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Comparison of Intravenous Ketorolac at Three Single-Dose Regimens for Treating Acute Pain in the Emergency Department: A Randomized Controlled Trial

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Study objective

Nonsteroidal anti-inflammatory drugs are used extensively for the management of acute and chronic pain, with ketorolac tromethamine being one of the most frequently used parenteral analgesics in the emergency department (ED). The drugs may commonly be used at doses above their analgesic ceiling, offering no incremental analgesic advantage while potentially adding risk of harm. We evaluate the analgesic efficacy of 3 doses of intravenous ketorolac in ED patients with acute pain.

Methods

We conducted a randomized, double-blind trial to assess the analgesic efficacy of 3 doses of intravenous ketorolac (10, 15, and 30 mg) in patients aged 18 to 65 years and presenting to the ED with moderate to severe acute pain, defined by a numeric rating scale score greater than or equal to 5. We excluded patients with peptic ulcer disease, gastrointestinal hemorrhage, renal or hepatic insufficiency, allergies to nonsteroidal anti-inflammatory drugs, pregnancy or breastfeeding, systolic blood pressure less than 90 or greater than 180 mm Hg, and pulse rate less than 50 or greater than 150 beats/min. Primary outcome was pain reduction at 30 minutes. We recorded pain scores at baseline and up to 120 minutes. Intravenous morphine 0.1 mg/kg was administered as a rescue analgesic if subjects still desired additional pain medication at 30 minutes after the study drug was administered. Data analyses included mixed-model regression and ANOVA.

Results

We enrolled 240 subjects (80 in each dose group). At 30 minutes, substantial pain reduction was demonstrated without any differences between the groups (95% confidence intervals 4.5 to 5.7 for the 10-mg group, 4.5 to

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5.6 for the 15-mg group, and 4.2 to 5.4 for the 30-mg group). The mean numeric rating scale pain scores at baseline were 7.7, 7.5, and 7.8 and improved to 5.1, 5.0, and 4.8, respectively, at 30 minutes. Rates of rescue analgesia were similar, and there were no serious adverse events. Secondary outcomes showed similar rates of adverse effects per group, of which the most common were dizziness, nausea, and headache.

Conclusion

Ketorolac has similar analgesic efficacy at intravenous doses of 10, 15, and 30 mg, showing that intravenous ketorolac administered at the analgesic ceiling dose (10 mg) provided effective pain relief to ED patients with moderate to severe pain without increased adverse effects.

Please see page XX for the Editor's Capsule Summary of this article.

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Author contributions: SM and CF conceived the study, designed the trial, obtained research funding, and supervised the conduct of the trial and data collection. SM, MY, IP, RH, JD, and CF undertook recruitment of participating subjects and managed the data, including quality control. AL and PH provided statistical advice on study design and analyzed the data. AL chaired the data oversight committee. MY and JD drafted the article and all authors contributed substantially to its revision. AL and PH had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. SM takes responsibility for the paper as a whole.

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