

TIA-Treatment: Stroke Units versus General Wards Mono-Center Study

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Abstract

Background and Purpose: Transient ischemic attack (TIA) is associated with a high short-term risk of stroke. The aim of this study is to compare the diagnostic evaluation, therapeutic procedures, and secondary prevention strategies in TIA patients who were directly admitted to a stroke unit (SU) and received semi-intensive care in comparison to those who were treated in general wards (GW) in a mono-center study.

Methods: During a 6-year period (2008-2013), 1114 TIA patients who were admitted to the Department of Neurology at the University of Schleswig-Holstein, campus Lübeck, were evaluated in a mono-center study.

Results: A total of 604 (57%) TIA patients were admitted to the SU, whereas 453(37%) patients were admitted to the GW. Patients with a TIA who were undergoing treatment in an SU were significantly younger (69.1 vs. 71.0 years; $P=0.023$) and had higher rates of paresis (30.1 vs. 21.8%; $p<0.003$), hypertension (79.7 vs. 74.3%; $P=0.042$) and hypercholesterolemia (57.2 vs. 46.7%; $P=0.001$) than those who were undergoing treatment in the GW. Patients in SUs received significantly higher rates of carotid revascularization for symptomatic carotid stenosis (5.8% vs. 0.4%; $P<0.001$), dysphagia screening (47.6 vs. 27.3%; $P<0.001$), speech therapy (33.0 vs. 14.8%; $P<0.001$), and physiotherapy (51.0 vs. 37.2%; $P<0.001$) in comparison to those admitted to GWs. The TIA etiology; cardioembolism was significantly more common (18.0 vs. 12.7%; $P=0.037$) in patients treated in stroke unit, whereas the undetermined etiology of TIA was significantly less diagnosed in patients who were admitted to SI-SU than those treated in CC (50. vs. 58%; $P=0.037$). Carotid revascularization for symptomatic stenosis was more performed in patients who underwent stroke unit care than those who were treated in general wards (5.8 vs. 0.4%, $P<0.001$).

Conclusion: TIA-Treatment in the SU appears to be correlated with more diagnostic and therapeutic procedures in comparison to care in general wards.

Keywords: TIA; Stroke; Stroke unit; General wards; Diagnostic evaluation; Secondary prevention

Introduction

Transient ischemic attack (TIA) is a marker for an unstable condition that is associated with high short-term risk of stroke [1]. The diagnostic evaluation of etiology and the therapeutic procedures used in patients suffering from TIA vary substantially worldwide. The results of several trials have indicated that TIA portends an increased risk of stroke and that this risk of stroke after TIA is highest during the early period after the index event [2-5]. Other studies revealed that the risk of stroke after TIA is ranging between 1.1% to 12.8% over a period of 7 days, reaching 21.4% at 1 year [5-7]. These findings underscore the need for the rapid evaluation of etiology and the implementation of secondary prevention strategies immediately after the TIA event. Several randomized controlled studies in different countries have shown the effectiveness of stroke unit (SU) care for stroke patients [8-11]. Our research group previously investigated the effectiveness of the management of patients with TIA who were admitted to departments of neurology with a stroke unit in comparison to those

who were treated in departments of internal medicine without a stroke unit, [12,13] but there are no published data comparing the diagnostic evaluation, therapeutic procedures, and secondary prevention strategies that are used in the treatment of patients suffering from TIA and who are admitted initially to a stroke unit (SU) with those who are admitted directly to general wards GW in the same hospital. International guidelines differ in their recommendations on how to manage patients with TIA. International guidelines recommend hospitalizing patients suffering from TIA depending on presenting time (within 72 hours) and ABCD2 score (≥ 3), [14,15] whereas other guidelines recommend that all patients suffering from TIA should be treated in an SU as soon as possible, independent from the ABCD2 score [16]. However, according to German recommendations on stroke treatment, all patients suffering from TIA should receive care at a stroke unit and get transferred to a hospital, as quickly as possible.

Methods

Study design

We aimed in the present study to investigate the management of TIA in a mono-center study. The study was a part of the ongoing benchmarking project (QugSS [German: Qualitätsgemeinschaft Schlaganfallversorgung in Schleswig-Holstein]), which was previously described [17,18]. The QugSS-register is a population-based study including 15 hospitals in Schleswig-Holstein in Germany, we previously compared the impact of stroke unit care at the departments of neurology to conventional care in the departments of internal Medicine in patients suffering TIA in accordance to the WHO definition (neurological symptoms of TIA regress within 24 hours) [19].

