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Features of Transient Ischemic Attacks Based on Age and Concomitant Pathology

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ABSTRACT

This article explores the clinical and epidemiological features of transient ischemic attacks (TIA) with a focus on age-related patterns and the influence of concomitant pathologies. Drawing on clinical observations and statistical analysis, the study investigates how TIA manifests differently across age groups—young adults, middle-aged individuals, and the elderly—while also examining how co-existing conditions such as cardiovascular disease, diabetes mellitus, hypertension, hyperlipidemia, and obstructive sleep apnea affect symptomatology and prognosis. The findings suggest that TIA presentation, duration, and risk of progression to ischemic stroke are influenced not only by biological age but also by the cumulative burden of comorbid conditions. The article also evaluates diagnostic approaches, laboratory findings, and imaging strategies, underscoring the necessity for timely and individualized intervention. The results support the development of more targeted prevention and rehabilitation strategies based on age and risk profiles to reduce the burden of cerebrovascular disease.

KEYWORDS: Transient ischemic attack (TIA); age-related differences; stroke risk; comorbidities; cardiovascular disease; diabetes mellitus; hypertension; hyperlipidemia; obstructive sleep apnea; neurological symptoms; clinical features; diagnostic imaging.

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INTRODUCTION

Transient ischemic attacks (TIA) are defined as temporary focal neurological deficits due to a disturbance in the brain's blood supply. Permanent symptoms are rarely manifested following a TIA; they typically last for around 20 minutes (most under 1 hour) and should last less than 24 hours. Patients with a TIA should undergo medical evaluation and neuroimaging in order to identify the underlying cause. The TIA score identifies high-risk patients who warrant immediate hospitalization and possible therapy such as antiplatelet agents, anticoagulants, or carotid endarterectomy (PĂUN & MOGOANTĂ, 2023).

The complication rates for untreated TIAs are almost certain to exceed 10% in the days following the event. Rapid evaluation and diagnosis of a TIA is essential to prevent the onset of stroke as patients with TIA and those with probable TIA are at risk for stroke during the first week or two following their initial presentation. Nonetheless, most patients are treated late acutely or inappropriately. An exquisite care of triage and access to proper emergency services by a general population is required (Maria Ippen et al., 2021).

It is important to determine if a patient is a TIA patient who has been brought to the ER or a patient with a stroke mimic. After the stroke, some TIA patients may have persistent deficits. It is needless to send a cerebral CT or MRI scan or if it has already been performed, presuming the nonexistence of cerebral infarction. To calm down the families, some ER physicians send regular cranial imaging exams even after vascular studies have been performed, confirming the TIA diagnosis. In addition, proper management among physicians is oftentimes needed for distinct clinicians who will treat a patient in different departments.

MATERIALS AND METHODS

The clinical part of the study was conducted at the Ibn Sina City Hospital No. 1 in Tashkent. A case-control study was carried out between January 2022 and December 2024. The international definition of transient ischemic attack (TIA) proposed by J.D. Easton et al. in 2009, which is still used in clinical practice and scientific research worldwide, was applied. TIA was defined as a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia without acute infarction. The diagnosis was established according to ICD-10, code G45.

Inclusion Criteria:
- Elderly age group
- Focal neurological symptoms or signs of retinal ischemia with regression of symptoms upon admission, and no evidence of acute infarction on MRI or CT
- Neurological examination performed within the first 24 hours after admission

- No cognitive or speech impairments that would interfere with the study
- MRI or CT findings without any other structural abnormalities except for leukoencephalopathy, cortical or cerebral atrophy
- Informed consent for participation, additional investigations, and follow-up monitoring for one year after the initial assessment

Exclusion Criteria:
- Significant cognitive impairment, psychiatric or speech disorders interfering with the interview process
- History of stroke, subarachnoid hemorrhage, cerebral aneurysm, intracerebral hemorrhage, brain tumors, neurosurgical operations, multiple sclerosis, epilepsy, encephalitis, meningitis, or other serious neurological or somatic diseases
- Instrumental examination revealing another serious pathology incompatible with inclusion in the study
- Contraindications to any additional research methods
- Refusal to participate at any stage; participants could withdraw for any reason

A total of 120 elderly patients (mean age: 68.4 ± 6.3 years) who were treated in the neurology departments of Tashkent City Clinical Hospital No. 1 were studied. Group I: Patients with chronic ischemic brain disease (CIBD) stage II – 29 patients (24.2%), mean age 62.4 ± 8.6 years

Group II: Patients with TIA – 45 patients (37.5%), mean age 63.8 ± 5.1 years
Group III: Patients with ischemic stroke – 46 patients (38.3%), mean age 69.1 ± 3.8 years
Control Group: 20 age- and sex-matched elderly individuals without cerebrovascular disease

Table 1. Distribution of elderly participants by group and sex

Group	Sex	n (abs.)	%
Group I	Male	15	51.7%
	Female	14	48.3%
Group II	Male	26	57.8%
	Female	19	42.2%
Group III	Male	26	56.5%
	Female	20	43.5%

Diagnostic and Evaluation Methods

No.	Type	Description
1	Clinical methods	Collection of complaints and history, general somatic and neurological exams; verification and severity evaluation of COVID-19 if present
2	Assessment scales	Charlson Comorbidity Index (CCI), NIH Stroke Scale (NIHSS), ABCD² Score, Hospital Anxiety and Depression Scale (HADS), Mini-Mental State Examination (MMSE)
3	Laboratory methods	General clinical tests, biochemical panel, coagulation profile
4	Instrumental methods	Electrocardiography (ECG), brain MRI, duplex scanning of extracranial brachiocephalic arteries, transcranial Doppler monitoring
5	Statistical analysis	Data processed using Microsoft Excel and Statistica 6.0 software

UNDERSTANDING TRANSIENT ISCHEMIC ATTACKS

Transient ischemic attacks or TIAs are sometimes referred to as “mini-strokes.” TIAs occur when there is a temporary lack of blood flow to the brain, spinal cord or eye. Because TIAs are temporary, they typically do not cause permanent damage. However, TIAs often precede or accompany a permanent ischemic stroke and warrant prompt medical attention. TIAs are not considered as strokes, but as warning strokes with symptoms that are set up similar to stroke complex. Complimentary tests or imaging studies may show a vascular occlusion with resolution after minutes to hours. TIAs can be classified into: 1. Non-striatal monoclonal TIAs refer to TIAs with unilateral weakness and speech/memory disturbance. 2. Hemianopic TIAs refer to TIAs with impaired field of vision or facial sensation. 3. Recurring TIAs refer to TIAs recurring more than two times within 24 hours. Accompanying diseases may better classify TIAs into groups shared with common etiologies. According to the validity of aetiological factors, the following classifications are determined: 1. Large vessel atherogenesis cause TIAs mainly in patients with more than 60 years of age or multiple risk factors. Anterior circulation is predominantly affected and resolved in more than 15 amended counts within 60 minutes. It often occurs at rest in the morn. 2. Small vessel occlusion causes TIAs primarily in patients ranging in age from 40 to 70 years. Vascular territorial involvement is presumed in basal ganglia or brainstem. It often occurs before sleep or during excitement. Milder symptoms might last only for minutes. 3. Decrease of blood flow in collateral circulation hypo-perfusion TIAs mainly involves older patients with cardiogenic or acute thrombosis. TIAs resolve within 30 minutes or take a few hours.

