Chapter 4.2

Types of sterilisation

Sterilisation can be physical or chemical. Physical include autoclaving and chemical include ethylene oxide sterilisation, glutaraldehyde and formaldehyde.

4.2.1 Steam sterilizers or autoclaves

Steam effectively kills all the micro organisms. It does so by irreversible denaturation and coagulation of proteins. Steam under pressure (autoclave) is the most dependable and economical method of sterilisation. It is the method of choice for metal ware, glassware, most rubber goods, and dry goods. All articles must be correctly wrapped or packaged so that the steam will come in contact with all surfaces of the article. Similar items should be sterilized together, especially those requiring the same time and temperature exposure

There are a number of manufacturers, but there are only two types of steam-under-pressure sterilizers. They are the downward displacement and the prevacuum, high temperature autoclaves.

Downward Displacement Autoclave: In the downward (gravity) displacement autoclave, air in the chamber is forced downward from the top of the chamber. The temperature in the sterilizer gradually increases as the steam heats the chamber and its contents. The actual timing does not begin until the temperature is above 250°F (121°C).

Prevacuum High-temperature Autoclave: The prevacuum, high-temperature autoclave is economical to operate and requires the least time to sterilize a single load. Flash autoclave is an example of this type. This is commonly used for sterilising instruments in between surgeries. The items need not be wrapped. All the air is evacuated using a vacuum pump before admitting steam. This causes rapid rise of temperature (134^0C). It permits instant steam penetration to all articles. The sterilisation time is reduced to 4 minutes. The cycle is timed automatically.

Prior to steam sterilisation

- The material to be sterilized should be steam compatible.
- Cleaning, disinfection and assembly of items for steam sterilisation should be carried out.
- The packing material should be permeable for penetration steam.

Points to remember

- Demineralised water or distilled water is to be used
- The cycle time and temperature depends upon the steam pressure which is chosen according to the articles to be sterilized.
- In no case should a cycle be aborted. In case of technical failure or power failure, the cycle should be repeated

Packaging and loading of instruments for sterilisation

- Instruments should be arranged in trays to prevent damage. Heavy instruments should be kept in the bottom tray. All detachable parts must be disassembled, syringes separated, caps, plugs removed, etc.
- Lubricated instruments should be thoroughly cleaned as steam or gas cannot penetrate. This would lead to improper sterilisation.
- The lumens of cannulae must be flushed through with water before being sterilized. Debris inside the lumen prevents steam penetration and will cause permanent blockage.
- Rubber sheets should not be folded or kinked, as steam cannot penetrate or displace the air from the fold or kink. The rubber sheet should be wrapped in linen. Rubber items should not be kept with metal instruments to prevent damage to the rubber items. Rubber items should be powdered before autoclaving, otherwise the heat will make the rubber stick and disintegrate.
- Perforated metal drums are used for sterilizing large items such as theatre drapes. Smaller items can be wrapped in paper bags or material and sealed with autoclave tape. All the items not in drums should be double wrapped in a cloth or paper bag.
- The articles should be packed to tightly. Space for the steam penetration and completion of drying cycle should be present.

All the items are loaded in such a way, that every surface is exposed to the steam. All the instruments should face the same side to avoid air pockets.

Labelling

Autoclave tape should be put onto all packs indicating the date of sterilisation, who packed them and their contents.

Unloading of sterile items

Once the pressure gauge shows zero atmospheric pressure and the autoclave cooled down, the items can be removed. The door should be partially opened to let out the steam. Once, all the steam is out, the door can be opened fully and the bins removed.

Drying

When the cycle is complete the contents should be removed, and placed on wire shelves to allow free flow of air around them so that they cool without condensation developing. If shelves are not available, the items should be placed in a cool place. Do not pile one on top of another. If drums are used, they should be sealed immediately.

Storing

Once items have cooled they can be wrapped in a polythene bag to prevent dust and external damage. Ideally the articles from a bin should be used within 24 hours of being sterilized. But this is not feasible in many hospitals. As an alternative they can doubly wrapped. Sterile packs must be stored above waist level, kept dry, protected from dust, handled only when necessary.

Testing the effectiveness of autoclave

Bowie Dick test: This test is done daily. The test checks if full penetration of steam is being achieved.

Method: For the test, fold 12 drapes and place a cross of autoclave tape on the 12^{th} drape. Place another 12 drapes on top, tie the bundle with string and place it in a drum in the autoclave to go through the full cycle. At the end of the cycle (the test must not run for longer than three and a half minutes at 134-135°C), remove and open the bundle and check if the tape in the middle has changed colour.

Result: The colour change should be uniform all through the tape. If it has, full penetration of steam has been achieved. If not, the autoclave is faulty and has not been sterilizing items effectively. The test does not confirm that sterilizing conditions have been achieved in the load, but it does prove whether or not steam penetration of the pack has been even.