Investigating the Effect of Endotracheal Tube Cuff Pressure on Sore Throat, Hoarseness and Cough in Patients with Coronary Artery Bypass Surgery

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Abstract

Introduction: Endotracheal intubation for general anesthesia and changes in level of consciousness, in order to prevent aspiration and improve the patient's breathing, is done when the symptoms are associated with this action. The aim of this study was to investigate the effect of endotracheal tube cuff pressure on sore throat, hoarseness and cough in patients with cardiac artery bypass surgery.

Materials and Methods: This quasi-experimental clinical trial was done in 72 patients undergoing coronary artery bypass graft surgery in Afshar Hospital of Yazd in 2016 and easy sampling where the patients were assigned to two groups, experimental and control, was carried out. In the control group routine tracheal cuff pressure was adjusted by the anesthesiologist. In the experimental group, after being intubated by standard manometer, pressure cuff at a rate of 2 ± 22 cm of water was regulated and controlled. Data regarding hoarseness, sore throat and cough are checked t intervals of 2, 6, 12 and 24 hours in both groups by measuring scales. Data was collected and analyzed using statistical software SPSS 20.

Results: The results showed that regarding endotracheal tube cuff pressure, reducing the cuff pressure reduced its complications, including cough and sore throat hoarseness in the intervention group ($p < 0.033$) and sore throat ($p < 0.004$) reduction was statistically significant but regarding the hoarseness ($p < 0.132$), the difference was not significant.

Conclusion: The results of this research set by the endotracheal tube cuff pressure manometer reduced the severity of cough and sore throat in Coronary artery bypass graft surgery patients so in order to prevent complications in these patients it is recommended that endotracheal tube cuff pressure be adjusted.

Key words: endotracheal tube cuff pressure, sore throat, hoarseness, graft coronary artery bypass graft surgery

Introduction

Coronary artery bypass surgery is one of the common treatments for coronary artery disease (CAD) and every year more than 2 million and twenty thousand practices in this area takes place, 4,500-5,000 annual actions in Tehran and Yazd and about 200 to 250 heart bypass surgery cases are carried out (1). In this procedure the patient is under general anesthesia for up to 5 hours. In most cases, the patient is placed under general anesthesia induction, intubation for airway management for ventilation and airway protection and the prevention of possible aspiration is done (2). Long-term complications after tracheal intubation are well known and often due to decreased blood flow in the mucosa caused by increased pressure over 30 mmHg. Short-term complications associated with endotracheal tube cuff is seen in patients with sore throat and hoarseness (3). Cough is due to the stimulation of the cuff; during emergence from anesthesia it is a major problem and clinically common and may bring unpleasant consequences (4). Several factors including positive pressure ventilation, duration of intubation, and head to body position, temperature, body movements and emissions can change the cuff pressure. Despite the many benefits of this treatment in patients, such as other treatments for complications if it is ignored, there will be the possibility of dangerous side effects, and sometimes irreversible. One of the most important of these effects, dilation tracheal mucosa injury is due to the cuff and the pressure on chip-walled capillaries at a pressure of 22 mmHg isnormal, and under ischemic complications such as erosion, inflammation, softening of the cartilage ring, chip expansion, bleeding and infection can cause tracheal stenosis (5). Sore throat, hoarseness, and mucosal damage, followed by endotracheal intubation is a common complication after general anesthesia as well. The incidence of postoperative sore throat was reported in 21 to 65 percent of patients (6-11). The condition is medically eighth common complication after surgery (12-14). Due to the efforts being made to reduce the frequency and severity of postoperative sore throat and hoarseness (15-18), these complications are still common problems after surgery (19). Sore throat due to injuries to the throat, larynx or trachea is also known(20). Impregnated with the local anesthetic drug the cuff also reduces sore throat (21). But given the limited impact of these drugs including lidocaine, after completion of treatment, sore throat appears again. There are few studies on the effects of factors related to tracheal tube and the patient's health but the effect of tracheal tube cuff pressure on sore throat and hoarseness and cough patients after cardiac surgery is new to the subject matter. Due to the lack of adequate information in this regard, there is need for this project. The aim of this study was to determine the effect of endotracheal tube cuff pressure and pain in the throat, hoarseness and cough in patients hospitalized in the intensive care unit after cardiac surgery.