To highlight the stroke unit care and to avoid bias selection, we included only patients suffering from TIA who were admitted to the Department of Neurology at the University hospital of Schleswig-

Holstein, campus Lubeck. All TIA patients underwent a standardized TIA evaluation and treated from the same physician's team. The TIA definition used in the present study was in accordance to the new (tissue-based) definition [15].

All patients over the age of 18 years who were suffering from TIA were recruited during a study period of 6 years (2008 to 2013). Inclusion criteria were TIA in accordance with the tissue-based definition (transient neurological symptoms without infarct evidence on the brain imaging including CCT and DWI-MRI, and admission to the Department of Neurology at the University of Lubeck within 48 hours of symptom onset. Exclusion criteria were admission to the hospital after 48 hours following symptom onset and patients who were admitted with suspected TIA, but diagnosed with other neurological disorders. The documentation and data collection followed a uniform study manual. Baseline characteristics at admission (Table 1) were recorded. A medical doctor who was not involved in the treatment of the patients checked the data. The study was approved by the local ethics Committee.

Baseline characteristics	Stroke unit N=604	General wards N=453	P
Age, mean (SD)	69.1 (13)	71.0 (14)	0.023
Female sex	273 (45.3)	236(51)	0.069
Duration of symptoms; <1 hour	235(39.4)	190 (42.0)	0.3
1 to 24 hours	362(60.7)	262 (58.0)	
TIA's symptoms; Paresis	178 (30.1)	100(21.8)	0.003
Aphasia	106 (18)	71 (15.6)	0.3
Dysarthria	92 (15.6)	63 (13.8)	0.4
Medical history;	470 (79.7)	339 (74.3)	0.042
Hypertension	145 (24.5)	98 (21.6)	0.2
Diabetes mellitus	329 (57.2)	211 (46.7)	0.001
Hypercholesterolemia	171 (29.2)	122 (27.0)	0.4
Previous stroke	104 (17.8)	71 (15.7)	0.3
Atrial fibrillation	256 (43.8)	195 (43.2)	0.8
Antiplatelet therapy before TIA			
TIA-Etiology (TOAST);	84 (18.0)*	42 (12.7)	0.038
Cardioembolism	70 (15.0)	57 (17.2)	
Large-artery atherosclerosis	55(11.8)	28 (8.5)	
Small-artery occlusion	24(5.2)	11 (3.3)	
Other determined etiology	233(50.0)*	193(58.3)	
Undetermined etiology			

Table 1: Baseline Characteristics in TIA patients treated in stroke unit compared to those with general wards. Value in n and (%) unless otherwise indicated. *Differences after a Bonferroni correction are significant.

Treatment concept

The stroke unit care provides semi-intensive care and combines advanced early monitoring of vital parameters and offer treatments based on pathophysiology of patients suffering from TIA. Here, a neurologist with stroke experience is present 24 hours a day, in addition to specialized staff. Patients should then have their blood pressure, electrocardiography, and blood oxygenation monitored for at least 24 hours—optimally 72 hours or longer, based on the

pathophysiology of TIA—and fever, blood sugar, and fluid balance should also be controlled. Patients receiving SU care should not be fed orally until dysphagia testing is performed. In cases where dysphagia is present, feeding routes are recommended. Patients' neurological status and National Institutes of Health Stroke Scale (NIHSS) score should be determined every 6 hours by a neurologist or by a doctor who has experience in treating stroke. The evaluation of etiology must be performed immediately during the monitoring period in the SU. If

cardiac diagnostic testing reveals cardioembolic source of TIA, patients should be administered oral anticoagulants. The SU team typically consists of neurologists with stroke experience working in cooperation with neuroradiologists. A specialized medical and nursing team should immediately implement physiotherapy and initiate speech therapy and ergotherapy as early as possible. All radiological investigations, such as cranial computed tomography (CCT), magnetic resonance imaging (MRI), magnetic resonance angiography, and transesophageal echocardiography as well as ultrasound sonography of the arteries of the neck and brain, should be readily performed when necessary.

Statistics

We analyzed the data with an SPSS software program (version: PASW Statistics 22). The mean, standard deviation, and percentage values were used to describe the data. We performed a χ^2 test to calculate the correlation between parametric variables, and a t test and a Mann-Whitney U test between nonparametric variables. A P value less than 0.05 was considered statistically significant.

