

Tendon Surgery



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Tendons



Anatomy

- ☞ Tendons consist of dense regular connective tissue.
- ☞ The main cellular component of tendons are specialized fibroblasts called tenocytes.
- ☞ Tendons contain fibroblasts that are arranged in parallel rows
- ☞ Tenocytes synthesize the extracellular matrix of tendons, abundant in densely packed collagen fibers.



- ❧ Tendons are vary in thickness, length, and shape in order to move over the joints.
- ❧ Tendons contain collagen fibrils
- ❧ Tendons contain a proteoglycan matrix
- ❧ Tendons connect muscles to bone.

Blood Supply



- ❧ The blood supply enters the tendon in three locations: through a musculotendinous junction and osteotendinous insertion as intrinsic systems, and paratenon or synovial sheath as extrinsic system

Nerve Supply



∞ Tendon innervation originates from **cutaneous, muscular, and peri-tendinous nerve** trunks and both sympathetic and parasympathetic fibers are present in tendon.

Functions



☞ Tendons carry tensile forces from muscle to bone

Tendon Healing



☞ The three main stages of tendon healing are **inflammation, repair or proliferation, and remodeling**, which can be further divided into consolidation and maturation. These stages can overlap with each other.

1. First or Inflammatory stage

- ∞ In the first stage, starts immediately after injury and lasts for approximately 10 days inflammatory cells such as neutrophils are recruited to the injury site, along with erythrocytes. Monocytes and macrophages are recruited within the first 24 hours, and phagocytosis of necrotic materials at the injury site occurs. After the release of vasoactive and chemotactic factors, angiogenesis and the proliferation of tenocytes are initiated. Tenocytes then move into the site and start to synthesize collagen III.

2- Reparative (proliferative) Phase:

It begins within **4 days** after injury and peaks at **3 weeks**.

After a few days, the repair or proliferation stage begins.

In this stage, the tenocytes are involved in the synthesis of large amounts of collagen and proteoglycans at the site of injury, and the levels of Glycosaminoglycan GAG and water are high.

3- Remodeling Phase:



- After about six weeks, the remodeling stage begins. The first part of this stage is consolidation, which lasts from about six to ten weeks after the injury. During this time, the synthesis of collagen and GAGs is decreased, and the cellularity is also decreased as the tissue becomes more fibrous as a result of increased production of collagen I and the fibrils become aligned in the direction of mechanical stress.
- The final maturation stage occurs after ten weeks, and during this time there is an increase in cross linking of the collagen fibrils, which causes the tissue to become stiffer. Gradually, over about one year, the tissue will turn from fibrous to scar-like.

