ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 05 | May - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

CT/MR ANGIOGRAPHY IN NON-TRAUMATIC SUB ARACHNOID HAEMORRHAGE

Radio-Diagnosis

Dr. Milap Kamal Singh Jhajj	Department of Radio-Diagnosis and Imaging/N.S.C.B. Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital,Meerut ,Uttar Pradesh,India.
Dr. Brij Bhushan Thukral	Department of Radio-Diagnosis and Imaging/N.S.C.B. Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital,Meerut ,Uttar Pradesh,India.
Dr. Abhinav Bansal	Assistant Professor department of neurosurgery, N.S.C.B. Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital,Meerut ,Uttar Pradesh, India.
Dr Akansha Singh	Department of Radio-Diagnosis and Imaging/N.S.C.B. Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital,Meerut ,Uttar Pradesh,India.
Dr. Mahesh Kumar Mittal	Department of Radio-Diagnosis and Imaging/N.S.C.B. Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital,Meerut ,Uttar Pradesh,India.
Dr. Sachi Ojha	Department of Radio-Diagnosis and Imaging/N.S.C.B. Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital,Meerut ,Uttar Pradesh,India.

ABSTRACT

Background: Non-traumatic subarachnoid hemorrhage (SAH) is a life threatening neurosurgical emergency with a high mortality rate of approximately 45% and high rates of long term morbidity and mortality in survivors. Computed tomography angiography (CTA) is today the primary method for the detection of intracranial aneurysms. The technique has evolved considerably during the last decade.We undertook this study in the department of radiodiagnosis at N.S.C.B. Subharti Medical College, Meerut to determine the role of Computed Tomographic Angiography and Magnetic Resonance Angiography in evaluation of non traumatic SAH in patients, to determine the cause and location of bleed, to determine the concordance between the surgical finding and CT/MR Angiography findings, and to determine the post treatment clinical follow up. **Materials and methods:** In this prospective study, The study was conducted on 50 patients.The source of data for this study were patients referred to Department of RadioDiagnosis, Imaging and Interventional radiology from OPD/IPD of C.S.S. Hospital,under the aegis of N.S.C.B Subharti Medical College,Meerut .After obtaining clinical history,relevant clinical examination was done.Each patient was explained the entire procedure and purpose in his/her language.CT examinations were done on Phillips Ingenuity 128 Slice .MR examinations were done on General Electric 1.5T. **Results:** Our study concluded that the specificity of CT Angiography was 90.9%, whereas the specificity of MR Angiography was 100% for detection of aneurysms in patients with non traumatic SAH.The positive predictive value of CT Angiography was 97.2%, whereas the positive predictive value of MR Angiography was 100% for detection of aneurysms in patients with non traumatic SAH. The negative predictive value of CT Angiography was 90.9%, whereas the negative predictive value of MR Angiography was 50% for detection of aneurysms in patients with non traumatic SAH. **Conclusion:** In instance of non-traumatic SAH, the diagnostic workup recommends vascular imaging, typically utilizing either CT angiography (CTA) or MR angiography (MRA) to visualize and define the underlying cause (mainly cerebral aneurysms). CTA holds the promise to act as a substitute MR angiography (MRA) which is an efficient tool in the detection of cerebral aneurysms, with a sensitivity and specificity of 85.7% and 100%, respectively.

KEYWORDS

INTRODUCTION

Non-traumatic subarachnoid hemorrhage (SAH) is a life-threatening neurosurgical emergency with a high mortality rate of approximately 45% and high rates of long- term morbidity and mortality in survivors[1]. Thus it can be concluded that a negative NCCT scan obtained within 6 h of initiation of symptom when interpreted by a qualified attending neuroradiologist is sufficient enough to rule out SAH without requiring further testing in case of neurologically intact patient presenting with thunderclap headache[2,3]. The pattern of distribution of extravasated blood products identified on NCCT head is helpful in determining the cause of SAH and is important in guiding further steps in management. Usually, 4 patterns are described which are summarized below.

Suprasellar or central basilar cistern with a peripheral diffuse extension pattern of SAH is usually observed in cases of rupture of saccular aneurysm, whereas SAH which is localized to the cerebral convexities is usually encountered in case of trauma[4].

Nonetheless, the etiology is more probably non-aneurysmal when there is presence of isolated, intrasulcular SAH in the absence of trauma. Higher magnetic fields permit improvements in MRI by providing increased SNRs in the images[5,6]. Scanners with higher magnetic fields are becoming more prevalent, and MR angiographic methods are being developed for use on these systems. Initial results demonstrate excellent image quality. Magnetic resonance imaging (MRI) is a versatile and useful imaging modality that provides a wealth of diagnostic information. It is able to demonstrate, with striking contrast, differences in signal intensities among different soft tissues[7].

We undertook this study in the department of radiodiagnosis at N.S.C.B. Subharti Medical College, Meerut to determine the role of Computed Tomographic Angiography and Magnetic Resonance Angiography in evaluation of non-traumatic SAH in patients, to determine the cause and location of SAH[8,9,10].

AIMS AND OBJECTIVES

1) To determine the role of Computed Tomographic Angiography And Magnetic Resonance Angiography in evaluation Of SAH in non-traumatic patients. .
2) To determine the cause and location of bleed.
3) To determine the concordance between the surgical finding and CT/MR Angiography findings.
4) To determine the post treatment clinical, follow up.

MATERIALS AND METHODS

Institution Ethical committee clearance was obtained before starting the study. Study was carried out in Department of Radio diagnosis, Imaging & Interventional radiology N.S.C.B Subharti Medical College, CSS Hospital, Meerut.

Type Of Study:
Prospective observational study.

Sample Size:
The study was conducted on 50 patients.

Duration Of Study:
The source of data for this study were patients referred to Department

of Radio Diagnosis, Imaging and Interventional radiology from OPD/IPD of C.S.S. Hospital, under the aegis of N.S.C.B Subharti Medical College, Meerut for a period from October 2020 to October 2022 after approval by the university.

Inclusion Criteria
- All patients of any age group referred to the radiology department with clinical suspicion of Non-Traumatic sub arachnoid hemorrhage.
- All patients of any age group with incidental finding of aneurysms on CT/MR scans.

