Do Patient Factors Affect the Outcomes of Total Joint Replacement Surgery?

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ABSTRACT

Objective: To determine if patient factors affect patient reported outcomes in simple primary total joint arthroplasty surgery.

Methods: Thirty-four patients selected in this cross-sectional study were obtained from a prospective cohort of postoperative patients who underwent joint replacement surgery in the Port-of-Spain General Hospital (POSGH) from September 1, 2013 to December 31, 2014. Statistical analysis was done to compare patient factors with patient reported outcome measures (PROM) and establish any relationships between groups. Oxford hip or knee score (OHS/OKS) and Short-form 12 (SF12) scores were compared with; age, gender, diagnosis, body mass index (BMI)/ weight class, pain, patient expectations and Beck's depression inventory (BDI).

Results: There was correlation between Oxford scores and BMI, pain and depression. There was also correlation between SF12 scores with respect to pain and depression. These patient factors showed an inverse relationship with PROMs and were statistically significant.

Conclusions: This study identified patient factors that influenced PRO scores with respect to functionality and quality of life. Obesity does not result in worse postoperative outcomes.

Keywords: Patient factors, patient reported outcome measures, total joint arthroplasty

¿Afectan los Factores del Paciente la Evolución Clínica de la Cirugía de Reemplazo Total de las Articulaciones?

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RESUMEN

Objetivo: Determinar si los factores del paciente afectan los resultados reportados por los pacientes en la cirugía de artroplastia de la articulación total primaria simple.

Métodos: Treinta y cuatro pacientes fueron seleccionados para este estudio transversal a partir de una cohorte prospectiva de pacientes postoperatorios sometidos a cirugía de reemplazo articular en el Hospital General de Puerto España, del 1 de septiembre de 2013 al 31 de diciembre de 2014. Se realizó un análisis estadístico con el propósito de comparar los factores del paciente con las medidas de resultados reportadas por pacientes (MRRP), y establecer relaciones entre grupos. La puntuación de la escala de Oxford de cadera y rodilla (OHS/OKS) y las puntuaciones del cuestionario de salud SF 12 (Short Form 12) fueron comparadas con la edad, sexo, diagnóstico, índice de masa corporal (IMC)/clase de peso, dolor, expectativas del paciente, e Inventario de Depresión de Beck (BDI).

Resultados: Se observó una correlación entre las puntuaciones de Oxford y el IMC, el dolor y la depresión. También hubo correlación entre las puntuaciones SF12 con respecto al dolor y la depresión. Estos factores del paciente mostraron una relación inversa con MRRP y fueron estadísticamente significativos.

Conclusiones: Este estudio identificó factores del paciente que influyeron las puntuaciones de MRRP con respecto a la funcionalidad y la calidad de vida. La obesidad no produce peores resultados postoperatorios.

Palabras claves: Factores del paciente, MRRP, artroplastia total de las articulaciones

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INTRODUCTION

Total joint replacement surgery involves the removal of diseased cartilage and bone and replacing with metal/ceramic alloys and polymer with the goal of relieving pain and improving functionality (1−3). Patient reported outcome measures (PROM) instruments are routinely used to measure a patients' belief on how successful a surgical intervention was from their perspective (3−5). Not all patients with degenerative joint disease report significant improvement after arthroplasty (6−7). As a result, it will be beneficial to identify patients who possibly would develop poor surgical outcomes (8). The aim of this study is to determine if there is a relationship between patient factors and PROMs in postoperative arthroplasty patients.

SUBJECTS AND METHODS
Study design and population

A prospective cross-sectional analysis was performed on patients who attended the Orthopaedic out patients' Clinic at the Port-of-Spain General Hospital (POSGH) from September 1, 2013 to December 31, 2014. The sample size over this time period was thirty-four patients. The cohort included any patient diagnosed by the consultant orthopaedic surgeon with severe hip or knee arthritis and who needed surgery. Patients were excluded from the postoperative group if they were within the three-month postoperative period, had a revision procedure or a complex primary joint replacement surgery. Patients who had emergency hip surgery and hip fractures were also excluded. Postoperative patients who had elective simple hip or knee surgery were included in the study. The data were collected in the surgical out-patient department of the POSGH. The consultant and supervised trainees of The University of the West Indies unit who performed the surgeries were not involved in data collection. The data collection was performed by an independent interviewer who did not belong to that particular Orthopaedic Clinic. The participants included in the study completed the questionnaire with the independent interviewer. All participants were asked precisely the same questions in an identical format and responses.

Questionnaire format and patient reported outcome measures
The questionnaire consisted of two main sections which were patient characteristics and PROM instruments. The questions on patient characteristics were based on age, gender, body mass index (BMI), diagnosis, type of arthroplasty received, current pain level – visual analogue scale (VAS), patient expectations (pain relief and walking better).

