

# INTRAMUSCULAR (IM) KETAMINE FOR TREATING MIGRAINE AND NEUROPATHIC PAIN IN THE CLINIC

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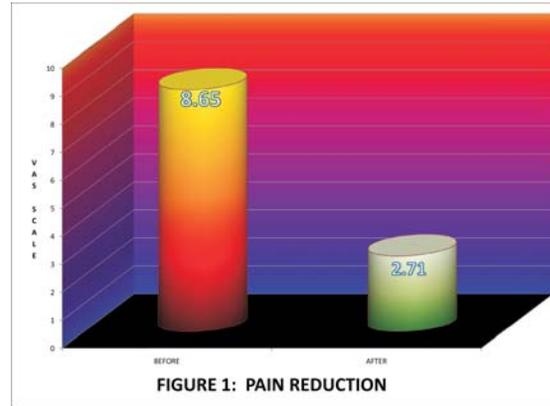
## ABSTRACT

Ketamine is a potent blocker of NMDA-subtype glutamate receptors, thought to play a role in pain transmission and migraine pathophysiology. We chose to study this agent intramuscularly (IM) in the clinic to treat pain flare-ups and refractory migraines where IV placement was technically difficult for the patient or where time was of the essence.

17 patients (12=f, 5=m) were treated for refractory pain and headache in the clinic. A total of 33 IM injections of ketamine were given. 0.4 mg/kg of ketamine was administered by IM injection [1/3<sup>rd</sup> of this dose was given, 15 minutes apart] and the VAS headache or pain score rated. If there were no side effects, another 0.4 mg/kg was administered in the same fashion. Patients rated their pain/headache on a 0-10 VAS every 15 minutes. 1 patient received 11 injections for recurring migraines using the same dosage schedule.

Beginning pain severity was 8.65/10 and this reduced to 2.71/10 after treatment ( $p < .001$ ). The average dose of ketamine was 68.3 mg. Side effects were "spaciness" in 3 patients and a sense of exhilaration in 1 more. No person fell asleep during treatment.

We conclude that IM ketamine for treating refractory pain and migraine flareups is a very effective new form of treatment in the outpatient clinic. IM ketamine should be studied in a double-blind fashion.



## Objectives/Rationale

Ketamine is a potentially useful agent for the treatment of neuropathic pain. It has a very specific pharmacology namely, that of NMDA glutamate receptor blockade. Although most of the existing literature and pain management has utilized intravenous ketamine, there may be a need, in certain clinical situations, for using this agent intramuscularly. For example, some patients are not amenable to intravenous line placement, or their severe symptoms demand a more rapid treatment strategy. For both reasons, we chose to study our own headache and pain patients in an outpatient setting using intramuscular (IM) ketamine. Our primary objective was reduction of pain and headache scores (0 to 10 VAS) in a sample of known pain and headache patients. Secondly, we wanted to study the safety and tolerability of IM ketamine, as very little information exists on the use of this medication intramuscularly.

## Methods

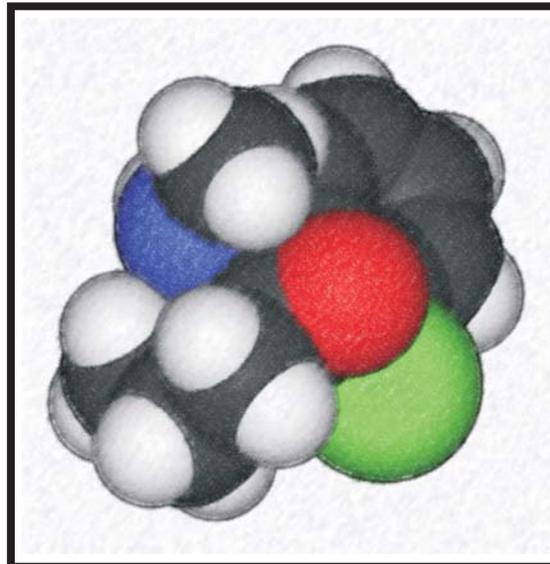
We studied 17 patients (12 female, 5 male) who came to the clinic for refractory pain and headache symptoms. In all instances, pulse oximetry monitoring was used throughout the treatment with ketamine. The patient's weight was converted to kilograms. 0.3-0.4 mg per kilogram of ketamine was drawn into a syringe. The dose was injected in three to four portions intramuscularly, with 10 to 15 minutes between injections. The patient rated their pain and headache score on a 0 to 10 VAS or numeric rating score (NRS).

10 patients were suffering primarily from refractory migraines seven patients primarily from exacerbation of pain (lumbar and cervical radiculopathy, TN, orofacial pain, CRPS). One patient was suffering from ongoing cluster headaches. Some patients (n=5) received more than 1 set of IM ketamine injections. One patient received 11 sets of injections for frequent refractory migraines.

## Results

The average pain score prior to treatment was 8.65/10 and this was reduced to 2.71/10 after treatment. (See figure 1) the results were statistically significant, via 2-tailed t test,  $P < .001$ . The average dose of ketamine was 68.3 mg. Patients who might otherwise not tolerate IV line placement or having very severe symptoms were delighted at the ease of treatment and rapidity of results with IM ketamine.

No patient fell asleep during treatment, nor were there any instances of hallucinations or emergence delirium. 4 patients described a sense of exhilaration or "spaciness" transiently after ketamine was given. In no instances did this side effect persist longer than a few minutes. Only two patients had return of symptoms to prior severity 24 hours after treatment with IM ketamine. Both patients returned for repeat treatment, again with success.



## Conclusions

We conclude the use of intramuscular (IM) ketamine can give rapid and sustained pain and headache relief when used in an outpatient setting. It requires monitoring but can be given rapidly without the need for intravenous (IV) line placement. It is both quite efficacious and well-tolerated with almost no side effects. This agent should be studied in a double-blind fashion for pain and headache flareup treatment.

## Discussion

There is almost no data on the use of IM ketamine to treat pain and headache flareups. Some studies evaluated intramuscular ketamine for emergency room orthopedic procedures, post-thoracotomy pain, thoracic surgery, inguinal hernia repair and tonsillectomies [1-5]. Only two studies evaluated IM ketamine for treating trigeminal neuralgia or neuropathic pain [6-7]. An equally small database for migraine treatment with ketamine exists [8-10], although these were intravenous and intranasal ketamine. Thus, the data is extremely meager on use of intramuscular ketamine.

For this reason, we chose study IM ketamine in a known population with pain and headache flareups. In addition, we treated in an outpatient center, with pulse oximetry monitoring, thus demonstrating ease-of-use and a high efficacy in reducing pain and migraine symptoms. IM ketamine should be studied in a double-blind manner to demonstrate efficacy.

The similar efficacy of IM ketamine to reduce both neuropathic pain and refractory migraine may speak to similar underlying mechanisms NMDA glutamate receptor overactivity in the nervous system. This mechanism may underlie both refractory migraine and ongoing neuropathic pain. Our results lend support to the hypothesis that glutamate-driven mechanisms play a strong role in migraine and neuropathic pain.

## CONCLUSIONS

- ◉ IM ketamine reduces refractory migraine and neuropathic pain with efficacy in the clinic
- ◉ It is very well tolerated with minimal side effects, but should be monitored with pulse oximetry
- ◉ Double-blind studies are warranted for IM ketamine

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