

Patient-reported allergies cause inferior outcomes after total knee arthroplasty

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Abstract

Purpose The main objective of this study was to analyse the outcomes after total knee arthroplasty (TKA) of a group of patients with at least one self-reported allergy and a group of patients without reported allergies. We hypothesized there is a significant negative influence on clinical outcome scores after TKA in patients with self-reported allergies.

Methods Four-hundred and seventy-five patients who had undergone TKA were analysed preoperatively and 1 year after surgery. The WOMAC, KSS and SF-36 scores were obtained. The patients' Yesavage depression questionnaire score was also recorded. The scores of the 330 (69.5 %) patients without self-reported allergies were compared to the scores of the 145 (30.5 %) patients with at least one self-reported allergy in the medical record.

Results Preoperative scores were similar in both groups. The WOMAC post-operative scores (23.6 vs 20.4; $p = 0.037$) and the KSS-Knee score (91.1 vs 87.6; $p = 0.027$) were worse in the group of patients with self-reported allergies than in the group without allergies. The scores from the Yesavage depression questionnaire and in the SF-36 were similar in both groups.

Conclusion Patients with at least one self-reported allergy have worse post-operative outcomes in terms of the WOMAC and KSS-Knee scores after TKA than patients without allergies. These poor outcomes do not seem to be related to depression. Therefore, more research is needed

to explain them. Reported allergies could be considered a prognostic factor and used when counselling TKA patients.

Level of evidence I.

Keywords Total knee arthroplasty · Outcomes · WOMAC · KSS · Allergies · Depression

Introduction

Although total knee arthroplasty (TKA) has been recognized as an effective procedure for improvement in terms of quality of life, pain and the functional limitations caused by knee osteoarthritis [16, 18], a significant proportion of TKA patients is not satisfied [28]. Moreover, they achieve relatively poor outcome scores after surgery when compared to the results after total hip arthroplasty [2, 17].

Many conditions such as being female [18], greater preoperative pain [4], depression [20] and anxiety [12, 23] have been related to suboptimal results after TKA. Recently, patient-reported allergies have also been considered a possible factor related to poor outcomes [7].

The main purpose of this study was to analyse the outcomes after TKA of a group of patients with self-reported allergies and a group of patients without reported allergies. We hypothesized there was a significant negative influence on clinical outcome scores after TKA in patients with self-reported allergies.

Materials and methods

This is a prospective study of a group of patients operated on at our institution to whom a TKA was implanted. Patients scheduled for TKA were asked about their

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allergies in the preoperative visit. Data about allergies were retrieved from the patients' medical record. All patients gave informed consent prior to their inclusion in the study.

Of the 475 patients studied, 344 (72.4 %) were females and 131 (27.6 %) were males. The average age was 70.9 (SD 6.6) years. There were 251 (52.8 %) right knees and 224 (47.2 %) left knees. The mean body mass index (BMI) of our patients was 31.4 (SD 5.4). There were no significant differences in gender, age, side or BMI in the groups of patients with or without reported allergies.

At the preoperative and 1 year post-operative visit, Spanish versions of the Western Ontario and McMaster Universities Arthritis Index (WOMAC), the 36-item Short Form Health Survey (SF-36) and the Knee Society Score (KSS) [1, 26] outcome scores were recorded. WOMAC values were looked at in terms of the total score as well as the pain, stiffness and function subscores. The SF-36 values were considered in each of its eight original sections and as the physical component subscore and the mental component subscore. The KSS scores were considered in the KSS-Knee score and the KSS-Function score. A Yesavage questionnaire score for depression [29] was also recorded.

The group of patients included in the present study is composed of a total of 475 patients with either a positive or negative history of allergies and preoperative and post-operative outcome scores. If both knees were treated with TKA, the scores referring to the first operated knee were taken into account.

Operative technique

Prophylactic antibiotics (2 g preoperative cephazolin IV and 1 g/8 h post-operative for 1 day) were used in each case. Two grams of IV vancomycin was used in patients with an allergy to penicillin. No differences in the rate of deep infection were found between patients with or without allergies (1.4 vs 0.9 %). Seven different surgeons were involved in the procedures. In all cases, a standard anterior incision and a medial parapatellar approach were used. The prosthetic components were implanted with cement after standard bone cuts and, when necessary, soft tissue release. In all cases, the patella was replaced. Wound closure was done in flexion, and one deep drain was left in the knee for 24 h.

Starting at 6 h post-operatively, enoxaparin was administered at 40 mg/24 h over 4 weeks. A compression stockinet was used in the operated lower limb.

