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THE UTILIZATION OF COMPUTED TOMOGRAPHY SCAN IN EXAMINING BRAIN ISCHEMIA

Saleh Alshurfat, Ishraq Abu Darweesh, Omar Batainah, Laith Alomari, Hajem Abu Dalo, Zeyad S. Bataineh

Royal Medical Services, Jordan

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ABSTRACT:

Introduction: Computed tomography (CT) scan is frequently utilized as a medical tool to investigate diseases in hospitals and other medical settings.

Study objectives: The main objectives of the present study are to investigate the frequency of requesting CT scan in King Talal Military Hospital, and their diagnostic efficacy in detecting brain ischemia.

Methods and subjects: A retrospective design was conducted to collect data from files of patients who had CT scan. A total of 200 files of those patients were reviewed. All data were entered into excel sheet to create the raw data, and after data had been completed, the data were exported into SPSS version 21 for further analysis. Data were presented as frequencies and percentages.

Results: A total of 200 files of patients who had CT scan were included. A total of 120 patients (60%) were males. The majority of patients were in the age ≥40 years. The results of CT scan for ischemic infarction was positive for 72.5%. There were 80 males (55.17%) and 60 (44.83%) positive cases for CT scan with brain ischemic infarction. Up to 12hrs of brain ischemic infarction, about 22% of patients were in hyper-acute, with HU (29-31). About 36% of patients were in acute-sub-stage, with 22-28 HU. About 42% of patients were in acute-sub-stage II, with 18-20 HU.

Conclusion: The results of the present study confirmed other studies in which neuro-radiologist have to give well-attention for the results of early CT scan findings of acute stroke to properly manage brain ischemic infarction.

KEYWORDS: CT scan, brain infarction, ischemia, stages, hyper-acute, acute sub-stage.

Corresponding author: Saleh Alshurfat
E-mail: salehalshurfat@gmail.com
Mobile No: 00962772151415

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INTRODUCTION:

A stroke, also known as cerebrovascular accident (CVA), is the sudden occurrence of a neurological alteration due to vascular causes[1, 2]. Acute ischemic stroke (AIS) is considered an important economic impact at global level on health system, and usually leads to disability and death[3]. The first choice of therapeutic options is the use of intravenous alteplase administration[4]. Recent trends have been introduced and involved the use of a mechanical thrombectomy for patients with AIS[16, 17]. However, the best clinical outcomes are correlated with early vessel recanalization[5].

Strokes can be categorized into two main categories: ischemic (infarction), and hemorrhagic[6]. Early diagnosis of ischemia is the most crucial stage in its management to enable the administration of thrombolytic therapy as early as within first 4 hours[1].

From a pathologic point of view, certain cerebral changes associated with the occurrence of ischemic stroke that can be categorized according to time, into: (a) Hyper acute Infarct: (up to 6 hours), (b) Acute Infarct: (6-24 hours), (c) Subacute: (1-7 days) and (d) Chronic: (more than one week)[6].

In cases of encountering acute stroke, CT scan is the most common used technique to establish clinical diagnosis, seek for sources of intracranial hemorrhage[18, 19]. It has been observed through several studies that the results of CT scan within the first 6 hours (hyperacute) to be as the lack of differentiation of gray-white matter in cortical gyrus, basal ganglia, and narrowing of the Sylvian fissure[7-10].

It has been reported that approximately slightly higher than the fifth of cases of ischemic stroke cases are misdiagnosed even in best hospitals at early stages[11].

Study objectives:

The main objectives of the present study were to investigate the frequency of requesting CT scan in King Talal Military Hospital, and their diagnostic efficacy in detecting brain ischemia.

METHODOLOGY:

Study design: A retrospective study design was conducted to collect data from study participants.

Study sample: A total of 200 files of patients who had brain CT scan were reviewed.

Study procedure: Files of patients with brain CT scan were reviewed to extract the following data:

- Age
- Gender
- The result of CT scan for ischemic infarction.
- Stage
- Distribution of CT Hounsfield of ischemic infarction in relation to the kinds of stroke.

The data were entered to excel sheet for all patients, the data analysis was carried out using SPSS version 21.

Data presentation: Data were described based on descriptive statistics. Frequencies and percentages were used to present data. Tables and figures were used to present data.

RESULTS

General characteristics of participants

As demonstrated in table (1), study sample consisted of 200 files of patients who had CT scan. A total of 120 patients (60%) were males. The majority of patients were in the age ≥40 years. The results of CT scan for ischemic infarction was positive for 72.5%.

