



RETROSPECTIVE EVALUATION OF MODERATE SEDATION VISITS THAT USED MEPERIDINE AND HYDROXYZINE DRUG REGIMENS WITH ORAL AND INTRANASAL MIDAZOLAM

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Introduction

Despite an increase in general anesthesia usage in pediatric dental settings, moderate sedation continues to be a common pharmacological behavior guidance technique that is used to help treat uncooperative children. While general anesthesia has near-perfect success in treating the broad spectrum of defiant and uncooperative behaviors, behavior guidance efficacy during moderate sedation is less predictable. To date, there is no single drug that has shown universal high success across a spectrum of ages when sedating children to guide behavior during dental treatment.

Sedation medications illicit a wide response in children, which contributes to the difficulty in assessing sedation efficacy between medication types and sedation regimens. For this reason, many pediatric dental residency programs in the USA use several different drug types and combinations of drugs to sedate children.

Purpose

The purpose of this study was to assess the effects of **substituting IN Midazolam for PO midazolam** within the three drug combination of meperidine-hydroxyzine-midazolam (*MEP-H-MID*) that is used for moderate sedation in pediatric dentistry

Hypothesis

The substitution of **IN midazolam for PO midazolam** in a three drug combination of *MEP-H-MID* would **reduce the discharge time** and provide **comparable efficacy** during dental sedation visits.

Methods

Pediatric dental records of sedation visits at the University of Minnesota residency clinic during the year 2015-2022 were chosen after IRB approval. Inclusion criteria included dental visits that billed moderate sedation and used *MEP-H-MID*, *MEP-H*, or single agent *MID*.

Demographic and clinical data was collected from clinic chart notes and sedation logs. The data was analyzed by Medcalc (Ver 20.218, Ostend Belgium)

Results

Table 1. Sedation Regimens and Dosing (mg/kg) Summary (Median(IQR)/[Min-Max])*

Regimen	Meperidine (PO)	Hydroxyzine(PO)	Midazolam (PO)	Midazolam (IN)
A (n=60)	1.94 (1.76-1.96) [0.93-2.06]	1.06 (0.94-1.32) [0.74-2.10]	0.40 (0.32-0.45) [0.07-0.50]	--
B (n=181)	1.94 (1.82-2.00) [1.2-2.09]	1.95 (1.73-2.26) [0.75-3.30]	--	--
C (n=38)	1.90 (1.70-2.00) [0.80-2.04]	1.88 (1.56-1.95) [1.00-3.00]	--	--
D (n=185)	1.91 (1.76-1.96) [0.86-2.17]	1.87 (1.75-1.96) [0.94-2.20]	--	0.04 (0.04-0.05) [0.02-0.1]
E (n=44)	--	--	0.42 ¹ (0.31-0.50) [0.25-0.73]	0.26 ¹ (0.25-0.33) [0.05-0.51]

*Dosing is presented in milligram per kg (mg/kg) with median, interquartile range (25-75%), and minimum and max doses used.

¹ Regimen E was either a PO or IN dose and never dosed concomitantly

Table 2. EFFECTIVENESS AND COMPLETION PERCENTAGES DURING SEDATION VISITS

Regimen	A (n=60)	B (n=181)	C (n=38)	D (n=185)	E (n=44)
Effectiveness (%)	80.0	81.8	81.1	73.7	56.8
Completion (%)	98.3	97.8	100	96.8	90.9

Results

Table 3. DESCRIPTIVE ANALYSIS OF SEDATION VISITS (Median(IQR))*

Regimen	A (n=60)	B (n=181)	C (n=38)	D (n=185)	E (n=44)
Age (years)	7.1 ¹ (6.2-8.0)	5.6 ¹¹ (4.7-6.9)	5.95** (5.2-6.9)	6.5 ¹ (5.7-7.4)	6.5 (4.5-8.8)
Weight (kg)	23.7 ¹ (21.5-27.6)	19.9 ¹¹ (17.8-25.1)	22.2 (20.0-26.0)	23.5 ¹ (20.8-26.3)	21.7 (19.0-29.6)
Height (cm)	121.7 ¹ (116.8-128.5)	114.0 ¹¹ (107.8-124.0)	118.5 (114.0-122.0)	119.3 ¹ (115.0-126.2)	118.5 (107.3-131.0)
BMI	15.7 (14.8-16.8)	15.9 (15.0-16.9)	15.6 (14.6-18.3)	16.3 (15.1-17.5)	15.9 (14.9-17.3)
Gender (F/M)	0.48	0.54	0.51	0.47	0.55