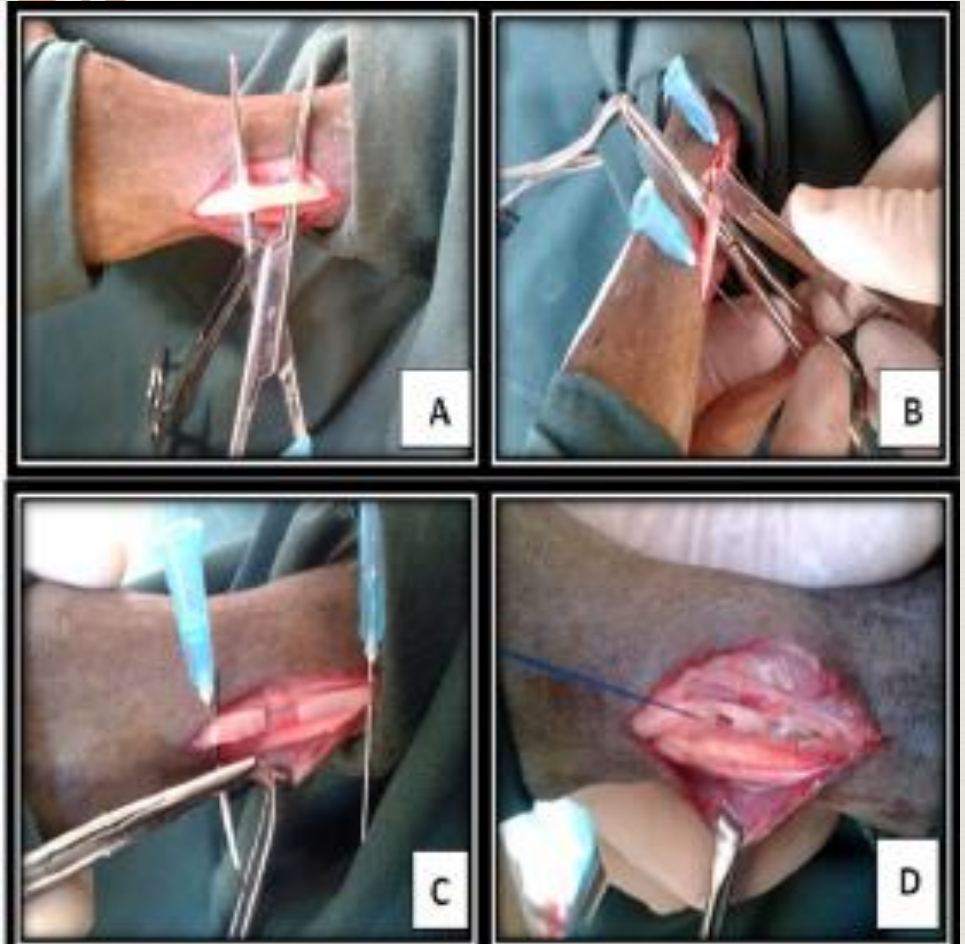
General Principles of Tendon Surgery

- 1- Minimizing the adhesions of tendon, this is accomplished by:
 - A- gentle handling of tissue
 - B- keeping the tissue moist (saline solution).
 - C- preventing hematoma formation.
 - D- preventing infection.
- 2- Apposing the normal tissues as perfectly as possible.
- 3- Use of a tourniquet.
- 4- If external fixation is required, a splint or cast applied.
- 5- A straight needle is used, or curved tapered needle may be used.
- 6- The suture material should be strong, permanent and non-reactive and the size of the material will depend on the size of the tendon.
- 7- The creation of a surgical wound should be away from the tendon.

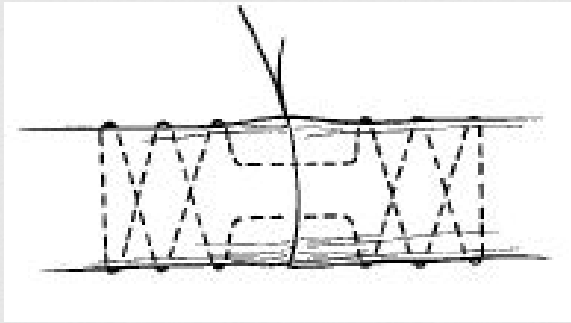
End- to- End Tenorrhaphy



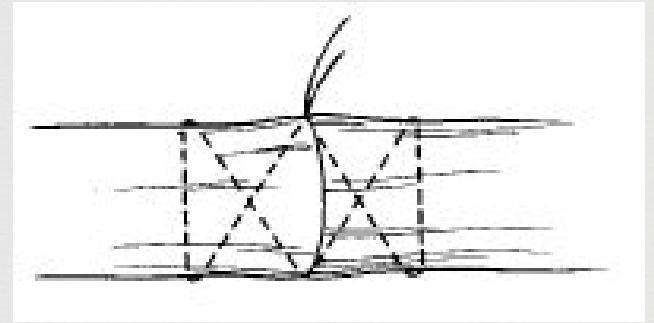
- ☞ Is the best method for restoration of a lacerated tendon (tenotomy).
- ☞ The tension may be overcome by passing 2 straight needles transversely through the tendon proximal and distal to the proposed suture pattern.
- ☞ Forceps are not recommended to use.
- ☞ Use suitable suture pattern.



