ORIGINAL RESEARCH

Conscious Sedation and Emergency Department Length of Stay: A Comparison of Propofol, Ketamine, and Fentanyl/ Versed

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ABSTRACT

***Study Objectives*: Three of the most commonly used agents for conscious sedation in the Emergency Department (ED) are ketamine, fentanyl/versed, and propofol. In this study, we measured and compared the total times spent in the ED with each of these agents. Our objective was to determine whether the use of propofol for conscious sedation was associated with a shorter length of ED stay as compared to the other two agents. *Methods*: This was a consecutive case series. All patients who required procedural conscious sedation who presented to the ED at University of California, Irvine Medical Center from January 2003 through April 2004 were included in the study. The attending ED physician evaluated the patient and determined which medication(s) would be administered. All patients underwent procedural sedation according to the ED's standardized sedation protocol. The times and dosages of administered medications and the sedation/ consciousness level (SCL) scores were recorded**

Guidelines for CalJEM Paper Submissions

OVERALL DESIGN
- Font should be in Times New Roman, 12 point.
- Submissions should be single-spaced and justified with a space between paragraphs and no indentation.

MARGINS AND ALIGNMENT
- Page margins should be one inch on all sides.
- The body of the paper should be left aligned.

TITLE PAGE
- The title page should have the following five elements, with one space below each element:
- The title of the submission in 18 point boldface, center aligned.
- The authors in 12 point boldface, the name separated from the titles by a comma.
- The institution of origin in 12 point italics.
- The word "**Correspondence**" in 12 point boldface, with address information in 12 point regular.
- Any history of prior data presentation, financial interests, or other pertinent information regarding the submission in 12 point italics.

ABSTRACT
- If an abstract is included, it should be in 11 point boldface, justified text.

HEADINGS
- Headings should generally be entitled: ABSTRACT, INTRODUCTION, METHODS, RESULTS, DISCUSSION, REFERENCES. A CONCLUSIONS section could be included as well, at the author's discretion. Furthermore, an OBJECTIVES section may be substituted for the INTRODUCTION section if the author wishes.
- Limitations to the study should be addressed in the DISCUSSION section.
- Headings should be separated by one line from the prior section, and by one line from the section following.
- Headings should be in 12 point Times New Roman boldface caps.
- Headings should not have a colon attached to them.

FOOTNOTES
- Please place footnotes at the end of sentences only.
- They should be placed after the period, like this.[1]
- Use the superscript function to place a footnote.
- There should be no spaces between multiple footnotes attached to the same sentence, and commas and hyphens should separate them, like this.[2,3,5-7]

TEXT CONVENTIONS
- Place one space after punctuation.
- The first time an abbreviation is presented, please spell it out and put the abbreviation in parentheses.
- If an abbreviation is presented in the abstract, please spell it out once again the first time it is presented in the body of the submission.
- When using the terms i.e. or e.g., they should be punctuated with periods, and a comma should be placed after them. They should not be italicized, and nor should etc., et al., or other commonly used Latin terms.
- Decimals between zero and one should be presented as 0.23, 0.05, etc., not .23 or .05.
- The signs =, >, and < should not have spaces around them: $p<0.05$, not $p < 0.05$.
- A comma should be placed between a month and a year, as in September, 1975.

TABLES AND FIGURES
- Tables and figures should be placed at the end of the paper.
- Tables should have row and column headings in boldface.
- Information should generally be centered on the first line of the table cell.
- Please capitalize the initial letter of important words in the row and column headings.
- Captions should be in boldface.
- Title captions should follow this basic format:

Figure 2. Effect of amiodarone on blood pressure.

REFERENCES
- References should be listed in 11 point, justified.
- Listings in references should have only one space after periods, and no spaces after colons and semicolons in the nomenclature that denotes year, volume, pages, and so on.
- The titles of referenced published papers should be in lowercase except for the first letter of the first word.
- Journal names or their abbreviations should be in italics, without a period at the end.
- Reference format should be based on the following structure:

4. Keyes LE, Snoey ER, Christy D, Simon BR, Frazee BF. Ultrasound guided brachial and basilic vein cannulation in emergency department patients with difficult intravenous access. *Annals of Emergency Medicine* 1999;34:711-4.

