

# Principles of Agnikarma and its Advances for Shonitsthapana (Hemostasis)

Fadanvis Prafulla<sup>1</sup>, Jaiswal Reena<sup>2</sup>, Sharma Harshala<sup>3</sup>, Vasant Gawande<sup>4</sup>

<sup>1</sup>Associate Professor, Dept. of Shalya Tantra, Datta Meghe Ayurvedic Meducal College, Hospital and Research Centre, Wanadongri Nagpur, <sup>2</sup>Associate Professor, Dept. of Shalya Tantra, Mahatma Gandhi Ayurved College, Datta Meghe Institute of Medical Sciences Sawangi, Meghe, Wardha-442001, <sup>3</sup>Professor, Dept. of Swasthavritta, Datta Meghe Ayurvedic Meducal College, Hospital and Research Centre, Wanadongri Nagpur, <sup>4</sup>Associate Professor Dept. of Orthopedics Jawaharlal Nehru Medical College, Datta Meghe, Institute of Medical Sciences Sawangi, Meghe, Wardha-44200

## Abstract

*Agnikarma* has been one of the peculiar parasurgical procedures described in *Sushrut Samhita*. The most important indication of *Agnikarma* is when there is bleeding from vessel or diseases in which bleeding is expected. Technology and instruments used for hemostasis now a days differ from ancient ones. However fundamental principle of heating the tissues remains same which is widely used in present era. Earlier rods (*shalaka*) made from different metals were used for burning out bleeding veins. Red hot *shalaka* was applied on tissues and bleeders so that contraction of vessels occurs. So hemostasis was achieved by cauterization of tissues at high temperature. With advancement of technology in bio-medical engineering various machines like Electrocautery, Infrared coagulation, Electrosurgical unit (high frequency and low frequency) and LASERS were invented for similar purpose.

In *Electrocautery* electrical current is used to heat a metal wire to burn or coagulate the specific area of tissue. In *Electrosurgical unit* alternating current is passed through tissue and heat is created by the resistance of tissue to current. Electrodes are used to cut, coagulate or even fuse the tissue. IRC involves the use of infrared light as a heat source to coagulate vessels supplying blood. Lasers are used to ablate the veins in which amplified light energy is used to generate heat. Tissue dehydration, protein coagulation and vaporization are the processes involved in achieving hemostasis.

Working principles and energy sources used in these devices vary from each other; however the hemostasis is achieved by common fundamental principle i.e. generating heat which is similar to *Agnikarma*.

**Keywords:** *Agnikarma, Hemostasis, Electrocautery, Lasers, BEIM.*

## Introduction

*Sushrut Samhita* is the core literature of *Shalyatantra* in which many principles of ancient surgery have been mentioned in *sutra* (concised) form. The concept of these *sutras* can be applied at various disease conditions and stages. *Agnikarma* has been one of the peculiar parasurgical procedures described in *Sushrut Samhita*. In which heat is used for intentional burning and therapeutic purpose. Diseases and conditions in which *Agnikarma* can be done are mentioned in *Sushrut Sutrasthana*<sup>1</sup>. However *Agnikarma* now a days is mostly used only in

varrious pain of musculoskeletal origin such as cervical spondylosis, tennis elbow, chronic plantar fasciatis, heel pain, sciatica, osteoarthritis of knee joint, calcaneal spur, frozen shoulder, lumbar spondylosis<sup>2,3</sup>. One of the important indication of *Agnikarma* mentioned in *Sushrut Samhita* is when there is bleeding from blood vessels<sup>1</sup> or diseases in which bleeding is expected like haemorrhoids(*Arsha*). Bleeding from vessel can be due to any type of external trauma e.g. lacerated (*Chhinna*) or punctured(*bhinna*) wound which tends to bleed more<sup>4</sup> or during an elective surgery.

