Dietary Recommendations in Fracture Healing in Traditional Persian Medicine: A Historical Review of Literature

Seyed Mohammad Hosseini Kasnavieh, MD, PhD1, Seyed Mohammad Hasan Sadeghi, MSc2, Seyed Mehdi Hosseini Khameneh, MD, PhD2, Mahmod Khodadaost, MD, PhD2, Azam Bazrafshan, MSc3, Mohammad Kamalinejad, PharmD2, Amir Mohammad Jaladat, MD, PhD4, Shirin Jafari, MSc2, Mohammad Reza Yasinzadeh, MD, PhD5, and Latif Gachkar, MD, PhD2

Abstract

Background. Fracture repair is a complex process. An inappropriate diet is a contributing risk factor for fracture nonunion. The aim of this study was to extract dietary recommendations for fracture healing according to traditional Persian medicine (TPM) literature. Method. The contents relevant to diets in fracture healing were selected from main textbooks in TPM like Al Qanon fi Al-teb (The Canon). Other reference textbooks in traditional medicine were also used for a comprehensive study in this respect. Finally content analysis was used for summarizing and describing the results. Findings. Food stuffs are classified in TPM according to their nutritive value, their assimilability, and the quality of achieved chyme. Some light meals like chicken soup are recommended for the early days of fracture and high-nutrient and dense foods such as goat’s or sheep’s head and nuts are advised in following days for fracture healing acceleration and callus formation. Several recommendations are also provided for pacing the healing process. Conclusion. A comparison of Avicenna and other Persian sage’s recommended regimens with the recent evidence revealed the potential positive effects of their regimen for bone healing acceleration. It can shed light on a part of history of orthopedics and add to current knowledge about bone fracture and its management.

Keywords
dietary recommendations, fracture healing, traditional Persian medicine

Received October 27, 2015. Received revised October 4, 2016. Accepted for publication November 21, 2016.

Fracture repair is a complex process. Approximately 10% of fracture patients eventually experience impaired healing, which causes a severe public health problem and results in huge social burden.1 Delayed or nonunion fractures are among complications, with complex and expensive treatment and socioeconomic burden occurring in about 5% to 10% of all fractures. Several risk factors contribute to the development of nonunion fractures. An inappropriate diet has been found as a contributing risk factor of nonunion fracture.2 However, studies examining dietary patterns and bone healing remain very limited, and more studies are needed in this area.

Avicenna (AD 980-1037) was the most famous Persian philosopher and physician whose points of view in various fields of medicine such as traumatic and orthopedic injuries are still cited in scientific articles.3-6 According to Avicenna, diet modification is one of the cornerstones of treatment.7 According to Avicenna and Rhazes (865-925 AD), great physicians of traditional Persian

1 Iran University of Medical Sciences, Tehran, Iran
2 Shahid Beheshti University of Medical Sciences, Tehran, Iran
3 Kerman University of Medical Sciences, Kerman, Iran
4 Shiraz University of Medical Sciences, Shiraz, Iran
5 7thTir Hospital, Iran University of Medical Sciences, Tehran, Iran

Corresponding Author:
Mohammad Reza Yasinzadeh, MD, PhD, Injury Control Research Center, 7thTir Hospital, Iran University of Medical Sciences, Tehran, Iran. Email: dryasin82@yahoo.com

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medicine (TPM), nutrition and food therapy has an important role in health preservation and treatment of illnesses.5,9 Persian physicians believed that “most illnesses arise solely from long-continued errors of diet and regimen”; they paid significant attention on food and diet in their therapeutic regimens. Despite recent developments in novel therapies for fracture, there is still a need for more effective treatments. It is hoped that the review of clinical approaches to nonunion fractures used by Persian practitioners will inform further research into the clinical benefits of those treatments for nonunion fractures.

In an attempt to address these challenges, this article has been developed to discuss Avicenna’s points of view about fracture healing acceleration through diet modifications. It also has tried to find a connection between Avicenna viewpoints in fracture healing recommendations and modern treatments.

