

ASEPSIS



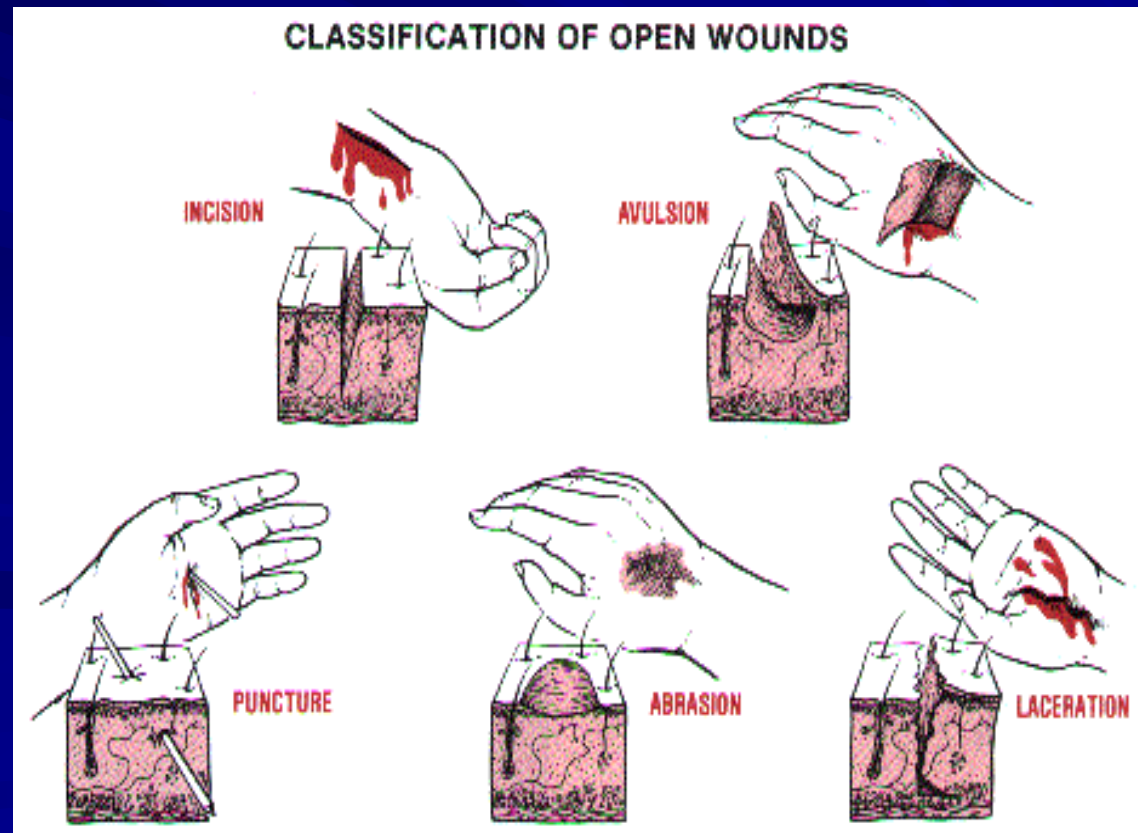
Lecture for general surgery
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Poltava

Introduction

The **main task** of surgery is a treatment of wounds

Wound is a disruption of the normal anatomical structures (integrity) of skin or mucosa



Infection an invasion of body tissue by microorganisms and their growth.
Microorganism is called an *infectious agent*