In ancient times *Agnikarma* i.e. cauterization<sup>5</sup> was used in these conditions for Hemostasis (*Shonitsthapan*)<sup>6</sup>. In present era also this principle is used for hemostasis. But with the advancement of technology, devices and machines used now a days are different. Researches especially in field of bio-medical engineering have lead to the development of various machines like Electrocautery, Infrared coagulation, Electrosurgical unit (high frequency and low frequency) and LASERs. Application of principles of physics along with basic principle of *Agnikarma* have resulted in these inventions. Hence use of these advanced instruments for hemostasis in reference with classical *agnikarm* is to be studied<sup>7</sup>.

**Review of Literature:** A procedure in which heat is applied or generated is called *Agnikarma*. Earlier *shalaka* made from metal was used for *Agnikarma*<sup>8</sup> while now electrodes, optic fibres supplied by various energy sources are used to generate heat at the point of cauterization.

In classical *Agnikarma* there is constriction of bleeding vein due to heat and thus hemostasis is achieved.<sup>9</sup>

Role of this principle is evident in modern era, as not a single surgical procedure is performed without use of electrosurgical unit. Claim of similarity in fundamental principles of *Agnikarma* and that of current

electrocoagulation machines can be understood after knowing basic mechanism of these machines.



**Fig. 1. Agnikarma Shalaka**

**Electrocautery:** Electrocauterization is a process in which a metal probe heated by electric current and heat conduction is used to cut, coagulate and desiccate (dry) tissues and small bleeders. In this electric current is not passed through tissue but electrode heated by alternating current is directly applied on target tissue area. (Fig. 2) Electrocautery can be used in various minor surgical procedures in dermatology, ophthalmology, plastic surgery, urology etc.<sup>10</sup>



**Fig. 2. Electrocautery**

**Electrosurgery:** Electrosurgery uses radio frequency (RF) alternating current to heat the tissue. In this, current induced intracellular oscillation of ionized molecules results in elevation of intracellular temperature. With rise in intracellular temperature simultaneous processes of tissue desiccation (dehydration) and protein coagulation occur (coagulation). If the intracellular temperature increases rapidly, the intracellular contents undergo a liquid to gas conversion, massive volumetric expansion, and resulting explosive vaporization i.e. cutting.

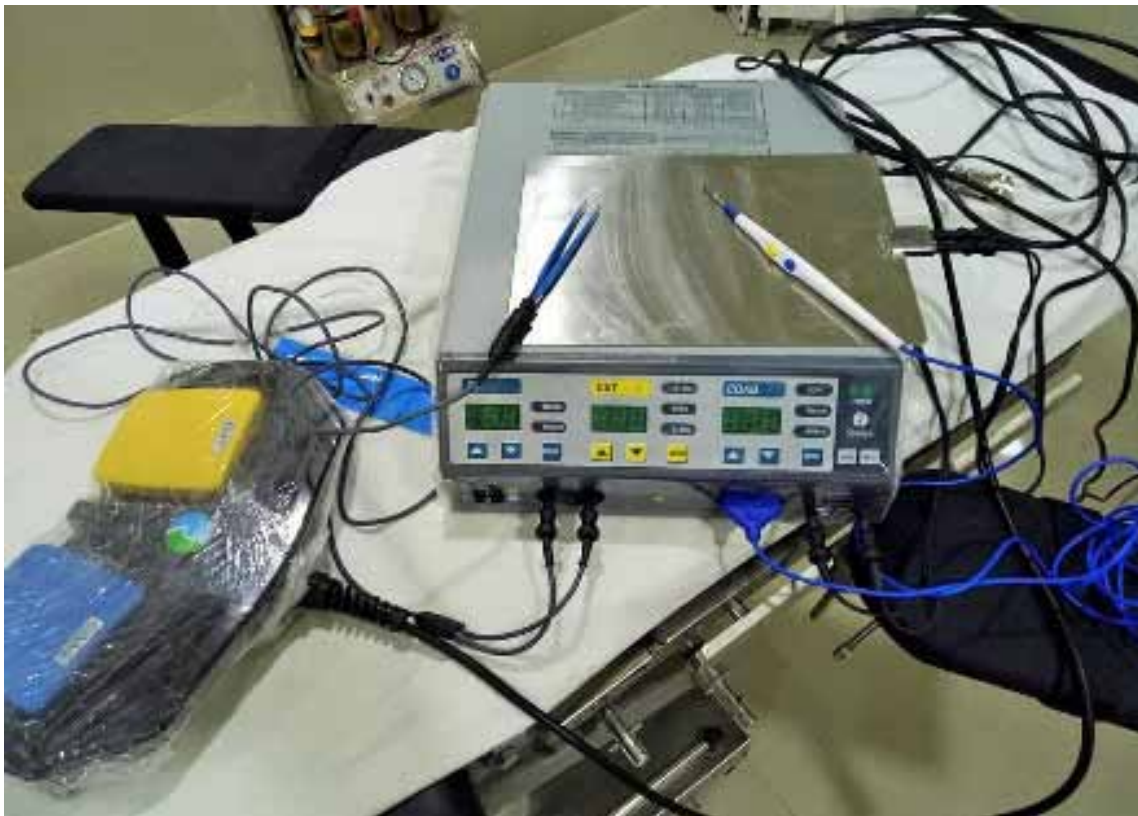
Coagulation is performed with lower average power, generating slow heat insufficient for explosive vaporization, but producing a thermal coagulum instead.

