Patient Reported Physical and Mental Health Outcomes Following Lumbar Spinal Fusion *versus* Total Hip and Total Knee Replacement

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INTRODUCTION:
TKA and THA are reliable surgical procedures for alleviating pain and optimizing function. Spinal fusion has also been shown to be beneficial, however the comparative benefit of THA/TKA to lumbar spinal fusion is incompletely understood. Therefore, this study will compare preoperative and 1-year postoperative physical and mental patient-reported outcome measures (PROMs) for total hip arthroplasty (THA), total knee arthroplasty (TKA), and 1-2 level lumbar spinal fusion.
METHODS:
This study analyzed a single-center database of patients who underwent primary lumbar spinal fusion, elective primary TKA, or THA between December 2016 and December 2022. PROMs included VR12 PCS and MCS for TKA/THA and PROMIS GPH and GMH for spinal fusion. Each outcome was compared between procedures, and also assessed for the percentage (%) of patients reaching the minimal clinically important difference (MCID).
RESULTS:
In total 771 patients were analyzed including 356 patients who underwent TKA, 290 underwent THA, and 125 underwent spinal fusion. Patients undergoing joint replacement were older (TKA: 68.0 ± 8.8, THA: 68.0 ± 9.3, Spine: 61.6 ± 11.2 years, p<.001), with higher BMI in the TKA group compared to THA and spine groups (TKA: 31.5 ± 5.7, THA: 28.9 ± 5.9, Spine: 29.4 ± 6.0, p<.001). Higher Charlson comorbidity index (CCI) was observed in the spine fusion group (TKA: 0.5 ± 0.8, THA: 0.4 ± 0.8, Spine: 2.9 ± 1.7, p<.001). Patients undergoing spinal fusion had a lower improvement in the physical component PROM than the joint arthroplasty patients (TKA: 9.4 ± 11.2, THA: 15.2 ± 11.2, Spine: 6.2 ± 8.7, p<.001) and a lower proportion of patients reaching the MCID (TKA: 67.4%, THA: 82.4%, Spine: 53.6%, p<.001). However, when examining only 1-level spinal fusion, the improvement in GPH was comparable between knee and spine patients (TKA: 9.4 ± 11.3, Spine: 7.4 ± 8.3, p=0.40). In addition, the spine patients had a higher mental component PROM improvement compared to the TKA group (TKA: -1.1 ± 10.7, THA: 1.1 ± 11.9, Spine: 1.8 ± 8.4, p=.009) and the highest proportion patients reaching the MCID (TKA: 21.0%, THA: 29.3%, Spine: 36.0%, p=.002).
DISCUSSION AND CONCLUSION:
Spinal fusion, total knee arthroplasty, and total hip arthroplasty all significantly improved PROMs at 1-year follow-up. At baseline, spinal fusion patients had better physical function scores and worse mental health scores compared to the hip and knee arthroplasty patients, while spinal fusion resulted in mean smaller gains in patient reported physical function and higher gains in patient reported mental health function compared to arthroplasty. These results may inform patient counselling, and additionally provide insight into the distinct benefits of these life altering procedures.

Variable	TKA	THA	Spine	p-value	1 level spine	p-value
n	356	290	125		78	
Age (mean ± SD)	68.0 ± 8.8	68.0 ± 9.3	61.6 ± 11.2	**<.001** (Significance in Bonferoni: spine and hip Spine and knee)	59.3 ± 11.1	**<.001** (Significance in Bonferoni: spine and hip Spine and knee)
Gender (F/M)	230/126	184/105	70/55	0.22	43/35	0.28
BMI (mean ± SD)	31.5 ± 5.7	28.9 ± 5.9	29.4 ± 6.0	**<.001** (Significance in Bonferoni: Knee and hip Spine and knee)	29.2 ± 6.2	**<.001** (Significance in Bonferoni: Knee and hip Spine and knee)
CCI (mean ± SD)	0.5 ± 0.8	0.4 ± 0.8	2.9 ± 1.7	**<.001** (Significance in Bonferoni: spine and hip Spine and knee)	2.7 ± 1.7	**<.001** (Significance in Bonferoni: spine and hip Spine and knee)

Table 1: Baseline characteristics of the cohorts.

	Knee	Hip	Spine	p-value	1 level spine	p-value
n	356	290	125		78	
Pre-op PCS/GPH (mean ± SD)	32.6 ± 9.0	29.8 ±9.3	37.0 ± 6.1	**<.001** (Significance in Bonferoni: Knee and hip Knee and spine Hip and spine)	36.5 ± 6.0	**<.001** (Significance in Bonferoni: Knee and hip Knee and spine Hip and spine)
Pre-op MCS/GMH (mean ± SD)	55.3 ± 11.3	53.7 ± 12.1	45.2 ± 9.3	**<.001** (Significance in Bonferoni: Knee and spine Hip and spine)	44.4 ± 9.6	**<.001** (Significance in Bonferoni: Knee and spine Hip and spine)
1Y PCS/GPH (mean ± SD)	42.0 ± 10.8	44.9 ± 10.6	43.2 ± 9.6	**.002** (Significance in Bonferoni: Knee and hip)	43.9 ± 9.4	**.002** (Significance in Bonferoni: Knee and hip)
1Y MCS/GMH (mean ± SD)	54.2 ± 10.6	54.8 ± 10.2	47.0 ± 9.8	**<.001** (Significance in Bonferoni: Knee and spine Hip and spine)	47.6 ± 9.6	**<.001** (Significance in Bonferoni: Knee and spine Hip and spine)
Delta PCS/GPH (mean ± SD)	9.4 ± 11.2	15.2 ± 11.2	6.2 ± 8.7	**<.001** (Significance in Bonferoni: Knee and hip Knee and spine Hip and spine)	7.4 ± 8.2	**<.001** (Significance in Bonferoni: Knee and hip Hip and spine)
Patients reaching MCID	240 (67.4%)	239 (82.4%)	67 (53.6%)	**<.001**	46 (59%)	**<.001**
Delta MCS/GMH (mean ± SD)	-1.1 ± 10.7	1.1 ± 11.9	1.8 ± 8.4	**.009** (Significance in Bonferoni: Knee and hip Knee and spine)	3.2 ± 8.1	**.002** (Significance in Bonferoni: Knee and hip Knee and spine)
Patients reaching MCID	75 (21.0%)	85 (29.3%)	45 (36.0%)	**0.002**	33 (42%)	**<.001**

Table 2: Patient-reported outcome measures of the cohorts