BASIC SURGICAL SKILLS:

Listen to everyone who will teach you, take nothing for granted or face value and learn to cultivate the best points of practice you see demonstrated. But, above all, use your skills, all mind and all your heart to care for those people who will inevitably seek your help in the years to come.

Jain J. Skinner

Principles of Basic Surgical skills

The Basic principles of wound management

Assessment of wounds

The pathology of wound healing

The surgical management of wounds

1- Assessment of wounds
   Classification
   A- Clean
   1- Example: a- elective surgical
       b- Hernia surgery
       c- Breast biopsy
   2- Comments:
       a- Low wound infection rate approximately 2%
       b- Routine primary closure
   B- Contaminated-tidy
       1- Cause:-
           a- Low-relocity traumatic insicisions
           b- Clean and sharp with local damage
           c- Contamination minor and brief
           d- Minor intraoperative contamination e.g. kitchen knife/ clean glass cut,
              small bowel or bronchial tree opened introoperatively.
2- Comments:
   a- Wound infection rate 1-5%
   b- Routine primary closure after some debridement and irrigation

C- Contaminated – untidy
   1- Cause:
      a- Low velocity lacerating, tearing, or bursting wounds
      b- Ragged and contused with gross local damage
      c- Contamination apparent and prolonged
      d- Major operative contamination
      e- All high-velocity injuries

e.g.
   a- Crush injuries
   b- garden tool injuries
   c- bullet wounds
   d- large bowel, infected bronchial tree or infected urinary tract opened intraoperatively

Comments:
   Wound infection rate 5-25% may be closed after wide debridement and copious irrigation or may require delayed primary closure

4- Dirty/infected

A- Cause:–
   1- Wounds with signs of infection such as erythema, cellulitis or pus
   2- Grossly contaminated wounds
   3- More than 12 hours after injury
   4- Severe tissue damage and excessive ischaemic tissue

B- Examples:
   1- Severe crush injuries
   2- Penetrating abdominal trauma with hollow visceral perforation
   3- War wounds
   4- Cloth, shrapnel, faeses etc. in wound
C- Comments:

1- Wound infection rate near to 50% if the wound is closed
2- May be closable after total excision or wide debridement and copious irrigation but often requires healing by delayed primary closure or secondary intention.

Pathology of wound healing

wound healing:

The repair of any soft tissue relies on:-

- The body generating capillaries and collagen on both sides of the wound
- This collagen cross-linting with wound-edge collagen and new collagen
- The wound contracting in size
- The unaligned cross-linked collagen mataning into regularly arranged bundles (a scas) to provide the health wound with strength
- Epithelial groth across the defect

Factor affecting wound healing:-

A- Local

1- Ischaemia
2- Tension
3- Dead space
4- Foreign bodies/ contamination
5- Wound infection
6- Haematoma
7- Chronic tissue factors
8- Local trauma
9- Sutures
10- Irradiation
B- General factors:

Age/ comorbidity, e.g. diabetes, renal failure

Anaemia/ blood loss

Shock, hypovolaemia/ hypoxia

Malnutrition – Micronutrient & protein

Major infection / Septicaemia

Advanced malignancy

Steroid use

C- Technical factors

1- Wound evaluation skills

2- Surgical techniques

1- Wound evaluation skills

  a- Ascertain the mechanism of injury
  b- Examine the wound site
  c- Decide on the wound repair

2- Surgical Techniques

  a- Before repair
     Closure

     Primary
     Delayed primary
     Secondary closure

Criteria for seeking expert and assessment of wound

  a- Inexperience
  b- Large skin loss
  c- Demonstrated deep structure injury
  d- Suspected or potential deep structure injury
  e- Large or complicated wound
  f- Type 3 or type 4 wound
  g- Inadequate facilities for repair
h- Adverse factors
   Local
   General
   Technical

Rehabilitation required

2- Explanation and consent four main areas should be discussed:
   The alternative to your treatment plan
   The benefits of your treatment plan
   The risks of both your treatment plan and alternative plans

3- Factors in wound management
   a- Antimicrobials
      Antibiotics
      Tetanus prophylaxis
   b- Anesthesia
   c- Haemostasis
   d- Debridement and irrigation
   e- Wound closure
      Method
      Materials
   f- Immobilization

4- Dressings and splints:
   a- Adhesive strips used to take tension off the skin and aid in opposition
   b- Dressing should be non-adherent e.g. talle gras with gauze over the dressings

D- Splinting of wound
   - If:
      Tendons
      Neurovascular tissue
      Bones

   - Splintes
      Plaster slab
      Cast
      Padded aluminium splints.
- Bandage sizes for body parts
  Finger / hand 2.5 cm
  Wrist / forearm 5.0 cm
  Upper arm / calf 7.5 cm
  Thigh 10.15 cm
  Head 10-15 cm

After repair. The discharge from emergency:

  a- Provision of slings or crutches
  b- Prescription of antibiotic Analgesic
  c- Arrangements for follow up & rehabilitation
  d- Best posturing and allowed movements
  e- Normal course of healing & variants to be expected during this time
  f- Problems to return for, and who to consult also need to be discussed
  g- Appropriate work certificates should be provided at this time

Surgical instruments and their use:

  1- Cutting instruments
     a- Scalpels
     b- Scissors
     c- Other cutting instruments.

A- Scalpels :
  - Recent one, two piece
    Permanent handle
    Disposable blade
  - Used for deliberate and precise division of structures with the minimum trauma to surrounding tissue
  - Variety of blades and handles
  - Not used on metal or bone
  - The whole length of the blade, not just the tip, should be employed in cutting and it should always be held at go to the skin surface.
  - The ease of cutting with a scalpel is one of its great problems
  - Inappropriate assessment of a situation may lead to the incision or division of a vital structure (e.g. peripheral nerve)
- Some simple rules to minimize this risk:-
  1- Do not cut anything that cannot actually be seen
  2- If the tissue to be divided is superficial to a vital structure, insert an instrument or cutting guide between then
  3- If dissecting near a known structure (e.g. nerve or vessel ) cut in the line of the structure to prevent dividing it accidentally
  4- Plan (and mark) your incisions and practice the cut in the air first
  5- If cutting is in deep cavity time spent improving the access and exposure equates to time saved repairing a potentiall error.

