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Effect of Nursing Intervention on Clinical Outcomes for Patients Receiving Cerebral Angiography

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Abstract
Background*: - Cerebral angiograph is minimal invasive procedure which indicated for study of the blood circulation of the brain and neck. The prevention, recognition and early detection of vascular and neurological complicationsis critical and essential for better outcomes .*
Aim*:-Evaluate the effect of nursing intervention on clinical outcomes for patients receiving cerebral angiography.*
Design*:-Quasi-experimental study.*
Setting:-*This study conducted in cerebral angiography department at the Neuro-psychiatry Center affiliated to Tanta Main University Hospital.*
Subjects*:- Convenience sample of 60 adult patients undergoing cerebral angiography divided alternatively into two equal groups, study group: managed by protocol of care implemented by the researcher and control group: received routine nursing hospital care.*
Tools*:-Four tools had been used .*
Tool I: *Patients Structured interview schedule for assessment of Patient's socio-demographic and Patient's clinical data.*
Tool II*:Glasgow Coma Scale for assessment of Patient's level of consciousness.*
Tool III:*Pain assessment tool (numerical rating scale andCritical-Care Pain Observation Checklist) for assessment of pain level.*
Tool IV:*Cerebral angiography access site related complications assessment tool(Hematoma Formation and Bleeding Scale andaccess site infection).*
Results: *There was statistically significant difference between both control and study groups regarding neurological problem, level of consciousness, and pain at insertion site and hematoma formation and bleeding during immediate period and first two hours post cerebral angiography procedure.*
Conclusions:–*The nursing intervention improved and had positive effect on clinical outcomes of the patients receiving cerebral angiography.*
Recommendations: -*Protocol of care should carry out as a routine care for all patients receiving cerebral angiography.*
Key words*: catheter based angiography, Intra-arterial digital subtraction, complications.*

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I. Introduction

Catheter- based angiography is considered the gold standard for diagnosis, evaluation, and treatment of cerebrovascular disorder [(1)]. It affords unique capabilities of evaluating dynamic and functional anatomy of cerebral and spinal circulation. [(2)].Cerebral angiography technique has become more popular in the post few years and it found a method to improve percutaneous vascular access through using of a flexible, polyethylene catheter in correct and professional manner[(3)].

Cerebral angiography is a minimally invasive test that uses x-rays and an iodine-containing contrast material to produce pictures of blood vessels in the neck and brain[(4)].Many purposes ofusing cerebral angiography arethere. It is use to evaluate cervicocerebral circulation and collateral circulation in conjunction with physiologic testing of brain perfusion when there is less information available from CT angiography or MRI .On the other hand it help in identifying the etiology of subarachnoid, intraventricular, parenchymal, craniofacial cervical hemorrhage. Also it describe location and anatomy of intracranial aneurysms,

cervicocerebral vascular malformation, evaluate vasospasm related to subarachnoidand investigate reversible cerebral vasoconstriction syndrome [5,6,7]

The success of cerebral angiographyprocedure isdepending mainly on a several circumstances, first a good patient preparation. Second a perfect cerebral angiography technique which mean a skillful selection of the appropriate puncture site location , in addition to professional nursing measures which play a major role in controlling of pain and access site infection[8]. A good patient preparation pre cerebral angiography procedure is consider a vital component of patient nursing care ,as it include taking complete patient history especially allergy history for any contrast material as well as patient must stop taking medications that can increase bleeding risk as blood thinners before procedure drugs, also nurse had to check femoral pulse, as well as the dorsalispedis and posterior tibial pulses[9]

The location of the puncture site of cerebral angiography is also important because it allows effective compression of the arteriotomy site after the procedure, a puncture location too low in the superficial femoral artery risk for inadequate post procedural compression because of the absence of a firm structure to compress against, and a puncture too high above the inguinal ligament risk for hematoma formation[10]. A professional nursing measures which include mainting correct patient body position and correct limb alignment ,using aseptic technique in caring of access site and give patients appropriate health instructions on discharge play a key role in control possible complications as localized pain and infection.[11,12]

Despite the beneficial effect ofcerebral angiography whichconsiders asafe and effective procedure, it may be associated with some risk of morbidity and mortality. The most common complication associated with cerebral angiography are broadly classified into neurological complication such as reversible(mild and moderate alteration of level of consciousness) or irreversible(sever alteration of level of consciousness) neurological complications andnon-neurological complication such as un-tolerated limb pain, vascular complications such as local groin hematoma formation and bleeding which can be life threatening complications and access site infection ,all of them require additional nursing , medical intervention or even surgical interference. Vascular complications especially expose patients to additional discomfort, extended hospital stay, and higher hospital costs, also patients may require additional treatment, such as blood transfusions and vascular surgery[13,14,15,16,17].

