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Effect of nursing interventions protocol on patients' clinical outcomes undergoing peri cerebral aneurysm coiling

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Abstract---Introduction: Cerebral aneurysm coiling considers ideal treatment for intracranial aneurysms. Objective: to evaluate the effect of nursing interventions protocol on patients' clinical outcomes undergoing peri cerebral aneurysm coiling. Materials and methods: Quasi-experimental study conducted at the Neuro-psychiatry Center affiliated to Tanta University. A Convenience sample of 60 adult patients undergoing peri cerebral aneurysm coiling for the first time. Four tools used Tool I Patients Structured interview schedule. Tool II Glasgow Coma Scale. Tool III Numerical rating scale. Tool IV: Post aneurysmal patient assessment tools. Results: The present study shows that less than half of both study and control group age ranged from 41-60 years, also it shows that more than half of study group and approximately two third of control group were female. In addition, it reveals that there was improvement of post aneurysmal coiling nursing interventions protocol mean results which include that majority of study group post nursing interventions protocol and

minority of control group post routine hospital care haven't localized pain and neck stiffness, furthermore all patients of study group and less than two third of control group haven't localized hematoma, Moreover majority of study group and less than one quarter of control group haven't aneurysmal nausea. Conclusions: Implementation of peri cerebral aneurysm coiling nursing interventions protocol enhancing patients' clinical outcomes.

Keywords---intracranial aneurysm, coil immobilization, endovascular coiling, neck stiffness, nausea, post aneurysmal headache.

Introduction

Cerebral aneurysm is an abnormal focal expansion of the middle cerebral artery caused by the weakening of the inner muscle layer (intima) of the blood vessel wall. Blood vessels form "blister-like" expansion, which can thin and rupture without warning. The resulting hemorrhage in the space around the brain is called subarachnoid hemorrhage (SAH). This type of bleeding can cause stroke, coma, and/or death (Malhotra, Wu, Gandhi, & Sanelli, 2018).

The global crude incidence rate of CA is 6.67 per 100,000 people and the WHO region varies widely, from 0.71 to 12.38 per 100,000 people. It is estimated that 6.5 million people in the United States have un-ruptured cerebral aneurysms, that is, 1 in 50 people have cerebral aneurysms and approximately 30,000 people suffer from a ruptured cerebral aneurysm each year, women are more likely to have cerebral aneurysms than men (3:2 ratio), especially women over 55 years. Nearly 500,000 people die from cerebral aneurysms worldwide, and half of the victims are under 50 years of age (Revilla-Pacheco et al., 2018).

Cerebral aneurysm is classified according to severity into unruptured aneurysm which includes pain above and behind the eye, numbness, weakness, paralysis on one side of the face, a dilated pupil and vision changes or double vision and ruptured aneurysm that includes a sudden and extremely severe headache (e.g., the worst headache of one's life) and may also develop double vision, nausea, vomiting, stiff neck, sensitivity to light seizures, loss of consciousness (this may happen briefly or may be prolonged) and cardiac arrest (Ishimaru, Nakashima, Takahata, & Matsuoka, 2013).

There are different lines for cerebral aneurysm management, the first line used is medical management to control symptoms and reduce complications. The second management line is surgical management. This treatment includes micro vascular clipping. This procedure involves cutting off the flow of blood to the aneurysm and requires open brain surgery (Raabe et al., 2005).

The third management line is endovascular management, which includes coil embolization. Aneurysm coiling is a minimally invasive procedure to treat an aneurysm by filling it with material that closes off the sac and reduces the risk of bleeding. It is performed from "within" the artery (endovascular) through a steerable catheter inserted into the blood stream at the groin and guided to the

brain. Tiny coils, glue, or mesh stents are used to promote clotting and close off the aneurysm. The main goal of aneurysm coiling is to isolate an aneurysm from the normal circulation without blocking off any small arteries nearby or narrowing the main vessel (Washington et al., 2013). The success of cerebral aneurysm coiling procedure is depending mainly on a professional nursing team. Safe, effective and ethical nursing practice is also an important component of patient care. As an indispensable member of a multidisciplinary team, professional nurse plays a key role in providing pre, ongoing and post cerebral aneurysm coiling nursing care (Wuchner, Bakas, Adams, Buelow, & Cohn, 2012)

