



## Estimation of Time Since Death From Post Mortem Lividity : Easy And Simple Method

**Dr. Shailendra G. Dhawane**

Professor & Head, Department of Forensic Medicine, GMCH, Chandrapur.

**Dr. Shashikant V. Dhoble**

Assistant Professor, Department of Forensic Medicine, GMCH, Chandrapur.

### ABSTRACT

*Background: Post mortem lividity is one of the earliest and reliable sign of death. Investigating officers are very much interested in knowing time since death as it helps them to connect criminal with the crime. The post-mortem lividity is caused by a purely mechanical function i.e. the earth's gravitation. The present study is carried to know the reliability of post mortem lividity in determining the time since death.*

*Objective: To determine time since death by simple method of studying post mortem lividity.*

*Materials and Methods: It was a prospective study conducted at Indira Gandhi medical College Nagpur from April 1998 to May 1999. Total 201 cases were examined from age group 4 to 84 years.*

*Results: 72.13 % were male while 27.86 % were females most of them belonged to age group 21-50 yr (67.64%); 49.26 % of total cases developed post mortem lividity within 7 hr after death while 50.74 % of cases post mortem lividity developed after 7 hr after death.*

*Conclusion: PM lividity developed within 7 hrs was not fixed & PM lividity developed after 7 hrs was fixed.*

### INTRODUCTION:

Post mortem lividity is one of the earliest and reliable sign of death. Investigating officers are very much interested in knowing time since death as it helps them to connect criminal with the crime. Time since death is most widely discussed topic in Forensic Medicine from past to present. Post mortem lividity however, recently has received little serious attention reflected by the relative paucity of publications in this area. The post-mortem lividity is caused by purely mechanical function i.e. the earth's gravitation. Therefore it is less affected by the environmental temperature than the cooling of the body, the rigor mortis and the turbidity of the cornea<sup>1</sup>. Different authors had given various ranges for determination of post mortem intervals from post mortem lividity like its appearance, distribution, fixation and disappearance. Therefore the present study is carried to know the reliability of post mortem lividity in determining the time since death. There are many advanced techniques available in estimating time since death like enzyme assay and biochemical changes in various body fluids but these advanced techniques are not available even in tertiary care centers. Thus post mortem lividity is very important in calculating time since death where other advanced techniques to determine time since death are not available.

### PATHOPHYSIOLOGY OF POST MORTEM LIVIDITY:

Post mortem lividity is the purplish or reddish purple areas of discoloration in the dependent parts of the body due to gravitation of accumulated fluid blood in the vessel after death.

It appears when the blood ceased to circulate; it tends to pool in the large venous reservoirs of the trunk, the vena cavae and their major tributaries. The blood then drains into the veins and venules of the dependent parts by the action of gravity producing discoloration in the areas of skin not subjected to pressure<sup>2</sup>.

Post mortem lividity begins in the form of mottled patches after death on the dependent parts of the body. Gradually these patches increase, coalesce and lividity is fully developed and fixed as the time since death increases<sup>3</sup>. Different authors had given different time intervals for the appearance and fixation of post mortem lividity. After complete formation of post mortem lividity, if the body is left undisturbed for a period of 5-6 hours, then the lividity over the areas get fixed. If the position of body is disturbed or altered after the fixation of the lividity, then the lividity will not be disturbed though the colour may slightly fade

in intensity. Fixation of post mortem lividity occurs mainly due to certain physical factors. Firstly, after the formation of the post mortem lividity, blood cannot easily pass through the capillaries. Secondly, by the time there has been total settling of the blood, rigor mortis is well established all around the body. This change in the muscle obliterates the big vessels passing through them. Hence after this period, the blood cannot pass through these vessels to settle in the small venules and capillaries in the new areas. Thirdly, after full establishment of rigor mortis, the venules lie almost empty and compressed in the rigid muscles at that time and cannot be easily distended by the resettling blood<sup>4</sup>.

Post mortem lividity undergoes changes when putrefaction sets in due to hemolysis of blood. As the process advances, lividity undergoes a series of changes in colour, viz. dusky, brown and green before finally disappearing with destruction of blood.

### MATERIAL AND METHOD:

The study was conducted at Indira Gandhi medical College Nagpur from April 1998 to May 1999. Total 201 cases were examined to ascertain the time since death from post mortem lividity. The cases were of age groups ranging from 4 to 84 years. There were 145 males and 56 females. Data regarding the actual time since death was obtained from police inquest and death certificate issued by certifying doctors in 191 cases. In 10 cases data regarding actual time since death was not known.

The meticulous examination of post-mortem lividity of all the bodies were performed which consist of :-

- a) Appearance of post mortem lividity
- b) Fixation of post mortem lividity

The procedure for the study was as follows:-

1. Bodies were examined in adequate light.
2. Room temperature was recorded.
3. Bodies were examined outside cold storage.
4. The exact time since death was noted.
5. The time of examination was noted.
6. The appearance of post mortem lividity was noted.
7. The fixation of post mortem lividity was carried by pressing the thumb of right hand over the lividity site for a period of one minute. If the pressure of the thumb blanches the

underlying area, the lividity was not fixed and if pressure of thumb does not blanches the area, then the lividity was fixed.