Exclusion Criteria
- Patient who does not give consent.
- Patients with traumatic brain injury
- Any previous brain surgery.
- Contraindicated cases for contrast study.
- Pregnant females.
- Claustrophobia

METHODOLOGY:
- Taking informed consent from the patient.
- After obtaining clinical history (ANNEXURES)relevant clinical examination was done. Each patient was explained the entire procedure and purpose in his/her language.
- CT examinations were done on Phillips Ingenuity 128 Slice.
- MR examinations were done on General Electric 1.5T.
- Imaging and Diagnosis of SAH was made as per departmental protocols.

Protocol Of Ct Angio Imaging

Patients included in the study were subjected to routine CT Angio brain by: Slice thickness :1 mm
Matrix : 512
Pitch : 0.516
Reconstruction : 1mm
Contrast : Nonionic iodinated iohexol(omnipaque) Contrast delay: 50 sec
Rate of injection : 5ml /sec (40 to 70 ml)Patient dose.: 1ml /kg

Protocol Of Mr Angio Imaging

Patients included in the study were subjected to routine MR Angio brain by:
1. TIME OF FLIGHT
2. PHASE CONTRAST

3D-TOF MRA ON 1.5T
WITH REPETITION
TIME(TR)= 23 ECHO
TIME(TE) = 6.9
FLIP ANGLE= 2

Statistical Analysis:
- Data was entered in MS excel and was analyzed for statistical significance.
- Quantitative data is expressed in mean, standard deviation, and difference between two comparable groups was tested by Unpaired t test or Man Whitney U test.
- Qualitative data will be expressed in percentage. Statistical differences between the proportions were tested by Chi square test or Fisher's exact test.
- Sensitivity, specificity, positive predictive value, negative predictive value of CT was calculated. ' P 'value less than 0.05 was considered statistically significant

OBSERVATIONS AND RESULTS

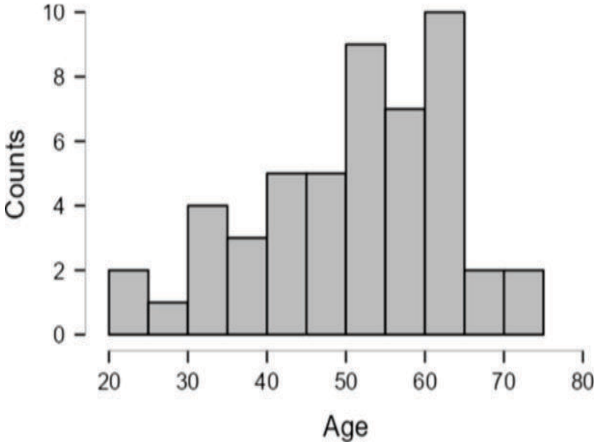
The age of patients in our study ranged from 24 years to 73 years with a mean age of 51.6±12.5 years.

Table 2: Age range of patients

Age Group (in years)	Number of Cases	Percentage
20-24	1	2%
25-29	2	4%
30-34	3	6%
35-39	4	8%
40-44	3	6%
45-49	7	14%
50-54	7	14%
55-59	5	10%
60-64	10	20%
65-69	5	10%
70-75	3	6%

Table 3: Data by age

Measure of Central Tendency	Age
Mode	60
Median	53.5
Mean	51.62
Std. Deviation	12.527
IQR	16.75
Minimum	24
Maximum	73

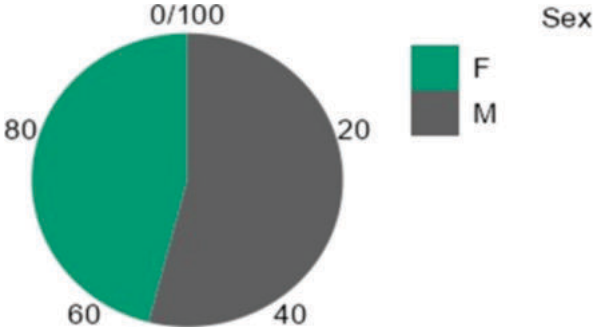


Graph 1

The study population comprised of 27 (54%) males and 23 (46%) females.

Table 4: Distribution of Sex

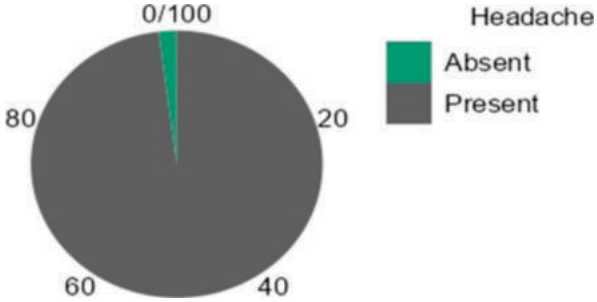
Sex	Frequency	Percent	Valid Percent	Cumulative Percent
F	23	46.000	46.000	46.000
M	27	54.000	54.000	100.000



Graph 2 In our study population 49 patients had headache accounting for 98%.

Table 5: Headache among the study subjects

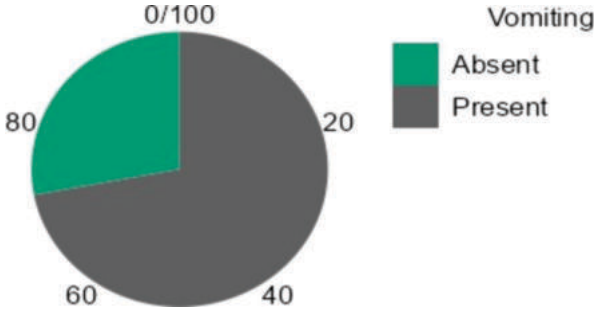
Headache	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	1	2.000	2.000	2.000
Present	49	98.000	98.000	100.000



Graph 3 36 (72%) patients had vomiting.

Table 6: Vomiting among the study subjects

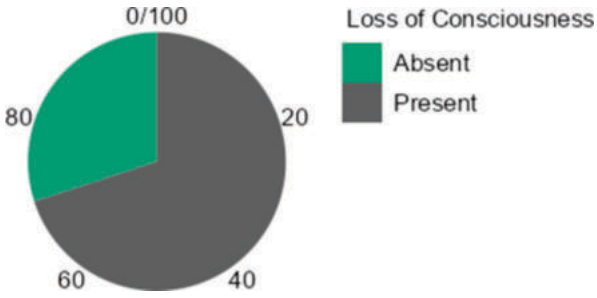
Vomiting	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	14	28.000	28.000	28.000
Present	36	72.000	72.000	100.000



Graph 4 Out of 50 patients, 35 (70%) patients had episode of loss of consciousness.