Table 1: Frequency and distribution of patients by CT scan

Variable	Frequency (N)	Percentage (%)
Gender:		
- **Male**	**120**	**60%**
- **Female**	**80**	**40%**
Age:		
- **<40**	**17**	**8.5%**
- **≥41**	**183**	**91.5%**
CT scan for ischemic infarction:		
- **Positive**	**145**	**72.5%**
- **Negative**	**55**	**27.5%**

Distribution of gender by positive CT scan for ischemic infarction

As illustrated in figure (1), there were 80 males (55.17%) and 60 (44.83%)

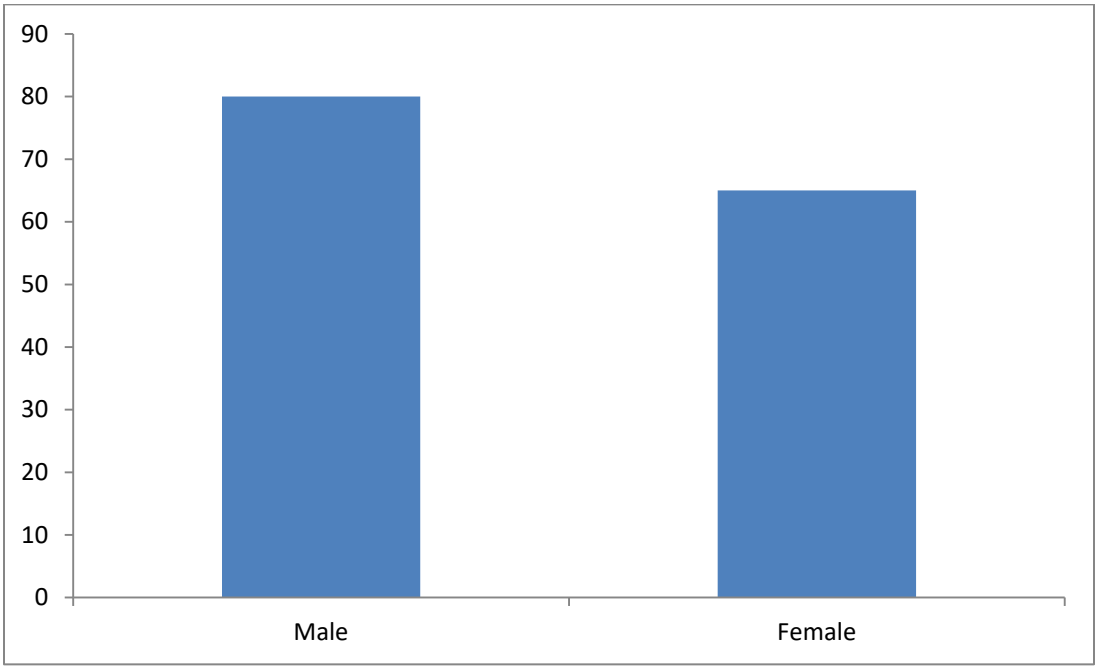

Figure 1: Distribution of gender by positive CT scan

Distribution of stroke patients with positive and negative brain CT scan

As shown in figure (2), there were 55 negative cases, and 145 positive cases with brain CT scan for brain ischemic infarction.

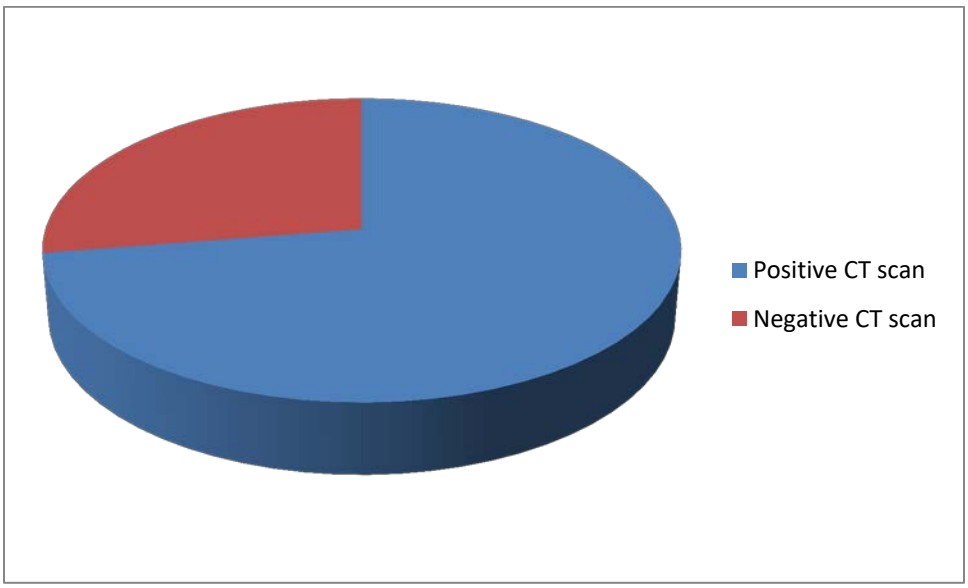

Figure 2: Distribution of stroke patients with positive and negative brain CT scan

Distribution of stroke patients with positive brain CT scan by age

The results showed that there were 139 cases with positive brain CT scan for patients with age ≥40, while 6 cases were positive with age <39 years (figure 3).

