ROLE OF TRANSCRANIAL DOPPLER-ULTRASOUND IN ASSESSMENT OF MIDLINE-SHIFT IN ACUTE ISCHAEMIC-STROKE PATIENTS IN-COMPARISON WITH CT BRAIN

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Introduction

Malignant ischaemic stroke is primarily caused by large hemispheric infarctions resulting from cardioembolic or thrombotic causes. These hemisphere infarcts are often caused by occlusions of the internal carotid artery (ICA) or the middle cerebral artery's proximal segment (stem or M1 segment).When the accumulation of blood & edema around the injured brain tissues exerts enough pressure to cause the entire brain to shift off-center, this is known as a midline shift. This is a warning sign & is regarded as a medical emergency.When measuring midline shifts, three primary structures are frequently evaluated. The most crucial of them is the thin, linear layer of tissue between the left & right ventricles called the septum pellucidum. Its distinct hypodensity makes it simple to detect on CT or MRI imaging. The 3rd ventricle & the pineal gland, which are both centrally positioned and caudal to the septum pellucidum, are the other two important midline structures.

The gold standard for MLS detection is the CT scan.

The temporal acoustic bone window allows for the measurement of the ultrasound MLS.

Aim of the Work

This study aimed to assess the predictive value of early transcranial Doppler in patients with acute ischemic stroke and to correlate different transcranial Doppler measurements with CT brain in the assessment of midline shift.

Patients and Methods

The prospective observational comparative cohort study was carried out on 40 patients with acute ischaemic stroke admitted to Critical Care Units in Alexandria Main University Hospitals, excluding Patients admitted ≥ 48hours after ischemic stroke, patients presented by out of hospital cardiac arrest or in-hospital cardiac arrest before performing the TCD, pregnant females, inability to obtain adequate ultrasound window, a trans calvarial brain herniation or a temporal bone fracture, open head injuries or patients in need for surgical intervention and patients underwent surgical decompressive craniotomy.

Trans cranialsonnograghy and CT-brain were done at time of admission, follow up after 24 hrs from admission and follow up after 48 hrs from admission.

The examination was done using phased array probe, Standing behind the head of the patient, the probe was placed over the temporal area just above the zygomatic arch and in front of the tragus of the ear and oriented slightly upward and anteriorly, the third ventricle was identified as a double hyperechogenic image over the midbrain and the distance between the external bone table and the centre of the third ventricle was then measured bilaterally. The difference between two measures (A and B) divided by two was used to calculate the MLS: MLS = (B - A)/2.

Results

Table 1: Receiver Operating Characteristics (ROC) analysis for diagnostic performance of TCS at day1, day2, and day3 differentiation between cases with MLS and control groups.

	AUC	AUC SE	Sig.	95% CI	Cutoff value	Sn (percent)	95% CI	SP (percent)	95% CI	PPV (percent)	95% CI	NPV (percent)	95% CI
TCS. Day.1	0.968	0.030	<0.001*	0.857-0.998	≥0.75	95%	75.1 - 99.9	90%	75.1 - 99.9	95%	75.1 - 99.9	95%	75.1 - 99.9
TCS. Day.2	0.984	0.014	<0.001*	0.955-1.000	≥1.2	95%	75.1 - 99.9	90%	68.3 - 98.8	90.5%	71.8 - 97.3	94.7%	72.6 - 99.2
TCS. Day.3	0.993	0.009	<0.001*	0.898-1.000	≥1.2	95%	75.1 - 99	95%	83.2 - 100	100%	82.4 - 100	95.2%	76.2 - 99

*Significant results ≤0.05; AUC: area under curve; SE: standard error; 95% CI: 95% confidence interval; Sn: Sensitivity; SP: Specificity; PPV: Positivepredictv evalue; NPV: Negativepredictv evalue.

Table 2: Paired-Sample Area Difference Under the ROCC urves for TCS&CT brainatday1, 2, and3 between cases and control groups.

TestResultPair(s)	Z	Sig.	AUC Difference	Std. Error Difference	95%CI
TCS.Day.1–CTbrainDay1	0.878	0.380	0.007	0.009	-0.009 -0.024
TCS.Day.2–CTbrainDay2	1.191	0.234	0.016	0.014	-0.011 -0.043
TCS.Day.3–CTbrainDay3	0.878	0.380	0.007	0.009	-0.009 -0.024

*Significantresults≤.05;95%CI:95%confidenceinterval; Std. Error: Standard error

Table 3: In traclass correlation for testing agreement between trans cranialsonography and brain CT method at day1, 2 and, day3 for MLS assessment among cases

	ICC coefficient	95%CI		Sig.
CTbrain-TCSday1	0.926	0.823	0.970	<.001*
CTbrain-TCSday2	0.889	0.742	0.955	<.001*
CTbrain-TCSday3	0.984	0.960	0.994	<.001*

*Significantresults≤.05;ICC,Intraclasscorrelation

Conclusion

We concluded from our study that TCS could detect MLS with reasonable accuracy in studied cases with acute ischemic stroke.

There was a significant positive correlation between CT brain & TCS on day 1, day 2 & day 3.

In management of critically ill patients who cannot undergo repeated CT scans, sonographic monitoring of MLS may be a helpful tool.