Pre cerebral aneurysm coiling care which include apply pre-procedure measures to prevent or minimize localized incision site infection as surgical localized hair removal technique through clipping technique, preliminary incision site skin preparation through antimicrobial invasive site disinfection, correct patient position in supine position, with head erect and access limb straight, monitoring access limb femoral pulse and dorsal pedal's pulse (Harrigan & Deveikis, 2018).

Ongoing cerebral aneurysm coiling care which include preparing equipment needed in cerebral aneurysm coiling procedure, followed standards practice of patient sterile draping technique and applied measures to maintain patient safety and reduce complication during the procedure as monitoring vital signs, O2 saturation, E.C.G monitoring and fluid intake continuously during cerebral coiling procedure. Post cerebral aneurysm coiling care, which includes applying measures to control localized access pain, bleeding, headache, nausea, and neck pain post-procedure (Vink et al., 2018).

Aim of the study was to evaluate the effect of nursing interventions protocol on clinical outcomes for patients undergoing peri cerebral aneurysm coiling. Research hypothesis: - The study group who are exposed to nursing intervention protocol exhibits minimal post coiling complication such as localized vascular access pain, bleeding, hematoma, post coiling headache, nausea, neck pain or stiffness than control group.

Materials and Methods

This study used quasi- experimental research design, conducted in the cerebral angiography unit, and neurology department at the Neuro-psychiatry Center affiliated to Tanta University. Convenience sample of 60 adult patients undergoing cerebral aneurysm coiling was selected based on Epi-info program and divided alternatively into two equal groups: Control group, had been received their routine nursing care by hospital nursing staff and Study group, received protocol of care implemented by the researcher. The subjects of this study had been selected according to the following inclusion criteria: conscious adult patients of both sexes and undergoing cerebral aneurysm coiling for the first time and exclusion criteria: patient with bleeding disorder and renal diseases.

Inclusion criteria

Conscious adult patients of both sexes and undergoing cerebral aneurysm coiling for the first time and exclusion criteria: patient with bleeding disorder and renal diseases.

Tools

Four tools had been used in this study: Tool (I) Patients Structured interview schedule. This tool was developed by the researcher. The alpha reliability coefficient of this tool indicated an acceptable internal consistency 0.840. Tool (II): Glasgow Coma Scale for assessment the level of consciousness: It was originally created by Teasdale and Jennett in 1974 (Teasdale & Jennett, 1974) and it was modified by Gill M, et al in (2005) (Gill, Windemuth, Steele, & Green, 2005) and Green SM in (2011) (Green, 2011). The alpha reliability coefficient of this tool indicated an acceptable internal consistency 0.891, and it developed for purpose of assessment of the level of consciousness and it scored as Mild (13-15), Moderate (9-12) and Severe (3-8).

Tool (III): Localized pain assessment tool (Numerical rating scale): It was developed by Cline M, et al (1992) (Cline, Herman, Shaw, & Morton, 1992) to assess severity of pain post cerebral aneurysm coiling. The alpha reliability coefficient of this tool indicated an acceptable internal consistency 0.898. It is a horizontal scale consist of 10 points numerical scale with "0" representing no pain "1-3" representing mild pain (4-6) representing moderate pain (7-9) representing sever pain, and (10) representing worst pain and scale assess pain intensity level. It is a horizontal 10-point straight line scale which represents continuum pain severity ranging from (0) to (10) scale.

