Flexor tendon repair &outcomes

Lawrence Ajekigbe, EBHD

Aims

- To discuss available options to restore function in unrepaired or failed repaired flexor tendon lacerations
- To be familiar with the reconstructive ladder and the indications, contraindications and complications of the choices

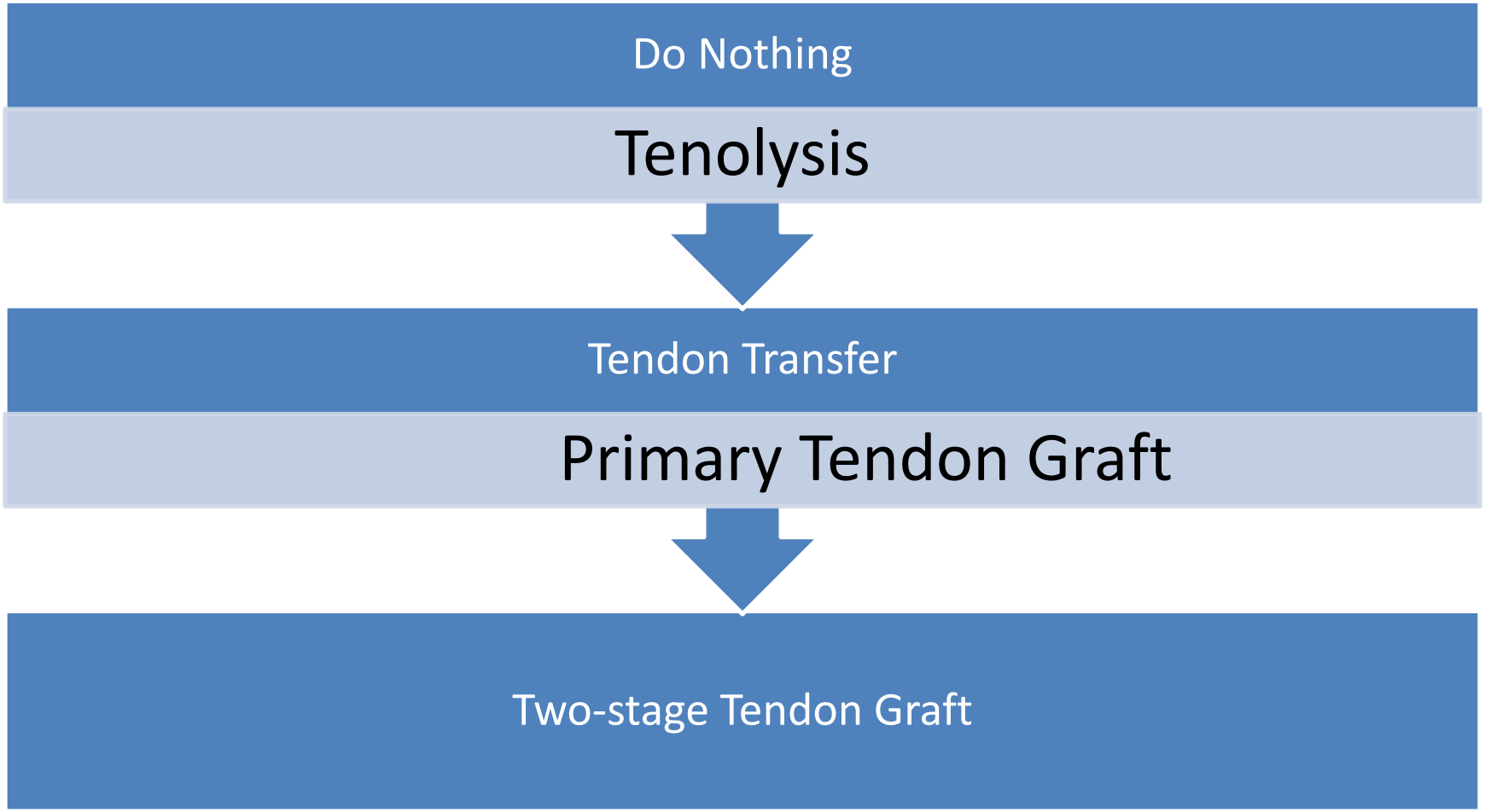
Choice of Reconstruction: Factors to consider

