

A Review Article on Soft Embalming Methods in Ayurveda and Modern Science

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ABSTRACT

Rachna sharir is basic concept of Ayurveda and Acharya Sushrut was the first surgeon who discovered the method of preservation of body for dissection. Description of various internal structures which are limited externally by skin can be available for practical demonstrations only by dissection. An expert surgeon who wants to have a detailed knowledge of the sharira should preserve and dissect the body. The subject studied in literature, should be experienced in Practical. These two methods are complimentary to each other and enhance the entire knowledge. Sharir is defined as "*Shiryate tat shariram*". Meaning a *Sharir* is "a physiological entity where continuous process of degeneration is carried out itself". A sharir can't be preserved and available after death. But embalming made the sharir available to dissect after death.

KEYWORDS: Dissection, Human cadaver, Mritsanrakshan, Embalming

INTRODUCTION

Acharya Sushrut defined sharir as "Combined shukra and shonita in the womb mixed with eight prakriti and sixteen vikar, ridden in by Atma is garbha and is further divided by vayu, metabolized by Teja, bewetted by apa, condensed by Prithvi and developed by Akasha. Acharya Charak asserted sharir is a biological unit of conglomeration of the derivatives of Panchamahabhutas clasping the soul and it is the site of manifestation of consciousness". Panchamahabhutas are interrelated in a proper media and they are present in the state of inseparable cohesion during life. Acharya Sushrut has a vast knowledge of sharir i.e. human body, its rachna and surgery in that ancient time. He discovered this information by both inspection as well as dissection as he believed that a physician can only become perfect after having complete practical and theoretical knowledge. In spite of all restrictions in Indian society and the dead body is considered as untouchable and sacred acharya Sushrut was able to overcome the problem and made the cadaver available for the study of students and also discovered

the method of Mritasanrakshan to teach his students. Acharya Shushruta says that what we learn from our samhitas and teacher should be confirmed by practical experiments. A physician can only become perfect after having complete practical and theoretical knowledge. The subject studied in literature, should be experienced in Practical. These two methods are complimentary to each other and enhance the entire knowledge. An expert surgeon who wants to have a detailed knowledge of the sharira should preserve and dissect the body.

A body for the purpose of dissection should be selected with features as¹

- A body with all organs and parts undetached,
- Death is not due to poison
- Death not due to suffering from chronic disease.
- Dead body should not be too old i.e. approaching the age of 100 years
- Faecal matter should be removed from intestines of the body.

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Method of preservation²:

For preservation, this cadaver is kept in a cage tied with *Munja, Valkala, Kusha or Shana* and kept immersed in slowly but continuously flowing water in a dark place to protect it from animals. And also water from that resource is not consumed by humans. After seven days, confirming the softening of body tissues, the body is dissected by *kurch yantras* made of *Usheera, Venu, Twak and Baala*. Rub the body surface slowly to visualize all the internal and external structures properly. Acharya advised to avoid sharp instruments for dissection.

Here the preservation aimed and focused on the softening of cadaver and then rubbing the surface with blunt instruments and not using sharp instruments to cut and dissecting it.

Modern Era³:

Teaching of anatomy of human body is an integral part of study of Ayurveda, medicine, dentistry and all paramedical sciences. In modern era study of anatomy has to be carried out on the dead, preserved human body called cadaver in which texture and appearance of the structures and organs of the body has not been altered. The word cadaver is derived from the Latin word "**Cadre**" means "**to fall**".

Dissection of a well preserved human cadaver is a best method of learning anatomy of different parts of the body. The dissection is a time consuming process and the body remains exposed for several months without dehydration and decomposition. The dissected parts of the body are displayed in the museum and kept for years. Therefore, proper preservation of the cadaver is necessary to understand the structural integrity and topography of human body.

Traditionally most of the anatomy departments use formaldehyde based embalming methods. Though, Formalin provide a long term preservation of structures as it is bactericidal, fungicidal, and insecticidal and has excellent antiseptic properties; however it causes over hardening, drying, extreme rigidity and has an unpleasant odor. Along with it also has health hazards. The formalin based embalming has been used for decades in spite of the concerns related to its contribution to various health issues like skin allergies, irritation in eyes and throat and even asthma and cancer are detected in long term exposure. Cost effectiveness, efficiency of preservation and sustainability are the major factors for continued use of this technique. However this traditional formalin fixation has been found to be unsuitable for the purpose of surgical skills training due to lack of flexibility, elasticity of tissues and low preciseness.

The fresh frozen cadavers though offer a good alternative for surgical skills training but they deteriorate faster due to repeated thawing, can be used for short term only and carry a significant risk of infection.