B- Scissors:
  1- Are used to cut tissues during many parts of the dissection process
  2- Are produced in both sharp-pointed and blunt-ended verities
  3- The most commonly used in general surgery is blunt-ended
  4- Other varieties include.

<table>
<thead>
<tr>
<th>Light</th>
<th>straight</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>angled</td>
<td>short</td>
</tr>
<tr>
<td>Heavy gnage</td>
<td>curved blades</td>
<td></td>
</tr>
</tbody>
</table>

5- Used for cutting
6- Scissors may also be used to dissect
7- Many styles of scissors are designed for the right hand
8- Types of scissors
   o Dissecting scissors, rounded points on both blades and are the most commonly used scissors in general surgery e.g. fine scissors metzenbaum’s scissors. Heavy scissors Myo scissors; short variey Dubois or golighers; long
   o Other scissors
   o Suture scissors e.g. Ferguson’s anyled straight mayo nurses scissors
   o Dressing and general purpose scissors
   o Straight bladed Myo’s scissors nurses scissors
   o Vascular scissors Pott’s angled scissors.
C- Other cutting instruments

1- Skin graft knife
   a- Several variations in size shape & complexity
   b- Single –sided razor blade to large electric skin graft harvester
      (dermatoma)
   c- Hamby knife
   d- Watson modification of Hamby knife

2- Bone cutters / nibblers used by
   Orthopedic surgeons
   Neurosurgeon
   Thoracic surgeon
   Vascular surgeon
   Plastic surgeon

To resects bone

Eithe have scissor

Like blades or scalloped cups

3- Periosteal elevator lifts the periosteum

4- Curette
   Shaped essentially like a scoop
   Used to clean out cavities by scraping away their contents e.g. abscesses
   Friable infected bone segments & uterus

Grasping instruments

- Forcep ; is the generic name given to any instrument that is used to grasp or hold
- Forceps may be:-
  - Hand –held (like tweezers)
  - Scissor pattern with or without rachet
- Forceps may be used to :-
  Grasp tissues
  Needles
  Sutures
  Or even other instruments
- Forceps are classified to:-
  1- Tissue forceps
  2- Vascular forceps
  3- Needle – holding forceps
  4- Other grasping forceps.

1- Tissue forceps:
   a- Basic purpose ; - to grasp tissue in minimally traumatic manner
      - For stabilization for retraction
   b- Two basic designs:-
      Hand –held pattern
      Scissor pattern
   c- To grip these instruments chopstick or perihandling grip is employed
   d- hand-held (thumb) forceps
      - Used for manipulation of viscera or soft tissues during the active phases of a
        procedure such as dissecting or suturing
      - They may be short, medium or long in size
      - Their hands may be toothed or non toothed.

Toothed Forceps:

- Used for skin stabilization for fascia and muscle handing during the process of
  suturing
- Presence of teeth, makes the grip required
- Number of teeth 1*2 or 2*3
- Examples
  Small, Adson forcep 1*2 tooth
  - Fine
  - Used in plastic surgery

  Medium:
  - Gillies forceps 1*2 tooth
  - Used for any type of skin
Non–toothed forceps:

Two basic patterns:

1- Has no teeth, only ridges or grooves e.g. dressing forceps
2- Has interloking longitudinal rows of teeth, very small are described as Debakey forceps; cardiovascular

Used for:

1- Vascular
   Bowel work
   Pulmonary
2- Manipulation of packs and dressings

Types:

Small short

Debakey forceps

Medium

Intra operative visceral

Manipulation

- Large/long
  Used predominantly in deep cavities
  Pelvis
  Thoracic surgery

Insertion of abdominal packs

Ratcheted (scissor-style) forceps:-

May be Traumatic

Atramatic
Sizes:

- Small
- Medium
- Large

Types:

1. Toothed ratcheted forceps
   a. Fine: Allis forcep
   b. Heavy: Kocher’s

2. Non-toothed forceps
   a. Fine: Babcock
   b. Heavy: Duvall

Vascular Forceps:

Categorized generically into:

A. Crushing
B. Non-crushing

A. Crushing:
   Artery forceps:
   - For control of bleeding
   - Holding tissues

B. Non-Crushing vascular clamps
   e.g. Bulldog
   - Temporary occlusion of vessels
   - It will not damage the tissue

Needle-holding forceps:

1. Used to drive a needle attached to a suture thread, through tissues
2. May be:
   a. Locking; have locking ratchet
   b. Non-locking
Bowel clamps:

A- Non – crusching bowel clamps
   1- Blades are longer than handles ensuring lower pressure on the tip
   2- May be :-
      Straight
      Curved

B- Crushing bowel clamps :-
   1- Strong, rigid , bowel is crushed between jaws
   2- Used on bowel e.g. Parker – Kerr clamps
      Kocher’s forcep

Gall bladder forceps

Different forceps used e.g.

