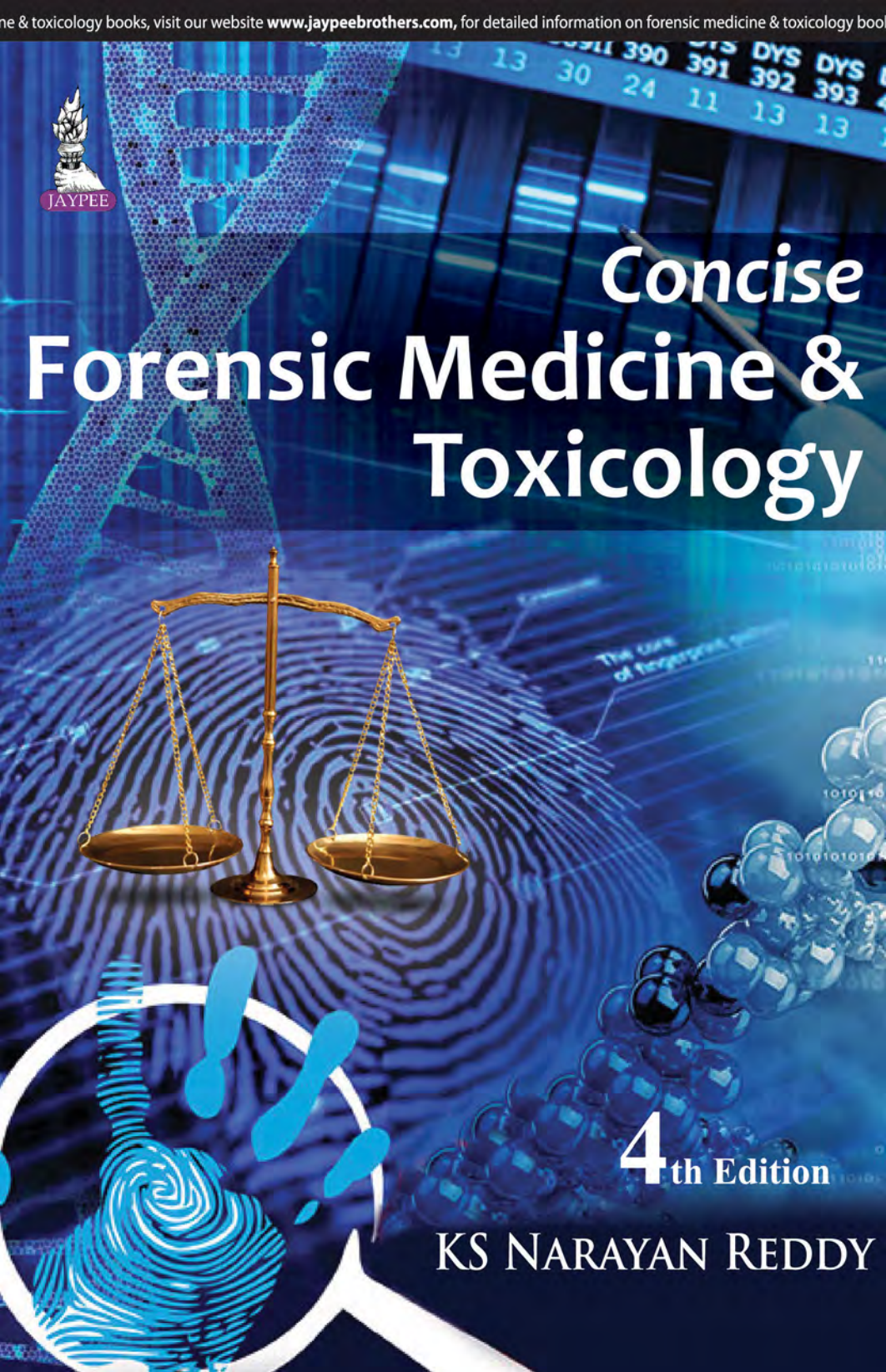
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Concise Forensic Medicine & Toxicology

4th Edition

KS Narayan Reddy

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CHAPTER 4

MEDICOLEGAL AUTOPSY

Objects: To find out (1) Cause of death (natural or unnatural). (2) Manner of death (suicide, homicide, accident). (3) Time since death. (4) Establish identity. (5) To collect physical evidence to identify the weapon and criminal. (6) In new born to determine liverbirth and viability.