Tool (IV) Post aneurysmal patient clinical assessment tool: The alpha reliability coefficient of this tool indicated an acceptable internal consistency 0.876. It was adapted by the researcher and it consisted of four parts: Part (I): Localized hematoma and bleeding assessment: It was originally created by Christenson R, et al in 1976 and modified by Hogan-Miller, et al in 1995 and then by Al Sadi, et al in 2010 (Al Sadi, Omeish, & Al-Zaru, 2010; Eisenberg & Mani, 1977; Hogan-Miller, Rustad, Sendelbach, & Goldenberg, 1995). It used to assess localized hematoma and bleeding which graded on an ordinal scale, from 0 to 4 in which 0 scores indicate no bleeding, no hematoma while 4 scores indicate large hematoma which needs surgical intervention(hematoma evacuation).Part (II): Headache Questionnaire assessment checklist: It was developed by Thomas T, Bileena K et al (Thomas, Bileena, Karanath, Swaroop, & Srinivas, 2018).It modified by the researcher to assess general characteristics of headache which include 5 sections (Quality, location, associated symptoms, aggravation by physical activity and interference with the activity of daily living). It scored as Yes or No, (Yes) equal to score 1 and (NO) equal to score 0. Part (III): Nausea assessment tool (0 to 5 Nausea Rating Scales): It was originally developed by Grady (Grady, 2010). It adapted by the researcher to assess nausea and vomiting post cerebral aneurysm coiling. It graded on an ordinal scale, from 0 to 5 with, no nausea equal to score 0 and sever nausea equal to score 5. Part (IV): Neck pain and stiffness assessment tool (Neck Disability Index): It was developed by Wheeler A, et al in 1999 and

modified by Eva B, et al in 2011 (Blozik, Himmel, Kochen, Herrmann-Lingen, & Scherer, 2011; Wheeler, Goolkasian, Baird, & Darden, 1999).

It is adapted, modified by the researcher to assess neck-specific disability post cerebral aneurysm coiling. The questionnaire has 10 sections concerning (pain, personal care, lifting, reading, headache, concentration, work, driving, sleeping, and recreation), each section is scored from 0 to 5 (with the no pain and no disability response equal to score 0 and Higher scores represent greater pain and disability equal to score 35

Procedure

Official permission to carry out the study was obtained from the responsible authorities at the study setting and data were collected over a period of 6 months. The developed tools were tested for content validity by nine experts in the field of Medical-Surgical, Critical Care Nursing, Medical Biostatistics, Neuropsychiatry field professors and accordingly needed modifications were done. A pilot study was carried out on 6 patients before the actual study after taking their oral approval; data collected from those patients were excluded from the total number of the study subjects. Written informed consent obtained from the patients to participate in the study. Confidentiality and privacy were assured using code number instead of name.

The study was conducted on four phases: During assessment phase, both control and study group were assessed using a tool (I) part one, part two, part three and tool (II). planning phase, based on data of assessment phase and literature review, nursing interventions protocol reduce post cerebral aneurysm coiling possible complications and a colored booklet was developed by the researcher. Implementation phase, control group patients receive their routine hospital nursing care, and Study group patients receive protocol of care implemented by the researcher, which includes the following: Pre-cerebral aneurysm coiling: Surgical localized hair removal: It includes using localized surgical hair clipping technique, Preliminary incision site preparation: it includes, gentle scrub of localized incision area with specialized soft gauze sponges and antimicrobial agent as an iodine solution. Patient position: The patient place in a supine position, with head erect and access limb straight. Femoral pulse and dorsal pedal's pulse monitor using fingertips of hand.

Intra-cerebral aneurysm coiling phase: Preparing the necessary tools and equipment needed in a cerebral aneurysm coiling procedure. Patient sterile draping technique: Used only sterile drapes material within the sterile field. Patient safety measures as: Patient connect with specialized monitoring apparatus as pulse oximeter, BP monitoring cuff, ECG monitor screen and infusion pump that allowed vital signs monitor and O₂ saturation. Post-cerebral aneurysm coiling phase: Immediately post procedure: Apply Correct Manual Compression Technique: 1-2 cm superior to the access site for 15-20 minutes post cerebral angiography procedure usually 5 minutes of occlusive pressure followed by 10-15 minutes of lesser pressure continuously not intermittent using finger tips.

