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Research Progress on Integrated Traditional Chinese and Western Medicine Treatment for Post-stroke Aphasia

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Abstract: ***Stroke, also known as "cerebral apoplexy," is a severe chronic non-communicable disease characterized by acute central nervous system injury caused by vascular events, leading to neurological deficits [1]. The incidence of stroke continues to show an increasing trend in recent years, making the prevention and management of stroke and its complications a critical challenge. Among these, aphasia is the most prevalent neurological dysfunction following stroke, with an incidence rate of 21%–38% [2]. Consequently, research on post-stroke aphasia (PSA) has become one of the key and hot topics in contemporary medical studies, garnering growing attention. This article provides a review of integrated traditional Chinese and Western medicine approaches for treating stroke-related aphasia.***

Keywords: Stroke, Aphasia, Treatment, Traditional Chinese and Western medicine.

1. Classification of PSA

Currently, there is no fully unified standard for the classification of aphasia in clinical practice. Due to the diversity and complexity of classification methods, there indeed exist some overlaps and contradictions among different classification approaches.

Classification by symptom manifestations: (1) Perilaterally located aphasia: Lesions are situated around the lateral fissure, with patients exhibiting difficulties in repetition. (2) Watershed area aphasia: Lesions occur at the junction of the middle cerebral artery and anterior cerebral artery or middle cerebral artery and posterior cerebral artery. Patients demonstrate relatively preserved repetition function but may present with other language impairments. (3) Complete aphasia: All language functions are significantly impaired, rendering patients nearly incapable of verbal or written communication. (4) Anomia: Patients primarily exhibit naming difficulties, with lesions predominantly located in the left angular gyrus or posterior middle temporal gyrus.

Classification based on impairment of motor and sensory functions: (1) Motor aphasia (Broca's aphasia): Primarily involves the motor language center. Patients can comprehend others' speech but are unable to express themselves normally due to dysfunctions in the tongue, lips, vocal cords, and other motor functions. (2) Sensory aphasia (Wernicke's aphasia): Primarily involves the sensory language center. Patients have normal hearing but cannot understand spoken language, and their speech may be fluent but incoherent in content.

Classification by fluency: (1) Fluent aphasia: Patients exhibit relatively fluent language expression, but the content may be incoherent or difficult to comprehend. (2) Non-fluent aphasia: Patients demonstrate non-fluent language expression with slow speech rate, often using short phrases and words for communication.

2. Pathogenesis of PSA

Post-stroke aphasia (PSA) refers to functional network dysfunction caused by brain lesions. Different lesion locations can lead to distinct types of impairment, while the same lesion site may present varying clinical manifestations. Even within the same lesion type, differences in lexical and grammatical metasstructures exist, reflecting multifaceted mechanisms involving multiple layers and perspectives. Consequently, the pathogenesis of aphasia remains highly complex, with multiple theories currently proposed. The pathogenesis of PSA exhibits relative complexity and diversity. Researchers primarily investigate PSA's onset and progression mechanisms by analyzing changes in metabolic rates and blood flow within affected brain regions. Key theoretical frameworks include the following:

2.1 Damage to Language Functional Areas

The direct involvement and destruction of corresponding language functional areas by stroke lesions may constitute the primary mechanism underlying post-stroke aphasia. The language functional areas located in the cerebral cortex serve as major higher centers responsible for language task processing, making cortical language area damage the predominant cause of aphasia. Lesions in different regions of the language center can lead to distinct types of aphasia. The development of aphasia involves not only intrinsic lesions within the language center itself but also indirect effects from pathological tissues in adjacent regions. These two factors may act independently or interact synergistically, both potentially resulting in localized cerebral hypoperfusion or metabolic disturbances. Under normal conditions, metabolites exist in brain tissues at specific concentrations. During stroke events, blood flow to lesion sites drops abruptly. When lesions occur in dominant hemisphere language functional areas, this can induce hypoperfusion and hypometabolism in the language center, ultimately causing language dysfunction [3, 4].

2.2 Distant Effect

The distant effect, as the name suggests, refers to the phenomenon where certain brain regions, despite being distant from language function areas, can still influence language processing when pathological changes occur due to neural connections between them. Stroke leads to increased levels of oxygen free radicals, excitatory amino acids, and inflammatory factors. These substances trigger inflammatory responses that spread to surrounding tissues, causing cellular damage. Furthermore, pathological changes may induce apoptosis of neuronal cells and their axons [5]. This cellular and axonal apoptosis can extend to adjacent regions, disrupting neural fiber connections between cortical language areas (e.g., Broca's area) and subcortical structures—a phenomenon known as the distant effect. These neural pathways typically transmit information and signals essential for language processing. When these pathways are impaired, the flow of information into cortical language areas becomes obstructed, reducing neuronal excitability and leading to decreased local circulation, reduced blood and oxygen supply, and consequently localized functional impairment.

