

ABSTRACT

Purpose: To investigate the amnestic effects midazolam when used for moderate sedation of pediatric patients undergoing dental treatment.

Methods: Sixty ASA I and ASA II pediatric patients aged 3-10 were recruited at the UTHealth Houston Pediatric Dentistry Graduate clinic. The study group consisted of patients receiving treatment with moderate sedation using midazolam. The control group consisted of patients undergoing routine exams without sedation. Both groups were asked to identify five photo cards at set time intervals in relation to the administration of the sedation medication. The patients and their parents were then interviewed on the day of treatment with a post-operative phone call.

Results: There were significant differences in the photo recall rates between the control and test groups with the third, fourth, and fifth photos after sedation administration. Within the test group, there was a significant difference in the photo recall rates of the third (P <0.001), fourth (P <0.001), and fifth (P <0.001) photos between the control and test groups. Within the test group there was a significant difference in the photo recall rates of the first (P <0.001, <0.001), second (P =0.002, <0.001), and third (P =.01) photos compared to the fourth and fifth photos. Children were able to recall events prior to receiving the sedation medication but not events performed during the sedation. Factors found to affect the recall rate within the test group were the level of sedation and the sedation regimen used.

Conclusions: Amnestic effects were observed in patients receiving midazolam for moderate sedation based on both photo recall and qualitative survey responses. These effects significantly increased as time progressed from the start of the sedation.

BACKGROUND

- Many children require advanced behaviour guidance techniques in order to safely and efficiently complete dental treatment. This may be due to a lack of psychological/emotional maturity, mental, physical, or medical disabilities, or extensive dental needs.
- Moderate sedation is a commonly used form of advanced behaviour guidance that is growing in parental acceptance.
- Moderate sedation can be achieved using various medications, including midazolam.
- Midazolam is a benzodiazepine commonly used for sedation in pediatric dentistry that has sedative, anxiolytic, and amnestic effects.

The purpose of this study was to investigate the incidence of the amnestic effects of midazolam when used for moderate sedation to provide dental treatment for pediatric patients.

METHODS

- This study was approved by the UTHealth Houston Institutional Review Board.
- Selection criteria: ASA I and II patients aged 3-10 seen in the UT Grad Pediatric Dentistry Clinic for moderate sedation with midazolam, or routine exam. Patients with neurocognitive or development delays were excluded.
- Five pictures were shown to assess amnesia. After treatment was completed, patients were asked to identify the images shown. An additional 5 images were added as distractors

Table 1. Time intervals that pictures were shown at in minutes:

Picture	Oral administration	Intramuscular administration
Cowboy hat	T-5	T-5
Flower	T-0	T-0
Car	T + 10	T + 5
Bird	T + 20	T + 10
Clock	T + 30	T + 15

- Patients and their caregivers were interviewed the same day following treatment.
- Recall patients were shown the same five images in rapid succession and asked to identify them at the end of their exam
- Statistical analysis completed. P-values <0.05 considered significant.

RESULTS

Figure 1. Comparison of recall rates of each picture between the test and the control group