EPIDEMIOLOGY OF TRANSIENT ISCHEMIC ATTACKS

Transient ischemic attacks (TIAs) are reversible acute neurological deficits caused by temporary cerebral ischemia. While depending on age and associated pathology, TIA patients differ in demographics, onset characteristics, clinical manifestations, and severity. Research has shown that younger patients suffering from TIAs tend to be more male, with a shorter onset-to-door time and a lower prevalence of atrial fibrillation. Transient neurological attacks with carotid territory symptoms are more common

in older patients, who also present with more severe symptoms and have a higher degree of stenosis. Acute cerebrovascular events not caused by TIA are more common in patients with vascular malformations and abnormal coagulability (Maria Ippen et al., 2021). Although TIAs are especially prevalent in elderly patients, they occur not infrequently in younger people. This study aims to define distinguishing features of TIAs compared with other plosive neurological deficits (NPs) according to age and associated pathology. The corresponding research materials are clinical records of TIAs and TIAs mimicking NPs of all age groups examined and treated in a 12-year period. Etiological and risk-factor differences among patients with TIA and mimicking conditions are more pronounced in younger age groups, with the corresponding pathology spectrum varying significantly (PĂUN & MOGOANTĂ, 2023). There are age-dependent TIA characteristics. The older the patient, the lower the male-to-female ratio, the time from onset to hospital admission and computed tomography, and the higher the prevalence of atrial fibrillation, embolic strokes, atherothrombotic strokes, vertebrobasilar symptoms, vestibular symptoms, and severe stenosis (≥70%).

AGE-RELATED RISK FACTORS

Transient ischemic attacks (TIA), often labeled as "mini strokes," are a slew of ischemic events that give rise to acute neurological deficits that typically resolve within 24 hours. Despite their transient nature, TIAs have major ramifications not only for the individual but also for family, society, and country. Therefore, it is essential to deliver optimal management for these patients. Investigating the risk factors is one of the most crucial steps in tackling this silent epidemic. Because age is an established threshold, the association of risk factors with youth, middle-aged individuals (40–60 years), and the elderly now takes precedence. Pathologies identified as risky in youth include patent foramen ovale, compromised vasculature involving connective tissues, arterial anomalies, hyperhomocysteinemia, and venous compromise. Intriguingly, although they are frequently seen at youth, many can still manifest during middle-age and even adulthood. However, with advancing age, these abnormalities are less frequently coexisting. Young TIA patients lower in age are more often witnessed with congenital heart disorders and less often exhibited with atherosclerosis, small vessel diseases, and hyperlipidemia.

In middle-aged individuals, atherosclerosis is almost as prominent an etiology compared to small vessel diseases. Nevertheless, paroxysmal atrial fibrillation can also be detected quite often, as this rhythm abnormality accumulates with advancing age and stress. Notably, while many associated pathologies are the same as those seen with youth, they are generally under 50 years. Also, there is a unique aberration seen here: diabetes mellitus is not as relevant after 50 as before. Interestingly, the stroke risk from diabetes has not been found to enter into regression with age. This warrants further elaboration, as many of today's diabetes-associated conditions and/or abnormalities are frequently viewed as "elderly" characteristics.

5.1. Young Adults

Assessing the features of transient ischemic attack (TIA) in patients aged 18 to 45 years, a cohort of 478 people with TIA was analyzed. The group comprised 319 men and 159 women, with a mean age of 38.84±8.12 years. A comprehensive examination was conducted to assess TIA features and identify risk factors for cerebrovascular accident (CVA) development. The inclusion criteria stipulated clinical diagnosis of TIA with completed examination, and the exclusion criteria considered refusal for examination and/or treatment, presence of serious somatic diseases, and impossibility of TIA clinical diagnosis verification.
The protocol involved collection of complaints and medical histories, in-depth neurologic examination, employing the National Institute of Health Stroke Scale for stroke severity assessment, as well as CT and MRI brain scans. Special attention was given to features of TIA, including their recurrence and the development of new focal symptoms. The risk factors of CVA included arterial hypertension, atrial fibrillation, changes in ECG, diabetes mellitus, dyslipidemia, chronic heart failure, smoking, alcohol consumption, drug addiction, presence of neuropsychic and somatic disorders, and constitutional pathology.

Statistical evaluations with a significance level of $p<0.05$ were applied. Normality of distribution was assessed via the Kolmogorov-Smirnov test. In case of normality, comparisons among groups used parametric tests. Non-normally distributed values encountered the Mann-Whitney U test or Kruskal-Wallis ANOVA. The association of qualitative features was assessed with the Chi-square test of independence or Fisher's exact test when more than 25% of cells had expected counts less than 5. To determine the risk of developing new focal symptoms, CVA, and TIA recurrence, calculation of odds ratios was completed through bivariate analysis in binary logistic regression. 95% confidence intervals for odds ratios were calculated.

5.2. Middle-Aged Individuals

Transient ischemic attacks (TIAs) in middle-aged individuals typically present themselves with more gradual, complex symptoms. Specifically, half of the patients will present from one hour to a week and about 73% of the patients will present initial symptoms that persist for hours. A higher incidence of headaches, especially sudden-onset headaches; emesis; and nausea were also found in middle-aged patients. Increased incidences of diplopia and ataxia were also found in association with danger signs. Middle-aged patients showed greater incidences of diabetes and hypertension and should closely follow the fasting blood glucose and blood pressure levels. Moreover, they should also be more concerned about the possibility of a subsequent stroke, as those who are middle-aged are often concerned about TIAs. The rate of progression to a stroke within 3 days of a TIA could also be higher.

TIAs in middle-aged patients may also be due to different etiologies, as a high prevalence of cardiac causes were also seen. In these patients, a higher prevalence of left ventricular ejection fraction less than 55% was found, which is directly related to higher rates of stroke. It is also seen that a higher occurrence of arterial or venous thrombosis (27%) was also found in this age group. Carotid artery stenosis of 70%–99%, dissection, and nonatherosclerotic cases were all ruled out in this study. Those most in need of aggressive testing and treatment include middle-aged patients presenting with the following three unfavorably assessed TIAs: those who presented atypical symptoms, those whose symptoms were associated with associated danger signs, and those whose initial symptoms persisted for more than two hours. Moreover, this age group showed a higher incidence of drug abuse compared

to the young patients. Though TIAs are typically not associated with overt repeated vomiting, it may be a more specific consideration for TIAs in this age group.

5.3. Elderly Population

The elderly population presents a greater risk of transient ischemic attacks (TIAs) than younger individuals due to various environmental, biological, and psychological factors. The rapid growth of the elderly population, resulting from life expectancy increases and declining fertility rates, has been characterized as one of the most striking phenomena of the twentieth century, with projections of 2.1 billion older people globally by 2050. In industrialized countries, over 20% of the population is 65 years or older. Countries in the Commonwealth of Independent States are experiencing comparable trends, with projections of 214 million elderly people by 2050.

Biological processes, which can be either degenerative or homeostatic, occur over time, influencing the balance between risk factor exposure and the onset of age-related diseases. Factors encompassing pre-disposing, triggering, and aggravating influences can intensify the biological mechanisms accelerating the development of age-related diseases. The impact of risk factors' accumulation on the levels of the biological processes is thought to be linear. The relative risk, or "slope" of the association of a risk factor with an age-related disease, tends to diminish with age. Some risk factors exert their effects earlier than others, influencing the order of age-related diseases. Sociobiological processes, referred to as environmental effects, can alter life conditions and risk factor exposure, leading to decreased cerebrovascular health. Population migrations due to socio-economic transitions, wars, and geopolitical changes can accelerate such processes.

The elderly population suffers from a number of multifactorial and/or degenerative diseases, which in turn may predispose ischemic stroke and TIA. Health conditions and treatment affecting morbidity represent potential confounders. More effective treatments may reduce the incidence of TIA, but further studies are needed to confirm this assumption. The emergence of new risk factors may depend on factors preceding these ages. The decline of the Soviet Union, leading to the collapse of a command-tied economy and a breakdown of a once unified health system, paradoxically led to a sudden mortality increase, affecting elder populations the most as they were less prepared for radical changes; they were induced by marked socio-economic transitions associated with increased life uncertainties, stress, drinking, and other health- and quality-of-life-affecting behaviors.