Safe, effective and ethical nursing practice is an important component of care for patients undergoing cerebral angiography procedure , professional nursing team play a key role in caring of that patient, before ,during and after procedure, beginning from assessing patient condition , providing appropriate nursing intervention and evaluating the outcome of these intervention provided [18]. Professional nursing team had a vital role in caring the patients with cerebral angiography immediately and early post cerebral angiography phase. The immediate concern is to assess pain intensity level post cerebral angiography, assess patient level of consciousness to reveal any neurological complication, monitor vital signs , assess the common access site complication such as bleeding, hematoma formation and assess dressing status around puncture site [19,20].

On the other hand , professional nursing intervention had a clear and positive effect on patients outcomes during immediate and early post cerebral angiography phase ,as it consider pain, bleeding and hematoma management is the highest nursing priority [21,22,23,24] . Therefore, our study was the first in this geographical location which were help such group of patients undergoing cerebral angiography to experience less complications rate, has a positive effect on clinical outcomes as pain level, hematoma formation andbleeding and could be helpful for other health professionals specially nurses in planning and implementing care for such group of patients in the future.

Aim of the study

Evaluate the effect of nursing intervention on clinical outcomes for patients receiving cerebral angiography.

Research hypothesis:

Patients undergoing cerebral angiography who received protocol of care, are expect to have no or minimal complications as un-tolerated pain, bleeding, localized hematoma formation and infection at vascular access site post cerebral angiography procedure than control group.

II. Subjects and methods

Research design:

A quasi-experimental design was used in the present research.

Setting:

This study conducted in cerebral angiography unit at the Neuro- psychiatry Center affiliated to Tanta Main University Hospital.

Subjects:

Convenience sample of 60 adult patients received cerebral angiography was selected based on statistical power analysis and divided alternatively into two equal groups: **Control group**, had been received their routine nursing care by hospital nursing staff and **study group**, managed by protocol of care implemented by the researcher. The subjects of this study had been selected according to the following criteria: conscious adult patients of both sexes and undergoing cerebral angiography for the first time.

Tools of data collections:

Four tools had been used in this study:

Tool (1) Patients Structured interview schedule.

This tool was developed by the researcher. It comprised from two parts as follows Part (1) patient's socio-demographic data and part (2) patient medical clinical data.

Tool (II) Glasgow Coma Scale[(25)]: **-**

This tool was developed at the University of Glasgow in Scotland in 1974 **[(28)]**.It developed for purpose of assessment of patient level of consciousness and it scored as Mild (13-15), Moderate (9-12) and Sever (3-8).

Tool (III):–Pain assessment tools: -

These tools used to measure pain severity post cerebral angiography.It included two scales as followsscale (1) **Numerical rating scale [(26)]**.It developed by **Cline et al., (2006)**. It is a horizontal scale consist of 10 cm straight line 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 (2)**Critical-Care Pain Observation Checklist[(27)]:** This scale was developed by **Gélinaset al., (2006)**. It composed of 12 item scale that evaluates pain on four behavioral indicators: facial expressions, body movement, vocalization and muscle tension .Each behavioral indicator contains 3 descriptors rated from 0- 2 score. The total score ranges from 0 that indicate no pain to 8 that indicate maximum level of pain.

Tool (IV):-

Cerebral angiography access site related complications assessment tool:-This tool wasdeveloped to measure hematoma formation and bleeding post cerebral angiography and local access site infection.It was comprised from two parts as follows. **Part** (1): **Hemostatic Scale**. It developed by **Christenson, Staab, Burko, &Foster[(28)]**and modified by **Hogan-Miller, Rustad, Sendelbach, Golden bergin 1995[(29)]**.It used forAssessment of the access site hematoma formation and bleeding, hematomas and bleeding were graded on an ordinal scale, from 0 to 4It scored as(0)No bleeding, No hematoma,(1) Small hematoma ,Scant oozing ,(2) Moderate hematoma or bleeding ,(3)Large hematoma or bleeding, (4) Large hematoma which need surgical intervention .Part (2):**Assessment of the access site infection**: This tool developed by the researcher after reviewing of the related literature**[(30,31)].**It used to assess local signs and symptoms of infection at access site , and it scored as present or not present , **(1)** gave for presence of local signs of infection at access site and **(0)** gave for absence of local signs of infection at access site.The alpha reliability Coefficient of all tools indicated an acceptable internal consistency; it was (0.817,0.772,0.926,and 0.829respectively)

Methods:

-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 4 months.

-The developed tools were tested for content validity by nine experts in the field of Medical-Surgical, Critical Care Nursing, MedicalBiostatistics,and Neuropsychiatryfield professors and accordingly needed modifications were done.

