



Investigation of suture surgery with ant by Hakim Mohammad the Iranian surgeon of Safavid Era (1501 to 1736)

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Abstract

Hakim Mohammad, a military physician, and surgeon of the Safavid Era (1501 to 1736) and the author of Dhakhira-Yi-Kamilah book, served as a young man in the Ottoman Empire Officer as a surgeon physician. In this study, the method of suturing by Hakim Mohammad has been introduced. Suturing with ant was a wound healing method that was carried out by Hakim Muhammad to treat the wounds of certain areas of the body, by a special species of ants called fire ants, and by the lower jaw of these ants.

Also, Hakim Mohammed suggested specific food and drug in order to take care of the wound and control infection and pain followed by this type of suture. Study of the treatment methods of predecessors shows us developments and the path to the progress of surgical affairs and can be used in the direction of further advances.

Keywords: Hakim Muhammad, Suture, Ant, Wound Healing, Persian Medicine

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Introduction

Surgery is an important discipline in the history of medical science because it can be used to treat many different diseases (1).

The study surrounding the history of the Safavid Era in comparison with some other sciences faces special problems (2).

Medical science in the Safavid Era was generally not in the hands of trained physicians; But some physicians learned medicine wholly scientifically from a teacher and through this, and in this way, the physician, when completed his studying course, could not do treatment, especially surgery without receiving licenses (3). Among the important physicians in the Safavid Era was Hakim Bashi (court physician) had a significant and valuable place in court (4).

In this study, the way that Hakim Mohammed used to suture and the subsequent recommendations for healing wounds are addressed.

In this review, we used books and valid scientific articles, and also through search engines of Pubmed, Magiran, Sid and Google Scholar. The keywords that were searched included "Safavid Era", "Suture", "Wound Healing", "Ant", "Hakim Mohammed", "Military Surgeon", and "Persian Medicine (PM)". In this research, by studying the sources and after classification and summarization, the results are presented in this paper.

Medicine in the Safavid Era

At the end of the fifteenth century, the Safavid dynasty built the Iranian Empire by forming a stable successful and long-term government (1501-1736)(5).

During the Safavid Era, physicians' education was very similar to the training of surgeons, and the young physician came to the service of experienced physicians for an internship, and for this purpose, this physician was one of those who worked in hospitals (6). Medicine was important in the Safavid Era, such as other courses (7). One of the physicians of this era was Hakim Muhammad who served as a military surgeon as well as one of the physicians of Safavid Era serving the Ottoman Empire (5).

Hakim Mohammed

Hakim Mohammad Surgeon was contemporary with Shah Abbas (1571-1629) and Shah Safi (1611-1642). There is not enough information about this surgeon; but in Dhakhira-yi-Kamilah's book, he introduced himself (8). His teachings and opinions about wounding, surgical procedures, and treatment are reflecting his views that are expressed exactly and certainly and naturally some of them are not correct (6).

Hakim Mohammed, who served as a military surgeon to the Ottoman Empire (1299-1922), collected his surgical experiences in the Dhakhira-yi-Kamilah book, and this book is written in Persian and mainly about the management of wounds and practical techniques (8). Dhakhira-yi-Kamilah includes an introduction, 6 chapters and 30 titles.

At the beginning of this book, the author wrote about general issues, and then he explained more about wounds. It also expressed practical damage and techniques in detail. Hakim Mohamed described the details of the treatment of abdominal and intestinal wounds and suturing of the intestinal hole with ant bite in two different parts of the book (8-10). Dhakhira-yi-Kamilah is of great importance in terms of clarifying the dark corners of medicine in the Safavid Era. This book was written in thirteen years (8,9).

Wound and suture

Skin wounds and reducing their recovery time are one of important aspects of medicine (11).

The healing of wound is to reinstate the physical integrity of damaged structures (12). Treatment and care of wounds, increased speed and prevention of infection have always been the attention of physicians. When there is a shear in the body for any reason, they use sutures (13, 14).

Closing wounds with yarn and needles go back thousands of years ago. The remaining writings of ancient Egypt identify that at that time, metal yarns were used for sutures, but these threads had disadvantages such as difficulty in knotting. At the end of the nineteenth century, various materials such as cotton, flax, hemp, silk, animal hair and so on were used to suture and close wounds(13, 14).