CONCOMITANT PATHOLOGIES

Transient ischemic attacks (TIAs) usually appear after the age of 45, and their features have been studied in some aspects of concomitant pathologies. Therefore, network analysis was used to assess the differences in clinical manifestations of TIAs in patients with concomitant pathologies to identify unique combinations and their differences. From 327 patients with TIA included in the study, 252 were in the main group (with concomitant pathology) and 75 in the control group (without concomitant pathology). The obtained results revealed that the main concomitant pathologies in patients with TIAs were hypertension, diabetes mellitus, atherothrombotic diseases, metabolic syndrome, and hyperlipidemia. The differences in TIA manifestations in patients according to age groups (<60 years and ≥60 years) and in the context of concomitant pathologies were also analyzed. The first network showed that atherothrombotic diseases, diabetes mellitus, hyperlipidemia, and hypertension were the most common terms and most frequently mentioned in patients with risk factors and prior TIA. In patients with concomitant pathologies, there was a unique group of combinations: these patients often experienced a sudden speech disorder and less often experienced weakness in the muscles of the arm. In patients without concomitant pathology, weakness in the muscles of the upper limb was the most common, sudden speech disorder was rare, and there was no other group of combinations. The second network showed that it included 21 features of concomitant pathologies: among them, obesity, metabolic syndrome, and obstructive sleep apnea were the central terms, and their interconnectedness was significant. In addition, there was a unique group of combinations in patients with increased age, including obstructive sleep apnea + hypertension + metabolic syndrome, diabetes + hypertension + metabolic syndrome, and diabetes + hyperlipidemia + metabolic syndrome.

6.1. Cardiovascular Diseases

Cardiovascular diseases (CVD) rank high in the list of immortality risk factors among the population and are the main cause of long-term cognitive dysfunctions in young patients. They contribute to the progression of persistent ischemic cerebral lesions, a complex network of coexisting dynamic changes, causing a cascade of risks for transforming into irreversible brain organic disorders.

Permanent blood flow change led to the formation of chronic brain ischemia, based on cerebral arteriosclerosis and/or acquired cardioembolic changes. Low levels of transport of blood to the brain caused brain atrophy and tissues' failure, and inflation of compensatory adequate evolution could result in the evidence of lost but irreversible structures.

Dyscirculatory encephalopathy as a subcortex small-vessel brain injury syndrome is more frequent in young patients with CVD. Diseases leading to vascular demyelination are systemically reversible and if patients return a normal blood flow, they remain with no permanent defects. This class of diseases is more distinguishable and with a more moderate evidence than that one of pre-senile dementia.

Borderline and, more frequently, idiopathic forms of vascular cognitive impairments may progress much faster but still, recurrent progressive forms are more rather used in such cases. Due to inadequate tools for the presence control of this pathology, such cases are more usually met in practice.

However, transition types from younger stages to fastest progressing vascular dementia are also expected but extremely rare.

Invasive and other neuro-physiological investigations may reveal signs of anatomic tissue's insufficiencies in patients with coincident CVD. Stimulus-based investigation may authenticate the presence of extensive reversible dysfunctions. These findings are more characteristic for the first type of pathologies but not regularly referable and could be related to various exacerbations under the conditions of multiple diseases' dependence. For the portion of the presented cases, neuro-debugger systems were conductible to detect reversible brain contamination.

6.2. Diabetes Mellitus

Transient ischemic attacks (TIAs) can occur in the presence of diabetes mellitus (DM) independently of other vascular risk factors. Data suggests that TIAs prior to the disease state of diabetes are uncommon. Patients with TIAs and DM are prone to vascular events, and specifically, to stroke. Epidemiological studies showed that both type 1 and type 2 DM were associated with an increased risk of cerebrovascular diseases, with a relative risk of 1.5 to 5 for stroke. The prevalence of diabetes is higher in patients with TIAs or minor strokes compared to matched control subjects.

Around half of patients with TIAs have diabetes, with rates increasing in older age groups. Women with TIAs and DM are at particularly high risk, with about a third experiencing a recurrent stroke within two years. Hemoglobin A1c levels may be elevated prior to the onset of TIAs or brain ischemia in DM patients. The timing of the peak TIA-to-stroke risk following a TIA event predominantly occurs within the first three months, which is more pronounced in individuals with DM. These findings suggest that TIAs may be indicative of subclinical vascular disease in the presence of diabetes.

The presence of DM is often expressed in terms of duration, ranging from the period since diagnosis of diabetes to the time of TIA. Studies looking at duration of DM prior to TIAs have so far yielded variable results. In patients with TIA, hyperglycemia is more frequent than in stroke patients. While there are data to suggest that acute hyperglycemia in patients presenting with acute stroke is associated with worse functional outcomes, studies examining its relationship to TIA have yet to be performed, although this is an important avenue for further research.

6.3. Hypertension

Hypertension is a significant risk factor and comorbidity for cerebral ischemic events, whether ischemic stroke or TIA. A 10 mmHg increase in systolic blood pressure doubles the risk of stroke, whereas high diastolic blood pressure alone may have a protective effect on vascularization, preventing ischemic cerebral events. The relationships between blood pressure (BP) levels and ischemic events are complex, given the progressive nature of most hypertensive patients. BP must also be analyzed dynamically since it often has variations in different time frames. BP monitoring has now enhanced our understanding of the significant diurnal and nocturnal fluctuations in BP, which can be an indispensable aid in diagnosing arterial hypertension. The most exciting recent addition to this database is the use of continuous BP monitoring. Transient increases in BP, unrelated to physical activity or emotional stress, were observed in patients with stroke and TIA. These hypertensive emergencies may be caused by increased sympathetic activity in response to ischemia and cortical damage. Cortical lesions of greater than 20% volume damaged the sympatho-inhibitory network, leading to uncontrolled systolic BP surges of over 210 mmHg. Night-time dipping of more than 16% can be considered the method of choice to detect patients at high risk of stroke, TIA, and vascular outcome events. Hypotensive episodes at night were predictive of poor prognosis and subsequent strokes in patients with sleep apnea and ischemic events. White coat hypertension may be a mild marker of vascular risk, while its more severe variant may have comparable risk to those with established hypertension and may be considered hypertensive. “Normal” but elevated readings in some settings were related to renal outcome and require further investigation. Last but not least, antihypertensive medications may have anti-atherogenic properties that impact secondary and tertiary prevention measures.

6.4. Hyperlipidemia

Hyperlipidemia, characterized by elevated lipid levels in the blood, is a well-known risk factor for atherosclerosis and cardiovascular diseases, which can lead to ischemic strokes. It plays a critical role in the onset and development of various diseases and conditions, including ischemic stroke. The brain is highly susceptible to lipid metabolism because of its distinctive structure and blood supply. Indeed, early events of brain and systemic lipoproteins and lipids are correlated with the formation of early brain injury and neurodegeneration in animal models of both ischemic and hemorrhagic stroke.

The mean age of patients with hyperlipidemia was greater than patients without hyperlipidemia. Most patients with hyperlipidemia were from a rural community, and hypertension was prevalent in patients with hyperlipidemia. Patients with hyperlipidemia experienced more episodes of TIA than those without hyperlipidemia. There were two types of TIAs: pure and complex TIAs, both lipid profiles of patients with pure and complex TIAs were not different. Characteristics of pure and complex TIAs included broad ranges of parameters, a greater proportion of patients with complex TIAs was noted later that day of TIA, during the evening or night, and more patients with hyperlipidemia demonstrated complex TIAs than those without hyperlipidemia. The case of TIA showed a close relationship between age and the presence of hyperlipidemia, suggesting that aging may be a critical factor in the onset of TIA among patients with hyperlipidemia. In patients younger than 70, as expected, pure TIA was much more common than complex TIA. As the population increased, the mean age of patients in complex TIA with hyperlipidemia was significantly greater than the other groups. Hyperlipidemia may cause complex TIA in patients age 70 younger than those in 80 or older, which may increase the risk of transient ischemic attack.