- Rampley’s sponge- holding forceps
- Moynihan forceps

Right angled forceps:-

1- Any scissor pattern, ratcheted forceps in which the jaws undergo a (virtually) 90 bend during their course.
2- May be:-
   Fine
   Heavy
3- Very useful for passing sutures, or slings, around or under structures deep in a wound
4- To grasp blood vessels

Sponge- holding forceps

- Rampley sponge holding forcep is another long , scissor – pattern , ratcheted forceps
- Used to hold swabs
- May also be used as a tissue forcep for the gall bladder or lung
RETRACTING INSTRUMENTS:

A- Essential for the display of deep tissues by assistant during operation

B- May be
- held by hand
- Self retaining that locks into position with a spring, ratchet or screw mechanism

C- Types:
   1- Hand- held retractors
      a- Small hand- held retractors
         Toothed small – hand – hed retractors
         e.g. skin – hook
         cats – paw rake
      
      b- Non – toothed small hand- held retractors
         Langen beck retractor
         Durham – bar retractor
         Czerny retractor
      
      c- Large hand – held retractors
         -Superficial retractors e.g. Morris retractor
            Fritsh or Kocher
         -Deep retractors
            Long, wide – bladed, hand- held retractors
            e.g.: Deaver retractor
            St mark’s pelvic retractor
   
   2- Self – retaining retractors
      a- The common fact of self- retaining retractors in their ability to lock into a fixed position
b-Retention occurs by a system of
  - Springs
  - Ratchets
  - Screws
  - Cranks
  - Hooks

c-Types:
  - Small self – retaining retractors used for:
    - Cutaneus
    - Superficial body wall
    - Superficial body cavity
      Anal
      Vaginal
      Nasal
  - Spring retractors
  - Ratcheted retractors
  - Weitlaner retractor
  - Screw retractors
  - Joll thyroid retractor
  - Duck- billed vaginal Speculum
  - Large self – retaining retractors
    1- Screw retractors :
      Balfour- doyen self – retaining retractor
    2- Crank retractors
      Similar to the balfour- Doyen e.g. Finichetto
- Hook retractors:
  Denis browne ring retractor

Other instruments

SUCKERS:

1- Simple suckers
   a-Small suckers
   Typical ENT sucker
   b-Large suckers
   Yankauer sucker

2- Sump suckers:
   Has a simple antral tube with a single end hole over which is screwed a sheath with multiple small perforations e.g.
   Poole sucker
   Simpson – smith sucker

TOWEL CLIPS:-

1- Ratcheted scissors – pattern towel clip
2- Spring – action towel clips

BOWLS:

- Kidney dish
- Splash bowel for washing gloves in
- Jug
- Gallipot (small) for preparation solution and other fluids
SURGICAL DIATHERMY:-

- Diathermy is an electrical device that can be used to coagulate from small –
caliber blood vessels, and to cut through tissues

- Basic principle of diathermy is that heat, created by the flow of current through tissues, will coagulate blood or vaporize tissue

- Has two modes
  - Monopolar
  - Bipolar

- Monopolar:
  - Used in general surgery avoided in
    - Cystic duct
    - Vessel walls
    - Nerves
    - Penis

- Bipolar diathermy:-
  - Relies on the passage of alternating current between the two tips of insulated instrument

SUTURE MATERIALS AND SURGICAL NEEDLES:-

Threads used for:

   Suturing: sewing
   Ligating: tying and securing
   Thread with needle- suture
   Thread swaged to a needle
Varieties of needles:-

Attached to suture = swaged needle

Threading with loose = Eye needles

Individual threads

SURGICAL NEEDLES:-

Properties of surgical needles

1- Corrosion – resistant material e.g. stainless steel
2- Rigid enough to penetrate tissue without bending
3- Ductile enough to deform without breaking
4- Slim enough to cause minimal trauma to tissues
5- Wide enough to draw the thread without undue abrasion
6- Sharp enough to penetrate tissues easily
7- A method of thread attachment e.g. eye or swage.
8- Stable when grasped and used in an instrument

Anatomy of a surgical needle:

Swage

Needle body

Needle point

Surgical needle characteristics:

The most important characteristics of surgical needles are:

Shape and curvature

Needle length and wire diameter (size)

Tip and cross-sectional shape

Attached to the suture material
Shape and curvature

½ circle – Ophthalmic and microsurgery
3/8 circle – General use in all tissues
½ circle – General use in all tissues
5/8 circle – CVS and cavities (oral, nasal, pelvis, etc...)
Straight – General use
J – shaped – Similar to 5/8 (femoral hernia)

Needle length and wire diameter (Size)

Tip and cross – sectional shape

Cutting (conventional) △ edge up
Reverse cutting ▽ edge down
Taper point ○ round - bodied
Blunt round - bodied
Taper –cut (edge down and round body)

Attachment to suture materials:

- Needle come preattached to their threads
- Eye needles are still in use
  ○ Gynaecology
  ○ Unusual circumstanus

Suture sizes:

Two systems:

1- USP standard
   Minimum and maximum diametters of the material in inches and the minimum knot pull strength
2- European pharmacopeia system (EP). Based on millimeter thickness and different knot pull tests (also known as metric system)
Suture selection:

12/0 to 7/0

Four times smaller than human hair exclusively microsurgical

6/0

Human hair size

The smallest

Face & blood vessel

Suture used in naked vision

5/0

Face, neck blood vessels

3/0

limbs, trunk, gut, blood vessels

2/0

Trunk, fascia, stomach, viscera & blood vessels

0-1

Small pencil lead ------ abdominal wall closure and other

Heavy facial tissues

PROPERTIES OF COMMON SUTURE MATERIALS

Polyglycolic acid (PGA) (Dexon 2)

Synthetic , multifilament , absorbable

Suture strength lost 3-4/52

Hydrolysed 10-90th days

Common uses

GI anastomosis

Muscle and fosciial closures

Subcuticular skin closure
Polyglactin (vicryl)

Synthetic, multifilament and absorbable
Polymer of glycolide and lactide
Strength is lost over 3.4/52
Hydrolysed 60-90 days
Common uses

- G1 anastomoses
- Muscle and facial closure
- Subcuticular skin closure

Trimethylene / Glycolic acid (Maxon)

Synthetic monofilament, absorbable has high tensile strength (28 Lb straight pull)
Loses half of its tensile strength in 5-6/52
Hydrolysis completed 180-210 ndays
Common uses:

- G1 anastomosis
- Fascial closure
- Caesarean section

Polydioxanone (PDS)

- Synthetic, monofilament & absorbable
- Good tensile strength
- Loses half of its tensile strength in 90-120 days
- Hydrolysis started at 90 days finished at 6/12
- Common uses:
  - G1 anastomosis
  - Fascial closure
  - Subcuticular closure
Other examples of polyesters

