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EMBALMING AND OTHER METHODS OF DEAD BODY PRESERVATION

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Abstract

Embalming is the process of preserving a human dead body with the purpose of postponing decomposition for as long as possible. It is a process intricately entwined with centuries of human history .Embalming is both an art and science. The treatment of the dead body with aqueous solutions of soluble germicidal and preservative chemicals by way of vascular and a cavity injection to prevent putrefaction is called embalming. In this paper we have discussed the various methods of preservation of dead bodies in detail along with the new advances.

***Keywords**: Embalming; Putrefaction; Preservation and Dead body.*

Introduction

Embalming is the process of chemically treating the dead human body to reduce the presence and growth of the microorganisms, to retard organic decomposition and to restore acceptable physical appearance[1].The use of balms and balsams to impregnate the dead body for preservation has gained the name embalming. Embalming causes the coagulation of tissue proteins that get fixed and hardened.

Embalming is restored:

1. In medical colleges to preserve the dead bodies for the purpose of dissection.
2. When the dead body has to be transported from one country to another for burial or cremation and the time taken in transit is such as would ordinarily lead to decomposition.
3. Necessity to preserve the dead body of some important personality for public view.

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History of Embalming

In classical antiquity perhaps the old world culture that had developed embalming to the greatest extent was that of ancient Egypt probably before 4000 BC and was used by them for more than 30 centuries. It was Egyptians who developed the process of Mummification.[2]

Steps of Mummification

1. The brain and internal organs were removed and placed into canopic jars.
2. The heart was left inside of the body because the Ancient Egyptians believed the heart controlled all thoughts, memories and intelligence.
3. The body was covered in a salty substance called Natron then left to dry out for 40 days.
4. The body was then filled with sawdust to lessen the limp and lifeless appearance
5. The body was then bathed in wine and spices, wrapped in linen and left for an additional 30 days
6. Once mummified, the bodies were placed in a mummy case, then in a coffin and then in asarcophagus.[3]

Important Embalmings

- Late British royal Diana princess of Wales was embalmed on the orders of British authorities to prevent tests which could have confirmed whether or not she was carrying her lover Dodifayed's child.[4]
- Soon after January 21, 1924, the day that Lenin died, the *Soviet* government received more than 10,000 telegrams from all over Russia, which asked the government to preserve his body somehow for future generations. On the morning of January 23, Professor *Alexei Ivanovich Abrikosov* — a prominent Russian *pathologist* and *anatomist* [5]
- When ***Abraham Lincoln's*** body was embalmed, the embalmer preserved it for the long term. At the turn of the century it was disinterred for forensic study, revealing a perfectly preserved corpse.[1]

Modern Embalming

Embalming as practiced in the funeral homes of the western world uses several steps. Modern embalming techniques are not the result of a single practitioner but rather the accumulation of many decades, even centuries of research, trial, error and invention. A standardized version follows below but variation on techniques is very common.[1]

The actual embalming process usually involves four parts:

1. **Arterial embalming:** It involves the injection of embalming chemicals into the blood vessels usually via the right common carotid artery. Blood is drained from the right jugular vein. The embalming solution is injected using an embalming machine and the embalmer massages the cadaver to ensure a proper distribution of the embalming fluid. In case of poor circulation other injection points are used.
2. **Cavity embalming** : 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.
3. **Hypodermic embalming**: Is injecting embalming chemicals under the skin as needed.
4. **Surface embalming**: Supplements the other methods especially for visible, injured body parts. [6]

Embalming Chemicals

Different types of the chemicals are the components of embalming fluid. These are:

1. **Preservatives:** These are the chemicals which inactivate saprophytic bacteria rendering it unsuitable media upon which such bacteria thrive. This arrests decomposition by altering enzymes and lysins of the body. These are a mixture of formaldehyde, glutaraldehyde and phenol. Formalin refers specifically to 37% aqueous formaldehyde.
2. **Germicides (disinfectants):** Chemicals used to kill microorganisms e.g. quaternary ammonium compounds (Roccal, Zephiran Chloride) and glutaraldehyde.
3. **Modifying agents**: These include buffers, humectants and inorganic salts. These agents influence the chemical reactions produced by preservative solution and function in embalming fluids to control the action of main preservative agents.
4. **Buffers**: They help to maintain acid base balance (pH) e.g. Borax, Sodium phosphate, Citrates and Sodium salt of EDTA (Ethylene diamine tetra acetic acid)
5. **Inorganic salts**: They play an important role in determining the osmotic qualities of embalming solution.
6. **Humectants:** they are used to hydrate the tissues e.g. Glycerol (Glycerine), Sorbitol, Glycol (Ethylene and Propylene glycol) and Lanolin.
7. **Anticoagulants***:* They retard the natural postmortem tendency of blood to become

more viscous e.g. sodium citrate, sodium oxalate and sodium salt of EDTA (Chelate).

