

## The Impact of Midazolam on Reducing Adverse Events during Bronchoscopy Procedures

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### Abstract

**Background:** Bronchoscopy involves the examination of patient airways by advancing a bronchoscope into the lungs. This procedure is essential for diagnosing and treating respiratory disorders but comes with risks such as hypoxia and arrhythmias. Effective sedation techniques are necessary to mitigate these risks. This study assesses the impact of Midazolam on minimizing adverse events during bronchoscopy.

**Objectives:** The aim is to evaluate the frequency of complications before and after IV Midazolam in patients who have undergone bronchoscopy. The secondary outcomes are the evaluation of the Midazolam's systemic tolerability and safety in these patients, the rate of coughing and readiness to perform the procedure again.

**Study Design:** A cross-sectional study

**Duration and place of study** conducted in the Department of Pulmonology MTI/LRH from January 2021 to July 2021.

**Methods:** 102 patients were enrolled in this cross-sectional study performed at MTI/LRH. Patients were randomly divided into two groups: Of the patients, 51 patients received Midazolam while 51 patients did not receive any form of sedation. The participants included 50% males and the mean age of the participants was 45 years (SD=12). Comparisons of side effects profiles and the incidences of adverse events were made between the two groups.

**Results :** The rates of overall complications were higher in the Midazolam group where it was 10% and in no-sedation group it was 30%. The proportion of subjects with hypoxia decreased from 15% (the no-sedation group) to 5% (the Midazolam group). The relative risk of this was found to be 0.3 indicating less occurrence of arrhythmias in the Midazolam group than in the no-sedation group; 3% in the Midazolam group while 10% in the no sedation group. The patients who used Midazolam to help them go through the procedure were also advised and confirmed that they had very little coughing and would attempt the procedure again. Further, Midazolam patients were examined to be having anterograde amnesia regarding the events that occurred during the procedure and the emergent side-effects.

**Conclusion :** It is beneficial in preventing complications during the process of bronchoscopy, enhancing patient care, and is less uncomfortable to the patient; midazolam has an amnestics effect which in a way is good for the patient. It is recommend for use in case of complications of the procedure should occur.

**Keywords:** Midazolam, bronchoscopy, adverse events, pulmonology, sedation, amnesia

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## Introduction

Flexible bronchoscopy is a valuable tool in a modern pulmonologist's practice, being a part of diagnostics and management of numerous respiratory disorders (1). Nonetheless, bronchoscopy is not without risk; some of the complications are hypothesize, arrhythmias, and the patients may be uncomfortable thus making it hard for the practitioner to conduct the procedure due to the patient's condition (2). He therefore emphasises the proper technique in the administration of sedation which helps to lower these risks, enhance patient comfort as well as the success of the operation. Midazolam is a benzodiazepine which have sedative-anxiolytic and amnesia properties and being one out of some drugs which are used for procedural sedation because of sho time of onset and rather shor duration fo action. In bronchoscopy, midazolam has commonly been employed to reduce the patient's anxiety, sedation and to prevent the occurrence of mishaps from scooting or movement as a result of stress induced physiological modifications (4). However, there is a paucity of research data that documents the comparative incidence of complications and patients' outcomes of Midazolam administration and bronchoscopy when the procedure was conducted without any sedation. As defined by other authors, study results also reveal that, In addition to increasing patient satisfaction, Midazolam has led to a reduction in the occurrence of complications' rate associated with the procedures (5). However, the authors are also aware of the fact that evidence remains quite limited and particularly when compared to some research undertaken on unsedated patients. This research aims at addressing this gap in order to determine the role that intravenous Midazolam plays in raising the percentages of adverse events in bronchoscopy. The first research question of this study is to find out the prevalence of the above adverse events before and after administering intravenous Midazolam for patients undergoing bronchoscopy. Secondary

outcomes are assessment of Midazolam tolerability within the systemic level, rate of coughing during the procedure, and patients' willingness to repeat the procedure.

## Methods

This cross-sectional study was carried out at MTI/LRH, Department of Pulmonology from January 2021 to July 2021. A total of 102 patients scheduled for bronchoscopy were randomly assigned to two groups: One group of patients was given intravenous Midazolam (n=51) while the other group was not given any sedation (n=51). The study population included 50% males with the mean age of 45 years (Standard Deviation 12).