Method

This study is a quasi-experimental clinical trial in 2016, on 76 patients undergoing coronary artery bypass surgery in Afshar hospital of Yazd with sampling easy and random allocation based on the number of coupled cases, with 36 patients in the trial group and individual case number, and 36 patients assigned to the control group. 4 of the samples because of the increased intubation time of more than 24 hours were excluded. Inclusion criteria were: age between 18-75 years, a patient for surgery was selected for the first time; surgery was between 1-4 hours and the duration of intubation during surgery less than 24 hours to prevent the impact of other detrimental factors, risks of surgery at levels 1 and 2 and the tracheal tube according to the sex of the patient, as well as not having a history of head and neck surgery. Anesthesia, and medications used was similar; as were adjustments to ventilator for all patients and those with a history of sore throat and pharyngitis to 4 weeks prior to surgery and a history of respiratory problems, addictions, smoking and drug allergy as well as patients in the study where throat pain was unbearable or due to housing request or on inotropic drugs or vasodilator in the intensive care unit and received more than 10 microns or longer than 30 seconds for intubation needed, or during the study needed to be repeated or replacing the pipes or more than 24 hours under ventilation were excluded from the study. In order to collect data, demographic data and medical records of endotracheal tube cuff pressure was used. In the control group, patients with endotracheal tube cuff pressure determined by the anesthesiologist (with more work experience than 5 years) with a 10 cc syringe using the touch pad cuff; during the first 10 minutes of anesthesia, time of admission to the intensive care unit and then in a period of 2 hours, 4 hours and 6 hours later using a handheld German construction company pressure measurement range between zero and 120 cm of water, was measured and recorded. In this study, all patients participating in the study used tracheal tube made of PVC with a life company (Intellectuals Health) brand was used. For women size 7-7.5 was used and for men Size 8-8.5. In the intervention group, after intubation by an anesthesiologist (with more work experience of 5 years) (using the touch pad cuff), and by trained nurses with listing for the control group (during the first 10 minutes of anesthesia) it was set at a rate of 22 ± 2 cm of water (in the first endotracheal tube cuff pressure measurement, if the level was different with the rate of 22 ± 2, at first, and then the correction was recorded). At the time of admission to intensive care unit and in the intervals of 2 hours, 4 hours and 6 hours after control, this amount was set. Then, after removing the tube samples both within 2 hours, 6 hours, 12 and 24 hours later, measuring of sore throat, cough and hoarseness, in terms of throat pain, cough and respiratory violence were investigated and recorded. To search for pain from zero to 3, (Zero score without sore throat, a score of 1 - Mild sore throat (only if the person is asked), score 2 - moderate sore throat (pharyngitis expressed by the patient) grade 3 severe sore throat (change in volume with sore throat) and also measured was any

cough, mild or the extreme on the scale from 0 to 4 (zero score without coughing, rare 1- score, score 2 - casual less than an hour, score 3 repeated one or more times an hour, the score 4 - almost unchanged) as well as a change in sound quality which was defined as hoarseness and its severity was determined by 4 degrees from zero to three (zero score without hoarseness, 1 score violence so that only noise was reported by the patient during the interview, score 2 a clear sound but mild violence, Score 3 violence clear sound and sharp) and transfer of the patient to the intensive care unit after surgery, after 2 hours, symptoms of hoarseness, shortness of breath, coughing and inflammation of the throat in a period of 2 hours, 6 hours, 12 and 24 hours study, the data was recorded. Cuff pressure measurement in the operating room in a state of sedation Ramsay 2 or 3, at the end of exhalation and while the patient was in line with the axis of the body and in a special section at the end of exhalation at positions 45 degrees while the patient was measured along the body. Data were analyzed by SPSS 20 statistical software. In order for ethical treatment approval and licensing by the Vice Chancellor for Research Ethics Committee and authorization by the medical university of Afshar hospital officials, was done for all patients preoperatively along with an interview to explain the objectives and characteristics of the work and steps, written consent was obtained for the study. Also patients participating or not participating in the study were reassured that there would be no effect on patient treatment and all the patient information would remain confidential.

Results

The results indicate that most subjects were over 60 years of age (44.1%), male (72.1%), as well as the majority of patients were intubated with a No. 8 (64.7%) which was used in 37 patients (54.4%) and it was introduced into the trachea tube at a rate of 23 cm and was on the chart (1). Average pressure at different times in the experimental and control groups, were compared to show that after setting the cuff pressure, changes in the intervention group but not the control group's the endotracheal tube cuff pressure in the test group, showed significantly less volatility ($p = 0.000$).

