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PLASTINATION AND DIFFERENT TECHNIQUE WITH AYURVEDIC CONCEPT FOR HUMAN DEAD BODY PRESERVATION– A CONCEPTUAL FRAMEWORK

CHAUHAN A[1*], WAHANE AS[2], SHARMA M[3] AND BANDAPALLE DN[4]

1: PG Scholar, Dept. of Rachana Sharir, Parul Institute of Ayurved, Parul University

2: Associate Prof. Dept. of Rachana Sharir, Parul Institute of Ayurved, Parul University

3: PG Scholar, Dept. of Rachana Sharir, Parul Institute of Ayurved, Parul University

4: Professor & HOD, Dept. of Rachana Sharir, Parul Institute of Ayurved, Parul University

***Corresponding Author: Dr. Annu Chauhan: E Mail: chauhanannu93@gmail.com**

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ABSTRACT

"Ayurveda, the national healthcare India system, is a rich resource of well-compile ancient medical knowledge". "The knowledge of this found in Vedic and post-Vedic eras, it is believed that a dedicated branch for healthcare were gradually established approximately between 400 BC and 200 AD". "According modern body preservation is the process of chemically preserved the dead body to decrease the presence and growth of microorganisms, in sequence to retard organic decomposition and restore acceptable physical appearance. "The first part have a short historical review of history of embalming, begning with old cultures such as Chinchorro culture, then going down the centuries and describing the anatomical techniques developed since last two centuries". "The second part deals in detail with embalming purposes by the chemicals". "The third part has many approaches to evaluating embalming methods, their suitability for biomechanical testing, antimicrobial properties etc". "The fourth and final part of embalming is European Biocidal Products Directive (98/8/EC) in the bright light".

INTRODUCTION

"The human dead body is a perfect educational tool as it is neither the student's 'first patient' nor a mere biological model". "Other methods like plastination techniques in recently used. The Anatomy Department has devised a modified short plastination' protocol, which is cost effective, needs minimal infrastructure, and gives remarkably well preserved specimens has provon" . It is a non-vital, mortal, and three-dimensional individual with a low health hazard and highly effective of haptic experience, relatively moderate costs according student. The student is not harmed by this process which is ethically sound good. If cadaver is kept safe from harm, and decomposition then Preservation can be considered appropriate,. This is attained by treating the cadaver with special chemicals, i.e. embalming. "Formaldehyde is the one of the most important chemicals used for this purpose. There is also the worried thing that formaldehyde can be embalming purposes by the Biocidal Products Directive 98/8/EC (European Parliament & Council, 1998). The target of this review article is give a brief overview of the history of embalming, compiling anatomical embalming procedures, identify and briefly describe the most important."

MATERIALS AND METHODS

Classical texts of Ayurveda viz. Sushruta, Charak, Vagbhat Samhita, Dalhan commentary, Chakrapani commentary were studied for research references of yogyavidhi, bandhvidhi, and anukatva. Literature available regarding modern simulation methods through various search engines as PubMed, Medline, Google Scholar was also collected. "These references are streams of knowledge were compared and analyzed critically."

DEFINITIONS[1,2]

"When we talk about human dead body preservation, the terminology has to be clarified."[1] Merriam-Webster's dictionary (http://www.merriam-webster.com/) defines preservation as an action to keep something 'safe from harm, destruction or decomposition', conservation is defined as the process of 'a careful preservation and protection of something', and finally embalmment is defined as the 'treatment (of a dead body) – with special chemicals – so as to protect from decay'.[1] These definitions show that while the terms "preservation" and "conservation" may be interchangeable. Whereas German speaking countries rely more often on the term 'conservation' of a

human body, in English the term 'preservation' is preferred. [2]

MEANING OF PRESERVATION[3,4,5]

Natural means of preservation Natural means of preservation include freezing, desiccation/ exsiccation either by dry cold or by dry heat, and the nature of the soil.[3] Artificial meaning of preservation comprise the application of simple heat or cold, powders, such as a sawdust bed mixed with zinc sulphate, drying, local incision and immersion, cavity injections."[4] Furthermore, simple immersion in alcohol, brine, etc., and sole arterial injection, which can be combined with cavity treatment and/or immersion, were use[5]

