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Scientific Correspondence:

Deciphering Tools for Postmortem Analysis: Unveiling the Instruments of Investigation.

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Abstract:

Post-mortem instruments play a crucial role in the autopsy process, aiding in the examination of a corpse to determine the cause and manner of death, and identify potential diseases or injuries. The evolution of post-mortem instruments has introduced new tools that enhance the ease and comfort of the autopsy procedure, replacing some older instruments. This review paper aims to collect and compile information on both new and old post-mortem instruments, providing insights into their uses, advantages, and disadvantages. Recognizing the lack of dedicated reference material for undergraduate and postgraduate students on this subject, this review serves as an attempt to gather essential information and cover various

aspects of postmortem instruments.

Introduction: An autopsy stands as a specialized surgical procedure crucial for determining both the cause and manner of death. Autopsy instruments, specifically designed devices, play an integral role in executing the autopsy process. Over time, these instruments have been crafted from a variety of materials, including bronze, ivory, iron, and silver. Modern advancements have introduced new materials such as stainless steel, chrome, titanium, and vanadium. Stainless steel, comprising chromium, iron, carbon, nickel, magnesium, silicon, molybdenum, and sulfur [12], has become the predominant material for manufacturing these instruments. Similar to surgical instruments, autopsy instruments

are tailored for specific tasks, contributing to effective dissection and prolonging their functional lifespan. Given the multiple risks associated with working in a postmortem room, selecting the right instruments is crucial to minimizing these risks. Despite the importance of autopsy instruments, there is a notable lack of comprehensive information available to undergraduates and postgraduates. This paper addresses this gap by compiling a comprehensive list of autopsy instruments, offering a valuable resource for easy understanding and reference.

Classification of Postmortem instruments:

In order to perform postmortem, team needs a number of postmortem instruments. Each of the instruments use is designed for a specific function. They can be classified depending on use as follows:

1. Dissecting instruments

A) Scalpel with blade: Bard parker handle, the handle is made of metal (reusable) or plastic (disposable); blades are

disposable, of various shapes and sizes. (10 to 24 sizes).

A.1. Scalpel: The scalpel blade has a slot - larger at its base and narrower at its top. The larger part is fitted to the groove of the handle, and the narrower part secures the blade into the groove.

A.2. Blades: they are available in variable sizes and they are disposable, the disposable blade is usually a 22 size, which is the largest commonly available. These Used to give incision, fine dissection and fascia reflex. Can dissect deep structures. [11]



[11]

B) Knives: There are various types of knives.

B.1. Cartilage knife, B.2. Resection knife, B.3. Organ knife, B.4. Brain knife B.5. Bistoury.

B.1. Cartilage knife: the length of the blade is available in 133mm and 101 mm. it is a solid forged (the process of heating, deforming, and finishing a piece of metal).

With this specialized surgical tool, cartilage grafts with thicknesses varying from 0.1 to 0.7 mm can be cut. This is how the cartilages are sliced. They make quick, fluid cuts through cartilaginous regions. They have a German stainless body with sturdy, sharp blades. [9]



[3]

B.2. Resection knife: The Resection Knife Solid Handle is used for clearing out parts of tissues in postmortem and amputations. It has a 6.5 cm small blade perfect for localized cuts. This handle also gives it access to narrow regions. The surgeon can easily manipulate its long handle for accuracy. [3]



[3]

B.3. Organ knife: this is also called as solid forged bread knife also referred to simply as the long knife. And is specifically designed for morticians and pathologists. [8]. This is

available in 152mm and 254mm blade length. This is used to smoothly cut solid organ into slice for examination, display, and photograph of organs cut surface. [1]



[13]

B.4. Brain knife: this is also called as Virchow brain knife. The brain knife has a double edge and is rounded at the front. It is available in 200mm blade size. These are used for dissection of brain during postmortem examination. [3]



[13]

B.5. Bistoury: [from Old French bistorie, dagger] - A slender knife, either straight or curved, used by introducing it beneath the part to be divided, and cutting towards the surface. [16]



[16]

C) Scissors: These are employed for blunt dissection, which involves inserting closed scissors between the planes to be divided and opening them before removing them, as well as for cutting tissues. Specialty scissors make dissection easier, especially when cutting tiny veins or opening specific organs.