Adhering to these guidelines will greatly facilitate the review process, and is much appreciated! Thank you very much.

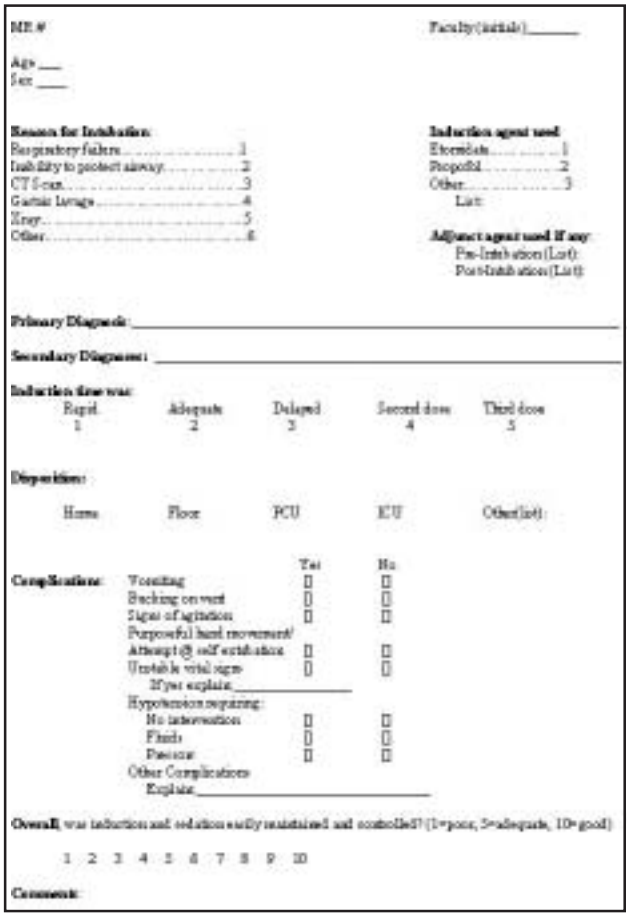
by ED nurses at 3-5 minute intervals. Data was abstracted prospectively. The time to sedation (first dose of agent to SCL score of 2 or less) and time to recovery (last dose of agent to SCL score of 4) of the different regimens were then analyzed and compared. *Results:* Thirty-eight patients received propofol, 38 received ketamine, and 14 received fentanyl/versed. The mean times to sedation (minutes) were: propofol 4.5 (95% CI: 3.3-5.7), ketamine 10.6 (95% CI: 5.8 –15.4), fentanyl/versed 11.5 (95% CI: 3.5-19.4). The mean times to recovery were: propofol 21.6 (95% CI: 16.1-27.1), ketamine 55.4 (95% CI: 46.2-64.5), fentanyl/versed 59.9 (95% CI: 20.3-99.5). Propofol had a statistically significant shorter time to sedation than both ketamine (p<.001) and fentanyl/versed (p=.022). Propofol also produced shorter recovery times than both ketamine (p<.001) and fentanyl/versed (p=.002). *Conclusion:* In this study, sedation and recovery times were shorter with propofol than with ketamine or fentanyl/versed. The use of propofol for conscious sedation in this non-randomized study was associated with a shorter ED length of stay.

Introduction

Conscious sedation is commonly utilized in the ED to facilitate the completion of painful procedures and imaging studies. Three of the most commonly used FDA approved agents for procedural sedation are ketamine, fentanyl/versed, and propofol. The purpose of this study was to compare the times to sedation onset and recovery times for propofol, ketamine, and fentanyl/versed as an indirect measure of the impact that each agent may have on ED length of stay. We hypothesized that the use of propofol, an ultra-short acting agent, would be associated with shorter duration of onset and recovery time.

Methods

This was a prospective consecutive case series of all adult or pediatric patients receiving ED procedural conscious sedation at the University of California, Irvine Medical Center from January 2003 through April 2004. All subjects underwent conscious sedation for orthopedic procedures, laceration repairs, minor surgical procedures, foreign body removal, or imaging studies. Choice of medication(s) for conscious sedation was determined by attending ED physicians. This study was not funded by the pharmaceutical industry. Standardized procedural conscious sedation protocols were used in all patients. The subject's vital signs, oxygen saturation, time and dosages of medications, as well as the sedation/ consciousness level (SCL) score were monitored and recorded by a trained ED nurse every 3-5 minutes.


