Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Science and Technology

Role of Computed Tomography in Evaluation of findings in Stroke Patients

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DOI: 10.36347/sjams.2022.v10i03.001 | **Received:** 19.01.2022 | **Accepted:** 24.02.2022 | **Published:** 04.03.2022

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Abstract **Original Research Article**

Study the role of computed tomography in evaluation cerebrovascular disease, where the total number of patients was 237 adult patients their age ranged from 19 up to 96 years, and male was 156 patients while the female 81 patients. Study was conducted in Aliaa Specialist Hospital in period from August 2018 to February 2020, where the machine was Toshiba CT scan, Avilion 64slice multi-detector. The results show that correlate between computed tomography appearance with age group were the appearance that revealed from computed tomography was 8 diseases were the diagnose hypodense area was dominant with 75 patients and the diagnose right basal ganglia with just three patients. Finally; the correlation between final diagnosis with the age group for all patients where the final diagnoses divided to 8 groups were the diagnose patients with hemorrhage was dominant with 86 patients than white matter ischemia with 49 patients while the diagnose Bilateral hypodense areas with the lowest number of patients with just 4 patients. The analysis of variance for all variables with patient's age were the p.value show that there is no significant difference between patients age with history, type of CVA, site, appearance and diagnose of computed tomography.

Keywords: Cerebrovascular Disease, Clinical Findings, Computed Tomography, Stroke patients.

INTRODUCTION

Stroke is a generic term that describes a clinical event characterized by sudden onset of neurological deficit. Stroke syndromes have significant clinical and pathological heterogeneity that is reflected in their underlying gross pathologic and imaging appearance.

Ischemic stroke currently represents one of the leading causes of severe disability and mortality in the western world and its early detection is extremely important [1, 2]. Several investigations have explored the risk factors for the development of ischemic events by confirming that the atherosclerotic disease of the carotid artery represents an important cause of the strokes [3, 4].

Noninvasive imaging plays an important role in identifying risk factors for stroke. Evaluation of the carotid arteries with invasive catheter arteriography is being replaced by duplex ultrasound (US), CT angiography (CTA), MR angiography (MRA) and time resolved contrast enhanced MRA (CEMRA), all of which show high diagnostic accuracy for internal carotid artery (ICA) stenoses of 70%–99% [5-8]. US is the most cost-effective screening method, increasingly combined with CE-MRA for complete evaluation. Measurement of reduced cerebral vascular reserve (CVR) or elevated oxygen extraction fraction (OEF) by using nuclear, CT and MR imaging techniques may further define risk but these methods are not yet in wide clinical use. Computed Tomographic is one of the most accurate methods available for identifying and localizing an infraction within the brain. Ischemic infarction, hemorrhagic infarction and intracerebral hematoma are usually differentiated. CT also permits identification of the acute and chronic sequence that may develop after a sequence of infarction. These include, in acute phase, brain swelling and conversion of a bland infarct into hemorrhagic infarct and in chronic phase, cystic parenchymal change, cortical atrophy and focal ventricular dilation [9].

The typology of stroke can be broadly classified into two categories:1) hemorrhagic stroke due to rupture of a blood vessel,and2)ischemic stroke or infarct due to an interruption of blood supply. Of these, ischemic stroke occurs more often, and it is also possible for the two Types of strokes to co- occur [10]. Computed tomography (CT) and magnetic resonance

imaging (MRI) are the two modalities regularly used for stroke lesion mapping. ThoughtSpot unusual For MR anatomic all images (usuallyT1-andT2-weightedimages) to be acquired in stroke patients participating in clinical research protocols, CT is the preferred procedure in the acute stroke unit, typically offering the advantages of speed, cost, and reduced exclusion criteria relative to MR imaging [11]. On the other hand, MR imaging is earlier at detecting ischemic stroke, and if available, is therefore performed in many cases swath a negative CT scan. In CT images, a hemorrhage appears as a bright region (hyper-intense).

Displaying sharp contrast against its surroundings. Conversely, an ischemic stroke appears as a dark region (hypo-intense), with the contrast relative to its surround depending on the time elapsed since the Stroke occurred. The standard method for lesion identification is currently the manual delineation of abnormal brain tissue by trained professionals [12]; however, this method has a number of disadvantages [13]. The aims of our study were to evaluation of findings in stroke patients, to determine the location and arterial territories involved of infarct with respect to onset of clinical symptoms and to detect other causes simulating stroke.

METHODOLOGY

The study was conducted in Aliaa Specialist Hospital, Omdurman city, Sudan in the period from August 2018 to February 2020. It was chosen as the most appropriate place to conduct this type of study because there is an emergency department in the hospital with a high capacity and the hospital had a new CT with a new advanced software program. Where the specification of the machine Toshiba CT scan, Avilion 64slice multi-detector. Tube 2.0 MHU MX 135, 3.9 million mAs, Software level 6.03, Fast scan 1.0 sec, Helical plus, 3D max, Power 200 mA, Acquisition, Helical 60 Max, Smart pre, It has voltage from 70- 150 kV and four options of mA, High (200).