8. **Surfactants:** These are the chemicals that reduce the molecular cohesion of a liquid so that it may flow through smaller apertures e.g. Sulfonates (alkyl sulfonates or alkyl aryl sulfonates and sodium Lauryl sulfate).

9. **Dyes (coloring agents):** they impart a definite color to the embalming solution e.g. Eosin, Ponceau Red, Erythrosine and Amaranth.

10. **Perfuming agents/Masking agents/ Deodorants:** they reduce the harshness or raw odour of the solution e.g. Benzaldehyde, Oil of cloves, Oil of Sassafras, Methyl Salicylate.

11. **Vehicles (Diluents):** liquids that serve as a solvent for the numerous ingredients that are incorporated into embalming fluids e.g. water, alcohols (methyl alcohol, glycerol).[1] These chemicals are combined in various concentration to produce:

    a) Vascular (arterial fluids) for injection into the arterial system during vascular embalming.
    b) Cavity fluids (these are injected into the cavities of the body.
    c) Supplementary fluids.
    d) Jaundice fluids (special vascular fluid with special bleaching and coloring qualities of use on body with jaundice).
    e) High preservation demand fluids.
    f) Accessory chemicals.[2]

Purpose of Embalming

- To temporarily preserve human remains to forestall decomposition and make it suitable for display at a funeral.
- Embalming for anatomical research and study. The cadavers are always very well fixed so that they can be used for not only anatomical dissection but also research for the vascular system by vasography, kinematics of the joint and other histologic examinations.

Medicolegal Considerations

Embalming alters the appearance of the body, tissues and organs making it difficult to interpret any injury or disease, detection of certain poisons (especially alkaloids and organic poisons) is rendered difficult. Hence, removal of specimens from such bodies should be completed before embalming. Embalming incisions may be mistaken for non existent antemortem stab wounds. Skin bruises may be markedly accentuated due to increased transparency of the overlying skin resulting from perfusion with fixative.

In a medicolegal case, conducing embalming before autopsy invites liability under section 201 IPC (causing disappearance of evidence of offence or giving false information to screen offender). Any disrespect of the corpse invites applicability of section 297 IPC. The Anatomy Act provides for the collection of a dead body for teaching purpose only if death occurs in a State Hospital or in a Public Place within prescribed zone of a medical institution provided the police has declared (after a lapse of 48 hours) that there are no claimants for the body and it could be used for medical purpose. [7]

Hazards of Embalming

Johns Hopkins researchers have reported the first known case of tuberculosis (TB) transmitted from a cadaver to an embalmer.[8] Infectious HIV has been reported in the pleural fluid, pericardial fluid, and blood of such patients after storage at 2°C for up to 16.5 days post mortem.[9] There is also reported case of HIV recovered from bone fragments, brain, bone marrow, spleen, and lymph nodes from a patient with AIDS at autopsy six days after death[10]. An accidental injury may occur during embalming causing occupational HIV infection.[11] The most frequently used fixatives and disinfectants are ethanol, formalin, and phenol. In suspension tests, 25 percent ethanol and 0.5 percent formaldehyde were shown to be effective against HIV[12].

Anatomical Exhibitions

These have been proliferating in North America since the Los Angeles debut of Body Worlds in 2004. The human bodies in the exhibitions undergo a process of polymer impregnation or plastination that replaces body fluids with various polymers that impede organic decay. Exhibitions continue to be very popular, expanding their presence from museums to science centers and casinos. "Bodies... The Exhibition" opened in spring 2007 at the Tropicana Resort and Casino in Las Vegas, Nev, alongside the Folies Bergère and "Xtreme Magic Starring Dirk Arthur. The goal of this exhibition is ambitious yet simple: to educate the public and to change the way people look at the human body.[13]

Uses of Plastination as a Method of Preservation of Dead Bodies

Plastination allows students to have hands on experience in this field without exposure to chemicals such as formalin.[14] Plastination of soft tissues, organs, bones and teeth has proved valuable in preserving delicate, friable and calcined specimens. The dry, odourless and biological inert specimens are durable and resistant to damage caused by frequent handling. Patterned injury may change due to shrinkage, but remain easily recognizable. Plastinated whole jaws are easily identifiable from Ante mortem records. Radiograph density is unchanged and putrid and charred specimens become manageable. In Medico-Legal cases, these specimens may be used for accurate identification and preservation of important material.[15] Body preservation method current to the 21st century is cryopreservation.

Cryopreservation is a process where *cells* or whole *tissues* are preserved by cooling to low sub-zero *temperatures,* such as (typically) 77 K or "196 °C (the boiling point of *liquid nitrogen*). At these low temperatures, any biological activity, including the biochemical reactions that would lead to *cell death,* is effectively stopped. However, when *vitrification* solutions are not used, the *cells* being preserved are often damaged due to *freezing* during the approach to low temperatures or warming to room temperature.[16]

Conclusion

Embalming in most modern cultures is the art of temporarily preserving human remains to retard decomposition and make it suitable for display at a funeral and important of all a science of preserving human body for anatomical research and study.

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