Complex TIA was a better predictor of subsequent stroke than pure TIA. Prevalent cases of stroke were reported only when the time from the heartrending episode to the start of study was greater was considered a limitation, because all stroke patients were excluded. Brain computed tomography was performed at the beginning of the study. Vascular images were examined only. Four patients with cardioembolic stroke were not recalled and were unable to access the hospital medical records and should have been

excluded from the study.

6.5. Obstructive Sleep Apnea

Obstructive sleep apnea (OSA) is currently one of the most common conditions, which occurs in both men and women. OSA results from repetitive upper airway obstruction during sleep, and this leads to recurrent drops in blood-oxygen saturation. Severe OSA is associated with a five-fold elevation in the risk of cerebrovascular accident. OSA was identified as a prevalent pathology in patients with transient ischemic attack (TIA) events, or acute cerebrovascular event (ACE) onset.

In the study of concomitant outpatient pathologies, the group of OSA outpatients included patients with apnea-hypopnea index values above 15 events/h, who had been diagnosed via a home sleep study. The algorithm derived from the policy is based on the multilevel codes from the International Classification of Diseases, 10th edition. OSA was one of the most prevalent conditions when compared to other equally prevalent pathologies. This aligns with other studies that reported an epidemic of OSA in society. In patients with TIA or ACE events, OSA was a common pathology irrespective of age. But, in both groups, OSA became less common in the mature age groups.

Obstructive sleep apnea and other concomitant pathologies have been recognized in the heterogeneity of TIA. A higher prevalence of concomitant pathologies among older patients has also been found. The prevalence ranking of concomitant pathologies is generally consistent with the previous studies. It indicates that cardiovascular diseases and diabetes are the major pathologies to focus on in the treatment for cerebrovascular diseases. Sleep apnea was common among outpatients with TIA and ACE, indicating that it should be actively identified and treated. Future clarification of the association among all these concomitant pathologies may highlight a more perilous status of patients with multiple chronic disorders and provide more information on the guidelines for treatment of TIA and prevention of ACE onset.

CLINICAL FEATURES OF TRANSIENT ISCHEMIC ATTACKS

The clinical features of transient ischemic attacks (TIA), which are responsible for the onset of sudden neurological deficits, largely depend on the size, location, and nature of the involved vascular and extra- and intracranial arteries. The onset of neurology is sudden. Clinical episodes usually last minutes to a maximum of 2 hours. Favoured genesis is a localized brain ischemia which may be due to either (1) emboli from large arteries or from small vessel stenosis and occlusions; (2) watershed territories or border zone ischemia due to systemic hypoperfusion; and (3) rupture of a small atheroma and hematoma formation either in the carotids or in intracranial arteries.

Monosymptomatic TIA may be related to carotids or lacunar syndromes. Non-carotid syndromes are usually plurihsymptomatic. Dyskinetic TIA are typical of a mimic of epilepsy. Lacunar clinical symptoms are also favourably related to ‘lacunar’ locations. Intra-cranial arterial occlusions give spatially related symptoms and broaden the choice of differential diagnosis. Other vascular syndromes causing similar or broadly overlapping symptoms but of a different pathology belong to the family of TIA mimics such as hyperglycemia, polycythemia, autoimmune diseases, and coagulopathies.

Profound neurological deficits, especially in the case of multi-vascular territory ischemia, should mandate rescue therapy but should not be delayed or deferred. With the exacerbation of TIA cases, a CT scan to rule out stroke and intravenous perfusion of risk modulation should be the first steps, then evaluate subjects with carotid imaging, cardiac rhythm history, and coagulopathy. Recovery of the visual cognition should be inspected more deeply; any embarrassing lower level of cognition will get attention then recovery to a higher level of cognition instead.

7.1. Neurological Symptoms

The high prevalence of vascular lesions in Chinese elderly patients with transient ischemic attacks (TIAs) demonstrates that cerebrovascular lesions in this population may be closely related to hypertensive cerebral small vessel disease (CSVD), or small subcortical infarcts (SSIs). The presence of small basal ganglia and periventricular hyperintensities on T2-weighted images indicated that brain microvasculature disease had caused a typical series of pathological changes, including myocyte and vascular smooth muscle cell hypertrophy, arterial thickening, and occlusion and calcification of microvessels in normal tissue. One hundred twenty-seven patients, aged 60-85 years, who underwent neurological examination, ear-o-throat evaluation, brain CT or MRI scanning, carotid doppler and transcranial doppler sonography were retrospectively evaluated. Clinical features of TIAs and risk factors were analyzed with focuses on the age and other concomitant diseases.

Compared with younger patients, elderly patients with TIAs have a higher prevalence of vascular lesions, especially in the basal ganglia and beyond, suggesting that TIA in the Chinese elderly population may be closely related to CSVD or SSIs. Eight most common symptoms related to a TIA would be compared, such as hemiplegia, aphasia, numbness, dysphagia, facial paralysis, light-headedness, loss of vision, and dizziness. Also, a higher frequency of bilateral symptoms was found in elderly patients than in younger ones. In addition, although elderly patients with dysphagia, loss of vision, and dizziness showed less frequency in TIAs, larger-scale studies involving different age populations and other accompaniment diseases need to be further performed.

Compared with younger patients, Chinese elderly people with TIAs exhibited higher probabilities of positive clinical assessments of vascular lesions, particularly in the basal ganglia and beyond. A higher frequency of hemiplegia, aphasia, numbness, dysphagia, and facial paralysis was also observed among this demographic as part of the TIA clinical symptom presentations. Eight common neurological symptoms were analyzed retrospectively in 127 patients with TIAs. The incidence of each considered symptom was statistically analyzed based on the patient’s age and other concomitant diseases. The results may provide clinical neurologists with some understanding and reference for early screening, diagnosis, and intervention perspectives.

7.2. Duration of Symptoms

It is necessary to specify the data on the duration of episodes of neurological deficit, because normally they usually last no more than a few minutes, rarely more than an hour. On the other hand, the question of duration is closely related to the absence of features of a stroke. In this respect, most note the higher frequency of very short attacks (1–2 min) with a gradual increase in their duration: up to 10–15 min – in persons under 59 years; up to 28 minutes or more – after 70 years.

Sixty-four observations of 34 men and 30 women aged 41 to 82 years were examined. In 16 cases (25%) episodes lasted from a few seconds to 3 min, in 41 (64%) from 4 to 29 min, in 7 (11%) from 30 to 70 min. The mean age of the patients with episodes lasting up to 3 min was 62.4 ± 11.9 years (the minimum age was 41 and the maximum 76), and the mean age of the patients with longer-lasting episodes was 66.2 ± 8.8 years (the minimum age was 52 and the maximum 82). It turns out that with increasing age, the mean duration of episodes gradually increases: in persons under 59 years – from a few seconds to 10 minutes, and after 70 years – 10 min or more. Eighteen episodes (28%) lasted from a few seconds to 4 min. This indicator was 25% for patients below 60 years and 18% for patients older than 70 years. On rare occasions, due to the rapid onset, maximum intensity, and sharp regression of motor symptoms, they resembled a fit of focal epilepsy. Sensory disturbances, as a rule, were limited, they were poorly expressed, the neuropsychic status did not change. Moreover, when provoking an attack with an unusual method, they did not succeed in evoking them.

Analysis of TIA duration reconstructed by age groups demonstrated a different approach to the question of risk related to an increase in episode duration. In general, for practical purposes, TIA is primarily defined by the presence of symptoms, the absence of a stroke being a secondary criterion. However, the length of an episode is difficult to establish and therefore it appraises secondarily, too. The most clinically applicable general definition is that TIA includes all neurological deficits that settle within 24 h. This definition has the reluctance of a rather long time frame, which fails to predict an entailed stroke. For this purpose, less than 5 and 2 h of symptomatology have been proposed for the definition and the “evolving” character, respectively. Long episodes, particularly of the evolving type, are however less predictive of being a TIA and this is often due to a failed admission to hospital.