Ongoing post procedure: Bed rest completely for about 2 - 8 hours post procedure. Patient positioning: The patient was placed in supine position /flat on back about 2 hours post procedure with the leg straight and extended and after the first 2 hours the head of bed elevated to about 30 degrees. Vital signs monitored every 15 minutes for 1hour then every30 minute for 1 hour and then hourly until discharge. Headache control measures as: applying correct Swedish relaxation massage of the temples, scalp and neck with hand, fingers researcher used a cold ice pack on the forehead, neck and temple for about 15 minutes.

Post-procedure application of nausea control measures: Followed movement restriction guidelines, maintain appropriate body position: firstly, assume sitting upright position followed by lying down with the head elevated position. Applied manual light pressure fingers technique: Use middle and index fingers and form a "C" shape. Post-procedure application of neck pain and stiffness reliving measures: Thermotherapy was used (alternatively cold and heat application) for about 20 minutes. Evaluation phase: Both groups evaluated for the presence or absence of post coiling complication. Tool II, III, IV used immediately, 8hrs post and one week post procedure.

Results

The present study reveals that Less than half (46.7%) (40.0%) of bot study II and control group, respectively I ranged from 41-60 years old. In addition, it shows that more than half (63.3%) of the study group about two and I third (73.3%) of control group II were female. Furthermore, it reveals that the approximately two third (73.3%) of the study group I and more than half (53.3%) of control group II were from rural area respectively.

Figure (I), shows that the incidence of localized pain in the control group is higher than in the study group, which explained as Immediately post cerebral aneurysm coiling less than quarter (20.0%) of study group I and minority (3.3%) of control group II had no pain with high statistical significance difference at p level=0.001.Eight hour post cerebral aneurysm coiling the majority (86.7%) of study group I and minority (3.3%) of control group II had no pain with high statistical significance difference at p level=0.001 while one week post cerebral aneurysm coiling the majority (96.7%) of study group I and the minority (13.3%) of control group II had no pain with high statistical significance difference at p level=0.001.

Figure (II), reveals that the incidence of localized hematoma formation and bleeding in the control group is higher than in the study group, which explained as immediately post cerebral aneurysm coiling more than half (63.3%) of study group I and less than quarter (20.0%) of control group II had no localized hematoma with high statistical significance difference at p level=0.001.Eight hour post cerebral aneurysm coiling all patients (100.0%) of study group I and less than quarter (20.0%) of control group II had no localized hematoma with high statistical significance difference at p level=0.001while one week post cerebral aneurysm coiling all patients (100.0%) of study group I and less than two third (70.0%) of control group II had no localized hematoma with high statistical significance difference at p level=0.001.

Figure(III), illustrates that incidence of post aneurysmal nausea in the control group is higher than in the study group, which explained as immediately post cerebral aneurysm coiling more than one third (36.7%) of study group I and the minority (10.0%) of control group II had no post aneurysmal nausea with high statistical significance difference at p level=0.001. Eight hour post cerebral aneurysm coiling the majority (86.7%) of study group I and the minority (10.0%) of control group II had no post aneurysmal nausea with high statistical significance difference at p level=0.001 while one week post cerebral aneurysm coiling the majority (90.0%) of study group I and the minority (16.7%) of control group II had had no post aneurysmal nausea with high statistical significance difference at p level=0.001.

