60 years of age, which results in lumbar spine spondylosis problems being regularly present in addition to knee OA symptoms in such patients (8). Although today modern instruments are available to assess knee-specified pain, it is yet challenging to part pain attributed to back from the pain of peripheral joints as in criteria studies and clinical trials of OA, it has been mentioned that OA of knee or hip, while being the study site, may not be the only problem patients are dealing with and in clinical examination of patients. It has not been shown that OA of the knee is requisite to patients' disability. And finally, due to OA being generalized in some forms, back pain can be a common combination in patients suffering from OA (9-11). The pervasiveness of patients experiencing back pain in addition to OA of the knee is 54.6% (12).

In the United Kingdom (UK), in comparison to UK general population, estimates tend to suggest a greater risk for TKA in patients with ankylosing spondylitis. TKA has a 5-year probability of 1.04% and a 10-year probability of 1.79%. The 10-year risk of TKA in the general UK population was 1.1% for women and 0.6% for men (13). The relationship between back pain and TKA has been studied among 42 patients retrospectively by Burnett et al. (14). The majority (74%) reported back pain for at least 10 years prior to TKA. More than 85% of the subjects reported pain in multiple joints, and LBP was the most common joint pain, along with knee pain. Duygun and Aldemir in their study reported a 16% and 17% prevalence of spinal stenosis in patients who had undergone unilateral and bilateral TKA, respectively (15). A high prevalence of back pain among patients with knee OA explains the importance of back pain treatment and prevention in reducing knee OA, knee pain, and the need for TKA (14).

Outcomes of TKA in Patients Harboring LBP

In a propensity score-matched cohort study conducted by Collados-Maestre et al., concomitant LBP was found to impair the postoperative patient-reported functional outcomes of over 65 years old patients undergoing primary TKA in a mean postoperative follow-up of 3.2 years. Regardless of the promising result in the knee, the LBP often persists more following TKA and may worsen satisfaction and patient outcomes (16). Similarly, in a cohort comprising 345 patients performed by Boyle et al., the potential role of LBP on the outcome of patients undergoing TKA was evaluated. The preoperative functional status was the robust determinant factor of

post-surgical success in patients undergoing TKA surgery, and symptomatic LBP impaired functional outcomes following TKA and correlated with limited or poor mental health improvement (17).

In a prospective cohort of multicenter study comprising 308 patients conducted by Novicoff et al. during at least 12-month follow-up, patients suffering from LBP at baseline represented worse scores on most standardized instruments compared with the lack thereof. The study suggests that concomitant LBP in patients undergoing revision TKA (rev-TKA) correlates with the worst postoperative outcomes. Orthopedic surgeons should therefore update their patients representing LBP regarding the likelihood of slower to less complete rehabilitation (18).

Pain and Functional Outcomes Following TKA with LBP

Lumbar spine problems represent the leading cause of functional disability. Even though pain resolution following TKA is expected in most sufferers, poor outcomes persist in almost 20% of cases and commonly are related to patient dissatisfaction. In a prospective study comprising 691 consecutive TKAs by Schroer et al., 371 presented with back pain that limited daily activity or back pain, and they determined the correlation between the history of spine disability and lower knee function scores. Oxford Knee Score (OKS) was significantly lower in patients with concurrent back problems compared with the lack thereof, pre-operatively (36.9 vs. 34.8, P = 0.0006) and postoperatively (20.2 vs. 17.0, P < 0.0001). However, no correlation was achieved in terms of improvement (16.7/17.8, P = 0.1000). Knee Society (KS) pain scores were found to be worse in patients with concurrent back problems compared with the lack thereof, pre-operatively (42.3 vs. 47.0, P = 0.0005), postoperatively (69.0 vs. 79.8, P < 0.0001), and for improvement (25.8 vs. 32.9, P < 0.0001). Worse KS function was related to preoperative function, age, female gender, health, and Oswestry Disability Index (ODI). ODI was associated with the KS function score (R = 0.54) and OKS (R = 0.57). The authors concluded that considering concurrent spine disability should guide the evaluation of TKA outcomes and patient expectations (19).

A recent systematic review by Olsen et al. investigated preoperative and intraoperative factors associated with postoperative pain in patients with OA undergoing TKA. The authors concluded that more symptomatic joints, pain catastrophizing, and pre-operative pain correlated with more pain. On the other hand, in more severe OA, less pain one year post-TKA is expected. More preoperative pain was correlated with better mental health, less pain, and more pain at three and six months (20).

Determinant and Predicting Factors for Satisfaction of Patients with Back Pain Following TKA

TKA represents one of the most common orthopedic procedures, with at least 1000000 subjects performed annually across the US (21).