Rules: (1) Conducted in mortuary only, except spot P.M. (2) Requisition from police or Magistrate necessary. (3) Avoid delay. (4) Collect information from inquest, accident register, case sheet, etc. (5) Conducted in day-light as far as possible, because colour changes, such as jaundice, P.M. hypostasis and colour of contusions cannot be made out in artificial light. (6) Body should be identified by the police constable. (7) No unauthorised person should be present. (8) Assistant should note findings. (9) Autopsy must be complete and never partial.

Incision: I-shaped incision extending from chin down to symphysis pubis in midline.

To demonstrate **pneumothorax**, a pocket is dissected on the affected side between the chest wall and skin, and is filled with water, and the wall punctured with knife under the water. Air if present will bubble out of the opening through water.

Air embolism: (1) Open the head first, and examine surface vessels of brain for gas bubbles. (2) Cut the apex of heart with knife. The left ventricle will contain frothy blood. (3) The heart will float in water if the right ventricle contains air. (4) Pericardial sac is filled

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with water and heart punctured with a scalpel and twisted a few times. Bubbles of air will escape if air is present.

Heart is opened in the direction of flow of blood.

Subendocardial haemorrahges: (1) They are seen in the left ventricle, on the opposing papillary muscles and adjacent columnae carnae. (2) The haemorrhages are flame- shaped, confluent and tend to occur in one continuous sheet rather than patches. (3) They are seen (a) after sudden severe hypotension due to severe loss of blood or from shock, (b) after intracranial damage, such as head injury, cerebral oedema, surgical craniotomy or tumours, (c) death from ectopic pregnancy, ante-partum or post-partum haemorrhage, (d) various types of poisoning, especially arsenic.

Stomach is removed by appliying double ligature at both ends. It is opened along greater curvature. **Small intestine** is opened along the line of mesenteric attachment, and large intestine along anterior taenia. **Liver and spleen** are cut in long axis, **pancreas** at right angles to long axis, and **kidney** is sectioned longitudinally through convex border into hilum. **Testis** is removed by incising inguinal canal and pulling loop of vas through it. **Duodenum** is the widest and most fixed portion of small bowel.

A.M. blood clots are dark red, firm and on section show alternate layers of platelets and thrombi. **Postmortem clots** are moist, smooth, rubbery, homogeneous, loosely or not attached to wall, and there are no lines of Zahn.

Fluid blood in a dead body is seen in: (1) septicaemia, (2) CO poisoning, (3) rapid death from asphyxia, (4) amniotic fluid embolism, (5) puerperal sepsis, (6) retained abortion.

Head: A coronal incision is made in the scalp, which starts from the mastoid process just behind one ear, and carried over the vertex of the scalp to the back of the opposite ear. The skull is cut by sawing horizontally. **Undertakers fracture** is tearing of intervertebral disc around C-6 or C-7.

For fixation of brain, lateral fissures are opened with the fingers and a long sagittal cut is made in the corpus callosum and kept in 10% formalin for one week.

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Spinal cord is not examined routinely. An incision is made on the back in midline extending from the occipital protuberance to the lower end of the sacrum. The laminae are sawed through the entire length of spine on each side and separated with chisel.

Preservation of viscera: In all cases of poisoning preserve: **(1) Stomach** and its contents. (2) Upper part of **small intestine** (about 30 cm) and its contents. (3) **Liver** half kg. (4) **Kidney** half of each. (5) **blood** 30 ml. (6) Urine 30 ml.

Preservatives: (1) **Saturated sodium chloride soultion** except in cases of poisoning by corrosive acids and alkalis, corrosive sublimate and aconite. (2) **Rectified spirit**, except in cases of poisoning by (a) alcohol, (b) acetic acid, (c) phenol, (d) paraldehyde, (e) phosphorus. **Never preserve viscera in formalin.**

Minimum of 10 ml. of blood should be preserved, to which 10mg/ml. of sodium or potassium fluoride is added. Blood should be collected from femoral, jugular, subclavian or iliac veins, but never from pleural or abdominal cavities.