2.3 Damage to Language Neural Networks

Language function involves the entire brain, not just localized brain regions, but requires coordinated efforts among multiple brain areas to achieve. These regions form a complex neural network that collectively supports language production, comprehension, and processing [6]. YANG [7] posits that damage to specific brain regions alters their activation patterns, potentially disrupting functional connections with other brain areas. The disruption of neural network continuity leads to abnormal coordination among brain regions, resulting in impaired collaborative functions. Such dysfunctional coordination may cause overall neural network dysfunction, including impaired speech abilities [8]. Some researchers suggest that when stroke reduces excitability in left hemisphere language function areas, the right hemisphere's inhibitory effect on the left hemisphere intensifies, potentially hindering neural recovery in language function areas [9]. Other scholars propose that compensatory mechanisms exist in the right hemisphere's language mirror regions in aphasia patients caused by left hemisphere damage, enabling these regions to compensate for lost language functions and facilitate recovery [10].

3. PSA Recovery Mechanism

3.1 Factors Influencing Language Recovery

The factors affecting language function recovery are multifaceted. Whether post-stroke language function can be restored and to what extent is determined by three key elements: lesion characteristics, individual factors, and rehabilitation interventions. Watila et al. [11] conducted a systematic review of multiple factors influencing language recovery in aphasia patients. The evaluation encompassed lesion features such as location and size, types of aphasia, and stroke severity, while also considering individual variations including patient gender, age, dominant hand preference, educational background, and other potential factors promoting language recovery. Predicting language recovery after aphasia remains challenging, involving not only complex interactions between lesions and neuroplasticity but also multiple treatment-related factors. Cappa [12] demonstrated through functional imaging and brain stimulation studies that aphasia recovery processes are closely associated with complex brain reorganization patterns involving ipsilateral and contralateral brain regions. These regional connections are modulated by lesion characteristics (size and location), disease onset timing, training modalities, and language task performance. Kim et al. [13] further emphasized that language functional reorganization depends not only on lesion size and location but also on individual-specific variables, which aligns with the findings of previous research.

3.2 Neurological Mechanisms of Aphasia Recovery

The recovery of post-stroke aphasia (PSA) is a slow and dynamic process. Patients with PSA typically experience spontaneous recovery during the acute phase after onset, meaning some improvement can be observed without treatment or intervention. Generally, aphasia patients show faster recovery within 3 months, with stabilization occurring after 6 months. The prevailing view holds that early spontaneous recovery of language function primarily relies on the critical role of blood flow reperfusion, while neuroplasticity and functional reorganization become pivotal factors during late-stage recovery [14]. Brain plasticity serves as the anatomical foundation for language function recovery, encompassing both structural and functional plasticity. The repair of lesion-induced cerebral damage and the involvement of homologous language areas in the healthy hemisphere jointly contribute to aphasia recovery. This includes functional reconstruction of unaffected language centers and participation of non-dominant hemisphere language mirror areas. The prefrontal and temporal lobes in both hemispheres form the primary neural networks for language functional reorganization. The key mechanism enabling aphasia patients to regain language function involves functional transfer from the dominant hemisphere's language center to homologous non-dominant areas, coupled with reorganization of unaffected dominant hemisphere language center functions.

3.3 Brain Hemispheres Involved in Recovery

In recent years, growing evidence indicates that not only the left cerebral hemisphere but also the right hemisphere participates in language function recovery. Valeria Blasi et al. [15] observed strong activation of the right frontal cortex during language tasks in eight patients with severe aphasia using functional magnetic resonance imaging (fMRI). Floel et al. [16] demonstrated significant improvement in naming accuracy through transcranial direct current stimulation applied to the right inferior frontal gyrus, confirming the right hemisphere's role in speech recovery. However, the mechanisms underlying right hemisphere involvement remain incompletely understood. Schlaug et al. [17] proposed that when left hemisphere lesions are limited in size, language recovery primarily relies on activating peripheral regions of the damaged left hemisphere. Conversely, extensive damage to the left frontotemporal lobe necessitates recruitment of homologous language and speech motor areas in the right hemisphere for functional restoration. Additionally, acute stroke phases predominantly activate non-infarcted left hemisphere language regions, while subacute phases exhibit bilateral language network activation with peak activity in the right Broca homologous area [18]. During chronic phases, normalized activation patterns and peak activations gradually migrate back to left hemisphere language regions.