The PROMs used were oxford scores for hip and knee (OHS and OKS). The Short-form 12 quality of life assessment tool (SF12) was also used. The Beck's depressive inventory (BDI) was used to assess severity of depression. The OHS and OKS consist of 12 questions directed towards patients' assessment of pain and function over the last month. Each question is based on a Likert scale taking values from 0 to 4. All the scores are summated with a total score falling within 0 and 48.

Scoring zero indicates the most severe symptoms whereas scoring 48 suggests excellent joint function (9−10).

The SF12 form consists of 12 questions consisting of two scales assessing mental and physical function. Two scores are derived which are mental and physical health composite scores (MCS and PCS) which range from 0 to 100. This corresponds from lowest to highest health levels. Both scores combine in such a way that they compare to a national norm with a mean score of 50 and a standard deviation of 10 (11).

The BDI is a 21-item questionnaire corresponding to a symptom of depression. The four point scale ranging from 0−3 is arranged in increasing severity about a particular symptom of depression. Total score has the following ranges 0−13 (minimal), 14−19 (mild), 20−28 (moderate) and 29−63 [severe] (12).

Statistical analysis was done to compare patient factors with PROM and establish any relationships between groups. Oxford hip or knee score (OHS/OKS) and SF12 scores were compared with age, gender, diagnosis, BMI/weight class, pain, patient expectations and beck's depression inventory.

Statistical methods
Statistical analysis and ethical approval
All statistical analyses were conducted using STATA® 11.0 data analysis, copyright 1984−2009 Statacorp. The statistical tests used were the Kruskal-Wallis test analysis after taking into consideration necessary assumptions and the Mann-Whitney test, Spearman rho correlation coefficient and Chi-squared tests for non-parametric data. Ethical approval was obtained from the appropriate Ethics Committee.

RESULTS

The mean patient age was 66 years (SD 11.02). More females received arthroplasty, 27 (79.41%) compared to seven males (20.59%). The mean BMI was 32.65 (SD 11.08). The commonest diagnosis/indication for surgery was primary osteoarthritis 19 (55.88%) followed by rheumatoid arthritis nine (26.47%), secondary osteoarthritis four (11.76%), osteonecrosis one (2.94%) and lupus (2.94%). Total knee replacements (TKRs) were performed more than total hip replacements (THRs), 22 (64.71%) and 11 (32.35%), respectively. In one case, the procedure was not recorded/NR (2.94%).

The VAS (current pain) mean was 1.42 (SD 2.19). With respect to patient expectations, 32 (94.12%) expected pain relief and improved mobility as compared to one patient not expecting any improvement (2.94%). In one case, patient expectations were not recorded. The mean oxford score (OS) was 38.74 (SD 7.41). The mean MCS was 53.76 (SD 6.77) and PCS 40.12 (SD 11.16) for SF12 scores. The BDI mean was 6.91 (SD 5.73).

The Spearman's correlation was used to assess the relationship between OS and BMI using a sample of 33 participants (one missing). There was a moderate negative correlation (Spearman's rho) between OS and BMI which was

statistically significant, $p = -0.352$, $p = 0.045$. However, the scatter plot showed a non-linear relationship.

The Spearman's correlation was also run to assess the relationship between OS and pain using a sample of 33 participants (one missing). There was a moderate negative correlation (Spearman's rho) between OS and pain which was statistically significant, ($p = -0.623$, $p = 0.0001$).

The Spearman's correlation between OS and depression BDI using a sample of 34 participants showed a moderate negative correlation (Spearman's rho) between OS and BDI which was statistically significant, ($p = -0.383$, $p = 0.025$).

Moderate negative correlation also existed between MCS and pain ($p = -0.391$, $p = 0.025$), n = 33 and one missing. Mental composite scores and depression ($p = -0.490$, $p = 0.003$) and PCS and Depression ($p = -0.383$, $p = 0.025$), n = 34.