ME #

Faculty (initials)_____

Age ___
Sex ___

Reason for Intubation:
Respiratory failure 1
Inability to protect airway 2
CT S-can 3
Gastric lavage 4
Xray 5
Other 6

Induction agent used:
Etomidate 1
Propofol 2
Other 3
List:

Adjunct agent used if any:
Pre-Intubation (List):
Post-Intubation (List):

Primary Diagnosis: _____

Secondary Diagnoses: _____

Induction dose was:

Rapid	Adequate	Delayed	Second dose	Third dose
1	2	3	4	5

Disposition:

Home Floor PCU ICU Other(list):

Complications:	Yes	No
Vomiting	☐	☐
Bucking on vent	☐	☐
Signs of agitation	☐	☐
Purposeful hand movement/ Attempt @ self extubation	☐	☐
Unstable vital signs	☐	☐
If yes explain:_____		
Hypotension requiring:		
No intervention	☐	☐
Fluids	☐	☐
Pressor	☐	☐
Other Complications		
Explain:_____		

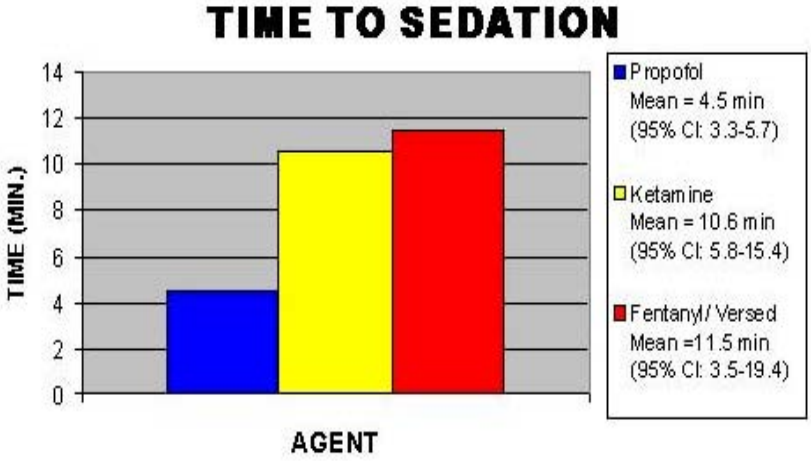
Overall, was induction and sedation easily maintained and controlled? (1=poor, 5=adequate, 10=good)

1 2 3 4 5 6 7 8 9 10

Comment:

Figure 1. Data Collection Sheet.

Figure 2.



Data were abstracted by emergency medicine research associates, who were trained to extract data using a scripted instrument. Data were analyzed using STATA 7.0 (Stata Corporation, College Station, TX). Time to sedation was defined as the time from the first dose of medication to the time that an SCL score of 2 (drowsy, delayed response to loudness and touch) or less was achieved. Time to recovery was defined as the time from the last dose of medication to the time that an SCL score of 4 (awake, alert, normal response to auditory stimuli) was met. We then compared the sedation and recovery times of the different agents using the Mann-Whitney rank test. Confidence intervals were calculated assuming a normal population. The study protocol was approved by our hospital's Institutional Review Board.

Results

Ninety patients were enrolled. Thirty-eight patients received propofol, thirty-eight ketamine, and fourteen fentanyl/versed. The mean times to sedation (minutes) were: propofol 4.5 (95% CI: 3.3-5.7), ketamine 10.6 (95% CI: 5.8 –15.4), fentanyl/versed 11.5 (95% CI: 3.5-19.4). See Figure 2. The mean times to recovery (minutes) were: propofol 21.6 (95% CI: 16.1-27.1), ketamine 55.4 (95%CI: 46.2-64.5), fentanyl/versed 59.9 (95% CI: 20.3-99.5). See Figure 3. Propofol had statistically significant shorter time to onset of sedation than ketamine ($p<0.001$) and fentanyl/versed ($p<0.022$). Propofol also produced shorter recovery times than ketamine ($p<0.001$) and fentanyl/versed ($p=0.002$).