-A pilot study was carried out on 9 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.

-Oral informed consent was obtained from the patients to participate in the study. Confidentiality and privacy were assured using code number instead of name.

During **assessment phase**, both control and study group were assessed using tool (I) part (one and two).

During **planning phase**, Based on data of assessment phase and literature review, protocol of care , it was developed based on determining needs ,patient's goal, priorities and expected outcomes criteria was formulated as the following.

Expected outcomes:
Decrease post procedure complication such as untolerated pain, bleeding, localized hematoma formation and infection at vascular access site.
In implementation phase, control group participants received their routine hospital nursing care. and**Study groupparticipants** managed by protocol of care implemented by the researcher , it included the following:
(A)Apply measures to control pain: It included **1-Bed rest:** ensure that patient is completely bed rest for about 2 - 4 hours post procedure .**2-Patient positioning:** patient placed in supine position about 2 hours post cerebral angiography with the leg straight and extended and after the first 2 hours elevate the head of bed to about 30 degree .**3- Immobilization of the access limb:** keep the patientaccess limb immobilized in place for about 2-3 hour post procedure through using of pillow· **4-Cold therapy:**Gently placed the cold compress around the cerebral angiography punctures and access site for 20 minutes**.5-Relaxation technique:** use different method of relaxation technique such as distraction and language technique.
(B) Apply measures to control bleeding and hematoma formation as the following:- **Correct Manual Compression Technique** :apply manual pressure 1-2 cm superior to the access site for 15-20 minutes post cerebral angiography usually 5 minutes of occlusive pressure followed by 10 minutes of lesser pressure · Use of **finger tips method** of three fingers to produce firm pressure. **Monitoring vital signs** (Temperature, pulse, respiration and blood pressure)every 15 minute for 1hour then every 30 minute for 1 hour and then hourly until discharge and special attention given for monitoring dorsal pedals and posterior tibial pulse on the access limb, keep patient access limb in **correct anatomical position** with back ,limb straight and feet positioning forward .
(C). Apply measures to reduce cerebral angiography access site related infection as the following: follow universal precaution principle pre and during and post cerebral angiography procedure which include hand hygiene, use of personal protective equipment, use close sterile gloving Technique and follow aseptic technique in caring of access site once 6 hours post cerebral angiography procedure ·
(D). Give appropriate health instruction for the patientsor his relevant family member about home care before discharge about physical activities, dressing removal, personal hygiene, medication ,diet and warning signs
During **evaluation phase:** Both groups evaluated for the presence or absence of neurological, non-neurological and vascular complication. **ToolII, III**, **IV** used immediately and first two hours post procedure.

III. Results

Table (1) Showed the distribution of patients' relevant to their socio-demographic data among the studied grouprelated to their age , more than h]

alf of patient in control and study group (56.7% and 53.3% respectively) were between (51-55) years old. Nearly two third of patient in control and study group (60% and 66.7% respectively) were males.

Table (2) Showed the distribution of patients' relevant to theirpast medical history among the studied groups, about two third of patients in control group (63.3%) , compared to the majority of patients in study group (80.0%) have cerebral aneurysm and regarding to vascular disease ,it was observed that more than one quarter of patients in both control and study group had varicose veins (26.7.3% and 30.0% respectively)

Table (3) showed the distribution of patients' relevant to their past surgical history, smoking history and allergy history. Regarding to smoking history, results showed that nearly three quarter of patients in control group (70.0%) , compared to about two third of patients in study group (63.0%) were smokers.

Table (4) showed the distribution of patients' relevant to theircurrent medical history among the studied groups. Statically significant difference between both groups was noted. In which result showed that half of patients in control groups (50.0%) , compared to nearly three quarter of patients in study group (70.0%) had hypertension . As a regard to neurological problems ,results revealed that ,the majority of patient in both group (100.0%-93.3%respectively) had headache while all patients in control group (100.0%), compared to about two third of patients in study group (66.7%) had dizziness and more than half of patients(56.7.3% and 53.3% respectively) in both group had fainting, and vomiting. Concerning the **type of cerebral angiography procedure** , results revealed that about two third of patients in control group (63.3%), compared to more than half of patients in study group(56.7%) received diagnostic cerebral angiography .In relation to the duration ofcerebral angiography procedure, result showed that the mean duration of diagnostic cerebral angiography procedure in both control and study groupwas (**28.42±6.021-32.35±5.623** respectively).