INFECTION CAUSE BY MICROORGANISMS

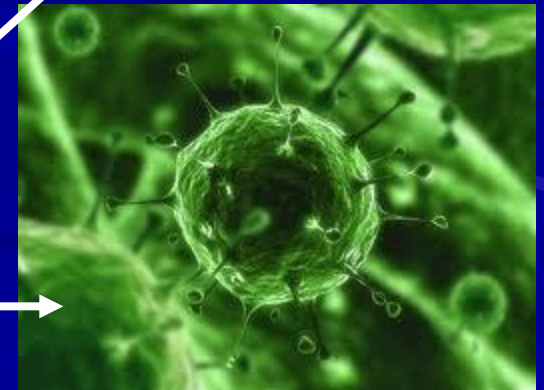
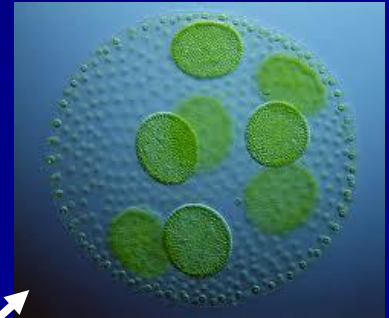
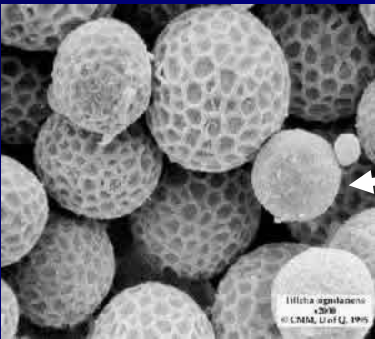
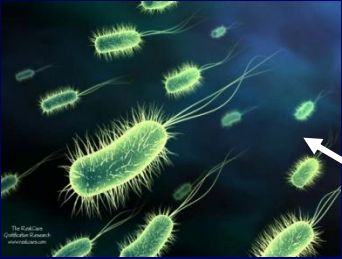
■ BACTERIA

■ FUNGI

■ PROTOZOA

■ ALGAE

■ VIRUSES



The **source** is taken to mean the place of dwelling, growth and proliferation of microorganisms.

Relative to the patient the source of infection can be either

exogenous

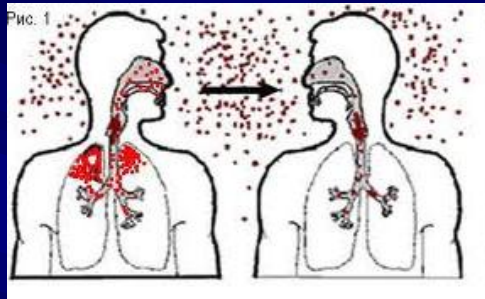
(from outside)

or

endogenous

(from within the body)

1.airborne



1.inf. of skin patient



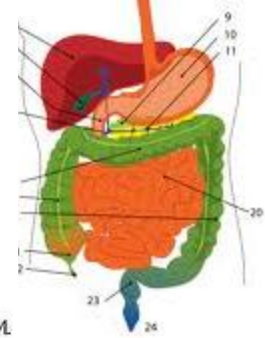
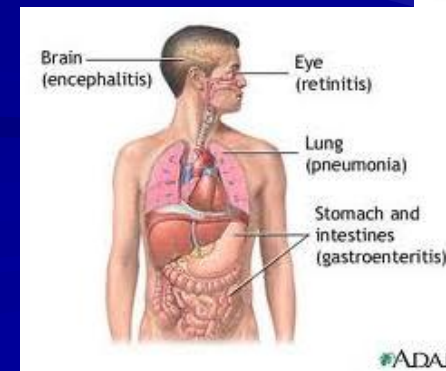
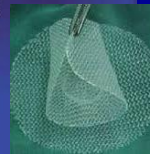
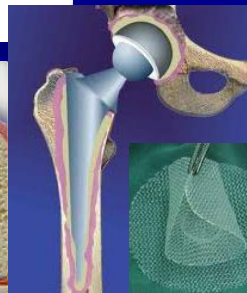
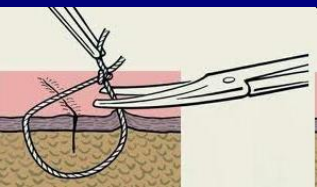
2.direct contact



2.inf.of internal organ



3.implantation



The spread of infection

Portal of Exit:

■ Via

- Bodily fluids
- Coughing, sneezing, diarrhea
- **Open wounds**
- Tubes, IV lines

Mode of Transmission:

■ Contact

- Direct – touching, kissing, sexual contact
- Indirect – contact through a fomites (inanimate objects or materials) or through vectors (animal or insect, flying or crawling); the fomites or vectors act as vehicle for transmission
- Droplet: coughs, sneezes, spits, or talks.