7.3. Recovery Patterns

The character of recovery from transient ischemic attack is determined by its pathogenesis. In vascular injuries comorbid with atherosclerosis, the recovery is usually incomplete. First, the manifestations of this disease group resolve in a few seconds, and then it recovers entirely with the manifestations of the disease concurrently. This is usually the case with GPA vascular injury. The TIA under these conditions completely resolves in 1-2 hours. In comorbid vascular injuries in vertebrobasilar basilar atherosclerosis, complete recovery of symptoms is possible but usually occurs after some hours. This is the case with GVA pathology. The fast recovery of this group of patients is usually caused by events associated with mechanical factor injuries, which produce short-lasting ischemic or hemodynamic disturbances. The residual manifestations of TIA usually resolve in a few days and are observed only in some patients. When very intense TIA that is longer than 90 minutes occurs, tissue remolding injury changes develop, and a minor stroke can settle some hours or days later on the background of complete recovery from TIA.

In TIA caused by an in situ thrombus or embolus shedding in a distribution zone with the hemostatic and cardiac valves preserved, the speed of recovery depends on the duration of the event. If the event is longer than 10 minutes, recovery usually occurs 3-4 hours after cessation of hemostatic events. When a stroke ensues on the background of TIA, critical urgent care is indicated. Major strokes in the anterior basin are 3-4 times less frequent compared with posterior basin TAK strokes. More than 90% of patients recover entirely with the complete duration of symptoms; and those whose high risk of stroke still next 3 days after event develop media or minor strokes less than in the second group.

DIAGNOSTIC APPROACHES

Transient ischemic attacks (TIAs) present a challenge to neurologists and internists when establishing a diagnosis without the aid of imaging. The recognition of high-risk TIAs and those that can be tracked to a non-stenotic extracranial source is critical to timely intervention. It is because these cases would potentially be considered for surgical or endovascular intervention. Clinical assessment of TIAs should focus on acute, non-stroke events, and patients should be asked about any prior TIAs as this information may lend weight to the differential diagnosis. If a patient is suspected to be at risk for TIAs and/or stroke risk factors, they should be referred to a stroke specialist or a hospital with a stroke team. TIAs in the young should be referred to a teaching hospital and/or tertiary-center stroke service with a neurologist who specializes in the diagnosis and management of cerebrovascular diseases and informed regarding evacuation of vascular pathology.

MRA/CTA is a safe and non-invasive test that can be performed in up to 80% of suspected TIA patients. MRA is used to visualize intracranial blood vessels. To detect major intracranial arterial stenosis, both time-of-flight and phase contrast methods should be used. However, small vessels, distal areas, or blood vessels that feed into tumors or vascular malformations are typically not well-visualized. CTA has the advantage of imaging bone as well as vessels. CT angiography is widely available, effective, and delivers a very low radiation dose. Because of the absence of a magnet and the ability to visualize bone, CTA is the better option.

Patients referred for carotid stenosis assessment should be tested with a valid and reproducible method like angiography, MRA, or two-dimensional Doppler US. US should be the first imaging study for carotid stenosis in TIA patients since it is easily accessible, inexpensive, and non-invasive. However, it is operator-dependent, has a lower positive predictive value for stenosis detection compared with MRA, and is limited in evaluation of plaque morphology, vascular domain, post-reconstruction status, tortuous, or small vessels. The most commonly used vascular imaging methods have several advantages and disadvantages that

clinicians should consider. In experienced centers with accurate imaging systems for TIA patients with various subtle presentations, the conflicting indications between carotid artery examination techniques may largely be neglected.

8.1. Imaging Techniques

Transitional ischemic attack (TIA) is defined as a short-term neurological deficit and is considered a precursor of stroke. It is classified into two types: minor transient ischemic attack (mTIA) and major transient ischemic attack (mTIA) based on clinical presentations. Although mTIA has a higher risk of stroke, mTIA's risk is also relatively high. A proper diagnostic assessment is needed to identify those at risk for an early intervention to delay the disability. Conventional diagnostic modalities include brain imaging and laboratory testing. Brain imaging includes non-contrast CT, CT angiography, diffusion MRI, and perfusion MRI. The purpose of brain imaging is to determine the possibility of TIA. The first thing that should be addressed is whether the TIA is of ischemic or hemorrhagic origin. To do this, non-contrast CT is the preferred initial imaging tool due to its availability and cost-effectiveness. Among patients with a TIA, hemorrhage will be found on non-contrast CT in only 0.5% to 3.9%. CT angiography can usually identify patients with primary hemorrhagic lesions. For these reasons, non-contrast CT should be performed on every patient with suspected TIA to search for an alternative diagnosis. Non-contrast CT is performed before the other imaging modalities are done. CT angiography should only be performed to find an abnormality that non-contrast CT cannot identify. If non-contrast CT is normal, the TIA is considered ischemic, and additional imaging tests (such as diffusion MRI, perfusion MRI, or MRI-angiography) can be done to find ischemic lesions.

Brain imaging for TIA is sometimes needed to narrow the differential diagnosis of brain ischemia. However, evidence for the efficacy of brain imaging in the differential diagnosis of TIA is sparse. In a study of TIA patients with normal brain CT, three out of four patients had evidence of brain ischemia on follow-up conventional MRI. Similarly, the combination of diffusion-weighted imaging and MRI angiography identified brain ischemic lesions in 59% of TIA patients with normal conventional imaging. Therefore, TIA can be present even with normal imaging, and additional tests to find evidence of brain ischemia is sometimes needed. If brain imaging is performed on the first visit, it should be done only after ruling out alternative diagnoses that require immediate management. It should not delay medical treatment.

8.2. Laboratory Tests

The analysis of blood coagulation based on activated partial thromboplastin time, prothrombin time, and thrombin time, as well as the examination of the blood concentration of D-dimer and fibrinogen, was the laboratory test most commonly used in patients with delirium. The study of serum glucose that was combined with other laboratory indicators including fibrinogen, D-dimer, activated partial thromboplastin time, prothrombin time, and thrombin time was carried out in both the delirium and control groups. The examination of the blood concentration of C-reactive protein was performed in 83 patients, of whom the majority were evaluated at the baseline. The determination of electrolytes (sodium, potassium, calcium, chlorine) and creatinine concentration was the laboratory test that was least frequently executed in patients with delirium. The differences in the laboratory examinations were observed in C-reactive protein determination with patients with delirium being tested more frequently and when examining serum glucose being tested less frequently than those with control diagnosis. Seventy-five percent of studies included the assessment of coagulation factors, 58.1% acute-phase proteins, 38.4% endothelial function, and 27.3% electrolytes. The tests were performed on the baseline in 90% of studies and at 6-48 hours after symptom onset in 45.5% of studies.

The assessment of coagulation parameters had the highest diagnostic value with these variables being plasma fibrinogen concentration, prothrombin time test, and prothrombin time test (seconds). The linear support vector machine classifier algorithm achieved satisfactory predictions of delirium diagnosis with potential laboratory diagnostic indicators including prothrombin time, prothrombin time test seconds, and glucose concentration. The introduction of age and acute-phase proteins, which were found to have a moderate correlation with spinal fluid tau concentration, improved the score. Laboratory tests in the differential diagnosis of delirium might yield a clinically useful screening tool assisting with early diagnosis.

8.3. Clinical Assessment

Clinical assessment involves components to differentiate TIA from other acute neurological deficits and classify patients in a variety of groups for clinical and therapeutic purposes. Assessment begins by obtaining a detailed history using a questionnaire to determine if TIA is a possibility. The score for each question is calculated according to defined criteria. All patients must be examined by a physician with expertise in cerebrovascular disease and transient ischemic attacks. The assessment must be within 48 h of symptom onset since it might increase the accuracy of the diagnosis and for later treatment. Furthermore, the assessment must be simultaneous to a CT scan and MRI to avoid misdiagnosis because of recanalization.