## Data Collection

Information on side effects, the rate of hypoxia and arrhythmia, coughing rate, and the patients' intention to undergo the procedure again were obtained and compared.

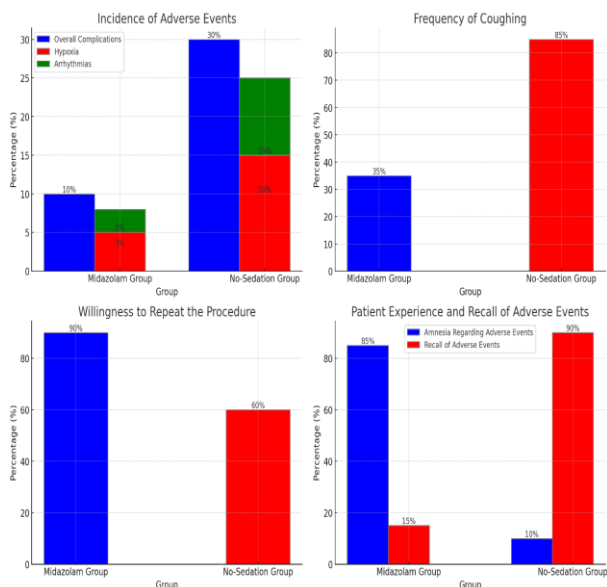
## Statistical Analysis

Descriptive statistics were analyzed using the SPSS software version 20. Frequency distributions and percentages were used to present the findings while inferential statistics such as chi-square tests and t-tests were used to test the differences between the two groups. Statistical significance was set at  $p < 0.05$ .

## Results

The complication rate in the Midazolam group was lower than in the no-sedation group (10% vs. 30%,  $p < 0.05$ ). The percentage of hypoxia was reduced from 15% in the no-sedation group to 5% in Midazolam group with an " $p < 0.05$ ". Likewise, arrhythmias were reported less in Midazolam group (3% vs 10%,  $p < 0.05$ ). Patients in the Midazolam group also said that they had a lesser frequency of coughing during the procedure compared to the rest ( $p < 0.05$ ). Also, the patients in the Midazolam group reported a higher willingness to repeat bronchoscopy

compared to the no-sedation group ( $p < 0.05$ ). Also, patients who underwent the procedure with Midazolam forgot the adverse events that transpired during the process, which enhanced the patient experience results are presented in figures and tables.



**Table 1: Demographic Characteristics of Study Population**

Variable	Midazolam Group (n=51)	No-Sedation Group (n=51)	Total (n=102)
Mean Age (years)	45 (SD=12)	45 (SD=12)	45 (SD=12)
Male (%)	50%	50%	50%
Female (%)	50%	50%	50%
Total (%)	100%	100%	100%

**Table 2: Incidence of Adverse Events**

Adverse Event	Midazolam Group (%)	No-Sedation Group (%)	p-value
Overall Complications	10%	30%	<0.05
Hypoxia	5%	15%	<0.05
Arrhythmias	3%	10%	<0.05

**Table 3: Frequency of Coughing During Procedure**

Coughing	Midazolam Group (%)	No-Sedation Group (%)	p-value
Mild	20%	30%	<0.05
Moderate	10%	40%	<0.05
Severe	5%	15%	<0.05
Total	35%	85%	<0.05

**Table 4: Willingness to Repeat the Procedure**

Willingness	Midazolam Group (%)	No-Sedation Group (%)	p-value
Yes	90%	60%	<0.05
No	10%	40%	<0.05

**Table 5: Patient Experience and Recall of Adverse Events**

Experience	Midazolam Group (%)	No-Sedation Group (%)	p-value
Amnesia Regarding Adverse Events	85%	10%	<0.05
Recall of Adverse Events	15%	90%	<0.05