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Based on Table 1 results show an average score of sore throat in the experimental group compared to the control group during the study that dropped with more time so that the average score in the experimental group rather than the control group was due to re-setting the endotracheal tube cuff pressure in the experimental group who experienced less of a sore throat, and this is observed and t test was significant in this context ($p < 0.004$).

Based on Table 2 the results indicate that the endotracheal tube cuff pressure in the experimental group reduced average scores of cough in this group more than in the control group so that with the passage of time more so that with more time after extubation average score of sore throat in the experimental group was associated with a greater reduction and t test was significant in this context ($p < 0.004$)

Table 3 Average score of hoarseness in both test and control groups shows that although endotracheal tube cuff pressure in the test group resulted in a significant reduction in the average score for this group, than in the control group hoarseness, and hoarseness in 6 hours after extubation the two groups was statistically significant but in general, t test was significant in this context ($p < 0.132$)

Discussion

The findings showed that 44.1% of the participants were in the age group 60 years and above. The findings show that most age groups above 60 years were studied. The findings also showed that the cuff pressure changes in the intervention group and the control group and there was no significant difference between the two groups and the reduction of morbidity in the experimental group in other words, setting the endotracheal tube cuff pressure and the change mitigation, to reduce the harm caused by pressure to the lining of the trachea and inflammation of the wall and reducing damage due to ischemia and tracheal mucosal blood flow is impaired as a result of complications such as coughing, hoarseness and sore throat decreases. The findings of this study are consistent with findings Khosravi (2005) which states that the patients in the experimental group compared to control group patients experienced fewer sore throats (22). The findings suggest that the severity of cough and sore throat in the experimental group and control showed significant difference. But for hoarseness, possibly due to decreased drug effect tradeoffs, there was no significant difference but at the time of 6 hours after extubation there is a significant difference. Ryu et al in a study in 2013 on the endotracheal tube cuff pressure in 90 patients undergoing thyroidectomy reported the endotracheal tube cuff pressure regulation reduces hoarseness, sore throat and cough, and in patients with endotracheal tube cuff pressure regulated and controlled, it was easier to swallow than for those in the control group (23). In line with this study, Liu and colleagues study also stated that after setting the endotracheal tube cuff pressure between the two groups of patients in terms of sore throat, hoarseness, cough and hemoptysis there is a significant difference ($p < 0.001$) and the control group sore throat, hoarseness, cough and hemoptysis was more than the experimental group (24). It is noteworthy that Mousavi et al (2009) study reported that in 30 patients admitted to the intensive care unit (ICU) who for whatever

