Original Research Paper

Time Passed since Death from Degenerative Changes In the Lung

[1]Vinita Kushwaha, [2]Harnam Singh, [3]Mukesh Yadav, [4]A.K. Srivastva, [5]Asha Agarwal

Abstract

Time since death is made out from gross postmortem changes like cooling of the body, postmortem staining, rigor mortis, decomposition etc. In the present study Histological changes in the lung tissue were studied at various postmortem intervals in the human body died due to road traffic accidents. This study is conducted in the Department of Forensic Medicine in collaboration with Department of Pathology, G.S.V.M. Medical College, Kanpur, U.P. A total of 45 cases are taken belonging to both sexes i.e. 36 males and 9 females were studied. These are of different age groups.

All road traffic accidents are taken into account. In this study control cannot be taken because the histological changes of tissue after death is influenced a great deal by atmospheric temperature and humidity besides other external and internal factors. Therefore these must be taken into account in all studies of postmortem interval whether histological, biochemical or physical.

Key Words: Lung, Interstitial oedema, Alveoli, Bronchiolar epithelium, Hyaline cartilage

Introduction:

Estimation of time since death is one of the most important object of post-mortem examination. Time passed since death continues to be a major problem for the Forensic pathologist and its determination plays an important and vital issue in medico-legal cases because of the fact that Forensic experts are very often required to answer questions relating to time of death in the courts of law.

The traditional methods of ascertaining the time since death based on naked eye observations of the gross changes in a dead body occurring after death to provide a rough approximation of post mortem interval, at best only and would appear to be still the closest approximation of the time passed since death in a given case.

Corresponding Author:

[1]Associate Professor, Dept. of Forensic Medicine, Muzaffarnagar Medical College, Muzaffarnagar;U.P
E-mail: drvinita7@rediffmail.com
[2]Prof & HOD, Dept. of Forensic Medicine MMC,Muzaffarnagar;U.P
[3]Dean/Principal
Siddhant School of Medical Science and Hospital Mainpuri, UP
[4]Prof& HOD, Dept. Forensic Medicine Subharti Medical College, Meerut
[5]Prof, Dept. of Pathology,
G.S.V.M. Medical College, Kanpur, U.P
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These various gross changes in the body after death are loss of corneal reflex and changes in eye, cooling of the body, post mortem hypostasis, rigor mortis, decomposition and other putrefactive changes.

Some clue of time of death is also gathered from the condition of food in stomach, intestine and urine in bladder. Attempts have also been made to determine time passed since death by studying biochemical changes in blood, CSF and intraocular fluids. The biochemical methods have been found to be of not much use once the decomposition changes start.

The problem worsens when body is mutilated, skeletonized or invaded by animals. Time bound histological and histo-chemical study of degenerative changes in various organs and tissues may be a good solution. [1-3]

Forensic pathologist throughout the world are trying to establish time passed since death by studying degenerative changes in organs and tissues at different intervals but definitive conclusion is still awaiting.

The histological studies on various tissues after death have been mostly confined to single organ or tissue by individual workers at different atmospheric conditions. [4]

Moreover very few workers works based on histological studies of post mortem tissue changes appears to have been undertaken by Indian and more so in Utter Pradesh. Since only a single organ was studied by most workers, any comparative evaluation of the varying rate of

decomposition of the different organs and tissues cannot be made out.

Material and Method:

Material for the present study is lung, taken directly from the dead bodies during post-mortem examination.

Only those cases where the time of death is known and verified either by the doctors or by relatives & friends present at the time of death and also supported by postmortem changes, have been taken for the study.

Thus, bodies found unnoticed will not be Studied, precautions will also be taken to exclude the cases having pathology affecting the cellular architecture or biochemical constituent of the material. Such tissues thus collected, sliced and fixed in 10% formalin for histological study.

Total 45 cases, in which 36 male and 9 female were studied. These are of different age and sex. All road traffic accidents are taken into account.

Collection of Organs:

These organs were then kept in 10% formalin for 24-48 hrs for fixation. Small pieces or blocks of tissues each 1-2 mm thick were taken for histological examination and were processed by the routine methods of processing for histological studies by fixation, dehydration followed by embedding in paraffin wax. [4-6]

The paraffin sections of tissues were labeled during the process of block making in the following manners from case:

1st case to 45th: lung from the blocks of tissues, sections were cut at 4-5 mu thickness with a rotating microtome. The sections were then placed in warm water at 50^{0}C in a tissue floatation bath for spreading out and were then mounted on glass slide smeared with albumin glycerin solutions. The slides were stained by reactive haematoxylin and eosin stain.

The stained slides were examined under light microscope for studying the various histological changes that take place in lung tissue at different time intervals after death. [7-9]

Plan of Study:

In this study total 45 cases of road traffic accident are taken. These cases are of different age and sex. The case in which time passed is known has taken.