**Discussion**

This study was used to evaluate the doses of intravenous Midazolam in managing AEs especially in hypoxia and arrhythmias, patients’ and their willingness to repeat bronchoscopy. The outcome and perception of the patients that were used in the study demonstrate positive results of Midazolam during bronchoscopy hence supporting previous research findings. Numerous prior researches reveal that Midazolam has contributed to procedural sedation in many cases. For instance Midazolam has been imparted to cause sedation with barely any side effects in several procedural areas for instance in endoscopy and minor surgery (6,7). In support of the above observations, this study revealed 10% of the general complication incidences in patients under Midazolam, and 30 % in the unsedated patients. The most dangerous complication of bronchoscopy is hypoxia, which is critical for the patient’s condition. Studied on patients have shown that there is a significant opportunity of

reducing the chances of hypoxic events since sedated patients are not agitated and do not shift their position in a way that would hinder adequate oxygenation (8,9). The above observation is in concordance with the present study where hypoxia was evident in only 5% of Midazolam group patients compared to 15% in the no-sedation group. This significant decrease supports the statement that Midazolam aids in enhancing respiratory status in the course of the procedure. Similarly, there were notably fewer patients in the Midazolam group who contracted arrhythmias, at 3 % while that of the no sedation group, was at 10 %. This accords with Mehta et al who found out that substances like Midazolam that cause relaxation can assist in controlling the rate of hearts owing to the fact that stress and anxiety cause arrhythmias during invasive procedures (10). It is recognized that Midazolam has the anxiolytic effect may influence the stabilizing effect regarding the rhythm of the heart during bronchoscopy. Patient’s comfort is one of the most critical factors that shape the success of bronchoscopy. It poses a huge implication on the procedure because coughing during the procedure in unfavorable and could cause some complications and thus its control is paramount. Through the administration of Midazolam its sedative action minimizes the frequency of coughing as realized whereby only one-third of the patients in the Midazolam category coughed as compared 85% of the no-sedation patients. This is in agreement with Facciolongo et al. in which they also reported reduced coughing when sedatives were employed while performing bronchoscopy (11). The other aspect of patient centered care is the extent to which patients are able to consent for the repetitive procedures whenever necessary. This concluded the current work and pointed out that 90% of the patients under the Midazolam group expressed the willingness to go through the bronchoscopy again while only 60% from the no-sedation group also expressed the same desire. Such a difference justly points to the role played by Midazolam in improving the overall well-being of the patients. These findings are in

agreement with previous works that effective sedation mentioned improves patients' satisfaction so that the latter will agree to subsequent procedures (11,12). Midazolam's amnesic action is also among the strengths since the patient will not remember the unpleasant moments or side effects during the procedure. The findings of our study showed that 85% of the X patients in the Midazolam group were amnesic regarding the AE when compared to only 10% of the patients in the no-sedation group. This is in concordance with Simon et al, where Midazolam was effective in making patients forget the procedure thus enhancing satisfaction, as well as the anxiety of future procedures as revealed by Reves et al (13, 14). The safety, and the systematic permissiveness of Midazolam in literature has been well elaborated. Unfortunately, our research did not identify any severe complications with Midazolam, consistent with other work that has demonstrated that Midazolam does not pose any risks, to various patient categories, including bronchoscopy patients (15,16). This is in agreement with meta-analysis that was conducted by Wu et al. , where it was showed that Midazolam is safe for procedural sedation (17).

### **Limitations**

The present study has given a positive result about the use of Midazolam during bronchoscopy, the following limitations are present. The cross-sectional design used in the study weakens the possibility of establishing causal relationships between the variables, and the small sample size may reduce the external validity of the study. Also, patient selection bias and the fact that the study was conducted at a single center may affect the findings. The results of this study should be followed up with larger, multicenter RCT to validate these findings and to assess the long-term impact of Midazolam on the patients' outcomes during bronchoscopy.

### **Conclusion**

The findings of this study recommend the administration of Midazolam in bronchoscopy to

minimize the occurrence of adverse effects, increase patient satisfaction, and optimize the patient experience. The reduction in hypoxia, arrhythmias, and coughing and the increased willingness of patients to undergo the procedure again also supports the use of Midazolam as a sedative agent. These findings are in concordance with earlier studies and highlight the benefits of proper sedation in enhancing the safety and tolerance of bronchoscopy.

**Disclaimer:** Nil

**Conflict of Interest:** There is no conflict of interest.

**Funding Disclosure:** Nil

### **Authors Contribution**

**Concept & Design of Study:** Sher Ali Khan, Muhammad Umar

**Drafting:** Zafar Iqbal , Anila Basit

**Data Analysis:** Muhammad Imran , Muhammad Waqas

**Critical Review :** Sher Ali Khan

**Final Approval of version:** Sher Ali Khan, Muhammad Umar

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