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(CASE REPORT)

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HUNTER TECHNIQUE IN TWO-STAGE FLEXOR TENDONS RECONSTRUCTION

A. Zaizi *, O. Azriouil, N. El Ghoul, H. Sallahi and A. Benbouha

Department of Orthopaedic Surgery and Traumatology, Avicenne Military Hospital, Faculty of Medicine and pharmacy, Cadi Ayyad, Marrakech 40000, Morocco.
* Corresponding Author

ORCID Details
A. Zaizi: https://orcid.org/0000-0002-2745-6919

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ABSTRACT

Two-stage surgical reconstruction of the digit flexor tendons by the Hunter technique is the basis for treatment in case of neglected tears or if a primary repair has failed due to re-rupture. We report a retrospective series of reconstruction of delayed flexor digitorum profundus tendon rupture of the long fingers between 2023 and 2026, in 8 patients, mean age 33 years old with a mean follow-up of 24 months. As a results, the total active range of motion (TAM) of the rays was 110◦ with a mean range of motion of the PIP and DIP of 70◦ and 38◦ respectively. Seventy five percent 75% of patients had a good and moderate results based on the Strickland classification with mean TAM 125◦ and mean QuickDASH score 22.6 however 25% of patients had a poor result with mean TAM 77◦ and mean QuickDASH score 43.4. Reconstruction of delayed hand digit flexor tendons injury presents unique clinical and research challenges. A simplified procedure such as Hunter technique combined to adapted physical therapy, could provide better results and reduce socioeconomic cost.

Keywords: Flexor, Hand, Hunter, Pully, Zone II.

1 INTRODUCTION

Hand tendon reconstruction is a great challenge because of the need to reestablish not only tendon continuity, but also gliding environments and surrounding structures with restoration of prehension. It results in variable functional outcomes with considerable socioeconomic and psychological consequences.

Two-stage surgical reconstructive techniques of the flexor tendons by the Hunter procedure are the treatment of choice followed by continuance postoperative physical therapy to had a perfect final outcome. In this article we outlined an approach to the difficulty of fingers tendon reconstruction.

2 MATERIALS AND METHODS

retrospective study was performed between 2023 and 2026, in 8 patients, mean age 33 years old with a mean follow-up of 24 months.

Inclusion criteria were two-stage reconstruction of zone 2 of the FDP, after neglected section of the two-flexor tendons. Patients with isolated tear in one of the two flexors and associated injuries to the thumb were excluded. Eight patients, 7 men and 1 woman mean age 28 years old (24–50) were reviewed with a mean follow-up of 34 months (12–120). The mean delay between the initial injury and the first stage of the operation was 3 months (20 days– 6 months) and 9 weeks (8–12 weeks) between the two operations. All the cases were neglected injuries that were managed late, with collapse of the fibro-osseous canal.

All patients had only single-digit involvement. The index finger was involved in 2 patients, the long finger in 2, the ring finger 3, and the little finger in 1 case. Injuries involved the right dominant hand in 5 patients, the left nondominant hand in 3 patients. Pulley reconstruction was performed during stage 1 in 5 patients; 4 had single pulley reconstruction; and 1 had two pulleys reconstructed.

At the first operation of the Hunter technique, surgical approach follows a zig zag incision that extends along the finger and into the palm a Silicone Foley Catheter (size 16-18 Fr) is passed through the pulley system and sutured distally to the distal profundus stump. The proximal end is left free in the palm at the level of the lumbrical origin. Pulley reconstruction was realized in this stage essentially the A2 and A4 pulleys and the digit was immobilized for 1 week; then passive range of motion exercises are started.

After 8 weeks, the second stage of the tendon graft was performed using a palmaris longus tendon in all cases (Figure 1).



Figure 1: Palmaris tendon graft.

The palm is opened, and the tendon graft was anchored to the proximal end of the catheter proximally and pulled into the new tendon bed. Distally, bony fixation to the distal phalanx was achieved using the ‘‘button-on-the-nail’’ technique with an absorbable suture (Polydioxone 3-0) (Figure 2).



Figure 2: ‘‘Button-on-the-nail’’ reinsertion of palmaris tendon graft.

Proximally, a Pulvertaft weave was used to unite the tendon graft to the musculotendinous unit in the distal forearm. Correct tension was achieved by observation of the IP joints during the wrist tenodesis effect of passive flexion and extension of the wrist. This procedure was followed by intensive physiotherapy according to the Kleinert regime.

