FEDERAL UNIVERSITY, NDUFU-ALIKE, IKWO, EBONYI STATE

STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

A REPORT OF SIX (6) MONTHS STUDENT INDUTRIAL WORK EXPERIENCE SCHEME AT

FEDERAL UNIVERSITY NDUFU-ALIKE IKWO (FUNAI) EBONYI STATE.

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Topic

A report of six (6) months student industrial work experience scheme

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Miss Itoro George Mr. Gabriel Godson Akunna

Dedication

I dedicate this work to the Almighty God; the one who was, is and is to come.

To him be all the Glory now and forever.

Acknowledgement

I want to extend my gratitude to my parents, friends, lecturers and fellowship brethren who in one way or the other has seen to the success of my stay in school.

With a great passion, I would like to acknowledge my uncle and wife who catered for me throughout the period of my Industrial training.

ABSTRACT

Students' Industrial Work Experience Scheme (SIWES) is a scheme in which students are exposed into their different fields of study in the industry. This report gives account of the knowledge gathered in the course of the six (6) months students' industrial work experience scheme in federal university Ndufu-Alike Ikwo (FUNAI).

Students' industrial work experience scheme SIWES as it is known is a program accepted by the Nigerian universities to form part of the academic degree programs. Its objective is to bridge the gap between theories and practical classes. It gives students a first-hand experience in school before graduation and employment.

Federal university Ndufu-Alike Ikwo was established 2011 although its academic session commenced 2012 with 3 faculties having Prof. Oye Ibidapobe as the vice chancellor. Subsequently, the school grew from three (3) faculties to seven (7) during the administration of Prof. Chinedu Nwajiuba as the vice chancellor of the university. The faculties which is been headed by the dean of faculty has different departments including anatomy department in the faculty of basic medical science.

This report is based on the knowledge acquired in histopathology, radiology, museum and morgue.

Histopathology deals with the collection and processing of histological specimens.

The radiology section reveals different imaging modalities used to produce the image of the internal structures of the body. The imaging modalities we were exposed to are x-ray and ultrasound.

The museum section deals with histological tissues received, fixed and potted in museum jars.

Mortuary section also known as morgue is as section where deceased bodies are embalmed and preserved.

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CHAPTER ONE

INTRODUCTION

1.1Meaning of SIWES

SIWES is an acronym for students' industrial work experience scheme. It is a skill training program accepted by Nigerian universities that forms part of the approved minimum academic standard of their degree programs.

It is aimed at bridging the gap between theories and practical on sciences and other professional education programs in the tertiary institutions.

It exposes students to the equipment, machines and professional method of working and safe guiding workers and their work areas – the industries and organization.

The Student industrial work experience scheme (SIWES) was established as a result of the realization by the Federal government of Nigeria in 1973 of the need to introduce a new dimension to the quality and standard of education obtained in the country in order to achieve the much needed technological advancement. It has been shown that a correlation exists between a country's level of economic and technological development and its level of investment in manpower development (Oniyide, 2000).

The ITF solely funded the scheme during its formative years. But due to the elevated rate of financial involvement, it was withdrawn from the scheme in 1978. In 1979, the Federal Government of Nigeria handed the scheme to both the National University Commission (NUC) changed the management and implementation of SIWES fund to ITF. It was effectively taken over by ITF in July 1985 with the funding being solely borne by the Federal Government.

SIWES involves the industrial training fund (ITF), Nigerian university commission (NUC), federal government, industries/firms and institution of higher learning. They are been given the various responsilities:

FEDERAL GOVERNMENT

- To provide adequate funds to the ITF through the Federal Ministry of Industries.
- To make it mandatory for all ministries, companies and parastatals to offer places of attachment for students in accordance with the provision of Decree No. 47 of 1971 as amended in 1990.

INDUSTRIAL TRAINING FUND

- Formulation of policies and guidelines on SIWES for distributions to all the SIWES Participating bodies, institutions and companies involved in the scheme on a regular basis organizing programs for the students prior to their attachment, receive and process master and placement list from the institution and supervising agencies i.e. NUC, NBTE, NCE.
- Supervise industrial attachment.
- Disburse supervisory and students allowance at the shortest possible time.
- Provide insurance during student attachment/Training.

THE SUPERVISING AGENCIES

- Ensure the establishment and accreditation of SIWES units in institution under their jurisdiction.
- Ensure adequate funding of a SIWES unit in all the institutions of the Federation.
- Vet and approve master and placement list of students from participating institutions and is been forwarded to ITF.
- Monitor and review jobs-specification in collaboration with the Institutions towards national minimum academic standard for all the programs approved for SIWES.

1.2 OBJECTIVES OF SIWES

There are numerous aims and objectives why SIWES was established. Some of them include:

1. To serve as a link between theories and practical experiences.
2. To create an avenue for students to know the work they will likely meet after graduation.
3. To enhance industrialization in Nigeria.
4. To promote and strengthen employers' involvement in entire educational process of preparing university graduates for employment.
5. To provide students the opportunity to make use of the theoretical knowledge in real work situation.

ORGANOGRAM AND PHILOSOPHY OF THE ESTABLISHMENT

1.3 Philosophy

Federal University-Ndufu-Alike Ikwo is an institution of learning established by the federal government. This comprises of different faculty, department, staffs both academic and non-academic staffs.

The main reason for establishing this institution is to impart knowledge to students in different fields of study. Federal University Ndufu-Alike Ikwo is one of the newly established universities in Nigeria. It has so many personnel of higher academic learning like Bachelor of Science or arts degree holders, master's degree holders, doctorate degrees and professors. The institution fosters academic learning, and skills acquisition. Its location and background or environment is such that fosters conducive teaching and learning.

1.3 HISTORY OF FUNAI

Federal University Ndufu-Alike Ikwo is a young university located in south eastern part of Nigeria precisely at Ndufu-Alike Ikwo in Ebonyi state. It was established on the 26th of Feb. 2011 under the leadership of President Goodluck Ebele Jonathan although its academic session commenced in 2012.

The environment now known as FUNAI was formerly a community secondary school in Ndufu-Alike Ikwo.