- Poliglecaprone (monocryl). Absorbable
- Polybuteser (novafil). Non absorbable
- Polyvinyliden (vilene). Non absorbable
- Polyether (dyloc). Non absorbable

Polyamides:

- Synthetic, multi/ monofilament and non absorbable
- Nylon
  
  - Monofilament
  - May be braided
  - Minimal action or breakdown

- Common uses
  
  - Facial closure
  - Skin closure
  - Hernia surgery
  - Neuro surgery

Polypropylene (prolene)

Synthetic, monofilament and non absorbable

High tensile strength

Good knot security and loses virtually no strength over time

Common uses

- Facial (abdominal) closure
- Vascular anastomosis
- Subcuticular closure
- Tendon repairs
- Ophthalmology
Polyster

- Synthetic, multi/monofilament and non absorbable
- High and permanent tensile strength
- Minimal tissue reaction
- Excellent handing, tying characteristics with good knot security

Common uses:

- Cardiac valve surgery
- Tendon suture
- Orthopedics
- Ophthalmology

Silk / cotton / linen

- Natural, multifilament and non absorbable
- Used less frequently after 1990 due to available alternatives
- Easy to handle
- Loses strength by enzymative digestion because they are proteins
- All three excite marked inflammatory reactions
- Common uses
  - Skin closure
  - Vascular ligation
  - GI anastomosis
  - Ophthalmology
  - Cardiac surgery

Stainless steel

Natural, multi/monofilament and non absorbable

Retains great strength

Excites minimal response

Tissue passage is good

Knot tying is difficult, twisted and bent over

Strongest of all suture material
Common uses:

- Sternal closure
- Hernia (Shouldice repair)
- Contaminated wounds
- Orthopedics

BASIC PRINCIPLES AND THE OPERATIVE FIELD

A- Understanding and attitude
   - Calm situation
   - Aims of the procedure how it is performed
   - Limitations

B- Exposure and positioning
   - Operative field
     - Easy
     - Comfortable
   - Adequate anesthesia
   - Surgeons should plan every manoeuvre and adjust their position to perform each one with maximum ease
   - Minimize resting tremor.

C- Lighting the operative field
   - Bright, concentrated
   - Do not be afraid to use headlight or lighted retractors

D- Maintenance of the operative field
   1- Ensuring sterility
   2- Ensuring tidiness
   3- Preparing and draping the patient
   4- Instrument placement
E- Preparing and draping the operative site

1- Application of antimicrobial solutions to the site of operation (Prepping).

2- Exclusion of other areas with sterile towels and sheets (Draping).

3- Common preparative solutions
   a- Chlorhexidine (0.5%) in alcohol (70%)
   b- Chlorhexidine (0.5%)
   c- Cetrimide (2%)
   d- 10% povidone iodine solution
   e- Alcoholic iodine solution
   f- Aqueous chlorhexidine (0.5%)

Note:

Special care must be exercised when using diathermy after alcoholic preparation

4- When scrubbed
   a- Painting
   b- Start at site of incision
   c- Go out in spiral fashion
   d- Swabs used for prepping should be discarded when dry and anew one used, not the old one re-dipped

5- Drapes
   a- Sterile
   b- Made of
      Cotton
      Par
      Plastic
   c- Held in place
      Combination gravity
      Friction
      Towel clips
F- Instrument issues
  1- Stored on trolleys
  2- Controlled by the scrub nurse
  3- Instrument safety
     a- “Owned” by scrub nurse
     b- The surgeon is merely “borrowing ” them
  4- All instruments are accounted for
  5- No sharps are left in unexpected position
  6- Instrument belongin to the operative field are
     a- Diathermy
     b- Sucker
     c- Instrument scabbard
     d- Clamps
     e- Self retaining
     f- Retractors while in- situ
  7- Exposed instruments can be steadied and protected by covering them with an opened wet pack

G- The theatre environment:
  1- Operative surgery
     a- Stressful
     b- Dangerous
     c- Absolute responsibility
     d- Any procedure success belongs to the surgeon alone
  2- Comfort & priorities of the surgeon
  3- Distractions such as conversation and music should be kep to aminimum

H- Tissue and blood supply
  1- Absence of oxygenated blood will cause healing failure
  2- Traumatic tissue handling techniques, suture line tension, devascularization during mobilization, strangulation with overtight knots and excessive haemostatic diathermy to the cut surfaces may play apart in this process
3- Excessive bleeding can lead to hematoma
   a- Wound disruption
   b- Wound infection

4- The wound should be non-bleeding viable

I- Tension in the wound
   1- Tension is the arch-enemy of surgical healing leads to :-
      a- Mechanical disruption
      b- Distracting forces
      c- Ischemia
   2- Appose tissues loosed
   3- Mobilization of tissues and preservation of their vascular supply

J- Assistance during the procedure:
   1- Skilled assistance is invaluable
   2- Assistance should understand the procedure

BASIC SUTURING TECHNIQUES

A- General principles
   1- The suture should run as deeply as the distance from the skin edge to
      the suture entry point
   2- The sutures should be spaced as widely as the distance from entry hole
      to exit hole, thereby forming squares.
   3- Sutures should be balanced evenly
   4- Equal bites must be taken on each side of the wound and the knot laid
      to the side of best sit
   5- Tissue apposed equally
   6- The most commonly suture materials
   7- For interrupted and exposed skin sutures are
      Nylon
      Prolen
   8- Sutures that are burried, or run in the skin as the subcuticular
      a- Non- absorbable
      Nylon
      Prolen
b- Absorbable:-
   Vicryle
   Dexone
   Monocryl

B- Variants of sutures
   1- Simple suture
      a- Evertting simple suture picks up more subcutaneous tissue than
         the skin width and when tied, this deeper tissue is squeezed
         superficially to evert the edges of the wound
      b- Inverting simple suture
         Dose the opposite of a- and takes less deep tissue. This
         allows the more superficial tissues to roll in towards each
         other causing inverting bowel edges
      c- Buried simple suture: used to secure deep layers of tissue