**There are two method of *electrosurgery*:**

1. Monopolar
2. Bipolar procedures.

- In monopolar electrosurgery, a complete electrical circuit consists of-
  - (a) Electrode
  - (b) Patient
  - (c) Return Electrode (patient plate)
  - (d) Electrosurgical generator [ESU] (fig.3).

With the *monopolar* technique, the electrical current travels from an electrode through the patient until it reaches a grounding pad (return electrode) placed in proximity on another location on the patient's skin and then the energy returns to the generator. Prolonged or repeated application of current to the tissue induces heat accumulation and undesired tissue destruction.<sup>11</sup>



**Fig. 3. Electrosurgical unit**

- The bipolar technique uses an electrode in the form of a forceps (fig.4) that serves as the electrode and return electrode, whereby the electrical current flows from one tip to the other, with the

desired tissue positioned between them. The main difference between the two is that monopolar uses a patient plate to direct the current, while bipolar uses opposing electrode points to do the same.<sup>12</sup>



**Fig. 4. Bipolar Forceps**



**Fig. 5. Bipolar Clamp**

A bipolar clamp (Fig.5) can also be used instead of a forceps which can seal the vessels up to diameter of 7mm. Currently BEIM (Fig.6) machines are making a buzz in the market. They are modified form of vessel sealer which automatically senses and deliver the energy required to seal the tissue and stops itself. So tissue charring and lateral heat spread is reduced.

There are various modes in electrosurgical unit like fulguration, desiccation, spray etc. according to need of procedure.



**Fig. 6. BEIM Machine**

**Infrared coagulation (IRC):** It is a non-surgical outpatient procedure for the treatment of hemorrhoids. IRC involves the use of infrared light as a heat source to quickly coagulate, or clot, vessels supplying blood to the hemorrhoids (Fig.7). A small probe is used to deliver a few short bursts of infrared light to the hemorrhoid. The infrared coagulation causes the enlarged hemorrhoidal tissue to shrink and recede.<sup>13</sup>

**Laser:** ‘Laser’ is an acronym for Light Amplification by Stimulated Emission of Radiation. A laser is a light beam that can be focused on a very small area (Fig.8). The laser heats the cells in the area being treated until they burst.<sup>14</sup> Laser increases the temperature of cells and it results in denaturation of proteins and collagen that leads to coagulation of tissue and it can necrotize cells.<sup>15</sup> The intense beam of light interacts with tissue and can be used to ‘Cut, coagulate or ablate the tissue. The laser-tissue interaction depends on the type of laser i.e. the wavelength of laser. Commonly used surgical lasers are-CO2 laser, Nd : YAG laser, Diode laser, Argon laser. Depending on purpose and type of laser, various modes are used.<sup>16</sup>

Laser ablation is the process of removing unhealthy tissue from a solid (or occasionally liquid) surface by irradiating it with a laser beam. At low laser flux, the tissue is heated by the absorbed laser energy and evaporates.<sup>17</sup> Laser ablation is used in a variety of surgical specialties including ophthalmology, general surgery, neurosurgery, ENT, dentistry, oral and maxillofacial surgery.

