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Current Status of Traditional Chinese and Western Medicine Research on Craniocerebral Injury

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Abstract: ***This paper studies the understanding of craniocerebral injury in traditional Chinese medicine and modern medicine, and lists the various methods used in clinical treatment and the treatment mechanism in various methods. From the basic theories of traditional Chinese and modern medicine to the integrated treatment of traditional Chinese and Western medicine for craniocerebral injury, in order to accelerate the recovery efficiency of patients after craniocerebral injury, and provides ideas for their early damage evaluation and subsequent diagnosis and treatment research on the development and changes of the disease.***

Keywords: Craniocerebral injury, Electric injection, Early intervention, Efficacy.

1. Introduction

Traumatic brain injury (TBI) also has traumatic brain injury, brain trauma, and other diseases in clinical medicine. It refers to damage to the morphology and function of the scalp, skull and brain tissue caused by direct or indirect external violence. It can lead to symptoms such as disorders of consciousness or decreased level of consciousness, memory loss or forgetfulness, other neurological or psychological abnormalities, and even death. It is the most common neurosurgery disease [1]. It has a high incidence rate worldwide, and the disease progresses rapidly and easily worsens, and has common characteristics such as functional disability and death outcomes [2]. With the rapid development of my country's economy, it is a population-intensive society, and the continuous and vigorous development of infrastructure construction, the clinical incidence of craniocerebral injury has continued to rise [3], bringing serious harm to the orderly development of society and family economic conditions. The early diagnosis and treatment of its diagnosis and treatment research on subsequent development and changes in the disease have become an important target for attention in the field of clinical medicine [4].

At present, modern medicine's main treatment methods for TBI include surgical hematoma and decompression surgery, drug treatment, hemostasis and anti-infection, prevention of stress ulcers, vital sign detection, preventive cryogenic treatment, nutritional brain nerves, hyperosmotic therapy, psychological evaluation, improved respiratory conditions, deep venous thrombosis prevention, epilepsy prevention, etc., and have achieved certain clinical efficacy [5]. With the continuous development of TBI pathological mechanism research and clinical treatment methods, the treatment effect of the disease is also constantly improving, effectively reducing the disability and mortality rate. However, there are still some problems that need to be explored and solved urgently. In addition to surgical and drug treatment measures, there are still lack of effective means to improve the prognosis level of TBI patients [6, 7]. Some patients still have some relatively complex symptoms after the end of the treatment cycle, such as impaired cognitive function, motor dysfunction, speech loss, psychological and behavioral dysfunction, which greatly affect the patients' daily life ability [8].

Traditional Chinese medicine believes that the brain is the home of the soul and the meeting of all yangs, which commands and controls the physiological activities of the human body throughout the body. Craniocerebral injury belongs to the categories of traditional Chinese medicine such as "head injury", "beating servant injury", and "Jinchuang" [9]. This disease is located in the brain, and blood stasis block is the basic pathogenesis of its development from the onset to the end of the disease, and it runs through the whole process. Traditional Chinese medicine theory believes that after trauma, violence is caused, blood is damaged, blood leaves the meridians, overflows outside the meridians, or is blocked inside, which is blood stasis, which blocks the brain and collaterals, causes failure of the clear orifices, and internal disturbance of the soul, causing various symptoms [10]. Research has shown that clinically, acupuncture, as a traditional treatment method, has been widely used in the treatment of related symptoms of TBI, can effectively promote awakening effects on comatose patients, and also has the effect of promoting consciousness recovery, improving cognitive dysfunction, and regulating motor function damage. Research on the mechanism of acupuncture utility has been carried out in many aspects such as inhibiting inflammatory responses, protecting neurons, reducing nerve damage, reducing cell apoptosis, and improving brain circulation. It has achieved remarkable efficacy and has been recognized by many clinical studies and systematic reviews at home and abroad [11-13]. Electric acupuncture is a reliable therapy that combines the common effects of acupuncture and microcurrent stimulation. Its stimulation amount is uniform and lasting, and its frequency and waveform are objective and controllable, and it has a remarkable effect in many diseases.