Figure (5) showed the distribution of patients' relevant to theirtotal GCS level of the studied groups throughout periods of study.Statically significant difference between both groups was noted regarding eye opening and regarding total Glasgow Coma Scale level immediately and first 2 hours after procedure , as p value= (0.024 - 0.004 respectively) Regarding the assessment of eye opening , the results revealed that the majority of patients in study group (80.0%) immediately after procedure and (100.0%)) the first two hour after procedure had spontaneous eye opening . Regarding Total Glasgow Coma Scale, only (3.3%) of patients in control group immediately after procedure had moderate and severe altered level of consciousness

compared to nothing (0.0%)in study group patients while the majority of patients in both control and study group(93.3% and 100.0% respectively) had no altered level of consciousness , immediately and first 2 hours after procedure.

Figure (6) showed the distribution of patients' relevant to their percentage of numerical ratingscale of the studied groups immediately and 1st 2 hrs after procedure. Statically significant difference between both groups was noted as p value was 0.011 immediate after procedure and 0.001 first two hours post cerebral angiography procedure. Results revealed that about two third of patients in control group(67.9%) immediately and first 2 hours after cerebral angiography procedure ,compared to the majority of patients in study group (93.3%) immediately and (100%) first two hours post procedure had no pain ,also more than one quarter of patients in control group(28.6%) compared to only (3.3%)of patients in study group had mild pain immediately after procedure and about one third of patients in control group (32.1%) compared to nothing (0.0%) of patients in study group had mild pain at the first 2 hours after cerebral angiography procedure. while only (3.6%) of patients in control group had worst pain compared to nothing in study group immediately post procedure.

Figure (7) showed the distribution of patients' relevant to theirextent of hematoma and bleeding among the studied groups throughout period of the study. Statically significant difference between both groups was noted as p value = 0.010 immediately after procedure and = 0.036 first 2 hours afterprocedure. Results revealed that ,more than half of patients in control group (56.7%) compared to the majority of patients in study group (93.3%) had no bleeding , no hematoma formation immediately post procedure , while the majority of patients in both control and study group (80.0 and 100.0 respectively) had no bleeding , no hematoma ,the first 2 hours post procedure. **Regarding small hematoma formation** (1) ,result showed that about one quarter of patients in control group (26.75), compared to only (6.7%) of patients in study group had small hematoma immediately post procedure and only (6.7%) of patients in control group), compared to nothing (0.0%) of patients in study group had small hematoma first two hours post procedure. **Regarding large hematoma formation** .Our results revealed that only (13.3%) of patients in control group had large hematoma formation immediately and first 2 hours post procedure , compared to no hematoma formation (0.0%) in study group patients immediately and first 2 hours post procedure.

Table (8) showed the distribution of patients' relevant to assessment of access site infection among the studied groups. Result revealed that only (3.3%) of patients in control group had local signs of infections as pain, redness, hotness, tenderness and swelling at the access site compared to no signs and symptoms of local infection at access site in patients of study group.

Table (1): Distribution of patients' socio-demographic data among the studied group

Characteristics	The studied patients (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
Age in years					
▪ (21-30)	1	3.3	2	6.7	
▪ (31-40)	4	13.3	5	16.7	0.541
▪ (41-50)	8	26.7	7	23.3	0.910
▪ (51-55)	17	56.7	16	53.3	
Sex					
▪ Male	18	60.0	20	66.7	FE
▪ Female	12	40.0	10	33.3	0.395
Marital status					
▪ Married	27	90.0	23	76.7	2.320
▪ Single	2	6.7	3	10.0	0.313
▪ Widow	1	3.3	4	13.3	
Residence					
▪ Rural	23	76.7	28	93.3	FE
▪ Urban	7	23.3	2	6.7	0.145
Educational level					
▪ Illiterate	5	16.7	11	36.7	
▪ Read and write	8	26.7	6	20.0	3.942
▪ Secondary education	5	16.7	6	20.0	0.268
▪ University education	12	40.0	7	23.3	
Occupation					
▪ Manual work	9	30.0	15	50.0	3.50
▪ Employee	12	40.0	6	20.0	0.174
▪ House wife	9	30.0	9	30.0	

Table (2): Distribution of the past medical history among the studied groups.

Past medical history	The studied patients (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
# Neurological disease					
▪ Stroke	1	3.3	1	3.3	1.111 0.430
▪ Subarachnoid hemorrhage	10	33.3	14	46.7	
▪ Carotid fistula	0	0.0	1	3.3	
▪ Cerebral aneurysm	19	63.3	24	80.0	
▪ Brain tumor	0	0.0	3	10.0	
# Vascular disease					
▪ Varicose veins	8	26.7	9	30.0	2.069 0.492
▪ Atherosclerosis	0	0.0	1	3.3	
▪ HCV	4	13.3	4	13.3	
▪ Peptic ulcer	2	6.7	0	0.0	
▪ hemoridictomy	0	0.0	1	3.3	
▪ D.M	0	0.0	3	10.0	
▪ retinal-detachment	0	0.0	1	3.3	
Previous hospitalization					
▪ <10 days	28	93.3	26	86.7	FE 0.671
▪ ≥10 days	2	6.7	4	13.3	
Duration of hospitalization					
Range	**(0-30)**		**(0-30)**		t=0.329
Mean ± SD	**3.03±7.595**		**3.63±6.467**		P=0.743

Table (3): Distribution of the past surgical history,smoking history and allergy history among the studied groups.

