

History of The Cautery Device

Reza SALEHINIA¹, Ebrahim NASIRI¹

¹ Department of Anesthesiology and Operating Room, Master Student of Surgical Technology, School of Allied Medical Sciences, Student Research Committee, Mazandaran University of Medical Sciences, Sari, Iran

² Department of Anesthesiology and Operating Room, School of Allied Medical Sciences, Traditional and Complementary Medicine Research Center and Addiction Research Institute, Mazandaran University of Medical Sciences, Sari, Iran

Correspondence

Ebrahim NASIRI

Department of Anesthesiology and Operating Room, School of Allied Medical Sciences, Traditional and Complementary Medicine Research Center, Addiction Research Institute, Mazandaran University of Medical Sciences, Sari, Iran

e-mail: rezanf2002@yahoo.com

ABSTRACT

In ancient times, fire was used for treating various diseases. This study aimed to analyze the history of surgical cautery.

A comprehensive search was conducted in international databases, including PubMed, Medical Journal, Google Scholar, Science Direct, Iran Medex, and Scientific Information Database (SID), to access the relevant studies and Persian Medicine text books.

Studies reported the use of surgical cautery in different cultures and ancient times. In the past, basic heating tools were used; however, nowadays, electrocautery devices are being used by doctors.

Over time, the change in the appearance of the cautery has changed both the energy required to heat the device and the burn hazards of using the device.

Key words: Cautery, history, Kayi

INTRODUCTION

In ancient times, fire was considered an effective treatment for various diseases such as warts, wounds, infections, bleeding, fatigue, stress disorders, gastrointestinal diseases, musculoskeletal pain, and skin cancer. Its first reference could be found in surgical papyrus (1550 BC) in Egyptian society. Cautery was considered a cure for religious beliefs. It became more known in the world in the late 1800–1900 AD. Hippocrates recommended its applications in many diseases such as hemorrhoids and sciatica (1-3). Cautery is called "Kaiy" in Arabic, which is derived from the Greek word "Kaiein," meaning "burning." Amal-Kaiyy is a method in which caustic soda, electric current, fire, hot metal rods, and so forth are used to burn a specific part of the body, dry excess fluid, remove flesh, and prevent bleeding, as reported by Alam et al. (4,3). Burning was used for treating patients with psychotic problems. The complications of burning included infection at the site, and 45.5% of patients needed

antibiotic therapy. Cautery is an invasive technique performed by traditional healers who believed in its effectiveness in treating many diseases. In a study on mice, burning reduced the phagocytic activity of neutrophils in the nonspecific immune system, which resulted in heat damage from burning, leading to sensory nerve dysfunction and hyperthermia. Pain from burning (e.g., from several places where cautery is used) can act as a distraction and lead to a transient improvement in some patients with psychiatric problems. Various Greek scholars, for example Razi, Majsi, Zahrawi, Baghdadi, Jorjani, and Masihi, shared their experiences with Amal Kaiyy in the relevant writings. Ibn Hubal Al-Baghdadi proposed this method for the surgical removal of pus from a liver abscess (5-7). According to Ibn Sina, burning is a very useful treatment method because it prevents the spread of infectious lesions and inhibits blood flow. Bukhari quoted Prophet Muhammad (PBUH: Peace Be Upon Him)

as saying: "There is healing in three things: 1. Using honey, 2. Cupping, and 3. Burning with fire." However, Prophet Mohammad (PBUH) forbade the burning to the ummah. Many hadiths have been narrated about burning, which shows that it is permissible in some circumstances. The use of fire and burning tools was reduced around 1800 AD with the advent of ligatures and tourniquets to control bleeding and the use of disinfectants in infectious wounds; however, it reemerged in the late 19th century with the invention of electric diathermy, which generated heat in a more controllable manner, and is still used today to stop bleeding during surgery (4). Greek scholars used burning to treat epilepsy, headaches, and pain because of the lack of available antibiotics, but today it is a painless method widely used to control bleeding (5). This study aimed to evaluate the history of surgical cautery.

