Araştırma Makalesi – Original Article

Content Analysis on Sports Medicine Practices of the Sections in the "Manual Treatment of Diseases" of Haly Abbas's Kāmil al-Ṣināʿa al-Ṭibbiyya*

ʿAlī b. el-ʿAbbās el-Mecūsī'nin Kāmilu'ṣ-Ṣınāʿati'ṭ-Ṭıbbiyye Adlı Eserinin "Hastalıkların El ile Tedavisi" Bölümünde Spor Hekimliği Uygulamalarına Yönelik Kısımların İçerik Analizi

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ABSTRACT

Background: This research aims to examine the current validity and usage of the information on 'fractures', 'dislocations' and 'sprains' written by Haly Abbas in the medical encyclopedia named *Kāmil al-Ṣināʿa al-Ṭibbiyya*.

Methods: In this qualitative study, the 9th article of the 2nd volume of the encyclopedic medicine book *Kāmil al-Ṣināʿa al-Ṭibbiyya*, called "Manual Treatment of Diseases" was used. The related article examined sections including fractures, dislocations, and sprains. The information given by Haly Abbas in the relevant sections was analyzed as content and compared with today's literature.

Results: Issues related to fractures, dislocations, and sprains, were identified between sections 82-111 of the 9th article (Manual Treatment of Diseases) of the 2nd volume of *Kāmil al-Ṣināʿa al-Ṭibbiyya*. These topics in the related article are categorized under three main headings in separate titles. The comparison of Haly Abbas's treatment algorithm and recovery durations with today is summarized in tables.

Conclusion: Many of the explanations and information about fractures, dislocations, and sprains in *Kāmil al-Ṣināʿa al-Ṭibbiyya*, written by Haly Abbas in the 10th century, were compatible with his predecessors, shed light on the scientists who grew up after him, and was found to be similar to the treatment methods used today with more advanced facilities.

Keywords: Haly Abbas, The Perfect Book of the Art of Medicine, Fracture, Dislocation, Sprain, The Royal Book.

ÖZ

Amaç: Bu araştırma, ʿAlī b. el-ʿAbbās el-Mecūsī'nin Kāmilu'ṣ-Ṣınāʿati'ṭ-Ṭıbbiyye adlı tıp ansiklopedisinde yazdığı 'kırık', 'çıkık' ve 'burkulma' ile ilgili bilgilerin güncel geçerliliğini ve kullanımını incelemeyi amaçlamaktadır.

Yöntem: Bu nitel çalışmada Kāmilu'ṣ-Ṣınāʿati'ṭ-Ṭıbbiyye adlı ansiklopedik tıp kitabının 2. cildinin "Hastalıkların El ile Tedavisi" başlıklı 9. maddesi kullanıldı. İlgili makalede kırık, çıkık ve burkulmaları içeren bölümleri bulundu. ʿAlī b. el-ʿAbbās el-Mecūsī'nin ilgili bölümlerde verdiği bilgiler içerik olarak incelenmiş ve günümüz literatürü ile karşılaştırılmıştır.

Bulgular: Kāmilu'ṣ-Ṣınāʿati'ṭ-Ṭıbbiyye'nin 2. cildinin 9. maddesinin (Hastalıkların El ile Tedavisi) 82-111. bölümleri arasında kırık, çıkık ve burkulma ile ilgili konular tespit edilmiştir. İlgili yazıda yer alan bu konular ayrı başlıklar altında üç ana başlık altında toplanmıştır. ʿAlī b. el-ʿAbbās el-Mecūsī'nin tedavi algoritması ile tedavi sürelerinin günümüzle karşılaştırması tablo şeklinde özetlenmiştir.

Sonuç: ʿAlī b. el-ʿAbbās el-Mecūsī'nin 10. yüzyılda kaleme aldığı Kāmilu'ṣ-Ṣınāʿati'ṭ-Ṭıbbiyye'de yer alan kırık, çıkık ve burkulmalara ilişkin açıklama ve bilgilerin birçoğu selefleriyle uyumlu olup, kendisinden sonra yetişen bilim adamlarına ışık tuttu ve günümüzde daha gelişmiş imkanlarla kullanılan tedavi yöntemlerine benzediği tespit edilmiştir.