■ Airborne: Via air conditioning, sweeping (through the respiratory tract)

DEFINITION OF TERMS

- **1. Asepsis** – is a complex of preventive surgical actions referred on the prevention of hit of an infection contamination in a wound.
- **2. Antisepsis** – is a complex of surgical actions referred on the destroying bacteria and infective material in a wound.
- **3. Sterilization** - process by which all forms of bacteria are destroyed.
- **4. Disinfection** - process by which only all the infective bacteria are destroyed.
- **5. Antiseptic** – a substance that will inhibit the growth of bacteria without necessarily destroying them.
- **6. Disinfectant** – is an agent, usually a chemical that kills pathogenic bacteria.
- **7. Germicide or Bactericide** – any agent that kill all germs or bacteria.

Asepsis is a complex
of measures for
protection of
wounds from
infection.



Asepsis

- **is the state of being free from disease-causing contaminants** (such as bacteria, viruses, fungi, and parasites) or, **preventing contact with microorganisms**.
- The term **asepsis** often refers to those practices used to promote or induce asepsis in an operative field in surgery or medicine to prevent infection.
- Ideally, a surgical field is "*sterile*," meaning it is free of all biological contaminants, not just those that can cause disease, putrefaction, or fermentation, but that is a situation that is difficult to attain, especially given the patient is often a source of infectious agents.
- Therefore, there is no current method to safely eliminate all of the patients' contaminants without causing significant tissue damage. However, elimination of infection is the goal of asepsis, not sterility.

History

The modern concept of asepsis evolved in the **19th** century.

- **Ignaz Semmelweis** showed that washing the hands prior to delivery reduced puerperal fever.
- After the suggestion by **Louis Pasteur, Joseph Lister**, 1st Baron Lister introduced the use of carbolic acid as an antiseptic and reduced surgical infections rates.
- **Lawson Tait** went from antisepsis to asepsis, introducing principles and practices that have remained valid to this day.
- **Ernst von Bergmann** introduced the autoclave, a device used for the practice of the sterilization of surgical instruments.

Medical vs. Surgical Asepsis

Medical asepsis:

- “clean technique”
- Includes procedures
To minimize # of
microorganisms and
their spread

Surgical asepsis

- “sterile technique”
- Includes procedures
to eliminate
microorganisms and
spores.

The main tasks of asepsis are

Prevention of

- 1) Airborne infection
- 2) Contact infection
- 3) Implantation infection
- 4) endogenous infection
- 5) nosocomial (hospital) infection

1) Prevention of airborne infection

■ A. feature of the organization of surgical department

1 - work at admission department – registration of patient, examination, partial and complete sanitary processing of patient and correctly transportation of patient

-the patient goes on foot



- transportation
on a wheel-chair



- transportation
on a wheel-stretcher



2 - Organization work in operation theater

To provide the regimen of sterility, there are the four special functional zones in the surgical block:

- **1. The sterile zone**, i.e. the operating theatre (to operate on patients), scrub-up room (for preoperative cleansing surgeons' hands and arms) and the room for sterilisation (to sterilise the instruments to be used during the operation).
- **2. The clean zone**, i.e. the rooms for personal hygiene and changing clothes of the staff.
- **3. The technical zone**, i.e. the rooms where apparatus for air-conditioning or oxygen supplying and vacuum devices are stored.
- **4. The dirty zone**, i.e. the nurse's room, the room of the head of surgery and the one for dirty clothes etc.

cleaning in a surgery block

To ensure patient and personnel safety, operating room cleaning procedures should be standardized and applied universally.

- Preliminary preparation of the operating room



- During the surgery (operation) - current cleaning
- After the procedure ends and the patient has exited the room
- Daily Terminal Cleaning
- General cleaning of surgery block (one time per week and according necessity)



3. Behavior rules in the operation theater

- Sterile persons keep contact with sterile areas to minimum.
- to minimize medical staff movements in the operation theater
- To limit of all talk
- The persons which immediately haven't been connected with surgery should be absent
- Hands are never folded under arms because of perspiration in axillary region.
- The same principle is true in leaning on the mayo stand. The axillary region is considered unsterile because of perspiration.