Types of scissors:

C.1.Dissecting C.2.Intestinal enterotome(straight and curved)

C.3.Mayo Dissecting Scissor

C.4.Lloyd-Davie (Goligher) Rectal Scissor

C.1. Dissecting: Is available in 5 inch (150mm) length in size, used for dissecting of coronary arteries.[1]. Some of them have unique for cutting fine and delicate tissues. Sharp blade is used for cutting dense tissues.



[13]

C.2. Intestinal enterotome: Is of 2 types straight and curved. These are large scissors are used for opening the intestines. Scissor comes with special probe tips that are ideal for blunt

dissection of delicate tissue. The bulb ended blade is inserted into the lumen of the gut, and the instrument is smoothly stripped down the length of the intestine. Cuts delicate bowel walls, membranes as well as surrounding fascia.[3].

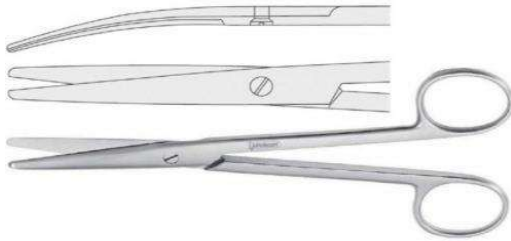


[3]

C.3.Mayo Dissecting

Scissor: They are of 2 types curved and straight, and are available in a variety of sizes, ranging from 14.5 to 23.5cm. Its main purpose is to offer a dependable method for cutting, dissecting, and removing tissues from various body cavities and places. While the curved blade pattern allows for the cutting of deeper structures, the straight profile aids in the cutting of superficial tissues and sutures.

It is also used in cardiovascular, general surgery,



[13]

C.4.Lloyd-Davie (Goligher)

Rectal Scissor:It is available in 27 cm in length. Comes with round tips that are ideal for blunt dissection of tissues.Cuts skin, fascia, membranes, internal soft tissue as well as sutures. Has blunt tips which prevent piercing trauma. Also, the smooth outer edges of the instrument ensure a traumatic dissection. They also prevent pulling of adjacent tissue to prevent injury during postmortem.[3].



[3]

D)Rib shears:1.Rib shear 2.Gluck Rib Shear 3.Bone Rongeur 4.Bone nipper

D.1.Rib shear: With an overall length of 23 cm, this is perfect for slicing through the majority of fibrous formations. The razor-sharp blades on the Rib Shear easily cut through bones. cuts through tendons, sheaths, and other fibrous structures in addition to bones.In particular, use hefty blades to cut through difficult structures with great force. consists of one long blade and one sharp blade. The hefty construction of the blades reduces the effort required to dissect.The blunt tips shield delicate tissue from harm.[3].



[13]

D.2.Gluck Rib Shear:- Its razor-sharp blades easily cut through bones.cuts through tendons, sheaths, and other fibrous structures in addition to bones.In particular, it has hefty blades that can cut through dense structures with great force. Additionally, the blunt tips guard against harm to delicate tissue. Additionally, the forceps' smooth edges guard

against unintentional harm to sensitive tissue. For quick action during procedures, the operating forceps have a rivet screw joint. And is available with an overall length of 21cm . [3].



[13]

D.3.Bone Rongeur: this is used to cut off small bone fragments and other hard tissues.[3].