2. Traditional Chinese Medicine's Understanding of TBI

2.1 Traditional Chinese Medicine Disease Name

Traditional Chinese medicine classifies TBI as "head injury" and "headache disease". I had a certain understanding as early

as the Spring and Autumn Period and the Warring States Period. “Su Wen·Five Clan Generation” says: “All marrows belong to the brain.” “Shen Shi Fang” says: “The disease falls from a high place and hurts the inside, and blood cannot be gathered in the abdomen.” “The Standard of Certification and Treatment” says: “Any brain bone injury can be cured when broken at the whip. If it is damaged, it cannot be cured.” Although there are many scattered records of TBI in classical Chinese medicine, due to historical reasons and the development of anatomy, a standardized and unified disease name system has not yet been formed [17]. At present, in the current national standards for the “Classification and Code of Traditional Chinese Medicine Diseases” in my country, TBI is classified as “orthopaedic diseases”, and close to it are also diseases such as “head injury”, “injury pain disease”, “injury bleeding disease”, and “trauma disease”, which still lacks certain scientificity and unity [18].

2.2 Causes and Pathogenesis

Traditional Chinese medicine believes that after trauma and violence, the qi is in chaos, the meridians are damaged, the blood leaves the meridians, and overflows outside the meridians, which means bleeding, or congestion inside, blood stasis remains in the body, and the soul is closed and concealed, causing various symptoms. “Lingshu·Evil Qi and Internal Diseases” Chapter says: “There are some falls and the evil blood remains in it.” Throughout the ages, doctors have agreed that blood stasis is the basic pathogenesis of this disease, but it is not the only pathogenesis [9,19]. In the complex pathological process of this disease, long-term blood stasis turns into heat, heat evil damages body fluids, and liquid refining becomes phlegm, phlegm and heat are mutually linked, the spirit and mechanism are lost, and the orifices are not effective. If blood stasis is left in the body, meridians are blocked, meridians are blocked, and blood is not good, it will be water, so water, dampness, phlegm and fluid are all produced, and the syndromes are intertwined [20]. Therefore, during the development of the disease, many factors such as blood stasis, phlegm, accumulation of heat, water and dampness, and the inability to nourish the spirit, and then there are pathogenic events such as blood stasis blockage, phlegm and turbidity, internal heat evil, deficiency of marrow, internal stoppage of water and dampness, disorder of the seven emotions, and deficiency of qi and blood, which are transmitted and changed, affecting the outcome of the disease. Therefore, mastering the complex pathogenesis and changes in the process of TBI development is of great significance to the diagnosis and treatment of the disease, alleviating sequelae, and improving viability.

2.3 Traditional Classification of Traditional Chinese Medicine

In the current “Quality for Diagnosis and Treatment of Traditional Chinese Medicine” [21], the disease is divided into a period of coma (congestion of qi, stasis and clearing of orifices, and phlegm and heat precipitation), a period of awakeness (transition from coma to awake), and a period of recovery (stasis blocking the brain, phlegm and turbidity precipitation, and heart and spleen deficiency). Due to the differences in the understanding and understanding of this disease in various clinicians, some other views have also emerged. Ling Jianghong [10] and others analyzed and summarized the research literature and clinical practice on craniocerebral injury in the past 30 years. According to the different stages of the disease, the acute phase is determined within two weeks of onset, and the recovery phase is determined by three weeks to six months of onset. The acute phase includes qi stagnation and blood stasis syndrome, blood stasis and clear orifices, and phlegm and blood stasis syndrome; the recovery phase includes qi deficiency and blood stasis syndrome, phlegm and blood stasis syndrome, and liver and kidney deficiency syndrome. In clinical practice, Yang Wanzhang [22] and others have a relatively consistent view, and they also believe that due to the large differences in the condition of the brain, the syndrome differentiation is more reasonable based on different stages. The acute phase is divided into six types: phlegm and heat obstruction, qi deficiency and blood stasis, dampness and turbid obstruction, blood stasis, phlegm and qi intersecting, vital qi failure, phlegm and dampness obstructing, dampness and heat accumulation, phlegm and water blocking, and combination syndrome; the recovery phase is divided into five types: liver and kidney deficiency, yin deficiency and wind movement, phlegm and dampness obstructing orifices, clear yang failure, qi deficiency and blood stasis, spleen and kidney deficiency, phlegm and blood stasis intersecting, phlegm and blood stasis, joint syndrome, etc. To sum up, although the syndrome differentiation and classification of this disease are different from various types of doctors, the basic recognition is based on the development stage of the disease, combined with the syndrome differentiation thinking of traditional Chinese medicine and the specific etiology and pathogenesis for diagnosis and treatment.

2.4 Traditional Chinese Medicine Treatment

At present, traditional Chinese medicine methods for treating craniocerebral injury are widely used and have good clinical effects, mainly including: traditional Chinese medicine treatment, acupuncture treatment, massage treatment, ear acupoint therapy, bloodletting therapy, etc.

