BASIC SURGICAL TOOLS  
and  
SURGICAL MATERIALS

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BASIC SURGICAL TOOLS
Surgical instruments are
- precisely designed and manufactured tools.
- for single (disposable) or multiple use (non-disposable),
- must be resisted physical and chemical effects, body fluids, secretions, cleaning agents and sterilization

For this reason, most of them are made of high-quality stainless steel; chromium and vanadium alloys ensure the durability of edges, springiness and resistance to corrosion.
Classification:

1. Cutting and dissecting instruments
2. Grasping, clamping, occluding instruments
3. Hemostatic instruments
4. Retracting and exposing instruments
5. Wound-closing instruments and materials
6. Special instruments
1. Cutting and dissecting instruments

The function of these instruments is to divide tissues, sutures, bandages, etc.
1.1. Scalpels

Use of scalpels

Conventional scalpel

Fiddle-bow-holding

Pencil-holding
1.2. Scissors
Use of ring-ended instruments with right and left hands

1-4 instrument-holding
1.3. Dissecting hemostatic forceps

Three main functions:
- dissecting tool,
- grasping tool,
- hemostatic tool.
1.4. Electrocoagulating system

<table>
<thead>
<tr>
<th>Monopolar</th>
<th>Bipolar</th>
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</table>

1.5. Ultrasonic cutting system
1.6. CUSA (Cavitron Ultrasonic Surgical Aspirator)
1.7. CO$_2$-LASER, neodymium-YAG-LASER
BASIC SURGICAL TOOLS

1.8. Dissector
1.9. Amputating knives
1.10. Saws
1.11. Raspatories
2. Grasping, clamping and occluding instruments

These instruments are used to grasp, pick up, hold and manipulate tissues, tools and materials.
2.1. Forceps

- Anatomical forceps
- Surgical forceps
- Ophtalmological forceps
- Ring tip forceps
- Dental forceps
Use of forceps

Forceps should be held like a pencil!

Forceps must never be held in the palm!!!!!!
2.2. Towel-holding clamps

Bachaus towel clamp

Schaedel towel clips
2.3. Hemostatic forceps

**Traumatic**

- Kocher
- Lumnitzer
- Bulldog

**Atraumatic hemostatic forceps**

- Blalock
- Satinsky
2.4. Needle holders

Mathieu needle holder

Hegar needle holder
2.5. Organ clamps

- **Allis** (lungs)
- **Ringed gallblader clamp**
- **Babcock** (gallblader)
- **Klammer** (intestinal clamp)
2.6. Sponge-holding clamp

Sponge-holding clamp

Handled sponge
3. Hemostatic instruments

These instruments are establishing hemostasis during the operation.
Important member of this group are the hemostatic claps (Pean, mosquito, abdominal Pean, Kocher, Lumnitzer, Satinsky, bulldog) and electocoagulatins system.

3.1. Deschamp needle and Payr probe
3.2. Argon beam coagulator (ABC)
4. Retracting and exposing instruments

These instruments are used to hold tissues and organs in order to improve the exposure and hence the visibility and accessibility of the surgical field.
BASIC SURGICAL TOOLS

4.1. Hook

4.2. Rake retractor

4.3. Roux-retractor
4.7. Weilander self-retractor

4.8. Gosset self-retractor
5. Wound-closing instruments and materials

These instrument and surgical materials are used during tissue closure procedures.
5.1. Staplers

**Linear Stapler**

**Circular Stapler**
5.2. Clips

Michel-clips

5.3. Self-adhesive strips

5.4. Surgical adhesives

BASIC SURGICAL TOOLS
5.5. Surgical materials
6. Special instruments

These instruments are not used routinely during all surgical interventions.
6.1. Volkmann’s curette

6.2. Instruments of bone surgery

6.3. Probe

6.4. Sucker system
SURGICAL MATERIALS
Surgical needles

Medicina is used numerous materials (bone, fishbone, thorn) as surgical needles, and metal needles are widespread from the XIX. Century.
The criteria of the ideal surgical needles

- Made in best quality and minimal tissue reaction causing stainless steel
- Slim and narrow, but strong
- Stabil fixation and control in the needle holder
- Lead the thread by safely and minimal traumatisation
- Sharp to get through the tissues
- Rigid, but flexible
- Easy sterilisation
Conventional needles

- Double thread (traumatisation)
- Lace time
- Re-sterilisation
- Care of needle-tip
- Corrosion