In 1990 Professor **Walter Thiel** developed an embalming technique that produced life like soft and flexible cadavers and the procedure since then called Thiel soft fix embalming.

Soft embalming is an alternative to the traditional based preservation method consisting of water based mixtures, like

- Propylene glycol
- ammonium nitrate
- potassium nitrate
- sodium sulfite
- boric acid
- chlorocresol
- low amounts of formalin
- Along with alcohol and morpholine.

The cadaver thus produced are not only soft, pliable, flexible but can be kept for longer time and are suitable for surgical skill training procedures. The embalming process comprises of an initial perfusion followed by immersion in immersion fluid for at least two months. After that body is stored in plastic bag and kept in freezers at - 4c. The cadaver is embalmed by arterial infusion into carotid or femoral artery. The sloughing of keratin layer of skin marks the end point of the infusion. This preservation is effective in long term, with estimated viability of 36 months. Thus, this method of preservation allows multiple uses of cadavers, increasing availability and reducing the cost incurred.

ROLE OF VARIOUS CONSTITUENTS OF SOFT EMBALMING FLUID⁴

- **Formaldehyde:** It is bactericidal, fungicidal and insecticidal. It destroys putrefactive organisms when dissolved in a vehicle which allows it to permeate the organisms.
- **Boric Acid:** It works as insecticide or bacteriostatic and is responsible for modification of the integrity and alignment of muscle fiber.
- **Phenol /Carbolic acid:** It is used as a disinfectant, acts as excellent fungicide and bactericide; although it causes discoloration and dryness of tissues. Liquefied phenol is very effective in preventing molding.
- **4-Chloro-3-methylphenol:** It is used as an antiseptic and preservative agent. It is highly soluble and remains active over a wide range of pH.

- **Ethyl glycol:** It is used to preserve the moisture and tissue Plasticity in preserved cadaver.
- **Ammonium nitrate, Potassium nitrate and Sodium sulfite:** They absorb the water content of the tissues. The nitrate gives red color to the muscles
- **Alcohols:** It have bactericidal and bacteriostatic and also have antiviral, antifungal and antimycosal effects by acting on proteins and denaturing them.

The consistency, color and tactile feedback of procedures done on **Thiel soft fix embalmed cadavers** are reported to be almost identical to live procedures. They have been used for various skills training in surgery. They form a useful resource for surgical training in many specialties like gynecology, otolaryngology, anesthesia, orthopedics and oral surgery.

Advantages of Thiel soft fix embalmed cadaver

1. Excellent flexibility and tissue quality.
2. High standards of preservation without releasing harmful substances
3. Easy identification of muscles
4. Increased range of joint movements

Disadvantages of Thiel soft fix embalmed cadaver

1. High cost
2. Short lasting
3. Muscular disintegration
4. Difficult to handle due to increased pliability
5. Loss of anatomical impressions and landmarks.

Logan described a method where he used alcohol, glycerine, phenol, formaldehyde. **Coleman and Kogan** modified it by adding high component of salt (NaCl) and replaced alcohol with isopropyl alcohol.

Glutaraldehyde embalming⁵:

The main component of this embalming fluid is Glutaraldehyde, first shown by Nateker and De Souza to be used in preservation for surgical dissection. The embalmed fluid was modified by adding 2% glutaraldehyde, methanol, glycerine, cetrimide, eosin, eucalyptus oil and water. Cadavers thus preserved are found to be more pliable and realistic; all joints were flexible, with no evidence of fungal infection. The cadaver was used several times without refreezing for five years.

Formaldehyde free embalming solution⁶:

It included ethyl alcohol 25%, polyethylene glycol 20%, chloroxylenol 0.1% and sodium nitrate 10% was made 100% with water base. The embalmed specimen resembled living specimen and also there were no microbial activity over six months.

CONCLUSION:

Since the ancient time, as Maharshi Sushrut did thousands of years before the soft embalming was preferred that time and also today in present era. In this article many soft embalming methods has been discussed from ancient times to modern era. In Ayurveda the method of preservation was natural, simple and without any harmful effect but it is unlogistic in present era. Thiel embalming technique is found to be best in many parts of world but it is not so success in tropical countries like India

An ideal embalming fluid

- Should ensure that there is no risk of infection on contact with cadaver
- Should produce natural life like appearance to the body
- Should prevent contamination with molds, maggots, fungus and insects
- Should ensure prevention of putrification in body
- Should not have any unpleasant effect on skin and other organs on prolonged contact as formalin has.

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