

REVIEW STUDY OF SUSRUTOKTA SHAV SAMRAKSHAN VIDHI IN THE MODERN PARAMETER

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ABSTRACT

Dissection is the base of practical knowledge of human anatomy for medical students and before the dissection; there is a need of preservation of dead body. In ancient era, *Acharya Sushrut* was the first physician who performed the dissection of human dead body. He explained the procedure of dead body preservation and method for dissection. He had explained the method at the time when touching a dead body was taboo in the society. For this procedure, *Sushrut* has used totally natural materials which are found anywhere easily. In modern era, the dead body preservation is done with the prepared solution of various chemicals. This process is called embalming. Some unsolved, doubtful and mysterious topics of *Ayurvedic Rachana Sharir* can easily understand, if we correlate them with the modern anatomy. Hence, it is very essential to compile and correlate the method of preservation and dissection given by *Acharya Sushrut* with the recent method of embalming. In this paper, we will discuss the *Sushrutokta* method of preservation and dissection of human dead body in detail along with the modern techniques.

Keywords: *Sushrut, Sharirsthana, Kurcha, Valkala, Munja, Kusha, Shana, Ushira.*

INTRODUCTION: Acharya Sushruta is the first man of ancient period who resorted the dissection to understand the structures of the human body in detail. Because of the method of layer by layer scraping the body, he was able to note the features of various tissues and organs scrupulously and describe them accurately. Though it cannot be said that all the points he has said are correct yet they cannot be dismissed off as thoroughly inaccurate and fanciful. There is much similarity between Sushrut's description and of modern anatomy on many topics like layers of skin, bones, joints, membranes etc¹.

Some important history of embalming:

In Vedic period, there is a reference regarding preservation of dead body of king *Dasharatha* in Tail droni². Mummification is the type of dead body

preservation that had been done by ancient Egyptian for religious concepts. The main preservative used was natron which is a naturally occurring mixture of sodium carbonate and bicarbonate in varying proportions³.

The dead body of princess of wales (Britain) Diana was embalmed on the order of British authorities to confirmation whether or not she was pregnant⁴. After the death of Lenin, the Soviet government received many more telegrams from all over Russia, which asked the government to preserve his body somehow for future generation⁵. Abraham Lincoln's body was embalmed for the long term. At the turn of the century it was disinterred for forensic study, revealing a perfectly preserved corpse⁶.

Sushrutokta Method: Sushrut samhita is the earliest and prime document in the world on the subject of dissection. Sushrutokta, layer by layer scraping method of dissection is a unique method that's why he was able to trace and describe the various structures of human body. He describes proper selection of dead body, preservation technique and process of dissection in detail, in chapter 5th '*Sharirsankhya Shaarir*' of Shaarir sthana.

Selection of dead body: According to Acharya Sushrut, following points are noticeable for the selection of dead body⁷-

- 1) A dead body of any person having all its parts intact or existed.
- 2) Death is not due to any type of poison.
- 3) Not dead by any chronic disease.
- 4) Not of hundred years of age obtained.
- 5) Faeces present in the intestine should be removed.

Preservation of dead body: After selection of the dead body, it is wrapped either with *Munja* grass, *Valkala* (bark of tree), *Kusha* grass, *Shana* (cannabis plant) or any such material, tied well and placed inside a cage which is kept in a slow running water of river at a hidden or lonely place and allowed to undergo putrefaction⁸.

Dissection of the dead body: After seven days when body has become properly putrefied, it should be taken out from running water stream and removed its binding layers of grass, scrubbing the skin slowly with *Kurcha* (brushes) made by *Ushira* (vetiver grass), *Bala* (hairs), *Venu* (bamboo), *Valkala* (bark of tree) or any other similar material and observe all the external and internal parts or organs of the body with own eyes. The very minute or fine structures in the body which are not

possible to see with naked eyes or physical eyes can be seen with *Gyan Chakshu* and *Tapas Chakshu*⁹.