■ B. separation of flows of patients



«clean» patients



«purulent» patients



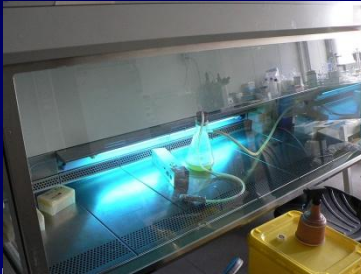
■ C. prevention of air-droplet infection

- Used of mask

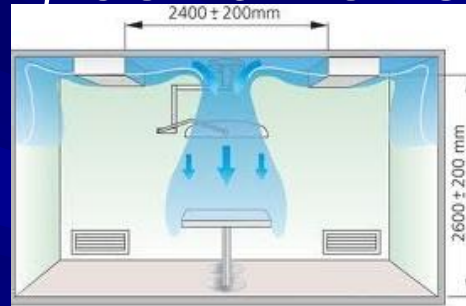


C. prevention of air-droplet infection (cont..)

- Ultraviolet germicidal irradiation (UVGI)



Ventilation - aeration, conditioners



- personal hygiene of patients and medical staff



2) Prevention of contact infection

All items which has a contact with wound in surgery or bandaging time must be *sterile*:

- surgeons hands
- surgical instruments
- bandaging materials and surgical dressing
- skin around the wound

Methods of sterilization:

Physical:

burning
and boiling

autoclaving

high-dry sterilization

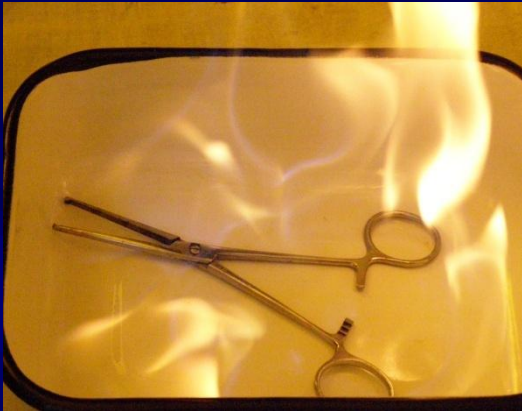
γ -radiation

Chemical:

soaking in antiseptic
solutions washing by
antiseptic solutions

by steam of antiseptic

Burning and boiling (used only at home' condition)



Burning

The tool is put on a metal subject, ethyl alcohol is poured and set fire



Boiling.

Metal sterilizers are used.
30 mines-1 hour

HIGH-DRY STERILIZATION (DRYTERMO)

Sterilization of surgical instruments and glass items

■ Conditions

- 180 degree C
- 1 hour
(60 minutes)



AUTOCLAVING

(sterilization by steam)

Conditions:

- - 120 °C, pressure 1.1 atmosphere, expositions time is 60 minutes
- - 126 °C, pressure 1.5 atmosphere, expositions time is 45 minutes
- - 132 °C, pressure 2 atmosphere, expositions time is 30 minutes



Sterilizations box

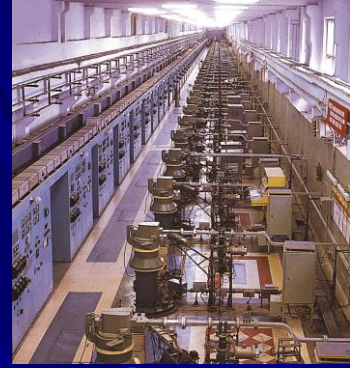


- Instruments (bandaging materials, surgical dress and all other items) must be inserting in sterilization box (bix). The steam came in box from the special opens which we must close after sterilization.





γ -radiation



(sterilization only on the factory)

■ All items for one use are sterilized by this method.

– Syringes, catheters, intubations tubes, systems for infusion of serum simulations solution and other.