Table 7: Loss of Consciousness among the study subjects

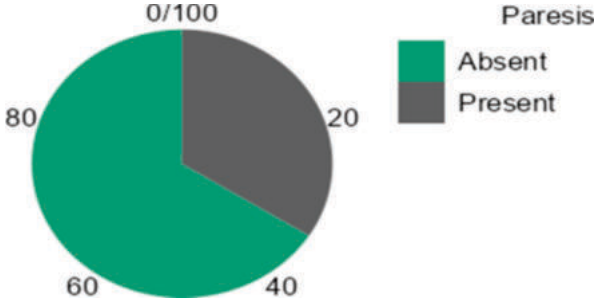
Loss of Consciousness	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	15	30.000	30.000	30.000
Present	35	70.000	70.000	100.000



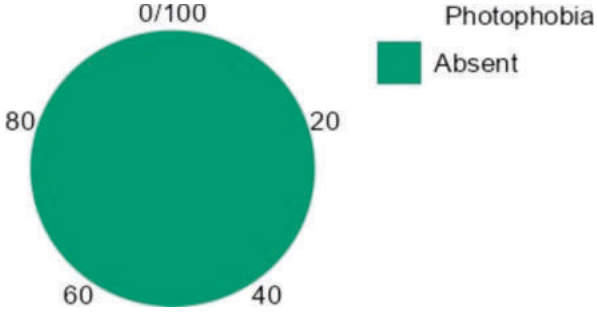
Graph 5 Out of 50 patients, 17 (34%) patients had episode of paresis.

Table 8: Paresis among the study subjects

Paresis	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	33	66.000	66.000	66.000
Present	17	34.000	34.000	100.000



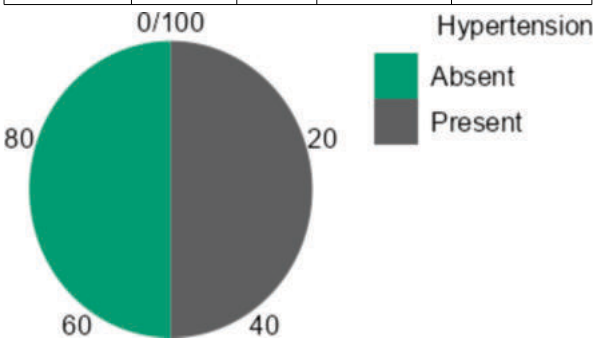
Graph 6 None of the patients had history of photophobia.



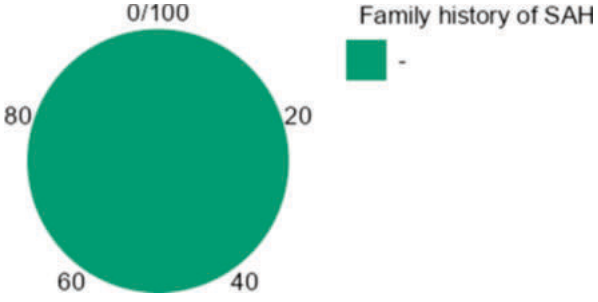
Graph 7 Among our study population, 25 (50%) patients had a history of systemic hypertension.

Table 9: Hypertension among the study subjects

Hypertension	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	25	50.000	50.000	50.000
Present	25	50.000	50.000	100.000



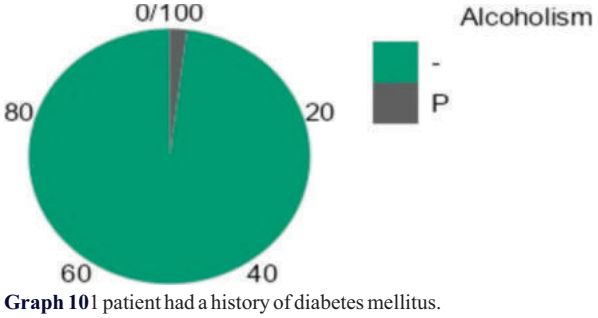
Graph 8 None of the patients had a family history of subarachnoid haemorrhage.



Graph 91 patient (2%) was alcoholic.

Table 10: Alcoholism among the study subjects

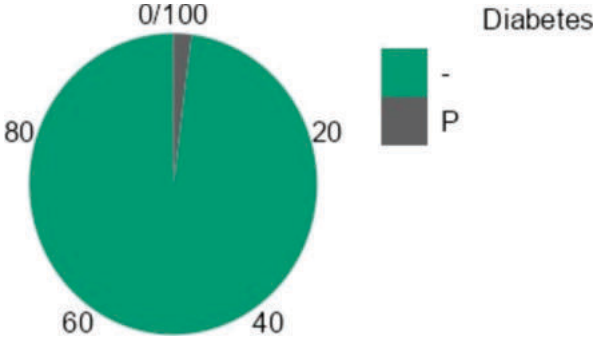
Alcoholism	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	49	98.000	98.000	98.000
Present	1	2.000	2.000	100.000



Graph 101 patient had a history of diabetes mellitus.

Table 11: Diabetes among the study subjects

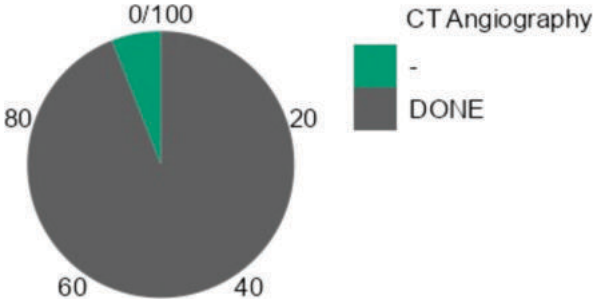
Diabetes	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	49	98.000	98.000	98.000
Present	1	2.000	2.000	100.000



Graph 11CT Angiography was done in 47 (94%) cases.

Table 12: CT Angiography

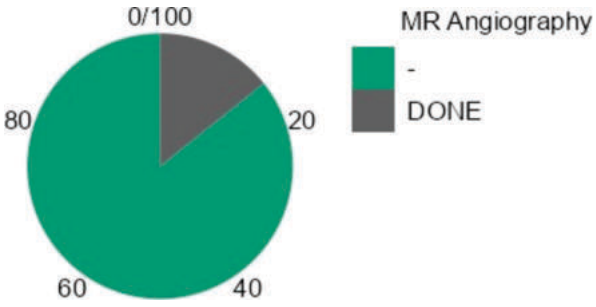
CT Angiography	Frequency	Percent	Valid Percent	Cumulative Percent
NOT DONE	3	6.000	6.000	6.000
DONE	47	94.000	94.000	100.000



Graph 12MR Angiography was done in 7 (14%) cases.

