



Categorization of Ischemic Stroke According to TOAST AND ACOS Into Various Subtypes

KEYWORDS

GCS-glasgow coma score, NTC-non-traumatic coma ICH-intracerebral haemorrhage, SAH- subarchnoid haemorrhage

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ABSTRACT **BACKGROUND:** The stroke prognosis mainly depends on types of stroke and etiology¹. Categorization of stroke into various sub types will yield basis for newer modalities of therapy as the outcome influenced by stroke subtypes. Early recognition of a stroke subtype followed by timely and appropriate treatment strategies have been shown to significantly reduce mortality .

OBJECTIVES: -1. To know the classification of stroke subtypes for therapeutic decision-making in daily practice

STUDY DESIGN: prospective observational cohort study.

MATERIALS & METHODS:

Stroke patients admitted in the emergency department of Gandhi hospital during October 2014 to October 2015 and 501 patients were evaluated by detailed history and clinical examination along with relevant investigations were considered in this study.

Statistical methods: The observations and data were analyzed in the statistical package social sciences (SPSS) trial version 11 by Chi-square and Fisher Exact test has been used to find the significance of proportions of outcome with various demographic, etiological and neurological factors. The level of significance was set at $P < 0.05$.

Results: undetermined (UD) stroke cases formed the majority of 107 which consists of (41%) followed by 61 lacunar stroke (23.40%) and 42 cases of Atherothrombosis (17%). Cardioembolic type are 29 in number (9.20%) along with 15 cases of ODE (5.70%) are in in the present study.

In the group of UD undetermined stroke cases 20 cases were evaluate completely (7.60%) and 87 cases were incompletely evaluated (33.40%)

Conclusions: 1.This can be applied in acute emergency situations to recommend specific treatment modalities.

2) Also useful to classify TIAs for prevention of future stroke.

INTRODUCTION:

Etiological subclassification of ischemic stroke has become important as new treatment modalities like thrombolysis have come. Introduction of CT scan gave the ability to discriminate rapidly between ischemic and hemorrhagic stroke.

Further differentiation of ischemic stroke is important for following reasons

1. Classifying patients for therapeutic decision-making in daily practice
2. Describing patients' characteristics in a clinical trial
3. Grouping patients in an epidemiological study
4. Careful phenotyping of patients in a genetic study.

The Trial of ORG 10172 in Acute Stroke Treatment (TOAST)² investigators noted that stroke prognosis, risk of recurrence, and choices for management are influenced by ischemic stroke subtype. Because of the potential importance of stroke subtype in interpreting the results of this

and other acute intervention trials, they devised a series of 11 definitions to classify patients with ischemic stroke into 5 major etiological/pathophysiological groupings.

TOAST Diagnostic Classification^{4,5}

Diagnostic Group	Collapsed Group
Atherosclerosis, probable	Atherosclerosis
Atherosclerosis, possible	
Cardioembolic, probable	Cardioembolic
Cardioembolic, possible	
Lacunar, probable	Lacunar
Lacunar, possible	
Other determined etiology, probable	Other determined etiology
Other determined etiology, possible	
Undetermined etiology, complete evaluation	Undetermined etiology
Undetermined etiology, incomplete evaluation	
Multiple possible etiologies	

In this study modified TOAST criteria is taken to classify patients to different etiologies.

The ASCO classification of stroke

A - Atherosclerosis

S - Small-vessel disease

C - Cardiac disease^{6,7}

O - Other causes

1 - Definitely a potential cause of the index stroke

2 - Causality uncertain

3 - Unlikely a direct cause of the index stroke (but disease is present)

0 - Disease not present

9 - Insufficient workup

Stroke is a heterogenous disease with many causes. Even after complete evaluation most studies have failed to identify a definite cause^{8,9,10} in 25-39% of patients.

RESULTS AND DISCUSSION:

In this study male to female sex ratio is 2:1. this indicates stroke incidence is more common in men.

In total stroke cases of 501 patients (table-1), 278 patients were ischemic strokes. Among ischemic strokes 95 presented with left hemiplegia, 129 presented with right hemiplegia, 25 with aphasia, 10 with altered sensorium, 10 patients presented with seizures, 11 had swaying, fasciobrachial palsy in 6, LOC found in 35, headache in 6, sensory stroke in 4 patients.

Large artery: In this study, the distribution of subtype atherosclerosis is 17%.

In this study, to define artery atherothrombosis criteria taken is any atherosclerotic stenosis 50% stenosis or occlusion of a major brain artery or branch cortical artery, presumably due to atherosclerosis or infarct >1.5 cm, stenosis of extracranial internal carotid artery.

Small artery stroke: In this study lacunar strokes are 23.4%.

Criteria taken to define small artery stroke (lacunar stroke) are one of the traditional clinical lacunar syndromes & no evidence of cerebral cortical dysfunction. H/o DM, HTN supports the diagnosis.

Should have a normal CT/MRI brain or relevant brainstem or subcortical hemispheric lesion with a diameter of < 1.5 cm.

Should not fulfill criteria for Large artery atherothrombosis or cardioembolic stroke.