Table (I), shows that the incidence of post aneurysmal headache in the control group is higher than in the study group, which explained as immediately post cerebral aneurysm coiling the majority (96.7%) of study group I and the minority (13.3%) of control group II had no post aneurysmal headache with high statistical significance difference at p level=0.001. Eight hour post cerebral aneurysm coiling the majority (86.7%) of study group I and the minority (10.0%) of control group II had no post aneurysmal headache with high statistical significance difference at p level=0.001 while one week post cerebral aneurysm coiling the majority (90.0%) of study group I and less than quarter (20.0%) of control group II had no post aneurysmal headache with high statistical significance difference at p level=0.001. Table (II), reveals that the incidence of post aneurysmal neck pain and stiffness in the control group is higher than in the study group, which explained as immediately post cerebral aneurysm coiling more than quarter (26.7%) of study group I and the minority (10.0%) of control group II had no post aneurysmal neck pain and stiffness with high statistical significance difference at p level=0.001. Eight hour post cerebral aneurysm coiling the majority (86.7%) of study group I and the minority (10.0%) of control group II had no post aneurysmal neck pain and stiffness with high statistical significance difference at p level=0.001 while one week post cerebral aneurysm coiling the majority (93.3%) of study group I and the minority (13.3%) of control group II had had no post aneurysmal neck pain and stiffness with high statistical significance difference at p level=0.001.

Discussions

Concerning the age, current study reveals that the highest percentage of the study group I ranged from forty-one to less than or equal fifty years old, this finding in the same line with study result finding was done by AlShammari et al (AlShammari et al., 2017). It also shows that the highest percentage of control group II ranged from fifty-one to less than or equal sixty years old. This finding is similar to study result finding was done by Brisman et.al (Brisman, Song, & Newell, 2006).

In addition, the current study shows that the highest percentage of the study group I and control group II were female. This finding is in agreement with study result finding was done by Jersey & Foster (Jersey & Foster, 2022), who reported that cerebral aneurysm highly incidence among females gender, also it shows that the lowest percentage of the study group I and control group II were males. This

finding is in agreement with study result finding was done by Wilkinson D et.al (Wilkinson et al., 2019), who reported that cerebral aneurysm low incidence among men. This may be related to that woman tend to have smaller blood vessel diameter and men have larger blood vessel diameter.

Moreover, the current study illustrates that, the majority of study group I and minority of control group II haven't localized pain eight hours and one week post cerebral aneurysm coiling. This finding was in the same line with study result finding was done by Miller D et al (Miller et al., 2003) who support that most of the patient receiving cerebral aneurysm coiling procedure had no access site pain. In addition, the current study reveals that no patient of study group I and minority of control group II had worst pain eight hours and one week post cerebral aneurysm coiling. This finding was incongruent with study result finding was done by Jolly et al (Jolly et al., 2011) who found that about one third of studied group patients had the worst pain. This is may be due to the application of protocol of care which includes maintain correct body alignment of access limb, immobilization of access limb for about 2-3-hour post procedure, keep patient access limb in correct anatomical position.

Furthermore, the current study reveals that all patients of study group I had no hematoma eight hours and one week post cerebral aneurysm coiling. This finding agreed with study result finding was done by Usman A et al (Usman, Sani, & Husain, 2012) and Kaufmann T et al (Kaufmann et al., 2007) who found that there is no localized hematoma formation in the majority of cases undergoing cerebral aneurysm coiling. This may be due to the protocol of care, which was implicated and includes using of fingertips technique, apply manual pressure 1-2 cm superior to the femoral access site for 15-20 minutes post cerebral angiography.

Concerning post aneurysmal nausea, the current study reveals that the majority of patients of study group I had no nausea post cerebral aneurysm coiling. This finding was in the same line with study result finding was done by Wallmark et al (Wallmark, Ronne-Engström, & Lundström, 2014), who stated that majority of study group I had no nausea post cerebral aneurysm coiling. This may be due to the protocol of care, which includes using of nausea reliving techniques and measures .On the other hand, this finding was in disagreement with study result finding was done by Toth G et al (Toth & Cerejo, 2018), who stated that majority of study group I had severe nausea post cerebral aneurysm coiling, also this finding was in disagreement with study result finding was done by Cianfoni et al (Cianfoni, Pravata, De Blasi, Tschuor, & Bonaldi, 2013), who stated that minority of study group I had no nausea post cerebral aneurysm coiling.