#### OBSERVATIONS & RESULTS:

The present study has been performed on 201 cases which were brought to Indira Gandhi Medical College and Hospital, Nagpur for routine medico-legal autopsy from April 1998 to May 1999.

Table no. 1 showed that 72.13 % were male while 27.86 % were females. In this study most of subjects belonged to age group 21-50 yr (67.64%) out of which 48.25 % were male while 19.39 % were females who developed post mortem lividity.

In our study Table no. 2 demonstrated that 49.26 % of total cases developed post mortem lividity within seven hours after death and not fixed. While in 50.74 % of cases post mortem lividity developed after seven hours after death and appeared to be fixed.

In all the 14 cases, post mortem lividity was found developed in which time since death was not known.

It was found that out of 41 cases (20.4%) in the duration of 6 to 9 hours, post-mortem lividity was found fixed in 15 cases and in 26 cases, post-mortem lividity was not fixed. Post-mortem lividity was found fixed in all the cases after 9 hours duration.

#### DISCUSSION:

Forensic medicine is concerned with the application of medical knowledge to help the law. In many medico-legal cases there is need to know the approximate time of death. The investigating officer expect the forensic expert to provide him information regarding the time of death so as to connect the criminal with the crime, when time since death is unknown, unwitnessed and creates a problem to the investigating authority.

Burton J.F. stated that post-mortem lividity appears within 20 minutes to 2 hours usually as purple red blotches in the skin of the dependent part of the body. These livid blotches may be blanched out by pressure of the finger against the skin, only to return when the finger is removed within the first 3 hours after the death<sup>5</sup>.

Francis E. Camps stated that post-mortem lividity first appears about 20-30 minutes after death as dry red patches which deepen and coalesce within 6-10 hours producing reddish purple colour. After 4-5 days hemolysis in the vessels produces sufficient pigment to stain the hypostatic areas which is permanent<sup>2</sup>.

Vander Over R. observed that the settling of the blood into the dependent parts of the body by the pure action of gravity produces a purple red coloring of the skin usually from 1 hour of the post-mortem. The maximum intensity of the lividity is reached in 8-12 hours after death<sup>6</sup>.

#### Appearance and fixation of post- mortem lividity:

It was found in the present study, in all the 17 cases studied from 0 to 50 minutes duration after death, post mortem lividity had not appeared. Out of 9 cases of 1-2 hours duration after death, post-mortem lividity was present in the mottled form in all the cases. In all the 11 cases of 2-3 hours duration after death, post-mortem lividity was present in the mottled form.

Out of 21 cases of 3-4 hours duration after death, post-mortem lividity was present in the mottled form in 13 cases and in the coalesce form in 8 cases. In 4-5 hours duration, in all the 20 cas-

es, post-mortem lividity was present in the coalesce form. Out of 24 cases of 5-6 hours duration, post-mortem lividity was present in the coalesce form in 16 cases and in developed form in 8 cases. In all the cases of 0 to 6 hours duration post-mortem lividity was not fixed.

Out of 14 cases of 6-7 hours duration after death, post-mortem lividity was present in the coalesce form in 2 cases and in developed form in 12 cases. In 12 cases lividity was not fixed while in 2 cases lividity was fixed.

Out of 12 cases in the duration of 7-8 hours after death, post-mortem lividity was developed in all the cases. In 8 cases lividity was not fixed while in 4 cases it was fixed. In 8-9 hours duration after death, lividity was developed in all the 15 cases. In 9 cases lividity was fixed while in 6 cases it was not fixed.

In the duration of 9-10, 10-12, 12-24 and 24-36 hours, post-mortem lividity was developed and fixed in all the cases. In 14 cases of unknown post-mortem interval, lividity was found developed and fixed in all the cases.

Parikh C.K. quoted that post-mortem lividity appears in the mottled patches on the dependent parts of the body after death within about 1-3 hours which gradually increase in size and coalesce in about 3-6 hours and lividity is fully developed and fixed in about 6-8 hours<sup>3</sup>.

Mukherjee J.B. stated that post-mortem lividity usually appears with in 1/ 2 - 1 hours after death as dull red or bluish pink patches. Gradually these patches coalesce and fuse together to form a large area of reddish purple discoloration within 6-10 hours of death. Post-mortem lividity becomes well fixed in 6-8 hours after death due to coagulation of blood<sup>7</sup>.

Nandy Apurba quoted that post-mortem lividity appears on the dependent parts of the body in the form of small patches by the end of 1<sup>st</sup> hour. It is completed by about 6 hours after death and fixation n of the post-mortem lividity occurs by about another 5-6 hours after its formation if body is left undisturbed<sup>4</sup>.

Di-Maio cited by Bernard Knight stated that post-mortem lividity takes 30 minutes to 2 hours to begin and becomes maximum by 8-12 hours<sup>8</sup>.