*Median and interquartile range (25-75%); Kruskal-Wallis Test with Post-hoc Analysis (Dunn) to test Differences of P<0.05 ¹ Different from regimen Group B ¹¹ Different from regimen Group A,D

** Different from regimen group A

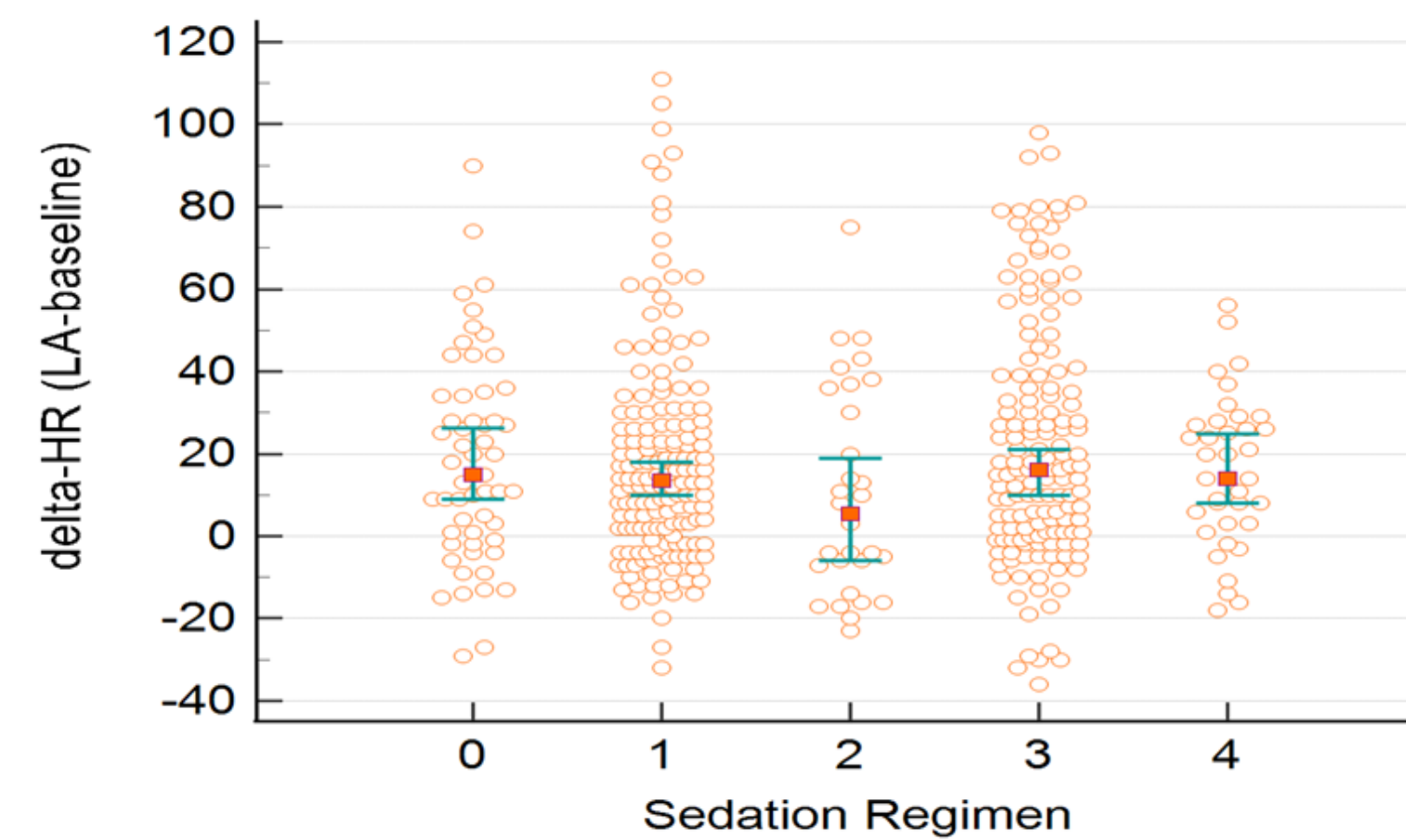


Table 5. OUTCOME ASSESSMENT OF COMPLETED SEDATION APPOINTMENT (MEDIAN(IQR))*

Regimen	A (n=58)	B (n=175)	C (n=37)	D (n=173)	E (n=40)
Teeth Completed	5 (4-8)	5 (4-6)	5 (4-6)	5 (4-6)	3** (2-4)
Med-to-Completion (min)	94.5 (78.0-115.0)	92.0 (78.0-106.0)	92.0 (73.0-109.5)	93.0 (81.75-106.0)	59.5** (43.0-68.0)
Med-to-Discharge (min)	138.0 ¹ (114.75-163.0)	114.0 (102.0-131.5)	114.0 (92.0-125.25)	115.0 (103.25-129.0)	94.00 ¹¹ (82.5-117.0)

* Median and interquartile range (25-75%). Kruskal-Wallis Test with Post-hoc Analysis (Dunn) to test Differences of P<0.05. Total Treatment time and teeth completed (n=483) and Time to Discharge (n=472) due to 13 missing entries ** Different from regimen group A, B, C, D

¹ Different from Regimen Group B, C, D, E ¹¹ Different from Regimen Group A, B, D

Table 6. UNIVARIABLE AND MULTIVARIABLE LOGISTIC REGRESSION MODELS TO ASSESS PRE-OPERATIVE VARIABLES AND EFFECTIVE BEHAVIOR DURING SEDATION VISIT

Variable	OR (95% CI)	P-value	Adjusted OR (95% CI)*	P-value
Age	1.13 (1.00-1.28)	0.072	1.37 (1.13-1.67)	0.0014
Weight	0.99(0.96-1.03)	0.65	0.95 (0.90-0.99)	0.025
Height	1.01 (0.99-1.03)	0.19		
BMI	0.89 (0.81-0.97)	0.012		
Gender**	0.80 (0.53-1.21)	0.29		
Regimen A ¹	3.04 (1.27-7.25)	0.012	2.65 (1.09-6.45)	0.032
Regimen B ¹	3.41 (1.68-6.90)	0.0007	3.73 (1.79-7.77)	0.0004
Regimen C ¹	3.26 (1.18-9.00)	0.022	3.56 (1.27-10.05)	0.016