Modern method: Modern embalming techniques are not the result of any single practitioner but rather the collection of many decades or centuries of research, trial and inventions. A standardized version is followed by embalmer but variation on techniques is very common¹⁰. Chemical preservation method of the cadaver had a great measure of success with Egyptians for over three millennia. The main preservative used by them was Natron, a naturally occurring mixture of sodium carbonate and bicarbonate in varying proportions. This was used with aromatic compounds like balsams to preserve the dead body. The use of balms and balsams for preservation the process has gained the term embalming. This term presently signifies the treatment of the dead body with antiseptics and preservatives to prevent putrefaction. Embalming produces a chemical stiffening similar to rigor mortis and normal rigor does not develop. It is better to perform embalming within 6-12 hours of death in summer and 24-48 hours of death in winter¹¹.

Embalming Chemicals: Modern embalming is done with a solution of various different chemicals which is generated specifically for the needs of each case. This solution is called embalming solution which include followings¹²

Main Preservatives: These are commonly a percentage based mixture of formaldehyde, glutaraldehyde or in some cases phenol which are diluted with other chemicals. In anatomical preservation, 40% aqueous formaldehyde called formalin is commonly used.

Humectants: Glycerin, Sorbitol, Glycol or lanolin are used to hydrate the tissues. Glycerin is frequently used as a humectant.

Buffer: These help to maintain the acid base (pH) balance. Borax, sodium phosphate, citrate and sodium salt of EDTA (Ethylene diamine tetra acetic acid) are used as buffers.

Anticoagulants: Sodium citrate, sodium oxalate and sodium salt of EDTA are anticoagulants which retard the natural postmortem tendency of blood to become more viscous.

Dyes: Dyes or coloring agents give a specific color to embalming solution which helps to differentiate the artery from veins. Eosin, Erythrosine etc is used.

Perfuming agent: Oil of cloves, oil of sassafras, benzaldehyde, methyl salicylate

Ingredients	Proportion	Functions
1) Formalin	1.5 L	Preservative
2) Sodium citrate	900 gm	Anticoagulant
3) Sodium chloride	800 gm	Crystalloids
4) Sodium borate (Borax)	600 gm	Buffer
5) Glycerine	600 ml	Humectants
6) Soluble winter green	90 ml	Perfume
7) 1% Eosin	30 ml	Dye
8) Water	up to 10 L	Vehicle

Preservation techniques: Basic consideration rests in forcing the embalming fluid into the tissues through arterial injection, diffusion occurs into the cells and tissues for preservation at the capillary level. Method usually include¹⁴

Gravity injector: In this process, the gravity bottle containing embalming fluid is raised above the body level and fixed at a height. Other end of this bottle in which the needle or cannula is attached, is inserted into the artery.

Electric pump: Embalming fluid from an injection take is forced into vascular system through electric pump. The injection pressure is much better in this

or any perfuming agent reduces the harshness or foul smell of the solution and body.

Vehicles (Diluents): Water or alcohol serves as a solvent for the many ingredients that are incorporated into embalming solution.

Germicides or disinfectants: Chemicals which are used to kill microorganisms. Phenol, Ammonium compounds, glutaraldehyde etc are frequently used.

Typical composition of embalming solution: Different types of the chemical are the components of embalming solution which are mixed up with a fixed proportion but this proportion may vary case by case¹³.

method than the gravity injector method and therefore less time is required.

Injection method: Where in multiple sites of injections are required as in cases of traumatic death, autopsied cases and postmortem mutilations.

The actual embalming process usually involves four parts¹⁵

1. Arterial embalming: The injection of embalming fluid into the blood vessels, usually via the right common carotid artery. Blood is drained from the right jugular vein. The embalming fluid is injected using an embalming machine and the embalmer massages the cadaver to ensure a proper distribution of the fluid. In

case of poor circulation of fluid, other injection points are used.

2. Cavity embalming: The suction of the cavity fluids of the cadaver and the injection of embalming fluid into body cavities, using an aspirator and trocar.

3. Hypodermic embalming: The injection of embalming fluid under the skin by using hypodermic needle as needed.

4. Surface embalming: Which supplements the other methods especially for visible injured parts of the body.

Steps of embalming¹⁶

1. Preparing the embalming solution by using various chemicals in an appropriate ratio as need as.

2. Solution is to be kept in a jar above to the body level for gravity injection or in an embalming machine for pumping method.

