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Patient Satisfaction and Return to Daily Activities Using Etomidate Procedural Sedation for Orthopedic Injuries

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Objectives: With regard to sedative agents used in procedural sedation and analgesia (PSA), such as etomidate, the focus has been on variables usually related to side effect profile and the success rates of various procedures, with both variables specifically taking place during the patients' stay in the emergency department (ED). There have been no extensive data on the functional status of patients after they leave the ED following PSA.

Methods: Prospective questionnaire evaluating functional status among consecutive adult patients discharged from the ED after undergoing etomidate PSA for orthopedic procedures.

Results: The study sample consisted of 26 cases using only etomidate for closed orthopedic reductions. The mean age was 50.1 years (SD: 20.5), mean weight 86.3 kg (SD: 17.2), and 61.5% were males. The average dose of etomidate given was 0.14 mg/kg with 26.9% requiring a second dose of 0.11 mg/kg. The average dose of analgesic given was 0.11mg/kg in morphine equianalgesic units. The median time between procedural sedation and return to normal sleep was 36 hours, while return to operating a motor vehicle or return to work was 72 hours. Overall, 80% to 100% of respondents felt that any temporary dysfunction was secondary to the orthopedic problems and not to the procedural sedation.

Conclusion: In this small follow-up study, adult patients undergoing PSA with etomidate for orthopedic closed reduction attribute post-discharge functional disability to the injury sustained and not to the PSA itself.

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INTRODUCTION

Procedural Sedation and Analgesia (PSA), as noted from the 2005 American College of Emergency Physicians clinical policy,¹ is defined as "...a technique of administering sedatives or dissociative agents with or without analgesics to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardio-respiratory function" (p.178).¹ Although emergency department (ED) physicians use PSA for the repair of complex pediatric lacerations and electrical cardioversions, PSA is also commonly used for reducing fractures and dislocations.²

Many drugs are available for procedural sedation. Etomidate has been used as an anesthetic agent for over a quarter century.²⁻⁴ It is a non-barbiturate hypnotic that induces sedation through g-aminobutyric acid (GABA) receptors in the central nervous system (CNS).⁵ Its rapid onset, short duration of action, clinically insignificant hemodynamic alterations and minimal side effects have accorded it prominence as an adjunct to rapid sequence intubation in emergency medicine. Etomidate's potential adverse effects include nausea/vomiting, potential loss of the protective airway reflexes, myoclonus, adrenal suppression,

Table 1. Etomidate and Analgesic Given

Dislocation	n	1st dose etomidate mg/kg (range)	2nd dose etomidate	2nd dose mg/kg (range)	Received analgesic also	Average IV opiate dose mg/kg (range)*
Shoulder	16 (59.3%)	0.13 (.09-.21)	5 (31.2%)	0.12 (0.12-0.12)	11 (68.7%)	0.09 (0.02 - 0.28)
Hip	5 (19.2%)	0.11 (.09-.13)	1 (20.0%)	0.09	2 (40.0%)	0.06 (0.02 - 0.09)
Elbow	3 (11.5%)	0.16 (.10-.20)	1 (33.3%)	0.12	3 (100%)	0.07 (0.05 - 0.10)
Ankle	2 (7.7%)	0.26 (.25-.28)	0	0	2 (100%)	0.33 (0.31 - 0.35)
Total	26 (100%)	0.14 (.09-.28)	7 (26.9%)	0.11 (0.07-0.16)	18 (69.2%)	0.11 (0.02 - 0.35)

* Opioid dose in morphine equianalgesic units

and hypotension. Electrolyte imbalances and oliguria may occur with prolonged use.^{5,6}

Previous research regarding sedative agents focused on variables usually related to the side effect profile of the medication and the success rates of the procedures involved. In addition, some research focused on more qualitative variables. These variables, however, are limited to questions regarding patient satisfaction and appropriate recovery time until discharge.^{2,7} Quantitative studies on the functional status of patients after discharge from the ED following procedural sedation needs investigation. This study examined the effects on the recovery and return to daily activities of adult patients who underwent procedural sedation for orthopedic reductions in the ED.