**Methods**

*Qanoon-fel-teb* (The *Canon of Medicine*) and several reference textbooks from Persian practitioners in traditional medicine10-16 were selected to extract relevant dietary recommendations in fracture healing. Alongside the *Canon of Medicine*, we reviewed the chapter of fracture healing from other famous text books of TPM including *Manfe’ alaghzie va mazareha* (Benefits of Food and Its Harmfulness) written by Rhazes (9-10th century), *zakhireh khazarshahi* from Sayyed Esmaiel Jorjani (11-12th century), *sharh-ol-asbab va Alamat* (The Causes and Symptoms) from Nafis ibn Avaz Kermani (15th century), *Tibb al-Akbar* (Akbar’s Medicine) from Muhammad Arzani (18th century), and *Exir-e-Azam* from Nazim Jahan (19th century); we also gathered the comments of Aghili Khorasani shirazi (18th century), and other Persian practitioners mentioned drinking of unripe grapes or verjuice syrup (sharab al-husroum in Arabic) as an astringent drink. According to the Avicenna recipe, this is made of wheat flour, rice, beef’s fat, and milk.18 It is a slow-cooked food with a paste-like consistency. Because of the long time and effort required to prepare it, that is known as *Haleem*, which means “patience” in Arabic.20

**Results**

**Food Definition and Classification Based on the Teaching of Avicenna**

Food stuffs are classified in TPM literature according to their nutritive values, as well as their assimilability and the quality of achieved chyme. Some foods produce thinner blood and some foods cause thicker blood. Dense foods (listed below) can make blood viscous; in contrast, a soft diet regimen and bloodletting can induce blood dilution.17

In the concept of Avicenna when fracture occurs, 2 stages for patient’s nutrition are considered. The first stage is until 4 to 5 days after fracture onset. Here blood dilution and food restriction and taking foods like chicken soup is recommended.3,12 But in the following days until complete healing for callus (Doshboz in TPM) formation and fracture healing acceleration, a high-nutrient food regimen with sheep head and feet are required.18

**Recommended Foods and Foods to be Avoided During Fracture Healing Period**

For callus formation and fracture healing acceleration, high-nutrient and dense food regimen are recommended, including the following:

1. **Head, feet (trotters), stomach (tripe), and skin of goat or sheep.** This is a traditional nutritious food known as *Kale Pache* in Iran. Similar dishes can also be found in other countries, for example, in Norway known as *Smulahove* (means head of sheep) and in Armenia known as *Khash* (made of cow’s head and feet). Today it is considered a festive winter meal, but in medieval days, medicinal healing properties was also conceived for it.19 Rhazes in his specific book on food and diet says that long-term consumption of sheep’s feet (*Pache*) is very beneficial for bone healing, but it may cause constipation and should be taken with vinegar and asafoetida (gum oleoresin; *Ferula asafoetida* Linn.).16

2. **Harisah (Haleem).** Harisah (also written as Harees, Hareesa) is another thick nutrient-rich traditional Persian dish that is popular in Middle East, Central Asia, and Indian Subcontinent with some variation across regions. According to the Avicenna recipe, this is made of wheat flour, rice, beef’s fat, and milk.18 It is a slow-cooked food with a paste-like consistency. Because of the long time and effort required to prepare it, that is named *Haleem*, which means “patience” in Arabic.

3. **Kaak.** A dry toasted bread that can be crushed and powdered. This type of bread can cause dryness and constipation.11 It has been considered among thick blood producer foods that can repair fracture.14

4. **Nuts.** Nuts like chestnuts and those that are not spicy are also recommended.18

5. **Eggs.** Some Persian practitioners believed that the egg10 and yolk of egg12 are useful for fracture healing.

6. **Thickened astringent drinks.** According to the *Canon of Medicine*, those substances that can create density in the parts and state of an organ and close its channels are astringent agents, and regularly concentrated drinks with astringent taste have this property. Avicenna has mentioned drinking of unripe grapes or verjuice syrup (sharab al-husroum in Arabic) as an astringent drink useful for fracture healing.18 This recommendation was not observed in the other reviewed sources.