4. Western Medical Treatment for PSA

Currently, there is no specifically targeted therapeutic agent for aphasia. Most pharmacological studies on post-stroke aphasia (PSA) suggest that stroke disrupts neurotransmitter transmission pathways. Early and appropriate pharmacotherapy can improve neurotransmitter function in damaged brain regions, thereby alleviating symptoms in PSA patients. Clinically, PSA treatments primarily include cholinergic neurotransmitter drugs (e.g., donepezil, galantamine, carbalazine, and piracetam) and non-cholinergic neurotransmitter drugs (e.g., bromocriptine, levodopa, and memantine hydrochloride). These medications demonstrate efficacy in improving spontaneous speech, comprehension, repetition, naming, and daily communication abilities in patients with Broca's aphasia [19, 20]. Li Chunyong et al. [21] randomized 30 patients with acute ischemic stroke-induced motor aphasia into two groups of 15 cases each. Both groups received conventional antiplatelet therapy and other foundational treatments. The donepezil group additionally received donepezil hydrochloride tablets, along with rehabilitation and speech therapy, for a two-week treatment course. Post-treatment analysis revealed significantly greater improvement in the donepezil group compared to the control group, with enhanced Broca area activation induced by donepezil showing positive correlation with aphasia quotient (AQ) improvement. The study concluded that donepezil promotes activation of language function areas in acute ischemic stroke patients with motor aphasia, facilitates brain functional remodeling, and aids in language impairment recovery.

5. Traditional Chinese Medicine Treatment for PSA

5.1 Traditional Chinese Medicine Treatment

Stroke-induced aphasia originates from brain lesions and manifests through tongue abnormalities. The pathogenesis primarily involves yin-yang imbalance in the heart, liver, spleen, and kidneys, with pathological elements invariably associated with wind, fire, phlegm, blood stasis, and deficiency. The brain serves as the abode of primordial spirit, while the kidneys store essence. Deficiency of renal essence fails to nourish cerebral orifices, leading to depletion of marrow fluid. Coupled with disrupted qi-blood circulation, wind-fire-phlegm-stasis may obstruct cerebral collaterals, resulting in orifice closure and mental impairment, ultimately causing unconsciousness and aphasia. The Feng's Secret Records documents six etiologies of post-stroke aphasia: "voice loss with mutism; tongue stiffness with mutism; unconsciousness with mutism; mouth closure with mutism; tongue protrusion with speech difficulty; tongue numbness with speech impairment." The Suwen·Maijie states: "Yang excess with organ decline leads to mutism," and "internal collapse with syncope manifests as mutism and pruritus, indicating kidney deficiency," highlighting internal deficiency and pathogenic invasion—particularly kidney deficiency—as critical causes of aphasia. Wang Zhixin identifies the pathogenesis of post-stroke aphasia as involving heart, brain, and tongue dysfunction, proposing a tripartite diagnostic approach (tongue, pulse, and saliva) [22], with favorable prognosis for lesions confined to tongue orifices versus those involving heart or brain orifices. Liu Gang [23] attributes pathological changes to wind-phlegm disturbance obstructing clear orifices, qi dysregulation with blood stasis, and visceral deficiency with yin-yang imbalance. Guo Xinxia emphasizes phlegm-toxin-stasis-heat obscuring orifices as the key pathogenesis [24]. Professor Li Yanmei [25] classifies post-stroke aphasia into liver-kidney deficiency, phlegm-stasis intermingling, wind-phlegm orifice obstruction, and phlegm-heat orifice closure, identifying phlegm-stasis obstruction as the pathogenic core, advocating "phlegm-clearing and orifice-opening" therapy. Ultimately, kidney deficiency constitutes the root cause, phlegm-stasis the manifestation, with kidney deficiency-phlegm-stasis disturbing consciousness and tongue orifice closure leading to post-stroke aphasia. Zhang Song [26] conducted a study dividing 90 stroke patients with aphasia of liver-kidney yin deficiency type into two groups. The control group received conventional Western medical treatment, while the treatment group received additional modified Rehmannia Decoction on top of standard Western therapy. Results showed that the total effective rate in the treatment group was higher than that in the control group, indicating significant efficacy of modified Rehmannia Decoction in treating stroke-related aphasia of liver-kidney yin deficiency type, which promotes language function recovery and improves clinical outcomes. Lü Jing [27] et al. posited that stroke-induced aphasia results from pathological factors such as "wind," "fire," "phlegm," and "stasis" disturbing the spirit, with phlegm-stasis obstructing collaterals, tongue obstruction leading to tongue stiffness and speech impairment, and affected organs including the heart, spleen, and kidneys. Treatment involved using Jieyu Dan (a herbal formula for unblocking collaterals, resolving stasis, calming wind, and resolving phlegm) to address speech disorders. A total of 100 post-stroke aphasia patients were randomly divided into two groups of 50 each. The treatment group received Jieyu Dan combined with speech therapy, while the control group underwent single speech therapy. After a two-month treatment course, results demonstrated that modified Jieyu Dan combined with speech therapy showed significant efficacy in post-stroke aphasia management, surpassing conventional rehabilitation therapy alone.

