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The effect of Riker sedation-agitation scale on clinical outcome of patients under coronary artery bypass graft surgery

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ABSTRACT

Aims: Frequent investigation of the patient for determining sedation level is one of the main measures in care of critically ill patient especially after heart surgeries. Riker scale is a valid and reliable tool which has been used in different studies as sedation-agitation scale in patients hospitalized in Intensive Care Unit (ICU). This study had been done with the aim of "investigating the effect of Riker scale on clinical outcome of patients under coronary artery bypass graft surgery (CABG)".

Methods: This clinical trial study was done in Imam Ali Hospital of Kermanshah in 2012. 116 patients, after coronary artery bypass graft surgery were selected and randomly divided into equal intervention and control groups through convenience sampling. In the intervention group, the level of patient's sedation was monitored by Riker scale with Kappa agreement coefficient r=0.92 and in control group it was done by a method based on physiologic responses. Data were collected with researcher-made questionnaire and checklist which had face and content validity and they were analyzed with SPSS-18 software and descriptive and inferential statistical tests (chi-square, independent t and fisher).

Results: There was a significant reduction in drug consumption of sufentanil (as sedating drugs) (8±5.5 vs. 23±12.5 microgram (mcg), duration of mechanical ventilation (7.1±2.37 vs. 9.3±2.6 hours) and duration of ventilation with SIMV mode (3.7±1.78 vs. 5.45±2.14 hours) in intervention group in compare with control group ($p<0.001$). There wasn't any significant difference statistically between two groups regarding length of stay in ICU and hospital and delirium appearance.

Conclusions: Findings of this study suggest use of Riker sedation- agitation scale for monitoring awakening in patients undergoing coronary artery bypass graft surgery in ICUs with the aim of decreasing duration of mechanical ventilation and sedative drugs.

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1. Introduction

It is necessary to use analgesics and sedatives in ICUs because of using supportive mechanical ventilation and invasive methods causing pain and stress [1]. High or prolonged prescription of sedatives makes dangerous complications for the patients [2]. An important part of nursing care in ICU is providing proper sedation for the patient and providing patient's comfort without coma has been described as a challenge [3]. Sedation in ICU is doing with the aim of relieving mental and physical stress due to ICU environment, invasive procedures, mechanical ventilation, and impairment of consciousness, fear, depression, pain and sleep disorders [4]. This procedure is often doing by using narcotic and sedative drugs for relieving pain and stress [5]. After heart surgery, short-term mechanical ventilation is a common measure and in order to provide patient's sedation, intravenous sedation is used in this period [6].

Patient's frequent investigation for determining sedation level is one of the main measures in care of critically ill patient especially after heart surgery [7]. Excessive consumption of sedatives and analgesics have dangerous complications such as; overdose sedation, respiratory depression, hemodynamic instability and complications due to drug accumulation in the body [8]. Purposive sedation and analgesia induction by using relaxation protocols, scoring systems and choosing aim for making sedation leads to sooner achievement to spontaneous breathing, faster remover of ventilator and reduction of length of stay in ICU and hospital [9].

Nurses play an important role in treating with sedatives; because they are constantly present in the patient's bedside and they treat patients with sedatives through investigating and monitoring them and injection of the drugs; so nurses should have a clear decision and monitoring framework for injecting these drugs [10]. The most appropriate way for investigating a patient's need to sedation is using an appropriate scoring scale [4]. Sedation-agitation levels are evaluated by clinical scoring systems such as; Ramzi, Riker and Richmond [9]. Riker scale is a valid and reliable tool which is used in different studies as a sedation-agitation scale in patients hospitalized in ICU [11,12,13]. Riker et al. (2001) used Riker sedation-agitation scale in patients under open heart surgery [14] and since then, using this scale in was welcomed different ICUs.

Considering the importance of sedation after heart surgery and noticing this point that there is no similar study in this regard in the country, the present study, which was designed in the form of MA thesis in intensive nursing, was done with the aim of investigating the effect of Riker sedation-agitation scale on the clinical outcomes of the patients under coronary artery bypass graft surgery.

