Macroscopic Characteristics of and Criteria for Biological Fixation of Bone Fracture in Chinese Mongolian Osteopathy

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Abstract

(Self)external fixation using small splints in Chinese Mongolian osteopathy originated from life and practice. Basing itself upon vital natural idea ‘correspondenc of nature and human’ (including the ‘unity of mind and body’) integrating limbs and body, consciousness and body, human and nature, it integrates external fixation using small splints with psychological and physiological self fixation, and realizes geometrical, mechanical, kinematical, functional and psychological dynamic fixation of the ends of bone fracture. The fixation is natural, closed and open, by oneself, uncovered biological macroscopic fixing model, so this implicates developing direction and the model of future of modern fracture fixation.

Keywords: Mongolian osteopathy; Bone fracture; External (self)fixation using small splints; Biological fixation; Macroscopic criteria

1. INTRODUCTION

Macroscopic concepts of Biological fixation of bone fracture: From ancient times there has been a kind of Chinese Mongolian osteopathy in the Khorgin grasslands, due to its unique maneuver and miraculous healing effects, it is inherited up to now. [1][2]

The fixation is a connecting link between fracture reduction and fracture healing, effective fixation not only consolidates the effects of fracture reduction but also accelerates healing process and promotes...
healing quality. In Chinese Mongolian osteopathy originated from life and practice, external (self)fixation using small splints, on the one hand, basing itself upon vital intrinsic needs—‘unity of mind and body’, it pays great attention to self-controlling natural instincts of human and so as to explore psychological self fixing functions at the ends of fracture, which comes from soft tissues such as muscle, tendon and skin; on the other hand, basing itself upon vital extrinsic needs—‘correspondence of nature and human’, it cherishes and mobilizes for harmony and unity of human and nature. The two aspects bring accessory external fixing functions of small splints at the ends of bone fracture into full play, and realize natural, closed and open, by self and uncovered fixation. All these not only consolidate reducing effects of bone fracture but also accelerate healing speed and promote healing quality of bone fracture, so the fixation has advantages such as less ache, exact reduction, quick healing and lower expenses. Obviously all these are not only due to vital natural idea that implicates integrating limbs and body, consciousness and body, the harmony and unity of human and nature, i.e. ‘correspondence of nature and human’ (including ‘unity of mind and body’) but also due to ‘dynamic’ stable fixing characteristics related to geometry, mechanics, motion, functions and psychology, which formed the macroscopic concepts of biological fixation of bone fracture.

Now naturopathy, natural medicines, and traditional medicine are paid increasing attention by people, all these have become hot spots of development in economy, science and technology, in this background to carry on and promote this ethnic and traditional original culture of bone fracture is of profound and lasting significance.

2. METHODS

Based on vital natural idea integrating limbs and body, body and functions, harmony of human and nature (including ‘psycho-somatic unity’) as well as based on a vast amount of clinic evidences over a long period of time, the macroscopic criteria for ‘dynamic’ stability of geometrical, mechanical, kinematical, functional psychological and biological fixation of bone fracture in the osteopathy, are investigated textually.

3. RESULTS AND CONCLUSIONS

Macroscopic characteristics and its criteria of biological fixation of bone fracture in Chinese Mongolian osteopathy:

3.1. Macroscopic characteristics and its criteria of geometrical ‘dynamic’ stability of biological fixation of bone fracture

In Chinese Mongolian osteopathy, external fixing system using small splints consists of 4—8 light and thin willow splints, 3 fixing bands and some coercive cushions. Model for external fixation using small splints is shown in Fig.1, from this model one may see the following: along diaphysis there are 3 bandings and fixing points (for example 1, 2, and 3) at each splint, according to ‘three points in a line’ the points define a geometrically stable line. While along direction perpendicular to diaphysis, 3 points (for example, 3, 4, and 5) belong to 3 splints respectively, according to ‘3 points define a plane’ it consist a geometrically stable plane. Based on vital natural idea ‘correspondence of nature and human’ (including ‘unity of mind and body’), external fixation using small splints in Chinese Mongolian osteopathy may maintain healing structural stability giving consideration to entire geometrical states and entire fixing and healing of bone fracture. As a result of elasticity of small splints and moderate degree of the tightness of
bandage, the fixation implicates obviously criteria of geometrical ‘dynamic’ fixing stability of biological fixation.\textsuperscript{[5][6][7]}

3.2. Macroscopic characteristics and its criteria of mechanical ‘dynamic’ stability of biological fixation of bone fracture

For external fixing system using small splints in Chinese Mongolian osteopathy, the analyses of suffered forces show that necessary and sufficient condition for mechanical equilibrium relative to the end of bone fracture can be expressed by:

\[
\sin \alpha dN - \cos \alpha dG \leq k_{\text{static}} \left( \cos \alpha dN + \sin \alpha dG \right) \tag{1}
\]

When \( \alpha \) is regarded as a constant, we have,

\[
N \leq \frac{k_{\text{static}} \sin \alpha + \cos \alpha - G}{\sin \alpha - k_{\text{static}} \cos \alpha} \tag{2}
\]

where \( N \) denotes axial force along diaphysis, \( G \) denotes binding force of bandage (including banding force \( G_e, G_x \) when doing reactive and active movements, \( \alpha \) denotes angle between the normal of cross section of bone fracture and diaphysis.