Regimen D ¹	2.12 (1.08-4.19)	0.030	2.06 (1.04-4.18)	0.039

* Non significant variables that are P > 0.15 are removed sequentially from multivariable regression model **Gender analysis of female with reference (1.0) male

¹ Regimen E is used as the reference (1.00) in the categorical variables of regimen type

Table 7. LOWEST PULSE OXIMETER READING DURING ENTIRE SEDATION APPOINTMENT

Regimen	A (n=60)	B (n=180)	C (n=38)	D (n=182)	E (n=44)
≥96%	60	179	38	180	43
> 92 but < 96%	0	1**	0	1 ¹¹	1 ¹¹
< 92%	0	0	0	1 ¹¹	0

*Clinic charts collected oxygen saturation during appointments with an ordinal scoring measurement: ≥96% (score 2), > 92 but < 96% (score 1), and < 92% (score 0). 504 readings with pulse ox as compared to total subjects 508, 4 subjects were uncooperative for pulse ox monitoring.

** Desaturation event of > 92 but < 96% was 20 min in duration before resolving to ≥96%

¹¹ Desaturation was limited to a single reading where ≥96% was achieved at subsequent 5 min interval

Discussion

Based on this study's results, the following conclusions can be made:

1. Meperidine based sedation regimens had higher likelihood of sedation effectiveness over single agent midazolam.
2. This current retrospective study suggests that MEP-H-(IN)MID may reduce discharge time compared to MEP-H-(PO)MID while providing comparable sedation effectiveness.
2. All sedation drug regimens, including MEP-H-(IN)MID, had high levels of oxygen saturation during the entire course of the sedation appointment.
2. Prospective randomized clinical trials are needed to further investigate MEP-H-(IN)MID and MEP-H-(PO)MID

References