Ants

Insects are one of the most mysterious creatures of creation (15) Ants are among the most diverse creatures on earth and are social insects (16).

There were different opinions about the role of ants in medicine and veterinarians (17).

A number of ants that are capable of biting, stinging and injecting poison into the host body are called stinging ants (18). There are many types of bite ants in the world, and in different areas, there are many species that are known as fire ants (10). The most important aggressive ants, in terms of medicine, are fire ants from the family of Solenopsis (19). Trap-jaw ants use their long lower jaws to disable the prey. When they approach the bait, the lower jaw is opened with an angle of 280° and in this range, they shut their jaw quickly (in less than a millisecond) to crush their prey and hunt the prey (20) (Figure 1 and 2).

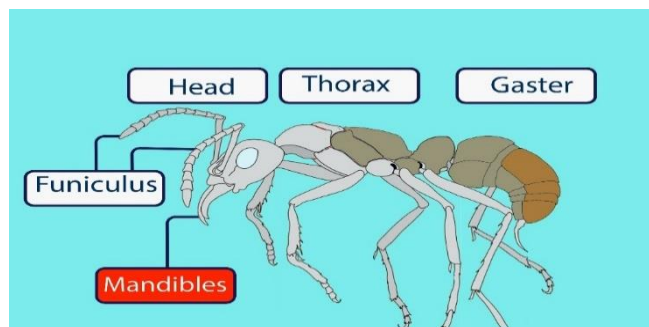


Figure 1. An image of the lower jaw of the ant.

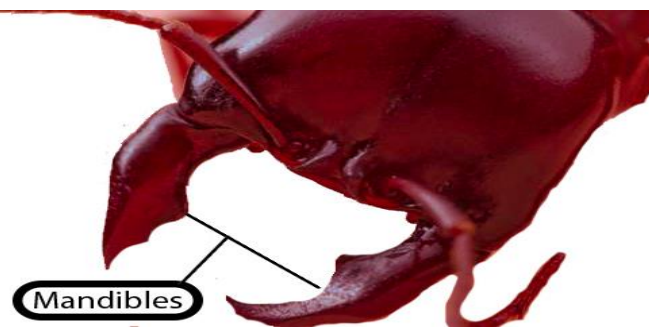


Figure 2. An image of the lower jaw of the ant.

Method of suturing with ants and aftercare

The medical use of the ant existed from the ancient period in a simple way and one of its medical applications in suture was wounds and injuries. In this

regard “Angela Royston” says: “Physicians, instead of suturing in surgery, benefited from the jaws of big ants in order to put the corners of the wounds on each other so that they can easily heal the wounds. When the jaws of the live ant are placed on the scar, the ant started to bite (Figure 3), hence the ends of the wounds reached together, then the physician, cut off the body of the ant and separated it from the wound(21) (Figure 4). Susruta, an Indian surgeon around 500 BCE suggested removing foreign material from the wound, then applying large black ants to the wound's edges and separating their bodies from their heads once they had tightly bitten the section with their jaws (22) Ants have been used for centuries to close and suture wounds in Central and South America (23). In Dhakhira-yi-Kamilah's book, Hakim Mohammad has described in particular the surgery of intestinal and abdominal wounds and the suture of the intestinal hole among ant stings (5). Hakim Muhammad used this method to treat wounds and holes in the intestine, and after suturing the intestine with this method, he put it in the abdomen and treated the abdomen, and after putting burned cotton on the wound, he covered it (dressing it up) (8).

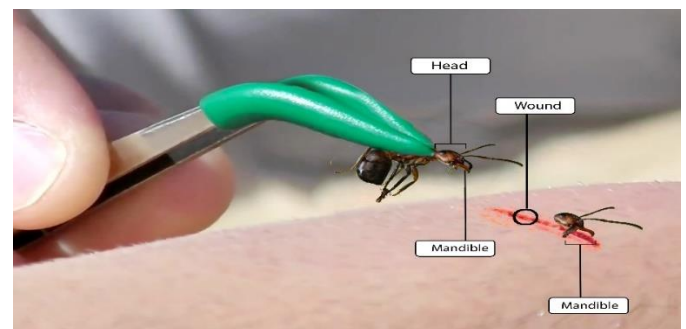


Figure 3. How to do suture with ant.