METHODS

Search strategy: According to the study protocol, all stages of the research method, including search, selection of studies, and data extraction, were done independently by two researchers. A comprehensive search of national and international databases, including PubMed, Medical Journal, Google Scholar, Science Direct, Iran Medex, and SID, was conducted without time constraints to obtain relevant studies. References to all related studies were also reviewed. General keywords, including history, Bovie, cautery, Kayi, cauterization, device, surgical instruments, and all possible combinations, were used for English and Persian language databases to maximize the comprehensiveness of the search. According to Fig. 1, in the initial search by 2 researchers, 1075 possible studies related to surgical incisions were found. No study on surgical incisions was found in the Persian language. Of the 1075

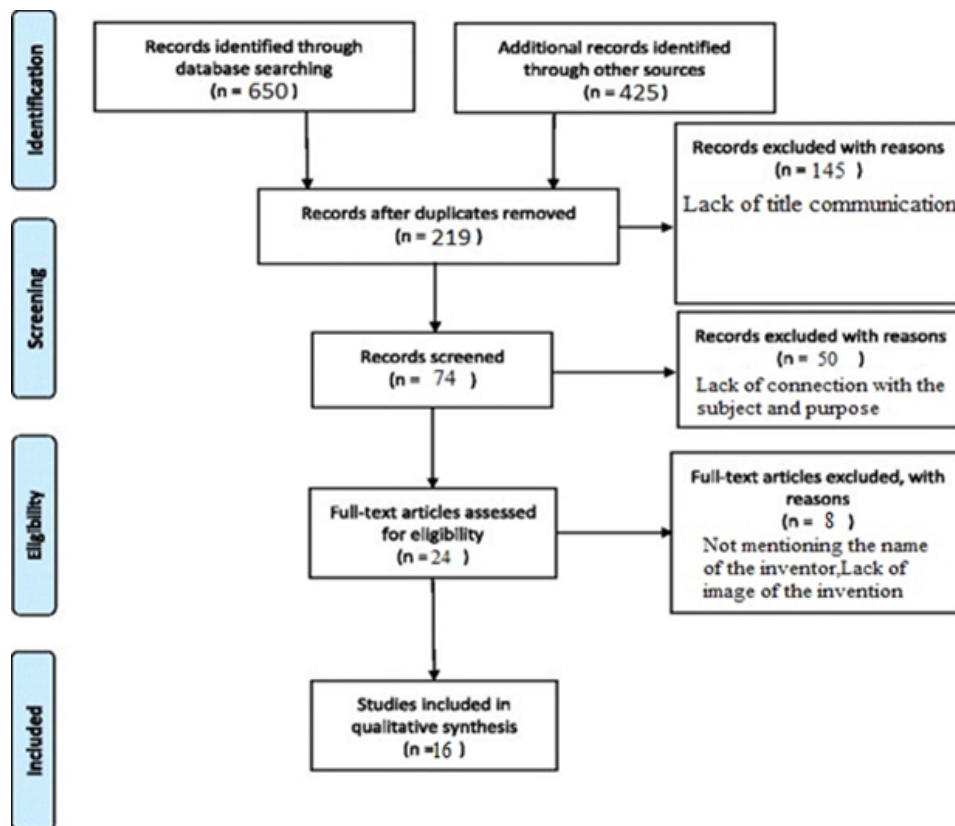


Figure 1 Flowchart of selection of studies.



Figure 2 Use of a catheter to treat pain.

studies, 856 were excluded due to duplication (duplicate studies are studies extracted by 2 researchers, with the same title, authors' names, and published journal). Again, 145 were deleted due to the lack of relevance of the study title, and 50 were deleted by reviewing the abstracts of the studies (Fig. 1).

Findings

The findings of the reviewed studies were as follows.

Introduction of the surgical cautery and its applications

Surgical cautery has been recorded in various cultures and ancient times, the first reference to which was found in surgical papyrus in Egypt in 1550 BC. In the past, several ancient cultures around the world recognized fire as an effective remedy for many diseases, including cancer, and also worshiped it ritualistically (6, 7). The evolution and progress of this device are endless. Fire is the historical symbol of this device, or the traditional method of healing, and its use dates back to ancient times. Cautery is called Kaiy in Arabic, which was considered a native healing method (8). Ibn Sina (1080–980 AD), Abu al-Qasim al-Zahrawi (Albocasis d. 1013 AD), and the book "Miracle" written by Zahrawi have mentioned that hot iron is one of the oldest common treatment methods of Hippocrates. It is used in the abscessed liver (6). One of the first references to the use of cautery is found in the books of Hippocrates (460–377 BC), which mentioned the treatment of various dis-

eases, such as bleeding. The second-century physician Jalin (1999–131), in his treatise on the effects of burning tumors, mentioned that the use of cautery could also be dangerous. Abul Hassan Ahmad ibn Muhammad Tabari (750–850 AD) and Zakaria Razi (865–925 AD) discussed about the effect of burning on the treatment of bleeding and sciatica (9). Temporal, frontal, and occipital arteries were used to reduce headaches in people with migraines. Burning was also used as a treatment in North America around 300–500 AD, based on evidence found on a burned skull in California (10).