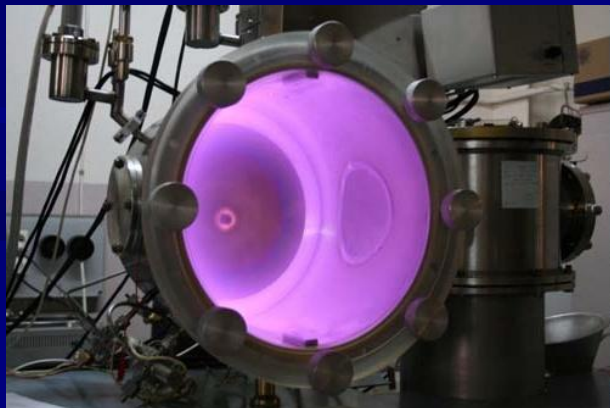
by steam of antiseptic (gas).



As sterilizing substance use –

- steams of Formalinum (for the bottom to the chamber put a Formic aldehyde tablet)
- Ethylene oxides
- Bromomethane
- mixtures of the specified substances

Tools are sterile in 6-48 hours



- steams of Hydrogen Peroxide and low-temperature plasma (peroksid-plasma sterilization) tools sterile in 35 minutes.

Soaking in antiseptic solutions

- - cutting instruments
- - rubber items

they are put in 96% ethyl alcohol
for 30 minutes

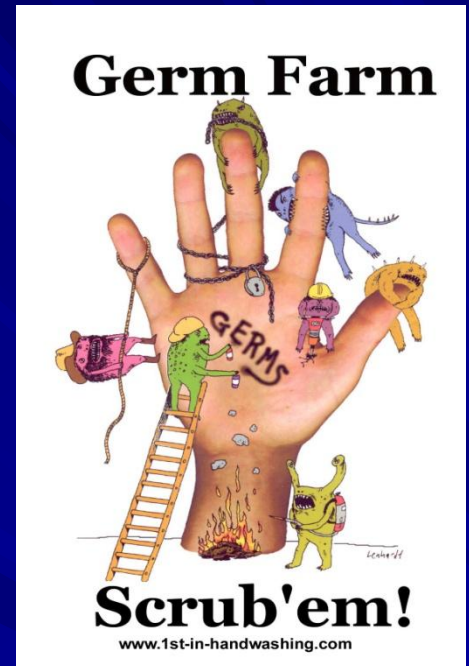


Washing by antiseptic solutions

- - surgeons hands
- (washing under the running water with soap – dry by sterile towel – washing by sterilium 30 seconds two ones)

- - surgical field

- 4 ones: before the dressing, before the cut, before sew up, before bandaging



Stage of sterilization

- stage 1 - preparation of the materials,
- stage 2 — preparing for sterilization itself,
- stage 3 — sterilization,
- stage 4 - safe-keeping of the materials sterilized

Control of sterility

1. Direct methods

- Inoculation of medium with a swab of the dressing material

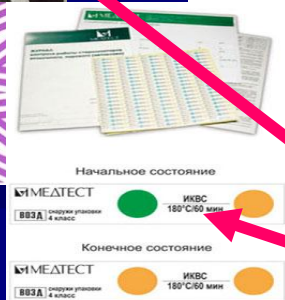
- *Bacteriological tests* (indicator).

2. Indirect methods

- Compounds with known specific melting points are used : benzoic acid (120°C), resorcinol (119°C), antipyrin (110°C) ascorbic acid ($187\text{—}192^{\circ}\text{C}$), succinic acid ($180\text{—}184^{\circ}\text{C}$), pilocarpine hydrochloride (200°C), thiourea (180°C).. Its are kept in ampoules, are placed in between the layers of materials to be sterilized. **Melting of the powdered** compound into a liquid mass show T in sterilizer

- Chemical –Test, indicator (change colors)

- Thermometry



Sterilisation instruments



Sterilisation of **instruments, syringes** (with the inscription «200 °C»), needles, glass containers is done with an dry-air oven



Sterilisation of **optical instruments** that cannot stand heat (**endoscopes, thoracoscopes, laparoscopes, the set of instruments used for artificial blood circulation or for heart-lung bypass**), are done in 1) special gas sterilizes.



2) can be done in alcohol solutions of chlorhexidine and povidone.



cutting instruments are put into 96% of ethyl alcohol for 30 minutes or in triple solution for 3 hours.