Table 13: MR Angiography

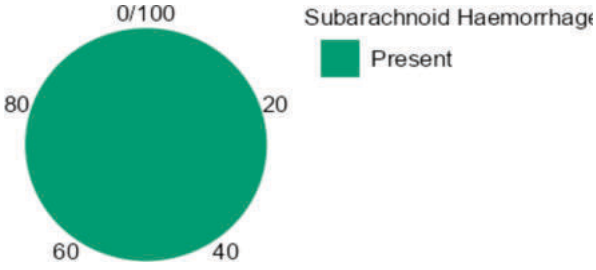
MR Angiography	Frequency	Percent	Valid Percent	Cumulative Percent
NOT DONE	43	86.000	86.000	86.000
DONE	7	14.000	14.000	100.000



Graph 13 CT/MR Angiography revealed a subarachnoid hemorrhage in all of the cases.

Table 14: Subarachnoid Hemorrhage among the study subjects

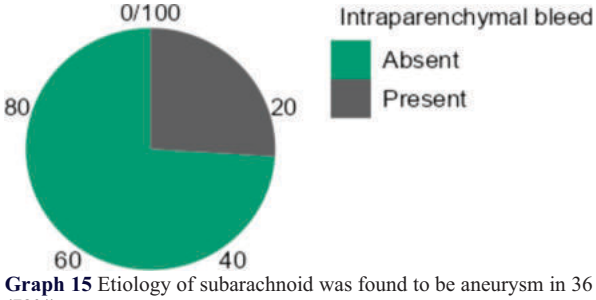
Subarachnoid Hemorrhage	Frequency	Percent	Valid Percent	Cumulative Percent
Present	50	100.000	100.000	100.000



Graph 14 Intraparenchymal bleed was present in 13 (26%) cases.

Table 15: Intraparenchymal bleed among the study subjects

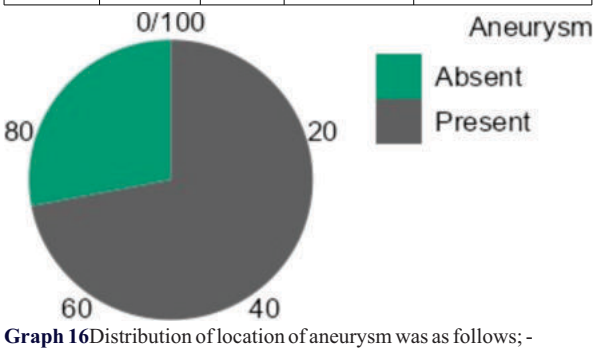
Intraparenchymal bleed	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	37	74.000	74.000	74.000
Present	13	26.000	26.000	100.000



Graph 15 Etiology of subarachnoid was found to be aneurysm in 36 (72%) cases.

Table 16: Aneurysm among the study subjects

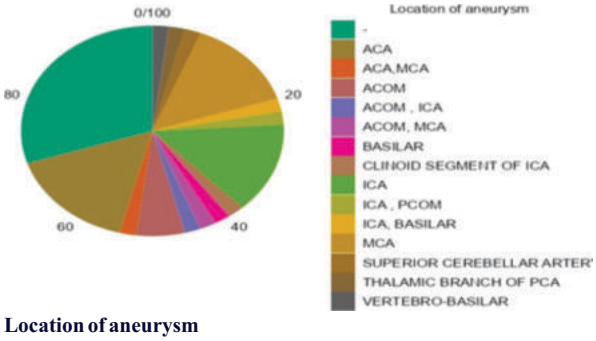
Aneurysm	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	14	28.000	28.000	28.000
Present	36	72.000	72.000	100.000



Graph 16 Distribution of location of aneurysm was as follows; -

Table 17: Distribution of Location of aneurysm

Location of aneurysm		Frequency Percent	Valid Percent	Cumulative Percent
-	15	30.000	30.000	30.000
ACA	8	16.000	16.000	46.000
ACA, MCA	1	2.000	2.000	48.000
ACOM	3	6.000	6.000	54.000
ACOM, ICA	1	2.000	2.000	56.000
ACOM, MCA	1	2.000	2.000	58.000
BASILAR	1	2.000	2.000	60.000
CLINOID SEGMENT OF ICA	1	2.000	2.000	62.000
ICA	7	14.000	14.000	76.000
ICA , PCOM	1	2.000	2.000	78.000
ICA, BASILAR	1	2.000	2.000	80.000
MCA	7	14.000	14.000	94.000
SUPERIOR CEREBELLAR ARTERY	1	2.000	2.000	96.000
THALAMIC BRANCH OF	1	2.000	2.000	98.000
PCA				
VERTEBRO-BASILAR	1	2.000	2.000	100.000
Missing	0	0.000		
Total	50	100.000		

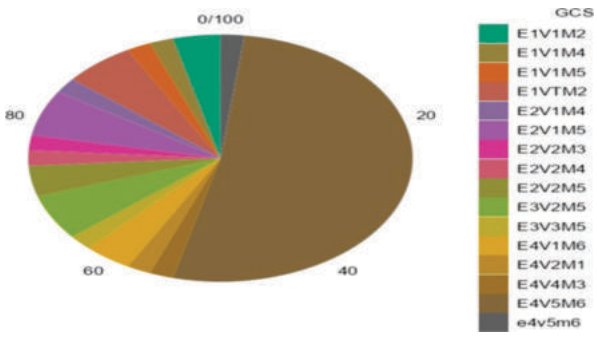


Location of aneurysm

Table 18: GCSamong the study subjects

GCS	Frequency	Percent	Valid Percent	Cumulative Percent
E1V1M2	2	4.000	4.000	4.000
E1V1M4	1	2.000	2.000	6.000
E1V1M5	1	2.000	2.000	8.000
E1VTM2	3	6.000	6.000	14.000
E2V1M4	1	2.000	2.000	16.000
E2V1M5	3	6.000	6.000	22.000
E2V2M3	1	2.000	2.000	24.000
E2V2M4	1	2.000	2.000	26.000
E2V2M5	2	4.000	4.000	30.000
E3V2M5	3	6.000	6.000	36.000
E3V3M5	1	2.000	2.000	38.000
E4V1M6	2	4.000	4.000	42.000
E4V2M1	1	2.000	2.000	44.000