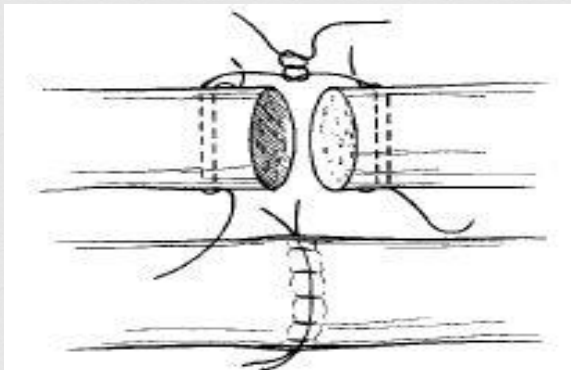
Core Suture Techniques



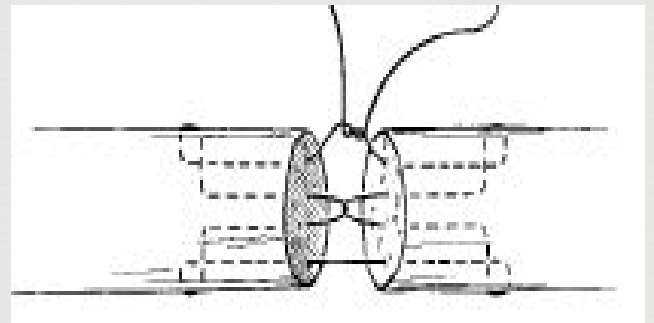
Bunnell stitch



Crisscross stitch

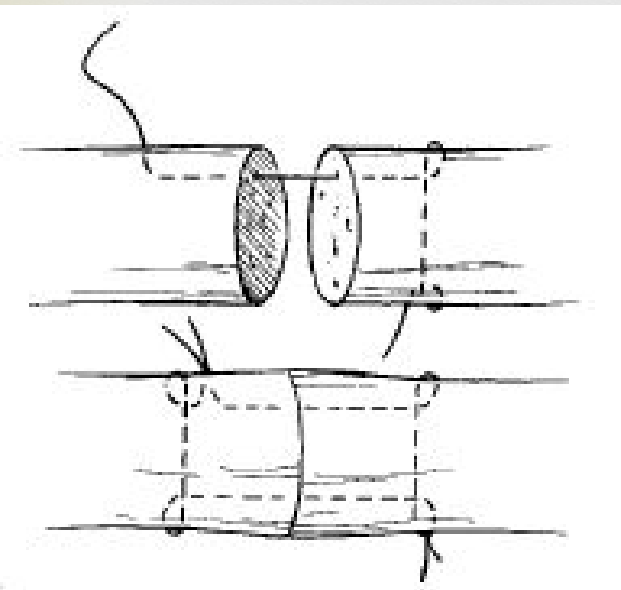


Mason-Allen stitch

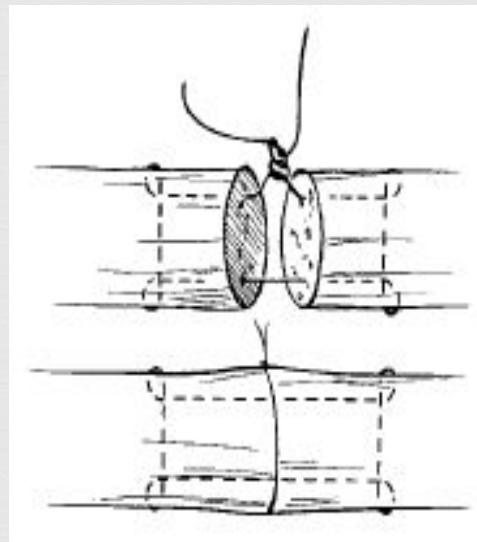


Robertson and Al-Qattan
Interlock stitch

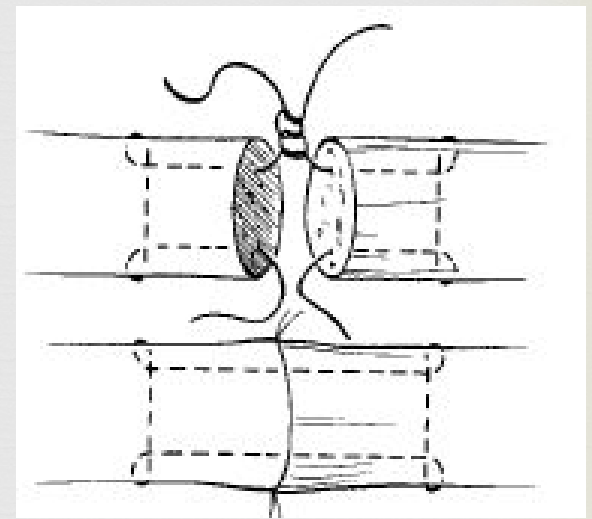
Core Suture Techniques



Kessler stitch



Modified Kessler



Tajima modification
Of kessler stitch with
double loop at repair
site

Contracted tendon



Contracted tendons it occur in foal ,calf ,lamb and pigs it can be congenital or acquired disease that most commonly involves the forelegs in one or both limbs.

Location:

1. Fore limb (either unilateral or bilateral)
2. Hind limb (either unilateral or bilateral)
3. It may affect the