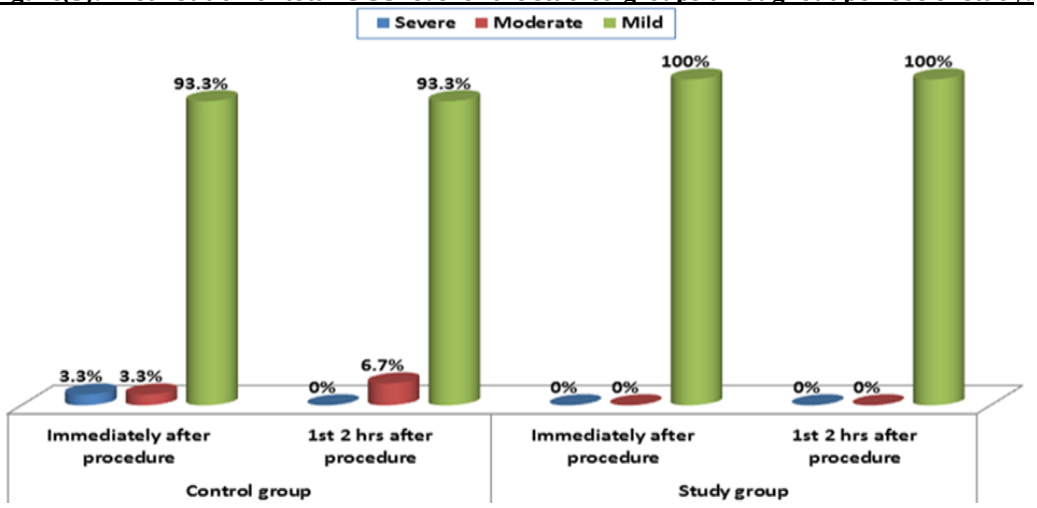
	The studied patients (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
Past surgical history					
▪ Vascular surgery	2	6.7	6	20.0	2.308 0.254
▪ Hernioplasty	3	10.0	2	6.7	
▪ Appendectomy	2	6.7	3	10.0	
▪ Hysterectomy	0	0.0	1	3.3	
▪ tonsillectomy	0	0.0	1	3.3	
▪ exploration	0	0.0	1	3.3	
Smoking history					
▪ Not smoking	9	30.0	11	36.7	**FE 0.0785**
▪ Smoking	21	70.0	19	63.3	
Allergy history					
▪ Medication	1	3.3	0	0.0	-
▪ Shellfish product	0	0.0	0	0.0	
▪ Iodine contrast material	0	0.0	0	0.0	

Table (4): Distribution of the current medical history among the studied groups.

History	The studied patients (n=60)				χ^2 P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
Heart disease					
▪ Myocardial infraction	1	3.3	0	0.0	2.501 0.187
▪ Hypertension	15	50.0	21	70.0	
▪ Heart arrhythmia	1	3.3	0	0.0	
▪ Angina pectoris	1	3.3	0	0.0	
Lung disease					0.0
▪ Bronchitis	1	3.3	0	0.0	1.00
Renal disease					0.235
▪ Renal stone	3	10.0	0	0.0	0.237
Bone disease					0.00
▪ Osteoporosis	0	0.0	1	3.3	1.00
Blood disease	0	0.0	0	0.0	-
# Neurological problem					
▪ Headache	30	100.0	28	93.3	**16.596**

▪ Seizure	3	10.0	9	30.0	**0.001***
▪ Dizziness	30	100.0	20	66.7	
▪ Fainting	17	56.7	16	53.3	
▪ Vomiting	15	50.0	15	50.0	
▪ Tinnitus	3	10.0	3	10.0	
▪ Tingling/Numbness	0	0.0	13	43.3	
▪ proptos	0	0.0	1	3.3	
▪ pho-pho	0	0.0	1	3.3	
▪ Diplopia	0	0.0	3	10.0	
Type of cerebral angiography procedure					
▪ Diagnostic	19	63.3	17	56.7	FE
▪ Interventional	11	36.7	13	43.3	0.792
1.Duration of diagnostic (in minutes) **Range** **Mean ± SD**	**(20-38)** **28.42±6.021**		**(20-40)** **32.35±5.623**		t=2.018 P=0.052
2.Duration of interventional (in hours) **Range** **Mean ± SD**	**(1-3)** **2.64±0.674**		**(2-3)** **2.38±0.506**		t=2.026 P=0.051

Figure(5): Distribution of total GCS level of the studied groups throughout periods of study.