[13]

D.4.Bone nipper - used for removal of fine bone parts.[16]



[16]

E.Saws

E.1.Saterlee bone saw

E.2.Charriere bone saw

E.3.Langenbeck bone Saw

E.4.Rachiotomy saw or Luer's rachiotome .5.Spinal laminae saw[spinal knife] **E.6. Hack saw**
E.7.Stryker autopsy saw
E.8.Autopsy saw
E.9.Waterproof autopsy saw with vacuum

E.1.Saterlee bone saw: The blade is used to cut fibrous tissues and bones with a sharp edge. To further avoid damaging nearby structures, you can secure the blade in place using the screw on the frame. The long, serrated edge of the blade keeps it from sliding off smooth bones. and has a length of 29 cm to access small areas.[3]



[15]

E.2.Charriere bone saw: the handle with a bulky frame to enhance your grip and dexterity. The handle curve increases your comfort and prevents hand slips.The sharp blade in order to make efficient cuts of bones and fibrous tissues. In addition, the screw on the frame allows to fix the blade in place in order to prevent damage to

surrounding structures. The blade has a long serrated edge to prevent it from slipping from the tissues.[3].



[3]

E.3. Langenbeck bone Saw:- the handle to place and stabilize the blade on the diseased tissues. The handle's thick structure improves your dexterity and grip. The flat profile reduces hand slippage and improves comfortable to effectively cut through fibrous tissues and bones with the long blade. The serrated edge of the blade keeps it from slipping from the tissues. In addition, the outer edge is blunt to prevent damage to surrounding structures. Is 24.5 cm long and has a slender profile in order to see the blade's position directly. [3].



[13]

E.4. Rachiotomy saw or Luer's rachiotome [sometimes written as

rhachiotome] - This is an old but sturdy instrument. Consists of two curved saw blades placed parallel to each other in such a way that the distance between them can be regulated by screws. There are two handles, a horizontal one for the right hand, and an upright one for the left hand attached to the fixed saw blade. It is used in opening the spinal canal.[16]



[16]

E.5. Spinal laminae saw[spinal knife] - Handy if rachiotomy saw is not available.[16].



[16]

E.6. Hack saw:-This is used to cut a long bone and to open the skull.[1].



E.7.Stryker autopsy saw: is also called as vibrating saw. The instrument of choice for most of the prosectors faced with removing the brain. The blade reciprocates rapidly with small amplitude. The action prevents the saw from cutting soft tissue notably the prosectors hand. The disadvantage of vibrating saw is that the throw up more potentially infectious aerosols than do hand saw. Used to cut the long bone and skull. They throw up more potentially infectious aerosol than hand saw. [1].



[15]

E.8.Autopsy saw/skull saw/oscillating autopsy saw:- Used to open the skull. [1]. Can cut without damaging tissues, above all dispersing debris. Potential transfer of harmful pathogens.



[15]

E.9.Waterproof autopsy saw with vacuum: Used to open the skull. Aerosols spread is less. We need well trained staff to use this instrument. [10].



[15]

F.Chisel:F.1.Brunetti chisel :(straight and curved.)

F.2.Virchow's (t shaped skull breaker)

F.3.Councilman chisel
F.4. Skull chisel/Chisel with fiber handle.

F.1.Brunetti chisel :(straight and curved.)

F1.1.Brunette chisel straight:
It is of 28.5 cm long (280mm). utilized to release the spinal column. During an autopsy, a chisel may reveal the underlying tissues. Grasping the handle, the physician inserts the blade beneath the bony section. Then, they lift the blade to split the bones above it by using the handle as a lever. A chisel that has a spindle handle to improve dexterity and grip. Its bulky contour also helps to improve

comfort and reduce hand slippage. The tiny blade is used to apply pressure only to a specific region of the bone. This makes it easier to separate the bones. Furthermore, the wide neck allows to see the working tip easily to prevent accidental slips and slides. Right and left blades are available to suit different indications.[5]



[3]

F.1.2. Brunetti Post Mortem Chisels (curved): the length of blade is 220 mm. During an autopsy, chisels may reveal the underlying tissues. The doctor grasps the handle and places the blade under the bony segment. Then, using the handle as a lever, they lift the blade to separate the bones above it. The **Brunetti Post Mortem Chisel** with a spindle handle to enhance your grip and dexterity. Moreover, it has a bulky profile to increase your comfort and prevent hand slips. The thin blade to focus the pressure on a small area of the bone. This ensures an easier

bone separation. Furthermore, the wide neck allows to see the working tip easily to prevent accidental slips and slides. Right and left blades are available to suit different indications.[5].