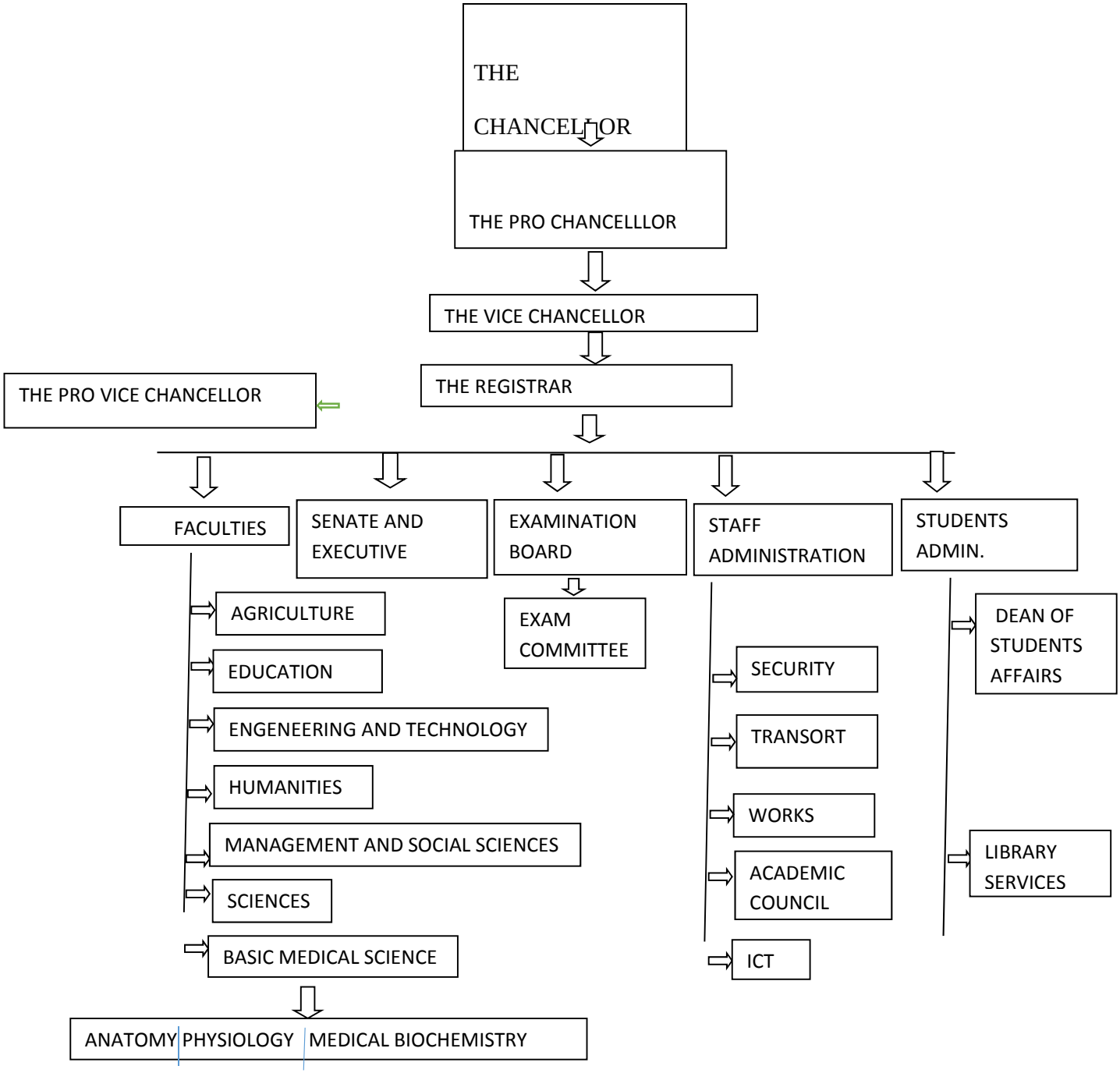
The establishment started with prof. Oye Ibidapobe as the pioneer vice chancellor, prof. G. O. Chukwu as the registrar and Alhaji Rufiu Aliu as the university bursar. Later, in 2016 prof. Chinedu Uzoma Nwajiuba became the second vice chancellor of the university. Before 2016, most of the departments in the institution were accredited to enable the pioneer students graduate.

The institution started with three (3) faculties which are faculties of basic medical science, science and technology and arts and humanities. As the population of students grew, the faculties became seven (7) which are: Agriculture, Basic medical science, Education, Engineering and Technology, Humanities, Management and Social Sciences and Sciences.

MOTTO: Home of Soaring Eagles

1.5 Organogram

FEDERAL UNIVERSITY NDUFU-ALIKE IKWO (FUNAI)



CHAPTER 2

2.1 Report on different units of the establishment.

1. **Histopathology/ Tissue Processing Unit**

This unit has to do with the microscopic examination of biological tissues to observe the appearance of diseased cells and tissues. It also deals with the collection and processing of histological and cytological specimen.

The main use of histopathology is in clinical medicine where it typically involves the examination of a biopsy by a pathologist.

Tissues are first harvested, fixed and processed before been examined by a pathologist to know the histological components of the tissue.

2. **Radiology unit.**

This section deals with imaging modalities used to examine the internal structures of the body. In this unit, modalities such as x-ray and ultrasound are used to view the internal organs based on the area of interest. This is carried out by a radiographer and sent to a doctor for interpretation. Its apartment consists of the radiographer's room, examination room, printing room etc.

3. **Museum Unit.**

In this unit, pathological tissues are collected and preserved in museum pot/jar for display in the museum in order to be viewed for learning purposes. This unit has different workers which includes: the pathologist who examines the tissue, curator who produces the museum pot, cleaner who cleans the workshop and receptionist who receives the tissue and writes down from where the tissue came and the name of the tissue. The museum has different rooms in it. They are: the pathologist's office, curator's office, workshop, display room and convenience room.

4. **Mortuary unit.**

This unit also known as morgue is where deceased bodies are embalmed and preserved before interment. It consists of the chief mortician, the driver and other mortuary attendants. The mortician embalms the bodies; the driver conveys the body in the ambulance for burial while the mortuary attendants clean the bodies and dresses them for interment. The apartments in the morgue are the embalming room, storage room, documentation room, reception room, dressing hall and the convenience.

2.2 INSTRUMENTATION

Instruments used in different units are:

INSTRUMENTS USED IN TISSUE PROCESSING.

1. Tissue bath.
2. Microtome. microtome
3. Paraffin dispenser.
4. Oven.
5. Microscope.
6. Cryostat.
7. Automated tissue processor.
8. Spatula.
9. Knife, surgical blade, for grossing.
10. Refrigerator.
11. Tissue slide: for mounting of tissues.
12. Bunsen burner. Paraffin dispenser

13. Embedding mold.

14. Tissue containers.

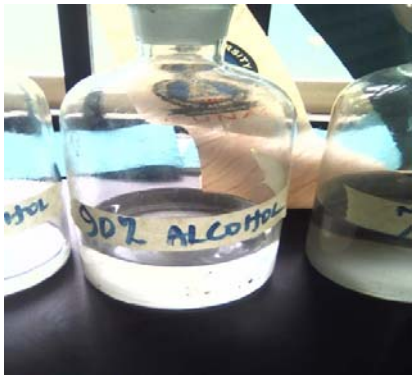
15. Staining containers.