**Superficial Digital Flexor Tendon or
Deep Digital Flexor Tendon or both of them.**



Treatment



The treatment is according to the degree of contraction;

- ☞ In case of mild contraction, splintage with continuous tension may lengthen the tendon and correct the contracture.
- ☞ If the contracture is severe the simplest method of correcting contractures and the simplest tendon operation is Tenotomy:

Site of operation:

1. Mid metacarpal region (fore limbs).
2. Mid metatarsal region (hind limbs).

In these sites no synovial sheath surrounding the tendons.

Anesthesia:

1. local S/c infiltration (in ruminant).
2. General anesthesia (in equine).



Tendon Lengthening (in contracted tendon)



1- Accordion method

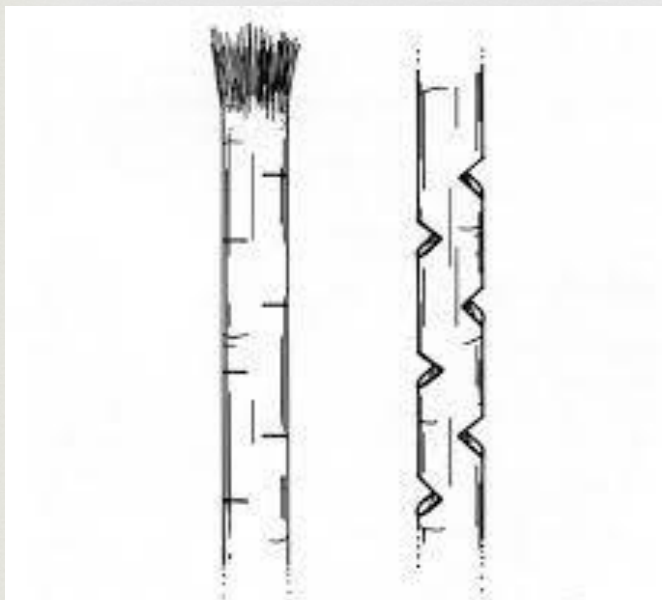


FIG. 68-5 The accordion technique for lengthening a tendon.