3 DISCUSSIONS

The hand and upper limb are easily at risk of injury in the setting of aggression, industry and domestic incidents. In delayed or neglected cases of flexor tendon injury, reconstruction of flexor digitorum profundus (FDP) is usually performed using free tendon graft due to the retraction of tendon ends and shortening of the tendon. Flexor digitorum superficialis (FDS), palmaris longus or plantaris tendons can be used as a free tendon graft. [1–2].

This reconstruction poses both a technical challenge to the surgeon and a rehabilitative challenge to the patient and therapist. In proposing a severity grading system for evaluating outcome following staged flexor tendon reconstruction, Staged reconstruction using a tendon graft respects Bunnell's principle by placing tenorrhaphy sites outside of zone II, where tendon adhesions are most likely to occur.3 Beyond the second stage, a tenolysis may be required if active digital motion lags behind passive to such a degree that function is impaired. Salvage treatments, such as arthrodesis or amputation, remain reasonable options for patients who are unwilling or unable to commit to such treatment programs and their associated rehabilitation regimens. As pioneered by Hunter and Salisbury, classic staged flexor reconstruction involves the use of an extrinsic free donor tendon graft placed at the second stage following a first-stage implantation of a flexible silicone gliding implant. Potential sources for the donor intercalary graft include palmaris longus, plantaris, extensor digiti minimi, extensor indicis proprius, or the extensor digitorum longus to the second toe. Many authors have reported reliable and satisfactory results with this technique. [3–4].

Secondary reconstruction by tendon graft whether staged or not is usually needed if more than three weeks passed after injury due to the retraction of tendon ends and shortening of the tendon [5].

Staged tendon reconstruction is usually indicated in case of previously failed repair, if the pulleys are scarred or needs reconstruction, if the fingers joints are stiff or in the presence of bad skin or soft tissue. These appropriate criteria are outlined by Boyes in grade 1. Often these conditions are not satisfied as in Boyes grade 2–5; therefore, those patients are generally better candidates for two-stage reconstruction. [6]

This technique, which was described by Bassett and Carroll in 1963 more than fifty years ago, was then developed by Hunter who presented the first series in the literature in 1965 and 1971. Later, Paneva-Holevich proposed a variation to the procedure using an intrasynovial graft with suturing of the flexor digitalis superficialis to the flexor digitalis profundus during the first operation. Hunter technique is still the gold standard for the reconstruction and to restore function to the flexor tendons. [7-8]

The most significant challenge in flexor tendon reconstruction is the absence of sufficient donor tendon materials for grafting and flexor tendon adhesions following surgery. Although palmaris, plantaris longus, and toe extensor tendon autografts are commonly used, the tissue required often far exceeds availability in the most complex and devastating injuries. Adhesions, are by far the most common complication following reconstruction. Research has demonstrated that intrasynovial tendons display intratendinous neovascularization rather than the peripheral vascularity seen with extrasynovial tendons, which explains the better functionality in intrasynovial grafts. This suggests that intrasynovial tendons undergo intrinsic healing, whereas extrasynovial tendons are dependent on peripheral neovascularization, which promotes adhesions. However, in clinical practice there is a donor site morbidity and a lack of accessible donor intrasynovial tendons. Cadaveric intrasynovial tendons allograft may be a rare alternative option. Peacock proposed a method in 1971 to harvest the finger flexor tendons and fibro-osseous sheath as a composite graft from a human cadaver and perform the reconstruction in a single surgery. However, this technique faces the same drawbacks as any allogeneic transplant, such as potential for disease transmission and need for immunosuppression though to a lesser extent than other tissue types due to the sparse cellularity of tendons. However, Tang and colleagues have shown promising results with tendon allografts that were sterilized and preserved by deep-freezing without decellularization. A pilot study in 22 patients displayed that this technique resulted in functional outcomes comparable to autografting and did not produce an immunogenic reaction. [9–10].

Successful tendon reconstruction, and functional outcomes depend on the patient factors such as age, function, medications, psychology, expectations, and compliance to the postoperative rehabilitation. In a patient unable or unwilling to endure this reconstruction process, arthrodesis or amputation may be better alternatives.

4 CONCLUSION

In the setting of flexor tendon injury, if favorable conditions for reconstruction in a single stage are not present, a staged reconstruction may be considered therefore, the Hunter procedure is the reference in such condition, poor functional results are related to infection and associated extensor apparatus damage, which should orient the surgeon towards a simplified technique.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in this case studies.

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