Is Ketamine the Answer?

Morphine Consumption Following Idiopathic Spinal Fusion Surgery

Ben Clevenger[1], Anna Hutton[2], Marina George[3]

[1]Royal National Orthopaedic Hospital, [2]Addenbrookes Hospital, [3]Great Ormond Street Hospital

Introduction

- Posterior spinal fusion (PSF) for spinal deformity is associated with severe postoperative pain
- Inadequate pain management can delay recovery and may develop into persistent postsurgical pain (1)
- Morphine administered via an intravenous patient controlled analgesia (PCA) system provides the mainstay of postoperative analgesia (2)
- Ketamine, an NMDA receptor antagonist, has been shown to decrease postoperative pain intensity and reduce opioid consumption (3)
- Our aim was to assess the impact of ketamine on postoperative opioid consumption

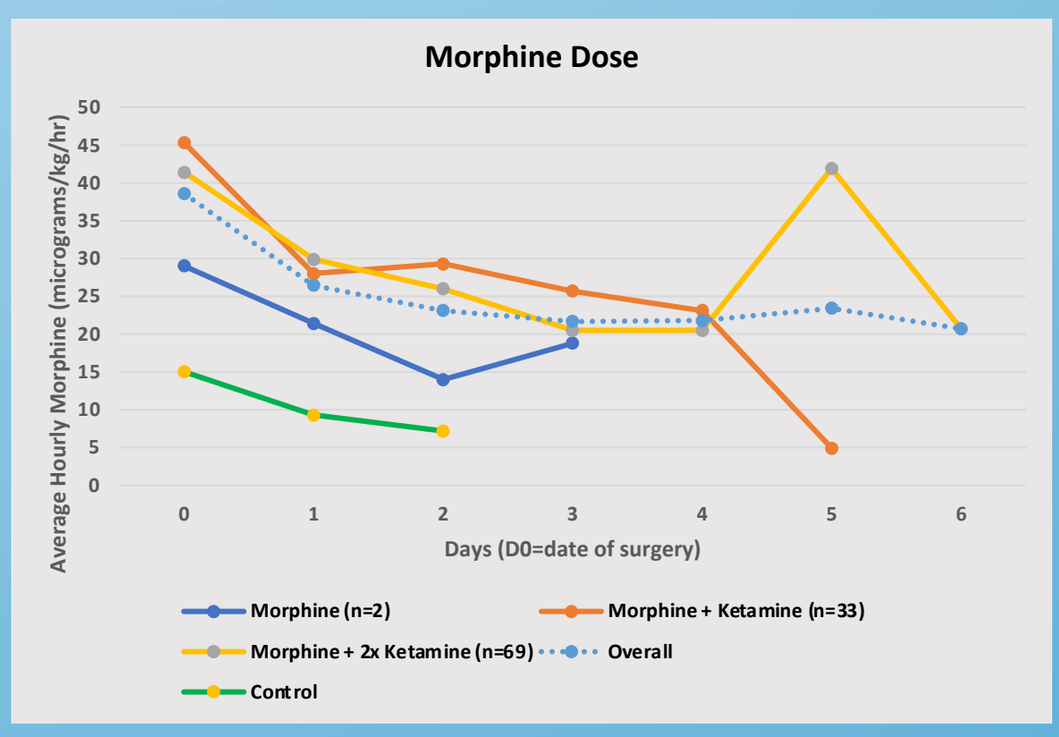
Methods

- A retrospective audit of patients undergoing PSF for idiopathic adolescent scoliosis at Great Ormond Street Hospital, London
- Primary outcome: morphine requirement (analysed in micrograms/kg/hour including PCAs with or without background infusions)
- Consecutive patients between 2012 and 2015 were identified
- Patients were divided into pain management technique used: morphine; morphine and 1mg/ml ketamine; morphine and 2mg/ml ketamine.
- Differences between groups were calculated using the Kruskal Wallis test, ANOVA or Mann-Whitney U test as appropriate.

Results

- 2 patients received morphine alone; 33 received morphine and ketamine; 69 received morphine and double strength ketamine
- 5 patients were converted to different programmes (morphine to fentanyl, adjusted concentration of morphine, or removal of ketamine). 4 of 5 of these had documented nausea. These were excluded from between group analyses
- On the day of surgery (D0), day 1, day 2, day 3 and day 4 post-operatively there were no significant differences in morphine consumption between groups (p=0.455, 0.491, 0.412, 0.327 and 0.920 respectively)

Demographics (n=109)	
Age [mean](range)	14.7 (11-19)
Weight [mean](SD)	55.5 (11.6)
Female (%)	84.4
Outcomes	
Overall morphine day of surgery [median](mcg/kg/hr) (n=104)	39.1
IV analgesia days (range)	3.91 (2-7)
Overall PONV (%)	39.6
Overall pruritis (%)	12.6



Discussion and Conclusion

- Multimodal analgesic strategies are required to reduce opioid requirements, but doubling the strength of ketamine does not further reduce overall morphine consumption
- Scoliosis surgery is extremely painful with median morphine consumption of 39.1 mcg/kg/hr on the day of surgery (D0)
- By comparison, in a study of postoperative NCA morphine in over 10,000 children the median morphine consumption was 15.02 mcg/kg/hr on D0 at the same institution (4) [Control group in Figure 1]
- The majority of patients received infusions of both ketamine and morphine post-operatively; and morphine requirements decreased on each subsequent post operative day. The numbers of morphine alone patients (n=2) is too small to use to draw valid conclusions as to whether there is any significant difference between those receiving only morphine and those receiving morphine and ketamine
- Doubling the ketamine concentration did not significantly alter the morphine requirement post-operatively nor the length of time needing intravenous analgesia

1 Chidambaran V, Ding L, Moore DL, Spruance K, Cudilo EM, Pilipenko V, et al. Predicting the pain continuum after adolescent idiopathic scoliosis surgery: A prospective cohort study. Eur J Pain. 2017;21(7):1252-65.

2 Seki H, Ideno S, Ishihara T, Watanabe K, Matsumoto M, Morisaki H. Postoperative pain management in patients undergoing posterior spinal fusion for adolescent idiopathic scoliosis: a narrative review. Scoliosis Spinal Disord. 2018;13:17.

3 Pendi A, Field R, Farhan SD, Eichler M, Bederman SS. Perioperative Ketamine for Analgesia in Spine Surgery: A Meta-analysis of Randomized Controlled Trials. Spine. 2018;43(5):E299-E307.

4 Jay MA, Thomas BM, Nandi R, Howard RF. Higher risk of opioid-induced respiratory depression in children with neurodevelopmental disability: a retrospective cohort study of 12 904 patients. British Journal of Anaesthesia. 2017;118(2):239-46.