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Insights into Avicenna's knowledge of the science of orthopedics

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Abstract

The art of orthopedics traces its history back to ancient civilizations like those of the Egyptians. The evolution of this branch of medicine is indebted to investigations of many scientists, including Greek, Roman and Persian scholars. The Persian physician Avicenna (980-1037 AD) is one such scientist who investigated different aspects of orthopedics. It is possible to analyze Avicenna's knowledge of orthopedics and his contributions to this branch of medicine by an examination of his epic encyclopedia of medicine, *Al-Qanun fi al-Tibb* (*The Canon of Medicine*).

Key words: Avicenna; Bone fractures; Canon; History of medicine; Persia

Core tip: The Persian scientist Avicenna investigated facets of orthopedics such as bone fractures and dislocations and ways of diagnosing and managing them. He contributed cutting-edge ideas relative to his era; among them, an early description of compartment syndrome and distinguishing between nerves and tendons.

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TO THE EDITOR

"*Ibn Sina*" (980-1037 AD), commonly known as "*Avicenna*" in the west, was a renowned Persian physician who lived in the midst of the *Golden Age of Islamic Medicine* (9th-12th centuries AD). His full name was "*Abu Ali al-Hussain ibn Abdullah ibn Sina*"[1,2]. His contributions to various aspects of science influenced not only Persian medicine, but also medical sciences in Europe[3]. Avicenna's prominent medical compendium was entitled *Al-Qanun-fi-al-Tibb* (*The Canon* (*or Law*) *of Medicine*) (Figure 1)[4]. The Canon of Medicine was the standard textbook of medical education in the West until the 16th century[5]. It could be said that The Canon is the most influential medical compendium ever written[1].

The Canon is composed of five volumes[6]. Bone fractures and dislocations are the main topics of focus in the fourth volume in the chapter entitled *Al-Jabr* ("orthopedics" in modern nomenclature). This chapter is divided into three parts. In the first part, Avicenna initially generally describes *Al-Khala* (bone dislocation) and then specifically discusses ways to diagnose and manage bone dislocations in fifteen bones of the upper and lower extremities[7].

The next two parts are devoted to bone fractures. The

Figure 1 Opening of the forth book of canon (probably, belonging to the beginning of 15th century, Iran). (Courtesy United States National Library of Medicine).

second is entitled *Fil Kasr Kalam-e Kolli fil Kasr* (Bone Fractures as a Whole) and focuses on the diagnosis and treatment of bone fractures in general. Avicenna discusses the types of manipulation to reduce fractures and classifies the types of fracture. For instance, he describes a fracture in which the bone breaks into several parts ("comminuted fracture" in current terminology). He distinguishes between open and closed fractures and considers different modes of management for them. Avicenna advocated the use of tools such as a drill and different types of saws to manage bone fractures[7].

The third subdivision is entitled *Fi Kasr Ozv Ozv* (Fracture in Each Part of the Body) and describes nineteen types of bone fracture[7].

In addition to bone fractures and dislocations, Avicenna used his knowledge of human anatomy to study tendon injury and repair. In his opinion, tendons differed from nerves. In contrast to his predecessors, apparently for the first time in the history of medicine, Avicenna recommended suturing of tendon lacerations to treat tendon tears. He also was a pioneer in peripheral nerve repair[7-9].

Some of Avicenna's views on the management of bone fractures are remarkable and can be regarded as early descriptions of current medical knowledge. One example is his description of fixation of the extremities for bone fractures. Avicenna strongly proscribed the use of tight bandaging, which was a common practice of the day. He explained that a tight bandage obstructs the blood supply to the extremity, which results in severe pain at rest and the eventual loss of viability of the extremity, leading to amputation. This description is an early explanation of compartment syndrome (a condition that involves an increased pressure in a confined anatomical space and adversely affects blood circulation) eight centuries before the work of *Richard von Volkmann* (1830-1889) who explained compartment syndrome in 1881[7,10,11].

Taken as a whole, Avicenna's discourses on bone fractures, dislocations and related issues establish his knowledge and contributions to the advancement of the science of orthopedics.

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