

CHADS₂ and CHA₂DS₂Vasc-Score in Peripheral Systemic Embolism

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Abstract

Objectives: We analysed the characteristics of patients with an acute peripheral embolic event considering the possible use of the CHADS₂-Score and the CHA₂DS₂Vasc-Score

Patients and Methods: We retrospectively analyzed 163 cases of acute peripheral arterial embolism treated in the Department of Vascular Medicine of the HELIOS Klinik Krefeld, Germany, from 2008 to 2011. We retrospectively screened the medical form for information regarding atrial fibrillation (AF) and the risk factors necessary to calculate the CHADS₂ and CHA₂DS₂vasc score.

Results: Arterial hypertension and age > 75 years were the most frequent risk factors. Mean CHADS₂ score was similar in males and females (2.3 ± 1.5 and 2.3 ± 1.4). 66% of the males and 63.3% of the females scored 2 and more points. Mean CHA₂DS₂Vasc score was 3.6 ± 2.0 in males and 4.6 ± 1.9 in females. 85.2% of the males and 95.4% of the females scored more than 2 points.

In the medical forms AF was documented in 79 (48%) patients, of which 23 (43%) were males and 56 (51%) females. Mean CHADS₂ score and mean CHA₂DS₂Vasc score were slightly higher in those with AF compared to the total group, but not significantly different. The rate of patients with 2 and more points increased for both scores: CHADS₂ score: males 82.6% and females 76.8%, CHA₂DS₂Vasc: males 100% and females 98.2%. Almost half of the patients with AF had anticoagulation with phenprocoumon before (males 12 (52%), females 24 (43%), but only every 10th was within the therapeutic range (INR ≥2)

Conclusion: The number of those with AF is high amongst patients with acute peripheral embolism. According to the CHADS₂ and CHA₂DS₂Vasc score, most of these patients had an indication for oral anticoagulation independent from the embolic event.

Introduction

Apart from atherosclerosis, arterial embolisms are the main causes of arterial occlusion leading to cerebral infarction and acute limb ischemia. Such embolisms themselves are frequently associated with atrial fibrillation (AF). To prevent arterial embolism is a great challenge in older patients suffering from AF. Much effort has been spent to implement a consistent anticoagulation strategy in the

case of AF in the recent years^{1,2} and new anticoagulants have been developed and introduced to the market.^{3,4,5} Specific scores have been developed to predict the risk of embolic events, predominately embolic strokes.^{1,2,6,7} Usually most guidelines talk about systemic embolism in general and do not differentiate between embolic stroke and peripheral embolism in the upper or lower limb. Unfortunately, there is no data available regarding the predictive value of these scores for systemic peripheral embolisms as these embolisms are less frequent than cerebral embolisms.

In general, data regarding peripheral embolisms is scarce. Usually, vascular surgeons or interventionalists talk about acute limb ischemia as a potentially devastating but treatable disease.^{8,9,10} Those papers deal with small number of patients only and do not give any information of a possible use of any score at the moment the event occurred. Due to the non-cardiac origin of the embolus occluding peripheral arteries, the classical scores accepted for the prediction of stroke in patients with AF might be less useful.

Therefore, we analysed the characteristics of patients with an acute embolic peripheral event considering the possible use of the CHADS₂-Score and the CHA₂DS₂Vasc-Score.

Key Words:

Embolic Event, Acute Limb Ischemia, Peripheral Embolisms, CHADS₂ Score, CHA₂DS₂Vasc: Score