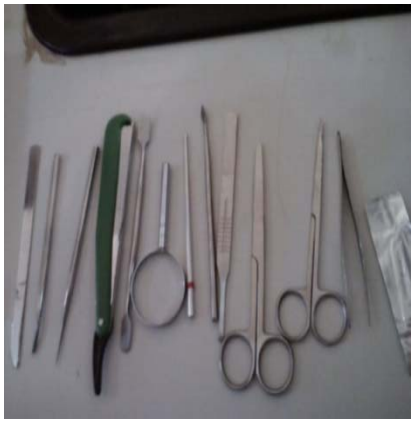
PICTURES GOTTEN FROM FUNAI HISTOLOGY LAB

Chemicals used in tissue processing include:

1. Bouin's fluid or formalin for fixation.
2. Alcohol for dehydration.
3. Xylene for clearing.
4. Melted paraffin wax.
5. Haematoxylin and Eosin for staining.





Pictures gotten with permission from histology lab FUNAI

INSTRUMENTS USED IN RADIOLOGY UNIT.

1. Ultra sound machine for imaging.
2. Ultra sound gel.
3. X-ray machine for imaging.
4. X-ray digitizer for producing clearer image of the film.
5. X-ray printer for printing of x-ray films.
6. Imaging bed for laying the patient.

X-RAY DIGITIZER

X-RAY CONTROLLER

Pictures gotten with permittion from maria assumpta klinicum, ogoja road abakalilki.

INSTRUMENTS, EQUIPMENTS, TOOLS AND CHEMICALS USED IN MUSEUM UNIT

1. Perspex sheet: used for constructing the tissue pot.
2. Mold.
3. Weighing balance.
4. Oral syringe.
5. File.
6. Brush.
7. Meter rule.
8. Fixatives.
9. Forceps.
10. Scissors.
11. Pipette.
12. T square.
13. Chloroform.
14. Saw: used for cutting Perspex sheet.
15. Work made: a table for construction.
16. Perspex cutter: for cutting Perspex sheet.
17. Needle and thread for stitching tissues.
18. Weight: for pressing down the pot.
19. Perspex cement for gluing the pot.
20. Tissue container: for fixing the tissue.
21. Drilling machine: for perforations.

PICTURES GOTTEN FROM FETHA II

INSTRUMENTS USED IN EMBALMING UNIT.

1. Trolley: used to move the corpse from embalming place to storage place.
2. Needle and thread: used for sewing and stitching.
3. Tray: where the deceased body will be laid on.
4. Surgical blade: used for opening the body.
5. Gravity tank: for storing embalming fluid.
6. Cold chamber refrigerator: for storing the corpse.
7. Scissors for cutting.
8. Forceps: used for holding the muscle of the body.
9. Cotton wool: for closing orifice.
10. Reagents for embalming such as formalin, glycerin, methylated spirit.

2.3 Other relevant experiences

This student's industrial work experience scheme has broadened my knowledge in different areas of anatomy. It has given me a better understanding of theory work done in the lecture hall.

This program has given more knowledge in histopathology, radiology, museum and morgue. In histopathology, I learnt how tissues are been processed and mounted on slides for microscopic view.

In radiology, I have been exposed to different imaging modalities like x-ray and ultrasound and how they appear on films. The museum work has helped me to understand how organs are potted for display for learning purposes and how the museum jars are constructed with Perspex sheet.

The mortuary unit has exposed me more on the structure of the body and how the femoral artery was mostly used for embalmment of deceased bodies.

CHAPTER THREE

Procedures/Steps on Different Section

3.1 HISTOLOGY/TISSUE PROCESSING UNIT

Histology/Tissue processing is an area of science that deals with the study of diseased tissues. This unit provides diagnostic service for the evaluation of biopsy specimen in humans and in animals. The diagnosis/evaluation is been carried out by the pathologist after the specimen have been produced and mounted on glass slide. This diagnosis follows different procedures/steps before the tissues can be viewed microscopically.

Tissue processing are procedures followed between fixations of those tissues and embedding/sectioning on paraffin blocks. Before tissues are brought into microscopic view, they undergo processing. It has different stages from fixation to mounting on glass slides.

Aims of tissue processing

The major aim of tissue processing is to remove water from the tissue and replaced with a solidified medium to enable the tissue to be sectioned. The process of removing water from the tissue is known as dehydration. For a tissue to be viewed in a microscope it must have a thin section. 5µm thick for light microscope and 80-100nm for electron microscope. The major component of tissue which is water has to be removed so as to be able to be viewed by the pathologists.

Tissue processing enables tissues to be rendered to more optical densities which increase the differential visibility in a microscope. After tissues are dehydrated, it is been cleared

using xylene to remove the dehydrating agent which is alcohol and infiltrated in paraffin wax.

Procedures for tissue processing

1. Reception
2. Grossing
3. Fixation
4. Dehydration
5. Clearing
6. Infiltration/Impregnation
7. Embedding
8. Mounting
9. Sectioning
10. De-waxing
11. Staining

Reception:

As the tissue arrives in the unit, the specimen is checked to ensure the following:

1. That the specimen is for histological or cytological examination.
2. That the container is clearly labeled and followed by a complete request form to show that the tissue would undergo processing.
3. That the sufficient fixative is in the container and that the specimen is not in a wrong fluid.
4. That the request form is detailed and stamped; the specimen is given an identity which will remain throughout the processing period till pathologist examination.
5. That the tissue is been registered and documented.

Grossing:

This is the process by which specimens are been examined or inspected with the bare eyes to obtain diagnostic information before further processing. This physical information which includes weight, measurement, color, any adjoining tissues and the type of tissue is written and documented.

After this physical examination, the tissue is cut up using surgical blade to obtain the sections of the tissue to be displayed.

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GROSSING OF TISSUES

PICTURES GOTTEN FROM HISTOLOGY LAB FUNAI

Fixation:

` This is the act or process of fixing of tissues. It is the process by which specimens are been preserved. Fixative is an agent used in preserving pathological or histological specimens so as to maintain the normal structure of its constituent elements. Fixatives are used to prevent tissues from undergoing autolysis.

Different fixatives are used for different tissues. Fixatives used for small tissues are not used for large tissues. Tissues like tiny blood vessels, adrenalin are small tissues and are fixed with bouins fluid. Tissues like skin can be fixed with formalin which contains formaldehyde, water and common salt. The commonly used fixative is formalin. Fixed tissues could last for a day or more before been processed.