- Age
- Functional status
- Occupational needs
- The patient's desires
- Preoperative sensory and circulatory status of the finger
- Mechanism and extent of trauma.
- Healing response of the patient

Alternatives to reconstruction

- Choosing not to operate
- Performing an arthrodesis
- Amputating the digit

Ladder of Tendon Reconstruction options



Tenolysis

Indication

Tendon adhesions

Preoperative Evaluation

A discrepancy exists between passive (full) and active (limited) range of motion after hand therapy has plateaued.

Caution

Do not operate earlier than 3 months status post repair or grafting.

Technical Points

- Use regional if possible. Otherwise, perform a “traction check” through additional wrist incision.
- Use zigzag incisions.
- Use tenolysis knives.

Factors affecting outcome

- Concurrent capsulectomy, concurrent osteotomy, age
- older than 40, and 1-year delay contribute to a worse prognosis.
- Postoperative Care
- Active range of motion exercises should begin immediately

BOYES' PREOPERATIVE CLASSIFICATION

1 Good: Minimal scar with mobile joints and no trophic changes

2 Cicatrix: Heavy skin scarring because of injury or prior surgery; deep scarring because of failed primary repair or infection

3 Joint damage: Injury to joint with restricted range of motion

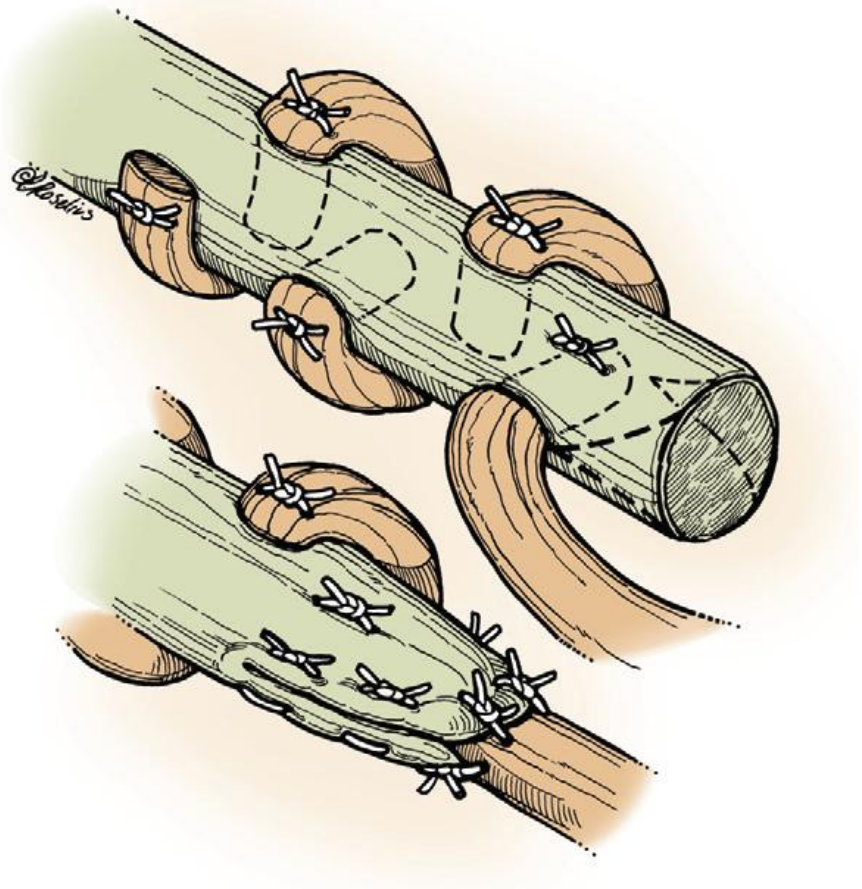
4 Nerve damage: Injury to digital nerves resulting in trophic changes in finger