Rehabilitation protocol: All the patients followed the same post-operative rehabilitation protocol, beginning with continuous passive motion (CPM) of the knee 24 h after surgery. It was carried out with 2 CPM sessions per day for 6 days until hospital discharge, following the hospital's clinical pathway. Patients began full weight-bearing

deambulation with crutches at 48 h after surgery. After discharge, the patients came to the hospital for 10 additional physiotherapy sessions. The present study received IRB approval by the Parc de Salut Mar Ethical Committee (2011/4286).

Statistical analysis

All data collected for this study were entered into an Excel database (Microsoft Office 2003, Redmond, WA) and analysed using the SPSS 18.0 (IBM Corp) statistical program. A descriptive analysis of the sample was done using rates for categorical variables, and the mean and standard deviation for continuous variables. To compare differences between both groups, a Chi-square or a Fisher exact test was used for analysis of categorical variables. The Student's *t* test was used for continuous variables. A power analysis was performed and based on the Student's *t* test for independent data. As we expected the distribution to be 2:1 in the groups of non-allergic and allergic patients, with a power of 80 % and α error <0.05, 262 patients in the group of non-reported allergies and 131 in the group of reported allergies were necessary to detect as statistically significant a difference in the studied scores of at least 0.3 standard deviations between both groups. The level of significance was set at $p < 0.05$.

Results

Three-hundred and thirty patients (69.5 %) reported no allergies, while 145 patients (30.5 %) reported at least one allergy. Of those reporting allergies, 107 patients (22.5 %) reported 1 allergy, 23 patients (4.8 %) reported 2 allergies, 11 reported 3 allergies (2.3 %), and 4 patients (0.8 %) reported 4–7 different allergies. That represents an average of 0.44 allergies per patient.

The two single more frequently reported allergies were to penicillin (51 patients, 10.7 %) and aspirin (22 patients, 4.6 %). Other less frequently reported allergies were to iodine (10 patients, 2.1 %), sulphonamides (10 patients, 2.1 %), diclofenac (8 patients, 1.7 %), metamizole (8 patients, 1.7 %), nickel (7 patients, 1.5 %) and 48 other different agents with <5 allergic patients each.

No differences in the preoperative WOMAC, SF-36 or KSS scores were found between patients with or without reported allergies (Table 1). The scores in the preoperative Yesavage depression questionnaire were also similar in both groups (1.7 vs 1.6; n.s.).

It was found that the patients reporting at least one allergy had worse average WOMAC post-operative scores than the patients reporting no allergies ($p = 0.036$; Table 2).

Table 1 Preoperative scores in the groups of patients with and without self-reported allergies in their medical record

	No allergies (<i>n</i> = 330)	Allergies (<i>n</i> = 145)	<i>p</i> value
WOMAC (total)	48.7	50.2	n.s.
WOMAC—pain	9.6	9.9	n.s.
WOMAC—stiffness	3.6	3.8	n.s.
WOMAC—function	35.3	36.4	n.s.
KSS—knee	47.1	45.2	n.s.
KSS—function	53.3	54.7	n.s.
SF-36 physical	32.1	31.8	n.s.
SF-36 mental	46.4	46.9	n.s.

WOMAC Western Ontario and McMaster Universities Arthritis Index, KSS Knee Society Score, SF-36 36-item Short Form Health Survey

Table 2 Post-operative scores in the groups of patients with and without self-reported allergies in their medical record

	No allergies (<i>n</i> = 330)	Allergies (<i>n</i> = 145)	<i>p</i> value
WOMAC (total)	20.4	23.6	0.036
WOMAC—pain	3.5	4.1	n.s.
WOMAC—stiffness	1.5	1.8	n.s.
WOMAC—function	15.4	17.7	0.037
KSS—knee	91.1	87.6	0.027
KSS—function	83.1	83.5	n.s.
SF-36 physical	43.8	42.7	n.s.
SF-36 mental	46.6	47.7	n.s.

WOMAC Western Ontario and McMaster Universities Arthritis Index, KSS Knee Society Score, SF-36 36-item Short Form Health Survey

These differences were mainly in the function subscore of the WOMAC ($p = 0.037$).

When analysing the results of the KSS scores, worst results were found in the KSS-Knee score in the patients with reported allergies ($p = 0.027$), but there were no differences in the KSS-Function score (Table 2).

When studying the quality of life with a generic outcome score, no differences in the physical or mental SF-36 score results between both groups were observed (Table 2).