2- Vertical mattress suture
3- Horizontal mattress suture
4- Continuous mattress suture
5- Continuous suture
6- Subcuticular suture
7- Barron suture
   One side appears as a horizontal mattress suture and the
   other as a subcuticular suture

8- Three corner suture:
   A variant of the barron suture, the three corner suture is used
   to hold the apices of stellate locertions

C- Surgical knot:
   1- Reef knot
   2- Granny knot
   3- Surgeons not
   4- Instrument knot
   5- One- handed knot
   6- Two- handed knot
D- Basic surgical techniques
   a- Incisions and excisions
      1- Scalpel used
      2- Blade at 90 to the skin surface
      3- Two common methods of holding a scalpel:
         a- The underhand grip
         b- The pen grip
      4- Simple rules that minimize cutting vital structures
         a- Do not cut anything that cannot actually be seen
         b- If the tissues to be divided is superficial to avital structure, insert an instrument or cutting guide between them
         c- If dissecting near a known structure (e.g. nerve or vessel), cut in the line of the structure to prevent dividing it accidentally. This dose not prevent incision it longitudinally but these injuries are usually much less serious.
         d- Plan (and mark) your incisions and practice the cut in the air first
         e- If cutting in a deep cavity, time spent improving the access and exposure equates to time saved repairing a potential error
         f- There is no substitute for excellent sharps technique in the prevention of penetrating wounds in the operator and scrub team.

b- Debridement
   1- Is a term applied to the manual removal of foreign, dead, devitalised and contaminated materials from an open wound
   2- Steps in wound debridement.
      a- Pre-op irrigation and scrubbing to remove surface debris
      b- Wide prepping and draping
      c- Avoid tourniquets unless vital
      d- Excise all foreign bodies and dead tissue
e- Excise crushed or dubiously viable tissue if primary closure is planned or leave it to declare and plan a second – look debridement

f- Cut skin edge and deep surfaces back to bleeding tissue. debride in the line of any longitudinal structures (e.g. limb arteries, veins or nerves) to avoid transection or damage.

g- Further irrigate the wound to wash out bacteria, residual foreign bodies and small non-viable tissue fragments. Use normal saline, not povidone–iodine solution, antibiotics or other antiseptics as they may be tissue toxic

h- Obtain haemostasis prior to completing the debridement

i- Decide whether a second-look debridement or formal closure is required

c- Haemostasis and diathermy

1- Principles:
   a- Haemostasis:
      - Prevention or reduction of bleeding from the operative site
   b- Two main principles in the process of haemostasis
      ▪ Prevention of bleeding
      ▪ Management of bleeding

2- Prevention of bleeding
   a- Pre-operative:
      - Correction of anaemia
      - Detection of clotting disorders: at risk patients:
        Jaundice
        Liver disease
        Uraemia
        Anticoagulants

   Corrected by

       Vit. K
Platelets are rarely of use:-
- They do not become active for some hours
- Normal clotting can still occur with platelet counts of as low as $40 \times 10^6$ per/mm$^3$

Oral anticoagulants aspirin; should be ceased at least one week prior to operating

Warfarine – approximately 4-5 days

INR checks

If need for anticoagulants

- Surgery delayed or
- The patient managed on heparine in the perioperative period

Preoperative cross match

Local haemorrhage

- Adrenaline
- Tourniquets

b-Intraoperative strategies

Careful incision

Diathermy to cut subcutaneous tissue

Blood vessels grasped and diathermied

Accurate dissection

Curved artery forceps & ligatures
Methods of mechanical haemostasis

* Initial pressure with a pack
* Progressive diathermy as the pack is removed
* Application of haemostatic substances
  
  Topical thrombin
  
  Gel-foam, haemostatic gauze
* Ligation, transfixion over-sewing of bleeding vessels or areas
* Packing and pressure left in-situ for a period of time

C-Postoperative measures

  Monitoring of coagulation profile and blood components
  
  Replace blood being lost
  
  Correct coagulopathies
  
  Anticipate the need for reoperation if bleeding is excessive
BASIC DISSECTION TECHNIQUES

Dissection:

Is the division of tissues required to approach, identify and expose an underlying structure or lesion.

May be:

- Sharp
- Blunt

Blunt dissection:

- Pushing away, splitting, stripping, squeezing or other methods that separate the tissue without actively cutting them.

Sharp dissection:

- Makes use of scalpels, scissors or divide tissues in a very precise manner.

Essential elements for successful dissection:

1. An intimate knowledge of gross and three-dimensional anatomy.
2. A knowledge of connective tissue structure.
3. An understanding of tissue planes.
4. Experience with various methods of dissection.
5. Minimization of tissue trauma by gentle tissue handling.
6. The ability to use tension (distraction of tissues) in the display of tissues and planes.

BASIC ASSISTING TECHNIQUES:

- Surgical assisting is itself an art and should not be regarded as a boring prelude to learning how to operate.
- It is as physically and mentally challenging as performing the operation itself.
- The best assistant is usually one who knows the operation intimately and who can predict the next step that will be taken.
- A good assistant makes the surgeon perform a good operation.
- The assistant has two major duties:
  a. Exposure of the operative field.
  b. The performance of surgical tasks.
Assistance may be:

Preoperative

Intraoperative

Postoperative

Preoperative assistance

Ensures:-

The presence of correct

X-ray

Appropriate reports

Test results

Moving and positioning of the patient

Insertion of in-dwelling urinary catheters

INTRAOPERATIVE ASSISTANCE:

Incision:-

Placing a point on the skin

Providing traction at 90 to the incision

Retraction

Retraction:-

A- Point to consider when retracting tissues:-

1- Gently displace the tissues without causing damage
2- Minimize energy expenditure and reduce fatigue so exposure is not lost.
3- Retain exactly the position the surgeon has placed the retractor in.
4- If the surgeon takes hold of retractors, let go he wants to move it.
5- Only move the retractor if:-
   - Told to so
   - Your verbal suggestion to improve exposure has been approved
   - It follows the pattern of dissection e.g. along the edge of a wound.
   - The surgeon is not cutting- loss of vision may result in accidental damage to a vital structure.
6- Be careful with the toes of long retractors as excessive pressure caused by pulling or “toe-in” movements may damage deep structures.