METHODS

This is a prospective questionnaire evaluating functional status among consecutive adult patients discharged from the ED after undergoing etomidate PSA for orthopedic procedures. The study used a 10-item telephone questionnaire format. One to two weeks after discharge, investigators completed the formal questionnaire. Consecutive patients were identified from the ED log for all patients undergoing procedural sedation from September 2004 to June 2005. The study was performed at an urban community hospital that serves 37,000 annual patient ED visits.

Study Protocol

This prospective study initially examined medical records for specific demographic data about the patient to assure inclusion parameters (use of etomidate, ED patients older than 18 years of age and procedures involving orthopedic reduction with or without use of analgesics). Exclusion criteria included pregnant patients, non-English speaking patients, history of organic brain disease (not alert, and oriented to person,

place, or time), and procedures conducted with analgesics but without the use of sedatives.

Measurements

Abstracted data included age, gender, weight, arrival and discharge times, time elapsed from sedation to discharge, diagnosis, names and doses of all medications related to the procedure, and complications. Anticipated complications reviewed included oxygen de-saturation (<94 %), blood pressure <90/60 mm Hg, blood pressure >140/90 mm Hg, respiratory rate <10 breaths per minute, respiratory rate > 20 breaths per minute, respiratory assistance, respiratory failure requiring intubation, mental status abnormality, vomiting, and rhythm changes. Investigators also recorded major medical conditions, allergies, use of tobacco, type of work, and exercise habits. Following acceptance by the Institutional Review Board, all data, including responses to the questionnaire, were recorded on preformatted data sheets, coded, and entered into an electronic database. Figure 1 shows the data collection tool.

Data Analysis

The Statistical Package for Social Sciences (SPSS) for Windows Version 11.5 (Chicago, IL, 2002) was used to calculate descriptive statistics.

RESULTS

Thirty patients received procedural sedation for closed orthopedic reductions during the study period. Two patients were excluded secondary to dementia. The remaining 28 patients were successfully contacted and agreed to participate in the study. However, one patient received both etomidate and diazepam for sedation and another patient received both etomidate and midazolam. These two cases were removed from analysis.

1. How effective was the medicine in putting you to sleep for the procedure?
 Not at all Somewhat Moderately Extremely
2. How effective was the medicine in making you forget what happened during the procedure?
 Not at all Somewhat Moderately Extremely
3. How nauseated were you after being discharged from the emergency department?
 Not at all Somewhat Moderately Extremely
 - a. How long? (Half-day increments) 0 hours 12 hours 24 hours
 36 hours 48 hours 60 hours
4. How likely would you undergo the same sedation medication in a future procedure?
 Not at all Somewhat Moderately Extremely
5. Do you drive a car? Yes No
 - a. If yes, how long before you drove a car?
 0 hours 12 hours 24 hours
 36 hours 48 hours 60 hours
 - b. Was this mainly a result of the medications or disability from the procedure?
 Medications Unsure
 Disability Other
6. How long before you ate a regular meal?
 0 hours 12 hours 24 hours
 36 hours 48 hours 60 hours
7. How long before you slept as you normally did?
 0 hours 12 hours 24 hours
 36 hours 48 hours 60 hours
 - a. Was this mainly a result of the medications or disability from the procedure?
 Medications Unsure
 Disability Other
8. How long before you returned to work?
 0 hours 12 hours 24 hours
 36 hours 48 hours 60 hours
 - a. Was this mainly a result of the medications or disability from the procedure?
 Medications Unsure
 Disability Other
9. Do you exercise? Yes No
 - a. If you exercise, how long before you returned to a sports or exercise regimen?
 0 hours 12 hours 24 hours
 36 hours 48 hours 60 hours
 - b. Was this mainly a result of the medications or disability from the procedure?
 Medications Unsure
 Disability Other
10. Did you require any help from friends or family for daily activities for which you are normally independent?
 Yes No
 - a. How long?
 0 hours 12 hours 24 hours
 36 hours 48 hours 60 hours
 - b. Was this mainly a result of the medications or disability from the procedure?
 Medications Unsure
 Disability Other

Comments:**Figure 1. Patient Interview**

The mean age was 50.1 years (SD: 20.5), the mean weight was 86.3 kg (SD: 17.2) and 61.5% of the sample were males. The majority of patients were employed with only eight (30.8%) retired. An associated medical condition was noted in 10/26 (38.5%) patients and five of those had either hypertension or heart disease. Table 1 provides the type of

orthopedic reduction and the average dose of etomidate used. A second dose of etomidate was required in 26.9% of cases.