In proctology, lasers specially Diode lasers are very much useful for In situ coagulation of hemorrhoids in which the hemorrhoid is shrunk from within and ablation of hemorrhoid in which tissue is destroyed. Fistula tract or pilonidal sinus are also ablated using lasers.<sup>18</sup> (Fig.9)

In esophageal varices endoscopic laser ablation is done. In varicose veins endovascular laser ablation (EVLA) is done. In which abnormal veins are heated by a laser. The heat kills the walls of the veins and the body then naturally absorbs the dead tissue and the abnormal veins are destroyed.<sup>19</sup>

**Radio surgery:** It is different from electrosurgery or electrocautery. The principle of radio surgery involves using high-frequency radio waves at 4.0 MHz, delivered at low temperature through radiofrequency microfiber electrodes; Unlike electrocautery the electrode used in radiofrequency surgery remains cold because of the use of the very high-frequency current of 4 MHz. (Fig.10)

Coagulation with radiofrequency energy occurs through the application of a high-frequency current which, when applied to tissue with sufficient current intensity, dehydrates the cells and coagulates their organic contents. This action is evidently self-limiting, because the surface coagulation helps protect the underlying tissues.<sup>20</sup>

## Discussion

From above all information it is clear that, working principle and source of energy used in above devices are different from each other. But some sort of heat directly or indirectly is generated in tissues or veins to coagulate or ablate it. *Agnikarma* done by metal *shalaka* burnout the tissue and bleeders and also cause significant damage to surrounding structures by lateral heat spread. So tissues injury is more. In electrocautery, heated metal wire or electrode will be less traumatic to tissues but it can stop bleeding from small vessels only. In Electrosurgery heat generated depends upon tissues resistance which is specific and for fraction of seconds thus less violent than electrocautery. In high frequency Radiowaves and Lasers thermal injury is further minimum. With advancement of these technologies easy and sophisticated modes are available for hemostasis, coagulation or ablation.

Symptoms of ideal *Sira Dagdha* i.e. cauterization of vein are *Krushna Vranata* (blackish colouration), *Stravsannirodh* (arrest of bleeding). These are also found after achieving hemostasis on bleeding vein. However blackish discoloration is due to charring of tissues in attempt to achieve complete coagulation. Sound and smell of burning the tissue, contraction of tissues are also observed in cut-coagulation process by any of the devices, which are quite similar to symptoms of ideal *Tvak* and *Maans Dagdha*.<sup>[21]</sup> Even in endovenous laser ablation and laser haemorrhoidoplasty sound and smell of burning of tissue is observed.

## Conclusion

The similarity proves, though tissue injury was more in conventional agnikarm method for achieving hemostasis, fundamental principle of ...*Dah sankochayet sira* is still evident in this era. Electrocautery, electrosurgery, radiofrequency, infrared coagulation, BEIM, Lasers etc. are new advancement in *Agnikarma* with wide range of indications and more sophisticated approach.