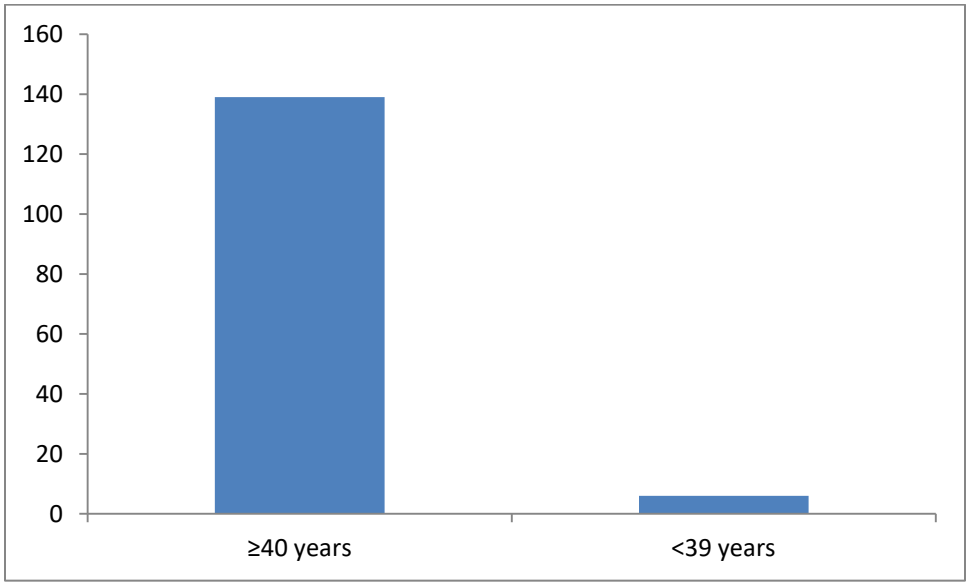

Figure 3: Distribution of stroke patients with positive brain CT scan by age

Distribution of CT Hounsfield of ischemic infarction in relation to the kinds of stroke

As shown in table 2, up to 12hrs of brain ischemic infarction, about 22% of patients were in hyper-acute, with HU (29-31). About 36% of patients were in acute-sub-stage, with 22-28 HU. About 42% of patients were in acute-sub-stage II, with 18-20 HU.

Table 2: CT Hounsfield of ischemic infarction in relation to the kinds of stroke

Phase (duration/hrs)	Ischemic infarction	
	Number	Density (HU)
Hyper –acute (up to 12hrs)	32 (22.07%)	29-31
Acute –sub-stage I (>12-24hrs)	52 (35.86%)	22-28
Acute –sub-stage II (>24-48hrs)	61 (42.07%)	18-20
Total	145 (100%)	

DISCUSSION

The results of the present study showed that of total 200 involved participants, males were more than females, and age, more than 40 years, was the predominant age group. This distribution of personal characteristics of participants agrees with previous studies[1, 12-14].

The results showed that patients who were positive for brain ischemic by CT scan were males more than females; and positive CT scan for brain ischemic infarction was 73%, and a total of 139 out of 145 patients were in the age group ≥40 years. These results are in consistent with previous studies[1, 12-14]. However, the prevalence of positive CT scan for brain ischemic infarction of this study was relatively less than reported by other studies. As an example, the prevalence of positive infarction for brain ischemic infarction was 85% in the study of Hassoun et al[1], while the study of Magda[13] found a positive rate of 80%, as well as the study of Davis et al[6] found a rate of 80%.

Finally, our results showed comparable findings of CT Hounsfield of ischemic infarction in relation to the kinds of stroke with the study of Hassoun et al[1], and the study of Kumar et al[15].

CONCLUSION

The results of the present study confirmed other studies in which neuroradiologist have to give well-attention for the results of early CT scan findings of acute stroke to properly manage brain ischemic infarction. This enables the initiation of thrombolytic therapy in emergency department.

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