7- Good retraction does not necessarily involve excessive force. The judicious raising of a hand with the bend of the retractor as the fulcrum will often retract structures much further with less force.

**Tension:**

1- Firm and gentle retraction of tissues at 90 to line of incision or dissection
2- Distract the tissues manually and assist with physical separation
3- May be achieved with:-
   a- Retractors
   b- Hands
   c- Tissue forceps
d- Hand- held forceps
e- A swab mounted on
   a- Sponge- holding forceps (swab- on – astick)

**Following:**

1- Holding the suture thread for the surgeon during suturing is termed following
2- It serves two main purposes:-
   a- Maintain tension in the thread
   b- Prevents suture slip and therefore laxity or gaps in the sutured tissue
3- The suture should be held “60-40” that is, 40% of the suture and the last stich and 60% between the hand and needle holder
4- The thread should be observed carefully in order to prevent tangling in instruments or other fixed structures (known as locking -up)

**Tying and suture skills**

1- Rarely the assistant has to tie
2- Present an artery forcep for tying around
3- When (and only when) asked, release the forceps slowly and gently and remove them from the surgeons line of sight.
4- When cutting sutures the scissors should be stabilized on the otherhand or another steady point and the thread cut with the tips of the blades
5- In general a tag end of 3-6 mm should be left depending on the size of the suture. Any longer than this and it may tangle with another stich or present a foreign body for infection. Any shorter and the knot may unravel, leading to potentially disastrous consequences
Haemostasis:-

Methods of pooling blood prior to adequate haemostasis:-

a- Sucker; rapid but may dislodge a clot and actually worsen the bleeding problem
b- Swab- on – a stick effective for small amounts of bleeding
c- Packing :
   - Soak up free blood tamponade bleeding pullout any free clot.
   - Very effective method for cavity bleeding such as in the pelvis

Wound closure

- Involves most of the skills mentioned:
  - Tissue retraction
  - Tying
  - Blood removal
  - Insertion of skin staples

POST OPERATIVE ASSISTANCE:-

1- Once the incision is closed the area is washed and dried
2- A dressing applied
3- Drains secured with dressings and tape
4- Assistance in moving the patients
5- The surgeon or assistant should take responsibility for all catheters and drains
6- One or both should then follow the patient into recovery to ensure all is well
7- It is only when the patient reaches the PACV safely that the “true” traditional assistants job is at end.

STERILE TECHNIQUE:

Introduction:-

1- Introduction by lister of antiseptic environment for surgery
2- Four main principles
   a- Reduction of environmental contamination
      Most important in prosthetic surgery, joint replacement.
   b- Disinfection of the procedural site
   c- Isolation of the procedural site
      - Provision of barriers between the proceduralist and the patients
      - Provision of barriers between the patient and the environment
   d- Sterilization of procedural equipment
THE PRINCIPLES AND PRACTICE OF STERILE TECHNIQUE:

1- Reductions of environmental contamination:

A- Clean staff:-
   a- Theatre clothing
   b- Cover hair and bears
   c- Shoes covered or special theatre footwear
   d- Masks ; when sterile instruments are open

B- Clean air:-
   a- Minimization of draughts
   b- Laminar flow (filtered air)
   c- Minimization of extrapersonne and their physical movement

C- Clean equipment
   a- Not to touch unless required
   b- Remain one meter from anything covered with sterile drapes
   c- Avoid inappropriate contact and maintain the sterile environment

D- Clean hands:
   a- Wash hands
   b- Wear gloves
   c- Scrub team wash their hands and forearms with antibacterial solutions such as povidone – iodine or chlorhexidine
   d- The first scrub of the day should be for 5 Minutes and the rest for 3
   e- Summary of ACORN guidelines for the surgical scrub
      a- Preparation :
         ▪ Wear proper attire , cover hair, jewellery off, keep nails short, don mask and plastic apron
         ▪ Ensure presence of a sterile scrub sponge and antimicrobial wash solution
      b- The scrub:-
         ▪ Time scrub for 5 minutes (first for the day) or 3 minutes (all subsequent scrubs)
         ▪ Wet arms to elbow under running water
         ▪ Wash with 2 ml of solution for 30 seconds with a circular motion; clean the nails, then rinse
         ▪ Wash again with 2 ml between fingers up to elbow, and rinse
         ▪ Wash arms, with 2 m and rinse
         ▪ Keep hands above elbows turn off water and enter theatre with hands above elbows still
c- Pre-gowning
- Dry hands and arms with sterile towel – use a quarter for each hand and forearm
- Gown and glove as appropriate

d- Disinfection of the procedural site

- Cleaning
- Depilating
- Decontaminating of the operation site

DECONTAMINATION:

Once gowned and gloved
- Paint the operative site with antibacterial solution (Prep)
- Start at the site of incision and go outwards in circles of increasing diameter
- Swabs for prepping should be discarded when dry and a new ones used
- The old swab should not be re-dipped in the solution

Common preparation solution include:-

- Chlorhexidine (0.5%) in alcohol (70%)
- Chlorhexidine (0.5%) and cetrimide (2%)
- 10% povidone – iodine solution
- Alcoholic iodine solution and aqueous chlorhexidine (0.5%)

Care must be exercised when using diathermy after alcoholic prep.