Cardioembolic Stroke: In this study 9.2% of patients are found to be having cardioembolic stroke.

High risk sources for cardioembolic stroke are mechanical prosthetic valves, mitral stenosis with atrial fibrillation,

atrial fibrillation other than lone AF, recent myocardial infarction (<4 weeks), LV thrombus, dilated cardiomyopathy, infective endocarditis.

Medium risk are mitral valve prolapse, mitral annular calcification, mitral stenosis without AF, myocardial infarction >4 weeks & <6 months.

Other determined etiology

Non atherosclerotic vasculopathies, hypercoagulable states, hematological diseases, cardiac sources or large artery atherosclerosis should be excluded.

In this study 5.7% of patients are described as having other determined etiology.

This is on higher side in this study because of many cases of high homocysteine levels.

Two cases are with mitral valve prolapse, two cases are found to be due to connective tissue disease with APLA positive.

Stroke of undetermined etiology: In this study the stroke (table-1) of UD etiology has 41% of cases. Criteria are two or more causes identified, negative evaluation, incomplete evaluation.

After complete evaluation in 7.6% of 41% cases we could not come to a conclusion.

In 33.4 of 41% of cases we could not evaluate completely because of non-willingness of patient attendants to undergo complete evaluation, death of the patient, sometimes non availability of resources.

ASCO classification

Compared with TOAST classification ASCO describes 4 categories of disease process. In this combining all patterns, ASCO describes all pathologies. There is no category as undetermined category.

1 - Definitely a potential cause of the index stroke, 2 - Causality uncertain, 3 - Unlikely a direct cause of the index stroke (but disease is present), 0 - Disease not present, 9 - Insufficient workup.

In this study grade 1 evidence to atherosclerosis found in 17%, for small vessel disease 24%, cardiac source in 9.2%, other determined etiology in 5.7%. In 41% of patients we could not come to a conclusion because of incomplete evaluation and in some patients more than one cause is found. This is similar to what we described with TOAST classification. In this study good correlation was found between ASCO and TOAST classification.

ASCO system did not greatly increase the assignment to specific etiology. It provided additional information not available in TOAST.

Patients with large vessel disease plus small vessel disease are categorized as having both pathologies with one as a significant cause.

Some patients were classified as having multiple etiologies. Some of the patients have both the etiologies like coronary artery disease with low ejection fraction < 25% are also having large artery atherosclerosis. Due to incomplete evaluation we could not classify some patients to any category.

Our findings support the validity of both TOAST & ASCO. We found good agreement between both systems.

Conclusions:

Etiological sub classification of ischemic stroke has become important as new treatment modalities like thrombolysis have come. It is important for prognostication in various etiological subtypes.

In this study we found high agreement with TOAST and ASCO classification systems.

Each system has its own strengths.

This study is useful for studying local epidemiological trends in stroke subtypes and risk factors and age and sex incidences.

Limitations:

- 1) In some cases, investigations for stroke mechanism may cease when a high risk source is found.
- 2) Due to death in some patients complete evaluation was not done. .

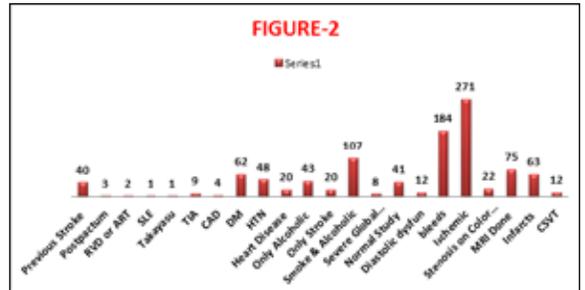
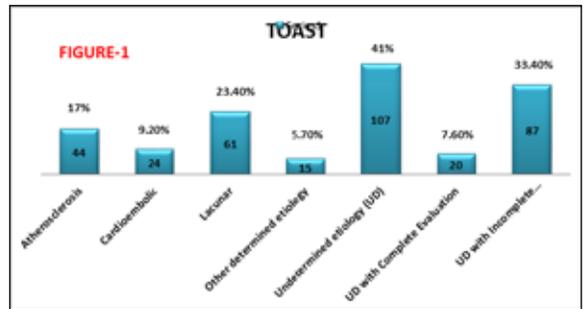
Recommendations:

- 1) This can be applied in acute emergency situations to recommend specific treatment modalities.
- 2) Also useful to classify TIAs for prevention of future stroke.
- 3) Can be used for follow up of patients with stroke to evaluate other causes.

GRAPHS & RESULTS

TABLE-1 Type of Stroke	No of Pts
Ischemic Stroke	278
Lt Hemiplegia	95
Rt Hemiplegia	129
Altered Sensorium	10
Aphasia	25
GTCS	10
LOC	35
Headache	6
Swaying	11
Sensory Stroke	4
Faciobrachial palsy	6

TABLE-2 TOAST	No of Pts	Percentage
Atherosclerosis	44	17%
Cardioembolic	24	9.20%
Lacunar	61	23.40%
Other determined etiology	15	5.70%
Undetermined etiology (UD)	107	41%
UD with Complete Evaluation	20	7.60%
UD with Incomplete Evaluation	87	33.40%



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