Comparison of the effects of formaldehyde used in plastinated and embalmed cadavers on medical student in anatomy laboratory in Basrah medical college .

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ABSTRACT:

A total of 224 medical students were rolled in a prospective study to compare the effect of formaldehyde in embalmed and plastinated cadavers on medical students. The study was conducted in Basrah medical college at 2009-2010 . Questionaire were used to study the effect of exposure of medical students to formaldehyde at department of anatomy. The results indicate the effect of formaldehyde used in embalmed cadavers is more than in plastinated cadavers. 66.38% of the students used embalmed cadavers and 8.99% of the students used plastinated cadavers developed eye symptoms like (itching ,burning ,lacrimation) , 14.69% of the students used embalmed cadavers and 12.77 % of the students use plastinated cadavers developed nose symptoms like (irritation ,running nose ,sneezing) 31.14% % of the students used embalmed cadavers and 7.36% the students use plastinated cadavers develop respiratory tract symptoms (sore throat ,cough) ,15% of the students used embalmed cadavers and 5.72% of the

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students used plastinated cadavers developed skin symptoms (itching ,dryness) ,33.9% % of the students used embalmed cadavers and 8.99% of the student used plastinated cadavers developed central nervous system symptoms (headache ,nausea ,vomiting) .

INTRODUCTION:

Formalin is a colorless irritant fluid which gives out pungent formaldehyde vapors and is widely used during disinfection procedures or embalming of bodies in medical fields [1,2] . The primary rout of exposure to formaldehyde is by inhalation It is gas at room temperature and is readily absorbed by lung and gastrointestinal tract and to a much lesser extent through the skin[3] . Cadaver preservation is the process of chemically treating a dead human body or its parts to protect them from the process of decomposition .Some preservation methods confer temporary protection ,such as traditional embalming method ,other such as plastination create permanent or semi permanent protection which may last several year [4].

Embalming is carried out by injection of the embalming fluid into the circulatory system usually through the carotid or femoral artery The blood is simultaneously forced out of the body [5]. The active ingredient in the embalming fluid is formaldehyde 40%,which fixes the soluble albumin in the cell and at the same time it kills most of microorganism in the body[6]. Plastinationis a method used to preserve bodies or body parts. The water and fat are replaced by certain plastics ,yielding specimens that can be touched, without smell , don't decay ,and retain most properties of original sample[7].There are four steps of plastination. Formaldehyde is used in one of these steps which is the step of embalming and anatomical dissection .The usual fixative agent is

formaldehyde solution which can be used to achieve the effect of fixation [4]. Formaldehyde vapors are emitted from cadavers during dissection and significant exposure of staff and students has been reported [8] .

Formaldehyde is highly reactive compound and very strong irritant [9]. The literature on formaldehyde contains reports on dermatitis and asthma [10] on industrial exposure to formaldehyde, only a few mention effect on medical student following exposure to formalin[11]. Respiratory symptom like running nose ,sneezing and sore throat , eye irritation and nerve toxicity following formaldehyde exposure at low concentration has been reported[12] [13] . Formaldehyde can cause asthma and contact dermatitis [14] . A recent review of studies has shown a strong association between exposure to formaldehyde and the development of childhood asthma [15] . Chronic exposure at higher levels, starting at around 1.9 ppm, has been shown to result in significant damage to pulmonary function resulting in reduced maximum mid expiratory flow and forced vital capacity [16].WHO international Agency For Research on cancer (IARC) ,in 1995 ,also classified it as a probable human carcinogen ,further information and evaluation of all known data led the IARC to reclassify formaldehyde as a known human carcinogen [17] .

Material and method

The study was conducted in the department of anatomy of Basrah medical college. The study groups includes 244 student divided in to two groups. The group of the first year consists of 122 students 80 female and 42 male used plastinated cadavers in their study and 122students 80 female and 42 male of the second year used embalmed part in their study .Any student having history of allergy, cough respiratory or skin disease was excluded from the study. The average duration exposure of the cadavers in the dissection hall was 3hrs/week for 5 month .The response from the students were collected and noted.