Anahtar Kelimeler: ʿAlī b. el-ʿAbbās el-Mecūsī, Kāmilu'ṣ-Ṣınāʿati'ṭ-Ṭıbbiyye, Kırık, Çıkık, Burkulma, Kitābu'l-Melikī.

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Introduction

Kāmil al-Ṣināʿa al-Ṭibbiyya (*The Perfect Book of the Art of Medicine*), also known as *The Royal Book*, which has been used in the education of medical students from the past to the present, was written by Haly Abbas.[1–3] Haly Abbas, especially with this book, became one of the representatives of Islamic medicine and surgery in the 10th century and pioneered many physicians who grew up after him, such as Avicenna.[1–5]

It is thought that Haly Abbas wrote *Kāmil al-Ṣināʿa al-Ṭibbiyya* in Arabic, dedicated to ʿAḍūdu'd-davla al-Būwayhī, one of the Buwayhid rulers, while he was a palace physician and probably working in Baghdad. *Kāmil al-Ṣināʿa al-Ṭibbiyya* was first translated into Latin by the African Constantine (~1015-1087), without mentioning the name of Haly Abbas, and was introduced to the West under the name Pantechne (Liber Pantegni).[1–5] This translation, taught as a textbook at the Salerno Medical School, was later published in the Constantini Africani Operum Reliquia.[1,4-6] The entire book was translated into Latin for the second time in 1127 by Stephanus of Pisa (Antakya), mentioning the name of Haly Abbas, and was published in Venice in 1492 and Lyon in 1523.[2,7] Haly Abbas examined the books of many physicians such as Hippocrates, Galenus, Paulus, Ḥunayn b. Ishaq, and Rhazes, referred to them in the introduction to the book and touched on their deficiencies, and he stated that he produced a more practical and perfect book.[4,8] There are translations in different languages and Turkish for several articles of this encyclopedic book consisting of twenty articles.[5,8,9] The 9th article (Manual Treatment of Diseases) of the 2nd volume of *Kāmil al-Ṣināʿa al-Ṭibbiyya* was translated into Turkish by Ph.D. Ozgur Kus and was studied as a doctoral thesis by comparing different manuscripts.[7] These manuscripts are copies of Būlāq/Cairo Printing House, Istanbul University Rare Works Library, Yale University, and Istanbul Suleymaniye Manuscript Library (Murad Molla Collection).[10-12] It was seen that there are also sections on treatment applications used in sports medicine in this translated part of the book.

Musculoskeletal injuries cause a substantial societal burden worldwide in the form of increased costs for treatment, disability, presenteeism/absenteeism, and deterioration in the quality of life. Fractures, dislocations, and sprains are common health problems that concern all age groups.[11–13] Sprains constitute almost half of all problems, especially in sports medicine. Approximately 70% of the population will have at least one ankle injury in their lifetime.[12] In our study, in which we examined Avicenna's view of exercise, it was revealed that many common parts are compatible with today's.[14] Although the development of technology provides continuous innovations and conveniences in terms of diagnosis and treatment in the field of medicine, past knowledge on fractures, dislocations and sprains may be used today, similar to exercise.

The purpose of this qualitative research is to examine the current validity and use of the information on 'fractures', 'dislocations', and 'sprains' written by Haly Abbas in the medical encyclopedia named *Kāmil al-Ṣināʿa al-Ṭibbiyya.*

Methods

In this qualitative study, the 9th article (Manual Treatment of Diseases) of the 2nd volume of the encyclopedic medicine book *Kāmil al-Ṣināʿa al-Ṭibbiyya*, which was translated into Turkish by Ph.D. Ozgur Kus and studied as a doctoral thesis, was used. The related article examined sections including 'fractures', 'dislocations', and 'sprains'.

