



GAUTENG PROVINCE

HEALTH
REPUBLIC OF SOUTH AFRICA



**University of the Witwatersrand
Forensic Pathology Service: Gauteng DoH
Faculty of Health Sciences
Department of Forensic Medicine & Pathology**

**Dr S Holland
Senior Specialist**

Tel: 011 - 489 1629/00

Cell: 082 7815571

Fax: 0114031477

E-mail: sholland@telkomsa.net

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RE-OPENED INQUEST INTO THE DEATH OF AHMED TIMOL

RE: POST MORTEM INTERVAL ESTIMATION

The following statement refers to the assessment of the post mortem interval (PMI) i.e. the estimation of how long a body has been dead.

Death in this case, being defined as irreversible, permanent cessation of heartbeat, respiratory effort and brain activity.

- The PMI is an estimation of the time since death and is based on the observation and assessment of the post mortem changes that the body undergoes from the time that death occurs.
- During the **early post mortem period** i.e. death until 48 hrs after death, the following post mortem changes are assessed to determine the PMI estimation:
 - Dehydration ("drying / desiccation of tissues")
 - Trucking of the retinal blood vessels
 - Rigor Mortis ("stiffening of muscles")
 - Hypostasis ("purplish-blue discolouration")
 - Algor Mortis ("cooling of body")
 - Post mortem chemistry analysis (not fully discussed as it was not performed in this case)

Dehydration (drying /desiccation)

- From the onset of death, the skin progressively loses moisture and elasticity and the thinner areas of the skin become brown and parchment like. These changes are especially noticeable on the surface of the lips and the skin of the scrotum.
- The eyes similarly desiccate, leading to clouding of the cornea and loss of the turgor or internal pressure of the eye.
- In cases where the eyelids have remained open after death, dark triangular-shaped areas may occur in the conjunctiva of the eye, the most superficial membrane of the eye. They are usually brown or black in appearance and called 'Tache Noire'. Tache Noire may appear within a few hours after death.

Trucking of the blood vessels

- This refers to the appearance of stagnant blood in the retinal blood vessels which occurs from a loss of blood pressure. This can only be seen by doing ophthalmoscopic examination of the retina and may be present between 15 mins and 2 hours after death.

Rigor Mortis

- Rigor Mortis is the stiffening of the muscles of the body after death (due to the ceasing of enzymatic activity in the muscle at a cellular level).
- It is preceded by an initial period of muscle flaccidity referred to as 'primary flaccidity'.
- Rigor Mortis first becomes evident in the small muscle groups of the face, hands and feet, approximately 3 hours after death.
- Rigor Mortis then becomes progressively evident within the larger muscles until full Rigor Mortis is established sometime between 8-12 hours after death.
- Full Rigor Mortis may remain present up to 24 hours after death where after the Rigor Mortis starts to dissipate and the muscles become increasingly flaccid.
- Complete flaccidity of the muscles is usually apparent 36 hours after death.



- There is great variation in the onset and duration of Rigor Mortis, dependent upon a number of factors as indicated below:
 - The two main factors are environmental temperature and the degree of muscle activity prior to death.
 - In colder temperatures, the onset is slowed and the duration prolonged
 - Increased muscle activity prior to death may cause more rapid onset of Rigor Mortis.
 - Age is also an important factor:
 - Infants and the elderly generally develop Rigor Mortis more rapidly.
- **Symmetrical** Rigor Mortis is where the Rigor Mortis is appropriate to the position of the body i.e. the position of the body at the time of death / the position in which the body was placed prior to the onset of Rigor Mortis.
- If the Rigor Mortis process is broken by movement of the body after the onset of Rigor Mortis, secondary onset of stiffness in the affected muscles groups will not occur.
 - **Asymmetrical** Rigor Mortis is thus an indication that the body was moved after death.
- Rigor Mortis needs to be differentiated from other conditions that may cause post mortem stiffening of the body, such as:
 - Cadaveric spasm
 - Heat rigor
 - Cold stiffening and
 - Ankylosis or fixing of joints