2.4.1 Chinese medicine treatment

Traditional Chinese medicine has achieved good results in the treatment of craniocerebral injury in the clinical field and has been widely recognized. Through its multi-target and multi-path characteristics, Chinese medicine prescriptions can maintain the unobstructed and completeness of the fine blood vessels in the brain, protect the functional role of the blood-brain barrier of the brain, effectively inhibit the occurrence of inflammatory responses, reduce the damage to neuronal cells, and effectively improve brain function. In response to the symptoms of Qi stagnation, blood stasis, blood stasis, and blood stasis after craniocerebral injury, the clinical practice is often based on the perspectives of stopping bleeding, promoting blood circulation, and removing blood stasis. The use of classic prescriptions such as Tianma Goutong Decoction, Tongqiao Huoxue Decoction, Buyang Huanwu Decoction and other classic prescriptions combined with regular Western medicine treatment is more significant. In clinical treatment, Tang Qingbo [23] and others used traditional Chinese medicine Tongqiao Huoxue Decoction plus and subtraction combined with hyperbaric oxygen to

treat aphasia after craniocerebral injury. After analysis and comparison, it was found that the total effective efficiency of patients in the control group was 78.18%, and the total effective efficiency of the experimental group using comprehensive treatment methods reached 92. 73%, with a large difference, and the comprehensive efficacy of the experimental group was better than that of the control group. Gao Yi [24] and others have studied the awakening effect and mechanism of Huoxue Huatan Prescription and Adamantane in patients with phlegm and blood stasis blocking orifices after TBI. According to the experimental results, Huoxue Huatan Prescription and Adamantane can effectively reduce the level of TNF-a, IL-1 and other factors in patients' serum, improve brain circulation, reduce the degree of coma in severe TBI patients, and help promote patients' awakening. Based on the conventional Western medicine treatment methods, Sun Ying [25] and others chose Changyu Erhuang Decoction in combination with traditional Chinese medicine to treat severe TBI phlegm, blood stasis, and heat congestion. They concluded that together, they can promote awakening, improve cerebral circulation, and reduce various injuries and complications secondary to severe TBI.

2.4.2 Acupuncture treatment

Acupuncture is the most traditional treatment method in traditional Chinese medicine. In the clinical field, it is widely used in the early stage or recovery period of TBI, the awakening of coma in consciousness, the improvement of cognitive dysfunction, the recovery of mental state abnormality, and the recovery of decreased limb motor function. Experimental studies have found that related research on the onset mechanism of acupuncture and electrical TBI can be explored from multiple angles such as inhibiting inflammatory responses, reducing cell apoptosis, reducing neuronal damage and promoting neural function recovery, improving brain circulation and reducing pathological changes in brain edema. Zhang Yimin [26] and others standardized and systematically searched the literature on the treatment of TBI and its sequelae by clinical methods of acupuncture theory in the past 30 years, and found that various acupuncture and moxibustion methods such as body acupuncture, scalp acupuncture, electric acupuncture, eye acupuncture, tongue acupuncture, abdominal acupuncture, etc. all had positive effects on TBI and its sequelae, and there were no reports of side reaction events. Luo Jianchang [27] and others used acupuncture combined with the treatment for 191 patients with post-brain trauma syndrome. Before and after treatment, they found that all the symptoms of post-brain trauma syndrome in the patients were improved, and they also effectively improved the blood circulation of the vertebral artery. Academician Shi Xuemin founded the acupuncture method of awakening the brain and opening the orifices many years ago. It is widely used and has significant therapeutic effects. It mainly takes the Du meridian and the Twelve-jing acupoints, and uses the black needle to drain the method; acupoints: Renzhong, Twelve Wells, Neiguan, Taichong, Fenglong, Hegu, etc., are mainly used to treat stroke disease (stroke stroke). In recent years, it has also been used to treat various encephalopathy and brain injuries, such as post-brain trauma syndrome, concussion and other mental symptoms, and the efficacy is accurate [28, 29].