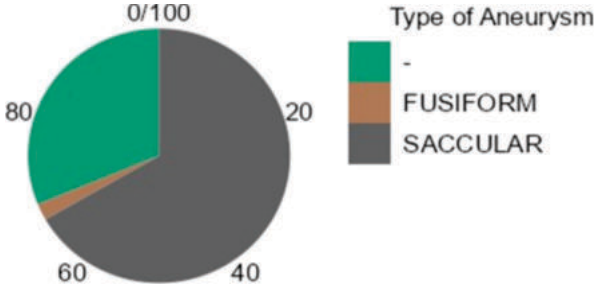
E4V4M3	1	2.000	2.000	46.000
E4V5M6	26	52.000	52.000	98.000
E4V5M6	1	2.000	2.000	100.000



Graph 18 On CT/MR Angiography, out of the 36 cases of aneurysmal subarachnoid haemorrhage the type of aneurysm was identified as saccular in 32 (64%) cases and fusiform in 1 case.

Table 19: Distribution of type of Aneurysm

Type of Aneurysm	Frequency	Percent	Valid Percent	Cumulative Percent
FUSIFORM	1	2.000	2.000	2.000
SACCULAR	32	64.000	64.000	66.000
Unidentified	3	6.000	6.000	72.000
Absent	14	28.000	28.000	100.000



Graph 19 Size of Aneurysm were as follows:-

Table 20: Aneurysm Sizeamong the study subjects

Aneurysm Size	Frequency	Percent	Valid Percent	Cumulative Percent
-	17	34.000	34.000	34.000
1.3X1MM	1	2.000	2.000	36.000
13X13X18MM	1	2.000	2.000	38.000
15.8X15.6	1	2.000	2.000	40.000
15X11MM	1	2.000	2.000	42.000
19X14MM	1	2.000	2.000	44.000
2.X1.9MM	1	2.000	2.000	46.000
3.3X2.8MM	1	2.000	2.000	48.000
3.4X3.4	1	2.000	2.000	50.000
3.5X3.3MM	1	2.000	2.000	52.000
3.8X2.9MM	1	2.000	2.000	54.000
3.9X2.6MM	1	2.000	2.000	56.000
4.4X4.2 MM	1	2.000	2.000	58.000
4.5X2.9MM	1	2.000	2.000	60.000
4X5MM	1	2.000	2.000	62.000
5.2X5.7MM	1	2.000	2.000	64.000
5.3X3MM	1	2.000	2.000	66.000
5X4MM	3	6.000	6.000	72.000
6X3 MM	1	2.000	2.000	74.000
6X4MM	1	2.000	2.000	76.000
6X5MM	1	2.000	2.000	78.000

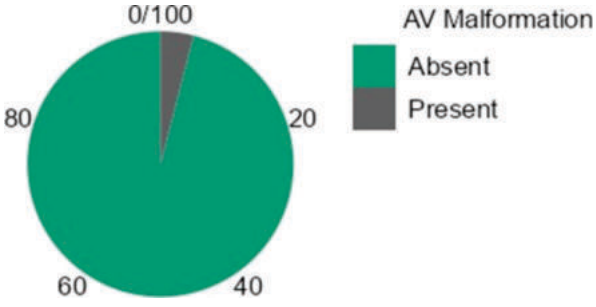
Table 20: Aneurysm Sizeamong the study subjects

Aneurysm Size	Frequency	Percent	Valid Percent	Cumulative Percent
6X6.5MM	1	2.000	2.000	80.000
7.2X6.3MM	1	2.000	2.000	82.000
7.5X5.0MM	1	2.000	2.000	84.000
7.5X5.2MM	1	2.000	2.000	86.000
7X6.63MM	1	2.000	2.000	88.000
7X7.1MM	1	2.000	2.000	90.000
8.8X7.7MM	1	2.000	2.000	92.000
8X5MM	1	2.000	2.000	94.000
8X6MM	1	2.000	2.000	96.000
9.3X9.2MM	1	2.000	2.000	98.000
9X6MM	1	2.000	2.000	100.000

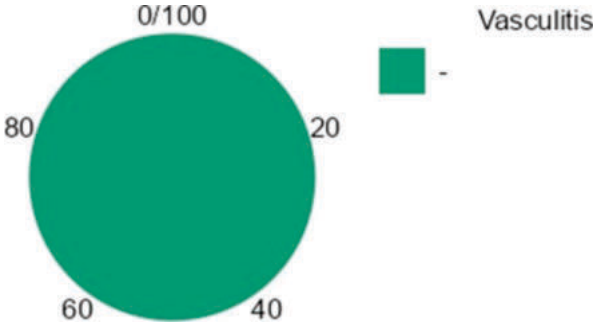
AV Malformations were seen in 2 (4%) cases.

Table 21: AV Malformation among the study subjects

AV Malformation	Frequency	Percent	Valid Percent	Cumulative Percent
Absent	48	96.000	96.000	96.000
Present	2	4.000	4.000	100.000



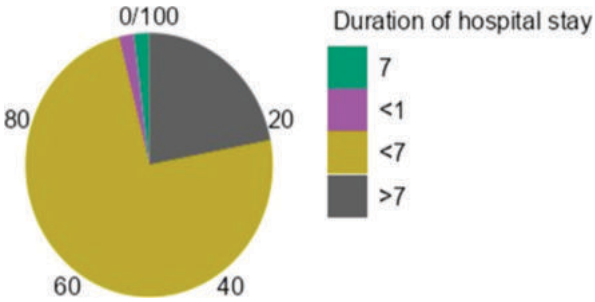
None of the patients in our study had vasculitis.