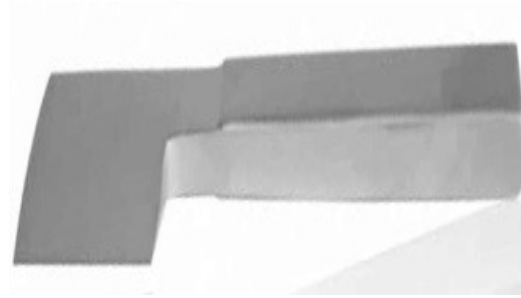
[1].

F.2. Virchow's (T shaped skull breaker): Helps by removing pieces of skull bones. Autopsy surgeon separates the bones of the skull after cutting them with bone saws. The Autopsy surgeon grasps the handle and places the blade under the bony segment. Then, they lift the blade to separate the skull bone above it by using the handle as a lever. T-shaped design to improve dexterity and grip. Its flat, straight profile improves comfort and keeps your hands from slipping. To concentrate the pressure on a specific region of the skull, the blade narrows. This ensures an easier bone separation. The slender neck allows to see the working tip directly to prevent accidental slips and slides. Virchow Skull Breaker has a blade size of 15 mm. [3].



[13]

F.3. Councilman chisel: in the course of autopsy, it may reveal the underlying tissues. Grasping the handle, the physician inserts the blade beneath the bony section. Then, they lift the blade to split the bones above it by using the handle as a lever. A sturdy handle on the Councilman's Chisel will improve your dexterity and grip. Its hefty shape also adds to your comfort and keeps your hands from slipping. The tiny blade is used to apply pressure only to a specific region of the bone. This makes it easier to separate the bones. Furthermore, the slender neck allows to see the working tip directly to prevent accidental slips and slides. This is of 18 cm long. [3].



[15]

F.4. Skull chisel/Chisel with fiber handle: After scoring the calvarium with the vibrating saw or hand saw, the chisel is used to gently finish the separation of the loop of the calvarium from the lower skull, thus exposing the brain and its meninges (coverings). [1]. Easy to operate with help of hammer. And this can damage brain tissue during autopsy.



[3]

G. Hammers :-

G.1. Hammer with hook: Hammers are used by forensic doctors to exert a striking force on bone chisels. [4] This helps separate the calvarium (the vault-like

part of the skull that holds the brain) from the lower skull.[1]. And the hook is used to pull out the skull bone.



[3]

H.Mallets: H.1.Hajek Bone Mallet

H.1.Hajek Bone Mallet: These come in handy during skull opening in combination with chisels. The head of the instrument has two flat hitting platforms. The head of the mallet has a flared design and its central part is slimmer than the sides. As a result, autopsy surgeons can press bone chisels or gouges against hard or cancellous bone and hammer with the mallet. The device features a hollow handle supplied with vertical grooves. This particular feature enhances gripping and minimizes finger strain during lengthy procedures.[3].



[13]

H.2.Gerzog Bone Mallet: Used in opening skull. The head of the mallet has a 25mm diameter. The

head also has two flat surfaces that make contact. Thus, in order to make incisions or gather tissue for grafting, autopsy surgeons can hammer the impacting platforms of osteotomes and chisels. Furthermore, the device has a large, hollow handle with vertical grooves. This unique design provides surgical comfort and minimizes fatigue.[3].



[3]

I.Probes: 1) Probes 2) Directors

I.1.Probes: Large and small, for probing wounds etc for foreign bodies. May be single ended or double ended.[16].



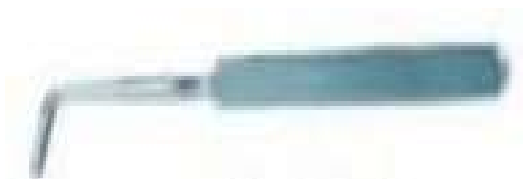
[16]

I.2.Directors (Curved and grooved) - A grooved metal probe used to direct another surgical instrument to a particular site which is out of view. Generally used by embalmers.[16].