Discussion

The pharmacokinetics and pharmacodynamics of propofol, ketamine, and fentanyl/versed are well described.[1] Propofol has emerged as an agent of choice for many ED physicians because of its effective sedation and brief recovery.1 In this study we found propofol to have a statistically significant shorter time to sedation and time to recovery than ketamine and fentanyl/versed. These two measurements, especially the latter, have a large influence on the ED length of stay. We believe that the major factors influencing ED length of stay for patients undergoing conscious sedation are time to onset of sedation, duration of procedure, and time to recovery. The length of the procedure is variable and operator dependent. Time to onset of sedation and time to recovery are the two variables influenced by choice of sedation agent, leading to a conclusion that the use of propofol may be associated with a shorter ED length of stay.

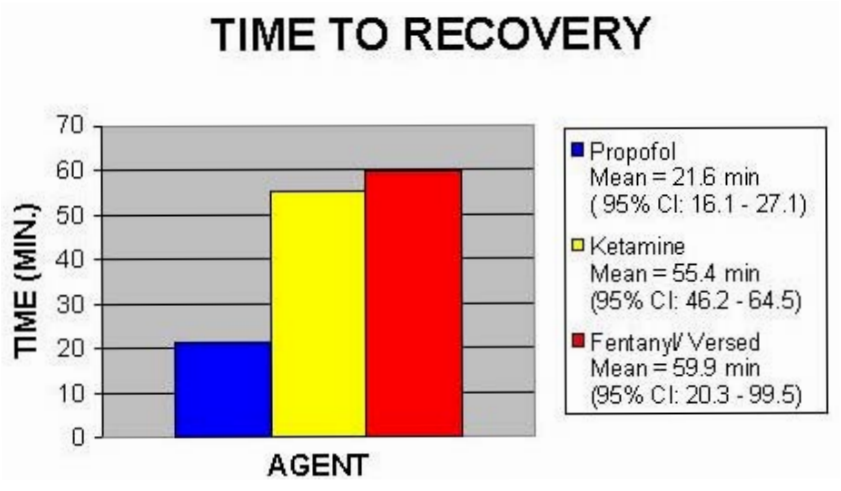
Propofol's shorter recovery time may also increase patient safety because of a potential decreased risk of aspiration and hypoxemia.[2-4,7] Shorter ED stay may also be associated with increased ED efficiency, greater patient satisfaction, and higher cost-effectiveness.[2,3,5,7,8]

Other studies have demonstrated similar recovery times to the 21.6 minute time that we found. Bassett et al. found a median recovery time of 18 minutes;[2,] Guenther et al. found a median of 25 minutes;3 and Havel et al. documented a mean recovery time of 14.9 minutes.4 Two other groups of investigators found shorter mean recovery times of 6.1 minutes and 8 minutes.[5,6]

Although we did not measure the incidence of complications among the three agents, many studies have shown no major respiratory complications with the agents we examined. This too was our experience as no subject required endotracheal intubation, a result likely arising from meticulous attention to pre-oxygenation and supplemental oxygen throughout the procedures.7

Aspiration, another potential complication, was not witnessed during any of our procedures. By definition, conscious sedation allows brainstem activity to remain normal and does not alter processes for maintaining essential cardiac and respiratory function. Although some argue that propofol produces "deep sedation," where one may partially loose protective reflexes, three factors may have protected patients from this complication: 1) propofol has antiemetic qualities; 2) patients are

Figure 3.



usually fasted for 6 hours, and 3) the procedures performed were of relatively short duration.8, 9 Both hypoxia and aspiration would seem to be less of a risk during a brief recovery from sedation.

We recognize several limitations of this study. Subjects were not randomized, and medications were chosen based on patient characteristics and physician preferences. Physicians were not blinded to the medication used and the effective dosages of medications may have differed. Thus, although suggestive, the results from this study cannot be viewed with the same confidence as results of a prospective, randomized, double-blinded trial. Further study is needed to definitively ascertain whether propofol is currently the best agent for ED procedural sedation.

References

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