Figure(6): Percentage distribution of numerical ratingscale of the studied groups immediately and 1st 2 hrs after procedure

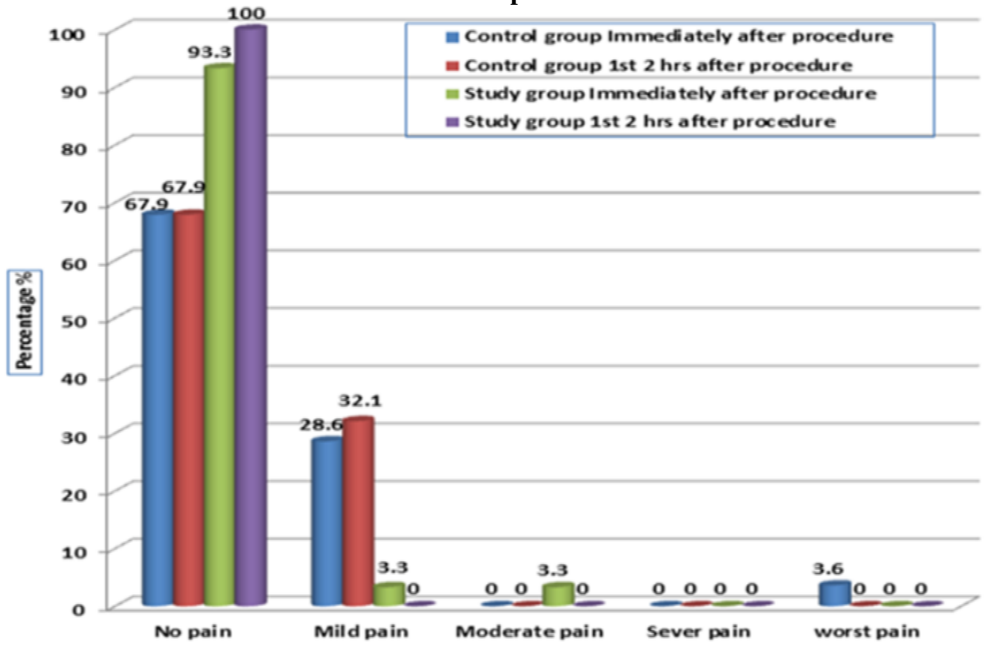


Figure (7): Distribution of extent of hematoma and bleeding of the studied groups throughout period of study.

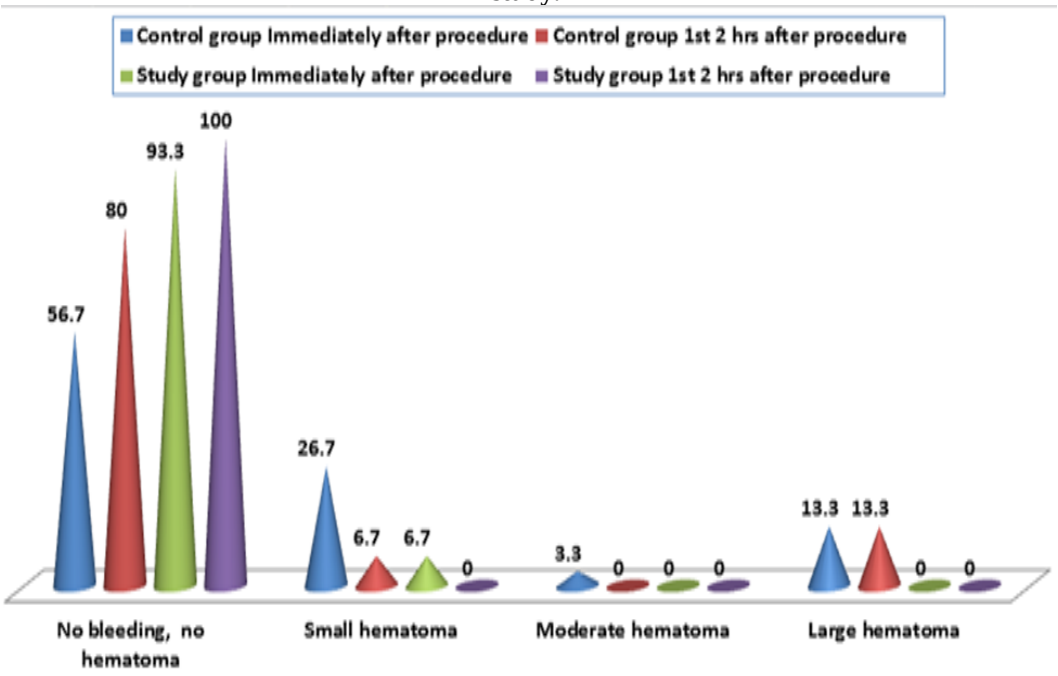


Table (8): Distribution of assessment of access site infection among the studied groups.