2.4.3 Massage treatment

The massage therapy in traditional Chinese medicine is based on the theory of yin and yang, qi and blood, meridians and internal organs as the theoretical basis. It uses push, hold, press, massage, and rub the tendon revision techniques to act on all parts of the human body, and provides comprehensive stimulation of the body's muscles, joints, bones, tendons, veins, etc. in a multi-directional manner, which helps promote local blood circulation, improve limb functions, and regulate various functions of the body. It is widely believed that the application of massage therapy can unblock the meridians of the human body, promote the flow of qi and blood, maintain the balance of yin and yang, benefit various physiological systems throughout the body, and promote the metabolism of the human body, thereby achieving internal and external unity and yin and yang coordination. It also has the advantages of wide application certificates, high safety and few side effects. Wang Jing [30] and others conducted clinical observations on the effects of acupuncture and massage combined with acupoint injection therapy on the nerve and motor function of patients paralyzed in TBI. By recording and analyzing the clinical effects and nerve and motor function of the two groups of patients in 28 days after treatment, it was concluded that acupuncture and massage combined with acupoint injection therapy was effective for patients with paralyzed after TBI, which greatly promoted the patients' cognitive and language function recovery, and could reduce the degree of nerve damage, improve motor function, have no side effects, and are safer, which is worthy of clinical optimization and promotion.

2.4.4 Ear acupoint therapy

The ear acupoint therapy originates from the traditional medicine of meridians and internal organs. It believes that specific areas on the ear are closely related to the internal organs of the human body and have a reaction point regulation effect on the physiological pathological conditions of various parts of the body. Ear acupoint therapy is a method to regulate body functions and prevent and treat diseases by stimulating specific parts of the ear, that is, the reaction area. It usually uses Wang Buliuxing Pills method or Ear Hair Needle and Ear Acupoint Burning Acupuncture Method, which has the effects of invigorating qi and blood circulation, unblocking orifices, and regulating yin and yang. In clinical practice, Li Baodong [31] and others used ear acupoint urging beans combined with traditional Chinese medicine syndrome differentiation and typing intervention to observe and record the changes in the corresponding indicators before and after treatment. After all treatments were completed, the overall effective efficiency of the ear acupoint urging beans combined group was higher than that of the control group. It is believed that ear acupoint therapy has a relatively obvious effect on post-TBI syndrome.

2.4.5 Bloodletting Therapy

Bloodletting therapy, also known as pricking bloodletting, is an external treatment method adopted by traditional Chinese medicine for some heat syndromes and empirical symptoms. "Su Wen·Blood and Qi Shaping Zhi" says: "Everyone curing a disease must first remove the blood." Use a triangular needle, a plum blossom needle or a hair needle to destroy the tiny

wound mouth or shallow meridians on the surface of the body to destroy the tiny wound mouth, and a small amount of blood flows out, so that the evil qi will go out, the positive qi will remain, and the disease will be cured accordingly. Cai Wendong [32] and others used bloodletting therapy to treat 69 patients with post-TBI syndrome by using bleeding therapy in Weizhong acupoints such as Baihui and Yamen. The efficacy is obvious. It is believed that bloodletting therapy has the advantages of simple operation, rapid effect and strong applicability in clinical practice.

3. The Understanding of TBI in Modern Medicine

3.1 Epidemiology and Pathogenesis

Traumatic brain injury (TBI) is also known as traumatic brain injury, brain trauma, etc. in modern medicine. In most cases, it is caused by sudden direct or indirect external violence, morphological and functional damage to the scalp, skull and brain tissue. It is a common neurosurgery disease. TBI is one of the common causes of injury and disability. With the continuous progress of the social economy, it has developed into a major social medical and health problem, attracting the attention of many medical and health workers around the world. Studies have shown that TBI is about 50 million cases per year worldwide, and about half of the world's population will encounter TBI in their lives. As one of the largest developing countries in the world, China has experienced TBI every year (55~64)/100,000 people, and the disability and mortality rates continue to rise [33], which seriously endangers the harmonious development of society and families.

Not all head blows can cause brain damage. The severity of brain injury can range from mild (temporary changes in mental state or consciousness) to severe. The signs and symptoms of a brain injury depend on the severity of the injury, the location and type of injury (diffuse or focal) [34]. Patients with mild TBI may remain conscious or may lose consciousness for a short period of time, accompanied by other symptoms including headache, dizziness, mixed thinking, blurred vision or eye fatigue, tinnitus, physical fatigue or lethargy, changes in sleep patterns, behavioral or mood, as well as memory loss, distraction, or cognitive dysfunction. People with moderate or severe TBI who are more ill may show the same symptoms in the clinical practice, but may also experience worsening or recurrent headaches that are difficult to cure, repeated vomiting or nausea, twitching limbs or acute seizures, difficulty awakening when sleeping, diffuse one or both pupils of the eyes, imperfect speech, weakness or numbness of the limbs, weak coordination, and increased emotional confusion, restlessness or agitation behavior [35].