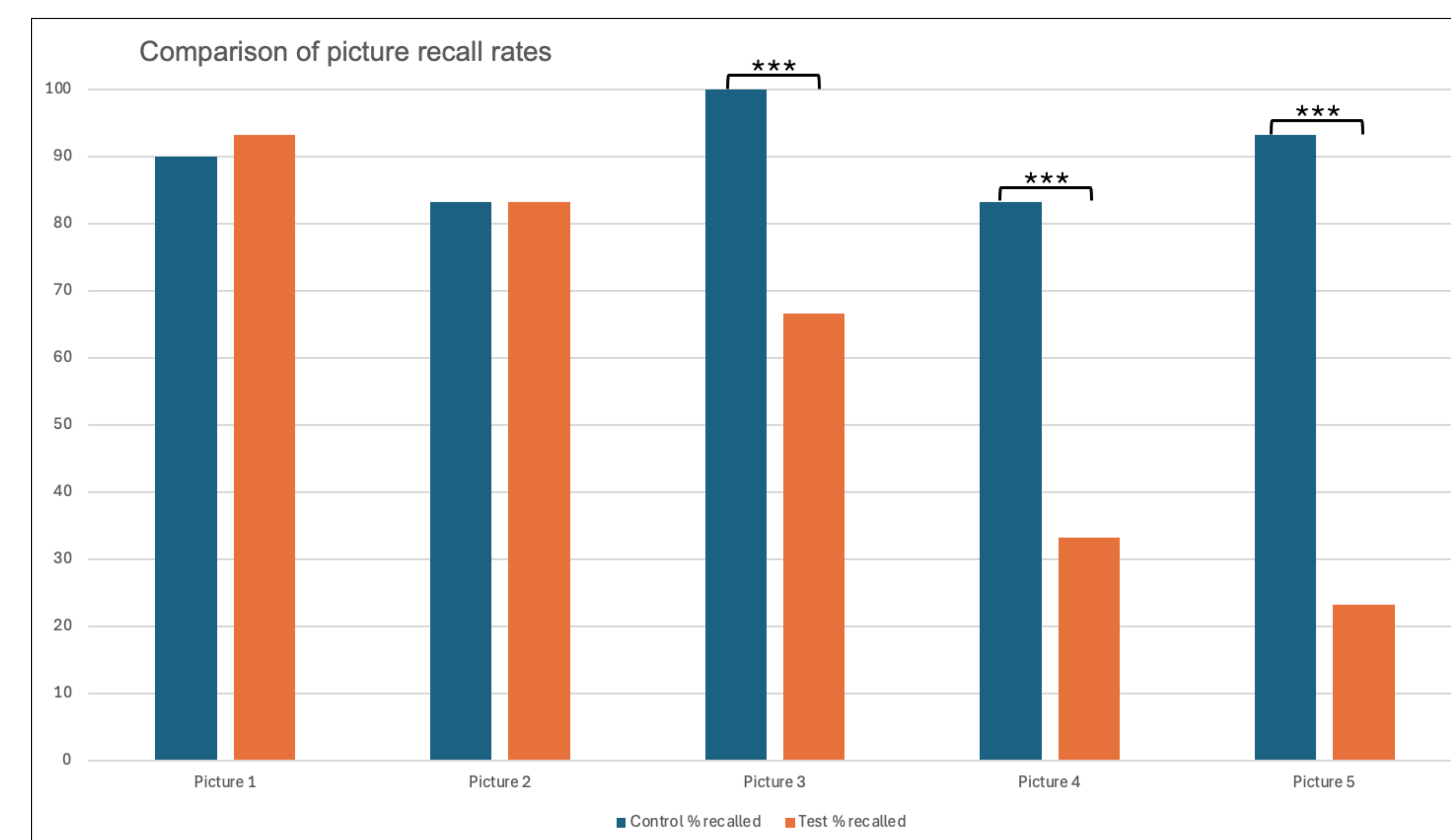


Table 2. Variables associated with picture recall within the test group only:

Variable	Picture 1	Picture 2	Picture 3	Picture 4	Picture 5
Midazolam Concentration	0.9427	0.1835	0.2777	0.7856	0.7794
Sedation Regimen	0.1701	1	0.07001	0.04292	0.743
Route of Medication	1	0.1188	0.09524	1	0.6769
Prior Sedation	1	0.5562	0.64	1	0.3041
Sedation Level	1	0.5461	0.06611	0.03024	1
SSC	0.1034	0.3	0.1008	0.8911	0.1813
EXT	0.4851	1	0.5177	0.1216	1
Pulpotomy	1	1	0.272	1	0.5476
Restoration	1	0.64	1	0.6904	1
Sealant	0.3103	0.1833	1	0.64	0.3041
Lesion Removal	0.06667	1	1	1	0.2333

- 60 participants were recruited for this study, 30 each in the test and control groups
- No significant differences were noted in the age, gender, weight, or ASA status between the two groups
- There was no significant time difference in the treatment duration of both groups
- The control group had significantly more patients that exhibited F4 behaviour, and the test group had significantly more patients exhibit F1 behaviour.
- The average concentration of midazolam used was 0.337 mg/kg.
- 63.3% of sedations were completed using a drug regimen of hydroxyzine, midazolam, and meperidine
- Within the sedation group: 24.1% exhibited minimal sedation, 75.9% exhibited moderate levels of sedation
- The most common procedures completed during sedation were: stainless steel crowns (SSCs) (66.7%), extractions (EXTs) (46.7%), and restorations (33.3%).
- There was no significant differences in the recall rate of each picture within the control group
- Recall rate declined over time within the test group with significant differences between:
 - Pictures 1 & 4, Pictures 1 & 5, Pictures 2 & 4, Pictures 2 & 5, Pictures 3 & 5
- No differences in the recall rate of pictures 1 & 2 between the test and control group → suggests no retrograde amnesia exhibited
- Within the test group, there was a significant effect of:
 - Level of sedation: those that were minimally sedated were more likely to recall picture 4 than those that were moderately sedated
 - Sedation regimen used: patients that received midazolam and hydroxyzine were less likely to recall picture 4 than those that received midazolam alone or in combination with hydroxyzine and meperidine.
- When questioned, patients were able to recall events that occurred prior to receiving the sedation medication as well as events that occurred during the recovery period
 - Many patients were unable to recall specific events during treatment (use of papoose board, nitrous oxide, local anesthetic injection)
- Future research may aim to compare amnestic effects of different sedation regimens or different routes of administration.

ACKNOWLEDGEMENTS

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CONCLUSIONS

- Midazolam exerts an amnestic effect on children when used for moderate sedation to complete dental treatment when compared to patients who did not receive sedation**
- Factors found to influence amnesia experienced were the level of sedation during treatment, and the time passed since administration of the midazolam**
- These findings support the use of midazolam for moderate sedation when amnesia is desired**

REFERENCES

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