Haly Abbas's comments on these issues have been intensely studied, analyzed, and interpreted by academics who are experts in the field of sports medicine. Its validity and use were evaluated by comparing it with today's literature.

Due to its scope, the research does not require ethics committee approval.

Results

Issues related to fractures, dislocations, and sprains, were identified between sections 82-111 of the 9th article (Manual Treatment of Diseases) of the 2nd volume of *Kāmil al-Ṣinā'a al-Ṭibbiyya*. These issues are categorized under three main headings; 1. General principle recommendations, 2. Recovery times in treatment, and 3. Complications.

1. General principle recommendations on 'fractures', 'dislocations' and 'sprains'

Haly Abbas recommended a general treatment algorithm first to treat the fractured bone and reduce the dislocated joint and precautionary methods for the patients. The treatment algorithm described in this book is summarized in Table 1 (*Table 1*). Haly Abbas said about fractures, dislocations, sprains, and weakness that *"the first thing to know is the treatment of a single fracture, then the treatment of multiple fractures with swelling or an injury, and then the correction of the lump, stiffness or curvature that occurs during the treatment of the bone."*

1a. Fractures

In his book of the related sections, Haly Abbas explained the foods used at the beginning of the treatment, bandaging, splint application, how to position the fracture ends, and how to maneuver the fracture/dislocation, in detail, according to the bone-specific and location of the fracture on the bone and also explained the complications that may occur during fracture treatment and their treatment, and even referred to malpractice by reporting that the non-union was due to the lack of knowledge of the bonesetter or that the patient moved the extremity before the bone solidified. The procedure that we can call surgery of that period is performed in fragmented bone fractures; by splitting the limb, the fracture or the piece that has sunk into the flesh is brought out, and another procedure is applied when other methods are insufficient to break the bone and restore it to its original state in incorrectly fused fractures, the limb is split, and the callus tissue is cleaned.[7]

Haly Abbas stated that the broken bone should be corrected and returned to its original shape in nasal fractures. He suggested that if the fracture is within the finger's reach, the little fingers are inserted into both nostrils of the nose, and if it is out of reach, the fractures are corrected with the help of a thick spindle and then stated that suppositories should be placed inside the nose and dressing should be done outside. He gave information about the healing time by stating that the fracture would heal with a few days of application in nasal fractures. Commenting on the conditions encountered during the treatment and the healing period, he suggested that when shortness of breath occurs, the drug-coated glands should be wrapped over the feather tubes and placed in the nose and warned that a flat nose would develop if the bone was not corrected in the presence of a split fracture and stated that when the nose is broken on one side, it is necessary to press it to pull it to the other side and talked about the treatment that can be done in this regard. According to Haly Abbas, in such a case, the nose should be attached to the trapezoidal side with good fish glue using thick tape and left until it dries. Then, the tape should be pulled to the opposite direction of the trapezoidal side, the nose should be covered with *cebir* drug, and the band should be tied by stretching towards the area where it will be flattened when it is tied.[7]

Haly Abbas stated that splints should not be placed on the shoulder or elbow joint in the section of arm fractures; when they are put in, they will damage the joint and nerve and cause swelling and also warned physicians that it is necessary to leave the splints and bandages until the third day, then dissolves and dress, and then apply the splint/bandage again.[7]

Regarding forearm fractures, Haly Abbas said that two bones in the forearm could be broken together or just one of them alone and stated that their treatment would be more complex and more complicated when two bones are broken, especially in a single area and described the treatment of a single bone fracture as more effortless. However, he reported that 'healing is slower in a radius fracture, while that of an ulnar bone fracture is faster'.[7] Similarly, he stated that the healing of fractures that break off by separating the clavicula would be faster than fractures that are not displaced.[7]

Haly Abbas divided the hand fractures into those in the thumb and wrist and those in the other fingers and recommended wrapping the thumb and wrist fracture with the palm and wrapping the other finger fractures together with the fingers next to it to fix the fractures and stated that there was no need for a splint.[7]