CLASSIFICATION OF FIXATIVES

Fixatives are classified based on:

i. **Number of chemicals that make up the fixative:**

They are of two types:

a. Primary Fixative: primary fixative is made up of only one fixative e.g. formalin, ethanol, methanol, 10% formal saline, 10% normal saline.

b. Secondary or Compound Fixative: It consists of two or more fixatives and combined in a solution e.g. Zenker's formal (contains mercuric chloride, potassium dichromate and formalin), Acetic acid and Picric acid, Formal alcohol, Carnoys fluid.

ii. **Specific application of the fixative:**

They are of two ways;

a. **Micro anatomical fixatives:** These are fixatives used to preserve the anatomy of the tissue e.g. 10% formal saline, buffered formalin.

b. Cytological Fixatives: These are fixatives used to fix intracellular structures.

They are:

- ✓ **Cytoplasmic Fixatives:** These fixatives fix the cytoplasm sometimes at the detriment of the nucleus e.g. Fleming's fluid without acetic acid, Helly's fluid, Scardin's fluid, Regaud's fluid, Formalin with post-chroming.
- ✓ **Nuclei fixatives:** These fixatives fix nucleus sometimes at the detriment of the cytoplasm e.g. Carnoy's fluid, Fleming's with acetic acid, Clarke's fluid, Newcomer's fluid.

Changes Tissue Undergo after been harvested from the Body

1. **Shrinkage:** This occurs due to loss of water.

2. **Putrefaction/ Post-Mortem Defect:** Putrefaction is the degradation of tissue by microorganisms that integrate it.

3. **Osmotic Changes:** If the tissue is left in a fluid, the osmotic change could either cause a swelling change depending on the osmotic pressure of the fluid.

QUALITIES OF A GOOD FIXATIVE

- ✓ It should kill rapidly without distortion.
- ✓ It should penetrate the tissue rapidly and evenly.
- ✓ It should prevent osmosis and leaking of the cell and tissue constituents i.e. it should render substances of the cell insoluble.
- ✓ It should prevent autolysis and putrefaction.
- ✓ It should permit long storage of tissue.
- ✓ It should give good optical differentiation to unstained tissue constituent for easy microscopy.
- ✓ It should harden the tissue for easy handling and renders it insensitive to subsequent treatment.

- ✓ It should permit restoration of natural colour of photomicrograph.

Aims of fixation

a. To prevent autolysis and putrefaction.
b. To restore the cellular component.
c. To stop any shrinkage or swelling of tissue.
d. To impact a suitable hardness and texture to allow easy section.
e. Prevent distortion by any reagent used subsequently.
f. To render the tissues receptive of stains.

Dehydration:

Dehydration is the means by which water is been removed from tissues by passing the tissues into increasing dehydrating agent. Due to the immiscible nature of paraffin wax, it is of utmost importance that the water in tissue is been dehydrated to reduce the water content of the tissue before it is infiltrated in wax. In this stage, the tissues are passed through increasing concentration of dehydrating agent until absolute alcohol is used to reduce the water in the tissues to avoid excessive distortion of the tissue cells.
Dehydrating agents used are:

- ✓ Ethyl alcohol
- ✓ Dioxane
- ✓ Acetone
- ✓ Isopropyl alcohol

Methods of Dehydration

- **Rapid method:** In rapid method of dehydration, the tissue is meant to pass through 70% alcohol for thirty minutes in two changes, 90% alcohol for 30mins in two changes and100% alcohol for 1hour in two changes.

- **Routine method:** Routine method of dehydration takes longer time to dehydrate tissues. 1hour for 70% alcohol in two changes, 1hour for 90% in two changes and 1hour for absolute alcohol in two changes.

Clearing:

Clearing which is also known as dealcoholisation. it is the removal of absolute alcohol from the tissue.

Clearing is done to make the tissue transparent or clear. Clearing agents are known as antimedia.

Antimedia used for clearing are benzene, toluene, xylene, petroleum ether, chloroform and carbon tetrachloride etc.

Qualities of a Good Antimedia

- It removes alcohol quickly.
- It is able to mix with dehydrating and impregnating medium.
- It clears the tissue without causing much hardening.

Methods of Clearing

- **Rapid method:** The tissue is cleared for a shorter period of time. The tissue is passed in xylene used as a clearing agent for 30mins in two changes.
- **Routine method:** the tissue is passed through xylene as antimedia for 1hour in two changes.

Impregnation:

Impregnation is done by replacing the xylene with molten paraffin wax. The molten paraffin wax displaces the clearing agent and infiltrates the tissue thereby solidifying the tissue. Impregnation can also be known as infiltration.

Procedures for impregnation:

- Cut out the paraffin wax.
- Melt in a paraffin dispenser.
- Fill the container containing the tissue with the molten paraffin.

Materials used: Reagent container, molten wax, Vacuum oven, spatula, forceps, samples in cassettes.

Impregnation could be done in two forms:

- **Rapid impregnation:**
- **Routine impregnation.**

The **rapid form** is done for 30mins in two changes.

The **routine form** is done for 1hour in two changes.

The jar containing paraffin wax I, II and III are been put in an oven at a temperature of 5^0C to 10^0C above the melting point of wax to keep the wax in molten condition. After the final impregnation, the tissue cassettes are transferred to embedding bench.

Embedding:

This is the process of aligning the tissues in an embedding medium. Tissues are firmly fixed in a medium. The medium used is usually molten paraffin wax thereby causing the tissues to be solidified. The embedding medium helps for easy microtomy and for preservation to be used in the future. The tissues are well oriented in the molten paraffin wax so as to show full representation of the tissue parts when viewed under microscope.

Equipment used for embedding are:

- ✓ Embedding mould: for embedding the tissue.
- ✓ Forceps: for picking the tissues.
- ✓ Bunsen burner and tripod stand: for heating.
- ✓ Vacuum oven: for melting.
- ✓ Molten wax: for embedding.
- ✓ Groundnut oil or engine oil: for greasing the mould to aid easy removal of the tissues when solidified.
- ✓ Wax jar, hot plate, cassettes, gauze, knives, bolts, processed samples.
- ✓ Water bath: for easy solidification of the wax.

Types of embedding mould are:

- **L-shaped mould:** Pieces of rust-proof metals held together by a hinge.
- **Metal containers:** A rectangular or square shaped metallic container.