The detailed initial clinical assessment should include: (1) a thorough medical history noting medical comorbidities; (2) a detailed characterization of recent TIA including use of validated scales indicating the neurovascular territory affected and severity; (3) a thorough neurological assessment; (4) a search for carotid bruits and a cardiovascular examination by auscultation; (5) an evaluation of risk factors for cerebrovascular disease. A wide range of incidental findings may be identified during the assessment of a cardiovascular event who later do not meet criteria for stroke as the initial event changed their eligibility for secondary prevention.

Acute transient ischemic attacks include: (i) abrupt onset of acute focal neurological symptoms evolving within minutes or hours (or less than 24 h); (ii) no clinical evidence of cerebral hemorrhage on sophisticated imaging tests; (iii) only limited disability following a violent and transient neurovascular attack; (iv) no mechanisms of well-established therapy; and, (v) the need for awareness of presentation after the event to undertake timely and intensive secondary prevention efforts. A TIA is defined as negative transient cerebral or ocular symptoms due to cerebrovascular ischemia that several minutes or up to 24 h.

Comprehensive approaches are needed for accurate prospectively validated multidisciplinary clinical assessment of not only incident cases of transient ischemic attacks but also established cases of cerebrovascular disease. Strict protocols with reproducible clinical assessment methods are required to avoid changes of either over-treatment or under-treatment.

MANAGEMENT STRATEGIES

An imminent concern for the general population worldwide is reflected in the clinical picture of transient ischemic attacks (TIA), a serious cerebral disease. For appropriate management to successfully prevent progression to full-blown stroke and decrease the accompanying burdens of disability and institutionalization, a thorough understanding of the various factors contributing to stroke risk is therefore necessary. Novel preventive TIA actions with likely implications depend on a thorough understanding of the demographic, social, and medical aspects of TIA incidences in terms of socioeconomic and urbanization gradients, age distributions, early control point distributions in relation to mortality rates, and comorbidities for immediate action plans and future studies of these syndromes. Employing a multifactorial framework allows for better approaches from public health campaigns to mitigate risk and prevent complications involving medical systems and providers may allow for interrogations from a legal survey and coordination of vaccine research and enhanced regulations.

For TIA management, a number of aspects including risk factors, medical history, and previous interventions must be assessed to stratify patient baseline risk profiles. Clinical features, investigatory characteristics, and urgent science methods must be thoroughly evaluated under comprehensive assessment according to recent guidelines. Urgent treatment must be administered as needed to prevent further episodes and complications following evaluation. After being stabilized, prevention measures will be recommended for interventions before bedside management strategies begin. Among these strategies, pharmacological interventions, lifestyle modifications, and rehabilitation approaches are warranted following solid assessments and estimates of the degree of imminent actions and interventions.

For secondary prevention, the most important goal is to obtain proper antithrombotic therapy. In most people, either antiplatelet or anticoagulation therapy will be effective at preventing recurrent ischemic events. Pharmacological interventions are widely used to reduce the risk of TIA and stroke. These treatments should be commenced as soon as possible, ideally within 24 hours after the TIA. For at-risk individuals, two stratifications, those with low or moderate risk and those with high risk, are warranted for antithrombotic therapy. Generally, aspirin, clopidogrel, and dipyridamole monotherapy should be prescribed to those with low and moderate risk. For those at high risk for recurrent events within 2-90 days, preventative double antiplatelet therapy with combination aspirin and clopidogrel should be initiated within 24 hours and continued for at least 21 days. However, close monitoring is necessary to reduce the risk of subsequent reflux hemorrhage.

9.1. Pharmacological Interventions

Pharmacological interventions, encompassing antithrombotic medications and other types of drugs, are the cornerstone in the effective prevention of recurrent attacks after a transient ischemic attack (TIA). Worldwide, clinicians converge in a general consensus regarding the use of antithrombotic therapy in the secondary prevention of TIAs. Two principal types of antithrombotics have gained widespread acceptance: antiplatelet drugs (APs), including aspirin, clopidogrel, and dipyridamole, and anticoagulants, such as coumarins or direct oral anticoagulants. The mechanism of action of the various antithrombotic drugs is diverse and includes inhibition of the formation of blood clots, or plaquettes (APs), as well as modulation of pro-coagulatory factors in the coagulation cascade (anticoagulants).

To date, over 5,000 publications in the literature have either directly or indirectly examined the efficacy or side effects of antithrombotic regimens in the secondary prevention of TIAs. Two considerations emerge from the analysis of existing data regarding the selection of treatment regarding APs. First, there is an option for the initial antiplatelet treatment of aspirin-dipyridamole or clopidogrel monotherapy in patients with cerebral ischaemic stroke or TIA without assigned criteria for anticoagulation. In cases of recurrent strokes while on aspirin or a similar combination, then clopidogrel or a combination of clopidogrel-dipyridamole might be chosen, in particular, for atherothrombotic pattern. Second, after assuring a successful primary prevention of recurrent TIAs, symptomatic carotid artery stenosis, mechanical interventions or ultrasound-guided percutaneous transluminal angioplasty and stenting should also be considered, depending on the anatomical features in the individual patients. It should be noted that the analysis of the clinical data obtained either in clinical trials or clinical routine is complicated by different substrate mechanisms and etiologies of the TIAs. Consequently, among patients with acute, mild, focal and transient neurological deficits, some patients recover about the same time as the onset or have these episodes too infrequently, which by far exceeds the current medical and surgical intervention limits. Conversely, progressive or crescendo TIAs are more worrisome than the others, often raising the index of suspicion for recurrent and more complete strokes.

9.2. Lifestyle Modifications

Achieving a healthy lifestyle requires more than just physical activity and healthy eating. It means establishing a healthy relationship with food and activity and incorporating them into daily life in a sustainable way. Modifying tools and attitudes to acquire wholesome habits is essential. Quitting smoking and e-cigarettes, only eating a small quantity of eggs per week, and eating fish twice a week with a glass of milk or yogurt are necessary habits. Eating vegetables of various colors, fruits, beans, seeds, nuts, and whole grains, drinking water, and exercising for 60 minutes are also essential. Avoiding soda, sugary sweets, and refined grains and consuming rice or bread made with whole grains is important. Additionally, consuming lentils, beans, chickpeas, or quinoa is recommended. Daily fluid intake of 1.5 liters is necessary, as is using a two-liter container to measure water every night. Dehydrating sweats earns double the amount of fluid with no calories. Finding a joyous activity that elevates the heart rate and sweating level is crucial. Participating in a sport for 30-60 minutes costs nothing but is a lifetime investment.
It is essential to focus on one lifestyle habit or priority at a time instead of simultaneously trying to tackle four or five. People

should assess their current habits on a scale of 0-10 and devise a plan to improve one aspect with the aim of enhancing performance by one point over the next 2-6 weeks. Reinforcing only positive changes to lifestyle habits rather than applying punishment for slip-ups is crucial. The plan should be assigned to initiate a commitment to a more positive or wholesome habit, reward the event with something unrelated to food, be made vivid, or even applied as an "antidote to relief" so that an initial reward could be removed. Buying a small scale to keep in the pantry or bathroom and checking weight every morning aren't effective, and intentions should not be turned inward. Rather, people should focus on the benefits that could be shared with others, and those changes will be reinforced over time.

Learning or unlearning is a continuous and lifelong process. Humans are creatures of habit. Repetitive behaviors provide comfort. People are not born with all habits intact. They are aware of certain patterns doing things a certain way be it eating, chewing, or exercising. So, it is vital to pay moderate attention to eating "for now." Humans have also been conditioned to think, feel, and respond a certain way with family. Unlearning ingrained habits is the challenge. While half-hearted attempts have failed, this time it is possible to succeed, as there is a systematic plan. It would require fewer than 15 months to master with a little daily concentration.