Concerning post aneurysmal headache the current study shows that the minority of patients of study group I had sudden and severe headache post cerebral aneurysm coiling, this finding in the same line with study result finding was done by Lebedeva et al (Lebedeva, Gurary, Sakovich, & Olesen, 2013), who stated that minority of study group I had sudden and severe headache post cerebral aneurysm coiling and less than two third of control group II had sudden and severe headache post cerebral aneurysm coiling. In addition, this finding in the same line with study result finding was done by Zhang et al (Zhang et al., 2017),

who reported that that minority of patients of study group I and less than two third of control group II had sudden and severe headache post cerebral aneurysm coiling. This may be due to the protocol of care, which includes using of headache relieving techniques and measures. On the other hand, this finding is in disagreement with study result finding was done by Lebedeva et al (Lebedeva et al., 2013), who stated that less than one quarter of study group I and more than half of control group II had sudden and severe headache post aneurysm coiling.

Furthermore, the current study reveals that the majority of patients of study group I had no neck pain and stiffness post cerebral aneurysm coiling. This finding was agreed with study result finding was done by Carpenter et al (Carpenter et al., 2016) who stated that about majority of study group I had no neck pain and stiffness post cerebral aneurysm coiling, also this finding disagreed with study result finding was done by Perry et al (Perry et al., 2010), who stated that about one third of study group I had no neck pain and stiffness post cerebral aneurysm coiling.

Conclusions

Implementation of nursing interventions protocol enhancing the clinical outcome of the patients undergoing peri cerebral aneurysm coiling, as it was effective to decrease minor and major post aneurysmal complications such as localized pain, localized hematoma formation, aneurysmal headache, aneurysmal nausea and neck stiffness.

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Tables

Table (I): distribution of the post aneurysmal headache among the studied groups. (Study and control groups) (n=60)

Post aneurysmal Headache			Study (n=30)	Control (n=30)	χ^2	P-value
Headache immediately post	No	N	29	4	42.106	0.001**
		%	96.7%	13.3%		
	Mild	N	0	2		
		%	.0%	6.7%		
	Moderate	N	0	1		
		%	.0%	3.3%		
	Severe	N	1	23		
		%	3.3%	76.7%		
Headache 8hrs. post	No	N	26	3	37.081	0.001**
		%	86.7%	10.0%		
	Mild	N	2	3		
		%	6.7%	10.0%		
	Moderate	N	0	1		
		%	.0%	3.3%		
	Severe	N	2	23		
		%	6.7%	76.7%		
Headache one week post	No	N	27	6	31.030	0.001**
		%	90.0%	20.0%		
	Mild	N	1	1		
		%	3.3%	3.3%		
	Moderate	N	0	1		
		%	.0%	3.3%		
	Severe	N	2	22		
		%	6.7%	73.3%		

Table (II): distribution of the neck pain and stiffness among the studied groups.
(study and control groups) (n=60)

Neck pain and stiffness tool			Study (n=30)	Control (n=30)	χ^2	P-value
Immediately Post	No	N	8	3	22.139	0.001**
		%	26.7%	10.0%		
	Mild	N	16	3		
		%	53.3%	10.0%		
	Moderate	N	1	6		
		%	3.3%	20.0%		
	Severe	N	3	12		
		%	10.0%	40.0%		
	Complete	N	2	6		
		%	6.7%	20.0%		
8 hours Post	No	N	26	3	36.176	0.001**
		%	86.7%	10.0%		
	Mild	N	0	0		
		%	.0%	.0%		
	Moderate	N	3	11		
		%	10.0%	36.7%		
	Severe	N	1	10		
		%	3.3%	33.3%		
	Complete	N	0	6		
		%	.0%	20.0%		
1 week Post	No	N	28	4	39.001	0.001**
		%	93.3%	13.3%		
	Mild	N	1	5		
		%	3.3%	16.7%		
	Moderate	N	0	6		
		%	.0%	20.0%		
	Severe	N	1	11		
		%	3.3%	36.7%		
	Complete	N	0	4		
		%	.0%	13.3%		