Hypostasis (Lividity / Livor Mortis)

- Hypostasis is the purplish-blue discolouration of the body resulting from the post mortem intravascular gravitation of blood into the dependant areas of the body.
- This occurs in both the skin and the internal organs.
- Hypostasis cannot occur where the tissues of the body are compressed , such as over the buttocks and back of a supine body



- Paradoxical hypostasis occurs where the blood appears to have gravitated into a position contrary to that expected from the position the body is found in after death.
- Hypostasis may become visible from 30 minutes to 2 hours after death.
- If a body is moved after the onset of Hypostasis has begun, secondary gravitation of blood may occur, referred to as 'Secondary Hypostasis'.
- It is important to differentiate between post mortem Hypostasis (as a result of gravitation) and ante-mortem bruising (as a result of trauma).

Algor Mortis

- Algor Mortis refers to the temperature changes that occur in a body after death.
- Heat is lost from the dead body by the processes of radiation, convection and conduction.
- Various factors may influence the rate of cooling of a dead body, including:
 - Initial body temperature, which may be increased by strenuous activity or fever and the body cools at a slower rate
 - Body dimensions
 - Adult vs. child – children's bodies tend to lose heat faster
 - Amount of subcutaneous fat
 - Increased fat may delay cooling
 - Oedema & dehydration
 - Dehydrated bodies may cool faster
 - Posture
 - A body in a 'spread-eagled' posture may lose heat faster than a body in a curled up posture
 - Clothing & covering
 - The more covering over a body, the slower heat is lost
 - The ambient temperature
 - If the ambient temperature is cooler, heat may be lost faster
 - Air movement and humidity
 - If there is air movement, this may increase heat loss;
 - humidity may decrease heat loss



- The medium around the body e.g. warm bath vs. cold sea
 - Heat will be lost faster in a cold water environment
- Pathology e.g. bleeding prior to death may cause faster cooling of the body
- The rate of heat loss follows a regressive curve:
 - Starting slowly in a plateau fashion as there is still some heat production after the moment of clinical death due to ongoing enzymatic activity in the body.
 - The heat loss from the body thereafter is almost linear until the body temperature approaches environmental temperature or ambient temperature when the curve again slows.
- The assessment of the change in body temperature in a deceased body must therefore be done with the knowledge that heat loss is not a linear function and can be affected by many variables.

Conclusion

- PMI estimation is not an exact science.
- It must ideally be carried out by examination of the dead body **at the scene of death**.
- To ensure optimum conditions for the PMI estimation, the body should not be moved or interfered with in any way prior to the examination of the body, as this would greatly influence the onset and/or duration of the post mortem changes manifestations (briefly described above), which would in turn influence the PMI estimation.
- The PMI estimation must be done by a forensic medical practitioner who is familiar with the various post mortem changes that can occur in a dead body and the many variables that can affect the post mortem changes.
- Even if done in ideal circumstances, PMI estimation can only offer a **range** of time estimate since death and not an exact time. In the early post mortem period, the range is over hours.

- The longer the body has been dead, the less precise the PMI estimation could be based on the nature of the post mortem changes which evolve progressively with the time interval after death.
- As the PMI estimation is based on observational data (i.e. the examination of the dead body), there is a level of subjectivity that can occur in the assessment
- These factors must be borne in mind when the PMI estimation is used in the investigation of any case.

Statement from Dr Kemp

- I was given a statement from Dr Kemp who was the district surgeon that examined the body of an Indian male on the 27/10/1971 at the safety office of the John Vorster police station.
- The statement indicates that Dr Kemp saw the body at 16H05 and he described that body as already dead and 'very recently dead'.
- These statements do not offer any value in determining the PMI estimation.



Dr. S. HOLLAND

MBCHB (UCT); DMH (CMSA); FCFORPATH (CMSA); MMEDFORPATH (WITS)

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