TBI is defined as a non-degenerative, non-congenital trauma. It occurs through external violence and is generally caused by various external factors. The more common ones include traffic accidents, falling from high places, falling and falling, as well as damage to the head by various sharp objects and large-mass blunt objects. According to the difference in the time and mechanism of action, it can be divided into two pathological processes: primary and secondary [36]. Mechanical damage can lead to changes in brain metabolism and blood flow, leading to cellular dysfunction and at risk of secondary damage such as hypoxia, hypotension, cognitive impairment, and epilepsy [37]. Alterations in cell metabolism function may trigger glutamate-induced excitotoxicity and neuronal cell death. Changes in the calcium homeostasis environment lead to an increase in oxygen free radicals and the generation of inflammatory responses, leading to the death of nerve cells, and ultimately impaired or altered consciousness levels, leading to long-term or temporary cognitive or physical dysfunction.

3.2 Primary Injury

Primary injuries are usually the moment when external factors act on the head. External forces and hedge forces act on the structure of the brain at the same time. The stability of the skull is damaged, and brain tissues move and contude within the skull due to force factors. The degree of damage of primary damage is determined at the moment of external force and cannot be reversed. It can only be reduced by increasing prevention awareness.

3.2.1 Intracranial hematoma

1) Epidural hematoma

It occurs between the dura and the skull, mainly due to skull damage due to dura vein or arterial-related lacerations, usually fractures, and occasionally double veins within the skull bone marrow [38]. A common cause of epidural hematoma is a rupture of the middle meningeal artery due to rapid increase in blood pressure.

2) Subdural hematoma

Usually occur in patients with severe trauma, which is produced by ruptured veins in the subdural space with injuries to meningeal artery or cortical veins. The associated mortality rate is high, about 60-80%, and the blood flow in patients with subdural hematoma is limited to the arachnoid and dura regions [39]. Subdural hematoma does not develop faster than epidural hemorrhage, but it can also develop into lump lesions, leading to death and dysfunction.

3) Cerebral hemorrhage

It refers to internal brain hemorrhage, brain parenchymal bleeding caused by brain contusions and lacerations, which damages the upper deep cerebrovascular through extensive cortical contusions. TBI can damage vasodilation and systolic functions, and can also cause damage to the blood vessel wall, causing red blood cells to seep out in the blood vessels. A large amount of red blood cell loss will cause local arterioles ischemia and necrosis, further aggravating bleeding and cerebral hematoma.

4) Subarachnoid hemorrhage

After acute brain injury, subarachnoid hemorrhage is very easy to cause complex pathological factors, a large amount of blood gathering in the subarachnoid cavity, imbalance of cerebral perfusion pressure and intracranial pressure, severe

damage to brain circulation function, brain tissue falls into a state of severe hypoxia and ischemia, cerebral vascular contraction and stenosis, cerebral blood flow decreases rapidly, platelet aggregation will cause intravascular obstruction, impaired protective function of the blood-brain barrier, and deepen secondary ischemic damage. Subarachnoid hemorrhage is most likely to cause cerebral vasospasm. If blood components hinder arachnoid villi, it can also lead to hydrocephalus.

3.2.2 Skull fracture

Skull fractures may be associated with brain nerve damage, hematoma and aggravated brain damage. About 4% of head injuries include skull base fractures. Most fractures (90%) are secondary to closed head trauma; the rest are caused by penetrating trauma [40]. Skull fractures can cause brain nerve damage, especially at the base of the skull. The brain nerves damaged by TBI are generally facial nerves, which lead to facial muscle paralysis. A skull fracture can damage the membrane covering the brain, causing a cerebrospinal fluid (CFS) leak.

3.2.3 Brain contusion and laceration

When the brain is affected by external violent factors, substantial damage will occur, and contusions and lacerations may occur at the same time. Brain contusions will induce secondary damage, resulting in multiple small hemorrhage foci on the surface or deep layer of the brain, causing venous blood stasis, and forming cerebral edema or cerebral hematoma. After brain lacerations, the fracture of blood vessels in the brain tissue and leponema is common. In the absence of skull fractures, contusions may occur due to the brain moving back and forth within the skull boundary. Brain contusion is caused by double damage to blood vessels and tissues. Contusion usually originates from the lower and polar parts of the frontal lobe and the lateral side of the temporal lobe [41].

3.3 Secondary Injury

Secondary injuries usually occur on the pathological basis of primary injuries, such as brain edema formation, secondary brainstem injury, neuroinflammatory response, apoptosis and oxygen free radical changes, which determine the prognosis and outcome of the disease.