3. Cotton pads are to be inserted into mouth, nose and ear to avoid any leakage.

4. Incision is to be made with scalpel in carotid triangle or in femoral triangle.

5. Identify the common carotid artery or femoral artery.

6. Cannula is to be inserted and fluid to be injected into the artery towards the heart.

7. The whole procedure may take 4-5 hours in gravity injection and few minutes in pumping method then cadaver is preserved in tank of 10% formalin solution, usually after 24 hours.

DISCUSSION: Acharya Sushrut has described the process of preservation and dissection of human dead body in very manner full sequence. Each and every point explained by him in many years ago is meaningful even at present time. While selecting a dead body for preservation, the criteria mentioned by Sushruta was very important. The dead body which is deprived of any of its part does not furnish correct and complete information. If dead

by any type of poison, the qualities of organs and tissues will have undergone abnormal changes in their texture, color etc. If dead by any chronic disease, the tissue and organs will have become emaciated, losing their normal qualities like size, shape, texture, appearance etc. If dead by very old age (more than hundred years) many issues and organs will have become shrunk in size and lost their qualities, appearance of wrinkles on the skin and face, falling away of teeth and hair, development of osteoporosis in bones, devoid of moisture and many such changes which are likely to be mistaken as normal. Removing the faeces from the intestine and surface of the body is to ward off offensive smell and for hygiene purpose. Wrapping the dead body with layers of grass may prevent damage of the body by fish and other aquatic animals. Placing the body inside a cage is to prevent the body from the flowing away in the stream of water and for protection from wild animals. Keeping the cage in a hidden or lonely place is meant the place which is not frequently used by common people, to avoid other persons who may interfere with the work of dissection. Allowing putrefaction for seven days is meant to make the body or skin soft and easy for dissection. Duration of seven days for completing the process of dead body preservation was probably sufficient for this purpose. Though putrefaction produces foul smell but it will be minimum in case of running water. Scrubbing the skin and other structures was being done with brushes of soft or hard bristles made by vetiver grass, hairs or *Valkala*. Thin and sharp pieces of Bamboo were being used to split and separate the hard structures like bones, muscles, ligaments, tendons etc.

Dissection starts from the scrapping of the skin because skin is the outermost layer of the body.

The term *Gyan chakshu* denotes the Knowledge obtained by study of various texts and *Tapas chakshu* denotes obtaining knowledge by penance or obtained from Acharya (teachers). The chemical components of embalming fluid used in modern embalming are variety of sterilization, disinfectant agents, perfuming agent, dyes, modifying agents (anticoagulants, buffer, and wetting agents) and preservatives. Embalming fluids provide a good structural preservation of organs and tissues together with retention of normal color of tissues and organs. They also prevent the fungal or bacterial growth.

Formaldehyde is bactericidal, fungicidal, and insecticidal and is an excellent tissue fixative. So, it is the chemical of choice for preservation of cadaver. Sodium borate has used as preserving agent and also works as insecticide, mild antiseptic or bacteriostatic. Phenol and its derivatives work against various bacteria, fungi and viruses due to its ability to denature and precipitate proteins. It is also effective to attack and destroy the cell wall due to its lipophilic property. Buffers act as pH balancing agents and afford protection against mould growth and bacterial decomposition. Glycerine is not only a humectant but also increases the efficiency of formaldehyde and enables the embalming fluid to enter all areas of the cadaver.

After 24 hours of injecting embalming fluid, the cadaver has kept in tank of 10% formalin solution. After some day's when dissection has to be started, the cadaver has taken out from tank. At present time various metal instruments like scalpel,

forceps, scissor, bone cutter, hammer, needle, probe etc are used for dissection. Scalpel is used to cut the skin and tissues. Forceps like artery forceps, thumb forceps, sharp forceps, and blunt forceps are used to grasp, hold and lift the delicate structures like membranes, vessels, nerves and muscles. Scissors are used to cut tough structures like tendons, ligaments etc.

CONCLUSION: Almost all the facts of modern embalming are same, as described by Acharya Sushrut but technique is different and advanced. Acharya Sushrut has used natural materials, instruments for preservation and dissection while modern science has used various chemicals and metal instruments for that. The purposes of both methods are same that are, to forestall decomposition and maintained the natural appearance of the dead body, so the process of dissection can be easily performed.

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