Steps in Embedding:

a) With forceps, pick out the paraffin infiltrated tissue cassettes from the jar containing molten wax.

b) Remove the paraffin infiltrated tissue from the tissue cassettes.

c) Arrange the L-shaped moulds or the metal container on the table and grease for easy separation of the wax from the mould. Use gauze to block any possible leakage from the L-shaped mould to avoid wastage.

d) Pour a little of the hot paraffin wax from the wax jar directly from the paraffin dispenser into the mould to fill the base area of the mould.

e) Using the forceps, Bury the tissue samples inside the molten paraffin wax quickly before the wax starts to solidify. Arrange the tissues so as to lie horizontally within the mould, to ensure proper orientation of the tissue and easy trimming of the block.

f) Use a warm forceps to slightly press the tissue down to the surface of the mould and use warm knife to melt any solidifying wax and keep the wax in a liquid state.

g) Place a label containing the name of the tissue close to the tissue for easy identification.

h) Fill the empty portion of the mould to the brim in order to get a perfect square shape.

i) Once the top of the wax has solidified, leave to solidify on its own or lift the mould carefully, and place it in cold water to speed up the solidification process. Leave in water bath for about 10minutes.

j) Remove the mould from the sample.

Trimming:

Trimming is cutting the wax into block shapes. Trimming is done to expose the tissue surface to level where a representative section of the tissue can be cut. The tissue must be trimmed to a thickness that will allow them pass through the microtome machine. Before trimming can be done, the tissue must have been removed from the embedding mould after been inserted in the water bath. The wax is not allowed to harden so much for easy cutting and to avoid breaking and disorienting the tissue. The tissue is trimmed to sizeable block/square shapes.

TRIMMED TISSUES

Mounting:

Mounting is done by attaching the tissue blocks to a wooden block.

This is done by holding a hot knife between the wooden block and the tissue block. This is done to ensure strong adhesion between the wooden block and tissue block.

Sectioning:

Sectioning is the process of cutting the tissue bocks into thin slices for examination under a microscope. Sectioning can also be known as **microtomy**. The microtome machine is adjusted to obtain thin sections of the tissue and the microtome knife is set in place in order to attain correct cutting.

Materials used for sectioning: Water bath, wax blocks containing embedded tissues, distilled water, rotatory microtome, microtome blade, frosted slide, 30% alcohol, glycerol and egg albumen.

Procedure for sectioning:

1) Set the water bath to reach 484 degrees Celsius before sectioning to heat water. This is used to float the tissue section prior to picking with a slide.
2) Place the wax blocks faced down on ice cubes for 10minutes to chill the block to facilitate fast sectioning. This renders the block sufficiently hard for thin sectioning.
3) Put the wax block in the block holder of the microtome.
4) Place a very sharp fresh blade on a microtome and lock it in place and make sure blade guards are closed. Lock microtome handle when not in use.
5) Adjust the block holder screws to place the block parallel to the blade.
6) Unlock handle and turn handle until samples starts cutting a little. The block is repeatedly sectioned at 20microns thickness per slice to remove excess wax till the entire surface of the tissue is exposed, discard the paraffin ribbon.
7) Secure and readjust the wax block and section the block at 3-5microns, this gives you a nice ribbon for easy microscopy. Some tissue biopsies are sectioned at different thickness but anything above 5microns is a thick section.
8) Gradually pick the sections with a forceps and lower onto a water bath.

9) If difficulty is encountered in spreading of the tissue, float the section on a 30% alcohol to increase the surface tension before transferring to the water bath.
10) Allow the section to remain on a water bath until it has spread sufficiently.
11) Pick the section with the plain side of a frosted slide, a mixture of glycerol and egg albumen at ratio of 50:50 is applied on the slide before picking the section from the water bath to enable the section stick to the slide.
12) Place the slides with paraffin sections on a hot plate or oven for 20 minutes (so the wax just starts to melt) to bond the tissue to the glass and also to dry some of the moisture.
13) Label the biopsy number on the frosted end of the slide with a pencil.
14) Arrange the slide on a staining rack for staining.

Staining:

Tissues are stained for differentiation purposes. Most tissues are transparent or colourless so it is stained so as to properly differentiate the cellular component of the tissues. The cells main cellular components are the nucleus and cytoplasm. Tissues are stained with dyes and some cells have affinity for different dyes. Using different dyes for tissue components helps to clearly identify the tissue component under light microscope. Before the tissue can be properly stained, it undergoes a process called **de-waxing**.

De-waxing is done to remove the paraffin wax. The wax is removed because wax is not permeable with stain. Wax is removed by immersing the tissue slide in xylene for 2-3mins in two changes.

After the tissues are de-waxed in xylene, the xylene which cannot be miscible with water is further removed. It is therefore removed by absolute alcohol for 1-2mins in two changes, followed by lower grade alcohol like 90% alcohol and 70% alcohol for 1-2mins each in two changes. The tissues are further hydrated with water. The sections are now rinsed with a distilled water or tap water. Now sections are ready to stain.

Staining is done using **Haematoxylin and Eosin** stain.

Haematoxylin stain: this is a generally used stain. It stains the nucleus of the cells. It produces blue color.

Eosin: is a cytoplasmic dye which stains the more basic proteins and other materials pink or red.

Constituents of Haematoxylin Stain:

*Hematoxylin - 2.5g

* Potassium alum - 50g

* Glacial acetic alcohol - 20ml

* Distilled water - 500ml

*Absolute alcohol - 250ml

* Mercuric chloride - 1.25g

Constituents of Eosin stain:

- Eosin - 10g
- Distilled water - 1000ml

Procedures for staining:

- Dip the slides in haematoxylin stain and leave for 10mins.
- Rinse in water.
- Dehydrate with alcohol for 3mins.

- Dip in eosin stain for 15mins.
- Rinse by dipping twice in water.
- Dehydrate with absolute alcohol and allowed to dry by exposing to air.

    - After staining, the slides are mounted using mounting solution called DPX mountant on the glass slide, cover with cover slip and allow to dry. Leave in xylene while mounting. Dry the slides in air, to make it ready for viewing with a microscope.

3.2 WORK IN ANIMAL HOUSE (DETERMINATION OF THE EFFECT OF VETEX DONIANA LEAF EXTRACT ON THE LIVER OF WISTAR RAT)

Twenty (25) rats were used for this and they were grouped. The rats were kept in groups of five (5) in five (5) cages and numbered group A, B, C, D, E

Group A is known as the control group

Group B, C, D, and E were the same.

The rats were left for two weeks to acclimatize with their environment.

