Clinical Study

Transient ischaemic attack clinic: An evaluation of diagnoses and clinical decision making

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ABSTRACT

The diagnosis of transient ischaemic attack (TIA) is based largely on the patient's symptom recall and clinical judgement. This decision-making process is highly subjective and the inter-observer reliability of TIA diagnosis is at best moderate, even among neurologists. The aim of this study is to examine the presenting features and final diagnoses of referrals to a TIA clinic and to evaluate characteristics that favoured the diagnosis of TIA over other TIA "mimics". Consecutive new referrals to a tertiary metropolitan hospital TIA clinic over a 9 month period were examined. Characteristics between TIA and non-TIA diagnoses were compared and analysed. Eighty-two patients were recruited. Eighteen (22%) were given a final diagnosis of TIA or stroke. Major alternative diagnoses included migraine (n = 17, 21%), presyncope/syncope (n = 13, 16%) and anxiety (n = 7, 9%). Four (5%) patients had unclassifiable symptoms with no clear final diagnosis. Mean age was $67 \pm$ a standard deviation of 17 years and patients diagnosed with TIA/stroke were on average older than those with non-TIA diagnoses (77 ± 10 *versus* 64 ± 17 years, $p = 0.003$). A diagnosis of TIA/stroke was favoured in the presence of moderate to severe weakness ($p = 0.032$), dysphasia ($p = 0.037$) or dysarthria ($p = 0.005$). Unclassifiable symptoms (for example, palpitations, confusion, headache) were reported in 27 patients (33%) and their presence favoured non-TIA diagnoses ($p = 0.0003$). TIA constituted a minority of the referrals to our clinic. Accurate clinical diagnosis of TIA facilitates early stroke prevention and avoids unnecessary investigations and prescriptions. Attempts to improve diagnostic accuracy of TIA should target improving the education and awareness of frontline medical practitioners.

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1. Introduction

A quarter of ischaemic strokes are heralded by transient ischaemic attacks (TIA), particularly in the preceding week [1]. Rapid access to early stroke care post-TIA significantly reduces subsequent stroke risk by up to 80% [2]. However, instituting early stroke prevention is dependent on making the correct diagnosis. In the absence of any useful objective tests, the neurologist's impression remains the diagnostic gold standard. The major limiting factor clearly lies in the patient's symptom recall and how they are interpreted, which can be highly subjective. Indeed, the inter-observer agreement of a diagnosis of TIA, even amongst stroke neurologists, is moderate at best [3]. We aimed to examine the clinical characteristics and final diagnoses of patients referred to a TIA clinic and evaluate features that made the clinician more inclined to diagnose TIA.

2. Methods

Clinical characteristics of consecutive new referrals to a tertiary metropolitan hospital (The Alfred, Melbourne, Australia) TIA clinic from April to December 2012 were documented. Characteristics between TIA and non-TIA diagnoses were compared using independent *t*-test for continuous variables and Fisher's exact or chi-squared tests as appropriate, for categorical variables. This study was approved by the Alfred Hospital Human Research Ethics Committee.

3. Results

Demographic and clinical information on 82 patients was analysed (Table 1). Referral source included emergency departments (n = 59, 72%), general practitioners (n = 11, 13%) and other hospital units (n = 12, 15%). Median time from referral to clinic visit was 16 days and this dropped to 14 days when only emergency department referrals were considered. Eighteen patients (22%) were

given a final diagnosis of TIA (n = 13) or stroke (n = 5). Non-TIA diagnoses included migraine (n = 17, 21%), presyncope/syncope (n = 13, 16%), anxiety (n = 7, 9%), metabolic (n = 4), seizure (n = 3), benign positional vertigo (n = 3), radiculopathy (n = 3), transient global amnesia (n = 2), carpal tunnel syndrome (n = 2), ophthalmic causes (n = 2), medication side effects (n = 2), de-compensation of pre-existing neurological deficits (n = 1) and subdural haemorrhage (n = 1). Four (5%) patients had unclassifiable symptoms with no clear final diagnosis. There were 40 male patients (49%). The mean age of all patients was 67 ± a standard deviation of 17 years. Patients with TIA/stroke were on average older than those with non-TIA diagnoses (77 ± 10 *versus* 64 ± 17 years, $p = 0.003$). The presence of other vascular diseases (including previous stroke), atrial fibrillation, renal function (known in 71 patients) and the number of cardiovascular risk factors did not differ between the diagnostic groups.

Symptom duration was classified as <30 minutes (n = 46, 56%), 30–60 minutes (n = 7, 8%), 61–180 minutes (n = 8, 10%) and >180 minutes (n = 21, 26%). Clinical presentation was categorised into weakness (n = 19, 23%), sensory disturbances (n = 22, 27%), speech disturbances (n = 28, 34%), visual disturbances (n = 15, 18%) and posterior circulation symptoms (dizziness/vertigo, ataxia and diplopia) (n = 25, 31%). Thirty patients (37%) had two or more symptoms belonging to these categories. A diagnosis of TIA/stroke was favoured in the presence of moderate to severe weakness ($p = 0.032$), dysphasia ($p = 0.037$) and dysarthria ($p = 0.005$). Unclassifiable symptoms (for example, palpitations, confusion, headache) were reported in 27 patients (33%) and their presence favoured non-TIA diagnoses ($p < 0.001$).