5.2 Acupuncture Therapy

5.2.1 Scalp Acupuncture

Scalp acupuncture therapy, also known as scalp acupuncture, is a method that stimulates specific acupoints or therapeutic areas on the scalp corresponding to the cerebral cortex through needle insertion techniques to achieve disease prevention and treatment purposes. Acupuncture can precisely regulate visceral functions. The head, as the "confluence of all yang," serves as the intersection point of visceral meridians, qi, and blood, while the brain acts as the center of mental activities, controlling language and tongue functions. Precise acupuncture at specific scalp regions can effectively harmonize the yin-yang balance of viscera, promote qi and blood circulation, unblock meridians, and thereby accelerate the recovery of damaged language center cells. Zhou Junjie et al. [28] employed scalp acupuncture combined with mirror therapy to treat motor aphasia in elderly patients after stroke, with the control group receiving only conventional rehabilitation therapy. After 12 weeks of treatment, the observation group demonstrated superior scores in aphasia quotient, listening comprehension, repetition, speech, vocal reading, reading, copying, description, dictation, and calculation compared to the control group. Both groups showed a downward trend in NIHSS scores from pre-treatment to the end of week 14.

5.2.2 Tongue Acupuncture

Tongue acupuncture is a therapeutic technique that involves needling tongue acupoints located both inside and outside the oral cavity, with high application frequency in acupuncture treatment for aphasia patients. Relevant studies indicate that tongue acupuncture therapy for post-stroke aphasia (PSA) can significantly improve the ABC score and patients' communication abilities, including spontaneous speech, oral comprehension, retelling, naming, reading, and writing [29]. Quan Lingling [30] selected 60 PSA patients and primarily used the three tongue acupoints as key points. The results demonstrated that the group receiving language function rehabilitation training combined with the three tongue acupoints as primary treatment points showed a significantly higher overall efficacy rate compared to the group receiving only language function rehabilitation therapy.

5.2.3 Body Acupuncture

Body acupuncture is the most widely used acupuncture therapy in the clinical treatment of cerebrovascular diseases. Relevant studies have statistically analyzed the acupoints with higher usage frequency in clinical acupuncture therapy for post-stroke aphasia (PSA), revealing that the most frequently used acupoints were Tongli, Lianquan, Jinjin, Yuye, and Baihui [31]. Guo Siling [32] selected Professor Lin Guohua's empirical body acupoints (Shanzhong and bilateral Jian Shi) as the treatment group prescription, and chose Baihui, Shangxing, bilateral Fengchi, Jinjin, Yuye, Lianquan, and bilateral Tongli as the control group prescription. After one treatment course, the total effective rate in the treatment group was 70. 0%, while that in the control group was 63. 3%, indicating comparable therapeutic efficacy between the two groups. Statistical analysis of scores from the Chinese Standard Aphasia Examination Scale and Functional Language Communication Ability Assessment revealed no statistically significant differences between the two groups, suggesting that both empirical body acupoints and traditional prescriptions demonstrate significant therapeutic effects in treating post-stroke aphasia, with equivalent efficacy between the two approaches.

6. Rehabilitation Therapy

6.1 Conventional Speech Rehabilitation

The optimal rehabilitation window for stroke patients occurs one month after onset [33], indicating that early rehabilitation training can significantly ameliorate speech impairments. Therapists may implement one-on-one or group-based interventions targeting listening comprehension, naming, repetition, and writing difficulties to facilitate recovery of speech-related muscle and organ functions. Studies demonstrate that group-based rehabilitation training exhibits superior functional outcomes and adaptability [34]. Integrating cognitive training—particularly attentional exercises—with conventional speech rehabilitation protocols has been shown to enhance listening comprehension abilities [35, 36]. Clinicians increasingly utilize rehabilitation tools such as cards, manuals, and smart devices to support training. Thematic micro-lectures have gained widespread adoption, serving not only as auditory and writing exercises but also as tools to reflect the core linguistic functions of individuals, thereby improving overall patient outcomes [37].