5 Multiple damage: Involvement of multiple fingers with combination of above problems

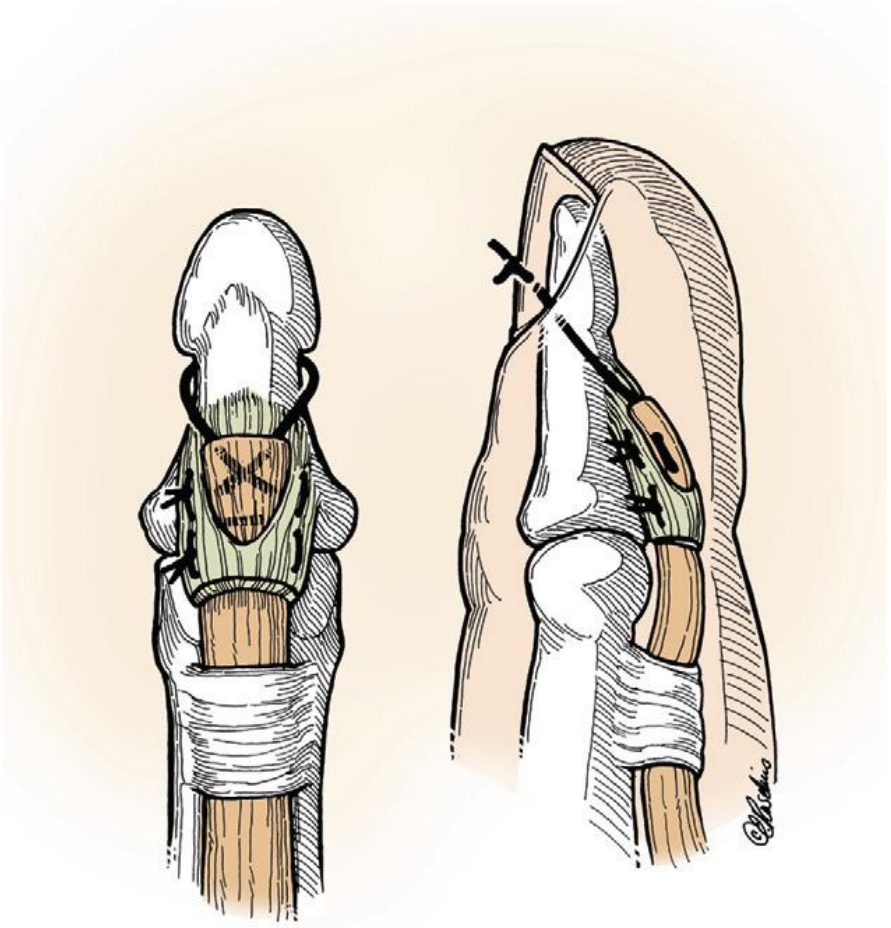
Preop conditions for tendon graft

- The wound should be well healed.
- The joints should be free of contracture, and maximum passive motion should have been attained (Boyes' grade 1)
- Pulvertaft emphasized that, "The hand is in good overall condition. There is no extensive scarring. Passive movements are full or nearly full. The circulation is satisfactory. At least one digital nerve in the affected digit is intact."