3.3.1 Brain edema

1) Cytotoxic edema

Cytotoxic brain edema is usually formed by the accumulation of water in cells of astrocytes, microglia, and neurons. Cytotoxic edema is an alteration of cell permeability that causes the ineffectiveness of the cell's ability to manage its ion gradient. The permeability changes in the cell membrane cause this pathology, with reduced energy resulting in the ion pump stopping and cell reabsorption of osmotic active solutes [42]. Blood-brain barrier damage and ischemia in various areas of the brain can also produce cytotoxic brain damage through blood flow recovery [43].

2) Vascular edema

Vascular cerebral edema is caused by the mechanical/functional disintegration of one's own digestive disorder or endothelial cells (an important system of the blood-brain barrier) or the reflexive expansion of cerebrovascular [44]. The destruction of the endothelial wall of the cerebral blood vessel promotes the free flow of ions and proteins from the blood vessels to the brain's interstitial (extracellular) areas, and causes water accumulation.

3.3.2 Intracranial pressure increased

TBI is closely related to the increase of ICP (intracranial pressure). TBI will lead to increased systemic blood pressure and cerebral blood vessels dilation, increasing the cerebral blood volume, which will lead to a widespread decline in cerebral perfusion and blood flow, and ultimately leading to cerebral infarction and ischemia [45]. In addition, hypertension produces intracranial hematoma, which makes the bleeding faster, further improving ICP.

3.3.3 Mitochondrial dysfunction

Impairment of mitochondrial function after TBI induces the production of free radicals after apoptosis, especially mediating secondary damage, requiring necessary treatment [46]. In patients with trauma, the reduction in cellular energy production can impair neurological function. Glutamate neurotoxicity can cause mitochondrial damage to neuronal cells, and mitochondrial Ca++ buffering capacity, oxidative phosphorylation, mitochondrial respiration and ion transport function are all irreversible losses [47].

3.3.4 Excitory toxicity

Excitory toxicity refers to the toxicity produced by the excessive stimulation of neuronal cells by NMDA and AMPA receptors (excitatory glutamate neurotransmitters). Experimental and clinical reports show that within minutes after brain trauma, depolarization of neuronal cells exceeding the normal number of neuronal cells leads to excessive increase in extracellular glutamate levels. This increased glutamate production increases Na+ and Ca2+ inflow into the cells, causing cell damage mechanisms that lead to cell apoptosis [48].

3.3.5 Oxidative Stress

Oxidative stress reaction is essentially the generation and neutralization of free radicals. Free radicals in the body react under the action of antioxidants, causing an imbalance between their destructive effects [49]. Oxidative stress involves the production of reactive oxygen species (generating oxygen free radicals and related species) in TBI damage. Excitation toxicity and endogenous antioxidant processes (such as peroxidase and catalase) are exhausted, causing the amount of reactive oxygen species to exceed the load. This process further leads to protein oxidation, DNA cleavage, and cellular and vascular system damage. These mechanisms are sufficient to trigger the inflammatory process, which ultimately leads to cell death [50].

3.3.6 Brain hernia

The formation of brain hernia is closely related to the increase of intracranial pressure. Changes in intracranial pressure distribution and large-sized space-occupying lesions will all cause the occurrence of brain hernia [51]. Disease classification is based on the site of onset, and it is divided into halogen hernia, halogen hernia of the occipital bone and subfamily hernia. The first two are the most common in clinical practice. Increased intracranial pressure brings more harm, and the formation of brain hernia is the most pathological type, and the prognosis after treatment is usually not ideal. Currently, in clinical treatment, the main focus is on preventing the occurrence of brain hernia. When the pathological level does not reach brain hernia, timely and effective intervention and treatment will be carried out on the underlying condition.

3.4 Treatment Progress

The treatment of craniocerebral injury can be divided into acute treatment and rehabilitation treatment. Acute treatment involves maintaining adequate lung gas exchange and brain perfusion to avoid secondary brain damage and strengthening neuroprotective treatment. It is supplemented with treatment measures such as prevention of early hypoxia, hypercapnia, hypotension and elevated intracranial pressure [52]. Impaired bleeding should be controlled as needed, and other complications that need to be monitored and prevented include hyperthermia, hyponatremia, hyperglycemia, and fluid imbalance. At present, the TBI condition worsens, and the main reason for the poor prognosis is secondary injury. After the primary injury, due to rapid development of vascular-derived cerebral edema, continuous increase in intracranial pressure, resulting in reduced cerebral perfusion, resulting in extreme ischemia and hypoxia, death of nerve cells, and neurological dysfunction in brain tissue [53]. Patients may experience different forms of disability complications, including cognitive, neurological, motor, emotional, or behavioral problems. Therefore, rehabilitation treatment is necessary, with the aim of reducing disability and enabling the patient to achieve maximum injury recovery within the limits of his or her remaining cognitive, neurological and motor functions.

