A Non-opioid Multimodal Pain Protocol Achieves Equivalent Pain Control After Total Shoulder Arthroplasty: A Randomized-Controlled Trial

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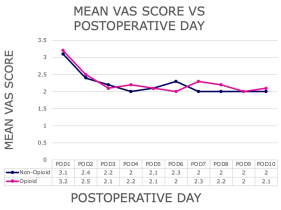
INTRODUCTION: Orthopaedic surgeons are among the highest prescribers of opioid medications. Significant effort has been made to curtail the number of opioids prescribed through improved awareness of opioid stewardship and the development of multimodal pain management protocols. However, there remains a paucity of prospective data demonstrating the efficacy of a non-opioid protocol after total shoulder arthroplasty. The aim of this study was to evaluate the efficacy of a postoperative non-opioid multimodal pain protocol compared to an opioid protocol in terms of patient opioid utilization, postoperative pain control, and adverse effects for patients who underwent shoulder arthroplasty.

METHODS: We performed a prospective, randomized controlled trial including patients undergoing anatomic or reverse total shoulder arthroplasty. Patients were excluded if they underwent revision surgery, fracture, or received opioids within 3 months of surgery. All patients received standardized preoperative analgesic medications, general anesthesia, and an intraoperative periarticular injection without a regional block. Patients were randomly assigned to a postoperative non-opioid multimodal pain protocol or an opioid protocol containing 28 tablets of 5mg oxycodone in addition to the multimodal regimen. Patients completed visual analog scale (VAS) pain and Patient-Reported Outcomes Measurement Information System (PROMIS) Pain Interference (PI) surveys, and were queried for opioid usage and recorded adverse effects of medications for 10 days postoperatively. An intention-to-treat analysis was performed.

RESULTS: A total of 74 patients were enrolled and included in the analysis with 37 in each cohort. There were no significant differences in VAS pain (2.1 ± 1.9 multimodal vs. 2.5 ± 1.8 opioid; $P > 0.05$) or PROMIS-PI scores (60.4 ± 7.7 multimodal vs. 60.4 opioid ± 6.7; $P > 0.05$) between treatment groups at 10-days postoperatively. The morphine milligram equivalents (MME) consumed between discharge and 10 days postoperatively for the opioid group was 32.9 ± 49.1 compared to 2.4 ± 6.9 for the non-opioid group ($P < 0.001$). Constipation (52.9% [18/34] multimodal vs. 72.2% [26/36] opioid) and drowsiness were the most commonly reported medication side effects by both cohorts, although there were no significant differences in the duration of side effects or the number of days without any side effects ($P > 0.05$) reported by a patient between treatment groups. The total number of medication side effects reported during the 10-day postoperative period were also analyzed. Constipation was more prevalent in the opioid cohort (76 vs. 48, $P = .011$) compared to the multimodal cohort. Age, sex, race, and body mass index were all similar between both treatment groups.

DISCUSSION AND CONCLUSION: A non-opioid multimodal pain protocol is safe and achieves similar pain control with significantly reduced MMEs consumed after shoulder arthroplasty.



Pain level and MME at 10-days Postoperatively

	Opioid Group (n=37)	Multimodal Group (n=37)	*P* - Value
VAS	2.5 ± 1.8	2.2 ± 1.9	.426
PROMIS-PI	60.4 ± 6.7	60.4 ± 7.7	.976
MME	32.9 ± 49.1	2.4 ± 6.9	< .001*

Data presented as mean ± standard deviation.
* indicates a significant *P* - value (< .05).

Medication Side Effects by Treatment Group

Variable	Response	Opioid Group	Multimodal Group	*P* - Value	Duration, days, Opioid Group	Duration, days, Multimodal Group	*P* - Value
Constipation	Yes	26 (72.2)	18 (52.9)	.035	2.1 ± 2.2	1.4 ± 1.7	.141
	No	10 (27.8)	16 (47.1)				
Nausea	Yes	7 (19.4)	9 (17.7)	.847	0.3 ± 0.6	0.4 ± 1.0	.434
	No	29 (80.6)	28 (82.3)				
Diarrhea	Yes	4 (11.1)	6 (17.6)	.435	0.1 ± 0.3	0.3 ± 0.8	.228
	No	32 (88.9)	28 (82.4)				
Upset stomach	Yes	13 (36.1)	9 (26.5)	.354	0.6 ± 1.7	0.8 ± 1.4	.616
	No	23 (63.9)	25 (73.5)				
Drowsy	Yes	20 (61.1)	21 (61.8)	.956	0.3 ± 0.8	2.1 ± 2.8	.197
	No	14 (38.9)	13 (38.2)				
Loopy	Yes	7 (19.4)	9 (26.5)	.494	0.6 ± 1.7	0.9 ± 1.3	.943
	No	29 (80.6)	25 (73.5)				

Values represented as n (%) or mean ± standard deviation

Total Number of Side Effects by Treatment Group

	Constipation	Diarrhea	Drowsiness	Loopiness	Nausea	Upset stomach	None
Multimodal Group	48	10	71	18	15	22	185
Opioid Group	76	4	83	20	10	30	171
***P* - Value**	.011*	.152	.224	.589	.437	.193	.062

Values reported as n.
* indicates a significant *P* - value (< .05).