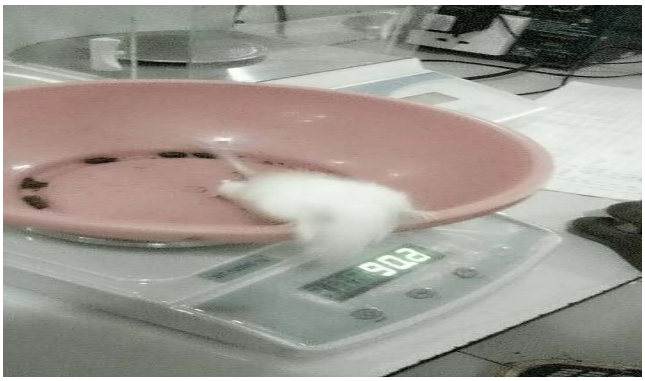
They were fed with water and vital feed.

After the acclimatization, the weight of the rats were taken and recorded.

The vertex doniana leaf was extracted and mixed.

The group B, C, D and E rats were given the vertex doniana extract according to their weight while the group A which is the control group were given formal saline.

The rats lasted for a total of six (6) weeks. After six weeks they were sacrificed and the following were harvested: Blood, Liver, pancreas, spleen, testes, and blood vessel.



WISTAR RAT BEEN MEASURED USING AN ELECTRONIC WEIGHING MACHINE

Feeding the animals with vital feed and water

3.3 RADIOLOGY

This unit was done at Maria Assumpta Klinikum Ogoja Road Abakaliki Headed by Dr. Ezeonu Paul.

Radiology is the branch of medicine that uses radiant energy or radioactive materials in diagnosis and treatment of diseases. Radiology uses different imaging modalities to examine the internal structures of the body. This examination is carried out by a medical personnel called a radiologist and further taken to a medical doctor for interpretation.

Different imaging modalities learnt in this unit are:

- Ultrasound scan.
- Plain radiograph.

Ultrasound Scan:

This is an imaging modality that uses high frequency of sound energy to view images of the internal structure of the body. It is a procedure used in viewing soft tissues in the body. Ultra sound scan can also be referred to as ultrasonography. Ultra sound does not emit radiation when internal images of the body is viewed therefore it is a preferred imaging modality used to view a developing fetus during pregnancy. In ultrasound, electrical energy is been converted to sound energy. It is a cheap and safe modality choice. One who performs ultrasound is known as a sonographer.

Principle:

The transducer or probe which is the main part of the ultrasound makes the sound waves and receives the echo. It generates and receives sound waves using a principle known as

piezoelectric effect. This principle was discovered by Pierre and Jacques curie in 1880. In the probe, there are one or more quartz of crystals called piezoelectric crystals. When an electric current is applied to these crystals, they change shape rapidly. The rapid shape changes or vibrations of the crystals produce sound waves that travel outward. When sound waves hit the crystals, they emit electrical current. Therefore the same crystal can be used to send and receive sound waves. The waves also have a sound absorbing substance to eliminate back reflections from the probe. The probe determines the it's field of view and frequency of emitted sound waves determines how deep the sound waves penetrates and the resolution of image.

Parts of the ultrasound machine

- **Transducer:** it is a handheld sensor placed on the body surface to send and receive the sound waves.
- **Display:** it displays the image from the ultrasound data processed by the CPU.
- **Central processing unit (CPU):** this does all calculation and contains the electrical power supplies for itself and the transducer.
- **Transducer pulse control:** this changes the amplitude, frequency and duration of the pulses emitted from the transducer.
- **Printer:** this prints the image from the displayed data.
- **Disk storage device (hard, floppy, CD):** it stores the acquired images.
- **Keyboard/cursor:** used to input data and takes measurements from the display.

Types of transducers

- ✓ **Abdominal probe:** used for imaging abdominal visceral.
- ✓ **Vaginal probe:** used in imaging pelvic visceral.
- ✓ **Breast probe:** used for imaging the mammary gland.

Types of ultrasound

There are different types of ultrasound. They are as follows:

- External ultrasound: this involves placing the transducer on the surface of the skin and moving it over the body part to be examined. External ultrasound can be used in the examination of the developing fetus in the mother's uterus, the reproductive organs, heart, gallbladder, liver and kidneys.
- Internal ultrasound: this involves placing an ultrasound probe into the vaginal or rectum.
- Endoscopic ultrasound: this involves insertion of an instrument known as endoscope into through the mouth to examine the esophagus, duodenum or stomach. The endoscope produces similar images to external and internal ultrasound.

Procedures for carrying out an ultrasound scan

Before an ultrasound, the patient may be asked to fast depending on the area of the body or organ to be imaged e.g. abdominal visceral.

During an ultrasound, the patient changes his/her clothing into a hospital gown, he or she lies down on the examination couch with area of the body to be imaged exposed. The sonographer applies the ultrasound jelly to the patient`s skin. If the pelvic region is to be imaged, the patient removes her under wear and the ultrasound gel is applied to the vaginal probe to prevent friction, act as grease, and to help as a transmitting medium of sound waves between the body surface and the ultrasound machine. Condom is used to

cover the transducer and is inserted in the vagina of the patient and constantly adjusted to produce images in different direction of the organ that is been imaged.

After an ultrasound, the condom is removed and gel is cleaned from the transducer. The patient is also given tissue paper to clean up.

Importance of ultrasound scan

1. Due to its zero radiation, it is comfortably used to image developing foetus and gives information to the mother to know the state of the foetus.
2. It helps in the detection and assessment of growths in the female reproductive organ like fibroid, tubal or ovarian masses.
3. It can also help in detecting abnormalities in other organs like the liver, kidneys, gallbladder, lymph nodes, prostrate, pancreas, breast, testes, thyroid and eyes.

Plain radiograph:

This is the imaging of body structure using electromagnetic radiation. Plain radiograph is also known as x-ray. X-ray is a form of radiation similar to radio waves, visible light and microwaves. X-radiation is a special imaging modality because it has a very high energy level that allows the x-ray beam to penetrate through the body and create an image or picture of the imaged part of the body. The x-ray unit consists of a radiologist and a radiographer.The radiographer makes a radiograph of the body while the radiologist interprets it.

Principle

X-ray imaging begins with a beam of high energy electrons that enters into the body. The point of penetration is based on the intensity, quality and wavelength of the x-ray beams. The

stronger the beam of x-ray, the higher its penetrating power. Also the higher the density of material to be imaged e.g. bone, the brighter the image on a photographic film.

Procedure:

Before a Plain Radiograph: before a plain radiograph is taken, the following are considered.

- An x-ray request form or referral letter gotten from a doctor. This is a legal requirement and no x-ray examination can be performed without it.
- Patients are taken to a changing room to remove their cloth and put on a hospital gown. This ensures clarity of the images produced as some clothing can make images blurred.

