

Butorphanol and Ketamine Use in Patients with a Diagnosis of Hurler Syndrome Undergoing Bone Marrow Transplantation (BMT)

Madeline Weber, MD; Alexa Svoboda, BA; Brittney Whitford, MD; Rachel Thienprayoon, MD



Background

- Bone marrow transplantation (BMT) is the only treatment with efficacy in halting the aggressive features of Hurler's syndrome and is most advantageous when performed early in disease course
- Management of mucositis pain** during BMT in these patients is **challenging because of respiratory depression from opioid medications in the setting of upper airway and pulmonary manifestations of Hurler syndrome**
- Due to safety concerns, in 2020 we changed practice to using butorphanol (a mu agonist/antagonist) and ketamine in patients with Hurler Syndrome undergoing BMT**

Objective

To evaluate the safety of butorphanol and ketamine compared to traditional opioid analgesics for management of mucositis pain during BMT in patients with Hurler Syndrome.

Methods

A retrospective review of fifteen children with diagnosis of Hurler Syndrome who underwent BMT requiring opioid pain management at a single pediatric institution was completed. Clinical course and pain management characteristics were obtained using a standardized data extraction tool.

Results

Table 1. Patient Demographics

Age at BMT Day 0 in days	
Average (range)	295 [94-791]
Weight (kg)	
Average (range)	8.58 [5.83-12.2]
Sex	
Male	9 (60%)
Female	6 (40%)
Prep regimen	
Busulfan, Cytoxan	10 (62.5%)
Campath, Fludarabin, Melphalan	2 (12.5%)
Busulfan, Cytoxan, ATG	3 (18.75%)
Busulfan, Cytoxan, CSA	1 (6.25%)
Pre-BMT Diagnosis of OSA	3 (20%)
Hospital Duration (days)	
Average (range)	94 (53-207)

Table 3. Areas of Safety

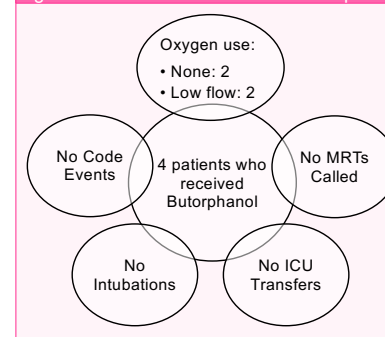
Oxygen Use	
None	5 (31.25%)
Low Flow	11 (68.75%)
High Flow	3 (18.75%)
Positive Pressure	1 (6.25%)
Mechanical Ventilation	4 (25%)
Medical Response Team (MRT) Called	
Once	6 (37.5%)
Two times	1 (6.25%)
Three times	1 (6.25%)
ICU Transfer during BMT Course	
Once	6 (37.5%)
Two times	1 (6.25%)
Three times	1 (6.25%)
Intubations during BMT Course	5 (31.5%)
Code Events	2 (12.5%)
Narcain Use	0 (0%)
Patients Receiving:	
Sedating Antihistamines	15 (93.75%)
Benzodiazepines	15 (93.75%)

Table 2. Pain Medication Use Data

Total Opioid Duration (days)	
Average, all (range)	50 (17-186)
Average, no butorphanol	55 (17-108)
Average, butorphanol	34 (19-56)
Initial IV Opioid	
Morphine	15 (93.75%)
Fentanyl	1 (6.25%)
Opioid Rotation	
Yes	6 (37.5%)
Yes, to stadol	4 (25%)
No	10 (62.5%)
Reason for Opioid Rotation	
Itch	2 (33%)
Sedation	1 (17%)
Respiratory Concerns	2 (33%)
Other	1 (17%)
Ketamine Use	2 (12.5%)



Figure 1. Patients Who Received Butorphanol



Summary

- Patients with Hurler Syndrome who were **rotated** from full Mu agonists to **butorphanol** during their BMT hospital course used less oxygen and **had zero**:
 - MRTs**
 - ICU transfers**
 - Intubations**
 - Code events**
- Ketamine was used** as an adjunctive pain medications **without adverse safety effects** in 2 patients in this study

Conclusions

- Butorphanol** is a **safe medication** in treating mucositis related in pain in patients with underlying respiratory disease
- Ketamine should be considered** as an adjunctive pain medication for mucositis related pain in patient populations with respiratory concerns

References

Contact: Madeline.Weber@cchmc.org

Photo: <https://inspire.cincinnatichildrens.org/inspire>

- Sources:
- Muenzer et al. Pediatrics, 2009.
 - Aldenhoven et al. Blood, 2015.
 - Kirkpatrick et al. Paediatr Anaesth, 2012.
 - Gassas et al. Bone Marrow Transplant, 2003.