[16]

J. Myelotome - This is used only for the purpose of cutting the spinal cord squarely across for the removal of the brain. Skull cap and dura removed, brain lifted lightly with fingers, myelotome inserted deep inside in the foramen magnum, and spinal cord sliced across. It has a slender steel stalk with wooden handle, and a short, thin, narrow blade set obliquely at the end of the stalk. This instrument is not absolutely necessary, as the cord may be satisfactorily cut with the point of the long section knife. [16].



[16]

Others: 1) Autopsy table
2) measuring jug 3) magnifying glass 4) Plastic visor

1) Autopsy table: It has a Self cleaning /washing sprinkler on sides. A support column with 2 access doors. The Basin

Width/Depth/ Height is 400 x500 x200 mm. A Knee-operated mixing tap used for cold and warm water 3 m shower hose with hand sprinkler. There are two splash proof electrical outlets. Two buttons for height adjustment. A Regulator valve for integrated sprinkler system. Three piece work top with large waste basin/sieve insert circumferential perforation for safe removal of all odors. Can adjust the height of table according to our convenience. [4]. This is not available in all kinds of autopsy table this facility is available in new models .eg: YORCO.



[4]

2. Measuring jug: This is used to measure the blood or contents of stomach and other fluids from the body cavity during postmortem examination. [1]. Easy to handle, easy to read the measurements.



[3]

3. Magnifying glass: There are various types. Can be used for viewing finger prints, also in ballistics examination.[14].



[14]



[1]

4. Plastic visor: for shielding eyes, face and mucosal surfaces from splashes etc while doing hazardous autopsies.[16].



[16]

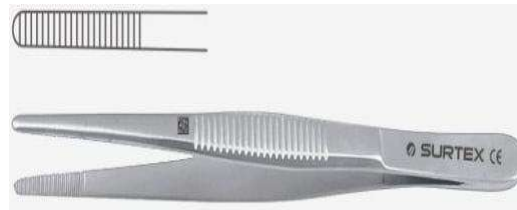
2) Tissue manipulating instruments: A. Forceps

A.1. Non toothed /Blunt

A.2. Toothed /Adsons

A.3. Rubbertipped A.4. Spencer-Wells forceps

A.1. Non toothed /Blunt: They have serrated or grooved inner grasping edges which allow them to hold tissues without damaging them. They are used for holding delicate tissues such as vessels, nerves and bowel. This instrument should be handled with great care, as it generates greater pressure between its' jaws. [7]



[3]

A.2. Toothed /Adsons : These forceps are used to hold (grip) skin/dense tissue, such as skin closure. [7]. They have inter

digitating teeth to hold tissue without slipping. They do cause a degree of tissue damage so should not be used on delicate tissue and care should be taken while performing autopsy.



[3]

A.3. Rubber tipped: Soft rubber tipped forceps allow for secure post-mortem dissection with minimal tissue damage or compression. A great choice for methods that don't involve contact with metal. Blue tips provide excellent contrast for specimen photography. [6].



[6]

A.4. Spencer-Wells forceps - Can be used to grip slippery structures. Used during esophageal eversion. [16].



[16]

3. Suturing instruments:

A. Needles:- half curved needle called as hagedorn and double curved called sailmaker's needle. This is large needle with an eye for sewing up the body when autopsy is finished. The stitching is similar to that used on the outer covering of baseballs. Heavy twine, which is much coarser than suture, is used for the procedure. [1].



[15]

[1]

B. Postmortem stapler: Used for sewing up dead body after postmortem or embalming. An alternative to traditional

thread and needle stitching. Stapler however is safer, as it reduces needle sticks. Faster, as it eliminates threading needles. Reduces stitching time. Disposable and one time use. Comes pre-loaded with 35, 1/4" length staples. A staple counter helps keep track of remaining staples. Staples are placed about 1/4" apart. Empty stapler disposed in infectious waste container.[16].