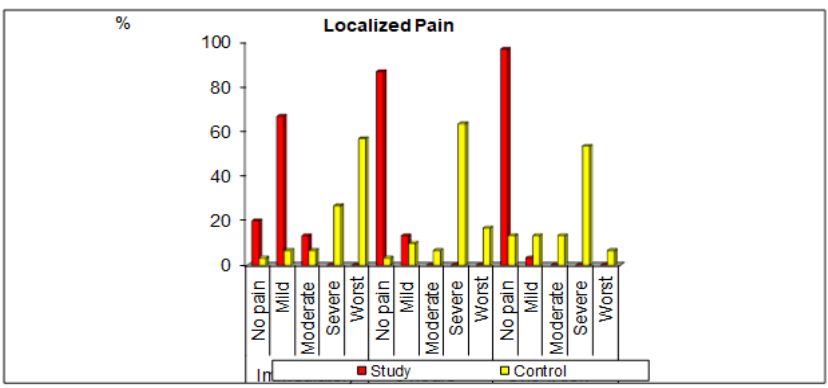


Figure (I): Percentage distribution of the localized pain among the studied groups. (Study and control groups) (n=60).

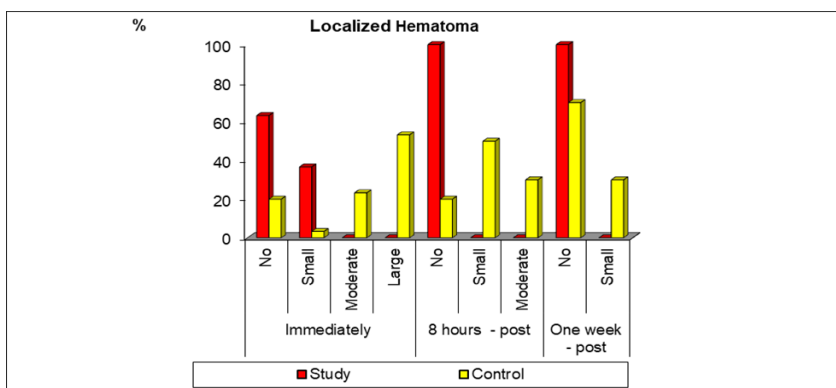


Figure (II): Percentage distribution of the localized hematoma among the studied groups. (study and control groups) (n=60)

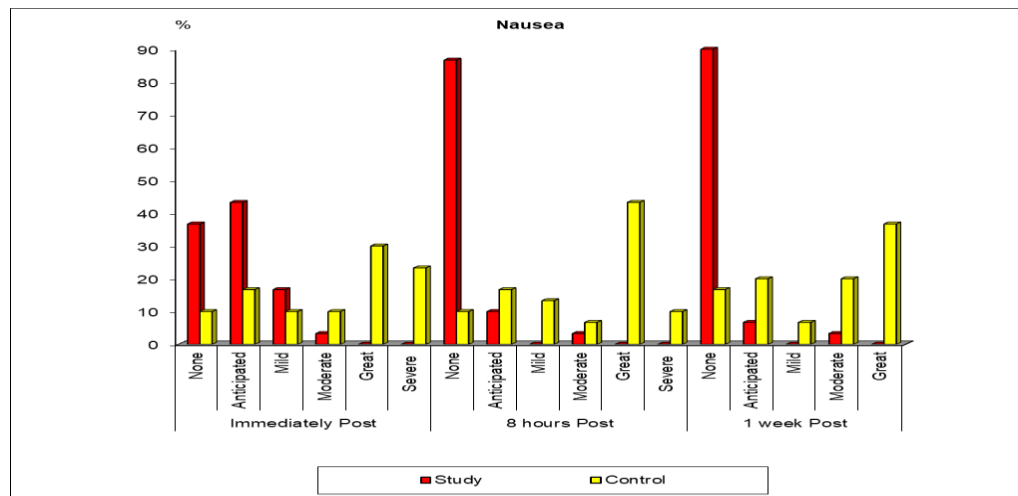


Figure (III): Percentage distribution of the post aneurysmal nausea among the studied groups. (Study and control groups) (n=60).