Graph 21 Duration of hospital stay among patients included in our study was as follows:-

Table 22: Duration of hospital stay among the study subjects

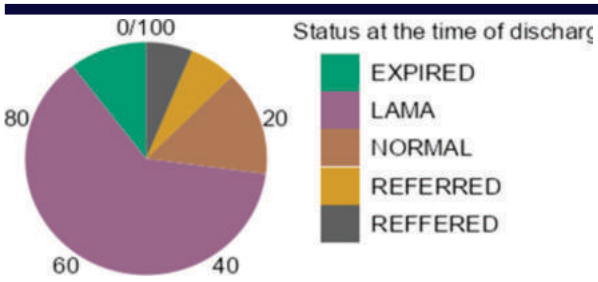
Duration of hospital stay	Frequency	Percent	Valid Percent	Cumulative Percent
7	1	2.000	2.000	2.000
<1	1	2.000	2.000	4.000
<7	37	74.000	74.000	78.000
>7	11	22.000	22.000	100.000



Status of patients at the time of discharge was as follows:-

Table 23: Status at the time of discharge among the study subjects

Status at the time of discharge	Frequency	Percent	Valid Percent	Cumulative Percent
EXPIRED	5	10.000	10.417	10.417
LAMA	30	60.000	62.500	72.917
NORMAL	7	14.000	14.583	87.500
REFERRED	3	6.000	6.250	93.750
REFFERED	3	6.000	6.250	100.000



Graph 23

Representative Images

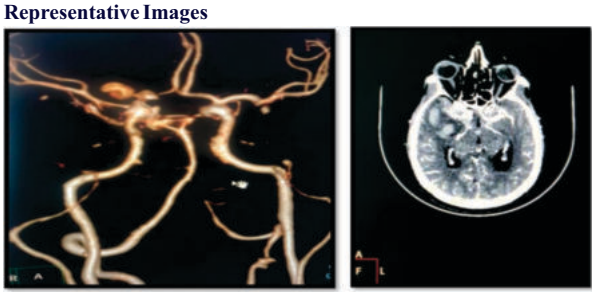


Figure 32: A 57 year male with history of head ache with left sided weakness and altered sensorium. CT Angio Axial image (a) Demonstrate a large trilobed aneurysm of size 13x13x18mm arising from cliniod/opthalamic portion of right internal cerebral artery and right ophthalmic artery arising from thr aneurysm and large hematoma in right temporal lobe with sub arachnoid hemorrhage (b) 3D reconstructed image demonstrating the trilobed aneurysm arising from clinoid part of right ICA. . B. Trilobed aneurysm demonstrated on 3D –reconstructed angiogram.

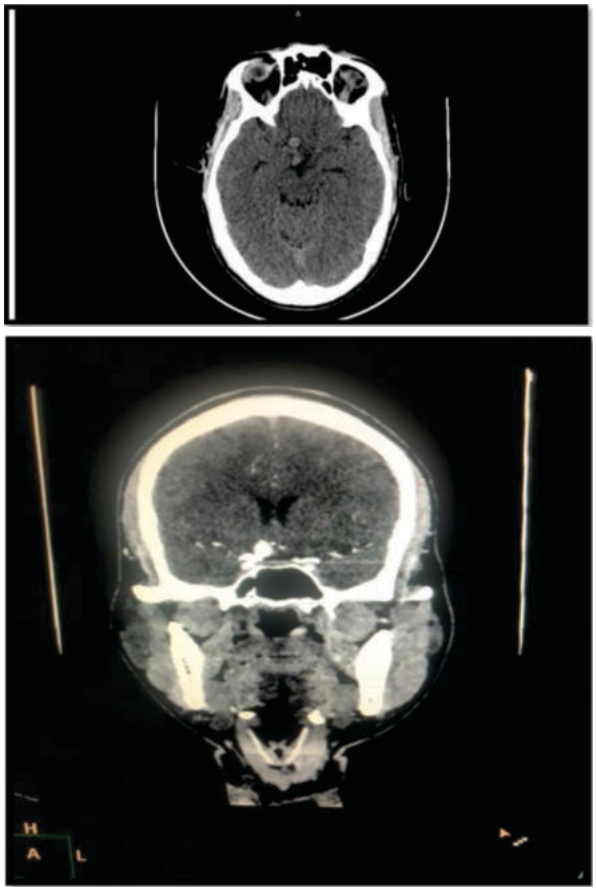


Figure 33: A 27 year male patient came with the complain of headche since one month, presented with altered senosorium (A) Non contrast axail section shows well defined hyperdense area of size9x9mm (B) CT Angiogram coronal section- reveals focal contrast filled outpouching in the ICA in C5 segment with adjacent blood atteuating hyperdensity in basal cistern.

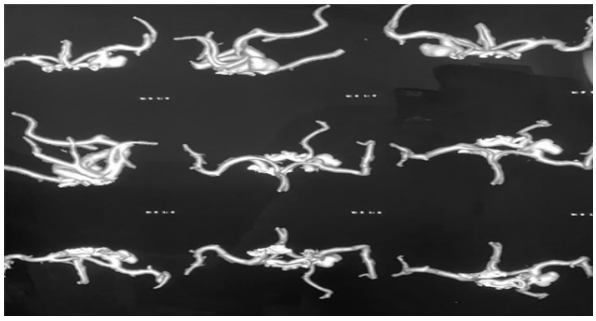


Figure 34: A 60 year female patient came with the complains of sudden loss of consciousness and vomiting. 3D CT ANGIO reveals saccular outpouching of size 9x6mm at supra clinoid segment of left ICA.

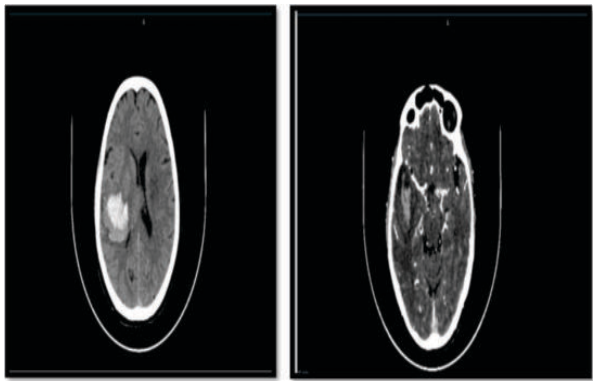


Figure 35: A 55 year female patient came with the complain of head ache and vomiting since one day (a) A large intraparenchymal bleed inn right temporal lobe with mass affect and mid line shift with subarachnoid hemorrhage. (B) CT Angiography reveals Small focal outpouching of size .45x.29mm in right capsule- thalamic region

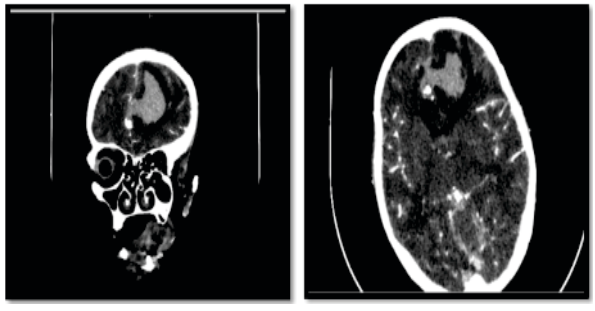


Figure 36: A 63 year female patient with complains of loss of consciousness with history of headache from past month. Image (a) &(b) CT Angiography axial sections reveals focal outpouching in the A4 segment in the right anterior cerebral artery.