Discussion

The main finding of this study was that patients with self-reported allergies have worse post-operative outcomes, as shown by the WOMAC and the KSS-Knee scores, than patients without allergies. Thus, so our hypothesis was confirmed. The fact that the WOMAC function score but not the KSS Function score was worse in the allergic patients

might be explained due to the fact that the KSS Function score only addresses knee function while walking and stair climbing and descending. However, the WOMAC function score addresses many other daily situations like sitting, rising from a chair, squatting, riding in a car, lying in bed and a few others. It is likely that the moderate differences in knee function can be better detected using the WOMAC rather than the KSS Function score. Then again, no significant differences in the Yesavage depression questionnaire or in the SF-36 outcomes were found. Those results suggest that differences in the post-operative outcomes do not seem to be related to mood disturbances.

Epidemiological studies on the prevalence of allergies have been focussed on hospitalized patients and hospital admissions [6, 11, 21, 24]. Few prevalence studies have been done on outpatients [5]. The true incidence of drug allergies is not well known because many people are catalogued as allergic to the drug without any further investigation [3] after having experienced a drug hypersensitivity reaction. On the other hand, when a specific study of allergies was done on suspected cases, only 17.6 [15] to 26.6 % [5] of the cases were definitively confirmed.

The rate of patients reporting at least one allergy in our study (30.5 %) is similar to that of other studies on surgical populations in Australia [14] and in Canada [10]. In those studies, a rate of 33.4 and 28.1 % was reported, respectively. Another community health study found a similar rate, with a 32.2 % self-reported allergy rate [19].

There have also been studies that reported much higher incidences of allergies, like the 64 % in the study by Graves et al. [7] on an American surgical population. On the other hand, the rate is much lower (14.7 %) in one other study [8] and only a 7.8 % rate of self-reported drug allergy in a study on a Portuguese population [6]. The explanation for the lower rate in this latter study might be related to the fact that the population was much younger (36.9 years on average) than the one in all the other studies, including our own. As a lower rate of drug allergies in the younger population has been previously reported [10, 21], it might be that that younger and healthier population would have not been exposed to as many drugs as the population in the other studies. One other possible explanation for the differences in reported allergies in different populations might be that some ethnic groups seem to be more prone to certain types of drugs allergies [6].

The most frequent reported allergies in our study were antibiotic agents, the main group being the penicillin family, as has been reported in other studies [5–7, 11, 14, 22].

As far as we know, the only study that has previously related allergies to worse results after TKA is the one by Graves et al. [7]. The rates of patients reporting at least one allergy (30.5 %) and those reporting more than 3 allergies (0.8 %) were much less in our study than those reported

by Graves et al. (64 % reported at least one allergy and 14 % reported more than 3 allergies). The allergy average per patient was also much lower in our study than in the one carried out by Graves et al. (0.44 instead of 1.69). As the rate of reported allergies in our study is lower, we decided to compare patients reporting at least one allergy with those patients who reported no allergies, instead of more than 3 allergies as in the study by Graves. The rate of patients reporting multiple allergies is lower in our study than theirs, so analysis with multiple allergies would have been underpowered in our study group.

An explanation for the worse outcomes in the group of patients with allergies might be a relationship between allergies, on the one hand, and depression [25] and anxiety disorders on the other [19], as has been suggested in the literature. Based on the WOMAC score, some studies have related psychological distress like anxiety or depressive conditions to worse results after TKA [9, 13, 20]. Nevertheless, the Yesavage depression questionnaire and mental SF-36 scores were similar in both groups of patients in our study. Consequently, depression does not seem to be the only explanation for the worse TKA results in allergic patients. Perhaps, other psychopathological diagnoses like anxiety or pain catastrophizing, which have been related to poor outcomes after TKA [27], are the explanation for the inferior scores in the allergic patients. More research is needed to explain the suboptimal results of allergic patients after TKA surgery.

Some limitations in this study are recognized. First, it is an analysis of self-reported allergies, and the existence of these allergies was based on medical records and no specific allergic tests were done to confirm these allergies. Second, as the number of patients reporting more than 3 allergies in our population is low, a specific analysis of this group of patients as was done in Graves' study was not possible. Third, even when some statistically significant differences in the post-operative WOMAC and KSS-Knee scores were found, these differences (3.2 points in the post-operative WOMAC and 3.5 points in the KSS-Knee score) do not seem to be clinically very significant and do not support changing our criteria for selecting patients for elective TKA.

Conclusion

Worse post-operative outcomes in the KSS and WOMAC scores after TKA are obtained by those patients with self-reported allergies. These poor outcomes do not seem to be related to depression. Therefore, more research is needed to explain them. Reported allergies might be considered a prognostic factor and used when prospectively counselling TKA patients.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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