SAMPLE SIZE

The sample size contained 237 Sundanese patients whose ages ranged from 19 to 96 years; all the patients were admitted to the hospital with suspected CVA disease and sent to the medical imaging department for CT brain.

DATA COLLECTION

Data were collected from CT reports within electronic patient files of the hospital information system (HIS) then collected in a datasheet which is prepared specially for this task; it included all information needed to formulate this study such as patient age, gender, pathology, etc…

Non-enhanced contrast CT scan: non-enhanced contrast scanning has been applied after activating a stroke code, for two reasons: highly sensitivity of a non CECT scan for the depiction of hemorrhagic lesion and detection of hemorrhage or other possible mimics of stroke (e.g., neoplasm, arteriovenous malformation).

Computed tomography parameters

Scout: Lateral, Landmark: OML, Gantry tilt: 0º to 10º.from OM, Slice plane: Axial, Breath-hold: None, I.V. Contrast: As required (40-50ml), Start location: Foramen Magnum, End location: Vertex, Slice thickness: 5 mm (from skull base to tentorial rim), 10 mm (from tentorial rim to vertex) and Filming: Soft tissue window and Bone window.

RESULTS

Study the role of computed tomography in evaluation cerebrovascular disease, where the total number of patients was 237 adult patients their age ranged from 19 up to 96 years, and male was 156 patients while the female 81 patients and the results presents below:

Table-1: Show correlation between type of CVA with age group for all patients:

Type of CVA	Age Group								Total
	19-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100	
Infraction	7	12	7	17	30	43	15	2	133
Ischemic	2	0	2	1	5	12	12	1	35
Hemorrhage	11	14	8	4	10	12	9	1	69
Total	20	26	17	22	45	67	36	4	237

Table-2: Show correlation between CT appearances with age group

CT Appearance	Age Group								Total
	19-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100	
Left frontal low density with cerebral infarction	2	4	2	2	7	6	1	0	24
white matter ischemic changes	0	1	4	3	7	18	12	0	45
Large hypodense area is noted consistent with infarct	2	1	3	5	7	9	6	2	35

	hemorrhage	2	4	2	0	5	4	2	0	19
	Bilateral peri-ventricular with white matter ischemia	2	4	1	3	3	7	6	0	26
	Hypodense area noted	9	10	4	7	14	22	7	2	75
	Hematoma	3	2	1	1	0	1	2	0	10
	There is lacunar infarct at the right basal ganglia	0	0	0	1	2	0	0	0	3
Total		20	26	17	22	45	67	36	4	237

Table-3: Show correlation between final diagnose with age group for all patients:

Final Diagnose * Age Group Crosstabulation									
Final Diagnose	Age Group								Total
	19-29	30-39	40-49	50-59	60-69	70-79	80-89	90-100	
Acute right frontal infarction	1	1	3	2	4	6	2	0	19
white matter ischemia	4	2	3	2	11	14	10	3	49
Bilateral old cerebral infarcts	10	9	3	6	14	24	20	0	86
"Left sided gliotic area with hemorrhage	2	6	5	4	3	4	1	0	25
"Left opccipital infract white matter ischemia "	1	6	2	3	10	14	3	0	39
Chronic left sided epidural hematoma	1	1	1	2	0	2	0	0	7
Acute left cerebral infarction	0	1	0	3	2	1	0	1	8
Bilateral hypodense areas are noted in para-ventricular regions	1	0	0	0	1	2	0	0	4
Total	20	26	17	22	45	67	36	4	237

Table-4: Show analysis of variance for all variables with patient's age:

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
History	Between Groups	2081.484	61	34.123	1.150	.241
	Within Groups	5193.234	175	29.676		
	Total	7274.717	236			
Type of CVA	Between Groups	57.890	61	.949	1.309	.090
	Within Groups	126.828	175	.725		
	Total	184.717	236			
Final Diagnose	Between Groups	176.387	61	2.892	1.307	.092
	Within Groups	387.191	175	2.213		
	Total	563.578	236			

DISCUSSIONS

Role of computed tomography in evaluation of findings in stroke patients, where the frequency distribution for the age group to all patients was divided into 8 groups starting from 19 up to 100 years. Were the more frequent age group being 70-79 years with 67 patients than the age group 60-69 years with 45 patients while the age group 90-100 was shown the lowest frequency with 4 patients. Table 1. shows a correlation between the type of CVA with the age group for all patients where the type of CVA was three types infraction, ischemic, and hemorrhage. And the age group was 8 groups. The patients with infraction type were 133 patients; ischemic patients were 35 while the hemorrhage was for 69 patients. Table 4. Show a correlation between the site with age group where the number of sites was 13 area where the patients with no clinical data were just one patient, while the patients with different sites were 236 patients.

