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REVIEW ARTICLE

Research on general treatment principles and methods of bone fracture in Mongolian medicine

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ABSTRACT

The Mongolian nomadic nation has created bone healing, or fracture healing, which is suitable for the extreme weather and territory, unique living conditions, and physical characteristics while struggling to fight diseases during a long historical period. Gradually, this treatment method has gradually developed into a more comprehensive theoretical system throughout history and has unique names due to the thinking scope of the Mongols, their cognition development, and thus their use of it in their everyday lives and continuing to enrich their knowledge. Mongols have rich experience healing bone fractures and injuries from ancient times. They are usually used to perform bone setting and massage therapy. On the other hand, they have experience using herbal and mineral medicines to heal bone fractures and injuries. During their practice, the knowledge of herbal and mineral medicines used for bone fractures and injuries became expansive. After Buddhism reemerged in the 16th century, Mongolian doctors and knowledgeable people wrote many medical books in Tibetan. One of the major representatives was Jambaldorj, who wrote Mongolian materia medica, called "The beautiful wondrous eye ornament," based on "Four medical tantras." In treating bone fracture and injury in traditional medicine, firstly, the four treatment methods mentioned in "Four medical tantras" are the main principles and methods, which are wind, bile and phlegm theory, dietary recommendations, advice on behavior, prescribing medicine, and accessory therapy. We concluded that the names of herbal and mineral medicines used to practice bone setting are the same, even though they are mentioned in various sources.

Keywords: herbal medicine; mineral medicine; bone fracture; four medical tantras

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1. Introduction

In modern medicine, bone healing or fracture healing is proliferative, physiological process in which the body facilitates the repair of a bone fracture. It involves complex processes of cell and tissue proliferation and differentiation. Many factors are involved including growth factors, inflammatory cytokines, antioxidants osteoclast and osteoblast cells, hormones, amino acids, and uncounted nutrients. In general, bone fracture treatment consists of pushing dislocated bone back it places via relocation with or without anesthesia stabilizing their position and then waiting for the bones natural healing process to occur[1].

The two basic types of fracture healing are the primary or direct fracture healing and the secondary or indirect fracture healing. Primary (direct) fracture healing occurs with very minimal callus

formation. It is a direct attempt of bone to reestablish its continuity and thus requires direct contact of cells in the cortex[2]. Primary healing occurs rarely as the majority of fracture repairs undergo secondary or indirect healing[3,4].

As for traditional medicine, the treatment of fracture is found in the writing of "The Mongolian four medical tantras" written by Sumbe khamba Ishbaljir, "The beautiful wondrous eye ornament" written by Jambaldorj and "Secrets of prescription recipes" or Uvidasyn Dalai by Mindol Jambal. The Mongolian doctors used to immobilize the injured limbs using the bandage impregnated with resin (shel.ta: Pine Resin)[5,6].

The main principle involved in such treatment is to bring and maintain the ends of broken fragments together so that nature's effort to bridge the gap continues unhampered. In clinical practice, there are many methods and techniques described for the treatment of fracture that would enable it to heal within reasonable amount of time[1].

2. Research objective

The purpose of the research is to define the general principles of treating bone fracture with traditional medical theory and methodology, and use of certain herbal and mineral medicines used for injury and bone fractures.

3. Research materials and methods

3.1. Core research materials

"Four medical tantras" གཞི་རྒྱུད་བཞི།[7].

"The beautiful wondrous eye ornament" written by Jambaldorj[8].

Bold SH. History and development of traditional Mongolian medicine. Ulaanbaatar: Munkhiin Useg Group; 2013[6].

3.2. Research methods

3.2.1. Method of the sources (ancient sutras and books)

The source-study method initially includes research activities of books, literary works, sources, and papers. We made historical study on date of authors and their literary works in order of the written time starting from the earliest, thus comparing special, innovative, and creative ideas in terms of content and meaning with other original literary works by using research materials in accordance with the research goal and objectives. In addition, we made conclusion choosing information and sources related to identify medicinal herbs and medicinal minerals for bone fracture and injuries from the classical medicine sutras of traditional Mongolian medicine.

3.2.2. Checklist method

Checklists are the simplest method for systematizing scoping of the likely effects of a proposed medicinal herbs and medicinal minerals. They help point out areas that require a more detailed assessment. In some cases, checklists also represent the impact analyses itself.

4. Result and discussion

4.1. General theoretical understanding of treatment

According to Mongolian medicine the characteristics of the body are twofold: the spheres which are the objects of harm, and the humors which are the harmers. Owing to the inter-dependence of each of the individual humors, bodily constituents and excretions, the body arises, endures, and disintegrates; and because the aggregates so formed are the root of this process, they are called the body. Firstly, the spheres of the objects

of harm are classified as: (1) the digestive heat, (2) its method of transforming, and (3) the time of completion of its results[7].