Instructions : (1) Stomach and intestine are put in one bottle and liver and kidney in another bottle. Separate bottles are used for blood and urine. (2) Stomach and intestine are opened, liver and kidney are cut into small pieces. (3) Quantity of preservative should be equal to viscera in bulk. (4) Two-thirds of bottle only should be filled. (5) Seal the bottles. (6) Label the bottles with all particulars of the case. (7) Sample of preservative should also be sent for analysis. (8) Samples are kept in a box, locked and sealed. (9) A copy of inquest and P.M report are also sent. (10) The box is handed over to police constable after obtaining a receipt, who hands it over in the laboratory.

In decomposed bodies, bullet wounds, large incised wounds, valvular lesions of heart and fractures can be made out.

EFFACEMENT OF IDENTITY : (1) Purposive removal of identifying features. (2) Attack by animals. (3) Burning or incineration. (4) Advanced putrefaction. (5) Dismemberment and burying different parts in different places. (6) Chemical destruction by corrosives. (7) Bomb explosion.

VIRTUAL AUTOPSY (VIRTOPSY): It is a non-invasive technique of examining dead bodies to find out the cause of

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death. It is a combination of CT and MR imaging. CT images give information about morbid anatomical findings and MR imaging focuses on soft tissue, e.g. muscles, bone, blood vessels, tissues and organs. MR spectroscopy measures metabolites formed due to decomposition, which help to estimate time since death. Two dimensional and three dimensional imaging is done with multislice CT. Emphysema, air embolism, pneumothorax, hyperbaric trauma and decompression effects can be better appreciated. When an injury is caused by a weapon, using a computer software, virtual model of an injury with the 3D image of a simulation can be created by using a similar weapon. The track of the projectile inside the brain or other internal organs with haemorrhage and damage to tissues can be viewed with CT scanning.

PSYCHOLOGICAL AUTOPSY: Psychological autopsy is a set of postmortem investigative procedures (gathering all the relevant information from the past life of the victim of suicide), that help ascertain and evaluate the role that physical and psychological factors play in the death of an individual, thus to determine the manner of death to as high a degree of certainty as possible. Description of scene of death, position of body, evidence at the scene, such as weapons, poison and notes, etc. are necessary. It involves systematic collection of psychological data (mental state) through structured interviews of the deceased's family members, friends, co-workers, employers and fellow students, who had dealt with the deceased are helpful, to reconstruct the habits of the victim as regard to his background, habits, character, personality traits, general life style and method of death. It is most commonly introduced in those involving custodial care-taking (police custody and prisons), and those of contested life insurance claims. They have also been introduced in criminal cases (suicide or homicide), workers compensation (unsafe job conditions), and professional negligence (proximate cause of suicide). **The psychological autopsy cannot validly inform an expert that a suicide definitely occurred, but it significantly improves manner of death determination.**

EXAMINATION OF BONES

General Description : (1) Keep the bones in anatomic arrangement and draw a skeletal chart, indicating which bones

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are present. (2) Photographs of all bones are taken. (3) Note the attachment of the soft tissues to bones if any, and their stage of putrefaction. (4) Note whether the bones are moist and humid, or dry and their smell. (5) The bones are then washed by brushing with lukewarm water, and are placed under shelter to dry slowly.

(1) Human or animal : (1) If the bone is fairly fresh, and some of the blood constituents are still present, the precipitin test is useful. **(2) Bones of the hand and wrist of the bears may be confused with human bones.** (3) Human and animal bones can also be distinguished by chemical analysis of bone-ash. (4) Microscopic structure is also useful.

(2) One or more individuals : (1) This can be determined by reconstructing the skeleton. (2) If there is no disproportion in the size of various bones, or reduplication, articulation is correct, and if the age, sex and race of all the bones is same, they belong to one individual. (3) If mixing of bones from more than one skeleton is suspected, they can be separated by the use of short wave ultraviolet lamp.

(3) Sex : (1) **Recognisable sex differences are not present before puberty**. (2) After puberty, the sex can be determined by examination of the pelvis, skull, diameter of head of femur and humerus and measurements of femur, tibia, humerus and radius.