[16]

4.Odontology:

1.Vernierscalipers

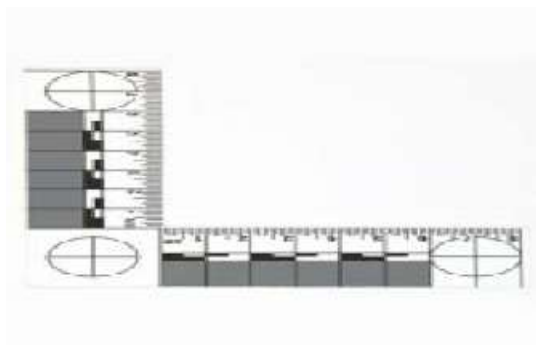
2.Photography scale 3.Dental cast 4.Tooth extractor

A.1.Verniers calipers: Used to measure fine dimensions.eg. Inter canine distance[1]. Depth and width of injury can be easily measured.



[13]

A.2.Photography scale: This is used during photography of the



bite mark, so that it becomes easy to make the photograph of bite mark life sized. It is commonly used as a standard photographic scale in forensic photography.[1].Used to provide the viewer with an idea of the size of a mark or an impression.[2].

[1]

A.3.Dental cast: this is used when patient wants to raise an action for damages based on accusations of negligence or breach of contract.[2]. And to identify the bite marks.



[2]

A.4.Tooth extractor:helps to extract the teeth during dental examination.



[3]

5.Anthropometric instruments:1.Measuring scale 2.Weighing machine 3.Weighing scale 4.Measuring tape. 5.Osteometric board/Anthropometric set/Hepburn type osteometry

A.1.Measuring scale:Available in 1feet/12 inch/30cm stainless steel. Used during examination to measure length and width of organs. Also used in age determination.[1]



[1]

A.2.Weighing machine:This is used to weigh the dead bodies usually before the postmortem is

carried out.[1]. Can identify the built of the body. And easy to measure weight.



A.3.Weighing scale: This is used to weigh the organs. We can measure from 10grams to 5kgs. [1].It is durable, portable, cost efficient.

[1]



A.4.Measuring tape: The Folding metal scale is available in 7feet it is also available as 10feet. This is used during examination of dead bodies to measure the length of the dead bodies for identification purposes and age determination.[1].



[1]

A.5.Osteometric

board/Anthropometric

set/Hepburn type osteometry: This is used to find out the length of the bone or fetuses.[1]. One fixed plane and one mobile plane to adjust according to length.

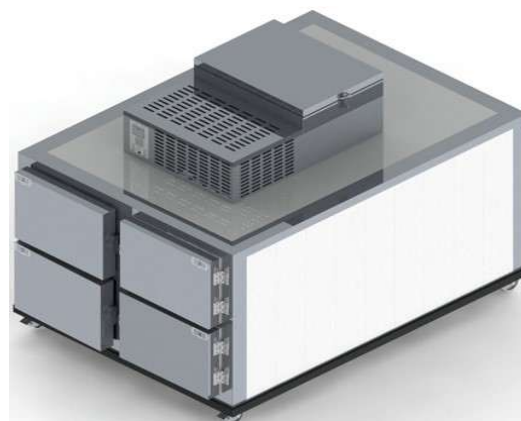


6.Others:

A.1.Mortuary chamber/cold

storage: Mortuary storage system is designed for storing cadaverous under cool condition to prevent decomposition. These are latest development in Mortuary technology offering vast spacing advantage, over the conventional type together, With greater hygiene. It is Double-walled. A gasket is provided on both the inside and the outside edges of the tongue sections. Front opening, hinged insulated doors lined with magnetic gasket, handle and lock arrangement with keys in duplicate for individual dead bodies. Tray to carry dead bodies are in one piece, Stainless Steel, with a tubular

edge and handle at both ends to carry dead body easily. Temperature -2°C to $+5^{\circ}\text{C}$ is maintained and 220V, single phase, 50 Hz. [4].



[4]

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