Items like watches, necklaces and certain types of clothing that contain metal objects such as zips are removed because these items may interfere with the quality of the image.

In my place of attachment, the patient was asked not to eat heavy food like eba, rice etc. but to eat foods like agidi, pap etc.

During a plain radiograph:

- A radiographer accompanies the patient to an x-ray examination room.
- The procedure is explained to the patient.
- Depending on the part of the body that is to be imaged, the patient is placed in a standing, sitting or lying position.(most plain radiograph are done with the patient lying down)

Depending on the pathological organ that is to be imaged, the radiographer determines whether an anterior-posterior (AP), posterior-anterior (PA), lateral or oblique view should be

used to image the organ. In AP the beam is shot from anterior position and dictated at posterior position; while in PA, the beam is shot from posterior position and dictated at anterior plane.

Most organs, particularly organs in the chest are well represented in images gotten from posterior-anterior (PA).

The radiographer instructs the patient to stay still few seconds before shooting the x-radiation beam. Any movement might make the image blur.

Urographin was injected into the patient body because the patient's kidney and ureter was to be examined. Urographin is excreted only by the kidney. The procedure whereby the kidney and ureter is been assessed using urographin is known as **intravenous urography.** The x-ray cassette was fixed and the urographin injected was left for 5mins before the x-ray was taken.

As the excretion progressed from the kidney, another shot was taken after 10mins. Then another was taken as the excretion reached the level of the ureter.

The patient was suspected to have a tied ureter so the ureter was examined to know the exact area of occlusion.

NOTE: urographin produces different reactions on different individuals. To some patients they may vomit while other can react more severely.

After a plain radiography: after the x-rays are taken, the cassettes are inserted into the digitizer to make a clearer picture of the body image and then sent to the printer for printing. A radiologist (specialist x-ray doctor) then carefully assesses the images, makes a diagnosis and produces a written report on the findings. The report is sent to the referring doctor, specialist or allied health professional that referred the patient for the test.

NOTE: X-rays are invisible and so not painful.

Importance of x-ray

X-ray imaging is useful to diagnose disease and injury such as pneumonia, heart failure, fractures, bone infections, arthritis, cancer, blockage of the bowel, and collapsed lung, etc.

Plain radiography is used to image most structures in the respiratory system, cardiovascular system, musculoskeletal system and urogenital system.

3.4 MUSEUM TECHNIQUES

This unit was done at Federal Teaching Hospital Abakaliki (FETHA 2).

MUSEUM: is a permanent institution in the service of the society and of its development open to the public which acquires, conserves, researches, communicates and exhibits for purposes of study, education, enjoyment, tangible and intangible evidence of the people and their environment.

Anatomical Museum: Anatomical museum is a branch of morbid anatomy which preserves normal and abnormal tissues of the human body and displays it for research or study purposes. It conserves a medical and surgical tissue for future generation. It is usually situated in the hospital and school to help the pathologist study the health condition of tissue and evaluate it and pass the knowledge for future use. Anatomy Museum can serve as tourist center where humans and animal tissues can be displayed.

Museum techniques: these are processes involved in the preservation of man and animal tissues.

People involved in museum

- ✓ Pathologist or an Anatomist
- ✓ Curator
- ✓ Technician
- ✓ Secretary
- ✓ Cleaner

Units in museum

- o Offices (of the pathologist and curator)
- o Storage room
- o Seminar room
- o Display room

Organization of the museum

The following are to be considered in setting up an anatomical museum

- ❖ Fund
- ❖ Space
- ❖ Specimen
- ❖ Purpose

Structure of an anatomical museum

a. Lighting: there should be proper lighting in the museum. Electricity is better used because sunlight could affect the specimen in the museum and make them fade.
b. Air: the museum should be air conditioned to avoid making the museum too hot or too cold.
c. Floor: rubber floor are preferable. It is not slippery and noisy.

d. Fittings: the fittings should not be too long or short. It should have cupboards with contrasting colors. The specimens should be spaced.

Things found in an anatomical museum

- ✓ Fluid preserved specimen
- ✓ Dried specimen
- ✓ Models
- ✓ Charts
- ✓ Slides
- ✓ Projectors
- ✓ microscopes

Basic museum techniques

1. Reception

2. Preparation

3. Fixation

4. Restoration

5. Preservation

6. Presentation

Reception:

On receiving any specimen, the name of the tissue is written, accession number (date of reception), catalogue number, the type of specimen whether organ or bone, fixed or unfixed specimen, name of the person that fixed it and the fixative used, name of the person that brought the specimen and where the specimen was taken from.

Preparation:

If the specimen came in fresh, photographs of it might be taken after trimming them. The specimen is washed with fixative preferably alcohol if it has blood. It should not stay for too long in the alcohol to avoid discoloring them.

Fixation:

The tissue is been fixed to avoid autolysis and decomposition and to maintain the normal size and shape of the tissue. The tissue is fixed with Kaiserling solution 1.The volume of the fixative used should be 10times the size of the tissue to be prepared. Larger specimen should be injected for uniform penetration.

Components of Kaiserling solution 1

- 40% Formalin - 400ml
- Potassium nitrate - 30g
- Potassium acetate - 60g
- Distilled water - 2000ml

Restoration:

The colour of the specimen is to be restored using kaiserling solution II. Normally it is a reducing agent. Ethanol can be used to restore the colour of the tissue.

Preservation:

Specimens are preserved according to the type of tissue. Organs are preserved using museum pot or jar.

Construction of museum pot

Museum pot is constructed using Perspex sheet.

Procedures:

- Put the organ in a tray and take the measurement of the tissue.
- Using the measurement, cut out the Perspex sheet.
- Remove the greasy part of the Perspex sheet.
- Using file, smoothen the articular surface of the Perspex sheet.
- Rub chloroform on the articular parts of the Perspex in order to accept the Perspex cement.
- Fix one side of the Perspex sheet with the other and leave for some minutes.
- Fix the other side of the Perspex sheet.
- Fix one cover of the Perspex and leave for a day.
- Put a weight on the jar.
- Fill with water to check leakages.
- Cut out the Perspex sheet to make the stoppers.
- Rub chloroform on the stoppers and fix on the museum jar using Perspex cement.
- Cut out the Perspex sheet to create the centre plate.
- Drill a hole on the centre plate and attach the organ to it using thread and needle.
- Insert centre plate containing the tissue into an alcohol for colour restoration and leave for some minutes. Do not leave for a long time to avoid bleaching the tissue.
- Wash the jar and fix the centre plate to it.