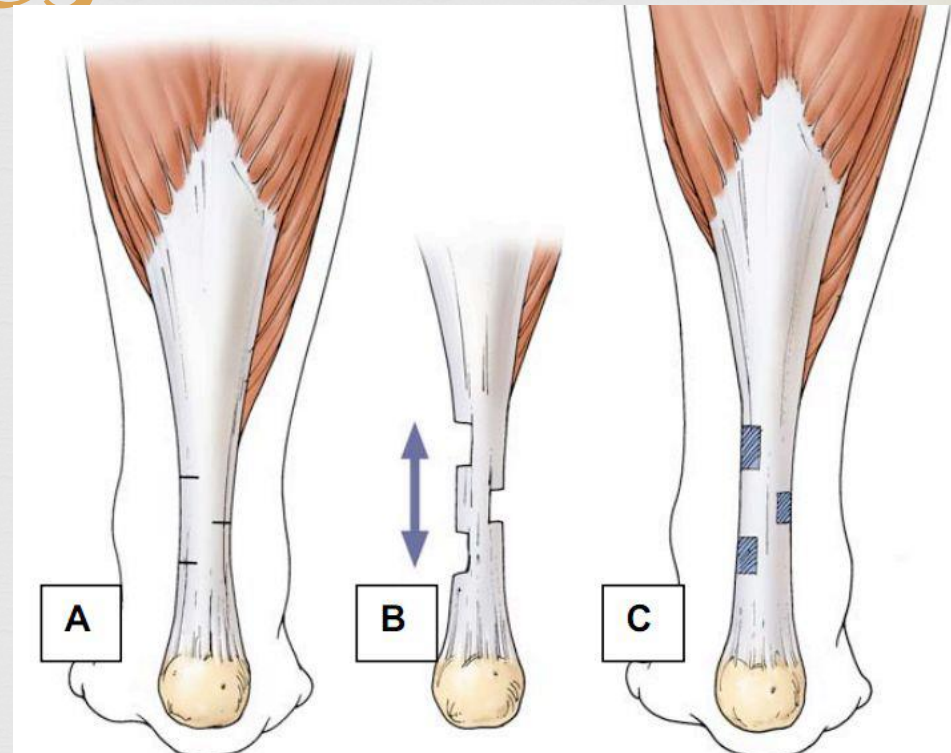


Figure A demonstrates the 3 cuts in the tendon.

Figure B demonstrates the tendon being lengthened.

Figure C demonstrates the healing of the lengthened tendon

2- "Z" Tenotomy and modified "Z" Tenotomy :

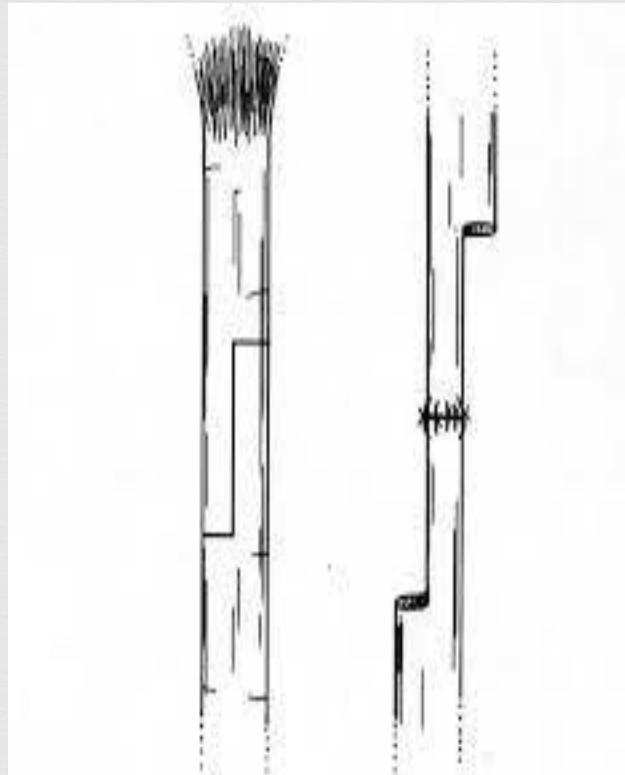


FIG. 68-6 The Z tenotomy technique for tendon lengthening.