ANCIENT CONCEPT OF SIMULATION

1. **Yogyasutriya[6,7]-** "the credit of Ayurveda in Simulation- Sushruta devoted a complete chapter "Yogyasutriyam(practical training)" to make a student perfect for surgical work. In the view of Sushruta, though the student has understood the elements of the science fully."[6] He must be made competent (yogya) because by acquiring only theoretical knowledge." [6,7]
2. **Bandha[8] (Bandaging)-** "Bandha is bandaging due to which wound healing". "Fourteen name of bandaging viz, 1.Kosa 2. Dama 3. Svastika 4. Anuvellita 5. Mutoli (or pratoli) 6. Mandala 7. Sthagika 8. Yamak 9. Khatva 10. Cina 11. Vibhandha 12. Vitana 13. Gophana and 14. Panchangi." [8]
3. "**Mrutshodhan (Dissection)"[9,10]** – "Good knowledge of anatomy is a prerequisite for the practice of surgery.[9] The concept of experimental and practical training (yogya) by making use of experimental modules like a dummy, parts of dead bodies, and different natural objects; to gain proficiency in operative surgery."[10]
4. **"Anukatva"[11,12]**- "Animals as a Simulator- some technical difficulties also come in simulation technique such as physical findings like skin colour, eye color, mental behaviour, etc in the present era.[11] But before 200BC Sushruta describes skin colour, hairs, nails, eyes colour, voice, body structure, etc are animals simulator."[12]
5. "**Limitation of Simulation"[13,14]**- "advanced technology in the field of simulation comes Generation to generation . Sudden development of technology comes in 21st century."[13] "Though the current state of science

finds that simulation usually leads to improved knowledge and skills, learners and instructors express high levels of satisfaction with the method that was already told in ancient science, but several types of simulations are not affordable to many teaching hospitals."[14]

EMBALMMENT METHODS[15]

1. **Mummification [15,16]-** It was the Egyptians who developed this process in ancient times. It involves the removal of the brains and viscera, filling the body cavities with a mixture of balsamic herbs and other substances and then drying-out of the cadaver.[16]
2. **Arterial embalming[17]-** As a result of centuries of research, trial, error and invention, a standardized technique was now developed which involves four parts: the injection of embalming chemicals into the blood vessels usually via the right common carotid artery.[17]
3. **Cavity embalming[18]-** It is the suction of the internal fluids of the cadaver and the injecting embalming chemicals into body cavities by using an aspirator and trocar.[18]
4. **Surface embalming[19] -** This method is often used to supplement the other methods, especially for visible, injured body parts (Ezugworie et al., 2008; Batra et al., 2010). [19]
5. **Hypodermic[20]** embalming Is injecting embalming chemicals under the skin as needed (Ezugworie et al., 2008; Batra et al., 2010). [20]
6. **Thiel embalming method[21]** – "This has been developed and refined over the past three decades. The embalming fluids are based on water, glycol and various salts." [21]

PRESENT MODIFICATION IN PRESERVATION[22,23,24]

"The procedure of plastination has four steps, i.e., fixation, dehydration, impregnation and curing."[22],[23] Polymer to be used varies according to the type of specimen, type of tissue, and its consistency.[23] "Considering these limitations, an innovation in the protocol of plastination has been performed at the Plastination Unit, Department of Anatomy, Maulana Azad Medical College in 2006."[22]

"Dr. Neelam Vasudeva in 2006–2008 introduced the protocol for plastination was in Rachana sharira (Anatomy). Dr. Janakiram et al. in 1993 explain the plastination procedure. According to this

technique, the specimens were immersed in equal parts of quickfix and amyl acetate.[24] We, at the Department of Anatomy, Maulana Azad Medical College, are using a curable polymer epoxy resin to satisfactorily plastinate small parts of the limbs and transverse sections Regular annual workshops are conducted by our department to train the postgraduate students and faculty."[24]

FUNERAL PERIOD[25,26,27,28]

" In 1861 in the American Civil War,some modern embalming used for mere funeral purposes.[25] Additionally, cosmetic work is used to restore injured facial features or for aesthetic reasons. Thus a separation of the fields of embalming by funeral directors and embalming for medical purposes occurred and schools of embalming, especially in the USA, were established.[26] Now a days Embalming methods for funeral purposes now consist essentially of the removal of all blood and gases from the body; the viscera might be removed and immersed in an embalming fluid and are then replaced in the body, in which they are covered with a preservative powder." [27]

"In the 19th and early 20th centuries, arsenic was frequently used as an embalming fluid, but has since been supplanted by formaldehyde." [28]

OTHERS DIFFERENT TECHNIQUE OF BODY PRESERVATION

Technique	Advantages	Disadvantages	Long-term storage	Teaching (dissection)
"Salafia[29] (c. 1927)"	Longterm storage	Toxic	Extremely well, when the coffin is sealed	Not tested
"Kaiserling[30] (Pulvertaft, 1950)"	Good preservation of colour and form	Only for isolated specimens	Not applicable	Not applicable
"Jores [31] (1896, 1913)"	Easy storage	No data available	Satisfactory	Satisfactory
"Woodburne & Lawrence[32] (1952)"	Very active as fungicidal agent; soft and plastic; cheap	Medium brown colour	No data available	Highly satisfactory
"Peters[33] (1956)"	Good preservation of intestines; does not affect the dissector's skin; odourless;	No data available	Possible	Satisfactory