Results:

A total of 244 medical students of the first and second class were enrolled in

the study 160 female (80 from each class) and 84 male (42 from each class) . On comparison of various effect due to formaldehyde exposure on the two groups ,the results in(Table 1) shows that the students deal with the embalmed cadaver develop adverse reaction after exposure to the formalin , 66.38% develop eye symptoms , 44.69% develop nose symptoms ,31.14% develop respiratory tract symptoms ,15% develop skin symptoms and 33.9% develop CNS symptoms . The students deal with plastinated cadaver develop adverse reaction to less than those deal with embalmed cadavers ,8.99 % develop eye symptom ,12.27% develop nose symptoms ,7.36% develop respiratory symptoms ,5.72% develop skin symptoms and 8.99 % develop CNS symptoms . Table 2 shows comparison between male and female in the adverse effect after exposure to formalin in both group .

.Among the students deal with embalmed cadaver 76.2% of female and 47.6% male develop eye symptoms,43.75% of female and 26.18% of male develop nose symptoms, 31.25%of female and 30.94% of male develop throat symptoms ,18.75% of female and 16.62% develop skin symptom and 36.25% of female and 27 .76% of the male develop CNS symptoms. Among the students deal with plastinated cadaver 10% of female and 6.9% of male develop eye symptoms ,12.5 of female and 11.9 % of male with nasal symptoms , 7.5% of female students and 4.76 of male students develop respiratory symptom ,6% of the female and 4.76% of male develop skin symptom 8.75 % of female and 9.36% of male develop CNS symptoms .

Table (1)Shows the comparison of the effect of formaldehyde between the students used embalmed and plastinated cadavers.

Area affected	Effect	Embalmed	Plastinated	P value
Eye	Itching	20(16.39%)	5 (4.09%)	0.491
	Burning	45(36.88%)	3 (2.45%)	0.240
	Lacrimation	16(13.11%)	3 (2.45%)	0.587
NOSE	Irritation	12(16. 83%)	5 (4.09%)	0.505
	Running nose	23(18.85%)	6 (4.91%)	0.434
	Sneezing	11(9.01%)	4(3.27%)	0.701
Respiratory tract	Sore throat	23(18.85%)	4(3.27%)	0.454
	Cough	15(12.29%)	5(4.09)	0.611
Skin	Itching	9(4.35%)	3(2.45%)	0.873
	Dryness	13(10.65%)	4(3.27%)	0.664
Central Nervous System	Headache	30(24.90%)	5(4.09%)	0.318
	Nausea	6(4.91%)	3(2.45%)	0.863
	Vomiting	5(4.09)	3(2.45%)	0.882

Table (2)Shows the comparison of the effect of formaldehyde between male and female students used embalmed and plastinated cadavers .

Area affected	Effect	Embalmed		Plastinated	
		Female	male	Female	Male
Eyes	Itching	15(18.7%)	5(11.90%)	4(5%)	1(2.3%)
	Burning	35(43.75%)	10(23.8%)	2(2.5%)	1(2.3%)
	Lacrimation	11((13.75%)	5(11.9%)	2(2.5%)	1(2.3%)
Nose	Irritation	10(12.5%)	2(4.76)	3(3.75%)	2(4.76)
	Running nose	16(20%)	7(16.66%)	4(5%)	2(4.76)
	Sneezing	9(11.25%)	2(4.76%)	3(3.75%)	1(2.38%)
Respiratory	Sore throat	16(20%)	7(16.66%)	3(3.75%)	1(2.38%)
	Cough	9(11.25%)	6(14.28)	3(3.75%)	1(2.38%)
Skin	Itching	6(7.5%)	3(7.1%)	2(2.25%)	1(2.38)
	Dryness	9(11.25%)	4(9.52%)	3(3.75%)	1(2.38%)
Central Nervous System	Headache	20(25%)	10(23%)	3(3.75%)	2(4.76%)
	Nausea	5(6.25.%)	1(2.38%)	2(2.5)	1(2.3%)
	Vomiting	4(5%)	1(2.38%)	2(2.5)	1(2.3%)