(4) Age at death : (1) It can be determined from examination of teeth, ossific centres, amount of wear and tear in teeth, length of long bones, epiphyseal union, pubic symphysis, closure of skull sutures, cortical resorption, bony lipping, osteoporosis, calcification, osteoarthritic changes, etc. (2) After the completion of bony union, age cannot be determined accurately.

(5) Race: There are certain racial differences in the skeleton, chiefly in the skull and face measurements, teeth and lower extremities.

(6) Stature: (1) When the skeleton is incomplete, or severely disintegrated, the stature may be calculated by applying mathematical formulae to the length of the long bones. (2) Long bones must be measured by means of osteometric board, measurement by use of the

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tapes or calipers are not accurate. (3) Pearson's formulae or Trotter and Gleser formulae are used. **(3) The principle of these formulae is to measure the length of long bone and multiply it with a given factor, and then adding a fixed factor.** (4) The formulae are different for dry bones and wet bones, for white persons and Negroes, and for males and females.

Osteometric Board: (1) This has a rectangular base with a ruler fixed along one of its long sides. An upright is fixed at one end of the board, and a second one slides along the board. (2) The bone is placed with one of its ends against the fixed upright and the movable upright is brought up to the other end of the bone. (3) The distance between the uprights is then shown on the ruler. (4) Weight bearing long bones are used for applying these formulae. (5) Femur and tibia give more accurate results than humerus or radius. **(6) Useful rule of thumb is that humerus is 20%, tibia 22%, femur 27% and spine 35% of the individual's height in life.**

(7) Identification: (1) Identity may be established from teeth, disease and deformities of the bone, old healed or healing fractures, orthopaedic surgical procedures, regional atrophy, spinal deformities, flat feet, supernumerary ribs, congenital defects, etc. and by superimposition technique using the skull. (2) Dental charts and dental radiographs are also useful.

(8) Nature of injury: (1) The ends of the long bones should be examined carefully to find out if they have been cut by sharp instruments or hacked or sawn or bitten by animals. (2) If the body disintegrates naturally, articular surfaces are smooth.

(9) Time since death : (1) After the soft tissues disappear, pieces of cartilage and ligaments remain attached to bone for three to four months. (2) Traces of marrow and periosteum may remain in, or attached to the bones for several months. (3) A fairly recent bone is slightly greasy to the touch and heavy. (4) Odour is a good indication of relatively recent death. (5) After the bones have lost the covering tissue, and the odour of decomposition is lost, the bones still appear fresh. (6) Repeated freezing and thawing of the bones when buried superficially may cause a bone to expand and crack within few months.

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(10) Cause of death : (1) The cause of death cannot be made out unless there is evidence of fracture or injuries which usually cause death, e.g. fractures of skull bones, upper cervical vertebrae, hyoid bone, several ribs, or marks of deep cuts in long bones or marks of burning. (2) The bones should be examined for firearm injuries or any disease, e.g caries or necrosis. (3) The type of the weapon can be known from the type and depth of the cut in the bone. (4) Metallic poisons, e.g., arsenic, antimony, lead or mercury can be detected in burnt bones.

EXHUMATION : (1) **It is digging out of an already buried body legally from grave.** (2) There is no time limit in India. It is done in cases of homicide, suspected homicide disguised as suicide, suspicious poisoning, criminal abortion, criminal malpractice, survivorship and inheritance claims, workmen's compensation claims, insurance claims, disputed identity, etc. (3) The body is exhumed only when there is a written order from Executive Magistrate. **(4) It is exhumed under supervision of medical officer in the presence of police and Magistrate.** (5) In cases of suspected mineral poisoning, half kg sample of earth in contact with body and from above, below, and from each side is collected. (6) Any fluid or debris in coffin, a portion of coffin and burial clothes are collected for chemical analysis. (7) Viscera should be preserved for chemical examination. Arsenic is most likely to be detected in exhumed bodies. (8) Disinfectants should not be sprinkled on the body. (9) Autopsy is done in usual manner. (10) If the body is reduced to skeleton, the bones should be examined.

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