History of surgical cautery

In the past, cautery was in the form of hot nails or skewers (11) placed on the site to be treated (Fig. 2). According to the previous studies, first, the desired point was marked with ink, and then a hot rod was placed on the case area to treat headache, back pain, and toothache. The tips of the tools used were of different shapes (Fig. 3). Sabunkogoghlu stated that heat burning was necessary as a last resort to control pain because this method had risks and complications. He argued that herbal medicine combined with burning had the maximum effect on healing (12, 13). Abu al-Qasim Khalaf ibn Abbas al-Zahrawi (936–1013), known as al-Zahrawi and Abu al-Kassi, invented a device to heat a rod to be used clinically in minor hemorrhages.

Olive (A), nail (B), triangle (C), sharp (D), crescent (E), and round (F). Adapted from a 15th-century textbook by Ganidaglı *et al.* (2004) (13).

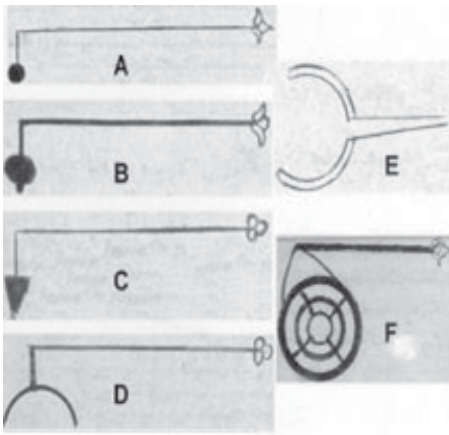


Figure 3 Some examples of Sabuncuoğ˘lu burning tools.

The methods of heating the cautery tool were different, such as using fire, olive oil (heating by boiling oil), acid and alkali (heating by corrosive substances), herbal (burning with herbal medicines), cupping, and electric current–electrocautery, which is a metal rod or electric current used to burn a particular area. Electrocauteries are of different types, such as thermal-monopolar and bipolar (Fig. 4).

Many people believe that a person named “Bovie” was the inventor of the electrosurgical method (Fig. 5), but the use of cautery dates back to prehistoric times when heated stones were used to stop blood flow (14, 15).

Burning, first used in the 16th century, was a method of burning various parts of the body, such as blood vessels or open wounds, to prevent bleeding and amputation. This medical instrument of the 1930s had a foot pedal with which the surgeon allowed the electrical current to be turned on and off. Nowadays, doctors use electrocautery devices, which are not heated by fire, but with electric current. The system is powered by a Tesla coil, which requires a high-frequency alternating



Figure 4 Types of electrocauteries.

current to provide precise cutting and coagulation of the area (Fig. 6) (16).

DISUCUSSION

According to previous studies, the cautery tool has made great progress over time and with the advancement of technology. In the past, this device used thermal energy to heat the device, but nowadays, electrical energy is used to heat this device. In the past, it was used to treat various diseases, such as to stop bleeding, warts, and liver abscess, but now it is mostly used in various surgeries to cut and coagulate the desired position.

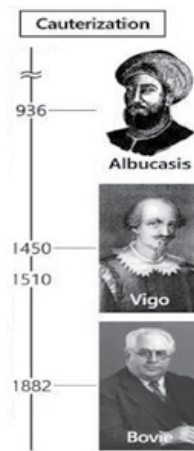


Figure 5 Inventors of cautery. Adapted from Massarweh et al. (2006) 14).



Figure 6 Primary cautery device in the Baken Museum. Adapted from Mohamed Kamel Hussein (1978) (16).

Nikhat et al. mentioned the benefits of using this tool to treat diseases such as epilepsy, headache, toothache, depression, and hemorrhoids (10), and Alam et al. referred to the effect of this device in treating mental illness (4). Qureshi et al. mentioned several ancient cultures around the world that considered fire as a very effective medicine for diseases, such as cancer, and also worshiped it ritualistically. Hippocrates recommended the use of fire for medical treatments such as hemorrhoids and sciatica (2). In the past, the tip of this device had different shapes, such as olive-shaped, round, sharp, triangular, and crescent, each of which had a specific application in a specific area (13). Despite all the advantages that previous studies mentioned about the use of this tool for various diseases, the most important complication associated with this device was the excessive burns in the skin layers (2).