Haly Abbas described lower extremity fractures similarly to the upper extremity. "*Placing a broken leg bone is like placing a forearm bone. The fracture to which the leg bone is exposed is the same as that for which the forearm bone is exposed." "If the fracture follows the knee, you must bring the bandage up to the thigh. If it is following the heel, you must bring the bandage to the foot. In placing this bone, you use a precaution as mentioned in the section on the placement of the forearm bone".*[7]

1b. Dislocations

Haly Abbas defined dislocation as the separation of the joint. Haly Abbas summarized the reduction process in case of dislocation as *"…a gentle and straight pulling off each of the two dislocated limbs in its direction, and then passing the prominence of one of the two bones into the groove of the other*". Afterward, he stated that the limbs should be equalized, bandages covered with medication should be put on, and the limb should be wrapped with bandages. Further and detailed explanations are also discussed in separate chapters from head to toe.[7]

Haly Abbas stated that the clavicula is not dislocated from the inside, and if it comes out with a severe blow, it should be treated like a fracture. On the other side of the clavicula, mostly dislocation cannot happen and commented, "*If it comes off due to wrestling or any other reason, it is put back in place and corrected with bandages and heavily folded compresses."*.[7]

While describing the shoulder dislocation, Haly Abbas said, *"The head of the shoulder does not dislocate upper direction, dislocate inward and outward very few, but mostly down". "Especially those who have little meat (skinny) get out quickly, while those who have a lot of meat (fat) will have the opposite. So, it is difficult for reduction and difficult to dislocate."* He also explained the difference in the inspection of shoulder dislocation as follows; *"When the shoulder dislocates, the head of the shoulder bone appears hollow. The shoulder tip looks sharper than the natural shoulder tip. The head of this protruding arm is visible under the armpit."* He describes Hippocrates' method of treating dislocation; *"The dislocation is seated when the physician holds the patient's hand and lifts the joint with the middle finger of the joint bone. If it has recently occurred, this dislocation can be seated in a child or a young person."* Haly Abbas states that the shoulder can easily be seated at the time of dislocation or one or two days after the dislocation by conveying his experiences and also describes two different maneuvers for more substantial and more severe dislocations in his book.[7] In addition, the arm bone remains short and cannot complete its development for the shoulder dislocations that occur during birth, and the disease is called the weasel arm.[7]

While describing knee dislocations, Haly Abbas said that the knee joint would be exposed to dislocation in three directions. *"The first goes inward, the second goes outward, and the third goes back. It does not go forward because the kneecap prevents it from going in this direction."* He explained stretching as the treatment. Stretching was done sometimes by hand only, sometimes with bandages as required. After the

joint returned to its place and wrapped with appropriate bandages. He suggested that this limb was left tied for days.[7]

1c. Sprains

Haly Abbas called the pain in the bone/limb due to a fall or a blow without separation in the bone extension as “weakness” and described “sprain” as a force for the dislocation of the joint.[7]

2. Recovery Duration in Treatment

The union durations (days) of most fractures and dislocations are given in the book. The comparison of these periods as those given by Haly Abbas[7] and those accepted today[15] is given in Table 2 (*Table 2*).

3. Complications

3a. Complications due to bandaging and casting

Haly Abbas has listed the points to be considered during bandaging and casting as follows: He states that the bandage should not be tight on the fractured edges and loose on the fracture in the treatment of single fractures; otherwise, blood will accumulate in the fracture area, therefore swelling, pain and even limb rot may develop. While explaining the characteristics of the splint to be used, he stated that the fracture should be three or four fingers long on both sides and not be placed on the joint. It is reported that the splint placed on the joint will damage it. He stated that the ligaments wrapped on the splint should be opened if they are too tight and/or cause pain. If a severe itching sensation develops at the dressing site, he recommends thawing the dressing, pouring medium-temperature water on the part where the dressing has been dissolved and leaving it open for an hour. He stated that the dressings used afterward should be soaked in a mixture of wine vinegar, rose oil, and rose water and emphasized that it is important to keep the dressing loose for the first three days so that swelling does not occur again.[7]