The actual objects of harm are classified as the bodily constituents and the excretions. The seven bodily constituents are said to be the nutriment, blood, flesh, fat, bone, marrow, and vital fluid. The excretions are stool, urine, and perspiration, etc. and are also objects of harm. Three factors dominate the operation and changes of seven constituents and three excretions.

The classification is humors (according to) wind (rlung), bile (mkhris pa), and phlegm (badkan). Wind is responsible for movement of the body and food transportation; bile is for mediation of body temperature and food digestion; and phlegm is for personality, sleep, and liquid delivery. The reason why people fall sick lies on the influence of environment, climate, and diet as well as the unbalance among three humors.

Diagnostic methods of Mongolian medicine refer to observation, interrogation, and pulse taking and stress the changes in coated tongue and urine for the first time in the morning. The diseases are classified into two groups: heat symptoms and cold symptoms. Mongolian medicine treatments include but not limited to bone art, massage therapy, medicine, acupuncture, moxibustion, bleeding, cupping, and medicated bath, etc.

There are four methods of treatment in Mongolian medicine, as follows: Dietary recommendations; advice on behavior; prescribing medicine; accessory therapy including injuries and bone fracture.

If the illness is not so serious we need only give advice as to the diet and behavior. Generally, the wind patient must try to eat food which has got heavy and nutritional potency, such as lamb, butter, molasses, alcohol, milk, soups, chicken, garlic, ginger, and onions. The bile patient should eat beef, vegetables, fresh butter, fresh low-fat cheese, cow's yogurt and buttermilk, drink weak tea, spring water and have less greasy food. The phlegm patient should have honey, mutton, fish, barley, wine, ginger decoction and plenty of hot water and cooked vegetables.

For behavior the wind patient should stay in dark and warm places, the surroundings should be very quiet, and there should be beautiful scenery. He should have good company such as lovers and close friends. The patient should also rest both physically and mentally without any worries. For the bile patient's behavior, she should have cold baths and showers, sit in shaded places and walk by the sea and use a cool perfume such as sandalwood. For the behavior of the phlegm patient, he should have lots of sun, warm fires in his home; he should do lots of exercise such as prostrations, walking and running.

The third method of treatment is the prescribing of medicine. It can be administered in various forms. In the form decoction, powder, pills, etc.

The filial method of treatment is surgery—divided into mild and rough. Mild surgery for the wind patient includes massage with year-old butter and oily compresses. Rough surgery for the wind patient is placing moxibustion on the selected points of wind; these are on the crown of the head, the first, fifth and sixth vertebrae of the spinal cord, the sternum, etc. For the bile patient mild surgery is sitting beneath waterfall and mild purgatives. Rough surgery for the bile patient is bloodletting and cupping. For the phlegm patient mild surgery is hot fermentations, saunas, and mild emetics. Rough surgery for the phlegm patient is golden needle therapy and the application of heated surgical styles.

4.2. Medicinal herbs to treat bone fracture used in Mongolian medicine

We compiled the herbal medicines used for bone injury and bone fracture from the "Four medical tantras," "The beautiful wondrous eye ornament" and other sources, clarified the use[8, 9]. Herein:

Eucommia ulmoides, Fraxinus rhynchophylla: has five names and is said to be a white or blue type of the spyi zhur tree (Terminalia tomentosa). It grows in forested, south-facing valleys and has bark similar to that of sbyar. pa (poplar). The leaf is pale green, and a fragment of the middle bark placed in water leaves a pillar-like

trace. It unites fractures and cures bone fevers. Modern research has found that Eucommia ulmoides decoction (The herbs were crushed into powder to make a decoction) has the effect of promoting osteoblast metabolism, increasing bone density, and promoting fracture healing. Dong et al.[10] used Eucommia ulmoides decoction in the treatment of nonunion and poor fracture healing, 35 cases in the experimental group were treated with Mongolian medicine Haoritu Baori Tang (Alias name of Eucommia ulmoides decoction, 3 g, twice a day). X-ray films were taken at 2, 4, and 6 months from the start of medication to determine fracture healing. After treatment, 17 cases had blurred bone fracture lines and 9 cases had callus formation, with an effective rate of 48.57%. 21 cases were treated in the control group, with 1 case showing blurred fracture line and no case of callus formation after treatment. The difference is statistically significant. 35 cases were treated with Eucommia ulmoides decoction without any adverse drug reactions. Hu et al.[11] suggested in their study that Eucommia ulmoides decoction can significantly enhance ALP activity and promote osteoblast metabolism. Research by Chen et al.[12] has shown that Eucommia ulmoides decoction leaf extract can induce sheep bone marrow mesenchymal stem cells isolated, purified, and cultured in vitro Mesenchymal stem cells differentiate and proliferate towards osteoblasts, while inhibiting their differentiation into adipocytes, which has a bidirectional regulatory effect, thereby increasing bone density, inhibiting bone resorption, and regulating bone metabolism. Ha et al.[13] demonstrated that Eucommia ulmoides bark extract can promote bone formation, inhibit osteoclast activity, and osteolysis. Many scholars have confirmed that Eucommia ulmoides has estrogenic effects[14, 15]. This clinical study confirms that Mongolian medicine Eucommia ulmoides decoction has significant therapeutic effects in promoting fracture healing, especially in treating non union and/or poor fracture healing. In addition, it was mixed 1:1 with Echinops sphaerocephalus L. to make a Eucommia ulmoides-2 decoction for oral administration.