Table 2. Shows a correlation between CT appearance with age group where the appearance that was revealed from computed tomography was 8 diseases where the diagnose hypodense area was dominant with 75 patients and the diagnose right basal ganglia with just three patients.

Table 3. show a correlation between the final diagnosis with the age group for all patients where the final diagnoses divided into 8 groups where the diagnosed patients with hemorrhage was dominant with 86 patients than white matter ischemia with 49 patients while the diagnose Bilateral hypodense areas with the lowest number of patients with just 4 patients.

Table 4. shows an analysis of variance for all variables with the patient's age where the p.value shows that there is no significant difference between patients' age with history, type of CVA, site, appearance, and diagnosis of CT.

CONCLUSION

The clinical computed tomography findings in stroke patients, where the total number of patients was 237 adult patients. correlation between the type of CVA with the age group for all patients was the type of CVA was three types infraction, ischemic, and hemorrhage. And the age group was 8 groups. The patients with infraction type were 133 patients, ischemic patients were 35 while the hemorrhage was for 69 patients. Correlate between the site with age group where the number of sites was 13 area where the patients with no clinical data were just one patient, while the patients with different sites were 236 patients. Correlate between CT appearance with age group were the appearance that revealed from computed tomography was 8 diseases were the diagnose hypodense area was dominant with 75 patients and the diagnose right basal ganglia with just three patients. Finally; the correlation between final diagnosis with the age group for all patients where the final diagnoses divided to 8 groups were the diagnose patients with hemorrhage was dominant with 86 patients than white matter ischemia with 49 patients while the diagnose Bilateral hypodense areas with the lowest number of patients with just 4 patients.

REFERENCES

1. Kim, A. S., & Johnston, S. C. (2011). Global variation in the relative burden of stroke and ischemic heart disease. *Circulation*, *124*(3), 314-323.
2. Saposnik, G., Kapral, M. K., Liu, Y., Hall, R., O'Donnell, M., Raptis, S., ... & Austin, P. C. (2011). IScore: a risk score to predict death early after hospitalization for an acute ischemic stroke. *Circulation*, *123*(7), 739-749.
3. Saba, L., Sanfilippo, R., Pirisi, R., Pascalis, L., Montisci, R., & Mallarini, G. (2007). Multidetector-row CT angiography in the study of atherosclerotic carotid arteries. *Neuroradiology*, *49*(8), 623-637.
4. Saba, L., Montisci, R., Sanfilippo, R., & Mallarini, G. (2009). Multidetector row CT of the brain and carotid artery: a correlative analysis. *Clinical radiology*, *64*(8), 767-778.
5. Barth, A., Arnold, M., Mattle, H. P., Schroth, G., & Remonda, L. (2006). Contrast-enhanced 3-D MRA in decision making for carotid endarterectomy: a 6-year experience. *Cerebrovascular diseases*, *21*(5-6), 393-400.
6. Honish, C., Sadanand, V., Fladeland, D., Chow, V., & Pirouzmand, F. (2005). The reliability of ultrasound measurements of carotid stenosis compared to MRA and DSA. *Canadian journal of neurological sciences*, *32*(4), 465-471.
7. Koelemay, M. J., Nederkoorn, P. J., Reitsma, J. B., & Majoie, C. B. (2004). Systematic review of computed tomographic angiography for assessment of carotid artery disease. *Stroke*, *35*(10), 2306-2312.
8. Wardlaw, J. M., Chappell, F. M., Best, J. J. K., Wartolowska, K., & Berry, E. (2006). Non-invasive imaging compared with intra-arterial angiography in the diagnosis of symptomatic carotid stenosis: a meta-analysis. *The Lancet*, *367*(9521), 1503-1512.
9. Osborn, A. G. (2013). Arterial anatomy and strokes. *Osborn's: brain imaging, pathology, and anatomy*, *8*, 170-214.
10. Berger, C., Fiorelli, M., Steiner, T., Schäbitz, W. R., Bozzao, L., Bluhmki, E., & von Kummer, R. (2001). Hemorrhagic transformation of ischemic brain tissue: asymptomatic or symptomatic?. *Stroke*, *32*(6), 1330-1335.
11. Rorden, C., Bonilha, L., Fridriksson, J., Bender, B., & Karnath, H. O. (2012). Age-specific CT and MRI templates for spatial normalization. *Neuroimage*, *61*(4), 957-965.
12. Fiez, J. A., Damasio, H., & Grabowski, T. J. (2000). Lesion segmentation and manual warping to a reference brain: Intra-and interobserver reliability. *Human brain mapping*, *9*(4), 192-211.
13. Ashton, E. A., Takahashi, C., Berg, M. J., Goodman, A., Totterman, S., & Ekholm, S. (2003). Accuracy and reproducibility of manual and semiautomated quantification of MS lesions by MRI. *Journal of Magnetic Resonance Imaging: An Official Journal of the International Society for Magnetic Resonance in Medicine*, *17*(3), 300-308.