2. Methods

It was a clinical trial study. The present study was done in ICU of Imam Ali hospital of Kermanshah in 2012 after taking permission from the ethics committee of research deputy and technology of Medical Sciences University of Kermanshah and registration in clinical trials database of Iran with this number; IRCT201209244736N4. Sample size was determined by using study of Marshal et al. (2008) and by using sample size formula for difference between two means with assuming mean and standard deviation of length of stay that in ICU in intervention and control group; 380±325 hours vs. 238±206 hours and confidence intervals: %95 and power of test: 80%, the least sample size in every group was estimated 58 in every group. Totally 116 people were the final size of the samples and they were divided into two intervention and control group randomly. Informed consent was taken from the samples before study.

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Riker sedation-agitation scale

Score	Sedation-agitation level	Answer
1	Non waking	There is the least answer or there is no answer at all to the painful stimuli, the patient does not communicate or does not do instructions.
2	Very quiet	The patient is awaken by body stimulation, but does not communicate or does not do instructions.
3	Quiet	The patient is awakening with difficulty, she/he is awaken with sound stimuli or a gentle shaking, but goes to sleep again, does the simple instructions.
4	Quiet and harmonious	The patient is quiet; she/he is awakening easily and does the instructions.
5	restless	The patient is anxious and worried/ tries to get up , but she/he is calm with verbal commands.
6	Very restless	The patient is not calm despite frequent verbal commands, she/he is not quiet, she/he is required to be limited, and bites endotracheal tube.
7	Dangerous restlessness	The patient drags the endotracheal tube, raises bedside bars, and tries to remove catheters, attacks caregivers and struggles.

In intervention group sedation-agitation level of the samples evaluated by Riker sedation-agitation scale from their entry to ICU to the extubation of trachea and in control group, investigating sedation level was done by nurses according to the common method which was based on physiologic answers. Sedation-agitation protocol for all the samples was two to three cc Sufentanil drug (equal to 10 to 15 mg) if it was necessary and in the case of patient's need to, received in surgery room, neostigmine injection with the amount of 0.04 mg for each kilogram of body weight and Atropine injection with the amount of 0.02 mg for each kilogram of body weight were used.

Inclusion criteria of the samples included: patients under coronary artery bypass graft surgery, age range of thirty to seventy years old, ejection fraction greater than thirty percent. Number of grafts between one to four without doing *endarterectomy* lack of vision and hearing problems and complete understanding of Persian language. Exclusion criteria of the samples included: patient's need to artificial ventilation for more than 24 hours, cardiopulmonary arrest during or after surgery, abnormal bleeding in a way that the patient needs reoperation and need to receive continuous infusion of sedative drugs and muscle relaxant drugs.

3. Results

Among all the samples of the study 79 (68%) of them were male and 37 (32%) were female. The mean age in both groups was 59.1±7.7 and the highest frequency was in age range of 60 to 70 years old. Matching was done between two groups from the approach of age, gender, duration of surgery, number of the grafts, left ventricular ejection fraction, history of cardiovascular risk factors, (Body Mass Index (BMI), hypertension, hyperlipidemia, diabetes, smoking and drug use) and intraoperative anesthetic protocol, there wasn't any significant statistical difference between two groups (table 1).

In intervention group in compare with control group, reduction of the mean of using Sufentanil drug, duration of intubation and duration of mechanical ventilation with SIMV mode was statistically significant ($p<0.05$).

There wasn't any significant difference statistically between two groups regarding duration of ventilation with CPAP mode, reduction of length of stay in ICU, length of stay in hospital and delirium emergence ($p>0.05$) (table 2).

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Table1: Comparing demographic information and risk factors in two intervention and control groups

Type of demographic information group		Intervention	Control	p value
age		59.1±7	59.1±8.4	P=0.69
gender	Male	68.4	67.8	p=0.94
	Female	31.6	32.2	
Left ventricular ejection fraction		48.4±9.3	47±10	p=0.99
Surgery duration		3.1±0.38	3.1±0.44	p=0.75
IBM		26.4±4.4	26.3±3.6	p=0.96
History of hyperlipidemia		36.2	48.3	p=0.125
History of hypertension		43.1	43.1	p=0.83
History of diabetes		27.6	26	p=0.92
History of smoking		39.7	34.5	p=0.47
History of opioid usage		22.4	20.7	p=0.74