The environmental temperature and humidity is recorded from newspaper from which average temperature is drawn. The average temperature ranges between 20^{0}C to 35^{0}C, humidity between 45% to 92% and duration range was 7-34 hrs. Now this temperature range and Duration is divided in 4 and 5 groups respectively (Table 1 & 2)

Now these 45 cases are studied with the effect of temperature and duration. First gross changes in lung studied. Then they were preserved in 10% formalin for microscopic study.

Table 1: Temperature Range

Group	Temperature	Cases
I	20^0 C	**9**
II	21-25^{0}C	**6**
III	26-30^{0}C	**11**
IV	31-35^{0}C	**19**
Total		**45**

Table 2: Duration Range

Group	Temperature	Cases
I	Up to 12 hrs	5
II	13-18 hrs	13
III	19-24 hrs	14
IV	25-30 hrs	9
V	31-34 hrs	4
	Total	45

Observations:

All cases are divided in groups according to temperature and duration which is discussed earlier.

Degenerative Changes in Lungs:

Points which are considered are:

1. Alveoli – collapse and edema. Breaking of alveolar wall and septa.
2. Bronchi – a. Pattern (Disturbed / maintained). b. Desquamation of bronchial epithelium.
3. Blood vessels – lysis.
4. Complete loss of architecture.

Grading of degenerative changes is done as follow–

Go: No Change.

G1: Mild Change (Architecture maintained, few edemas in alveoli)

G2: Moderate change (Architecture is maintained, more oedema in alveoli, bronchial epithelium disruption)

G3: Severe change (Architecture disturbed, marked oedema in alveoli and breaking of alveolar wall & septa, bronchial epithelium disruption)

G4: Very severe Change (Complete disorganization)

Discussion:

In the present study 45 cases of different age and sex are taken in which 36 male and nine females. These all cases are of road traffic accidents. Average environmental temperature ranges between 20-35^{0}C, humidity between 45-92% and duration range was 7-34hrs. We have divided these cases in groups according to temperature and duration which is discussed earlier. In human body besides environmental temperature, humidity, other factors also play role on both gross and microscopic changes.

Discussion on Microscopic Observation:

In this study, the sequence of various microscopic changes in different organs and tissues are compared with those of gross changes. In some cases there are some differences between gross and microscopic change. The earliest microscopic changes are observed in liver followed by lungs, kidney and skeletal muscle. These microscopic post-mortem changes are studied in different organs and tissues at on average temperature of 21-25^{0}C, 26-30^{0}C and 31-35^{0}C with duration of up to 12 hours, 13-18 hrs, 19-24hrs, 25-30hrs and 31-34 hrs. The findings which are observed are as follows:-

In Lungs: (Table 3-5)

It was observed that within 12 hrs after death with temperature range of 26-30^{0}C all type of changes are seen. (No change, mild and severe). (Table 6, Fig. 3) In 13-18 hrs and at higher temperature severity of changes increased. (Fig. 2) In 24 hrs with higher temperature severe changes are more prominent. (Fig.1)

But with the duration of 34 hrs and temperature is 35^{0}C only mild to moderate changes are seen. These all cases fall in adolescent age group, so severe changes are not observed. A study done by Dr. Rakesh Tandon also showed the same sequence of histological changes in lungs at 20^{0}C, 30^{0}C and 40^{0}C but in different time as to their appearance.

In that study at 30^{0}C after 12 hrs mild autolytic changes such as focal collapse of alveoli, interstitial oedema and desquamation of bronchial epithelium at places were seen. [10]

By 24 hrs these changes were diffused and could be seen throughout the lung parenchyma. In our study inn 36 hrs there was moderate degree of autolysis, complete loss of lung architecture, only vogue outlines of bronchi being visible and there was heavy bacterial infiltration. At the end of 48 hrs only cartilage could be seen and the remaining areas show granular pink appearance, there was heavy bacterial growth. After 72 hrs the lungs had completely liquefied.

At 40^{0}C lungs showed mild changes at 12 hrs, moderate degree of autolysis by 24 hrs, advanced autolysis after 36 hrs and complete liquefaction was seen in 48 hrs. While at 20^{0}C, lungs had not liquefied even after 72 hrs but showed moderate to severe autolytic changes.