Table 1: Baseline patient characteristics and patient reported outcomes

Patient factor/ PRO	Mean	SD	n (34)	%
Age (years)	66	11.02		
Gender				
F			27	79.41
M			7	20.59
Diagnosis				
1° OA			19	55.88
RA			9	26.47
2° OA			4	11.76
AVN			1	2.94
SLE			1	2.94
Surgery				
TKR			22	64.71
THR			11	32.35
NR			1	2.94
Pt Expectation				
Yes			32	94.12
No			1	2.94
NR			1	2.94
VAS	1.42	2.19		
OS	38.74	7.41		
MCS	53.76	6.77		
PCS	40.12	11.16		
BDI	6.91	5.73		

OA – osteoarthritis, RA – rheumatoid arthritis, AVN – osteonecrosis, SLE– lupus, THR – total hip replacement, TKR – total knee replacement, NR – not recorded, VAS – visual analogue scale, OS – oxford score, MCS – mental component score, PCS – physical component score, BDI – Beck's depression inventory score

DISCUSSION

The main statistically significant findings were as follows: first, there was negative moderate correlation between OS and BMI. Obese patients had decreased functionality. However, this relationship was non-linear and not clinically significant as the functionality was still good. Secondly, similar correlation existed between OS and pain. Low postoperative pain scores were associated with higher functionality. Thirdly, the patient-reported OS and depression (BDI) also showed negative

Table 2: Spearman's rho correlation coefficient – relationship between patient factors and patient reported outcome measures

Var A	Var B	n	NR	p	p-value	Effect size
OS	Age	34	–	-0.1307	0.46	
MCS	Age	34	–	-0.1661	0.348	
PCS	Age	34	–	0.1201	0.499	
OS	BMI	33	1	-0.3521	0.044	Mod
MCS	BMI	33	1	0.1623	0.367	
PCS	BMI	33	1	-0.0256	0.888	
OS	Pain	33	1	-0.6234	0.0001	Mod
MCS	Pain	33	1	-0.3906	0.025	Mod
PCS	Pain	33	1	-0.3409	0.052	
OS	BDI	34	–	-0.3831	0.025	Mod
MCS	BDI	34	–	-0.4909	0.003	Mod
PCS	BDI	34	–	-0.3831	0.025	Mod

Var – variable, n – sample size, OS – oxford score, MCS – mental component score, PCS – physical component score, BMI – body mass index, BDI – Beck's depression inventory score Mod – moderate

Table 3: Mann-Whitney U test-comparing patient factors and patient reported outcome measures

Var a	Var b	n	Z score	p-value
OS	Sex	34	1.347	0.178
MCS	Sex	34	-0.149	0.881
PCS	sex	34	1.022	0.306

Var – variable, OS – oxford score, MCS – mental component score, PCS – physical component score

Table 4: Kruskal-Wallis test – comparing patient factors and patient reported outcome measures

Var a	Var b	n	NR	χ² (df)	p-value
OS	Pain exp	33	1	$\chi^2 (1) = 2.179$	0.139
OS	Walk exp	33	1	$\chi^2 (1) = 2.179$	0.139
OS	Dx	34	–	$\chi^2 (4) = 10.982$	0.027
MCS	Dx	34	–	$\chi^2 (4) = 6.202$	0.185
PCS	Dx	34	–	$\chi^2 (4) = 4.454$	0.348

Var – variable, pain exp – pain relief expectation, walk exp – improvement in mobility expectation, Dx – diagnosis, OS – oxford score

moderate correlation or an inverse relationship. Generally minimal depressive symptoms corresponded with better function. Fourthly, an inverse relationship also existed between pain or depression and SF12 scores. Low pain or minimal depression correlated with good functionality. All effect sizes for the above relationships were moderate.

The present study showed that obese patients still had good functionality after arthroplasty. This result was similar to other literature as other studies have shown that BMI was not a good determinant of outcome (13−15). This is important as in some instances doctors may advise patients that they are too obese to receive arthroplasty and should actually advise patients to proceed with surgery, if necessary (8, 15).

Patients with less pain also had better functional outcomes postoperatively. This study compared to other papers that showed similar results (16−20). Higher depressive levels have been shown to predict worse functional outcomes (16). The inverse relationship is represented by this paper as it showed minimal depressive levels correlated with good functionality. Pain and depression was also shown to be predictive of health related quality of life outcomes [HRQoL] (21). This compared to low pain and minimal depressive levels correlation with reasonable SF12 scores.

The strengths of the study include an adequate sample size to obtain statistically significant results by grouping arthroplasty procedures. The data were collected prospectively after at least three months postoperatively. The PRO instruments were valid and reliable improving the accuracy of results. This type of research was never performed in this country. The limitations were the lack of other pre-operative factors such as OS, co-morbidities and severity of joint damage that could possibly affect outcomes. It was not feasible to obtain similar candidates pre-operatively and follow them-up postoperatively as the surgical waiting list exceeds three years in our local setting.

We were able to identify the statistically important patient factors that correlated with PROMs. Good functionality and HRQoL levels corresponded with low pain and depressive scores. Despite an inverse relationship existing between OS and BMI, it was not clinically significant as good mean functional scores were associated with obese patients postoperatively. The common misconception that obese patients would have a worse postsurgical outcome can therefore be discarded.

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