3b. Complications in complex fractures and non-union/malunion of the bone

Haly Abbas recommends fasciotomy in the treatment of complex fractures to protect the oppressed areas from the development of necrosis and gangrene and also reports that when a bone fragment remains in the scar tissue, healing does not occur, and pus and inflammation occur. *“Lumps and stiffness seen in some types of fractures damage the joint of the organ and prevent its healing. Particularly if this lump is close to some joint and has recently occurred, it is wrapped in strong bandages with very astringent drugs, or a piece of lead is put on it and tied tightly. So, these lump sticks can disappear. If this lump is hardened and petrified, it is necessary to split it from the top and cut it with a razor.”* He stated that excessive formation of callus tissue in this type of fracture would damage the joint and joint healing and cause joint stiffness. He writes that in case of wrong bone union, the limb's shape, function, and movement will deteriorate. In this case, it says that a fracture should be created again. Before the re-fracture procedure, the treatment algorithm described by Haly Abbas is as follows; *“Emollients containing duck, chicken, marrow, and cow fat are applied to the callus tissue. Some people use it by adding dates to it. Some people pour hot water and violet oil on the limb and then pull the limb back to its original state. If it is insufficient, a preparation consisting of medicines such as verdigris ointment, butter, and natural cotton can be placed on this area to dissolve the callus tissue. The limb can then be pulled out and slowly removed from the fracture site. In addition, the callus tissue can be dissolved by massaging with emollients. If the callus tissue has hardened and these treatment methods have not benefited, it is necessary to split the limb with a razor or scalpel, then separate the fused bone and treat it as necessary.”.*[7]

Discussion

The encyclopedic book *Kāmil al-Ṣināʿa al-Ṭibbiyya*, also known as The Royal Book, written by Haly Abbas in the Xth century, has different importance in terms of medical history in the context of issues such as revealing Islamic medicine was influenced by western medicine like Hippocrates and Paulus Aegineta, references to the books of other physicians in the book, translating the book without mentioning the author and making it available to medical students as a resource. It can be said that the fact that the information on 'fractures', 'dislocations', and 'sprains' in the book has aspects that are still used despite the passage of time is proof of how valuable a physician Haly Abbas was. However, some of the book's information is incompatible with today's information.

As can be understood from the treatment algorithm summarized in Table 1 of Haly Abbas, starting the treatment by taking blood and getting food and beverage support is far from today's approach (*Table 1*). The theory of "Humoral Pathology" developed by Hippocrates and improved by Galenus, which was valid then, tried to explain the formation mechanism of diseases and treatment methods. In this theory, he stated that gases (physai) formed from indigestible food residues (perissomata) and spreading throughout the body and replacing healthy breath (pneuma) cause diseases. According to this understanding, called the Humoral Theory of Pathology, vitality consists of water that forms the liquid parts of the body, the earth that makes up the solid parts, air that provides breathing, and fire that creates the spirit, which is the essence of life. Man, a part of the universe, has four basic fluids (hilt/humor) (blood, phlegm, bile, black bile) composed of these four elements and having different compositions. Each of these has two properties like them, in return for water, earth, air, and fire. Blood, hot-wet (har-ratb) air; sputum, cold-wet (barid-ratb) water; bile to the hot-dry (hâr-yabis) fire; black bile (love in Islamic medicine) corresponds to cold-dry (barid-yabis) soil. It has continued its influence in Eastern and Western medicine for about 2000 years.[16] Health is the result of a balance between these four elements, and diseases result from the deterioration of the balance between them in various ways. Evacuant methods are included in the treatment based on the humoral pathology theory. In this context, blood was drawn, and cupping, leech, or enema was applied. In addition, emetic and diuretic medicines were given to the patient, or the disease was transferred to a harmless area by cauterization and suction cups.[7] Instead of the "Humoral Pathology" theory, the "Cellular pathology" theory put forward by Virchow in the 19th century is accepted today.[17] Since humoral pathology is not valid today, the approach is also different. However, the repair and fixation of the fracture first, the distinction between the treatment of single fractures and multiple fractures, and the fact that only the dressing is sufficient for sprains and muscle weakness can be considered similar aspects of the book to today's approach. In today's approach, surgical treatment is mainly preferred in complex fractures, which differs from the approach of Haly Abbas.[15] The reduction of the dislocation joint is still made in the same way today.[15]