Washing surgeons hands



■ **Dressing materials and operation sheets** are sterilised in an autoclave for 30 minutes at 2 atmospheres (temperature 132,9 °C).

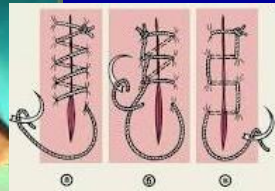


Keeping the sterilized materials

- Sterile materials are kept in special containers. Sterile and non-sterile items may not be kept at the same container.
- Materials can stay sterile in a dressing box, which has not yet been opened for **48 hours**.
- If before packing in the dressing box the materials were wrapped in (towels, sheets or napkins) as is the case with rubber drains), then they **can stay sterile for 3 days**.
- In cases of centralized sterilization syringes can be sterile for 25 days or more, according mode of sterilization.

Preparation of surgical field (skin around the wound)

- hygienic processing before operation
- shaving not earlier than before 6 hours before operation
- processing before linen applying (the dressing)
- after applying by linen before the cut
- before suture (sew up)
- after suture before bandaging



3) Prevention of implantation infection

- Sterilization of suturing material
- Sterilization of prothesis (prothesis of the valve of heart, vessel graft, joint prothesis)
- Sterilization of drainages, tubes, catheters
- Sterilization of special adaptations (cavafiltres, spirals, alloplastic grid)

4) Prevention of endogenous infection

- Treatment of chronic diseases, sanation of the centers of an infection, preventive prescription of antibiotics

5) Prevention of hospital infection

Nosocomial infection acquired in a health-care facility

- Cost to the health-care system = \$4.5 billion/year
- Leading cause of death
- Preventable with use of aseptic principles/ techniques

Exogenous Nosocomial Infection: Pathogen acquired from health-care environment

Endogenous Nosocomial Infection: Normal flora multiply and cause infection as a result of treatment

Nosocomial subcategories

- Iatrogenic
 - Infection from a procedure
ex: UTI from foley insertion
- exogenous
 - Infection from non-normal flora
ex: clostridium
- Endogenous
 - Infection when normal flora altered
ex: yeast infection

Causes of nosocomial infections

- Urinary TI
 - Insertion, contamination of drainage system, improper cleansing
- Surgical site
 - Improper technique for handwashing or dressing change
- URI - Improper handwashing or suctioning technique
- IV - Improper handwashing or site care
- Extended LOS in hospital
- Multiple care givers
- Antibiotic choices and over use
- Improper medical or surgical asepsis

Who is at risk of nosocomial infections

- Age
 - Very young and very old
- Poor nutritional status
- Smoker, ETOH use
- Existing co-morbid conditions
- Chronic illnesses, chemo, radiation
- Clients with invasive procedures
- Clients with prolonged stress

Prevention:

- Containing nosocomial infections
CLEAN, DISINFECT, STERILIZE
- Controlling/eliminating reservoirs
 - Bathing, dressing changes, patent drainage systems
- Controlling the portal of exit
 - Cover mouth/nose, wear mask, client teaching
- Controlling transmission
 - Do not share equipment, proper handling of linens, HANDWASHING
- Controlling portal of entry
 - Maintain skin integrity, position changes, proper wiping techniques, maintain drainage integrity

Question for education

WHAT'S WRONG WITH THIS PICTURE?



ASEPTIC PRINCIPLE

- **Unsterile persons avoid sterile areas.**

WHAT'S WRONG WITH THIS PICTURE?



ASEPTIC PRINCIPLE

- **Unsterile persons avoid reaching over the sterile field, while sterile persons avoid leaning over an unsterile area.**

WHAT'S WRONG WITH THIS PICTURE?



ASEPTIC PRINCIPLE

- **Tables are sterile only at table level**

WHAT'S WRONG WITH THIS PICTURE?



ASEPTIC PRINCIPLE

- **Unsterile persons avoid reaching over the sterile field, while sterile persons avoid leaning over an unsterile area.**

WHAT'S WRONG WITH THIS PICTURE?



ASEPTIC PRINCIPLE

- **Sterile persons keep well within the sterile area.**

WHAT'S WRONG WITH THIS PICTURE?