Disclosures:
None

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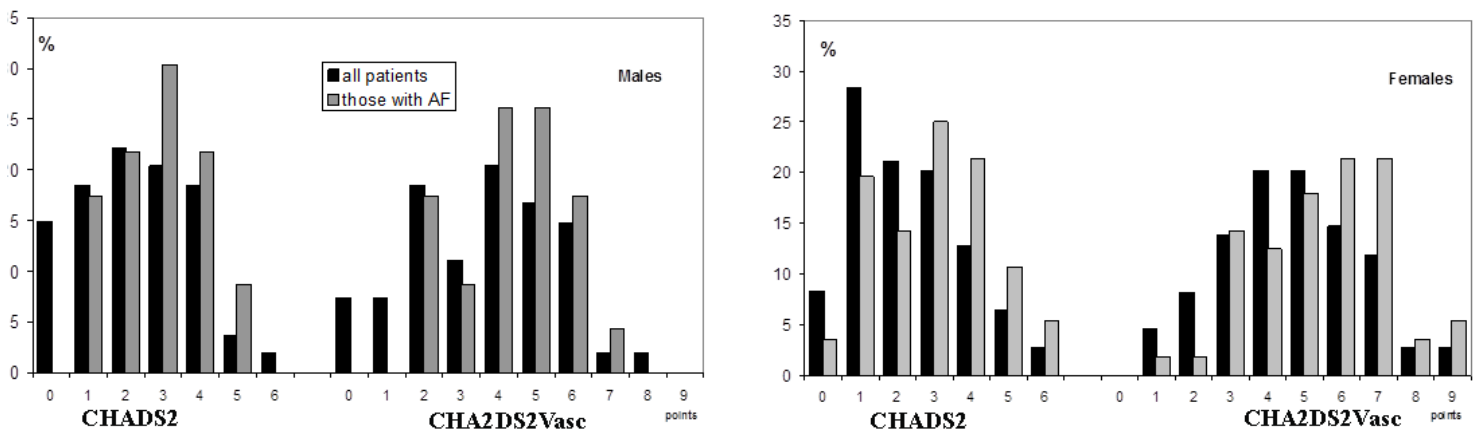


Figure 1: Distribution of points estimated using the CHADS₂ (left) and the CHA₂DS₂Vasc score (right) in all patients and those with documented AF, separated for males and females

Patients and methods

Krefeld is a city of 240,000 inhabitants in West Germany, and the HELIOS Hospital in Krefeld has 1000 beds and treats about 46.000 patients a year.

We retrospectively searched for all cases treated surgically by open embolectomy for acute limb ischemia from 2008 to 2011 in the Department of Vascular Medicine. Cases were accepted as embolic event if:

- there was an acute onset of ischemia within 5 days before admission to hospital.
- the sonographic or angiographic (intra-arterial digital subtraction angiography, MR-angiography) imaging showed a short occlusion adjacent to a arterial bifurcation or trifurcation of the limb arteries
- the intra-operative findings revealed a circumscribed embolus and no or only minor atherosclerotic narrowing of the affected artery.

In addition, we included some patients with acute embolic events affecting the visceral and renal artery if they became acutely symptomatic and the clinical work-up and CT or MR images diagnosed an embolic occlusion.

We retrospectively screened the medical form for information regarding AF, a proven source of the embolus and the risk factors necessary to calculate the CHADS₂ and CHA₂DS₂Vasc score.

Statistics

Data management and calculations were done using Microsoft® Excel 2003 and Microsoft® Access 2003. T-Tests were done to prove statistical significance and a p-value of 0.05 was accepted to be significant.

Results

163 cases were defined as acute embolic events (Tab. 1). Two thirds were females and females tended to be older, without it being significant. The left limb was affected more frequently (50%) than the right limb (37%), and the lower limbs (64%) more frequently than the upper limbs (26%).

Looking at all patients, arterial hypertension and age > 75 years were the most frequent risk factors (Tab. 2). Mean CHADS₂ score was similar in males and females (2.3 ± 1.5 and 2.3 ± 1.4). 66% of the males and 63.3% of the females scored 2 and more points. Mean CHA₂DS₂Vasc score was 3.6 ± 2.0 in males and 4.6 ± 1.9 in females. The difference is due to the risk factor "female" included in this score. 85.2% of the males and 95.4% of the females scored more than 2

points.

In the medical forms AF was documented in 79 (48%) patients, 23 (43 %) of which were male and 56 (51%) of the female. Looking only at those patients with documented AF, arterial hypertension and age > 75 years were still very frequent in males, but the rate of patients with diabetes mellitus and a prior stroke or embolic event increased (Tab. 3). In contrast to the males, the rate of all risk factors included in the different scores decreased in females. Mean CHADS₂ score and mean CHA₂DS₂Vasc score were slightly higher compared to the total group, but not significantly different. The rate of patients with 2 and more points increased for both scores: CHADS₂ score: males 82.6% and females 76.8%, CHA₂DS₂Vasc: males 100% and females 98.2% (Fig. 1)

Almost half of the patients with AF had had anticoagulation with phenprocoumon before (males 12 (52%), females 24 (43%), but only every 10th was within the therapeutic range (INR ≥2) (Tab. 3).