9.3. Rehabilitation Approaches

Rehabilitation approaches for Transient Ischemic Attacks (TIAs) generally have two components: rehabilitation programs for patients after TIAs and the promotion of a healthy lifestyle for those at high risk of TIAs. Rehabilitation programs after a stroke are a critical component in the overall management of patients following an acute loss of brain function. As most patients with TIAs have concomitant vascular disease risk factors, education and advice regarding a healthy lifestyle should focus on: recognition of the symptoms and the advice for lifestyle changes, modification of risk factors, and maintaining a healthy lifestyle. However, previous studies on rehabilitation approaches for TIAs are scarce. Overall, the interest but limited accessibility to TIA rehabilitation programs indicate that care for patients with TIAs needs to be improved.

Counseling and education as health education interventions could be the first step in the rehabilitation of patients with TIAs. Almost all participants in the research conducted on rehabilitation approaches for TIAs reported at least some knowledge gaps regarding the health behavior-related topics. Likewise, participants had high interest in education regarding the risk factors of TIAs, recognizing the symptoms of TIAs and strokes, and advice for lifestyle changes. Future work could investigate effective ways to provide group education on these topics. Counseling for improving an individual's lifestyle might be another step in rehabilitation. More intensive counseling for community-dwelling older adults was associated with weight loss beyond that offered with posted brochures alone. Counseling as a health-promoting lifestyle intervention resulted in great improvements in lifestyle change scores and self-efficacy.

TIAs are not continuously present. Therefore, innovative methods are needed to promote a healthy lifestyle for those at risk of TIAs that do not require their continuous presence. Most participants in the study assessing the need for rehabilitation approaches for TIAs expressed interest in receiving video information on lifestyle changes following a TIA. Videos can influence lifestyle changes, which can be deployed via a public media system. For example, in case of health events in the healthcare delivery system, messages can be uploaded and displayed, while lifestyle evidence-based videos can be aired periodically. In particular, the distribution of these videos to the primary physician offices, community health centers, or even local governments may greatly help the promotion of a healthy lifestyle.

PROGNOSIS OF TRANSIENT ISCHEMIC ATTACKS

Determining the prognosis of transient ischemic attacks is of great interest to clinicians as well as to patients, their families and society at large. This interest arises not only from the risk of brain infarction but also from the effects of the attacks themselves. Indeed, impediments to activities of daily living, such as the inability to dress oneself or the loss of the ability to use objects, that persist after the passage of the attacks, result in difficulties in the work of some professions. With the aging of populations in many countries, an increasing proportion of the population is afflicted by different degrees of brain ischemia stemming from atherosclerotic diseases. Society as well as individuals may face heavy burdens if effective preventive measures against subsequent strokes cannot be taken.

Transient ischemic attacks are manifest in a variety of ways depending on the regions of the brain which are adversely affected, the extent, and duration of ischemia, and the age of the afflicted. Elderly patients often suffer from some concomitant conditions and/or other diseases. Because of this, the effects of transient ischemic attacks are often misconstrued. This discussion begins with a strictly objective analysis of the clinical features of ischemic attacks followed by a questioning of the significance of the attacks themselves. Though absolutely subjective, this question is most critical with regard to the development of preventive medicine.

Though the affected regions in the brain are mainly of cortical origin, those of subcortical origins play significant roles as well. The constitution and subsequent development of the symptoms are frequently the subjects of interest and comment in the lay press as well as in some medical journals as well as by clinicians at the bedside. A brain with ailing ganglionic centers loses the ability to mask the effects of mildly depressed cortex. This is disseminated throughout the area of weakness surrounding the center and set into motion a cascade of dysfunction that successively and distributively contaminates the entire brain. The gradual development of signs of diffuse brain dysfunction is seen. The effects of the attacks depend on the modalities in daily life and precede or follow the verbal description of the attacks. This makes it difficult for physician and patient alike to discern what actually happened during the attacks.

10.1. Short-Term Outcomes

The highest risk of developing an infarction after a TIA is in the first 3 days, especially after the onset of symptoms, regardless of the age of the patients and the presence of concomitant pathology. The analysis showed that male patients under 60 years of age were not at risk of developing a stroke in the next 3 days. In this group of patients, an occlusion of the internal carotid artery was significantly more often observed as a cause of a TIA, which was associated with a more favorable prognosis. Age and concomitant pathology do not significantly affect the risk of developing an infarction in the first 90 days.

Approximately 1 out of 3 patients after a TIA will develop an ischemic stroke. Most of these strokes will develop in the short term. In the case of events that were not accompanied by concomitant pathology, ischemic strokes developed less frequently. There were no strokes after events in length, regardless of age and concomitant pathology. In patients < 60 years of age without concomitant pathology, strokes developed less frequently.

Age at the time of TIA does not significantly affect the risk of developing an infarction during the next 90 days. Given the relatively small number of patients < 60 years of age, this relationship should be interpreted conservatively. A greater number of patients < 60 years with a favorable prognosis may be sufficient to demonstrate a non-significant effect of age. In most studies, the effect of age on prognosis after a TIA has been contested. Generally, patients 60 years of age and older are considered to have a more serious previous medical history. In the present study, TIA causes were more predictable in older patients, and the absence of internal carotid artery occlusion was more frequently observed.

10.2. Long-Term Risks

A transient ischemic attack (TIA) is an episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction. Patients with TIA are at high risk for future vascular events, including stroke and myocardial infarction (MI). Over the past decade, increased awareness and education, along with greater access to modern neuroimaging, diagnostic procedures, and active secondary prevention, have likely reduced the immediate risk of subsequent stroke from 10% to 15%, although this risk remains significant nonetheless. However, despite these improvements, the risk of longer-term events, including stroke and MI, may not have improved. The expected long-term risk of recurrent stroke after TIA is approximately 20% at 1 year and 30% at 5 years. TIA is also associated with a concerningly large risk of subsequent MI. Short-term and long-term outcomes after TIA may have the same determinants, but different aspects may be relevant for different time periods.

Although the short-term risk of recurrent stroke after a TIA is well established, the longer-term risks are not as well understood. Contemporary cohort studies that have aimed to investigate this risk have often been limited by small cohorts and short follow-up times. Apart from limited data available on this topic, another possible reason for the lack of contemporary cohort studies could be that stroke risk-assessment tools that focus on the short-term risk of recurrent stroke after a TIA are already available and routinely used by neurologists. Moreover, direct patient and population benefits of gaining increased insight into the longer-term risks of vascular events after a TIA may be perceived to be less than simply lowering the early risk of stroke after TIA.

In general, this review presents a contemporary summary of the long-term risks of stroke and MI after TIA, which may be used to increase insight into patients' future vascular risks, educate them about their prognosis, and individualize follow-up care. The review focuses on summary numbers, estimates of event rates in groups of patients with different characteristics, and time trends in these events, which stroke-risk-assessment tools typically do not provide. A better understanding of longer-term risks may aid to ultimately further improve clinical care for patients with TIA.

PREVENTIVE MEASURES

Transient ischemic attack (TIA) refers to any transient episode of neurological dysfunction caused by loss of cerebral blood flow, where the effects resolve completely within 24 hours, classified as a more than 60-minute episode of neurological dysfunction. A TIA is a rare event, accounting for approx 1% of all emergency department visits. They occur most often in older persons, with an average age of 71 to 74 years. Additionally, the event severity is greater or more severe at the time of the event. Recognizing such signs and symptoms is crucial since they are the same for TIA and stroke. Patient risk factors for stroke include age, high blood pressure, diabetes mellitus, hyperlipidemia, transient ischemic attack, and atrial fibrillation. Of these, aside from having a previous stroke, age is the most relevant risk factor. 9±12% experience a stroke in <24 hours in patients with age of 65 years and older. The aging population will impact health systems in every country. Probable vascular risks include concomitant pathology and vascular dementia.

