GMJ. 2016;5(4):165-72
www.gmj.ir

REVIEW ARTICLE

Received: 2016-06-10
Revised: 2016-07-02
Accepted: 2016-08-09

Effects of Natural Substances on Healing of Long Bone Fractures: A Narrative Review of Traditional Persian Medicine

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Abstract

Fractures, especially leg fractures, are one of the most common problems in the world, and it causes a considerable economic and social burden for patients and societies. Orthopedic surgery plays the most important role in the treatment of fractures, but it is expensive and requires anesthesia which has a variety of side effects. Besides surgery and conventional treatments, it seems that the use of natural substances as complementary therapy can be useful. In Traditional Persian Medicine (TPM) manuscripts, many diverse natural substances, especially medicinal herbs, are mentioned as useful medications for fracture healing. The aim of this study was to investigate medicinal plants and natural substances used in TPM as useful in fracture healing, by an overview of traditional knowledge as compared with new investigations. The main manuscripts of TPM, including the *Canon of Medicine*, *Tohfat-ol-Moemenin*, *Exir-e–azam* and *Makhzan-ol-advieh*, were assembled through a literature search, to select the substances used in fracture healing. Also, current evidence on related substances were studied through a search of Google Scholar and PubMed databases. In this study, eleven substances were identified and categorized into three groups: plants, animals, and minerals. The results of our study showed that the most cited substances were used due to their effects on fracture or wound healing, inflammations, and pain. This historical assessment can help in obtaining new data about natural substances for faster fracture healing, which may lead to subsequent opportunities to assess their potential medicinal use. **[GMJ. 2016;5(4):165-72]**

Keywords: Fracture Healing; Traditional Medicine; Natural.

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Introduction

Fractures especially leg fractures are one of the most common problems in the world [1]. Tibia shaft fractures are one of the main groups of leg fractures with an incidence of 17 to 21 per 100,000 in the general population, representing 2% of all bone fractures, and 36.7% of all long-bone fractures in adults [2]. Fractures with a prevalence of approximately 49% in males and 60% in females, gradually increased from younger to older ages, thereby placing a significant economic and social burden on patients and societies [1]. The expected maximum time for fracture healing is about 24 weeks, and when it exceeds this limit, it is considered as delayed union [3]. The type of treatment used for fractures is dependent on situational conditions. Common treatments for fracture healing include immobilization with plaster, functional plaster or splint, traction, external fixation, and open reduction internal fixation [4].

Orthopedic surgery plays a major role in the treatment of fractures, but it has high cost and involves anesthesia that has many side effects. It seems that the use of natural substances as complementary therapy besides surgery and conventional treatments can be useful. Despite the emergence of new drugs in contemporary medicine, the use of herbal remedies and natural substances is yet to reduce [5].

In Iran, the use of medicinal substances for fracture healing dates back to ancient times. A review of historical manuscripts in medical science authored by Persian medieval scholars revealed valuable information in the field of medicinal herbs and natural substances usage [6].

In Traditional Persian Medicine (TPM) manuscripts, many diverse natural substances, especially medicinal herbs, are mentioned as useful medications for fractures, some of which are commonly used in folk medicine around the world. Since these medications are frequently used nowadays, conducting a review so as to evaluate their effects seems to be scientifically necessary. The aim of this study was to investigate the medicinal plants and natural substances used in TPM, as useful substances in fracture healing with an overview of traditional knowledge, as compared with new investigations.

Search Strategies

In this literature study, some important Persian medical and pharmaceutical manuscripts were investigated. The manuscripts were composed of the book of *Al-Qanoon fi al-Tibb* (The *Canon of Medicine*, written by Avicenna) [7], *Eksir-e-Azam* (*Ekseere- Azam* written by Azam Khan) [8], the book of *Tohfat-ol-Moemenin* (written by Mohammad Tonkaboni) [9], and *Makhzan-ol-advieh* (Storehouse of Medicaments, written by Aghili Shirazi) [10].

The words searched in the mentioned books were: ‘‘kasr’’ (that means fracture),”jabr” (which means Orthopedic) “shekastegi” (which means fracture), “azm” (which means bone), “enjebaar” (which means union), “ezaam” (which means bones), “maksour” (which means Broken), “sad`e” (which means fracture), “ostekhan” (which means bone). The medicinal herbs and natural substances used in treating the bone fracture and accelerating the union process of broken bones were gathered. The scientific names of the reported plants were confirmed using some textbooks such as Popular Medicinal Plants of Iran (Amin, 2005) and Dictionary of Medicinal Plants (Soltani, 2004). A search was done on the reported pharmacological effects related to the mentioned medicinal herbs, using PubMed and Google Scholar databases o make a correlation between traditional data and new investigations. The searched keywords were fracture healing, antioxidant, anti-inflammatory, analgesic, antimicrobial, and wound healing.