Table 1. The treatment algorithm described by Haly Abbas

Order	Process	Application
1	Taking blood	According to the patient's strength, age and time, blood should be taken from the vein of the injured limb.
2	Nutrition	A small amount of Armenian mud with aloe vera drizzled with some rose water is given to the patient. Then, as needed, the patient is returned to his natural state by giving scaly/ skinned cucumber-shenbar, cannabis, mandarin or fruit juice, ivy or dried violet juice. Thus, possible pain and swelling can be prevented. The patient primarily should be fed with food and beverages such as chicken, partridge, lettuce, chicory, purslane, etc.
3	Limb treatment	
	Muscle weakness or sprain	Bandage made of Armenian mud kneaded with myrtle juice or finely ground mung beans mixed with ervalenta and myrtle juice is used.
	Single fracture without injury and swelling	The fractured bone ends are placed by pulling the limb slowly and softly from both sides in its direction. Bandages measuring the width of the limb are covered with splint material and tied circularly to the fracture area. Medium hardness and softness bandages are used. The bandage

		is put on the fracture area tightly and rolled upwards by making three or four turns. Then another bandage is taken, rolled over the broken area two or three times, and then down the limb. The bandage should be even along the entire limb, and there should be no difference in height on the surface. Splints made of hard cypress wood pieces three or four fingers long from both sides of the fracture are placed on the bandage. The spacing between each of the splints should not exceed one finger. Then, it is re-bandaged with bandages to include all of the first bandages and all of the splints, and then it is tied with ropes starting from the middle, one end from the right and the other from the left side. The tightness and looseness of the ties should not be felt by the patient and should not cause pain and suffering to the patient. The bandages should be tightened until the onset of callus formation. The bandages should be loosened gradually as the callus becomes firm and the bone fuses.
	Fracture with swelling	Indian hyacinth, white and red sandalwood, chicory juice, coriander, and kelp water are applied and tied lightly. The next day, it should be opened, and the application process should be repeated. If the swelling is large, dressings and bandages should not be applied until this swelling calm down. If there was crushing, these crushed areas should be split open in small amounts to avoid decomposition and gangrene.
	Injury accompanying the fracture and comminuted fracture	If there is a vascular injury and the bleeding continues, the bleeding should be stopped with aloes, Boswellia, sarcocolla, Dragon's- blood and similar things. If there is no active bleeding or exposed bone, sutures and bandages should be used to connect the wound lips; a curative treatment applies. In the presence of small rustling bones in the wound, the bones should be removed without suturing. Two bandages should be applied both above and below the fractured area so that the wound opening facing down the limb is exposed, and it should be opened daily or every other day. Cotton should be placed in the wound mouth; when the pus dissolves, swelling and fever subside, the flesh-forming ointment should be applied. If a large bone has come out of this area, treatment should be started before an infection develops. If the infection has developed, the fracture is not treated until the infection is finished. To straighten the protrusions in the bone and make it proportional, it is necessary to cut and remove it either with the help of an iron tool called "berm" or a saw. After the roughness of the bone is smoothed and restored to its original shape, it is supported with splints and treated with honey and ointments, as in the treatment of ulcerated wounds. It should be known that in cases where the wound does not heal and becomes infected, there may be a broken bone fragment in the wound, and it must be removed. Infections in the wound are soothed with dry sandals sprinkled on the dressings and wrapped from the top with light bandages.
	Fractures with bone splinters that do not protrude through the skin	Some are boring and severely painful and should not be wrapped in bandages, as they can cause swelling and bruising on the limb. In the treatment, the area of the fracture is split; if it is easy, the bone fractures are removed; if it is not easy, they are cut and straightened with a sharp tool, and treatment is applied as in the fractures that occur with the injury.
	Non-union (no callus tissue) fractures	Treatment should be directed towards the cause (loose dressing, frequent wet dressing, too much movement, too much dressing, bandage, or soft and malnutrition). In order to attract the substance that forms callus tissue to the limb, a warm dressing should be done, a diet consisting of dense and viscous foods should be given, white wine should be drunk, and the area of the fracture should be washed with fresh water.

