

Patient factors that influence the outcome of total knee replacement: a critical review of the literature

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Abstract

Introduction

Total knee replacement is a cost effective treatment for end-stage osteoarthritis of the knee and the rate of this procedure continues to increase, which is thought to be due to an aging society with greater functional demands. The outcome of total knee replacement is variable, however, with approximately one in five patients not being satisfied with their knee after surgery. There are multiple patient factors that are thought to affect the outcome of total knee replacement. The aim is to review the published literature and present the current evidence regarding the influence of patient factors upon the outcome of total knee replacement.

Conclusion

A patient's outcome according to the Oxford knee score is not influenced by their age, socioeconomic status and mental wellbeing, but is influenced by fulfilment of their pre-operative expectations and their post-operative general physical health. In contrast to the Oxford knee score the rate of patient satisfaction is influenced by socioeconomic status, mental wellbeing, in addition to fulfilment of expectations and the post-operative general physical health of the patient.

Introduction

Total knee replacement (TKR) is an effective procedure for the treatment of end-stage osteoarthritis of

the knee, and the rate of this procedure continues to increase year on year¹. However, one in five patients undergoing TKR will not be satisfied with their knee replacement post-operatively^{2,3}. The rate of patient satisfaction is influenced by multiple patient-dependent factors, which also influence patient-reported outcome measures (PROMs). The outcome of TKR can be measured by using numerous PROMs. The Oxford knee score⁴ (OKS) and the Short Form-12 (SF-12) questionnaire⁵ are two such PROMs that are commonly used. The OKS is a joint-specific score that enables subjective measurement of knee function and pain after surgery. The SF-12 score, in contrast, is a generic health measure of a patient's overall physical and mental wellbeing. This critical review presents the current literature regarding the influence of patient factors, specifically age, socioeconomic status, mental health, expectation and general health, on the outcome of TKR according to PROMs and patient satisfaction.

Discussion

The author has referenced some of its own studies in this review. These referenced studies have been conducted in accordance with the Declaration of Helsinki (1964) and the protocols of these studies have been approved by the relevant ethics committees related to the institution in which they were performed. All human subjects, in these referenced studies, gave informed consent to participate in these studies.

Age

Small retrospective reports of TKR in patients over the age of 80 years report significant pain relief and

improved functional outcomes, at a cost of increased rates of post-operative complications and mortality⁶⁻⁸. Comparative studies have also shown that patients aged 80 years or more experience pain relief and a functional improvement that is equal to their younger counterparts at 1-year follow-up; however, in contrast to other studies the rates of complications were not increased in older age groups⁹⁻¹¹. A recent prospective study demonstrated that patients 80 years or older undergoing TKR are more likely to be females, enjoy an equal improvement in their OKS and have a similar satisfaction rate as younger patients¹². However, these very elderly patients had less of an improvement in their general physical health post-operatively, which was thought to be reflective of their increased age and comorbidity. There was, however, a greater post-operative complication rate, although with no difference in the 1-year mortality rate and a longer length of hospital stay.

Social deprivation

Socioeconomic status has been shown to affect the functional outcome of total hip replacement¹³; however, there is conflicting evidence regarding the effect of deprivation on the outcome of TKR. Murray et al.¹⁴ found no correlation between socioeconomic status and pre-operative disease severity or the outcome after TKR. Davis et al.¹⁵ after adjusting for confounding variables demonstrated that disease severity pre-operatively was greater in those with the lowest financial income, but they achieved the same final functional outcome as those with a greater financial income. More recently Lopez-Olivo et al.¹⁶ demonstrated multiple psychosocial

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factors that determined the outcome of TKR, which included both social and mental factors. Clement et al.¹⁷ demonstrated that socially deprived patients undergoing TKR were significantly more likely to be of female gender, younger age, suffer a greater level of comorbidity and had a poorer mental health status. They also had a significantly greater level of functional deficit, according to the OKS, which persists post-operatively. Interestingly, social status was not an isolated predictor of outcome; factors that were more prevalent within the socially deprived significantly affected the improvement of their OKS. In addition, after adjusting for other independent predictors of dissatisfaction, being more prevalent in the socially deprived, there is no difference in the rate of dissatisfaction according to social status.