Results

Fractures, especially leg fractures are one of the most common problems which have a huge economic burden on patients and the society [1]. Currently, different treatment methods, such as plating, casting, internal and external fixations are widely recommended [11]. A historical approach can help in detecting some viewpoints that cannot be addressed or paid attention to by a purely medical one [12]; as such, in this literature, a study review on

four main TPM manuscripts was carried out [8-10]. In this study, more than one hundred natural substances affecting union fractures were found. Depending on their origin, these substances were divided into three categories of mineral, plant and animal origin. Finally, the eleven natural substances most cited in the mentioned manuscripts were selected and listed in Table-1; eight of them are of plant origins, two have mineral origins and the other substance is of animal origin.

These eleven substances were mentioned in at least two sources of TPM, as having the ability to repair the fracture. This is why in new studies, their effects on fracture repair were not found, except for only one substance.

Discussion

Dehghan *et al*. showed that mummy is effective in fracture healing [11]. Also, all the substances except *Glossostemon bruguieri* are mentioned in TPM as effective in wound healing [7, 9]. In new investigations, this effect was studied and approved only in mummy [11-14], *Trigonella foenum* [15-18], and *Althaea officinalis* [19-22] (Table-1).

Moreover, all substances except for V*icia ervilia* had an anti-inflammatory effect in TPM [8]; while in new studies, this effect was confirmed in only six of these substances. No study was found in the new investigations of this effect of *Glossostemon bruguieri*, *Teen-ol-armani*, *Ulmus campestris* and akare [23-24].

In addition, according to the TPM sources, eight out of eleven substances had an analgesic effect. In the new studies, this effect was investigated and confirmed in six of these eleven substances. However, no study of this effect was found on Glossostemon bruguieri and akare.

In TPM sources, *Commiphora myrrha* has analgesic, anti-inflammatory, and wound healing effects and is also effective in fracture healing, growing, and healing of muscles [9].

In new studies, no effects on fracture and wound healing were observed. On the other hand, anti-microbial and anti-oxidant effects which can prevent bone and wound infection and reduce recovery time were also mentioned in the new studies [13].

In new investigations, the wound healing, analgesic, anti-inflammatory, antibacterial, and antioxidant effects of *Commiphora myrrha* [25-28], *Althaea officinalis* [19-22] and *Trigonella foenum* [15-18] were confirmed; in addition to the first three effects in TPM resources, the effect on fracture repair was also mentioned [7], but no studies on this effect were found in the new surveys. Perhaps, their anti-oxidant and anti-inflammatory effects can assist in fracture repair.

In TPM sources, *Pistacia lentiscus* and *Myrtus communis* have analgesic and anti-inflammatory effects and are effective in wound and fracture healing [9]. These effects were examined and approved in the new studies, except for wound and fracture healing [29-34]; but the antibacterial and antioxidant effects mentioned had an indirect influence on fracture and wound healing [13].

The only substance whose wound and fracture healing effects (in addition to its anti-inflammatory and antioxidant effects) were examined and approved in the new sources is mummy [11, 14]. Mummy is a mineral substance which, in other countries, is known by other names, in particular, shilajit.

It is a black or brown nearly solid material like pitch, secreted in fractures and cracks in the Earth's outer layers and found in the cracks of cave walls [11, 35].

Ulmus campestris (elm) is also effective in wound and fracture healing in TPM sources [8], but has not been investigated in new studies. In our search through new investigations, only the antioxidant and antimicrobial effects have been approved; this can be an introduction to the effects of wound and fracture healing [23, 24].

The remaining four substances for fracture healing in TPM sources include "*Teen-ol-armani*," "akare" (some animals` feet), *Vicia ervilia* and *Glossostemon bruguieri*. The first substance has a mineral origin; the second an animal origin, while the third and fourth substances are of vegetable origins. In new previous studies, with the keywords above, no studies about fracture, wound healing and other effects were found; while in the TPM resources, all of them were rated as effective

Table 1. Natural Substances That Were Most Cited in TPM Sources

Persian name	Scientific name	English name	Useful effects in current investigations	Useful effects in TPM in bone fracture	Pharmaceutical form in market
Mummy		Mineral pitch Asphaltum Shilajit	Healing of bone fractures Analgesic [11] Anti-inflammatory [12] Antioxidant [13] Wound healing [14]	Fracture healing Anti-inflammatory Wound healing [7, 8, 9, 10] Analgesic [7, 8, 10]	Shilajit Capsule (Planet Ayurveda Co.)
Holbeh	*Trigonella Foenum*	Fenugreek	Analgesic [15] Anti-inflammatory [15] Antioxidant [16] Wound healing [17] Antimicrobial [18]	Fracture healing [10] Analgesic [9, 10] Anti-inflammatory [9, 10]	Phytophage Tablet (Irandarouk Co.)
Khatmi	*Althaea officinalis*	Marsh-mallow Marsh mallow Common marshmallow Hollyhock	Antibacterial [19] wound healing [19] antioxidant [20] Anti-inflammatory [21] Analgesic [22]	Anti-inflammatory Analgesic wound healing [9, 10] Fracture healing [8, 9, 10]	Altadin Chewable Tablet (Dineh Co.)
Narvan Dirdar	*Ulmus campestris* *Ulmus minor*	Elm	Antioxidant [23] Antimicrobial [24]	Fracture healing Wound healing [8, 9, 10]	Ulmus campestris Syrup (Herbal Gem Co.)
Murr	*Commiphora myrrha*	Myrrh African myrrh Herabol myrrh Somali myrrhor, Common myrrh gum myrrh	Analgesic [26] Anti-inflammatory [26] Antimicrobial [27] Antioxidant [28] Useful in muscular and vascular injuries [29]	Anti-inflammatory Analgesic Useful in muscular injuries [10] Adhesive It heals the ulcers and facilitates growth of flesh on bones [7] Germination muscle on the bone [9] Fracture healing [8, 10]	Myrrh Tincture (Hawaiipharm Co.)