**Discussion**

The high prevalence of fracture shows the importance of proper treatment to decrease the recovery period. It is now clear that the healing process for bone fractures is sensitive to blood supply at the fracture site,21 and the role of food supplements like milk in fracture healing enhancement has been shown in an animal study.22 To date the importance of adequate calcium and vitamin D intakes on bone health is emphasized.23,24
Besides, adequate dietary protein intake is among the required life style modifications in osteoporosis prevention and nutritional approaches to healing fractures.25-27

In the TPM regimen, existence of valuable micronutrients such as calcium and high nutrient value of nuts and recommended milk in the cooking of Harisah is highly emphasized.28,29 A food like harisah, which supplies meat plus milk, can retain substantial amounts of calcium and phosphorus.30

Adequate protein is essential to provide the collagen and optimum levels of bone synthetic enzymes; also they are required for supplying micronutrients, such as zinc, and for stimulating the production of endogenous growth factors that are principle to bone formation.31 A low-protein diet can induce secondary hyperparathyroidism, which could be detrimental to skeletal health.32

An interesting point in the Avicenna recommendation is using gelatin in a high-protein diet like sheep’s head and feet (kale pache). Gelatin plays an important role as shown in recent studies of bone metabolism.33,34 It has been shown that ingestion of gelatin has more favorable effects on bone mineral density than milk casein in protein undernourished mice.35 In human blood, food-derived collagen peptides have been identified after ingestion of gelatin hydrolysates from porcine skin, chicken feet, and cartilage.36 It has been identified that different sources of gelatin hydrolysates can cause different quantity and structure of hype-containing peptides in human blood. Besides, fish foods are found to be better sources than porcine skin in this regard.37

In the Avicenna regimen, other than nutrient supplementation, therapeutic role of nutraceuticals, food texture, and its assimilability have also been considered.

Texture-modified foods and thickened fluid prescribing is another key point in Avicenna diet that today is considered in the treatment of some disorders like dysphagia.38-40 Concentration can influence the levels of amines, proline, and the physicochemical characteristics of juices. Concentrated juices like orange juice, which is a recommended fluid for fracture cases,27 have varied pH and more acidity.41

A diet high in acid-ash proteins due to acidogenic content causes removal of calcium from the bones,42 but long-term human studies have shown that large amounts of dietary proteins do not necessarily lead to calcium loss43 and is not associated with osteoporotic bone disease because of body compensatory systems and increased absorption of calcium via the gastrointestinal system.44 Elevated calcium has a stimulating effect on osteoblasts that may reduce the time needed for a fracture to heal.45

Albeit this buffering action of bone cannot be continued over several decades and that is why in the practical advices excessive protein intakes has been considered to be harmful for bone health.31

The healing process requires a great deal of energy, but high-protein diet and energy-dense foods are associated with various diseases. In addition, thickened diet in this regimen can be accompanied with changes in patient hydration status and may increase the risk of dehydration.46 So long-term use of this regimen influences the patient’s healthy longevity.37-39 Avicenna also noted this fact and stated: "We should (also) take care to avoid foods of solid texture, since we know the fact that these give rise to obstructions (in the ducts and tissue channels as well as in the intestines)."50

Conclusion

These results show the potential positive effects of Avicenna and other Persian sage’s regimen for bone healing acceleration. Although no evidence is found for some of these suggestions, further investigation is required to evaluate TPM suggestions in treating and managing fracture.

Authors’ Note

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

Author Contributions

Seyed Mohammad Hosseini Kasnavieh and Seyed Mohammad Hasan Sadeghi: Substantial contributions to the conception or design of the work, reviewing the literature, and drafting the manuscript. Amir Mohammad Jaladat and Shirin Jafari: Drafting the work and revising it critically for important intellectual content. Mahmood Khodadoost, Seyed Mehtdi Hosseini Khameneh, Mohammad Kamalinejad, and Azam Bazrafshan: Drafting the manuscript and final approval of the version to be published. Latif Gachkar and Mohammad Reza Yasin-zadeh: Agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by the School of Traditional Medicine, Traditional Medicine and Materia Medica Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Ethical Approval

No ethical approval was required as this is a review article.

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