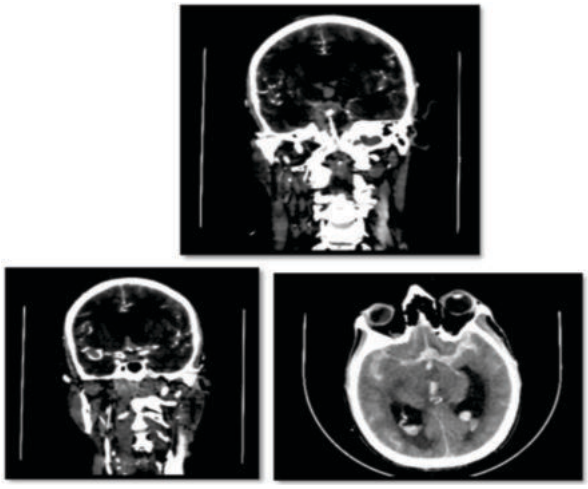


Figure37: a 60 year MALE with complain of headache since 1 day

Presence of aneurysm arising from supraclinoid portion of right ICA & basilar artery just before bifurcation with diffuse subarachnoid hemorrhage & intraventricular hemorrhage Atheromatous plaque in cavernous, clinoid & supraclinoid portion of bilateral ICA

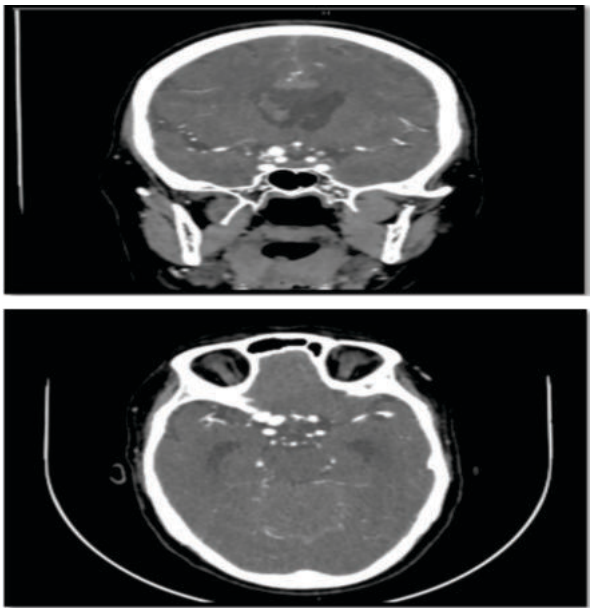
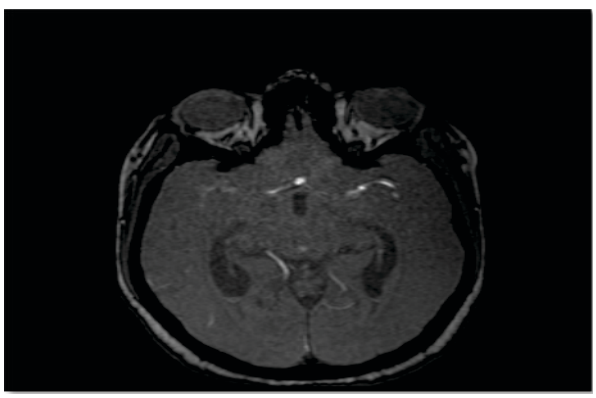


Figure 38: a 60 year female patient with complains of sudden loss of consciousness A saccular aneurysm measuring ~ 7.5 x 5.2 mm arising from the ophthalmic segment of right internal carotid artery. The aneurysmal neck size is 2.4 mm. Intraparenchymal hemorrhagic bleed noted along the corpus callosum and extending into the bilateral lateral ventricles, 3rd ventricle and 4th ventricle with effacement of adjacent frontal sulcal space.

Figure 39: A 57 year female patient with complain of headache and loss of conciuosness. Small saccular aneurysm in proximal part of M1 segment of left middle cerebral artery just distal to its origin. Subarachnoid hemorrhage in bilateral fronto- temporo-parietal sulcal spaces, bilateral sylvian fissures, interpeduncular space and ambient cisterns with intraventricular extension in bilateral lateral ventricle and 3rd ventricle.



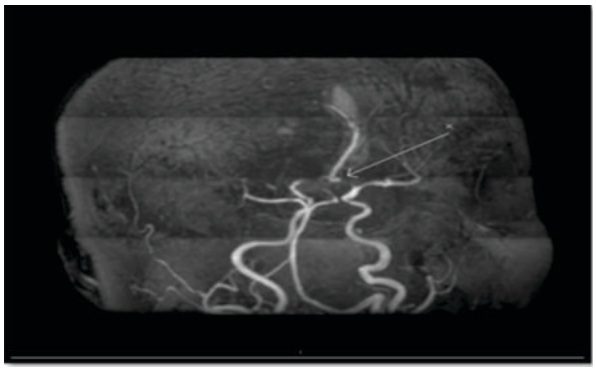


Figure 40: A 53 year female with complains of head ache since 7 days and bilateral upper and lower limb weakness. MR ANGIO & TOF reveals An aneurysm arising of size 3x3.1mm from anterior communicating artery and another small aneurysm arising from proximal segment of M2 segment.

DISCUSSION

The present study was conducted at NCSB Subharti Medical College, Meerut to study the role of CT/MR Angiography in patients with spontaneous/nontraumatic subarachnoid haemorrhage. Patients with a non-traumatic/spontaneous subarachnoid haemorrhage mostly present primarily to their general practitioner. Since subarachnoid haemorrhage is not a common occurrence in general practice, it can be a diagnostic as well as management challenge . For detection of aneurysm as a cause of non traumatic subarachnoid, the sensitivity of CT Angiography was 97.2%, whereas the sensitivity of MR Angiography was 85.7%. The specificity of CT Angiography was 90.9%, whereas the specificity of MR Angiography was 100%. The positive predictive value of CT Angiography was 97.2%, whereas the positive predictive value of MR Angiography was 100%. The negative predictive value of CT Angiography was 90.9%, whereas the negative predictive value of MR Angiography was 50%.The findings of our study were similar to the study conducted by Uysal E et al (2005) to investigate the diagnostic accuracy of spiral CT angiography in detection of cerebral aneurysms in cases with acute SAH which found that CT Angiography had a sensitivity of 97% and specificity of 100% in diagnosis of intracranial aneurysms. The Therefore, Spiral CT Angiography is a highly accurate, relatively economical and non-invasive imaging method to aid in diagnosis of intracranial aneurysms in cases with subarachnoid haemorrhage and can be used as a safe alternative method to DSA when emergency surgery is needed.