Table 1 also provides the median dose of associated analgesic drugs used during procedural sedation. An intravenous analgesic along with etomidate was given in 18 (69.2%) patients. Morphine was given solely in nine (34.6%)

Table 2. Return to Normal Activities and Function Following Shoulder Reductions n=16

	Responses	Median hours (Inter-quartile range)	Respondent felt temporary dysfunction related to orthopedic problem rather than procedural sedation
Time before a regular meal	16/16	18.0 (12.0-24.0) 16 responses	
Time before regular sleep	16/16	24.0 (24.0-48.0) 16 responses	12/14 (85.7%)
Time before patient drove a car	12/12 drivers	72.0 (60.0-120.0) 11 responses	11/12 (91.7%)
Time before return to work	7/8 working	96.0 (48.0-120.0) 7 responses	7/7 (100%)
Time requiring help from family or friends	14/16	24.0 (12.0-48.0) 14 responses	8/14 (57.1%)

Table 3. Return to Normal Activities and Function Following Other Type Reductions n=10

	Responses	Median hours (Inter-quartile range)	Respondent felt temporary dysfunction related to orthopedic problem rather than procedural sedation
Time before a regular meal	9/10	24.0 (12.0-24.0) 9 responses	
Time before regular sleep	9/10	48.0 (30.0-48.0) 9 responses	9/9 (100.0%)
Time before patient drove a car	8/8 drivers	72.0 (48.0-114.0) 4 responses	8/8 (100.0%)
Time before return to work	4/4 working	66.0 (60.0-72.0) 2 responses	4/4 (100.0%)
Time requiring help from family or friends	10/10	48.0 (24.0-72.0) 9 responses	8/10 (80.0%)

cases, while six (23.1%) were given fentanyl only, and three (11.5%) received both.

Our study found no patients that experienced oxygen de-saturation, emesis, rhythm changes, or mental status abnormalities; however, four (15.4%) patients had slightly decreased or increased respiratory rates. None required intervention. Overall, 14 (53.8%) patients had alterations of systolic blood pressure, but only one patient required intervention. This patient received enalapril for elevated blood pressure. On the follow-up survey all 26 reported that the procedural sedative was extremely effective for amnesia to the events. All 26 also were willing to undergo the same sedation again. All 26 experienced nausea following ED discharge, but only one patient reported nausea for more than 12 hours.

Table 2 and Table 3 show the median time for return to

normal activities and function. It is seen that in 80% to 100% of cases, patients felt that their temporary disability was secondary to their orthopedic issue rather than related to their procedural sedation.

DISCUSSION

This study examined the effects of procedural sedation on ED-discharged adult patients and their recovery and return to daily activities. Etomidate was the primary sedative used for orthopedic reductions. Overall, patients receiving etomidate for PSA in the ED were satisfied and PSA was well tolerated. Of the 26 patients in our study, only one patient required any intervention for an adverse response. These results are consistent with previously published reports.^{2,4,5,8,9}

The median time of functional disability for the patients

in our study was one to three days. However, over 80% of the respondents felt that their disability, i.e., returning to normal sleep, operating motor vehicles, and returning to work, was not related to PSA. Almost all of the patients required family/friend assistance for a median of 1.5 days, and 57.1% of the patients felt that this was directly a function of PSA. These findings directly affect how emergency medicine physicians can educate their patients prior to discharge following PSA. Certainly, the medical condition that necessitated PSA will limit their activities for 1-3 days, but they should also be aware that they may need extra assistance from family and friends.

LIMITATIONS

A major limitation to this study is the small sample size. However, given the emerging popularity of etomidate PSA among emergency physicians and that much of PSA in the ED is performed for orthopedic reductions,^{2,4,9} these results are clinically relevant for many practicing emergency physicians. Finally, this study relied on accurate patient perceptions and recall. Some patients may have had trouble truly delineating the cause of the limitations, in other words, the medication involved in the procedure, or the medical condition necessitating the procedure.

CONCLUSIONS

Etomidate for orthopedic reductions in the ED is well tolerated with very high patient satisfaction and low adverse events; however, patients will have some temporary disability following discharge. Adult patients will likely have some functional disability for 36 to 72 hours. The vast majority of patients related their temporary functional disability to their underlying orthopedic problem and not to the procedural sedation itself.

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