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The Effects of Subcutaneous Ketamine on Postoperative Analgesia and Behavior in Sprague-Dawley Rats

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Abstract

The use of multimodal analgesia is preferred over single-agent analgesia for postoperative pain management due to synergistic modulations of pain pathways. The two most common first-line analgesics, non-steroidal anti-inflammatory drugs (NSAIDs) and opioids, both have the potential to confound experimental outcomes depending on the research paradigm. If only one of these drug classes is compatible with a particular study design, a different adjunctive analgesic may be necessary to provide sufficient pain management and ensure animal welfare. Ketamine, an NMDA-receptor antagonist most often used in rodents as an anesthetic, will be evaluated in this study for its efficacy as an auxiliary analgesic agent. Here, female Sprague-Dawley rats all received either Buprenorphine Extended-Release or Meloxicam Extended-Release following midline laparotomy. Rats additionally received subcutaneous injections of either ketamine (30 mg/kg) or saline intraoperatively, with subsequent doses of ketamine (10 mg/kg) or saline being administered at 24 and 48 h postoperatively. Prior to recovery, 100 uL of fluorescent oil (GloGerm) was applied to the nape of all rats to indirectly assess grooming behavior and postoperative pain, a method only previously validated in mice. All animals were assessed at 3, 6, 12, 24, 32, 48, 56, and 72 h post-surgery in regards to pain, behavior, body weight, food and bedding consumption, and fluorescent signal spread or extinction. A retroactive assessment of pain behaviors from the first 30-60 min postoperatively will also be evaluated.