ASEPTIC PRINCIPLE

- **The edges of anything that encloses sterile contents are considered unsterile.**

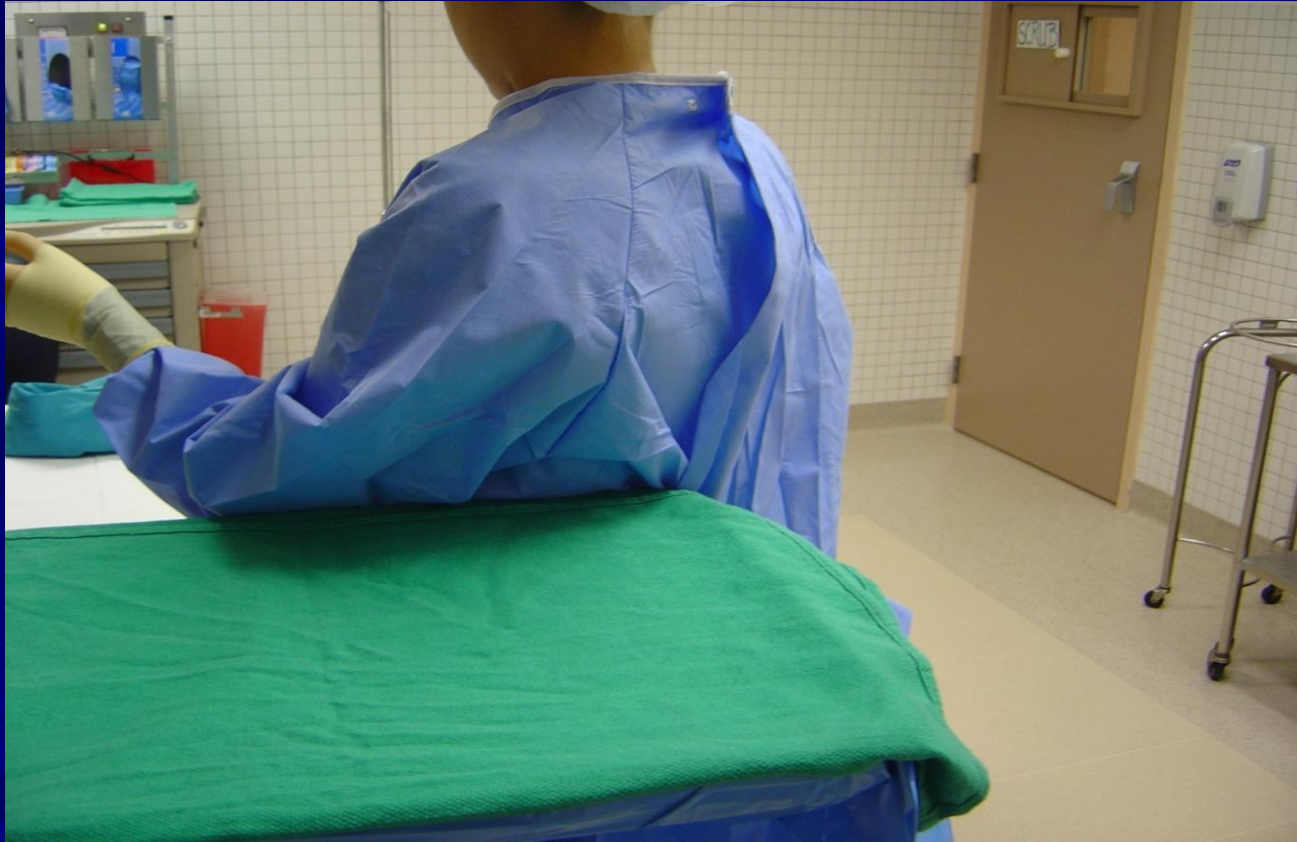
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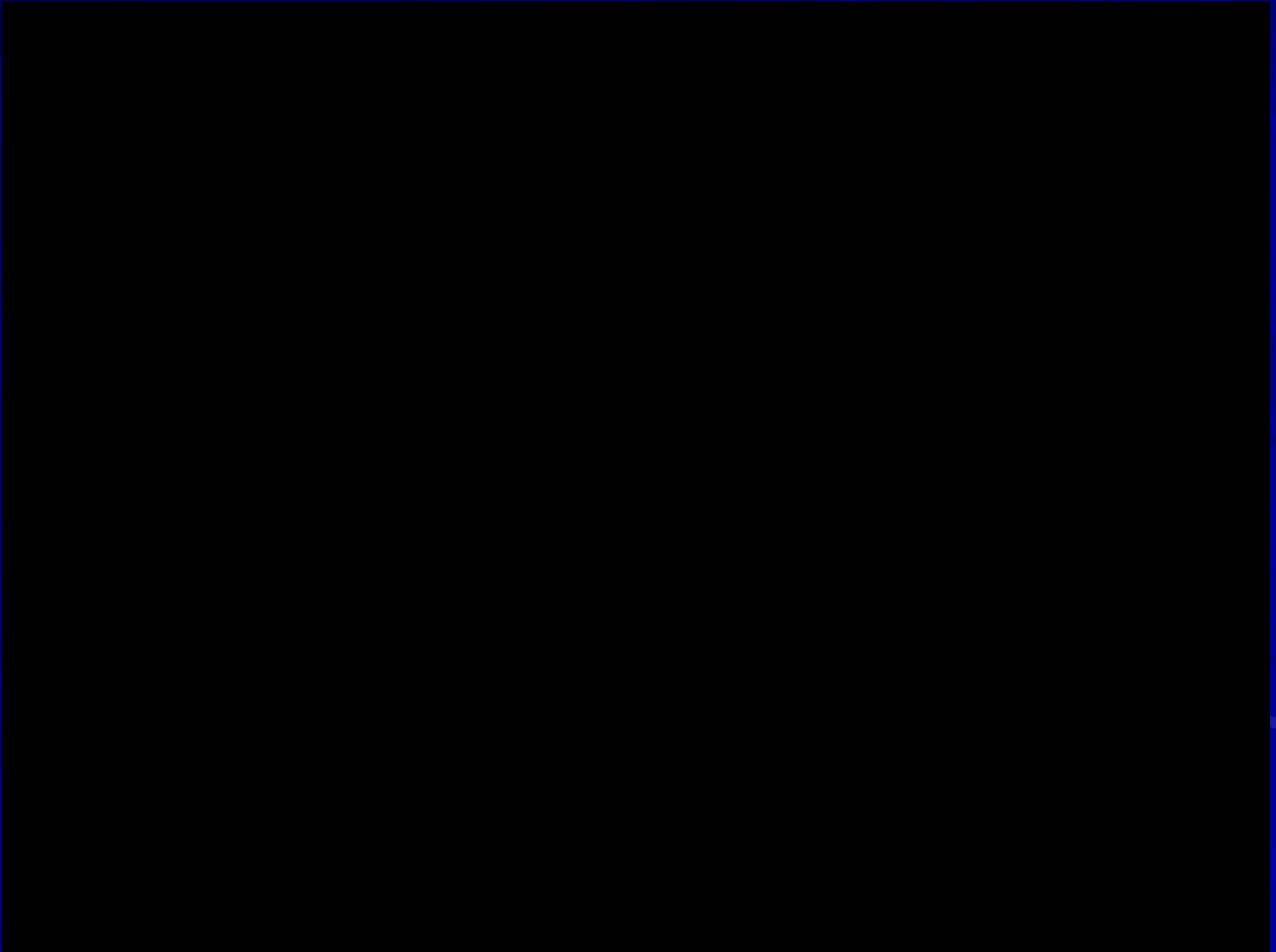
WHAT'S WRONG WITH THIS PICTURE?



ASEPTIC PRINCIPLE

- **Sterile Persons are gowned and gloved**
- ***Gowns are considered sterile only in front from chest level of sterile field and the sleeves from two inches above the elbow to cuffs. When wearing a sterile gown consider the sterile only the area you can see in front down to the level of the sterile field.***

Basic Surgical Instrumentation



The end....



Thanks for you attention!