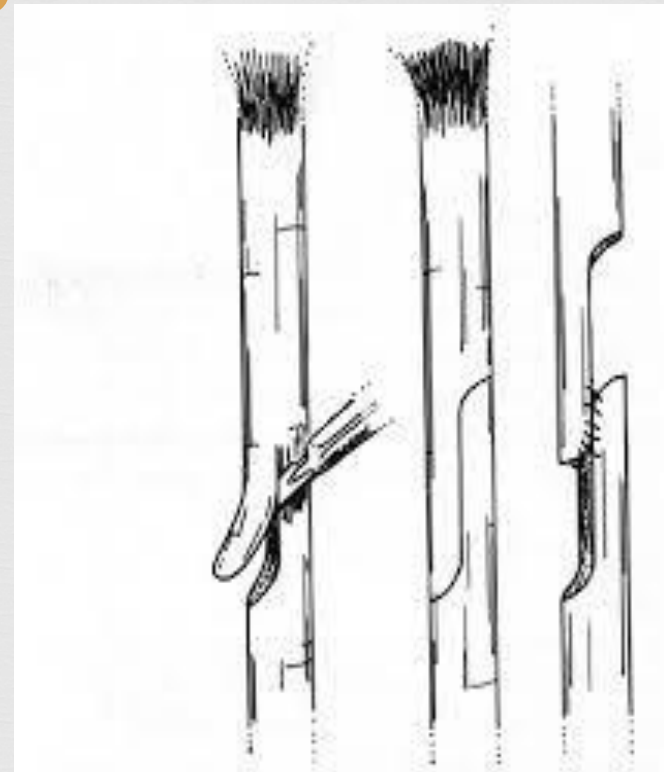


FIG. 68-7 A modified Z tenotomy.

3- Oblique splitting and gliding technique

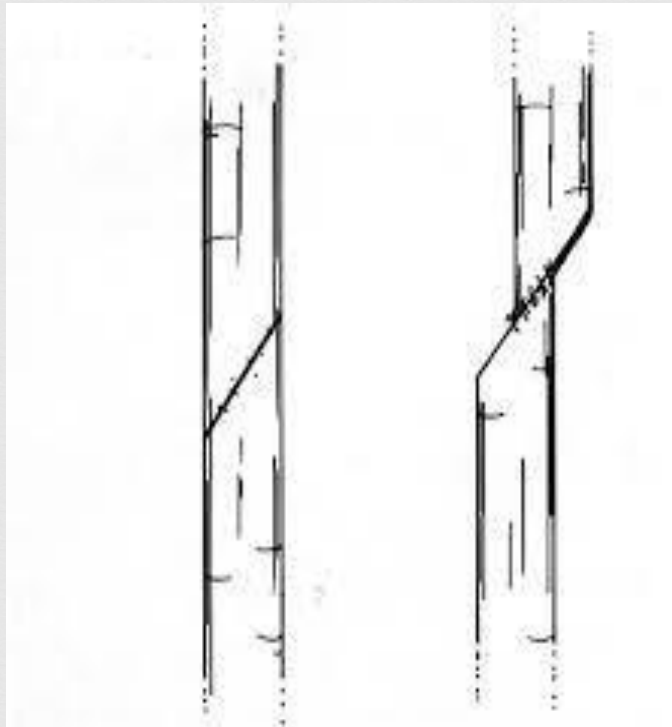
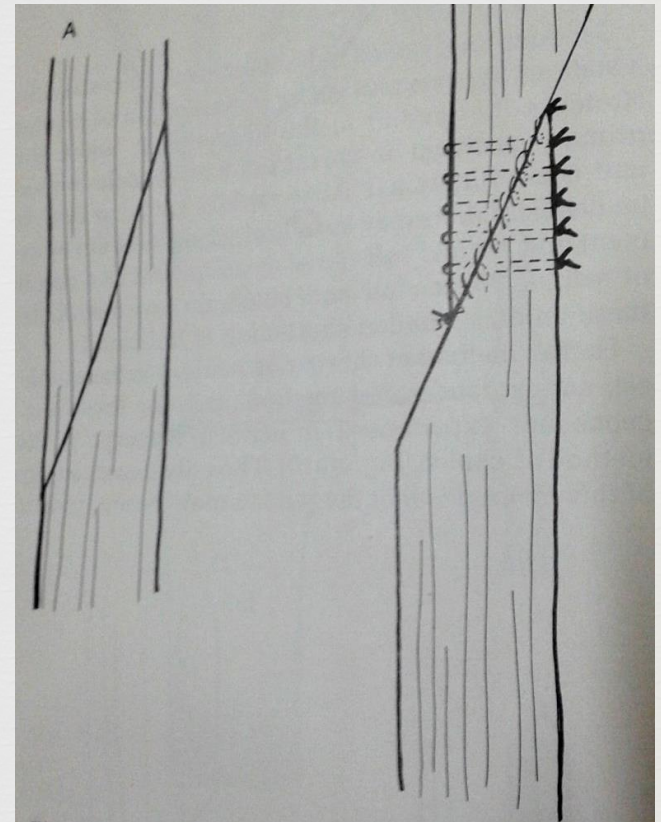


FIG. 69-8 The oblique section and sliding procedure.