Tinospora cordifolia. (Family Menispermaceae) stem paste is used as a bandage for the treatment of bone fracture and dislocation of bone.

Terminalia arjuna. (Family Combretaceae) contains tannins, arjunic acid, arjunantin, calcium carbonate, and sodium chloride. The bark has hemostatic properties. Powder of bark is used orally for bone fracture treatment.

Cassia tora L. (Fabaceae) are the plants used for healing of bone fracture. Liquidambar formosana Hce. 35 g, Trogopterus xanthipes Milne-Edwards 25 g, Cassia tora L. 15 g, Abutilon kusnezoffii Reichb. 15 g, Melia toosendan Sieb. 15 g, Aucklandia lappa Dence. 10 g, Sophora flavescens Ait. 10 g, Gardenia 5 g, myrobalan 5 g, Dianthus superbus L. 5 g, etc. were mixed to make Fabaceae-10 decoction.

Piper longum L. (family Piperaceae) is also known as Piplie; Piper longum L. 15 g, Chebulae fructus 50 g, Radix Aconiti Kusnezoffii 25 g are mixed together to make NARU-3 decoction and it is used in fracture of the bone and sciatica pain.

4.3. Medicinal minerals to treat bone fracture used in Mongolian medicine

“Four medical tantras” and traditional Mongolian medical books written by Mongolian doctors in Tibetan mentioned there are 3000 kinds of crude drugs used to use in the traditional medicine. Among these drugs, the mineral originated medicines are always important and widely use even today. Therefore, we tried to define a frame work of the mineral originated medicines [8, 16]. In modern times, in the actual clinical diagnosis and treatment process, less and less minerals were used as a drug for fracture, and almost no relevant literature research has been reported, so this article does not mark the usage and dosage here. Only the names and sources of the drugs were presented.

Conch shell: conch shell has five names and is of superior and ordinary types. The superior type of right clockwise swirl, incarnates five times as a conch and is lily white, with a clockwise swirl. Another superior type is red in color. The ordinary types are recognized as having an anti-clockwise swirl, and there is also a “thorny” conch. All four types of dry pus, puncture whorls of pus, etc., cure bone fever, and are beneficial for

the eyes.

The brown frog's back stone or hematite is of two types. The male frog (type is brown, hard, heavy, and similar to a frog's back) or the superior type bears a stupa design and has large bumps, whilst the common type has small bumps only and is of superior quality. The female frog type bears a lotus design and has no bumps, whilst the common type is just without bumps. Both types expel, extract and dry lymph, maintain bone resin, heal fractures and sustain the brain.

Fossil muscovite, ophicalcite: It has no fixed color and bears the design of the horn of a goat or sheep. The male type is coarse, and the female type is smooth. The medium types are regarded as natural. All types of muscovite cure bone fevers.

Pig's head fossil: Bears the shape of a pig's head and is orange in color. It heals bone disorders and drains lymph (accumulations).

Red lead, at least, has six names. One coarse type is obtained from stone, while a smooth type comes from earth, and a sticky type is obtained from wood. In Nepal, an artificial type is made from lead. All types of red lead unite bone fractures and stop necrosis.

Red ochre, halloysite: has two names and is found in the form of a red stone (is a blue type of halloysite; red and blue halloysite) cure eye diseases and bone fever and dry lymph (accumulations).

Lodestone, magnetic ore: This has four names and also is of four types. It is of superior, medium, and ordinary qualities. The superior type is found to the south of Mount Meru, where there is a lion shaped rock of lodestone. Therefore, the needle of the compass points north. Medium quality lodestone comes from China and can hold ten needles together in a chain. The ordinary type is dark brown and can attract needles. Lodestone expels arrowheads bullets, shrapnel, etc. through the digestive tract and cures disorders of the brain, bones, and channels.

5. Conclusion

In treating bone fracture and injury in traditional medicine, firstly, 4 treatment methods mentioned "Four medical tantras" are the main principles and methods, which are wind, bile and phlegm theory, dietary recommendations, advice on behavior, prescribing medicine, and accessory therapy.

We concluded that names of herbal and mineral medicines used to practice of bone setting are the same even though it is mentioned in various sources.

Conflict of interest

The authors declare no conflict of interest.

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