Unlike the dressing, splint, and bandage materials made of hard cypress wood used by Haly Abbas in the treatment, today plaster (plaster of Paris), gauze, and elastic bandage are used. In order to facilitate plaster application, the form impregnated with web-shaped strips or roll-knitted materials (crinoline-type) is used. Materials such as a prefabricated splint, stockinet, and padding are also used today.[18]

The treatment of nasal fractures in the book of Haly Abbas is the same as that of Paulus Aegineta and Hippocrates. Therefore, it has been evaluated that it can be said that Paulus Aegineta benefited from Hippocrates and Haly Abbas benefited from Paulus Aegineta.[7]

Haly Abbas described in his book as keeping the splints and bandages for the follow-up of the fracture treatment until the third day, then loosening, dressing, and reapplying.[7] Today, these follow-ups are made with radiographs, but again, the first three days are the process that should be considered for bone healing.[15]

In the book of Haly Abbas, he stated that the treatment of fractures in the clavicular bone that are non-displaced is more complicated than those that do.[7] Similarly, non-union is high in displaced fractures located medial to the distal clavicle type 2 coracoclavicular ligament.[15] Of course, the details of today's fracture

typing, etc., in the book of Haly Abbas, although we could not specify, the observations of the healing process are in accordance with our current knowledge.

Haly Abbas reported that the treatment/healing period of fractures in the arm, thigh and leg bones is forty days at most.[7] Currently, plaster casts are generally used for fracture treatment for six weeks, except for those who go to surgery. However, some non-displaced fractures can heal faster, and some recovery may take up to 12 weeks. More details on this subject are given in Table 2 **(*Table 2*)**.[15]

Table 2. Recovery Duration

Organs	Haly Abbas's opinion	Current literature
Clavicula	28-30 days	28-42 days
Humerus	Up to 40 days	For a non-displaced supracondylar fracture, 7-14 days of posterior splint usage can be followed by exercise with a hinged brace for up to 6 weeks. A posterior splint is used for three weeks of non-displaced capitellum and trochlea fractures. Medial epicondyle fractures require 10-14 days, and lateral epicondyle fractures require three weeks of posterior splint usage.
Forearm	Mostly 30 days	In the treatment of olecranon fractures, after using plaster for the 3rd week, range of motion exercises should be started, but flexion and extension above 90° should not be allowed. Non/minimally displaced fracture of the ulnar bone requires 7-10 days of immobilization with sugar-tong plaster application, followed by eight weeks of range of motion exercises and orthoses or slings. Non-displaced proximal radius fractures can be fixed with a long arm cast. In the distal, six weeks of plaster application is required.
Femur	Up to 40 days	Distal femur 42-84 days
Tibia	Up to 40 days	Up to 112 days

Haly Abbas said there would be no dislocation in the sternoclavicular joint; if it does, it will be with severe trauma and also stated that the acromioclavicular joint "mostly does not come off".[7] Today, the sternoclavicular joint's dislocation rate is considered 3-5% of shoulder injuries. In addition, spontaneous atraumatic subluxation can be seen in female patients with multidirectional instability and ligament laxity and is expressed as a sprain. Sternoclavicular dislocation; is caused by a single trauma, most commonly a motor vehicle accident or crash sports such as rugby/American football.[19] In this context, the information in work differs from the information we have today.