6.2 Compulsory Induced Speech Therapy (CIAT)

CIAT primarily restricts non-verbal communication methods, enabling aphasia patients to undergo structured speech rehabilitation training during treatment to facilitate the recovery of language communication abilities. Due to brain plasticity, certain inhibited neural pathways can be stimulated under appropriate conditions to activate the latent potential of the cerebral cortex, thereby compensating for impaired functions. CIAT not only enhances patients' speech functions and social participation but also demonstrates superior efficacy compared to traditional rehabilitation therapies. Research by Wu Huixiang et al. [38] indicates that the mechanism by which compulsory induced speech therapy improves language function in chronic aphasia patients may involve upregulation of left inferior frontal gyrus activation, downregulation of right inferior frontal gyrus activation, or promotion of reorganization across multiple brain regions in bilateral frontal and temporal lobes, as well as the entire language function network.

6.3 Noninvasive Brain Stimulation (NIBS) Technology

6.3.1 Transcranial Magnetic Stimulation (TMS)

TMS is a non-invasive, painless, and mild therapeutic modality based on the generation of magnetic pulses, widely applied in neurorehabilitation for patients with post-stroke aphasia (PSA). Depending on the stimulation type, it can be categorized into two therapeutic approaches: single TMS pulse stimulation of the cortex and repetitive transcranial magnetic stimulation (rTMS) involving multiple pulses administered at short intervals. Low-frequency rTMS is applied to unaffected cerebral hemispheres to suppress their hyperexcitability, thereby promoting activation of the lesioned hemisphere and leveraging interhemispheric interactions to enhance bilateral cerebral hemisphere regulation [39]. High-frequency rTMS is typically administered to perilesional areas of the left hemisphere to augment activation during language processing. Studies have demonstrated that rTMS primarily improves naming function in PSA patients with sustained efficacy, and this therapy also facilitates remodeling of left hemisphere language networks [40].

6.3.2 Transcranial Direct Current Stimulation (tDCS)

tDCS modulates cortical excitability by delivering constant current to the scalp, representing a convenient, safe, non-invasive, low-risk, and non-addictive brain stimulation therapy [41]. Studies indicate that left inferior frontal gyrus anode tDCS serves as an effective adjunctive approach for routine speech-language therapy in patients with non-fluent post-stroke aphasia (PSA) [42]. tDCS treatment may produce cumulative effects, facilitating the consolidation of neuronal networks.

6.4 Physical Therapy

6.4.1 Music Therapy

Music therapy is an innovative rehabilitation approach that employs techniques such as singing and music appreciation to enhance auditory perception in aphasia patients through rhythm and melody, while improving language comprehension via lyrics and musical notation, and regulating speech frequency and clarity. Compared to conventional speech rehabilitation methods, music therapy demonstrates distinct advantages including strong rhythmicity and high patient compliance. Joyful music can stimulate brain neurons, balance cortical regions, promote blood circulation, and facilitate metabolic enhancement as well as alleviation of depressive symptoms [43].

6.4.2 Hyperbaric Oxygen Therapy and Acoustic Wave Treatment

Hyperbaric oxygen therapy (HBO) enhances intracerebral oxygen partial pressure and oxygen content, dilates ischemic cerebral vessels, constricts normal blood vessels, accelerates collateral circulation in ischemic brain regions, and reduces hypoxia, ischemia, and cerebral edema [44]. Studies by Miduqiu [45] demonstrated that HBO treatment increases blood flow to language-affected cortical areas, promoting language function recovery, with 0. 18 MPa pressure being the safest and most effective regimen. Wang Yao et al. [46] utilized acoustic wave stimulation to target intact left cerebral hemisphere language regions, neural gland tissues, and brainstem reticular formation. This approach accelerated functional reconstruction in language areas and improved lesion recovery, highlighting its significant role in enhancing language comprehension and expression abilities in aphasia patients.

7. Summary

This article provides an overview of traditional therapies for post-stroke aphasia and emerging treatment approaches for PSA patients. Current research has confirmed the efficacy of various therapeutic modalities in managing PSA-related conditions. In clinical practice, clinicians should prioritize addressing individual functional impairments in stroke patients, integrating speech training objectives and treatment contexts to select optimal interventions. By leveraging the complementary strengths of conventional techniques and innovative technologies, we can effectively address speech and language deficits in aphasia patients, improve verbal communication barriers in PSA cases, create optimal rehabilitation environments, and ultimately facilitate comprehensive recovery outcomes.

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