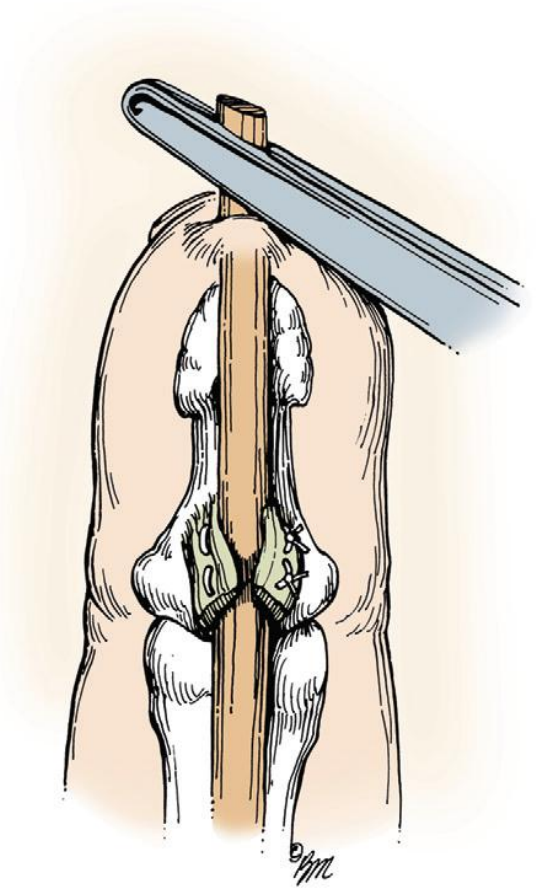
Modified Pulvertaft end weave technique. The graft is secured to the proximal motor tendon via multiple weaves through the motor tendon held in place with 3-0 polyester sutures.



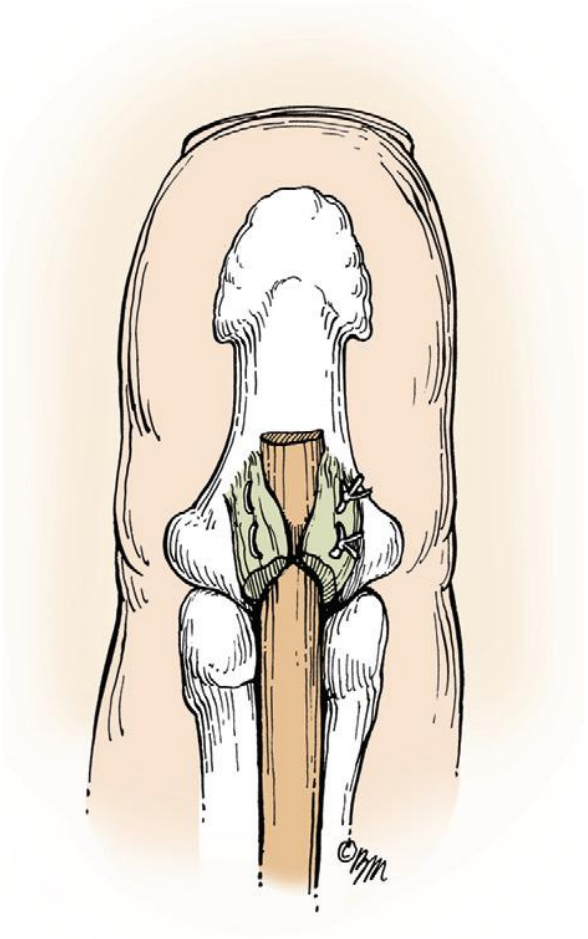
Tendon graft is woven through distal
stump of profundus. Pull-out suture is passed around sides of
distal phalanx through nail bed and tied over nail plate.



Distal juncture technique. Graft is drawn through the pulp, and after tension adjustments are made, is sutured to profundus stump.



Distal juncture technique. In this tendon-to-tendon technique, an interweave suture is used to fix graft to stump of FDP tendon.



Single stage flexor tendon Grafting: FDP & FDS injured

Indications:

1. Injuries resulting in segmental tendon loss.

2. Delay in repair that obviates primary repair. Lacerations that have been neglected for more than 3 to 6 weeks show tendon degeneration accompanied by scar within the tendon sheath.

3. Patients in whom the surgeon believes delayed grafting is
the better treatment alternative for a zone 2 injury where a large section of the tendon has been damaged.

4. Delayed presentation of flexor digitorium profundus
(FDP) avulsion injuries associated with significant tendon retraction.