Results

A total of 1114 consecutive patients suffering from TIA (mean age, 70.5 ± 13 years; 49.9% women) with an NIHSS score (mean, 1.4 ± 2.5)

	Stroke unit N=604	General wards N=463	P
CCT	583 (98.5)	439(96.9)	0.08
MRI	257(45.2)	196(44.3)	0.7
Duplex sonography, extracranial transcranial	566 (98.1) 545 (94.1)	428 (96.2) 411 (92.8)	0.063 0.3
Dysphagia screening	272 (47.6)	121 (27,3)	<0.001
OAC after TIA	115 (19.5)	69 (15.1)	0.062
AT after TIA	485(81.5)	389(85.1)	0.12
CR after TIA	34 (5.8)	2 (0.4)	<0.001
Physiotherapy	288(51.0)	167 (37.2)	<0.001
Speech therapy	188 (33.0)	67 (14.8)	<0.001

Table 2: Diagnostic and therapeutic procedures of TIA patients during hospitalization CCT, cranial computed tomography; AT, Antiplatelet therapy; OAC, oral anticoagulation; CR; carotid revascularization. Data recorded in n (%).

The length of hospitalization for patients in the SU was longer than that of those in the GW (6.0 vs. 5.5 days; P=0.004). Complications during the hospital stay did not differ between the two groups (Table 3).

Complications	Stroke unit N=604	General wards N=463	P
Pneumonia	8(1.7)	10 (1.7)	0.9
Urinary tract infection	21 (3.5)	10 (2.2)	0.2

at NIHSS score (mean, 1.4 ± 2.5) at admission were included in this study. A total of 604 TIA Patients were admitted to the stroke unit and underwent semi-intensive care for at least 24 hours, whereas 37% patients were admitted directly to the GW.

Patients with TIA who were undergoing treatment in a SU were significantly younger (69.1 vs. 71.0 years; P=0.023) and had higher rates of paresis as TIA symptoms (30.1 vs. 21.8%; p<0.003), hypertension (79.7 vs. 74.3%; P=0.042) and hypercholesterolemia (57.2 vs. 46.7%; P=0.001) than those who were undergoing treatment in the GW (Table 1). The findings of the diagnostic evaluations (cardioembolic source) were found to be significantly higher in patients who were monitored in the SU compared to those in the GW, whereas the undetermined etiology of TIA was less common in patients who received TIA work up in the SU (Table 1).

The diagnostic and therapeutic procedures were shown in table 2. The carotid revascularization, dysphagia testing, physiotherapy, and speech therapy were performed at higher rates in patients who were admitted to the SU than those in the GW (Table 2).

Fall during hospitalization	3 (0.5)	3 (0.6)	0.7
Confusion	8 (0.6)	26 (1.1)	0.8
Cardiovascular complications	1 (0.2)	3 (0.6)	0.2
Other complications	18 (3.0)	14 (3.0)	0.9

Table 3: Complications after during hospital Stay; Value are in n and (%).

Discussion

TIA symptoms are frequently unspecific and are not consistently classified as vascular events, that may be associated with high risk of stroke, [20-22] the primary aim of the treatment of TIA is the protection of patients from disability and mortality caused by a potentially forthcoming stroke, which is carried out after the first event and through the implementation of investigations to evaluate the etiology and to eliminate the causes of TIA. The rapid evaluation and early initiation of treatment after a TIA can reduce the risk of stroke following TIA remarkably [23-25]. Furthermore, the implementation of secondary prevention strategies can be started immediately after the TIA event. Edlow and colleagues [26] found that only 54% of patients suffering from TIA who visited emergency departments were admitted to hospital. This finding suggests that 46% of patients suffering from TIA obtained an evaluation of etiology later in ambulatory care. SUs have been established to treat patients with stroke, but the ways of managing TIAs often vary and depend on the severity of the neurological deficits and findings of the brainimaging [15,16,25]. The hospitalization of TIA patients has been found to correlate with high rates of adherence to secondary prevention strategies and to reduce the stroke risk following TIA event, which is the main goal of TIA Management [27,28].

According to the diagnostic evaluation, the cardioembolic sources of TIA were detected more in patients in the SU than those in the GW and the undermined etiology of TIA was found to be less common in patients who were admitted to a stroke unit.

The hospital stay for patients in the SU was longer than for those in the GW. This could have been caused by the higher frequency of patients in the SU that underwent a carotid revascularization after the detection of a carotid stenosis or an implementation of oral anticoagulant after findings of a cardioembolic source [29]. Another reason for longer hospitalization time in patients who are been treated in the SU might be the need for monitoring for 24 hours at the very least.

In summary, this study shows that diagnostic evaluation, therapeutic procedures, and secondary prevention strategies used in treating patients with TIA, and are carried out more often in patients who were admitted to a stroke unit than in general wards that may prevent TIA patients from a disabling stroke. Further prospective randomized studies are needed.

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