3.4.1 Surgery treatment

For patients with severe trauma, the prognosis is usually poor. Early surgical intervention, especially timely intracranial decompression and removal of intracranial hematoma, played an important role. The surgical treatment is for osteotomy decompression. Intracranial hypertension after craniocerebral injury can be caused by the lump effect of hematoma or contusion. The practice of decompression bone flap resection has been widely used to strive to control intracranial high pressure and prevent further brain damage. Removing part of the skull can release the pressure in the cranial cavity, and the pressure under brain tissue is buffered, and removing part of the skull also increases the compensatory volume in the cranial cavity to a certain extent, effectively relieving the compression of brain hernia on brain tissue, thereby achieving the purpose of protecting brain tissue [5]. Li Qiang [54] and others performed 31 severe TBI patients with upper and lower joint bone flap decompression surgery. After clinical treatment and observation and evaluation, they believed that timely decompression surgery for severe TBI in the early stage can effectively reduce complications, improve the prognosis status of the patients, and improve the comprehensive treatment efficacy. However, as of now, the time and indications for patients with craniocerebral injury need to undergo decompression surgery under which the conditions are required for patients with craniocerebral injury have not been uniformly concluded [44].

3.4.2 Drug treatment

Clinical research in recent decades has developed some effective drug therapies for craniocerebral injury. The use of statins during the treatment process can effectively inhibit cholesterol synthesis and inflammatory response, reduce neuronal excitotoxicity, reduce neuronal damage, and improve cell apoptosis. Erythropoietin (EPO) is an endogenous hormone. EPO, as a neuroprotective agent, has shown high therapeutic potential in animal experiments. It can pass through the blood-brain barrier without being affected and efficiently combine with receptors on the surface of most brain cells. It has the effect of improving blood circulation, reducing neuronal cell damage and promoting neural function recovery. It also has the effect of inhibiting neuronal apoptosis procedures and reducing the body's inflammatory response [55]. Researchers believe that EPO is beneficial for TBI patients to reduce mortality and shorten hospital stays without increasing the risk of deep venous thrombosis. In experimental studies, women in some patients with craniocerebral injury responded lighter than men, and focused on a powerful steroid hormone synthesized by the central nervous system, progesterone, which is synthesized by oligodendrocytes, whose receptors are on nerve cells. Its mechanism of action includes: it can effectively reduce the toxic effect of glutamate, reduce the occurrence of inflammatory response, protect and maintain the function of the blood-brain barrier, and reduce cell apoptosis. In addition, progesterone may reduce the incidence of cerebral edema by regulating aquaporin expression [56]. Citicoline is a single nucleotide derivative that can effectively increase the formation of ATP, accelerate the metabolic process in brain tissue, and promote awakening and accelerate the improvement of brain function for comatose patients. It is widely used in clinical treatment for brain injury. In addition, studies on the application of amantadine, tranexamic acid, corticosteroids, and anti-inflammatory therapies are still underway, in the hope that side effects can be reduced and dosage and dosage time can be optimized [57]. The treatment of TBI is a major global health challenge and priority. The current promising research direction aims to optimize neurocritical care programs, establish an evidence base for surgical interventions, and apply promising neuroprotective drug therapies to human pathology. Given the pathological heterogeneity of TBI, a single intervention cannot solve all pathological mechanisms, and the importance of personalized medicine and combination therapy in the field of TBI cannot be exaggerated. This is inconsistent with the traditional randomized controlled trial approach and may result in a large number of randomized controlled trials failing to prove any benefit to this pathology [35].