Clinical features of patients diagnosed with migraine, presyncope/syncope, anxiety and other diagnoses were analysed separately (Table 2). Of the patients diagnosed with migraine, 76% were known migraine sufferers or had previous similar episodes. The presence of any visual disturbances ($p < 0.001$), particularly those other than visual loss ($p = 0.001$ overall, especially scintillation, $p < 0.001$) in combination with other motor, sensory, speech or posterior circulation symptoms ($p = 0.031$) made the clinician more inclined to diagnose migraine. Presyncope/syncope was favoured when patients reported dizziness/vertigo with a suggestive history ($p = 0.023$), especially when speech disturbances were absent ($p = 0.003$). The diagnosis of anxiety was made more frequently in female patients ($p = 0.012$), particularly in the presence of positive sensory symptoms ($p = 0.025$). No clinical features favoured other miscellaneous diagnoses as a group.

Adequate data was available for calculation of the ABCD^2 score [4] for 69 patients. Mean ABCD^2 score was higher in patients with TIA/stroke compared to patients with non-TIA diagnoses (4.4 *versus* 3, $p = 0.001$). TIA/stroke patients more frequently scored 4 or higher on ABCD^2, indicating moderate to high stroke risk (13/16, 81% *versus* 24/53, 45%; $p = 0.02$). The three patients with TIA who scored low on ABCD^2 presented with posterior circulation symptoms. Of the patients with non-TIA diagnoses scoring 4 or more, only 46% (11/24) scored on "Clinical Features" compared to 92% (12/13) of patients with TIA/stroke ($p < 0.001$).

4. Discussion

TIA/stroke constituted less than a quarter of the referrals to our clinic. Clinicians were more inclined to diagnose TIA/stroke in older patients with weakness of at least moderate severity, and speech disturbances (dysphasia or dysarthria). On the other hand, symptoms not classifiable to weakness, posterior circulation symptoms and sensory, visual or speech disturbances weighed in favour of non-TIA/stroke diagnoses. Migraine was the most common alternative diagnosis followed by presyncope/syncope and anxiety.

Clinicians strongly favoured migraine when visual disturbances other than visual loss, especially scintillation, were present in conjunction with other motor, sensory, speech or posterior circulation symptoms.

In Australia, stroke causes the second highest number of deaths after heart disease and carries a cost burden of $2.14 billion per year [5]. Despite this, early access to stroke care post-TIA is limited. Only 22% of Australian hospitals not adopting an "admit all TIA" policy have rapid access to outpatient TIA clinics. More alarmingly, of the hospitals not having an "admit all TIA" policy or access to TIA clinics, 38% are large centers that admit more than 100 strokes per annum [5]. Due to the serious implications of a diagnosis (or missing a diagnosis) of TIA, referrals to TIA clinics tend to be more inclusive in order to maximise the sensitivity of TIA detection. Consequently, specificity is sacrificed in the process. Therefore, avoiding the over-diagnosis of TIA is equally important. TIA is not a trivial diagnosis as it commits patients to lifelong risk lowering medications with enormous ensuing health-economic implications. To illustrate this, in the year ending June 2013, prescription of rosuvastatin increased by over 10%, and together with atorvastatin generated the highest costs of any prescribed drugs for the Australian government, in excess of $720 million. Clopidogrel came in at 13th ($97 million) and perindopril at 37th ($43 million) [6]. In addition to providing early stroke care, the TIA clinic plays a pivotal role in ensuring rational utilisation of medical resources.

Unfortunately, diagnosing TIA in practice continues to rely heavily on the clinician's history taking and the patient's ability to recollect and describe their symptoms. The clinician's concept of what constitutes a TIA and interpretation of the patient's symptoms ultimately determines the final diagnosis. The inter-observer reliability for TIA diagnosis between non-neurologists and neurologists is poor and is no better amongst neurologists [3,7,8]. Common conditions misdiagnosed as TIA by non-neurologists include syncope, seizure, transient global amnesia, benign positional vertigo, and migraine. Symptoms other than motor or sensory deficits such as confusion, falls and imbalance and transient higher function disturbances pose the greatest diagnostic difficulties [7].

Acute MRI has been advocated to improve the diagnosis of TIA in recent times. The use of diffusion-weighted and perfusion-weighted imaging was thought to be positive in up to 50% of patients with TIA [9,10]. However, the use of acute MRI in all patients presenting with transient neurological symptoms is clearly unrealistic due to limited resources. In Australia, more than a third of hospitals treating stroke patients have no access to MRI, with the majority being rural centers [5]. Transient neurological symptoms are extremely common in general practice and emergency departments. Consequently, any new diagnostic test needs to be widely available and time and cost-effective to perform, akin to cardiac troponin in ischaemic heart disease. Unfortunately, such a diagnostic test remains elusive, at least in the foreseeable future.

The ABCD^2 score has received criticism regarding its lack of sensitivity at any cut-off point as a standalone stroke risk prediction tool [4]. In addition, there are inherent weaknesses including the lack of consideration for posterior circulation symptoms, atrial fibrillation and cerebral and vascular imaging findings. The original ABCD score was derived from a highly selective cohort of patients assessed by neurologists as having probable or definite TIA [11]. In practice, access to neurological expertise is often limited. When the ABCD^2 score is applied to TIA "mimics" such as migraine, this can generate unwarranted concerns and may drive unnecessary interventions including hospital admissions. In our study, 45% of patients with non-TIA diagnoses were deemed to be at moderate to high stroke risk according to the ABCD^2 score. The scores of over half of these patients were purely accounted for by age, symptom duration and the presence of hypertension and diabetes without taking into account the clinical presentation.