CT Angiography was done in 47 (94%) cases. MR Angiography was done in 7 (14%) cases. CT/MR Angiography revealed a subarachnoid haemorrhage in all of the cases. Intraparenchymal bleed was present in 13 (26%) cases. Etiology of subarachnoid was found to be aneurysm in 36 (72%) cases. Out of the 36 cases of aneurysmal subarachnoid haemorrhage the type of aneurysm was identified as saccular in 32 (64%) cases and fusiform in 1 case. AV Malformations were seen in 2 (4%) cases.

None of the patients in our study had vasculitis. Surgery revealed aneurysms in 39 patients and no aneurysm in 11 patients.An MRA scan takes less time than traditional catheter angiography and requires no recovery period. MRA is less costly than catheter angiography. Collaboration with shared indication and decision making and communication are key elements for a good outcome. The MRA is usually recommended by a specialist treating a specific disorder. It is important to orient the patient about the procedure as some patients are afraid of the machine or have physical limitations. Some patients are unable to lie flat or stay in the position for a long period of time.It is very important for the referring physician to clearly annotate the indications for the study, so the neuroradiologist and MRA technician performs the preferred technique to yield the best diagnostic outcomes

SUMMARY

- The age of patients in our study ranged from 24 years to 73 years with a mean age of 51.6±12.5 years.
- The study population comprised of 27 (54%) males and 23 (46%) females.
- With respect to symptomatology, 49 (98%) patients had headache, 36 (72%) patients had vomiting, 35 (70%) patients had episode of loss of consciousness, 17 (34%) patients had episode of paresis,

none of the patients had history of photophobia.

- With respect to past history 1 patient had diabetes mellitus, 25 (50%) patients had a history of systemic hypertension, 1 patient (2%) was alcoholic, none of the patients had a family history of subarachnoid haemorrhage.
- CT Angiography was done in 47 (94%) cases.
- MR Angiography was done in 7 (14%) cases.
- The sensitivity of CT Angiography was 97.2%, whereas the sensitivity of MR Angiography was 85.7% for detection of aneurysms in patients with non traumatic SAH.
- The specificity of CT Angiography was 90.9%, whereas the specificity of MR Angiography was 100% for detection of aneurysms in patients with non traumatic SAH.
- The positive predictive value of CT Angiography was 97.2%, whereas the positive predictive value of MR Angiography was 100% for detection of aneurysms in patients with non traumatic SAH.
- The negative predictive value of CT Angiography was 90.9%, whereas the negative predictive value of MR Angiography was 50% for detection of aneurysms in patients with non traumatic SAH.

CONCLUSIONS

In instance of non-traumatic SAH, the diagnostic workup recommends vascular imaging, typically utilizing either CT angiography (CTA) or MR angiography (MRA) to visualize and define the underlying cause (mainly cerebral aneurysms).CTA holds the promise to act as a substitute MR angiography (MRA) which is an efficient tool in the detection of cerebral aneurysms, with a sensitivity and specificity of 85.7% and 100%, respectively. Despite being time consuming, MRA has many desirable attributes and hence has proven to be an efficient investigation in the diagnosis and workup of patients with non traumatic SAH..

REFERENCES

1. Cohen-Gadol AA, Bohnstedt BN. Recognition and evaluation of nontraumatic subarachnoid hemorrhage and ruptured cerebral aneurysm. American Family Physician. 2013 Oct 1;88(7):451-6.
2. Huhtakangas J, Lehto H, Seppä K, Kivisaari R, Niemelä M, Hernesniemi J, Lehecka M. Long-term excess mortality after aneurysmal subarachnoid hemorrhage: patients with multiple aneurysms at risk. Stroke. 2015 Jul;46(7):1813-8.
3. Carpenter CR, Raja AS, Brown MD. Overtesting and the downstream consequences of overtreatment: implications of ―preventing overdiagnosis for emergency medicine. Academic Emergency Medicine. 2015 Dec;22(12):1484- 92.
4. Dubosh NM, Bellolio MF, Rabinstein AA, Edlow JA. Sensitivity of early brain computed tomography to exclude aneurysmal subarachnoid hemorrhage: a systematic review and meta-analysis. Stroke. 2016 Mar;47(3):750-5.
5. Wu WT, Pan HY, Wu KH, Huang YS, Wu CH, Cheng FJ. The Ottawa subarachnoid hemorrhage clinical decision rule for classifying emergency department headache patients. The American journal of emergency medicine. 2020 Feb 1;38(2):198-202.
6. Rosen DS, Macdonald RL. Subarachnoid hemorrhage grading scales. Neurocritical care. 2005 Apr;2(2):110-8.
7. Salmela MB, Mortazavi S, Jagadeesan BD, Broderick DF, Burns J, Deshmukh TK, Harvey HB, Hoang J, Hunt CH, Kennedy TA, Khalessi AA. ACRappropriateness criteria® cerebrovascular disease. Journal of the American College of Radiology. 2017 May 1;14(5):S34-61.
8. Dankbaar JW, de Rooij NK, Velthuis BK, Frijns CJ, Rinkel GJ, van der Schaaf IC. Diagnosing delayed cerebral ischemia with different CT modalities in patients with subarachnoid hemorrhage with clinical deterioration. Stroke. 2009 Nov 1;40(11): 34938.
9. Backes D, Rinkel GJ, Kemperman H, Linn FH, Vergouwen MD. Time- dependent test characteristics of head computed tomography in patients suspected of nontraumatic subarachnoid hemorrhage. Stroke. 2012 Aug;43(8):2115-9.
10. Mitchell P, Wilkinson ID, Hoggard N, Paley MN, Jellinek DA, Powell T, Romanowski C, Hodgson T, Griffiths PD. Detection of subarachnoid haemorrhage with magnetic resonance imaging. Journal of Neurology, Neurosurgery & Psychiatry. 2001 Feb 1;70(2):205-1