Echocardiography, either trans-thoracally or trans-esophageally, was done in 62 (38%) patients only (in 41 (52%) of those with AF). Intra-cardial thrombus was documented in 13 (5 males and 8 females) patients only. 8 of them had documented AF. In addition, embolisms might have been associated with 3 aortic thrombi, 2 infrarenal aortic

Table 1: Characteristics of the 163 cases accepted with the diagnosis of acute limb ischemia due to arterial embolism

	Males	Females
Number	54	109
age (mean ± SD)	71 ± 13	75 ± 15
Mesenterial or renal artery	5	8
Aorta	2	1
Upper limb	12	34
Proximal (including cubital artery)	12	34
Distal (distal from cubital artery)	0	0
Lower limb	37	67
Proximal (iliac and femoral arteries)	18	30
Distal (popliteal artery and more distally)	19	37
Limb embolisms		
Both sides	1	3
Right side	15	46
Left side	31	51

aneurysms and one endocarditis. Unfortunately we do not have any follow up after discharge from hospital.

Discussion

Our data show that around 50% of the patients becoming clinically symptomatic for acute limb or organ ischemia due to peripheral arterial embolism present with AF. According to the CHADS₂ or CHA₂DS₂Vasc score criteria, the majority of the patients presenting with AF should have been on anticoagulation, but that was the case for only 50%. In most of the patients on anticoagulation, INR was not within the therapeutic range when they became clinically symptomatic.

Large registers giving a systematic description of distribution of peripheral embolic events and characteristics of affected people are missing. Peirara et al reported on 29 cases of peripheral arterial embolisms out of a total of 20,211 hospitalizations in a cardiology centre in the city of São Paulo.¹¹ Karapolat reports on 730 patients who were seen between January 1984 and April 2004.¹² Atrial fibrillation was documented in 59.3% of patients. HU reported on 346 patients who were treated between January 1998 and October 2008, 210 of which were males, with 56 events affecting the upper and 290 the lower extremities.¹³ Causative factors included cardiogenic embolisms (n = 301), vasogenic embolisms (n = 33) and unknown origin (n = 12). Magishi et al reported on 21 patients treated from January 1993 to July 2007 with acute arterial occlusion in the upper extremity.¹⁴ Their average age was 73.0 years, with 66% being male. The main associated disease was arrhythmia in 95% of cases. Gossage et al. reviewed the prevalence and outcome of all surgically treated upper and lower limb embolisms presenting to one vascular unit for acute limb ischemia from January 2001 to June 2004: 27 for lower limb ischemia and 15 for upper limb ischemia.¹⁵ Two thirds of these patients were found to have atrial fibrillation at presentation (n = 28). Tofgh et al reported the incidence and outcome of all cases of upper

and lower limb embolisms which were treated surgically from January 2001 to June 2006: 58 for lower and 27 for upper limb ischemia.¹⁶

Rates of AF mentioned in the literature reporting about acute limb ischemia varied from two thirds up to 95% without specifying the arrhythmias.^{11,12,15} In our population 43 % of the males and 51% of the females had documented AF. As we present a retrospective analysis, the number of patients with AF might be higher for different reasons. The main point is that we included patients treated in a vascular surgical department, with AF not being systematically looked for by Holter monitoring. AF was documented only if patients had a history of AF or if it was documented by routine ECG on admission. Thus, we could have missed some patients with non-permanent AF.

In contrast to other reports, this is the first report that looked for the role of the CHADS₂ and CHA₂DS₂Vasc scores in patients with peripheral arterial embolisms. According to the CHADS₂ score, around 80% of all patients with AF and an acute embolic peripheral event scored 2 or more points. According to the CHA₂DS₂Vasc score, nearly 100% of these patients scored 2 or more points and should have been on anticoagulation. Therefore, guideline-recommended anticoagulation in our patients with AF is less than optimal and needs to be improved. This fact is addressed in some recent papers as it is a general problem.^{17,18,19}