Continus in next page

Continus of **Table 1.** Natural Substances That Were Most Cited in TPM Sources

Mastaki	*Pistacia lentiscus*	Mastic	Antimicrobial [29] Antioxidant [29] Anti-inflammatory [30] Anti-nociceptive [31]	Fracture healing Anti-inflammatory Analgesic Wound healing [7, 10] Fracture healing Analgesic Germination muscle on the bone [9]	Mastic Gum (Wildcrafted Co.)
Aas	*Myrtus communis*	Myrtle	Antioxidant [32] Antimicrobial [33] Anti-nociceptive [34] Anti-inflammatory [34]	Analgesic [10] Anti-inflammatory wound healing Fracture healing [7, 8, 10]	Myrtoplex Cream (Daroo Pakhsh Co.)
Karsannah	*Vicia ervilia*	Ervil Bitter vetch		cleansing ulcers softening the hardness of ulcers [7] Fracture healing [8, 9, 10] Blood absorbent Deep wound healing [9, 10]	Vicia ervilia (Aniara Co.)
Teen-ol-armani (Gele-armani)		Red armenian bole Bolus armenia rubra		Anti-inflammatory [9, 10] Fracture healing [8, 10] Wound healing [7, 10]	-
Mughath	*Glossostemon bruguieri*	Moghath		Fracture healing, treatment of muscular strain, dislocation [7] Fracture healing [7, 8, 9, 10] Analgesic [9, 10] Anti-inflammatory [10]	-
Akare				Fracture healing Wound healing Analgesic [9, 10] Anti-inflammatory [10]	

in fracture healing.

Three substances had wound healing effect, three substances with an anti-inflammatory effect, two cases with analgesic effect and one case had wound cleansing and blood absorbent effects [10].

The first substance is "*Teen-ol-armani*" or "*Gele-armani*" (that means Armenian mud). It is a mineral substance to which no scientific name was found in the new sources, but in the *Canon*, it was mentioned as red Armenian bole or *Bolus Armenia Rubra* [7]. The therapeutic effect of this substance in improving or accelerating the fracture process, alone or in combination with other substances has frequently been mentioned. Also, wound healing and anti-inflammatory effects were listed for it; however, no sources regarding this substance were found. There is the need to carry out research on this substance and its properties.

The second substance is "akare"; that is the foot of some animals (such as sheep, cow, and goat). The best kind is sheep`s foot. "Akare" has been traditionally used as food in many parts of Iran and many other countries such as Afghanistan, Pakistan and India (alone or as a part of a dish named "*Kalleh-Pacheh*"). Also, it has therapeutic effects and has been widely used in folk medicine for the healing of fractures, since more than a thousand years ago. Moreover, in TPM resources, other effects like wound healing, as well as the analgesic and anti-inflammatory effects of this substance have been mentioned [9]; however, no new research study was found to have carried out any investigation on them.

The third and fourth items are *Vicia ervilia* and *Glossostemon bruguieri* for which many properties (such as blood absorption, therapeutic effects on deep wound healing, fracture healing, dislocation and muscular strain) are listed in TPM resources [8]. In new studies with the aforementioned keywords (fracture healing antioxidant, anti-inflammatory, analgesic, antimicrobial and wound healing) no study was found on the therapeutic effects of these plants.

Conclusion

Outstanding philosophers and scientists found amongst Iranian scholars have logically worked based on the observations made and assessed considerable discoveries in many fields of science and through randomized controlled trials [36-38]; as such, this study gives us an intuition into the past ideas and can be valuable in new data finding in herbal medicine, so as to accelerate fracture treatment. This can enhance future investigation of their possible medicinal uses and may also lead to subsequent opportunities in assessing their potential medicinal use and if useful, would be a step to reducing the number of procedures and another step to prevent fracture complications, recovery of patients to normal condition (which are mainly young and active), lower costs, and use of natural and indigenous products for the treatment of diseases.

Acknowledgements

This manuscript was derived from an ongoing Ph.D. thesis, at the School of Traditional Medicine, Shahid Beheshti University of Medical Sciences.

Conflict of Interest

The authors have no conflict of interest.

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