Tendon shortening

1- Hoffa's method

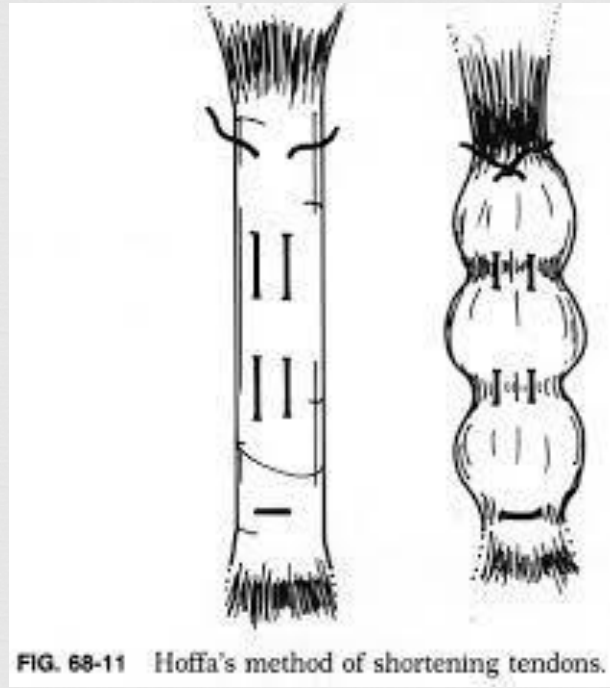
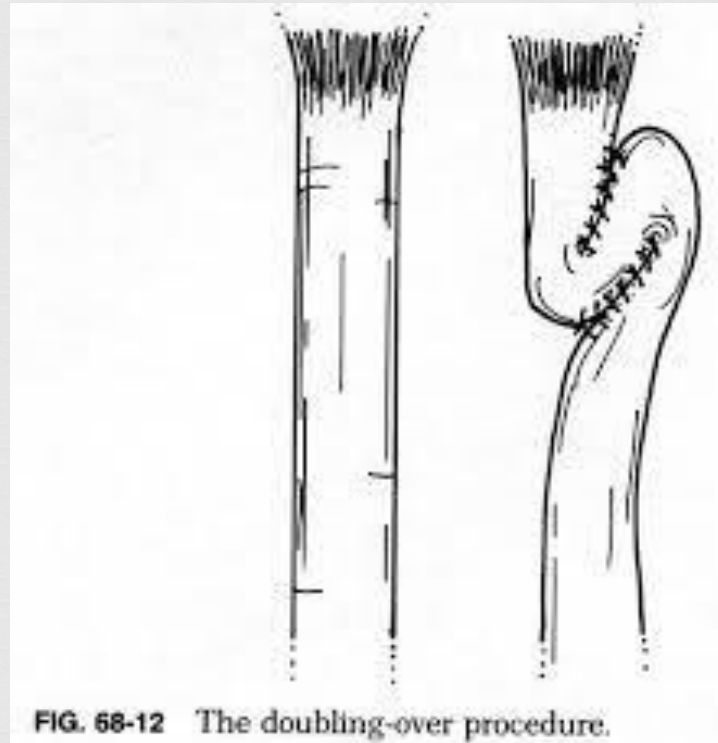
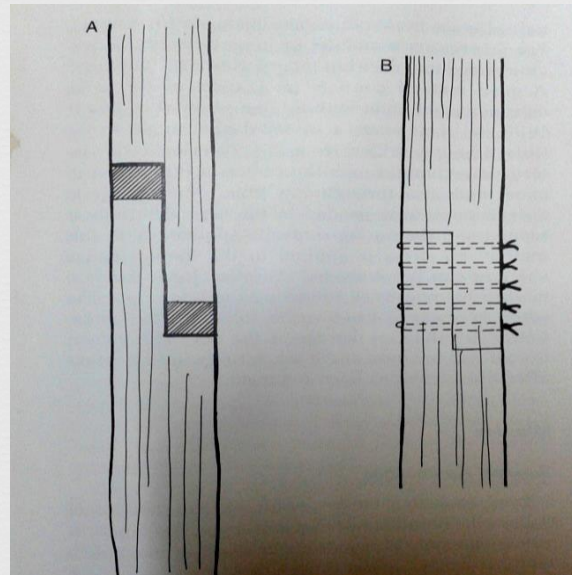


FIG. 68-11 Hoffa's method of shortening tendons.