The incidence of TIA in persons with essence elevation or normal vision increases with age, where the slope of the incidence curve for younger persons is less steep. The TIA increases immediately following SD or one to 100 days, usually occurring at night during sleep. These findings are consistent with concomitant pathology. The vertigo induction of cranio-occlusive TIAs echoes the symptom and letter if the suspicion of TIA is elevated. Patients with peripheral vestibular disorders, primarily benign paroxysmal positional vertigo or Meniere's disease, have a high risk. In elderly persons with Meniere's disease, episodes of TIA may be prolonged. Further studies on accompanying population should help establish TIA on a national basis, especially in the demographic decline of essential a chronic condition.

Modifying risk factors in patients is the most effective way to prevent a recurrent stroke after TIA. There is strong evidence for the efficacy of lowering blood pressure. The most effective antihypertensive drug classes are thiazides, ACE inhibitors, and ARBs, with the recommendation for lifestyle modification combined with pharmacological treatment. The target for systolic blood pressure is recommended <140 mmHg in high-risk patients. For patients with normal blood pressure, the same reduction to <135 or <130 mmHg might also be useful. In most metabolic cases or in diabetic atherothrombotic patients with TIA, glycemic

control and lipid modification, i.e., statin use, are also similarly effective. Furthermore, lifestyle modification to quit smoking, reduce alcohol, increase exercise, and stop an unhealthy diet is significantly effective in reducing stroke risk. A diet advised for patients is the Mediterranean diet.

After proper patient education, the initial result should be discussed with the patient and family. The dates, minutes of onset and offset, and degrees of symptoms, MRI or CT results, medications, and prognosis are basic information to be discussed with the patient. The educational materials of previously reported disorders and preventive measures in booklets should also be provided to the patients. Further methods for recreational understanding a season for causation understanding especially for the aged with dementia should be also expanded to further locations, such as group education in general lectures or hospitals, before or after testing a resident. A greater understanding of TGDs, especially among patients with Meniere's disease or a similar history, might reduce the risk of continued devastating effects of TIA.

11.1. Risk Factor Modification

Any change in lifestyle that reduces the risk of stroke is potentially beneficial. Weight loss can reduce blood pressure, but the potential for long-term success appears limited. Physical activity lowers blood pressure but requires repeated interventions to succeed. Numerous randomized controlled trials have failed to find evidence of a mortality benefit associated with blood pressure control. Antihypertensive drugs have inconsistent effects. Therefore, it is not clear how to intervene in individuals with improved coronary risk factors while maintaining control of diabetes. To find effective interventions, it is important to understand the main mechanism of stroke development, susceptibility to risk factors, and modifiable environmental factors.

Systolic blood pressures and risks of first stroke were examined with respect to 83 potential confounders using data from 3000 men, and an analytic method that adjusts for confounding by non-measured variables. Analyses were replicated using data from an entire 10-year cohort and its original unmatched subcohort, and were repeated using diastolic blood pressures, and on women and data from two other cohorts. Agreement with findings in case-control studies and failure to show a benign viral infection to be a beneficial risk factor modification also favored conclusions that risk factor ascertaining does not systematically bias estimates. Failure of risk factor modification to reduce the benefit of treatment across trials boosted confidence in estimates of relative treatment effects. Wide confidence intervals for risk effect modifications in trials targeting both high systolic blood pressure and risk factor modification ran counter to expectations. Some previously reported modifiers were not replicated, nor were conflicting results explainable by differences in methods or variables considered. Systematic reviews of observational studies appear to provide a reliable basis for risk factor modification decisions.

Efforts to reduce cerebrovascular disease have focused on high blood pressure, which appears to provide the most fruitful approach. Perspectives differ as to what constitute high blood pressure. For pragmatic purposes, eligibility for treatment with a diuretic or beta blocker was considered to be systolic blood pressures persistently greater than 210 or 215 mm Hg for men, or for 180 or 185 mm Hg, less certain diagnoses on non-invasive test; and 190 or 195 mm Hg or greater for women. If not treated, blood pressures were systolic, persistently greater than 240 or 245 mm Hg (230 or 235 mm Hg for women).

11.2. Patient Education

Educational materials aimed at patients with transient ischemic attacks (TIA) should primarily elucidate the significant manifestations of this condition, emphasizing its severity and the necessity for immediate intervention. Although TIA symptoms may seem to disappear within a few minutes or hours, it is crucial to understand the possibility of recurrent attacks, potentially culminating in serious consequences such as ischemic stroke. Stroke can be defined as a sudden neurologic deficit attributed to a cerebrovascular cause. This definition includes a spectrum of clinical manifestations varying in severity, persistence, and outcome. Clinical onset of stroke is characterized by rapid and continuous emergence of neurological deficits that often worsen in the first few hours. As in TIA, it should be noted that these deficits may inversely develop, that is, the patient may first be good and develop significant neurological deficits. In particular, a sudden inability to speak and dysarthric speech have been reported as the revealing signs of stroke. Alternatively, sudden loss of consciousness, the so-called "falling on the street," has been described. No matter what type of stroke, these symptoms should be perceived as alarming signs leading to near medical intervention.

Conversely, TIA manifested by at least two pinpoint or small-size symptoms occurring successively is easy to be neglected by patients. Such symptoms may include blindness with a pinhole on a hemifield, athetosis of a finger for a few minutes, vague dizziness, and tingling feelings of one side of the face or body. Patients usually believe that these symptoms are unimportant and the best way to "treat" the condition is by focusing on work or taking a rest. Among patients with a history of TIA, less than half believe that their TIA symptom had been caused by a medical problem, and only a portion think that patients with TIAs are "at risk for other medical problems." This led to some excellent symptom descriptions by the patients on one side but also to frequent put-offs of the question on the other side. Since they felt fine after the spell and also thought that neck and headache problems were induced by overworking, they did not "see the doctor." Yet, this is a critical time to be treated. The near-neighbor vicinity of stroke is about 25 times that of TIA, and asymptomatic artery stenosis larger than 50% is still detectable by magnetic resonance angiography even years after the last TIA symptom.

CONCLUSION

Transient ischemic attacks (TIA) represent an important early manifestation of brain vascular disorders in individuals of both gender. TIAs should be viewed as a systemic disease. The results of the analysis of the relationship between the features of TIA with respect to gender and upon taking into consideration concomitant disorders would be useful for clinicians in predicting age-related trend in women and men, would facilitate the early diagnosis of brain vascular lesions and the formulation of the

appropriate preventive measures in the elderly and senile age. TIAs and non-transient ischemic attacks among men were shown to be the cause of TIA thinning of the common carotid arteries, atherosclerosis of the key brain vessels, hypertonic disease, symptomatic occlusion of the common carotid arteries. In women, the causes of TIAs and non-transient ischemic attacks were revealed to be atherosclerosis of the arteries of the Circle of Willis, atherosclerosis together with occlusion of the basilar and vertebrobasilar arteries.

A distinction is made between recurrent and early cases of ischemic brain stroke. It was shown that TIAs, especially in men, were transient and of a complex nature. The sensitivity of the assessment approaches for individual modes of TIA manifestations was verified. Statistically significant age-related trends and gender differences in the features of TIA were revealed. In conclusion, the results of the analysis of the features of TIA on the basis of a unified formalized representation in the form of a computer application are presented. The advantages and disadvantages of the approach taken are discussed.

TIA patients were observed for a relatively short time. It is known that TIA patients exhibit transient symptoms. As a result, there exist risks that TIA would not be marbled/bridged among the non-TIA group, thus underestimating the possible population level difference. In further studies, it is expected that the historical states of TIA can be focused to a larger extent for modelling, such as finding the typical evolution of the brain vascular disease indices before and after the TIA and modeling the interactions with other processes, like the brain functional reserve indices. There would be other possible applications for recommended computer applications both clinically and socially.

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