Single stage flexor tendon Grafting: FDP & FDS injured

Surgical principles:

- Place only one graft in each finger.
- Never sacrifice an intact flexor digitorum superficialis (FDS).
- Use a graft of small caliber.
- Perform the junctions outside of the tendon sheath.
- Ensure adequate graft tension

SINGLE-STAGE TENDON GRAFTING:
FLEXOR DIGITORUM PROFUNDUS TENDON DISRUPTED, FLEXOR DIGITORUM SUPERFICIALIS TENDON INTACT—cont'd

- Never remove an intact, fully functioning FDS tendon in an effort to place a graft.
- Use a similar technique as in free tendon grafting.

- Know that a thinner graft is easier to pass (plantaris).
- Pass graft through FDS tendon decussation.

- If area is tight, pass graft around FDS tendon.

- One FDS tail can be removed for tendon graft passage.
- Grafting can be done in two stages.

TWO-STAGE FLEXOR TENDON RECONSTRUCTION: STAGE I

- Crushing injuries associated with underlying fracture or overlying skin damage
- Failure of previous operations
- Excessive scarring of the tendon bed
- Damaged pulley system
- Contracted joints

TWO-STAGE FLEXOR TENDON RECONSTRUCTION: STAGE I—cont'd

- The patient must understand the necessity of the arduous postoperative therapy program.

- Arthrodesis or amputation may be a better alternative.

- A range of motion and scar-softening therapy program

is important to attain maximal preoperative passive range of motion and to evaluate the patient's willingness to participate in postoperative therapy.

TWO-STAGE FLEXOR TENDON RECONSTRUCTION: STAGE I—technical points

- Preserve potential pulley material, injured or uninjured.
- Excise flexor tendons leaving 1-cm FDP stump.

- Transect the proximal FDP tendon at the level of the lumbrical origin.
- Correct joint flexion deformities.

- Make second incision in the distal forearm.
- Identify the involved FDS tendon, draw it into the wound, and transect it near the musculotendinous junction.

- Determine the appropriate size of the silicone implant.
- Assess the integrity of the pulley system; A2 and A4 pulleys at least are needed.

- Pass the implant from the proximal palm to the distal
- forearm between the FDP and FDS tendons.

- Fix the implant beneath the FDP stump.
- Exert traction on the proximal end of the implant to observe potential range of motion.
- If implant assumes a bowstring posture, reconstruct needed pulleys.

TWO-STAGE FLEXOR TENDON RECONSTRUCTION: STAGE II

- The interval between stages I and II is approximately 3 months.
- The hand must be soft, and the joints must be well mobilized.
- The newly formed sheath is disturbed as little as possible.
- Proximal juncture is placed in the forearm (most cases): a longer graft is needed (plantaris or toe extensor), motored by the FDP tendon.
- Proximal juncture is placed in the palm (palm not involved in trauma): a shorter graft can be used (palmaris), motored by the FDP tendon at lumbrical ORIGIN

TWO-STAGE FLEXOR TENDON RECONSTRUCTION: STAGE I—TECHNICAL POINTS

- Open the distal portion of the finger incision to the middle of middle phalanx.

- Locate the implant at its attachment to profundus stump.
- Reopen proximal incision in the distal forearm. Excise forearm fascia, and incise sheath.

- Select motor.
- Obtain tendon graft.

- Suture graft to proximal end of implant, and pull it distally through sheath.
- Fix distal juncture.
- Create proximal juncture

THUMB FLEXOR TENDON RECONSTRUCTION

- Repair of FPL tendon is delayed, or significant trauma does not allow repair

- Satisfactory preoperative range of passive IP joint motion

- Free tendon graft: similar indications as for fingers.

- Superficialis transfer: alternative to free tendon graft.

- Two-stage tendon reconstruction: severely scarred
- tendon bed or destroyed pulley system or both.

- IP joint arthrodesis: when strong pinch is required,
- especially in the presence of intra-articular damage

at the IP joint or in patients with hyperextensile IP joint.