Preoperative Chronic Pain Predicts Worse PROMs and Dissatisfaction 1-Year After THA: A Large Prospective Cohort Analysis

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INTRODUCTION:

Chronic pain, defined as pain persisting for over three months in one or more areas of the body, affects approximately 25% of adults in the United States. These individuals often have altered pain perception, physical deconditioning, and varying psychological challenges which may lead to dissatisfaction with pain-relief surgeries such as total hip arthroplasty (THA). While research has focused on predictors of postoperative pain, there is a notable gap in literature regarding the influence of preoperative chronic pain on THA outcomes. Thus, this study aims to investigate (1) clinically significant improvements in patient reported outcomes measures (PROMs) and (2) self-reported satisfaction one-year post-THA among patients with and without a preoperative chronic pain diagnosis.

METHODS:

Patients undergoing a primary elective unilateral THA at a large tertiary academic center in the United States between 2016-2022 were eligible. A cohort of 9,229 patients were included in this study. Electronic medical records were reviewed to identify preoperative chronic pain diagnoses using ICD-9 codes 338.2 and 338.4, and ICD-10 codes G89.2 and G89.4. Multivariable logistic regression models were employed to compare 1-year PROMs between patients with and without chronic pain. The PROMs evaluated included the Hip Disability and Osteoarthritis Outcome Score (HOOS) Pain, Physical Function Shortform (PS), Joint Replacement (JR), and Veteran RAND-12 mental component score (VR-12 MCS). Clinically relevant improvements were determined by the minimal clinically important difference (MCID) and Patient Acceptable Symptom State (PASS) thresholds. The models were adjusted for pre-specified demographic and surgical variables. The primary outcome was defined as failure to reach the threshold, considered a treatment failure, and modeled as the event of interest. Predictor importance was assessed using the Akaike Information Criterion (AIC) increase, with an AIC increase of ≥ 2 indicating a statistically improved model. All statistical tests were two-sided with a Type I error rate of 0.05. Cohort characteristics are detailed in **Table 1.**

RESULTS:

Within the included cohort, 1,407 patients (15.2%) had a diagnosis of chronic pain before undergoing THA. Multivariable logistic regression modelling shows chronic pain was independently associated with failure to reach MCID improvement in HOOS Pain (odds ratio [OR] 1.35; 95% confidence interval [CI]: 1,1.81; p=0.05), PS (OR 1.66; 1.35,2.04; p=<0.001), JR (OR 1.55; 1.17, 2.05; p=0.002), and VR12-MCS (OR 1.24; 1.07, 1.43; p=0.004) **(Table 2)**. Chronic pain is also independently associated with failure to reach PASS threshold in HOOS pain (OR 1.52; 1.34, 1.74; p=<0.001), PS (OR 1.43; 1.24, 1.64; p<0.001) and JR (OR 1.34; 1.17, 1.53; p<0.001) **(Table 3)**. Finally, those with chronic pain are 58% more likely to be dissatisfied at 1-year after THA (OR 1.58; 1.33, 1.88; p<0.001) compared to those without chronic pain **(Table 4)**. Chronic pain was the second most important predictor of dissatisfaction with an AIC of 23.4 **(Figure 1)**.

DISCUSSION AND CONCLUSION:

Patients with preoperative chronic pain are at increased risk of failing to reach clinically significant improvements in hip pain, function, mental health, and overall satisfaction one-year post-THA. These results were evident even after accounting for PROM phenotype, highlighting the intricate nature of pain perception in these patients and its potential impact on their postoperative experiences. To better support patients with chronic pain undergoing THA, surgeons should consider adopting personalized interventions and support systems tailored to their specific needs, aiming to optimize postoperative outcomes and increase patient satisfaction. Further investigation is necessary to develop and evaluate additional strategies for lessening the influence of chronic pain on THA results and enhancing comprehensive patient care within this group.

Figure 1 – Top ranking variables for predicting dissatisfaction 1-year after THA

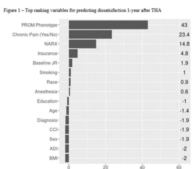

Table 1 – Cohort demographics comparing chronic pain versus non-chronic pain patients undergoing THA