In this study, post-mortem lividity appeared 1-4 hours after death in the mottled form, 4-6 hours after death in the coalesce form and lividity was found developed after 7 hours. Post-mortem lividity get fixed in the duration of 7-9 hours after death.

Findings of this study regarding the appearance and fixation of post-mortem lividity are consistent with the findings of Vander Over R<sup>6</sup>, Parikh C.K<sup>3</sup>, Mukherjee J.B<sup>7</sup>, and Di-Maio<sup>8</sup>.

#### SUMMARY AND CONCLUSION:

201 cases were studied, out of which 145 were male and 56 were female.

Exact time since death was known in 191 cases while in 10 cases exact time since death was not known.

Post-mortem lividity appeared 1 to 4 hours after death in the mottled form, 4 to 6 hours after death in the coalesce form and lividity was found developed after 7 hours.

Fixation of post-mortem lividity occurred in the duration of 7 to 9 hours after death.

**TABLE No.- I Showing the relation of Age with Sex in Post Mortem lividity**

| Age in years | n= 201 | Male  | Percentage | Female | Percentage |
|--------------|--------|-------|------------|--------|------------|
|              | 1-10   | 3     | 1.49       | 1      | 0.49       |
|              | 11-20  | 18    | 8.95       | 12     | 5.97       |
|              | 21-30  | 44    | 21.89      | 21     | 10.44      |
|              | 31-40  | 30    | 14.92      | 12     | 5.97       |
|              | 41-50  | 23    | 11.44      | 6      | 2.98       |
|              | 51-60  | 17    | 8.45       | 4      | 1.99       |
|              | 61-70  | 8     | 3.98       | 0      | 0          |
|              | 71-80  | 1     | 0.49       | 0      | 0          |
|              | 81-90  | 1     | 0.49       | 0      | 0          |
| TOTAL        | 145    | 72.13 | 56         | 27.86  |            |

**TABLE No.- II Showing time since death in hours and appearance and fixation of post-mortem lividity**

| Time since death in hours | No. of cases n=201 | Per-centage | Post-Mortem Lividity         |           |            |                            |       |
|---------------------------|--------------------|-------------|------------------------------|-----------|------------|----------------------------|-------|
|                           |                    |             | Appearance of Lividity n=201 |           |            | Fixation of Lividity n=201 |       |
|                           |                    |             | Mot-tled                     | Coa-lesce | Devel-oped | Not fixed                  | Fixed |
| 1-2                       | 9                  | 4.48        | 9                            | -         | -          | 9                          | -     |
| 2-3                       | 11                 | 5.47        | 11                           | -         | -          | 11                         | -     |
| 3-4                       | 21                 | 10.45       | 13                           | 8         | -          | 21                         | -     |
| 4-5                       | 20                 | 9.95        | -                            | 20        | -          | 20                         | -     |
| 5-6                       | 24                 | 11.94       | -                            | 16        | 8          | 24                         | -     |
| 6-7                       | 14                 | 6.97        | -                            | 2         | 12         | 12                         | 2     |
| 7-8                       | 12                 | 5.97        | -                            | -         | 12         | 8                          | 4     |
| 8-9                       | 15                 | 7.46        | -                            | -         | 15         | 6                          | 9     |
| 9-10                      | 9                  | 4.48        | -                            | -         | 9          | -                          | 9     |
| 10-12                     | 22                 | 10.95       | -                            | -         | 22         | -                          | 22    |
| 12-24                     | 27                 | 13.43       | -                            | -         | 27         | -                          | 27    |
| 24-36                     | 3                  | 1.49        | -                            | -         | 3          | -                          | 3     |
| Not know                  | 14                 | 6.97        | -                            | -         | 14         | -                          | 14    |
| TOTAL                     | 201                | 100         | 33                           | 46        | 122        | 111                        | 90    |

**REFERENCES:**

- Inoue Masashi et al;** Development of an instrument to measure post-mortem lividity and its preliminary application to estimate the time since death; Forensic Science International, 1994, 65, 185-193.
- Francis E. Camps;** Changes after death; Gradwohl's Legal Medicine, 1976, 3<sup>rd</sup> Edition, 81-85.
- Parikh C. K.;** Medico-legal aspects of death; Parikh's textbook of medical jurisprudence and toxicology, 1990, 5<sup>th</sup> Edition, 142-148 and 156.
- Nandy Apurba;** Death and post-mortem changes; Principles of Forensic Medicine, 1<sup>st</sup> Edition, 1995, 150-159.
- Burton J. F.;** Fallacies in the Signs of Death; Journal of Forensic Sciences, 1974, 19, 529-598.
- Vander Over R.;** A review of the literature as to the present possibilities and limitations in estimating time of death; Medicine Science and Law, 1976, 16(4), 269-276.
- Mukherjee J. B.;** Death and its medico-legal aspect; Forensic Medicine and Toxicology, Volume One, 1994, 2<sup>nd</sup> Edition, 217-223 and 234.
- Di-Maio** cited by Bernard knight; Hypostasis; Forensic pathology, 1996, 2<sup>nd</sup> Edition, 58.