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Fig. 1: Changes in Lung at Temp. 20^{0}C & Duration 21 Hrs

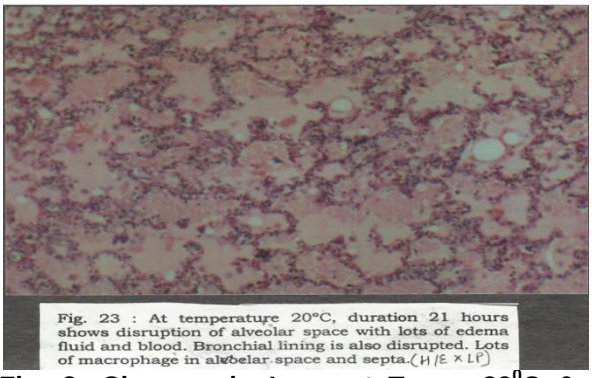

Fig. 2: Changes in Lung at Temp. 33^{0}C & Duration 16 Hrs

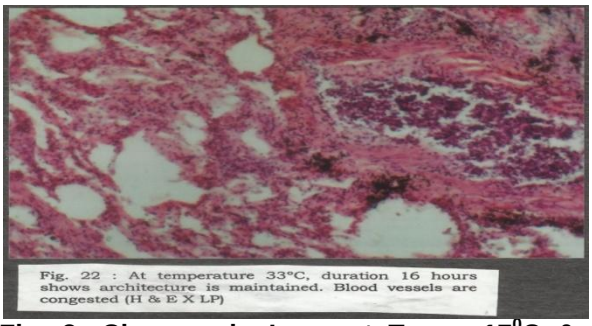

Fig. 3: Changes in Lung at Temp. 17^{0}C & Duration 24 Hrs

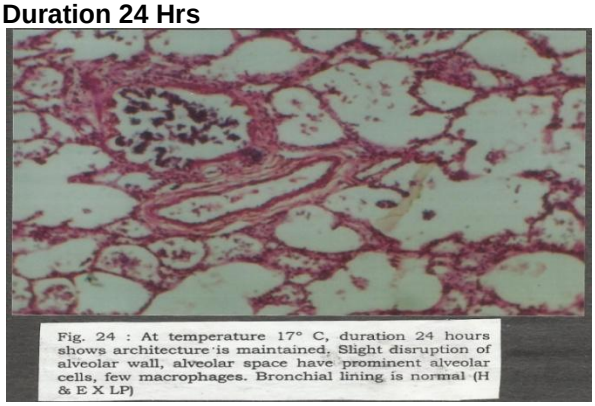

Table 3
Degenerative Changes in Lungs (According to Duration)

Duration	G 0		G1		G 2		G 3		G 4	
	No	%	No	%	No	%	No	%	No	%
Up to12hrs(5 cases)	2	40	2	40	-	-	1	20	-	-
13-18hrs(13cases)	4	30.8	3	23	5	38.5	1	7.7	-	-
19-24hrs(14Case)	-	-	5	35.7	3	21.4	6	42.9	-	-
25-30hrs(9 cases)	-	-	5	55.6	3	33.3	1	11.1	-	-
31-34hrs(4 cases)	-	-	1	25	3	75	-	-	-	-

(-) No case available

Table 4
Degenerative Changes in Lungs (According to Temperature)

Duration	G 0		G1		G 2		G 3		G 4	
	No	%	No	%	No	%	No	%	No	%
Upto20^{0}C(9 cases)	2	22.2	4	44.4	3	33.3	-	-	-	-
21-25^{0}C(6cases)	-	-	5	83.3	1	16.7	-	-	-	-
26-30^{0}C(11Case)	2	18.2	3	27.3	4	36.4	2	18.2	-	-
31-35^{0}C(19 cases)	2	10.6	5	26.3	5	26.3	7	36.8	-	-

(-) No case available

Table 5
Relation between Temperature and Duration

	12hour(5 cases)	13-18hours(13 cases)	19-24hours(19cases)	25-30hours(9 cases)	31-35hours(4 cases)
Upto20^{0}C(9 cases)	-	2 cases	2 cases	2 cases	3 cases
21-250C(6 cases)	-	-	3 cases	3 cases	-
26-30^{0}C(11Cases)	5 cases	3 cases	3 cases	-	-
31-35^{0}C(19cases)	-	8 cases	6 cases	4 cases	1 case

(-) No case available

Table 6
Relation between Temperature and Duration

	12hours(5cases)		13 -18hours(13cases)		19-24hours(9cases)		25-30hours(9 cases)		31-35hours(4 cases)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Upto20^{0}C(9 cases)	x	X	Go-2	100	G1-2	100	G1-2	100	G2-3	100
21-25^{0}C(6cases)	X	X	X	X	G1-2 G2-1	66.67 33.33	G1-3	100	X	x
26-30^{0}C(11cases)	Go-2 G1-2 G3-1	40% 40% 20%	G1-1 G2-2	33.33 66.67	G2-2 G3-1	75 25	X	X	X	X
31-35^{0}C(19Cases)	X	X	GO2 G1-2 G2-1 G3-1	25 37.50 25 12.50	G3-5 G1-1	83.33 16.67	G2-3 G3-1	75 25	G1-1	100