Chart 1: Compare endotracheal tube cuff pressure control and test groups

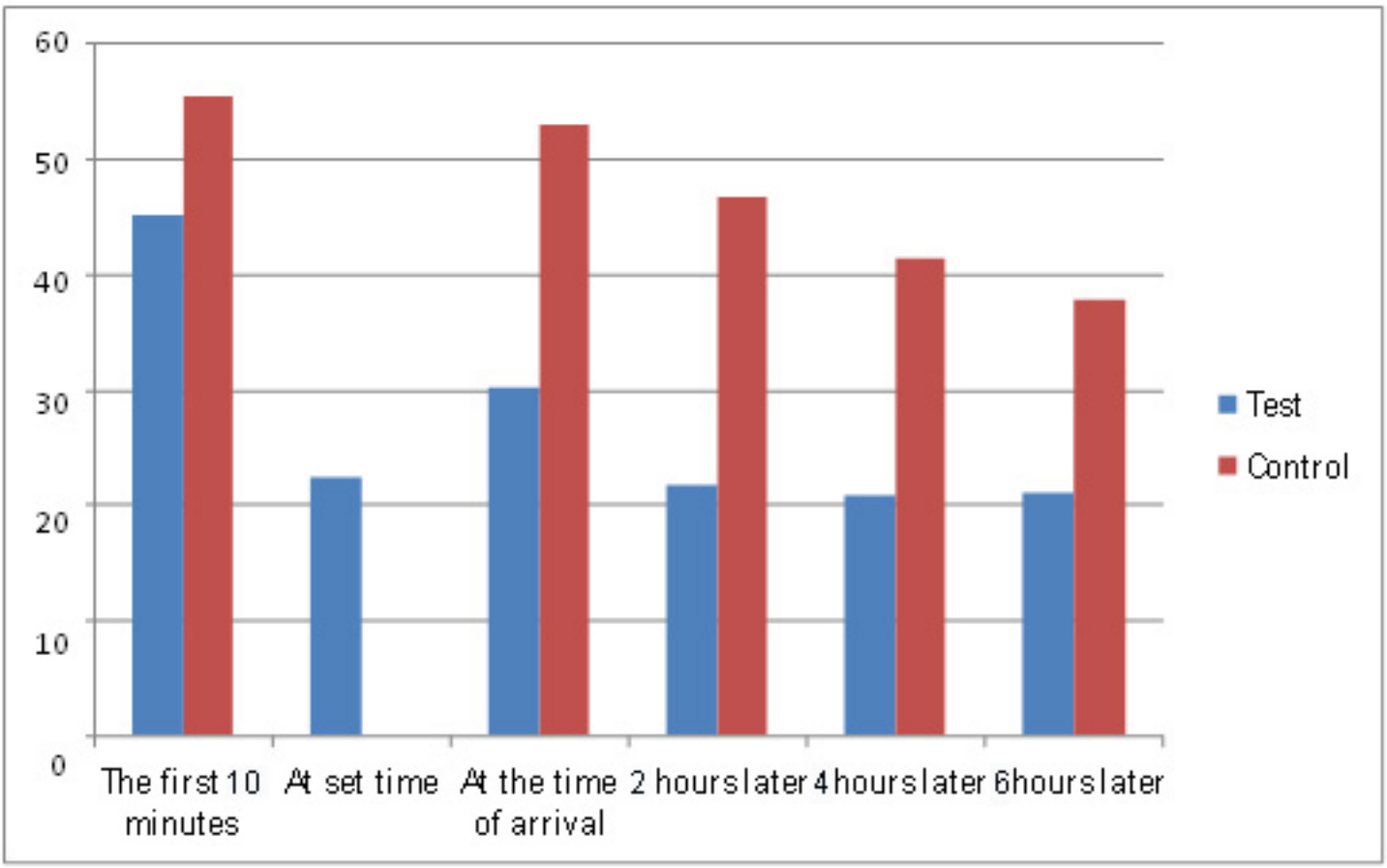

Table 1: Comparison of mean scores in both experimental and control groups during the study of sore throat

Groups Variable	Test Groups		Control group		
	Average	Standard deviation	Average	Standard deviation	T-test
Sore throat 2 hours after extubation	0.24	0.496	0.65	0.645	0.004
Sore throat 6 hours after extubation	0.24	0.606	0.59	0.499	0.011
Sore throat 12 hours after extubation	0.18	0.576	0.35	0.485	0.176
Sore throat for 24 hours after extubation	0.12	0.409	0.38	0.551	0.028

Table 2: Comparison of cough score in both experimental and control groups during the study

Group Variable	Test Groups		Control group		
	Average	Standard deviation	Average	Standard deviation	T-test
Cough 2 hours after extubation	0.1471	0.43571	0.4118	0.55692	0.033
Cough 6 hours after extubation	0.1471	0.43571	0.4412	0.61255	0.026
Cough 12 hours after extubation	0.18	0.459	0.38	0.604	0.118
Cough 24 hours after extubation	0.12	0.327	0.38	0.604	0.028

Table 3: Comparison of hoarseness in both experimental and control groups during the study

Variable Parameter	Test Groups		control group		
	Average	Standard deviation	Average	Standard deviation	T-test
Hoarseness 2 hours after extubation	0.6471	0.73371	0.9412	0.85071	0.132
Hoarseness 6 hours after extubation	0.2059	0.4786	0.6176	0.73915	0.008
Hoarseness 12 hours after extubation	0.2353	0.49597	0.4706	0.74814	0.131
Hoarseness 24 hours after extubation	0.2059	0.4786	0.3529	0.64584	0.29

reason endotracheal intubation was performed. They were measure twice within six hours All ETT cuff pressure measurements by standard manometer were done by an expert trained to do so . In the field of measurement and control endotracheal tube cuff pressure in patients in the intensive care unit, the results showed that 18.5 percent of the ETT cuff pressure despite pressure correction in the first instance, at the second time the cuff pressure was outside of the standard. A not so important reason for this careless cuff pressure being set is perhaps the wrong size tube was selected for the causes outlined (25).

Conclusion

The results suggest that regular adjustment of endotracheal tube cuff pressure reduces the incidence of sore throat and cough in patients with coronary artery bypass surgery and given that this is an easy, cheap and effective way in maintaining and improving the health of these patients and it is recommended that endotracheal tube cuff pressure is maintained by providing training for medical staff in this area and it is also stressed the need for precise control of the pressure at intervals determined so that the preventable complications of endotracheal intubation should be avoided.

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