Items		The studied patients (n=60)				χ^2 P
		Control group (n=30)		Study group (n=30)		
		N	%	N	%	
1.	Pain at the insertion site	1	3.3	0	0.0	1.017 0.313
2.	Redness	1	3.3	0	0.0	
3.	Hotness	1	3.3	0	0.0	
4.	Tenderness	1	3.3	0	0.0	
5.	Swelling	1	3.3	0	0.0	

IV. Discussion

Concerning socio-demographic characteristics of the study subject's .The results revealed that more than half of patients in control and study group were between (51-55) years old. This finding was agreement with the study of**Fritz et al., (2015)** [32]who found that the mean age of the studied groups was 51 years, **Abd El-Hay and El Mezayen(2015)** [33]who found that the age of the studied groups was male 55 and female 52 years**Kay Sin et al, (2010)** [34]who found that the age of the studied groups was 54 years,and **Kaufmann et al., (2007)** [35]who found that the mean age of the studied groups was 52.9 years**.** On the other hand this result was disagreed by**Qasimet al., (2018)** [36]who found that the mean age of the studied groups was 49.7 years,**Zalan et al., (2018)** [37]who found that the mean age of the studied groups was 58.8 years**, Abd El-Hay etal., (2018)**[38] who found that the age of the studied groups was 49 yearswho found that the age of the studied groups greater than 65 years **.**

Regarding sex, it was found that the majority of the patients in control and study groups were males. This finding was supported by**QasimB et al (2018)** [36] ,**Warnock N et al (2014)** [33]**and Kaufmann T et al (2007)** [35] who found that the majority of the studied groups patient received cerebral angiography procedure were males .Concerning the past medical history, it was found that the most common diagnosis in control and study group was cerebral aneurysm. This finding was agreement with the study of**QasimB et al (2018)** [36]**,Cloft H et al (2011)** [39]**and Yoon D et al (2009)** [40] who found that the most common diagnosis in studied group received cerebral angiography procedure was cerebral aneurysm .

Concerning thecurrent medical history, it was found that the most common diagnosis in control and study group was hypertension. This finding was disagreementwith thestudy of**Fritz S et al (2012)** [41] who

found that the most common diagnosis of studied group patients' cerebral digital subtraction angiography was recurrent ischemia.

Regarding to neurological problem, it was found that that majority of patients in both control and study group was suffered from headache and dizziness. This finding was agreement with **Giovanni et al (2016)** [(42)]and **Connolly et al., (2012)** [(43)]who found that the majority of patient were complained from headache and dizziness. Our study result alsoshowed that about half of patients of control and study group were suffered from vomiting and fainting.This finding was agreement with **Wolfe et al., (2016)** [(44)] and**Kumar et al., (2012)** [(45)]who found that the most of patients receiving cerebral angiography procedure were suffered from vomiting and fainting.

Regarding the duration of cerebral angiography procedure ,the present study was found that the duration of diagnostic angiography in both control and study group ranged between 20-40 minutes and this is results was supported by **Yuichi et al., (2015)**[(46)]**, Chenet al**.,**(2012)** [(47)] **and Orrison et al., (2011)** [(48)] **,** who concluded that the duration of diagnostic angiography was 30 minute and by **Fritz et al, (2015**) [(32)]who found that the duration of diagnostic angiography was 25 minute. On the other hand this result was disagreed with **Kaufmann et al., (2007)**[(35)] who found that the duration of diagnostic angiography was 60 minute.

Regarding level of consciousness of the studied group Results showed that the majority of patient of both control and study group was full conscious and didn't experience altered level of consciousness. This finding was agreement with **Fritz et al., (2012)** [(41)] **,** who found thatthemajority of patient of both control and study groupneither reversible nor transient neurological complications were found..On the other hand this result was disagreement with **Robert et al., (2003)** [(49)]who revealed that only(2.8%) of patients had no alteration of level of consciousness and**Abd El-Hay and El Mezayen(2015**)[(33)]was revealed that only(0.8%) of patients had no alteration of level of consciousness.