Table 2: Comparing clinical outcomes in two intervention and control groups

Clinical outcomes	Control group (M±SD)	Intervention group (M±SD)	Result of the test (p value)
the amount of using sedatives	4.6±4.5	1.1±1.6	*p=0.000
Mechanical ventilation duration	9.3±2.6	7.1±2.37	*p=0.000
duration of ventilation with SIMV mode	5.45±2.14	3.7±1.78	*p=0.000
Duration of ventilation with CPCAP mode	3.7±1.97	3.4±1.8	p=0.30
Time period to the first awakening	140.8±85.1	165.3±98.1	p=0.12
Length of stay in ICU	24.2±5.5	22.7±1.4	p=0.05
Length of stay in hospital	7.4±1.06	7.4±1.4	p=0.94
Delirium emergence	1.7%	1.7%	p=0.49

4. Discussion

Results which have been observed regarding the effect of Riker scale on clinical outcomes of the patients under coronary artery bypass graft surgery in the present study such as; reduction of the amount of narcotic drugs consumption and duration of mechanical ventilation confirm hypothesis of the study. By the progress of the present century in supportive mechanical ventilation in patients and pharmacodynamics and pharmacokinetic changes of sedative drugs and painkillers used by ICUs, nursing care process of the patients with mechanical ventilation has been changed remarkably. Nowadays, nurses in ICU do not only need to know how to regulate mechanical ventilation, but they also need to know about appropriate sedative for enduring mechanical ventilation in patient, the amount of the drug, how to consume it and evaluation criteria of drugs efficacy.

In the present study, using Riker sedation-agitation scale led to significant statistical reduction of the amount of consuming Sufentalin. This finding confirmed the results of the study of Marshal (2008) [13], but in the study of Degrado et al. (2011), there wasn't any statistical significant difference in the mean of consuming narcotic hypnotic drugs in two case and control groups [8]. In this study using Riker sedation-agitation scale caused statistical significant reduction during mechanical ventilation which was in consistent with the results of the study of Brook et al. [1999] about the patients hospitalized in internal ICU [15], but, there wasn't any significant difference during intubation in the studies of Arias [16]and Viliams et al. (2008), [17]. There was statistical significant reduction in intervention

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group during mechanical ventilation with SIMV mode (p=0.001) which shows faster time of isolation from ventilator and receiving spontaneous ventilation. This finding is emphasized as an important principle in nursing cares of patients with mechanical ventilation and it emphasizes this principle that reduction of the amount of consuming sedatives is along with reduction of mechanical ventilation duration [18].

Using Riker sedation-agitation scale for the patient's stay in ICU did not have any significant statistical effect and also there was not any significant statistical difference regarding the length of stay in the hospital which confirm the results of the study of Buknal (2008) and Yeylmaz (2010) [11,17]; but in the study of Rabinson et al. (2008), there was significant reduction regarding patients' stay in the hospital and ICU in intervention group that achieved sedation based of the protocol [19]. Another aim of this study was comparing delirium emergence between two groups with the hypothesis of delirium emergence reduction in intervention group, but there was not any significant difference in the amount of delirium emergence between two groups which confirm the results of the study of Typel et al. (2011) [20].

5. Conclusions

Results of this study suggest that Riker sedation-agitation scale should be used for investigating sedation and agitation level of the patients with mechanical ventilation after coronary artery bypass graft surgery with treatment aim of reducing drug consumption and mechanical ventilation duration and accelerating the separation process of ventilator.