- Fill the pot with a mounting fluid.
- Fix the top cover of the tissue.
- Drill a hole on the top cover using the drilling machine.
- Through the holes, fill the pot to the brim
- Cut out the Perspex sheet to create the Perspex rod.
- Attach the rod to the holes on the top cover of the pot.

Preservation:

Specimens are preserved with kaiserling solution III. This is the solution which the specimen carries on display.

Components of Kaiserling III Solution:

- Glycerine - 100ml
- Sodium acetate - 100ml
- Formalin - 50ml
- Distilled water - 1000ml

Presentation:

The specimens are labelled and catalogued. The labels should be neat. For the pots, type their names and tape on them. For bones, drill a small hole and put a tape bearing the catalogue number and accession number.

Each specimen should have a card. They are to be placed in a glass table in order not to be tossed around.

3.4 MORTUARY UNIT (MORGUE)

This unit was also done at Federal Teaching Hospital Abakaliki (FETHA 2)

Mortuary is a place where deceased bodies are preserved and kept before interment.

Deceased bodies are preserved by embalmment.

Embalmment: this is the art of preserving deceased bodies.

Types of embalmment

There are two types of embalmment. They are:

1. **Dry embalmment**: this is done by putting the corpse in a freezing chamber.
2. **Wet embalmment**: this type of embalmment is mostly used. It is done by injecting chemicals into the dead body.

The fluid used for embalmment is known as embalming fluid.

Constituent of embalming fluid

- Formalin which is 40% formaldehyde solution
- Ethanol which is an absolute alcohol.
- Phenol which is an anti-fungal agent. It prevents the action of bacteria.
- Glycerol: reduces the harsh effect of formalin.
- Water: used for dilution.

Forms of Embalmment:

1. **Injection:** this is done through the skin, muscles, tissues, orifices. This method does not reach the organs; it only reaches tissues close to the skin
2. **Infusion:** is the gravity-flow method used for arterial embalmment.
3. **Refrigeration:** this is done by putting the bodies in a cold room.
4. **Immersion:** this is done by submerging the bodies in a pool of embalming fluid.

Processes of Embalmment

The actual embalming process usually involves four parts;

1. **Arterial Embalming:** this involves injection of embalming fliud into the blood vessels. It could be through the femoral artery, saphenous vein, carotid artery and brachial artery. While the embalming fluid is circulating, it displaces the interstitial fluids and blood is expelled through the openings of the body.
2. **Cavity Embalming:** this involves injecting the embalming fluid into cavities of the body with the use of an aspirator and trocar.
3. **Hypodermic:** this is a type of embalming in which hypodermic needle and syringe is used to inject the embalming chemicals into the tissues, especially those areas where arterial embalmment could not get, depending on the trauma prior to the death.
4. **Surface embalming:** this is another type of embalmment in which the corpse dipped into a solution of embalming chemical to preserve and restore areas directly on the skin's surface and other superficial areas.

Procedures for Embalmment.

Prior to embalming, there is certain procedures one need to consider.

Pre-embalming procedure

When a body is brought to mortuary:

I. A medical doctor who is not part of the embalming must certify that the body is dead.
II. The body must be registered and have a document pertaining the cause of death, date of death and the date in which the body will leave the mortuary.

Embalming procedure

After the above processes, the body is undressed; the jewelries are removed because it could occlude the flow of the embalming fluid.

1. The body is cleaned with disinfectant and germicidal solution.
2. The body is placed in anatomical or supine position, the arm, hand, legs are flexed to release rigor mortis.
3. An oblique incision is made along the femoral triangle to locate the femoral artery, carotid artery, brachial artery depending on choice of the mortician, but mostly femoral artery is used in adults and saphenous vein in children.
4. The forceps is passed under the artery and an oblique incision is made on it.
5. Upper part of the artery is tied tightly and the lower part is tied loosely.
6. The aspirator bottle pipe is put in the femoral artery, one facing the upper limb and the other facing the lower limb.
7. An embalming fluid is infused into the femoral artery with the help of trocar.
8. Position the hands, legs and head of the deceased body.
9. If the body is a female, the breasts are tied together.
10. The fluid is allowed to circulate within the body.
11. The blood and other tissue fluids are drained through the corresponding vein.

12. After the embalming fluid circulates, the forceps is removed and the artery is tied with cotton cloth.

Dressing embalmed body.

Before a deceased body can be conveyed for interment, the morticians have to make them look in life manner.

Steps

1. The body is washed with a solution of disinfectant and germicidal solution.
2. Shaving may be done to clear the mandibular hairs if it was overgrown before embalmment.
3. The body is dressed with cloth, hand glove, stockings and other applicable clothing material.
4. Dyes, cosmetics and jewelries may also be applied.
5. Glycerin oil may also be applied on the face to look like the deceased body is sweating.
6. The body is laid inside the coffin and ready to be transported to the interment ground.

CHAPTER FOUR

4.1. CONCLUSION

SIWES attachment has given me a very wonderful privilege and I never regretted exploring it because of the practical knowledge I gained. It was not just another academic requirement to me, but an opportunity to peer into the organisational structure and how they operate. SIWES attachment has made me to be smart as a student and to understand the jobs which am likely to meet in the nearest future and how to get used to machines and other working

equipment that can enhance the performance of a particular task. I was able to acquire practical knowledge in the following field:

a) Tissue processing techniques

b) Different radiological imaging techniques.

c) Tissue pot construction.

d) Embalming and mummification

I also learnt how to relate with different people. I was opportune to meet a lot of people like academic staffs, non-academic staffs, doctors, patients, and other hospital personnel. Interacting with them on regular bases has helped me to keep a positive attitude.

CHALLENGES ENCOUNTERED

- In one of the places where I did my industrial training, most important machines there had no complete parts and electricity was not always available to carry out our work. Some of the equipment was not available and we had to improvise, therefore some procedures are performed manually or manoeuvred. This requires much labour and it's also time consuming and sometimes the end result are affected.
- Another challenge was that sometimes the diagnoses carried out on the patients were done at night when we must have gone home.
- I encountered financial challenge and it made me to trek most times from my place of resident to my place of work even though they were not so close. This really affected me because I got exhausted when I reached my place of work.

4.2. RECOMMENDATION

- All university students that are to enter into industries, firms and establishment should have a first-hand experience of SIWES program.

- The organisations should ensure that there is regular maintenance and provision of all laboratory equipment and machinery to enable students on industrial training carry out their practicals effectively.
- I also suggest that ITF should liaise with some companies so that they will take up students for industrial training. This will help students who find it difficult to find attachments.