Intravenous Meloxicam versus Intravenous Ketorolac for Pain Control Following Total Joint Arthroplasty: a Randomized Controlled Trial

Michael G Rizzo, Joseph Patrick Costello[1], David S Constantinescu, Maya Rae Moore, Aziz Shittu[1], Orel Tabibi, Michele R D'Apuzzo[2], Victor H Hernandez
[1]University of Miami Miller School of Medicine, [2]University of Miami

INTRODUCTION: Orthopedic surgeries, such as total joint arthroplasty (TJA), are associated with significant postoperative pain. Effective pain management is essential for enhancing patient recovery, reducing hospital stay duration, minimizing mortality risk, and improving patient quality of life. Current guidelines advocate for multimodal analgesia with limited opioid use. Non-steroidal anti-inflammatory drugs (NSAIDs) like meloxicam effectively alleviate postoperative pain while limiting opioid consumption and related side effects. As a selective COX-2 inhibitor, meloxicam spares the gut lining, resulting in fewer gastrointestinal complications compared to non-selective NSAIDs. Moreover, it requires only once-daily dosing, unlike other NSAIDs such as ketorolac. While IV meloxicam has demonstrated efficacy in reducing postoperative pain scores and opioid usage in clinical trials, few studies have compared its analgesic effect to other NSAIDs. This study aimed to evaluate the efficacy of IV meloxicam for postoperative pain management in TJA compared to the standard of care, IV ketorolac. We hypothesized that pain control would be similar between groups, but the IV meloxicam group would experience a lower incidence of postoperative nausea.

METHODS: Following institutional review board (IRB) approval, we registered our randomized controlled trial at clinicaltrials.gov (ID NCT05291598). Patients scheduled for total hip or knee arthroplasty were randomized to receive either the standard pain protocol (IV ketorolac) or IV meloxicam. Both groups received a standardized multimodal pain management regimen alongside their respective drug assignments. Pain scores, nausea scores, and opioids required (morphine milligram equivalents [MME]), were assessed at 2 and 24 hours postoperatively. Length of stay (in hours, nights, and number of same-day discharges), change in creatine levels, and baseline characteristics (age, sex, body mass index, laterality, procedure and Apfel risk score for postoperative nausea and vomiting) were also collected. Mann Whitney U and Fisher's exact test were utilized for comparisons with $p < 0.05$ considered significant.

RESULTS: Between April 2022 and April 2023, 223 patients undergoing TJA were enrolled, with 114 patients in the standard group and 109 in the IV meloxicam group. No significant differences were observed between groups regarding pain at 2 hours (mean 3.34 vs. 3.32, p=0.89) or 24 hours (4.06 vs. 3.75, p = 0.46), nor in nausea at 2 hours (0.42 vs. 0.54, p = 0.56) or 24 hours (0.48 vs. 0.29, p = 0.82). Opioid consumption at 2 hours (1.98 vs 2.00, p = 0.09) was also not different, however, by 24 hours the IV ketorolac group required significantly less opioids (20.59 vs 28.21, p = 0.004). The IV ketorolac group also experienced significantly shorter lengths of hospital stay as measured by the hours hospitalized (37.87 vs 41.56, p = 0.03), nights in the hospital (1.51 vs 1.63, p = 0.02), and number of same day discharges (23 vs 10, p = 0.02). No differences were observed for the average change in creatinine level (0.09 vs 0.09, p = 0.63). There were no differences between the groups with regards to baseline age, sex, body mass index, laterality, procedure or Apfel risk score for postoperative nausea and vomiting.

DISCUSSION AND CONCLUSION: The intraoperative administration of IV meloxicam for TJA resulted in a significant increase the amount of opioids (MME) required by 24 hours postoperatively and longer lengths of stay when compared to IV ketorolac. Though the once daily dosing schedule of IV meloxicam may be more convenient, IV ketorolac is superior for the perioperative management of patients undergoing.

Table 1: Baseline Characteristics of Patients Between Groups			
	IV Ketorolac	IV Meloxicam	P value
Average Age in Years	64.65	64.34	0.52
Number of Males	52	49	>0.99
Number of Females	62	60	
Average Body Mass Index	30.73	31.10	0.87
Laterality Right	57	58	0.74
Laterality, Left	56	51	
Laterality, Bilateral	1	0	
Total Knee Arthroplasty Procedures	69	65	>0.99
Total Hip Arthroplasty Procedures	45	44	
Apfel Nasuea Risk	1.77	2.00	0.08

Table 1: The baseline characteristics of patients in the IV Ketorolac group versus the IV Meloxicam group

Table 2: Outcomes of Patients Between Groups			
	IV Ketorolac	IV Meloxicam	P value
Average Pain Score at 2 Hours	3.34	3.32	0.89
Average Pain Score at 24 Hours	4.06	3.75	0.46
Average Nausea Score at 2 Hours	0.42	0.54	0.56
Average Nausea Score at 24 Hours	0.48	0.29	0.82
Opioid Consumption (Average MME) at 2 Hours	1.98	2.00	0.09
Opioid Consumption (Average MME) at 24 Hours	20.59	28.21	***0.004***
Length of Stay, Average Hours Hospitalized	37.87	41.56	***0.03***
Length of Stay, Average Nights Hospitalized	1.51	1.63	***0.02***
Length of Stay, Number of Same Day Discharges	23	10	***0.02***
Average Change in Creatinine Level	0.09	0.09	0.63

Table 2: Patient outcomes for patients in the IV Ketorolac group versus the IV Meloxicam group