**Ethical Clearance:** Taken from institutional ethics committee.

**Source of Funding:** Self.

**Conflict of Interest:** Nil.

## References

1. Sushruta, Sushruta Samhita, Sutra Sthana,

1. Agnikarmavidhi Adhyaya. 12/10, Marathi translated by Prof. Athavle, P.G. "Drushtartha Sushrut Chintan" Vol I. Nagpur: Shri Dhanwantari Books Publishers; 2017. 101 p
2. Rathod N, Kuchewar V. Review on role of Agnikarma in pain of various musculoskeletal disorders. *Journal of Indian System of Medicine* [Internet]. 2019 [cited 28 April 2020];7(1):43.
3. Misar S. Agnikarma in management of Vatakantak (plantar fasciitis). *J Indian Sys Med* 2017;5:126-9.
4. Sushruta, Sushruta Samhita, Chikitsa Sthana, Sadyovrana Chikitsa Adhyaya.2/23, Marathi translated by Prof. Athavle, P.G. "Drushtartha Sushrut Chintan" Vol II. Nagpur: Shri Dhanwantari Books Publishers; 2017. 25 p
5. Cauterization [Internet]. *En.wikipedia.org*. 2020 [cited 28 April 2020].
6. Sushruta, Sushruta Samhita, Sutra Sthana, Shonit Varnaniya Adhyaya. 14/39, Marathi translated by Prof. Athavle, P.G. "Drushtartha Sushrut Chintan" Vol I. Nagpur: Shri Dhanwantari Books Publishers; 2017. 128 p
7. Dalhanacharya, Sushrut Samhita with Nibandhsangraha commentary, Sutra Sthana, Agnikarmavidhi Adhyaya. 12/1, edited by Yadavji Trikamji. Varanasi: Chaukhamba Surbharati Prakashan; 2008. 66 p
8. Sushruta, Sushruta Samhita, Sutra Sthana, Agnikarmavidhi Adhyaya. 12/4, Marathi translated by Prof. Athavle, P.G. "Drushtartha Sushrut Chintan" Vol I. Nagpur: Shri Dhanwantari Books Publishers; 2017. 99 p
9. Sushruta, Sushruta Samhita, Sutra Sthana, Shonit Varnaniy Adhyaya. 14/40, Marathi translated by Prof. Athavle, P.G. "Drushtartha Sushrut Chintan" Vol I. Nagpur: Shri Dhanwantari Books Publishers; 2017.128 p
10. 3 Key Differences Between Electrosurgery & Electrocautery- Bovie Medical [Internet]. Bovie Medical. 2016.
11. Suryavanshi, P et al. Comparative evaluation of effectiveness of surgical blade, electrosurgery, free gingival graft, and diode laser for the management of gingival hyperpigmentation. *J Datta Meghe Inst Med Sci Univ* [serial online] 2017 [cited 2020 Apr 28]; 12:133-7.
12. Palanker D, Vankov A, Jayaraman P. On mechanisms of interaction in electrosurgery. *New Journal of Physics* [Internet]. 2008 [cited 28 April 2020];10(12):123022.
13. Infrared Coagulation (IRC): Procedure & Prep | NorthShore [Internet]. Northshore.org.
14. Lehrer, M, Zieve D. Laser surgery for the skin: *MedlinePlus Medical Encyclopedia* [Internet]. *Medlineplus.gov*.
15. Ansari M, Erfanzadeh M, Mohajerani E. Mechanisms of Laser-Tissue Interaction: II. Tissue Thermal Properties [Internet]. *Journals.sbmu.ac.ir*. 2020
16. Kulkarni S. Lasers In Treatment of Haemorrhoids. *Bombay Hospital Journal* [Internet]. 2020 [cited 23 March 2019];42.(2):A single page.
17. Laser ablation [Internet]. *En.wikipedia.org*. 2020 [cited 27 April 2020]. Available from: [https://en.wikipedia.org/w/index.php?title=Laser\\_ablation&oldid=950207744](https://en.wikipedia.org/w/index.php?title=Laser_ablation&oldid=950207744)
18. Khilnani N, Winkour R. Varicose Vein Treatment With Endovenous Laser Therapy: Overview, Indications, Contraindications [Internet]. *Emedicine.medscape.com*. 2018 [cited 27 April 2020]. Available from: <https://emedicine.medscape.com/article/1815850-overview>
19. EVLA Treatment for Varicose Veins- Endovenous Laser Ablation Therapy [Internet]. *Circulationfoundation.org.uk*. [cited 27 April 2020]. Available from: <https://www.circulationfoundation.org.uk/help-advice/veins/varicose-veins-endovenous-laser-therapy>
20. Gupta P. Novel Technique: Radiofrequency Coagulation- A Treatment Alternative for Early-Stage Hemorrhoids. *Medscape General Medicine* [Internet]. 2002 [cited 28 April 2020];4(3). Available from: <https://www.medscape.com/viewarticle/437376>
21. Sushruta, Sushruta Samhita, Sutra Sthana, Agnikarmavidhi Adhyaya. 12/08, Marathi translated by Prof. Athavle, P.G. "Drushtartha Sushrut Chintan" Vol I. Nagpur: Shri Dhanwantari Books Publishers; 2017. 101 p