Discussion:

Our results show that the first excruciating symptom of formalin is irritation to eye and respiratory tract. Our study showed that 66.38% of the students deal with embalmed cadavers and 8.99%of students deal with plastinated cadavers develop allergic reaction in the eyes in a form of

lacrimation and burning sensation due to daily exposure to formaldehyde. .It was reported that redness of the eyes is one of the most common complaints after exposure to formaldehyde [18] . This result goes with a report from Belgium and India observe that excessive exposure to eye could lead to poor vision later in life[19].Our observation showed that 44.69% of the students deals with embalmed cadavers and 12.27% of the students deals with plastinated cadavers develop running nose due to its unpleasant irritated smell and acute reaction of the mucosa of the nose to the formaldehyde and increase the rate of mucous production and ciliary activity. It was reported that the first excruciating symptom of formaldehyde was its unpleasant smell[18]. A report in Japan shows that formaldehyde considered to be a probable cause of nasopharyngeal tumors in human [18] .It was observed that respiratory tract irritation was more pronounced after acute exposure to formaldehyde vapor[9] .

About 31.14% of the students of the second year and 7.36% of the students of first year develop respiratory tract symptom due to inhalation of formaldehyde vapour which lead to shortness of breath and irritation of upper respiratory tract in a form of dryness of throat and cough .Our results goes with work done in Vienna showed that inhalation of fumes of formaldehyde caused shortness of breath ,mild irritation of upper respiratory tract and comprised pulmonary function[20] . Recent review of studies has shown a strong association between exposure to formaldehyde and the development of childhood asthma [7].and also significant damage to pulmonary function [17]. The study showed that 15% of the students of the second year and 5.72% of the first year students develop skin reaction in a form of ,erythema ,scale and dry skin .It was seen that one of the most common effect of formaldehyde is the skin related disease [18] ,and this is the reason for protective wears in the hand and other part of the body .

Formaldehyde also affects CNS in a form of dizziness and headache [18].Our study showed that 33.9% of the second

year students and 8.99% of the first year students develop headache, nausea and vomiting.

Conclusion

This study demonstrate the effect of the formaldehyde on the eyes, nose ,respiratory system ,skin and central nervous system on the medical students which is more among the students used embalmed cadavers but there is no difference between male and female.

These effects can be reduced by :

1. Good exhaust ventilation systems
2. The use of gloves apron and mask
3. The use of less toxic chemical for embalmment and plastination

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مقارنة تأثيرالفورمالين المستعمل في الجثث المحنطة والمجبسة على الطلاب في مختبر التشريح في كلية طب البصرة

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الخلاصة

224 طالب من طلاب كلية الطب طووا في دراسة مستقبلية لمقارنة تأثير الفورمالين عليهم الموجود في الجثث المحنطة والمجبسة ولقد اجريت الدراسة للفترة 2009-2010 في مختبر التشريح لكلية طب البصرة. تشير النتائج الى ان تأثير الفورمالين الموجود في الجثث المحنطة اكثر من الجثث المجبسة حيث ظهر ان 66.38% من الطلاب الذين يستخدمون الجثث المحنطة و8.99% في الجثث المجبسة ظهرت عليهم علامة حكه, حرقة في العين و 44.69% من الطلاب ظهرت عليهم علامة عطاس او رشح في الجث المحنطة و 12.77% في الجثث المجبسة و 31.14% ظهرت عليهم اعراض في الجهاز التنفسي (التهاب الحنجرة, السعال) في الجثث المحنطة و7.36% في الجثث المجبسة و15% ظهرت عليهم اعراض جلدية (حكة,جفاف الجلد) في الجثث المحنطة و5.72% في الجثث المجبسة, و33.9% ظهرت اعراض عى الجهاز العصبي المركزي (صداع,غثيان قئ) في الجثث المحنطة و 8.99% في الجثث المجبسة.