A multicenter prospective cohort study conducted by Ayers et al. comprised 9057 subjects undergoing primary unilateral TKA. The ODI pain intensity questionnaire was recruited to evaluate back pain intensity. Following the first year, a total of 1657 TKA subjects were dissatisfied. A total of 4765 subjects experienced back pain pre-operatively, including severe back pain in 657 subjects, moderate in 1844 subjects, and mild in 2264 subjects. Severe back pain was strongly correlated with patient dissatisfaction following postoperative year one (P = 0.0006). Patients presenting severe back pain were 1.6 folds more likely to be dissatisfied compared to the lack thereof [odds ratio (OR): 1.63, 95% confidence interval (CI): 1.23-2.16, P = 0.0006]. However, mild back pain or moderate back pain (OR: 0.98, 95% CI: 0.82-1.17, P = 0.8700; OR: 0.97, 95% CI: 0.80-1.18, P = 0.7800) were not accompanied by a higher dissatisfaction rate. Educational level (OR for post-high school vs. less: 0.83, 95% CI: 0.71-0.97), age (OR for younger patients < 65 years vs. older patients ≥ 65 years: 0.74, 95% CI: 0.59-0.92), Charlson Comorbidity Index (CCI) (OR for CCI ≥ 2 vs. CCI = 0: 1.25, 95% CI: 1.05-1.49), and smoking (OR for nonsmoker vs. current smoker: 0.63, 95% CI: 0.45-0.87) were among other factors determining patient's dissatisfaction (22).

Clement et al. assessed the effect of coexisting back pain on the 12-item Short-Form Health Survey (SF-12), OKS, and patient satisfaction in 2392 subjects undergoing primary total knee replacement (TKR), among which 829 patients presented with back pain. Those presenting with back pain had a greater level of comorbidity, a worse preoperative OKS (2.3 points, 95% CI: 1.7-3.0), increased likelihood of being female (OR: 1.5, 95% CI: 1.3-1.8), and worse SF-12 mental (3.3 points, 95% CI: 2.3-4.3) and physical (2.0 points, 95% CI: 1.4-2.6) components compared with the lack thereof. One year postoperatively, patients representing with back pain reflected worse outcome scores with a mean difference in the OKS of 5 points (95% CI: 3.8-5.4), SF-12 mental component of 4 points (95% CI: 3.1-4.9), and the physical component of 6 points (95% CI: 5.4-7.1) compared with the lack thereof.

Patients presenting with back pain had a lower likelihood of being satisfied (OR: 0.62, 95% CI: 0.50-0.78). By adjusting for confounding variables, coexisting back pain represents an independent predictor of dissatisfaction and a worse postoperative OKS. Healthcare professionals should stick this in mind that patients suffering from coexisting back pain pre-operatively have a higher likelihood of dissatisfaction postoperatively (23).

Discussion

Knee and lower back pain are the two leading causes of chronic pain across the US (24). TKA provides the most effective procedure for functional recovery and pain relief in cases with advanced degenerative arthritis of the knee (25, 26). Moreover, knee OA sounds to be more prevalent in cases that radiographically reveal signs of spinal degeneration (27). While pain relief is routinely expected following TKA, functional deficits may persist, leading to dissatisfaction in a considerable number of patients (28, 29). Hence, coexisting back pain and TKA could obscure a surgeon's aptitude to appropriately assess the efficacy of the surgical intervention postoperatively. LBP is thought to be nonspecific, and the etiology of 80-90 percent of all cases remains unknown for decades. Many potential anatomic sources may contribute to inducing LBP, including muscle, nerve roots, fascial structures, joints, bones, and intervertebral discs (30).

A recent meta-analysis demonstrated that patients representing mild radiographic OA had an increased likelihood of post-TKA pain. It seems that patients presenting with severe OA may gain more from TKA surgery compared with the lack thereof. Non-surgical management should be taught to all who radiographically represent low-grade OA pre-operatively (31, 32).

The standard global spine's sagittal alignment is critical in maintaining the gravity line centered in the pelvis and keeping the standing position with low muscle tone. Once the sagittal alignment is disrupted, more effort is warranted to sustain body balance lacking external

support (33-35). To maintain the sagittal spinal balance, compensatory mechanisms are required in the pelvis, spine, and the and/or lower limb areas (34). Global balance is clinically determined by sagittal vertical axis (SVA), and if the C7 plumb line is greater than 5 cm (anterior or posterior to the sacral promontory), the sagittal balance loss is consumed to be significant. TKA candidates primarily demonstrate anteriorly shifted global imbalance secondary to the knee flexion contracture, which favors local segment-dependent insufficient compensatory mechanisms (30).

Several reports described that sacral slope (SS) and lumbar lordosis were decreased significantly by more than 5° in cases with knee flexion contractures highlighting that the spine and knee affect each other (36).

Disrupted flexion contracture secondary to TKA influenced the SS in a few patients by which the pelvic tilt value remained unchanged. Hence, the pre- and post-operative advantage of pelvic incidence remained inconsistent with unknown causes (37). In a larger prospectively designed cohort study by Kitagawa et al. (30), the pre- and post-operative advantages of pelvic incidence appeared consistent. Hence, mild increase and decrease in post-surgical benefits of pelvic tilt and SS might be derived from mild anteversion of backward tilted pelvis with no changing morphology of the intrinsic pelvis. It was suggested that the sagittal global imbalance might not be retrieved following the knee flexion contracture removal in a short while after TKA.

Conclusion

The hip, knee, and spine are anatomically connected; hence, corresponding degenerative changes could frequently justify some discomfort arising from this axis, indicating so-called "knee-hip-spine syndrome". LBP is regarded as one of the most frequent conditions related to knee pain which could strongly influence the outcomes of TKA. Surgeons should be aware of post-surgical outcome determinant factors of patients undergoing TKA with concurrent spine problems.

Conflict of Interest

The authors declare no conflict of interest in this study.

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