The surgeon must ensure all the alcohol has evaporated or a spark may cause it to ignite

E- Isolation of the procedural site
1- draping the procedural site:
   a- sterile drapes:
      Cotton
      Paper
      Plastic

      Held in place by combination of gravity, friction and towel clips
   b- waterproof draps used, if not a plastic sheet should be placed between the first layer of drapes and the patient to prevent fluid soaking
c- in general the whale Patient (except the head) is covered with drapes and two layers are the minimum standard at any point
d- araised sterile curtain is usually placed between two poles to separate the anaesthetist and the surgeon
e- square draping is the creation of quadrilateral space containing the operative field

F- gowning and gloving

1- gowning :
   a- remove the gown from the sterile field and allow it to fall open in front of you
   b- locate the sleeves and work the arms into them
   c- keep hands within the sleeves unless the scrub-nurse is to put on your gloves
   d- allow the back ties of the gown to be tied
   e- once gloved, spin the wrap-around tie, with other sterile personnel, to cover the back of gown

2- gloving : (closed method)
   a- pick up the left glove, with the right hand, through the sleeve material
   b- place it palm-to-palm and thumb-to-thumb on the upturned left hand
   c- grasp the lower fold of the glove, with the left hand, through the sleeve material
   d- lift the upper fold of the glove over the open sleeve end.
   e- slide the hand into the glove
   f- repeat on the right hand

3- removing gowns and gloves:
   a- undo the wrap around tie.
   b- allow the back ties to be undone by other staff
   c- pull down the gown remove it first bundle it and deposit in linen skip
   d- remove the gloves by grasping the cuffs and turning inside out
   e- deposit gloves in contaminated disposal bin

G- surgical Gloves:

1- packaging :

Sterile – in sealed packages (for procedures)

Clean- in boxes, etc for protection
2- Material

Latex - most common but allergies

Neoprene – for latex – allergic (staff- or patients)

Vinyl – as sterile undergloves or non- sterile

3- Lubricant:

Starch – but, remember, granulomas and adhesions may be caused by this substance and it should be avoided if possible

None – rely on natural slip to allow gloving

4- Size:

Hand sizes 5 1\2 up to 9

These are standard but tend to vary with manufacture

5- Thickness:

Variety of thickness – depends on material, manufacture and the function they are designed for

Special orthopedic gloves very thick

Micro – thin gloves for microsurgery. These thinner gloves are easier for double-gloving and don’t compromise safety by easier rupture

Normal

Vary in thickness according to manufacturer and specific material used

6- Problems:

Allergies to latex

Starch allergies and patients reactions (granulomas and adhesions)

Inconsistencies in manufacture – thickness, holes

Some difficult for double-gloving (esp-no starch)

To guarantee sterility a safe gloving technique (closed method) should be learnt

No – touch technique
a- used in orthopedics

b- use of instrument alone to manipulate and handle tissues, sutures and prosthesis

STERILIZATION OF PROCEDURAL TOOLS:

a- Sterilization; is the process by which all forms of microbial life (viruses, bacteria, spores and fungi) are completely destroyed. either a physical or chemical process may achieve this end-point. Sterility is an absolute concept – i.e. an object is either sterile or it is not.

b- Disinfection
A process that destroys all harmful organisms, but not spores, and therefore renders the instrument clean but not sterile

Instrument:

Reusable
Sterilized

Disposable
Sterilized by ethylene oxide

STERILIZATION
Undertaken in a number of ways

Steps:

Macroscopic removal of debris:
Manually and then packed for sterilization

Sterilization
Steam
Dry heat
Chemical
Steam

a- used for
   All wrapped articles (including gowns and draps)
   Unwrapped instrument

b- not used for :
   Paper
   Inks
   Oils and heat- sensitive items

Dry heat

Used on anhydrous items- that can withstand 160 c for at least one hour

Chemical methods

1- such as ethylene oxide, can be used for items that cannot tolerate steam or dry methods
2- could be :
   Gas: ethylene oxide
   Liquid (glutaraldehyde)
   Plasm (ionized hydrogen peroxide gas)
   Ethylene oxide

   Penetrates most materials
   Broadly active
   Does not require the heat and pressure level of other methods
   Non- corrosive

However
   - It is expensive
   - Highly flammable
   - Severely toxic
   - retain in tubular equipment and may damage some plastics
   - Should never be used on equipment that can be steam- sterilized
Ionizing radiation:

Used by manufacturers rather than hospital units

Plasma sterilization

New method

Utilizes low-temperature hydrogen peroxide plasma in an hour-long cycle

The sterilized chamber is evacuated of all gas; hydrogen peroxide liquid is introduced and then vaporized

An magnetic or radio-frequency field is then passed through the low pressure gas to ionize the molecules

The reactive cloud of ions, electrons and neutral particles then collides with, and destroys, micro-organisms

It is very effective against all viruses, bacteria, fungi and spores

There is no toxicity as the ions reconstitute as oxygen or water
SAFETY IN THE OPERATING THEATER

Potential hazards

Infectious disease

Injury

Other operating suit injuries

- Electric accident

- Diathermy problem

THE SURGEON AND SCRUB TEAM COMPRIS

One surgeon

One to two assistants

Scrub – nurse

Major hazards

Exposure to body fluids

Sharps

Instruments

Electricity

Radiation

Inexperience

BODY SUBSTANCES

a. body fluids

Blood

Urine

Pus

Gut contents

Faeces

Pleural fluid

Peritoneal fluid
Lymph

Bile

b. other substances
   Bone dust

Irrigation splash

Diathermy smoke

c. All carry
   HBS

   HBC

   HIV

d. prevention
   i. Avoidance of direct contact or ingestion is the best way to prevent the spread
   ii. Care with operative technique and tissue handling
   iii. Prevention of spills, splashes and other airborne dissemination
   iv. Barriers over blood vessels
   v. Gentle and careful pouring to avoid spills
   vi. Not throwing wet or contaminated materials
   vii. Suction;

   Bone dust

   Diathermy smoke

SHARP AND SURGICAL INSTRUMENTS:

1- first risk from assembly of the scalpel while attaching the blade to the handle, or removing it
2- hollow needles should only be placed onto syringe while sheathed
3- suture needles loaded directly from the packet or handled with forceps
4- all sharps should be passed in a bowl or kidney dish
5- sharps precautions:
   a- Assemble with care
   b- Never place a sharp on the patient
   c- Only ever pass blades, syringes and needles in a dish
   d- When passing a needle holder with needle, protect the point by reversing the needle to point back into the joint of instrument
   e- Always tell a scrub nurse that you are passing a sharp back to her
   f- Don't recap sharps
   g- The sharps "belong" to the scrub nurse- ensure you return each- one as they must be counted at the end of the case
OTHER HAZARDS

1- radiation
   a- all personnel with five meter of the unit
   b- all should be shielded by lead
      Apron
      Screen
   c- cumulative exposures over years is a definite risk factor in the development of various neoplasmas

2- Electrical hazards
   a- from
      - micro
      - macro
      shock
   b- source of electricity
      Monitors
      Diathermy
      Various central venous access lines
   c- adequate earthing and special micro – shock electrical safety

CARE WITH TOXIC SUBSTANCES:

  glutaraldehyde ------ endoscopy
  formaline -------- specimen bottles

To protect staff

  Careful handling
  Minimization of handling
  Special equipment
  Ventilated work
  Spaces

INEXPERIENCE:

  Pretheatre instructions
  Bench training
UNIVERSAL PRECAUTIONS

Used with all patients

Hand washing

Use of barriers

Gowns

Gloves

Glasses

Masks

Save disposal of sharps and contaminated materials

Gowns

Sterile

Waterproof

Plastic apron

Gloves

Double

does not prevent needlesticks or penetrating injuries

THE PATIENT

Three distinct phases:

a- preparation for the procedure
b- the procedure
c- postprocedure period
A- preparation for the procedure:
1- Each patient adequately prepared
2- Patient education
3- Paperwork
4- Indicated investigation
5- The patient must be transferred to the theater suite
6- In theatre transferred to operating table
7- Anesthesia
8- Correct positioning
9- Preoperative precautions followed:
   a- the correct patient is being operated on and is fit for the procedure
   b- consent is signed, the correct site and side are on it and the patient understands both the procedure and its risks
   c- the correct organ, system limb is being operated on
   d- the correct side is being operated on
   e- the lesion side is marked to avoid intraoperative confusion
   f- all x-rays available in theater
   g- allergies, drug reactions and special patient precautions are known

10- Before moving the anesthetized patient:
    a- The anesthetic should secure the endotracheal tube in position
    b- Check all drips, and other lines

11- Precautions needed when positioning the patient
    a- There must be no metal-to-skin contact in order to prevent diathermy burns from accidental earthing of the patient
    b- Pressure on body prominences and nerves must be avoided or padded to prevent injury
    c- Abdominal traction or angulation must be avoided
    d- Eyes should be taped shut to prevent drying
    e- DVT prophylaxis should be used in cases longer than half an hour, in the elderly, in patients with a past history of DVT and patients with any other risk factor
    f- If there is any risk of patient movement, padded, retaining bolsters and taping should be used to prevent this.

12- The operation site should then be prepared with an antiseptic substance to which the patient is not allergic

13- All alcoholic preparations should be allowed to dry

14- Any type of tourniquets must have a time limit set before its application, inflation or application time, deflation or removal time.

THE PROCEDURE:

1- Multiple potential hazards
   a- Adverse effects of routine equipment usage
   b- Procedure itself
   c- Actions or errors of a member of the scrub team
2- Instruments:-
   a- Incorrect or careless use of scalpels, scissors or any instrument with a sharp edge
   b- Vigorous use of a retractor
      Contusion
      Frank injury:
      Liver
      Spleen
      Bowel

3- Diathermy

4- Anesthetic equipment tourniquets, lasers, endoscopes and gauzes

5- Sterile technique:
   - Inadvertent breaches in technique

HAZARDS OF THE EQUIPMENT:

1- Sharps:-
   a- Needle stick injury
   b- Accidental laceration and trauma to adjacent structures
   c- Inadvertent division of or damage to structures

2- Retractors
   a. Toe damage deep within the abdomen and chest
   b. Skin bruising
   c. Traction injuries to nerves or vessels

3- Forceps:
   a- Puncture wounds
   b- Tearing of structures

4- Sutures:-
   a- Tear out and damage tissues
   b- Puncture viscera (needle)
   c- Knots unwined and reduce wound strength
   d- May provide anidus for infection

5- Diathermy
   a- Flux injuries and direct contact accidents
   b- Electrocution
   c- Burns to the surgeon
   d- Inadvertent division of or damage to structure

6- Gauze / pack
   a- May be left inside the patient by accident
   b- Wipes off clots, causing bleeding

7- Suckers
   a- Promotes bleeding by vigorous suction
   b- Traumatises tissues
AFTER THE PROCEDURE:-

1- Transfere from the procedure table has the same risks as transferring on but compounded by the level of anesthesia
2- Accidental dislodgement of tubes or drips is not uncommon
3- Potential injuries to the patient:
   a- Fracture and dislocation (even the spine)
   b- Laceration
   c- Dropping the patient

Such incidents are inexcusable and often reflect poor planning, haste, lack of experience and inadequate numbers of staff

4- While recovering from anesthesia there are risks of
   a- Airway compromise
   b- Effects of drugs that have been administered

5- PACU problems
   a- Incorrect administration of drugs
   b- Incorrect connection of breathing circuits
   c- Incorrect connection of electrical equipment

OTHER PERSONNEL:

1- Common – sense attitudes are required to ensure safety for other theatre staff
2- Prevent spills of blood and other body fluids
3- Only fully gowned and gloved number of the scrub team should deal with soild drapes or instruments
4- Assistance should be provided with lifting/ sliding the patient to reduce the strain on each person

Remember, while medical staff must bear the greatest responsibility in regard to theatre procedures, we are all members of health – care team dedicated to just one thing.

THE OPTIMUM CARE OF APATIENT.