Variable	Level	Total (N=9299)	No Chronic Pain (N=7822)	Chronic Pain (N=1407)	P-value
Age		66.0 [59.0;73.0]	66.0 [59.0;73.0]	67.0 [60.0;74.0]	0.02
Sex	Male	3893 (42.2%)	3411 (43.6%)	482 (34.3%)	<0.001
	Female	5336 (57.8%)	4411 (56.4%)	925 (65.7%)	
BMI		28.9 [25.4;33.3]	28.8 [25.2;33.1]	29.9 [26.1;34.4]	<0.001
Race	White	8015 (88.9%)	6802 (89.1%)	1213 (87.9%)	0.004
	Black	158 (1.75%)	144 (1.89%)	14 (1.01%)	
	Other	838 (9.30%)	685 (8.98%)	153 (11.1%)	
Education		14.0 [12.0;16.0]	14.0 [12.0;16.0]	14.0 [12.0;16.0]	0.001
Smoking	Never	4987 (54.0%)	4267 (54.6%)	720 (51.2%)	0.104
	Quit 6m+	3145 (34.1%)	2632 (33.6%)	513 (36.5%)	
	Quit <6m	354 (3.84%)	302 (3.86%)	52 (3.70%)	
	Current	743 (8.05%)	621 (7.94%)	122 (8.67%)	
ADI		51.0 [30.0;72.0]	51.0 [30.0;71.0]	55.0 [36.0;76.0]	<0.001
CCI		0.00 [0.00;2.00]	0.00 [0.00;1.00]	1.00 [0.00;2.00]	<0.001
Insurance	Private	3093 (38.2%)	2668 (39.4%)	425 (32.0%)	<0.001
	Medicaid	333 (4.11%)	259 (3.82%)	74 (5.57%)	
	Medicare	4553 (56.2%)	3741 (55.2%)	812 (61.1%)	
	Other	124 (1.53%)	107 (1.58%)	17 (1.28%)	
PROM Phenotype	Pain+ PS+ MCS+	2378 (25.8%)	2073 (26.5%)	305 (21.7%)	<0.001
	Pain+ PS+ MCS-	1329 (14.4%)	1129 (14.5%)	200 (14.2%)	
	Pain+ PS- MCS+	516 (5.60%)	454 (5.81%)	62 (4.41%)	
	Pain+ PS- MCS-	497 (5.39%)	427 (5.47%)	70 (4.98%)	
	Pain- PS+ MCS+	486 (5.27%)	413 (5.29%)	73 (5.19%)	
	Pain- PS+ MCS-	560 (6.07%)	451 (5.77%)	109 (7.75%)	
	Pain- PS- MCS+	1239 (13.4%)	1048 (13.4%)	191 (13.6%)	
	Pain- PS- MCS-	2214 (24.0%)	1818 (23.3%)	396 (28.2%)	
Diagnosis	OA	8188 (88.7%)	6943 (88.8%)	1245 (88.5%)	0.798
	non-OA	1041 (11.3%)	879 (11.2%)	162 (11.5%)	
Anesthesia	General	3222 (35.4%)	2853 (37.1%)	369 (26.3%)	<0.001
	Spinal	5560 (61.1%)	4566 (59.4%)	994 (70.9%)	
	Other	313 (3.44%)	274 (3.56%)	39 (2.78%)	
Narx		110 [0.00;200]	30.0 [0.00;190]	140 [0.00;230]	<0.001

Data reported as median [IQR] or n (%). BMI: body mass index, ADI: area deprivation index, CCI: charlson comorbidity index, NARX: narcotic opioid risk score

Table 2 - Multivariable logistic regression model, using **failure to reach MCID improvements in HOOS Pain, PS, JR, and MCS** as outcomes.

		MCID KOOS Pain			MCID KOOS PS			MCID KOOS JR			MCID MCS		
Factor	Level	OR (95%CI)	Pvalue	Overall Pvalue	OR (95%CI)	Pvalue	Overall Pvalue	OR (95%CI)	Pvalue	Overall Pvalue	OR (95%CI)	Pvalue	Overall Pvalue
Group	Chronic Pain (v no Chronic Pain)	1.35 (1, 1.81)	0.05	0.05	1.66 (1.35, 2.04)	<0.001	<0.001	1.55 (1.17, 2.05)	0.002	0.002	1.24 (1.07, 1.43)	0.004	0.004

This model was adjusted for Age, Sex, BMI, Race, Education, Smoking, ADI, CCI, Insurance, Diagnosis, Anesthesia, PROM Phenotype, Baseline JR, Narx.

Table 3 - Multivariable logistic regression model results, using **failure to reach attainment of PASS thresholds in HOOS Pain, PS, JR** as outcomes.

		KOOS PAIN PASS			KOOS PS PASS			KOOS JR PASS		
Factor	Level	OR (95%CI)	Pvalue	Overall Pvalue	OR (95%CI)	Pvalue	Overall Pvalue	OR (95%CI)	Pvalue	Overall Pvalue
Group	Chronic Pain (v no Chronic Pain)	1.52 (1.34, 1.74)	<0.001	<0.001	1.43 (1.24, 1.64)	<0.001	<0.001	1.34 (1.17, 1.53)	<0.001	<0.001

This model was adjusted for Age, Sex, BMI, Race, Education, Smoking, ADI, CCI, Insurance, Diagnosis, Anesthesia, PROM Phenotype, Baseline JR, Narx.

Table 4 - Multivariable logistic regression model results, using **failure to answer PASS (yes)** as outcome.

Factor	Level	OR (95%CI)	Pvalue	Overall Pvalue
Group	Chronic Pain (v no Chronic Pain)	1.58 (1.33, 1.88)	<0.001	<0.001

This model was adjusted for Age, Sex, BMI, Race, Education, Smoking, ADI, CCI, Insurance, Diagnosis, Anesthesia, PROM Phenotype, Baseline JR, Narx.