Mental health

Patients with a diagnosis of psychological depression have been shown to have a significantly lower satisfaction rate after TKR³. It is estimated, however, that 30% of patients undergoing knee replacement experience pre-operative psychological distress¹⁸. The evidence as to whether pre-operative psychological distress impairs the functional outcome and satisfaction rate after a TKR is conflicting¹⁹. Nilsdotter et al.²⁰ demonstrated that the mental health component of the SF-36 had no influence on the functional outcome of TKR, which was affirmed by Bert et al.²¹. There are, however, other studies that have demonstrated a diminished functional outcome with a poorer pre-operative mental health status²²⁻²⁴. Furthermore, Lingard et al.²⁵ identified that poor pre-operative mental health was associated with diminished improvement in outcome 2 years after TKR. A recent prospective study concluded that patients with mental disability had a significantly greater subjective physical disability post-operatively²⁶. However, the absolute

improvement in their joint specific score (OKS) is not affected by a patient's mental health, but in contrast the improvement in their global physical health, according to the SF-12 physical component score (PCS) did not improve to the same magnitude²⁶. However, patients with mental disability, of any degree, were demonstrated to have a significant improvement in their mental health post-operatively²⁶. Despite the similar improvement in the joint specific scores and improvement in their mental health, patients with mental disability are significantly more likely to be dissatisfied with their TKR at 1 year²⁶.

Patient expectations

Pre-operative patient expectations are an important factor in a patient's decision to undergo TKR²⁷. Post-operatively, the fulfilment of these expectations, or otherwise, appears to be an important determinant of patient-reported outcome and satisfaction^{3,28,29}. An understanding of the nature of these patient expectations is important if surgeons are to best educate their patients, minimise expectation/outcome mismatch and maximise PROMs success. It has previously been suggested that expectations of pain relief, improvement in walking ability and improvement in psychological well-being are the most important to patients with total hip replacement and TKR^{30,31}. High pre-operative expectations have been associated with both favourable outcomes³² and worse outcomes with poor patient satisfaction when optimistic expectations are not met^{20,33}. The most important expectations that a patient has of their TKR is the ability to walk and relief from pain. Interestingly, male gender, younger age and a worse pre-operative OKS were predictors of increased level of expectation of their TKR³⁴. However, only 10% of patients had all of their 'very important' or 'somewhat important' expectations fulfilled 'greatly' or 'a lot' at 1 year³⁴. A worse

pre-operative OKS and greater improvement in the score and SF-12 PCS are independent predictors of fulfilment of patient expectations³⁴. Fulfilment of these expectations is directly correlated with patient satisfaction, with those patients enjoying a greater level of expectation fulfilment having the greatest satisfaction rate³⁴.

Patients' general health

A great deal of work has been carried out analysing how patient satisfaction is influenced by the post-operative OKS, and identifying pre-operative predictors of change in the OKS to facilitate identification of those patients who may be most satisfied with their TKR^{2,3,35}. However, limited work has been undertaken to describe the effect of a patient's post-operative generic physical health and the influence this has on patient satisfaction³. Scott et al.³ reported that 18.6% of patients were unsure or dissatisfied and 81.4% of patients were satisfied or very satisfied with their TKR, and demonstrated a greater rate of patient dissatisfaction with worsening pre-operative generic physical health. However, they did not describe the case-mix variables for this group of patients. A large prospective study demonstrated that the post-operative generic physical health, measured using the SF-12 score, only improved in two-thirds of patients after a TKR and was bimodal in distribution, that is two differing groups²². Patients with a poor post-operative generic physical health (SF-12 PCS <40) and those with a sub-clinical improvement (<4 points) have a greater rate of dissatisfaction with their TKR despite a clinically significant improvement in their knee function according to the OKS³⁶. Furthermore, half the patients after a TKR will have a poor post-operative generic physical health and one-third will have a sub-clinical improvement in their SF-12 PCS. Factors that are

predictive of these two groups of patients are increasing age, those with heart disease, back pain, pain in other joints and worse pre-operative OKS and SF-12 MCS³⁶. Hence, it would appear that for patients with other factors that influence their general physical health, in addition to their knee symptoms, are not as satisfied with their TKR as those patients whose general physical health is predominantly limited by their knee symptoms.

Clinical relevance

One of the most important aspects of pre-operative management is to provide the patient with known facts about their potential outcome after their TKR. The outcome, depending on the measures used, is not universally the same for all patients presenting for a TKR and the pre-operative predictors of improvement in OKS and patient satisfaction that have been identified in this review could be used to inform patients of their potential outcome. Hence, those patients who are at a greater risk of dissatisfaction after TKR should be made aware of this pre-operatively to enable them to make an informed decision.

Conclusion

The OKS has been approved by the NHS in the UK as the PROMs of choice to measure the outcome of TKR for audit and research purposes. The case-mix variables, such as socioeconomic status, mental wellbeing and general physical health influencing the post-operative OKS, have been demonstrated to affect PROMs. These variables would need to be acknowledged and the OKS adjusted to enable a fair comparison of differing study cohorts or orthopaedic units with dissimilar patient catchment populations.

Abbreviations

OKS, Oxford knee score; PCS, physical component score; PROM, patient-reported outcome measure; TKR, total knee replacement.

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