Predominately vascular surgeons and in part interventionalists see those patients presenting with acute limb ischemia, but from an education point they are not familiar with AF and the predictive role of different scores. The low rates of echocardiography and Holter monitoring to document cardiac thrombi and AF, respectively, in our population and in the literature show that a general clinical pathway regarding the role of AF in patients presenting with peripheral

Table 2: Characteristics of the 163 cases accepted with the diagnosis of acute peripheral arterial embolism. The numbers and rates are shown in per cent or mean \pm SD

	Males n = 54	Females n = 109
Congestive heart disease	15 (27.8)	28 (25.7)
Hypertension	37 (68.5)	80 (73.4)
Age > 75 years	22 (40.7)	67 (61.5)
Diabetes mellitus	15 (27.8)	27 (24.89)
Stroke + prior embolism	18 (33.3)	29 (26.6)
Stroke	12 (22.2)	18 (16.5)
Prior embolism	6 (11.1)	11 (10.1)
Vascular diseases	35	66
CHD	24 (44.4)	33 (30.3)
prior MI	9 (16.7)	13 (11.9)
Carotid stenosis	6 (11.1)	10 (9.2)
PAOD	23 (42.1)	36 (33.0)
CHADS ₂	2,3 \pm 1,5	2,3 \pm 1,5
CHA ₂ DS ₂ Vasc	3,6 \pm 2,0	4,6 \pm 1,9

Table 3: Characteristics of the 79 cases suffering from AF accepted with the diagnosis of acute peripheral arterial embolism. The numbers and rates are shown in per cent or mean \pm SD

	Males (n = 23)	Females (n = 56)
Congestive heart disease	8 (34.8)	6 (10.7)
Hypertension	20 (87.0)	16 (28.6)
Age > 75 years	12 (52.2)	14 (25.0)
Diabetes mellitus	10 (43.5)	3 (5.4)
Stroke + prior embolism	14 (60.9)	9 (16.1)
Stroke	3 (13.0)	5 (8.9)
Prior embolism	11 (47.8)	4 (7.1)
Vascular diseases	30	11 (19.6)
CHD	10 (43.5)	7 (12.59)
prior MI	5 (21.7)	1 (1.8)
Carotid stenosis	2 (8.7)	1 (1.8)
PAOD	13 (56.5)	2 (3.6)
CHADS ₂	2,8 \pm 1,2	2,9 \pm 1,6
CHA ₂ DS ₂ Vasc	4,3 \pm 1,5	5,4 \pm 1,8
On anticoagulation	11 (52)	22 (43)
INR \geq 2	1	2

embolism in vascular departments has not been established. After the treatment of local ischemia, patients are dismissed as soon as possible. Treatment strategies depend on the intensity of ischemia and tissue viability. In the case of embolic strokes a strict diagnostic work-up, including neurologists, cardiologists and radiologists is the standard in most countries.²⁰ A similar strategy has to be implemented in association with vascular departments treating patients with acute peripheral embolisms. Unfortunately, the necessity of such a strategy is not mentioned in the recent guidelines for peripheral arterial disease.²¹

The unresolved question is the therapeutic clinical strategy in the subgroup without documentable AF and CHADSVasc score more than 2 and those without any suspected source of embolism. The question is whether anticoagulation is justified and how long it should be performed. A longterm follow-up of these patients would be necessary to analyse the risk benefit ratio. We can not draw any conclusion from our data, but would recommend an anticoagulation for a specific time to see whether AF or any other suspected disease become clinically manifest.

The strength of this study is that the analysis has been done in a homogenous group of patients with well defined non-cerebral embolic events. Even the recent studies on new anticoagulants in patients suffering from atrial fibrillation do not definitively specify the embolic aetiology of each vascular event. Primary outcomes were either stroke or systemic embolism.^{3,4,5} "Stroke" covers each ischemic stroke without differentiation of embolisms of cardiac, aortic or carotid origin. "Systemic embolism" was defined as an acute vascular occlusion of an extremity or organ, documented by means of imaging, surgery or autopsy.

Systemic embolism was not differentiated from acute local arterial thrombosis.

As this is a retrospective analysis, the number of patients with AF as well the number of risk factors can be assumed to be underestimated.

Conclusions:

The number of those with AF is high amongst patients with acute peripheral embolism. According to the CHADS₂ and CHA₂DS₂Vasc score, most of these patients had an indication for oral anticoagulation independent from the embolic event.

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