Haly Abbas said, *'The shoulder often goes down'*.[7] Today, it is accepted that 80-97% of shoulder dislocations occur anteriorly.[20,21] In the book, the expression *'those with much meat'* is thought of as fat (and wrote parentheses) by the translator.[7] In our opinion, Haly Abbas' expression 'those with much meat' can be interpreted as describing those with strong, hypertrophic shoulder muscles due to the anatomical structure of the shoulder rather than fat. In a study conducted in the UK between 1995 and 2015, primary shoulder dislocation of individuals between the ages of 16-70 was most often found in those with a body mass index value that was accepted as normal.[21] In addition, Haly Abbas' description of shoulder dislocation inspection suggests the square off shoulder, which is accepted as a typical inspection finding in anterior shoulder dislocations today.[22] Although Haly Abbas stated that the reduction model he refers to Hippocrates could be easily applied at the time of emergence, one or two days later, nowadays it is accepted that the reduction can be made easily at the time of emergence and within a few hours, and the reduction becomes more difficult as the duration increases. Haly Abbas also described two different maneuvers for stronger and more severe dislocations. These maneuvers are used today; Spasso technique, Stimson technique, Hippocrates technique.[23-25] In addition, the disease he called the ferret arm is considered a plexus brachialis injury due to shoulder strain that developed during birth.[26] Although it is stated in the article that shoulder dislocation will most frequently occur in the downward direction, the diagnosis and treatment mentioned are similar to our current medical approaches for anterior shoulder dislocation. In this context, it was suggested that the

'downward' aspect described when radiological imaging was not in use was due to the difference in interpretation due to the lack of equipment.

The complications of a single fracture described by Haly Abbas in his book are consistent with today's plaster complications. Complications of plaster known today; include burns, pressure sores, pain, ischemia, skin infections, neurological injury, infection, joint stiffness, and compartment syndrome. The most serious and morbid of these complications is compartment syndrome, which develops based on ischemia.[18] Haly Abbas' suggestion of fasciotomy in case of a severe complication such as compartment syndrome has been interpreted as an attitude similar to today's treatment approaches.

Haly Abbas listed loose dressing, frequent wet dressing, moving too much, applying too much dressing and bandage, or soft and malnutrition as the causes of non-union of the fracture. Today, other factors are accepted, along with what Haly Abbas has defined as the cause of delayed or non-union in the union of the fracture. These are; fractures are accompanied by severe soft tissue damage, infection, segmental fractures, pathological fractures, soft tissue interposition between the fracture ends, the poor blood supply to the bone, systemic diseases, malnutrition, corticosteroids, and iatrogenic injuries. In addition, many methods are currently being tried to accelerate fracture healing. These are; physical stimulation methods such as electromagnetic, low-intensity ultrasonography, extracorporeal shock therapy, and local applications such as autologous bone marrow, autologous bone graft, and platelet-rich plasma.[27] When our current knowledge on this subject is compared with the information in the book, it has been evaluated that the knowledge of fracture unions has increased with the development of science.

The history of medicine reveals that many scientists have knowledge that has survived to the present day and is still valid. This situation proves the knowledge and skill level of some physicians who left a mark in medicine, like Hippocrates, Galenus, Paulus Aegineta, and Haly Abbas. The books they have written show that they wanted to be useful to others as physicians and the value and importance of sharing knowledge as teachers of physicians. It is hard to believe that there are still common points with *Kāmil al-Ṣināʿa al-Ṭibbiyya,* which was written in the 10th century by Haly Abbas, even today, where new technological-based development is experienced every day, both in terms of diagnosis and treatment, such as fractures, dislocations, and sprains. Although many of the explanations and information about fractures, dislocations, and sprains in this book were compatible with his predecessors, it shed light on the scientists who grew up after him and are found to be similar to the treatment methods used today with more advanced facilities. We also need more studies to protect these valuable scientists and our past.

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Author Contributions

Aydan Orscelik: Idea/concept, design, data collection and/or processing, analysis and/or interpretation, literature review, writing the article, references and fundings.

Sabriye Ercan: Control/supervision, literature review, critical review, references and fundings.

Ozgur Kus: Control/supervision, literature review, critical review, references and fundings.

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