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References

1. Mottahedian Tabrizi E, Tadrisi SD, Mohammadyari A, Ebadi A , Mirhashemi S. Validity and reliability of Ramsy sedation scale in adult patients hospitalized in critical care units. IJCCN. 2010;3(1):15-16. [Persian]
2. Tadrisi SD, Madani SJ, Farmand F , Ebadi A , Karimi Zarchi AA, Saghafinia, et al. Richmond agitation–sedation scale validity and reliability in intensive care unit adult patients Persian version. IJCCN. 2009;2(1):15-21. [Persian]
3. Weisbroadt L, Mckinley SH, arshall AP, ole L, Pelt IM. Daily interruption of sedation in patients receiving mechanical ventilation. Am J Crit care. 2011;20(4):80-90.
4. Botha J. The Effect of a Sedation Scale on Ventilation Hours, Sedative, Analgesic and Inotropic use in an Intensive care unit. Crit Care & Resuscitation. 2004;6:253-7.
5. Elliott R, Kinley SH, Aitken L, Hendrikz J. The effect of an algorithm- based sedation guideline on the duration of mechanical ventilation in an Australian intensive care unit. Intens Care Med. 2006; 32(10):1506-14.
6. Hellström J, Öwall A, Sackey PV. Wake-up times following sedation with sevoflurane versus propofol after cardiac surgery. Scandinavian Cardiovascular J. 2012;3(5):1-7.
7. Simmons LE, Riker RR, Prato BS, Fraser GL. Assessing sedation during intensive care unit mechanical ventilation with the Bispectral Index and the Sedation-Agitation Scale. Crit Care Med. 1999; 27(8):1499-504.
8. DeGrado JR, Anger KE, Szumita PM, Pierce CD , Massaro AF. Evaluation of a local ICU sedation guideline on goal-directed administration of sedatives and analgesics. J Pain Res. 2011;4(2):127-34.
9. Dossow VV, Moshirzaeh M, Kastrup M, Wernecke KD, Konertz W, Spies C. Performance of the A-line Autoregressive Index (AAI) and of the Bispectral Index (BIS) at Assessing Depth of Short-term Sedation Following Cardiac Surgery. J Inter Med Res. 2009;37(3):611-20. [Persian]
10. Azizi A , Tadrisi S. D , Ebadi A , Asad Zandi M , Babatabar Darzi H , Madani S. J, et al . Validity and reliability of Glasgow scale modified by Palma & Cook (GCSC) in adult patients hospitalized in critical care unit. IJCCN. 2009;2 (2):75-79. [Persian]
11. Bucknall TK, Manias E, Presneill JJ. A randomized trial of protocol-directed sedation management for mechanical ventilation in an Australian intensive care unit. Crit Care Med. 2008;36(5):1444-50.
12. De Wit M, Epstein SK. Administration of sedatives and level of sedation: comparative evaluation via the Sedation-Agitation Scale and the Bispectral Index. Am J Crit Care. 2003;12(4):343-8.
13. Marshall J, Finn CH, Theodore AC. Impact of clinical pharmacist-enforced intensive care unit sedation

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protocol on duration of mechanical ventilation and hospital stay. Crit Care Med. 2008; 36(2):427-33.
14. Riker RR, Fraser GL, Simmons LE, Wilkins ML. Validating the sedation-agitation scale with the bispectral index and visual analog scale in adult ICU patients after cardiac surgery. Intensive Care med. 2001; 27(4):853-8.
15. Brook AD, Ahrence TS, Achaiff RD, Rentice D, Sherman G, Hannon W , et al. Effect of a nursing implemented protocol on the duration of mechanical ventilation. Crit Care Med. 1999;27(12):2609-15.
16. Arias RS, Sánchez M, Santos DR, Gallardo MJ, Sánchez IR, Frutos VF, et al. Effect of a nursing-implemented sedation protocol on weaning outcome. Critical Care Medicine. 2008; 36(7):2054-60.
17. Yilmaz C, Girgin NK, Ozdemir N, Kutlay O. The effect of nursing-implemented sedation on the duration of mechanical ventilation in the ICU. Turkish J Trauma & Emergency Surgery. 2010;16(6):521-6.
18. Brattebo g, Hoffos D, Fletten H, Muri Ak, Gjerde S, Plsek PE. Effect of a scoring system and protocol for sedation on duration on patient's need for ventilatory support in a surgical intensive care unit. BMJ. 2002; 324:1386-9.
19. Robinson BR, Mueller EW, Henson K, Branson RD, Barsoum S, Tsuei BJ. An Analgesia–Delirium–Sedation Protocol for Critically Ill Trauma Patients Reduces Ventilator Days and Hospital Length of Stay. J Trauma Injury Infect, & Crit Care. 2008; 65(3):517-26.
20. Taipale PG. Post-Operative Delirium & Cardiac Surgery: The Role of Nursing Care. 4th ed. Wolters kluwer. Philadelphia. 2011.

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