Technique	Advantages	Disadvantages	Long-term storage	Teaching (dissection)
	objects sty smooth and elastic; colour-preserving			
"Erskine[34] (1961)"	Soft and flexible	Nil	Sufficient Time of storage	Sufficient
"Richins et al.[35] (1963)"	Decreased rigidity; increased bactercidity and fungicidity; less browning	No data available	Successful for 2 years	No data available
"Dayton et al.[36] (1965)"	NIL	NIL	NIL	NIL
"Beck[37] (1966)"	N/A	N/A	N/A	N/A
"Tutsch[38] (1975)"	"Cheap; odourless"	N/A	N/A	"Satisfactory"
"Bradbury & Hoshino[39] (1978)"	Moderate degrees of movability and adequate degree of hardness […] for dissection	No adequate fixation of brains	No data available	Satisfactory
"Platzer et al.[40] (1978)"	Increased fungicidity; cheap	No data available	Almost unlimited, when vacuum packed	No data available
"Logan[41] (1983)"	Soft preservation; obviates excessive noxious fumes	No data available	Satisfactory	Facilitates micro-dissection
"Frølich et al.[42] (1984)"	Soft and flexible	Slight odour, headache, drowsiness; mild eye, nose and throat irritation	Up to 10 years	'Suitable'
"Frewein et al.[43] (1987)"	Smooth, colour-preserving	Fluid accumulations	No data available	Satisfactory
"Ikeda et al.[44] (1988)"	'Well fixed'	No data available	No data available	Satisfactory
"O'Sullivan & Mitchell[45] (1993)"	Formaldehyde vapour levels below COSHH limits; improved tissue preservation; more nature	No data available	Proved up to 2.5 years	Satisfactory

Technique	Advantages	Disadvantages	Long-term storage	Teaching (dissection)
	coloration			
"Macdonald & MacGregor[46] (1997)"	Less toxic	Grey hue of skin and muscles	No data available	Satisfactory up to 6 month
"Coleman & Kogan[47] (1998)"	Excellent preservative properties; minimal structural distortion; tissue supple; little desiccation; natural colours	No data available	No data available	Satisfactory
"Thiel[48] (1992, 2002)"	High colour preservation, smooth and flexible	Expensive; Disintegration of muscular tissue; limited time for dissection	No data available	High acceptance
"Powers[49] (2003)"	N/A	N/A	N/A	N/A
"Silva et al.[50] (2007)"	Laskowski: flexible	Laskowski: dark, loss of tissue texture,	N/A	Laskowski: less suitable for skin Modified Larssen: well accepted by students
"Barton et al.[51] (2009)"	Soft	N/A	N/A	More acceptance
"Mills[52] (2010)"	High mould preventiong	No data available	No data available	No data available
"Al-Hayani et al. [53] (2011)"	No structural distortion, not colour changes	Hardening outside the tank; > 2 days for re-softening	When waxed, possible	No data available
"Anichkov et al. [54] (2011)"	Natural appearance, odourless	No data available	Up to 1.5 years	No data available
"Janczyk et al. [55] (2011a)"	Neutral smell	Yellowish coloration; corrosion; Disintegration of abdominal organs	Up to 1 year	Limited usability
"Hammer et al. [56] (2012)"	Flexible tissues, aesthetic appearance; less toxic	Expensive	Up to 3 years	No data available
"Shi et al. [57] (2012)"	Less toxic, good preservative properties, low volatility		Up to 2 years	No data available
"Goyri-O'Neill et al. [58] (2013)"	Good coloration and	No data available	No data available	No data available

Technique	Advantages	Disadvantages	Long-term storage	Teaching (dissection)
	flexibility		**(good short term preservation ≤ 6 month)**	

DISCUSSION

- The short protocol for body preservation is cost-effective, less time-consuming, nontedious, and can be easily performed with a simple setup without using costly equipment such as vacuum chambers and deep freezer.
- The specimens, obtained over the period of 5 years in our department, have retained their life-like appearance without any decay.
- The computerized reconstruction of pelvic floor plastinates has proven useful for various medical specialists such as gynecologists, urosurgeons, and radiologists.
- Further research is in the line to innovate protocols for preservation of brain slices. Customized vacuum chambers instead of currently available expensive industrial vacuum chambers are being considered for upcoming research work on.

CONCLUSION

- Despite the strengths and weaknesses of the various embalmment techniques, the modern embalming techniques have proven to be more effective than the ancient techniques.
- Since without the body decomposing by autolysis and putrefaction these modern methods can keep a body intact for decades without the body decomposing by autolysis and putrefaction.

RESEARCH SIGNIFICANCE

The study highlights the efficacy of "Ayurveda" which is an ancient tradition, used in some parts of India.

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