3.4.3 Hyperbaric oxygen therapy (HBOT)

Hyperbaric oxygen therapy is to expose patients to an environment higher than normal atmospheric pressure and intermittently inhaling high concentrations of oxygen. It can effectively target ischemia and hypoxia after brain injury, thereby reducing the damage to brain microcirculation and reducing intracranial pressure. It can promote vasoconstriction and vascular regeneration, improve the oxygen content in the blood, and improve the oxygen supply to the brain. It plays an important role in the synthesis of mitochondrial functions and adenosine triphosphate in brain cells, improve the utilization rate of oxygen in brain metabolism, effectively reduce the degree of hypoxia damage, and improve the patient's neurological function, prognosis and quality of life. One of the hot topics in the research on the mechanism of hyperbaric oxygen treatment of craniocerebral injury, HBOT can promote brain cell metabolism, accelerate the decomposition and absorption of damaged brain tissue, promote the establishment of collateral circulation, restore the oxygen supply of neurons, effectively reduce the occurrence of brain edema and brain hernia, reduce the disability and mortality rate of patients with craniocerebral injury, improve the prognosis level of patients, and prevent secondary brain injury. Meng Xiangen [58] and others used hyperbaric oxygen combined with conventional therapy to conduct observation indicators and analysis and evaluation of 100 patients with cognitive dysfunction after TBI. They believed that hyperbaric oxygen can significantly reduce the harm of secondary injury of brain trauma, improve the comprehensive treatment effect, and effectively improve the cognitive function and prognosis level of patients.

3.4.4 Sub-hypothermia therapy

Sub-hypothermia therapy is to use sedative drugs and physical factors that have an inhibitory effect on the central nervous system to reduce body temperature and other methods to control and maintain the patient's body temperature at a value lower than normal body temperature. This can make the central nervous system in a suppressed state, thereby reducing the body's response to various external pathological stimuli, effectively reducing the body's metabolism, reducing oxygen consumption in the whole body's tissues and organs, and alleviating the pressure of the blood-brain barrier. In recent years, sub-low-temperature technology has been a commonly used auxiliary means to prevent and treat secondary craniocerebral injury. For every 1℃ reduction in body temperature, the central oxygen metabolic rate is reduced by 5~7%. This technology has certain advantages in TBI treatment. Through research, Du Yanping [59] and others found that the relevant brain injury markers and oxidative stress indicators in patients with severe craniocerebral injury are effectively reduced under the action of sub-hypothermia therapy, indicating that it can effectively improve the degree of secondary damage and coagulation function of patients with severe craniocerebral injury, promote patients' wake-up, improve prognosis level, and reduce the occurrence of related complications. It can be promoted and adopted in the clinical treatment process.

3.4.5 Neurological regulation therapy

In recent years, with the development of science and technology and medical levels, the clinical application rate of neuromodulation technology has been continuously increasing. It uses physical factors and chemical means to effectively stimulate neurons in the central and peripheral nervous system and the edges of the autonomic nervous system, and has an excitatory effect on the neuronal network. It may also interfere with the regulatory effect of neurons to meet the treatment needs, thereby improving the quality of life of patients and promoting the recovery of patients' neurological functions. It is a very effective biomedical engineering technology in clinical applications [60]. In addition, it has many advantages. In practical application of neuromodulation technology, the targeted diseases are broad, the targeted treatment effects are highly targeted, and continuous intervention can be carried out in the treatment time, and it is also reversible. At present, the techniques for craniocerebral injury in clinical treatment are mainly repeated transcranial magnetic stimulation and transcranial direct current stimulation [61]. Repeated transcranial magnetic stimulation is to use repetitive pulsed magnetic fields on the local nervous system, which can change the membrane potential of nerve cells, affect the metabolic function of brain tissue, improve the metabolic rate of brain tissue, promote the absorption and regeneration of damaged cells, and regulate nerve movement, thereby affecting the body's physiological and chemical reactions, and speeding up the patient's recovery process. This technology has very little trauma, good safety, simple and easy to operate, and basically no side effects. Transcranial DC stimulation is a non-invasive brain stimulation technology that uses fixed frequency, current magnitude and direction to stimulate the cerebral cortex, affect neuronal cells, and regulate neural network activity. It is widely used in the field of neurorehabilitation, and has certain therapeutic effects on weakened limb function and impaired cognitive function after stroke. It also has many advantages such as low cost, easy operation, small side effects, and strong tolerance, and is a reliable choice outside of drug treatment.

4. Summary

Due to the specificity of brain tissue, complexity of structural functions, and the form and degree of TBI damage, the clinical manifestations are even more complex and changeable, which brings great difficulty to clinical treatment. At present, the treatment of TBI is mainly dominated by modern medicine, relying on drugs and surgical procedures, and cooperate with related rehabilitation treatments, but the effect is relatively limited. In recent years, many clinical studies have confirmed that acupuncture has been widely used in related treatments of TBI, which can effectively intervene in various disorders such as consciousness, cognition, mental, and exercise caused by TBI. The research on its related mechanism of action is becoming more and more in-depth, and it has indeed been effective in many aspects such as reducing cerebral edema, suppressing inflammatory response, regulating neurotransmitters, promoting neuronal repair and regeneration, antioxidant, inhibiting cell apoptosis, and improving brain circulation.

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