Results also show that only (3.3%-0.0% respectively) of patients in both control and study group hadsever alteration of level of consciousness. This finding was agreement with**Qasiem B et al (2018)** [(36)]and**Citron S et al (2011)**[(50)]who found that(2.5%-0.0% respectively) of studied group patients had sever alteration of level of consciousness. On the other hand it disagreement with **Fritz A et al (2015)**[(32)]who revealed that (2.9%- 0.05% respectively) of studied group patients had sever alteration of level of consciousnessas neurological complication of cerebral angiography.

Regarding to localpain at insertion site. Our study result showed that about two third of patients in control group had no pain compared to the majority of patients in study group immediately and first two hours post procedure had no pain .This finding was agreement with **Miller et al., (2012)** [(51)]who support that most of patient receiving cerebral angiography procedurehad no access site pain**.** Our study also show that more than one quarter of patients in control group compared to only (3.3%)of patients in study group had mild pain immediately after procedure and about one third of patients in control group compared to no patients in study group had also mild pain at the first 2 hours after cerebral angiography procedure. Our result also showed that only (7.1%) of patients in control group had worst pain compared to no patients in study group. This finding was disagreement with **AlYousef (2013)** **[(52)]andSanjitet al., (2011**) **[(53)]**who found that (3.1%) of patients had worst pain.

Regarding to hematoma formation and bleeding ,our study results showed that the majority of patients of both control and study group had no bleeding , no hematoma formation immediately post procedure and first 2 hours post procedure.This finding was agreement with **Fritz A et al (2015)** [(32)], and **Kaufmann T et al (2007)** [(35)]who found that **there** is no hematoma formation and no bleeding in majority of cases undergoing cerebral angiography procedure.

Regarding small hematoma formation,result show that about one quarter of patients in control group (26.75), compared to only (6.7%) of patients in study group had small hematoma immediately post procedure and only (6.7%) of patients in control group), compared to nothing (0.0%) of patients in study group had small hematoma first two hours post procedure This finding was disagreement with**Morteza T and et al (2012)[(54)]**who found that only (0.7%-11.7% respectively) of studied group received cerebral angiography procedure had small hematoma as local vascular injury complicationsof angiography procedure

Regarding large hematoma formation ,result show that only (13.3%) of patients in control group had large hematoma , compared to no patients in study group immediately and first 2 hours post procedure .This finding was agreement with**Kaufmannet al (2007)** [(35)]who found that (12.3%) of control group has large hematoma. On the other hand this finding was disagreement with **Abd El-Hay and El Mezayen(2015**)[(33)]**, Cloft et al (2011)** [(39)]and **Franklin et al (2014)**[(55)]who found thatonly (1.8%) of patients had large hematoma and requiring surgical drainage, also this finding was disagreement with**Sanjit et al (2011)** [(53)]who found that (3.0%) had large hematoma ,**Tavakol et al., (2011)** [(56)]who found thatonly(2.8%) and **Miller et al (2012)** [(51)]who found that (only 0.5%) had large hematoma .

Regarding local signs and symptoms of access site infection, results show that only one patient (3.3%) in control group had local signs of infection which include pain at the insertion site, redness, hotness,

tenderness and swelling compared to no patients in study group (0.0%)developed access signs infection.This finding was agreement with **Willinisky et al (2018**) [(57)] ,**Tavakolet al., (2011)** [(56)]and**Abd El-Hay etal., (2018)**[(38)] who found that majority of patients received cerebral angiography procedure had no local access site infection .

V. Conclusions

Based on the results of this study, it could be concluded thatthe protocol of care improve and had positive effect on clinical outcomes of patients receiving cerebral angiographyprocedure. Also, the present study confirm that maintenance of correct body alignment and immobilization of access limb were effective in reducing incidence of access site pain ,the applications of correct manual pressure technique 1-2 cm superior to the femoral access site, for about 15-20 minutes and the use of finger tips technique were effective in reducing incidence of local hematoma formation and bleeding and following universal precaution principle pre , during and post cerebral angiography procedure were effective in reducing incidence of localaccess site infection.

VI. Recommendations

Based on the finding of the current study, the following recommendations are derived:

Recommendation for clinical practice: Development of in service training program for cerebral angiography unit nursing staff of protocol of care that should be applied and carried out as a routine nursing care for all patients receiving cerebral angiography procedure

Recommendation for patients: All patients receiving cerebral angiography procedure and their families both of them should be given verbal and written health instruction about access site home care as dressing removal, physical activity,personal hygiene, and warning signs prior to discharge.

Recommendation for administration Development of written policies that oblige all members of medical and nursing staff of cerebral angiography unit to follow standard nursing and medical care render for patient receiving cerebral angiography procedure.

Recommendations for further research studies: Re-apply the study to a larger number of patients and follow them for a longer period so that we can circulate the results.

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