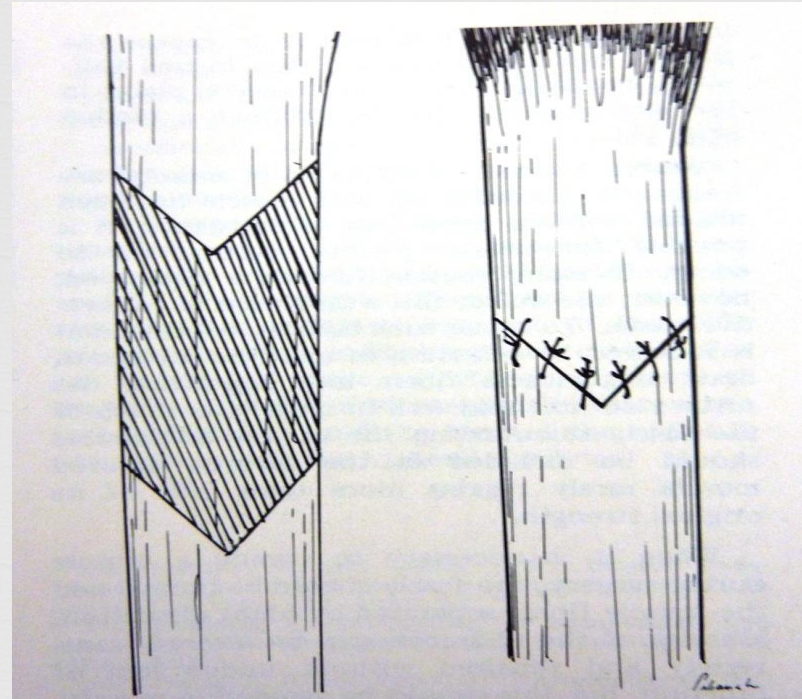
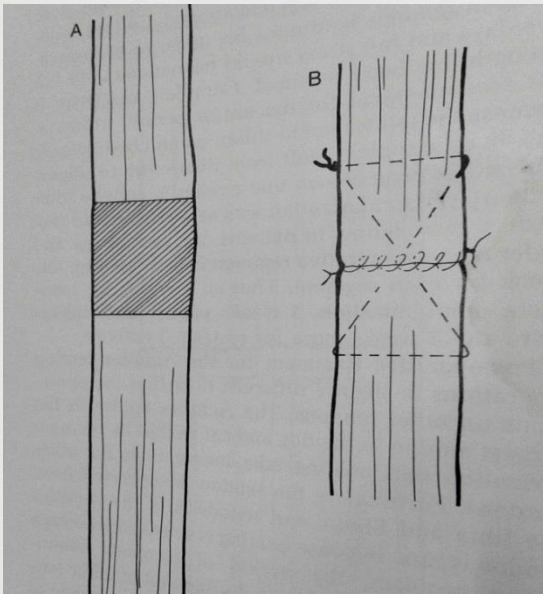
2- Doubling over method



3- "Z" incision with excision of the tendons ends



4- Shortening by remove portion and Anastomoses



POSTOPERATIVE CONSIDERATIONS FOLLOWING TENDON SURGERY



- ❧ It is essential that all tension be removed from the tendon during the healing period for the first 3 weeks.
- ❧ Tendons have little ability to hold sutures for the first 5 days after surgery, and the wound strength is not increased to any marked degree until after 14 days.
- ❧ At this point the strength increases rapidly.
- ❧ Between 3 weeks and 6 weeks exercise should be quite restricted.
- ❧ Immobilization should be accomplished by cast application. If the tendon is a flexor or extensor tendon, the cast is applied in such a way that it reduces any stresses on the anastomotic area.



Thanks to Listen