SURGICAL MATERIALS
Atraumatic needles

- Simple thread (atraumatic)
- Manufactured connection of needle and threads

- No Lace time
- No re-sterilisation
- No Care of needle-tip
- No Corrosion
Shape of needle

- ¼ Circle
- 3/8 Circle
- ½ Circle
- 5/8 Circle
- Progressive curved
- Multiple curved
- Straight
- J-shaped
SURGICAL MATERIALS

Shape of its body

Round needle

Triangular (Cutting) needle
SURGICAL MATERIALS

Round needle

- Taperpoint
- Tapercutting
- Blunt taper
Cutting needle

Conventional

Reverz cutting

Spatula
Criteria of ideal surgical materials

Moynihan, 1912:

- Nonelectrolytic, noncapillary, nonallergenic, noncarcinogenic.
- Nonferromagnetic, as is the case with stainless steel sutures.
- Easy to handle.
- Minimally reactive in tissue and not predisposed to bacterial growth.
- Capable of holding tissue layers throughout the wound healing.
- Resistant to shrinking in tissues.
- Absorbed completely with minimal tissue reaction after serving its purpose.
- Sterile.
## Classification of surgical materials

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Natural</th>
<th>Synthetic</th>
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<tbody>
<tr>
<td>Structure</td>
<td>Monofil</td>
<td>Multifil</td>
</tr>
<tr>
<td>Absorbability</td>
<td>Absorbable</td>
<td>Non-absorbable</td>
</tr>
</tbody>
</table>
SURGICAL MATERIALS

Raw material: Natural

Advantage:
- Present in the nature - cheap??
- Good handling
- Knotting properties, knot security

Disadvantage:
- Strong tissue reaction by animal and vegetable tissues
- Enzimatic absorption – tissue reactions
- Uncalculable absorption
- Procurement, screening, monitoring (economies ?)
Advantage:
- Minimal tissue reaction
- Absorbtion by hydrolysis – calculable
- Strong

Disadvantage:
- Bad handling of Monofil threads
Advantage:
- Smooth surface
- Smaller tissue trauma
- No bacterial culture
- No capillarity
- No tumor cell invasion

Disadvantage:
- Bad handling and knotting
- „Thread memory“
**Advantage:**
- Strong
- Soft and flexible
- Good handling
- Good knotting

**Disadvantage:**
- Bacterial and tumor cell invasion
- Capillarity
- Elongation
- Rough surface – tissue trauma
  (sawing and cutting)
Advantage:

- The human body breaks down them
- Not remain foreign materials (granuloma)

Disadvantage:

- Time of tissue cohesion
  (important the choose)
Absorbable

1. Polyglycolic acid (Safil®, Safil Quick®, Dexon®)
2. Polyglactin (Vicril®, Vicryl Rapide®)
3. Glycomer (Biosyn®)
4. Polyglytonge (Caprosyn®)
5. Glyconate (Monosyn®)
6. Polyglyconate (Maxon®)
7. Polydioxanone (PDS II®, MonoPlus®)
8. Lactomer (Polysorb®)
9. Gut (Cromic Gut®, Plain Gut®)
Absorbability: Non-absorbable

Advantage:
Permanent tissue cohesion

Disadvantage:
Resist foreign materials in the tissues
(foreign-body reactions, granuloma, microabscess, fibrosis)
Suture rejection
Non-absorbable

1. Polyamide (Dafilon®, Ethilon®, Supramid®, Nurolon®, Surgilon®)
2. Polyester (Ethibond®, Ti-Cron®, Synthofil®, Dagrofil®, Mersilene®)
3. Polybutester (Novafil®, Vascufil®)
4. Polypropylene (Premilene®, Prolene®, Surgipro®)
5. Silk (Silkam®, Virgin silk®, Mersilk®, Softsilk®)
6. Steel (Steelex®, Steel wire®, Steel®)
No ideal surgical materials!

Choice:
- Synthetic
- Absorbable
- Coated multifil or flexible monofil
The size-systems of threads

**Metric units / European Pharmacopeia/**
from 0,1 metric (0,010-0,019 mm)
to 10 metric (1,00-1,09 mm)

**USP / United States Pharmacopeia/**
from 11/0 (0,010-0,019 mm) to 7 (1,00-1,09 mm)

11/0, 10/0, 9/0, 8/0, 7/0, 6/0, 5/0, 4/0, 3/0, 2/0, 0, 1, 2, 3, 4, 5, 6, 7