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**Zoology**

# Role of Computed Tomography in Evaluation Cerebrovascular Disease

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**Abstract** **Original Research Article**

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 (156 male and 81 females. 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. And the results show correlation between history with age group where the history of patients was 12 disease and 8 age groups, where the patients with no clinical data was 47 patients, and the patients with different histories was 190 patients with 11 disease from the all 237 patients. And correlate between type of CVA with age group for all patients were 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 for 69 patients. The correlation between final diagnoses with age group for all patients where the final diagnoses divided to 8 groups were the diagnose patients with hemorrhage was dominant with 86 patients then white matter ischemia with 49 patients while the diagnose Bilateral hypodense areas with 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 CT. and the linear regression between the variables with gender were the p.value shows that there is no significant difference between the patient's gender with history, CVA and final diagnose.

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



## INTRODUCTION

In the past years digital angiography (DA) was the imaging technique most used for the detection of the carotid artery pathology. However, a fundamental limit of DA is that it is a pure luminal methodology that offers information regarding only the lumen of the vessel but no information about the carotid wall and the plaque. Ultrasound (US), magnetic resonance (MR) and computed tomography (CT) have emerged as non-invasive imaging tools. These three techniques offer a detailed overview of the lumen of the vessel and the plaque and have completely come to substitute for the DA [1-5].

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. Arterial ischemia /infarction are by far the most common cause of stroke, accounting for 80% of all cases. The remaining 20% are mostly hemorrhagic, divided between primary spontaneous intracranial hemorrhage (sICH), nontraumatic subarachnoid hemorrhage (SAH), and venous occlusions [6].

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 [6].

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 stroke to co- occur [7].

Computed tomography (CT) and magnetic resonance imaging (MRI) are the two modalities regularly used for stroke lesion mapping. Though it is not 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 [8]. On the other hand, MR imaging is earlier at detecting ischemic stroke, and if available, is therefore performed in many cases with 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.

So, the aim of this paper to study the role of computed tomography in evaluation cerebrovascular disease and to detect other causes simulating stroke.

## METHODOLOGY

The study was conducted in Aliaa Specialist Hospital, Omdurman city, Sudan in 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 programme. Were 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 their age ranged from 19 to 96 years, all the patients were admitted in the hospital with suspected CVA disease and sent to 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 data sheet 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 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 history with age group**

| History * Age Group Crosstabulation | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| History | Age Group | | | | | | | | Total |
| | 19-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90-100 | |
| No Clinical Data | 6 | 6 | 6 | 5 | 10 | 10 | 4 | 0 | 47 |
| Right Side Weakness | 2 | 1 | 1 | 2 | 4 | 5 | 5 | 0 | 20 |
| Decrease LOC Sepsis | 2 | 1 | 0 | 1 | 1 | 6 | 1 | 0 | 12 |
| Left side hemiplegia | 1 | 4 | 3 | 4 | 10 | 4 | 5 | 1 | 32 |
| Multiple Stroke | 0 | 5 | 1 | 5 | 5 | 13 | 9 | 1 | 39 |
| Dementia | 2 | 0 | 0 | 1 | 1 | 1 | 4 | 1 | 10 |
| Parkinson’s Disease | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Left leg Numbness | 1 | 1 | 0 | 0 | 3 | 12 | 7 | 0 | 24 |
| IVH + ICH | 1 | 0 | 2 | 2 | 5 | 7 | 0 | 1 | 18 |
| RTA | 4 | 7 | 2 | 0 | 2 | 5 | 0 | 0 | 20 |
| Meningioma | 1 | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 6 |
| Hypertensive | 0 | 1 | 0 | 2 | 3 | 1 | 1 | 0 | 8 |
| Total | 20 | 26 | 17 | 22 | 45 | 67 | 36 | 4 | 237 |

**Table-2: Show correlation between type of CVA with age group**

| Type of CVA * Age Group Crosstabulation | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 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-3: Show correlation between final diagnose with age group:**

| 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:**

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| | | 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 | | | |

**Table-5: Show linear regression between the variables with gender:**

| Coefficients[a] | | | | | |
|---|---|---|---|---|---|
| Model | Unstandardized Coefficients | | Standardized Coefficients | t | p.value |
| | B | Std. Error | Beta | | |
| (Constant) | .552 | .114 | | 4.847 | .000 |
| History | -.001 | .006 | -.017 | -.247 | .805 |
| Type of CVA | .062 | .036 | .115 | 1.712 | .088 |
| Final Diagnose | .008 | .021 | .024 | .362 | .718 |
| a. Dependent Variable: Gender | | | | | |

## DISCUSSION

Table-1 show correlation between history with age group where the history of patients was 12 disease and 8 age groups, where the patients with no clinical data was 47 patients, and the patients with different histories was 190 patients with 11 disease from the all 237 patients.

Table-2 show correlation between type of CVA with age group for all patients were 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 for 69 patients.

Table-3 show correlation between final diagnose with age group for all patients where the final diagnoses divided to 8 groups were the diagnose

patients with hemorrhage was dominant with 86 patients then white matter ischemia with 49 patients while the diagnose Bilateral hypodense areas with lowest number of patients with just 4 patients.

Table-4 show 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 CT.

Table-5 show linear regression between the variables with gender were the p.value shows that there is no significant difference between the patient's gender with history, CVA and final diagnose.

## CONCLUSION

Aim of this paper to study the role of computed tomography in evaluation cerebrovascular disease and to detect other causes simulating stroke. The total number of patients was 237 adult patients. And the correlation between history with age group where the history of patients was 12 disease and 8 age groups, where the patients with no clinical data was 47 patients, and the patients with different histories was 190 patients with 11 disease from the all 237 patients. And correlate between type of CVA with age group for all patients were 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 for 69 patients. The correlation between final diagnoses with age group for all patients where the final diagnoses divided to 8 groups were the diagnose patients with hemorrhage was dominant with 86 patients then white matter ischemia with 49 patients while the diagnose Bilateral hypodense areas with 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 CT. and the linear regression between the variables with gender were the p.value shows that there is no significant difference between the patient's gender with history, CVA and final diagnose.

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