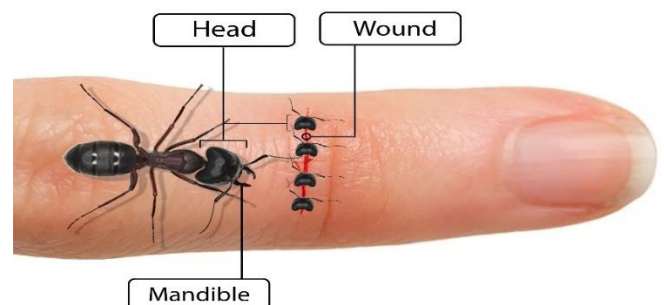


Figure 4. The suture was done by ant.

The stings of ants are often painful and with severe itching, and in some cases, with blisters and some other symptoms, and even complications, such as severe sensitivity, anaphylaxis shock and even death(10). In the view of Hakim Mohammad, wound care is that in these patients, the wound is well covered and does not feed (heavy foods) the patient for two days and since three hours after the suture, fatty soup (very light food) must be consumed that is anti-thirst and has nutritious features and do not feed water to the patient to prevent wound infection, and then tamarisk water should be given (boiled water of tamarisk).

the patient should be given this soup for three days and on the fourth day if the patient wants water, he may be given it according to the following method: First, break and ground the pieces of tamarisk and boil in a stone cauldron with water, screen and re-boil to halve and then use.

Among other important points to be considered in these patients is that the patient must be well taken care of and must wear warm clothing. The patient should be barred from having visitors, and if the wound suffered from pus, it should be treated by the following method: olive oil, white wax, turmeric, *Onosma dichroanthum* Boiss, and washed swamp stone, *Chelidonium majus* L, washed lentil hematite, and tragacanth; Mix all and put on the wound and remove a few days later. If the patient has pain, resolve the pain in the following way: 45 grams of unripe olive, 13.5 grams of white wax, 18 grams of grounded frankincense, 13.5 grams of alum crystal; make a poultice of them all and add egg oil and put on the scar every day (8).

In addition, many findings indicate that ant treatment and suturing are also effective in preventing infection, which may be due to the ants' chemical defense against infectious agents. The secreted glands are involved in destroying many microorganisms (24).

Nowadays, new and modern methods have been replaced, but sutures with ants are similar to today's sutures, including the following:

- In terms of suture pattern, given that in this method, sutures were individually and in a row. Therefore, it can be known as similar to modern sutures today.

- In terms of absorbability, given that this type of suture was performed in the intestine and intra-abdomen, it seems that it was absorbed and it can be divided into today's absorbent sutures.

Certainly, the method that Hakim Mohammad introduced in his time and used ants to treat wounds was a very amazing issue and opened a new path in suturing techniques for humanity. But this method had limitations. It was possible to use sutures with ants in certain places such as the intestines and abdomen. Its use in some organs that are hard and cartilaginous is considered one of the limitations of the work. Sometimes, if necessary, to improve the condition of the sutures in the wounds, it was necessary to use the ant several times to create a stronger suture. The killing of ants in this process is also one of the disadvantages of this technique.

Today's medicine is the result of the work and actions of the former times and even events that occurred in the past.

Conclusions

Suturing is one of these methods. Hakim Mohammed used ant for sutures of abdominal wounds and intestines.

In this paper, suturing method with ant and nutrition method and treatment of pain and after suturing pus by Hakim Mohammad during the Safavid Era was investigated. It is worth mentioning that the present study, based on the latest data of the researchers of this paper, is the first research on suture surgery with ant by Hakim Mohammad, the Iranian physician of the Safavid Era, so there is not much information about Hakim Muhammad and the suture method with ant. Study of the treatment methods of predecessors shows us developments and the path to the progress of surgical affairs and can be used in the direction of further advance.

Author contribution

SS writing, methodology, investigation. **MQ**, investigation, writing. **FK** conceptualization, supervision, writing, investigation.

Conflict of interest

No potential conflict of interest was reported by the authors.

Ethical approval

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