CONCLUSIONS

Over time, besides the change in the appearance of the surgical instrument, the energy used to heat the device has also changed, and the risk of burns from using the device has been minimized. It is hoped that with the advancement in surgical instruments, this device can be used in patients without any adverse effects.

REFERENCES

1. Qureshi NA, Al-Amri AH, Abdelgadir MH, El-Haraka EA. Traditional Cautery among Psychiatric Patients in Saudi Arabia. *Transcultural Psychiatry*. 1998;35(1):75-83.
2. Qureshi N, Salem S, Gazzaffi I, Alsanad S. Cautery Looked through the Lens of Clinical Perspective: Indications, Contraindications, Adverse Effects and Complications. *Journal of Advances in Medicine and Medical Research*. 2018;26(9):1-16.
3. Alsanad S, Asim A, Gazzaffi I, Qureshi N. History of Cautery: The Impact of Ancient Cultures. *Journal of Advances in Medicine and Medical Research*. 2018;25(9):1-17.
4. Alam MT, Khan N, Kalam MA, Sheeraz M, Ahmed M. Aml-I-Kaiyy (Cauterization)-An Effective Mode of Treatment In The Light of Unani Medicine And Tibbe Nabvi (Prophetic Medicine). *Pharmacy And Pharmaceutical Sciences*. 2020;9(7, 2143-2151).
5. Avicenna MH. *Al-Qanun fi al-Tibb (The Canon of Medicine)*. Ed by Masoudi A. Kashan: Morsel; 2007. [In Persian]
6. Rhazi M. *Al-Havi fil teb*. Beirut: Dar Ehyae Altorse Arabi; 2001
7. Aghili Alavi Shirazi SMH. *Kholasat al-Hikmah*. Qom: Ismailian Publications; 2006. [In Persian].
8. Sultana A, Ansari S. Medical and Scientific Basis of Cauterization (KAI). *International Journal of Current Research*. 2016;8(05).
9. Alsanad SM, Gazzaffi IMA, Salem SO, Qureshi NA. Cautery Looked through the Prisms of Shapes, Types and Methods: A Critical Appraisal. *Journal of Complementary and Alternative Medical Research*. 2018;6(2):1-19.
10. DeLeon MF, Yeo CJ, Maxwell PJ. The evolution of cauterization: from the hot iron to the Bovie. *The American surgeon*. 2011;77(12):1574-5.
11. Alsanad SM, Asim A, Gazzaffi I, Qureshi NA. History of Cautery: The Impact of Ancient Cultures. *Journal of Advances in Medicine and Medical Research*. 2018;25:1-17.
12. Nikhat S, Fazil M. Kayi (Cauterization): A Tribute to Unani Scholars. *Medical Journal of Islamic World Academy of Sciences*. 2013;21(2):81-8.
13. Nasiri E, Hosseimehr SJ, Azadbakht M, Madani SA. A review of natural products for burn healing based on the Iranian traditional medicine. 2014; 23(110): 263-76 [Persian].
14. Tesfai B, Debesai A, Mekonnen S, Girmay F, Kibreab F, Hussien L, et al. Knowledge, attitude, practice and prevalence of traditional cauterization among patients in Massawa Hospital, Eritrea: a cross-sectional study. *Pan Afr Med J*. 2020;36:230-.
15. Maunoir JP. On the use of the actual Cautery as a remedy for the Cure of Diseases. *Med Chir Trans*. 1818;9(Pt 2):364-81.
16. Ganidagli S, Cengiz M, Aksoy S, Verit A. Approach to painful disorders by Serefeddin Sabuncuoğlu in the fifteenth century Ottoman period. *Anesthesiology*. 2004;100(1):165-9.
17. Massarweh NN, Cosgriff N, Slakey DP. Electrosurgery: history, principles, and current and future uses. *J Am Coll Surg*. 2006;202(3):520-30.
18. Hwang K. Tracing the Use of Cautery in the Modern Surgery. *Journal of Craniofacial Surgery*. 2018;29(1).
19. Mohamed Kamel Hussein (1978), *The Concise History of Medicine and Pharmacy* (cf. Mostafa Shehata, "The Father Of Islamic Medicine: An International Questionnaire", *Journal of the International Society for the History of Islamic Medicine*, 2002 (2): 58-59 [58]).