Improving the Embalming Protocol under Non-ideal Conditions

MOHD AZRUL ASUAD MOHD ZAIN, MOHD HAIRULHISYAM NGATIMAN & FADLUL AZIM FAUZI MANSUR

ABSTRACT

Preservation of cadaver for educational purposes are central in anatomical education. The embalming process is a standardized protocol involving fixatives such as chlorine and alcohol-based preparations. Under ideal conditions of temperature and humidity, cadavers stored in storage fluid may last a long time. However, under an increase in temperature and humidity such in poorly ventilated rooms or with direct sunlight exposure, mold infestation may occur resulting in deterioration of preservation quality notable by malodorous cadaver or greenish change in storage fluid. We experimented with different combinations and volumes of storage fluid to achieve an effective protocol for cadaver preservation under non-ideal conditions of humidity and temperature. An addition of 200ml phenol to standard protocol for storage fluid preparation resulted in well preserved cadaver free from mold infestation. Phenol volume of less than 200ml or the addition of other fixatives such as chloroform in volumes exceeding the standard protocol value was not effective. Addition of 200ml phenol to storage solution standard protocol was effective against mold for cadaver preservation under non-ideal conditions.

Keywords: phenol, embalming, cadaver

INTRODUCTION

Preservation of cadaver for educational purposes are central in anatomical education (Mayer 2012). The embalming process is a standardized protocol involving methyl alcohol and a small amount of formalin as fixatives, ethylene glycol as a preservative, and liquefied phenol as a mould preventive (Macdonald & Macgregor 1997). Under ideal conditions of temperature and humidity, cadavers stored in storage fluid may last a long time. However, under an increase in temperature and humidity such in poorly ventilated rooms or with direct sunlight exposure, mold infestation may occur resulting in deterioration of preservation quality notable by malodorous cadaver or greenish change in storage fluid (O'Sullivan & Mitchell 1993). Improvements from standard protocol have been proposed involving low formaldehyde component (Coleman & Kogan 1998) and even completely different solution like saturated salt solution (Hayashi et al. 2014). We describe a novel approach based on phenol volume for long lasting cadaver preservation.

MATERIALS AND METHODS

We experimented with different combinations and volumes of storage fluid to achieve an effective protocol for cadaver preservation under non-ideal conditions of humidity and temperature.

RESULTS

An addition of 200ml phenol to standard protocol for storage fluid preparation resulted in well preserved cadaver free from mold infestation (Table 1). Phenol volume of less than 200ml or the addition of other solutions were not effective (Table 1).

Table 1. Addition of chemical compounds used for embalming

Chemical compound	Volume (ml)	Storage solution condition
Phenol	100	moldy
Glycerin	100	oily
Metallic spirit	100	moldy
Phenol	200	clear

DISCUSSION

The successful addition of 200ml phenol to the standard protocol in preserving cadaver may be attributable to phenol's antifungal property (Mayer 2012). However, the effective volume at 200ml of phenol is not known but may be attributable to its solubility (Sherma & Rieman 1958). The failure use of other solutions such as Glycerin and metallic spirit may be due to their lack of of antifungal property. While others may resort to drastic different embalming solutions like saturated salt (Hayashi et al 2014), we managed to propose a simple, yet effective innovation based upon standard protocol to improve cadaver preservation under non-ideal condition of increased temperature and humidity.

CONCLUSION

Addition of 200ml phenol to storage solution standard protocol was effective against mold for cadaver preservation under non-ideal conditions.

MOHD AZRUL ASUAD MOHD ZAIN
MOHD HAIRULHISYAM NGATIMAN
FADLUL AZIM FAUZI MANSUR*

Faculty of Medicine and Health Sciences,
Universiti Sains Islam Malaysia,
Pandan Indah, Kuala Lumpur,
Malaysia

*Corresponding author: fadlul@usim.edu.my

REFERENCES

Coleman, R., & Kogan, I. (1998). An improved low-formaldehyde embalming fluid to preserve cadavers for anatomy teaching. *The Journal of Anatomy*, *192*(3), 443-446.

Hayashi, S., Homma, H., Naito, M., Oda, J., Nishiyama, T., Kawamoto, A., & Mashiko, K. (2014). Saturated salt solution method: a useful cadaver embalming for surgical skills training. *Medicine*, *93*(27).

Macdonald, G. J., & MacGregor, D. B. (1997). Procedures for embalming cadavers for the dissecting laboratory. *Proceedings of the Society for Experimental Biology and Medicine*, *215*(4), 363-365.

Mayer, R. G. (2012). *Embalming: history, theory, and practice*.

O'Sullivan, E., & Mitchell, B. S. (1993). An improved composition for embalming fluid to preserve cadavers for anatomy teaching in the United Kingdom. *Journal of anatomy*, *182*(Pt 2), 295.

Sherma, J., & Rieman III, W. (1958). Solubilization chromatography: Phenols and Alcohols. *Analytica Chimica Acta*, *18*, 214-220.