![Fig.1 Model for external fixation using small splints](image)

Because value of \( k_{\text{static}} \) is larger than that of ordinary materials, and when \( \alpha \) is smaller value the expression holds undoubtelly. In view of this, based on vital natural idea ‘correspondenci of nature and human’ (including “psycho-somatic unity”), external fixation using small splints in Chinese Mongolian osteopathy maintains the stability of suffered forces under entire mechanical state of bone fracture. Due to the elasticity of small splints and moderate degree of tightness of bandage, obviously, this implicates macroscopic characteristics and its criteria of mechanical ‘dynamic’ stability of biological fixation.\textsuperscript{[5][6][7]}

3.3. Macroscopic characteristics and its criterea of kinematical ‘dynamic’ stability of biological fixation of bone fracture

Based on geometrical ‘dynamic’ stability and mechanical ‘dynamic’ equilibrium of biological fixation, external fixation using small splints in Chinese Mongolian osteopathy maintains the stability of the ends of bone fracture in terms of relative ‘static’ and realizes necessary stimulation of physiological stresses with the help of limited ‘dynamic’. The idea of fixation of bone fracture, such as basing on static, aiming at dynamic, relating dynamic to static, uniting dynamic and static, is just obedient to the natural law of vital activities, often creates favorable circumstances and conditions for fixation and healing of bone fracture. This shows that external fixation using small splints maintains entire static and dynamic
equilibrium of healing. Due to the elasticity of small splints and moderate degree of tightness of bandage, obviously, this implicates macroscopic characteristics and its criteria of kinematical ‘dynamic’ stability of biological fixation of bone fracture.\[2\][4]

3.4. Macroscopic characteristics and its criteria of functional ‘dynamic’ stability of biological fixation of bone fracture

External fixation using small splints in Chinese Mongolian osteopathy favors early functional exercises, encourages favourable activity, and avoids unfavorable static, the fixation may reduce automatically remnant small angles, tangential dislocation, and engages fracture closely with the help of effective physiological stresses, and accelerates healing of the ends of bone fracture. According to the model of external fixation using small splints shown in Fig.1, physiological stresses obtained at the ends of bone fracture can be expressed by:

\[ d\sigma = \frac{dG_s}{A_0} \sin \alpha + \frac{dN}{A_0} \cos \alpha \]  

(3)

Let \( \alpha \) be constant, then

\[ \sigma = \frac{G_s}{2A_0} \sin 2\alpha + \frac{1}{2A_0} \left[ G_g \sin 2\alpha + N(1 + \cos 2\alpha) \right] \]  

(4)

Where \( A_0 \) is a cross section of diaphysis. \( \frac{G_s}{2A_0} \sin 2\alpha \) is a constant physiological stresses when without functional activity. It can increase friction force and reduce shearing force, also promote mutual compact embedding at cross sections of broken bone, shorten creeping distance of newborn cells, and accelerate healing of bone fracture. As for \( \frac{1}{2A_0} \left[ G_g \sin 2\alpha + N(1 + \cos 2\alpha) \right] \) is a discontinuous physiological stresses varying with functional activities. Its roles are favorable to the activation of osteoblast and unfavorable to that of osteoclast. Thus the fixation promotes functional healing of bone fracture in time, speed and quality. All these show that external fixation using small splints in Chinese Mongolian osteopathy maintains equilibrium between osteoblast and osteoclast of healing taking account of entire states of fixation of bone fracture. Due to the elasticity of small splints and moderate degree of tightness of bandage, the fixation implicates obviously macroscopic criteria of functional ‘dynamic’ stability of biological fixation.\[5\][8][9]

3.5. Macroscopic characteristics and its criteria of psychological ‘dynamic’ stability for biological fixation of bone fracture

Chinese Mongolian osteopathy not only pays attention to supplementary external fixation using small splints but also cherishes and makes use of physiological and psychological self fixing instinct of patients itself. Human being has certain innate self control and self healing instinct, it may also strengthen later on. In ordinary conditions under the protection and fixation of soft tissues such as muscle tendon and skin, vivo bone undertakes various posture and movements. After bone fracture, under the physiological and psychological instructions from higher nervous system, these soft tissues still maintain certain self controlling and self healing instinct (mechanical and psychological instinct) and trend to restoration. Chinese Mongolian osteopathy may fully arouse and mobilize this self fixing instinct of human, and
maitains entire physiological and psychological equilibrium of healing. Since stochastic changes of physiological and psychological equilibrium states of human body, obviously there are macroscopic characteristics and its criteria of psychological dynamic stability in biological fixation of bone fracture.[1][2][10]

Acknowledgement

Our research was supported by the National Natural Science Foundation of China (No. 30660239) in 2006, the Natural Science Foundation of Inner Mongolia (No. 20080404MS1107), and the National Natural Science Foundation of China (No. 30960518) in 2009.

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