Case Report:
Two-Stage Flexor Tendon Reconstruction Using Nasogastric Feeding Tube

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Abstract

Background: Cost-saving and finding safe and affordable alternatives to the established instruments and materials is a crucial task, especially in under-developed countries.

Case Report: We present a case where we used a nasogastric feeding tube as a cheap, easily obtainable and effective alternative for the much more expensive Hunter rods in a two-stage flexor tendon reconstruction. After the completion of the reconstruction and physiotherapy the patient had an excellent range of motion with no complications.

Conclusions: The use of a nasogastric tube for flexor tendon reconstruction is a cheap and effective alternative instead of Hunter rods in hand surgery. Surgeons should be trained on the diagnosis of flexor tendon injury and their early surgical management.

Key Words: Hunter silicon rods – Flexor tendon injury.

Introduction

RECONSTRUCTION of delayed zone II flexor tendon injuries is one of the most challenging procedures in hand surgery. Using Hunter rod in the first stage has been the gold standard, but it is very expensive and not readily available in some centers [1,2].

Using silicon rods in the first stage of tendon reconstruction was first described by Hunter and Salisbury in 1971 [3]. The reason for using Hunter’s rod is to obtain a suitable pseudo-sheath allowing for flexor tendon grafting [4]. Since then it became standard to use Hunter silicone rods for staged flexor tendon reconstruction. It does help providing a smooth sheath that permits placement of tendon grafts [5].

There is no argument about the safety and the efficacy of this technique. However, the cost and the availability of Hunter rods may constitute a barrier for its usage, especially in remote areas and poor countries [4].

Therefore, in this case report we describe effectively using a nasogastric feeding tube as a cheap and widely available alternative for the Hunter rods in cases of two stage tendon reconstruction.

Case Report

On January 15th, 2014, a right hand dominant, 10-year old boy presented to the Surgery Clinic at Aseer Central Hospital, Abha, Saudi Arabia complaining of inability to flex his right long finger following a glass injury 4 years earlier. He was previously seen at a local secondary health care hospital, where surgeons just sutured the skin laceration and nothing more was done for him afterwards.

On examination, there was a scar at the volar aspect of the long finger at the level of A2 pulley. There was no active flexion at the distal and proximal phalangeal joints of the long. His passive range of motion was also impaired. Both digital nerves were intact. Diagnosis of neglected flexor tendon injury was made and physiotherapy was started immediately to restore his passive range of motion.

After 8 weeks of physiotherapy we did the first stage of the flexor tendon reconstruction. Under general anesthesia and tourniquet control, a Bruner incision was made after exploration of both tendons.
which were cut completely. The remnant flexor digitorum superficialis was excised of Flexor Digitorum Profundus (FDP) which was also excised leaving about 1 cm stump attached to the distal phalanx to be used for later reconstruction.

Since Hunter rods were not available we have inserted instead infant size nasogastric tube and secured the tube to FDP stump with 2-figure of eight sutures using 3-0 ethibond and left the proximal end of the tube free in the palm.

Postoperatively, the patient was kept in a dorsal splint with wrist in neutral position and Metacarpophalangeal (MCP) joint flexed 70º and the fingers extended. The hand was kept in the splint for 21 days. Passive range of motion was started 5 days post-operatively and was continued until the second stage without any splint.

After 6 months, we did the second stage of the reconstruction. Two incisions were made, one at the level of the distal interphalangeal joint and another one proximal in the palm and a smooth gliding of the tube was confirmed. Patient's plamaris longus was absent. So, we have harvested half of the flexor carpi radialis as a tendon graft using multiple stab incisions in the forearm.

The graft was sutured to the implant (nasogastric feeding tube) and was passed from proximal to distal with no difficulties. The graft was then secured distally to the FDP remaining stump and to the distal phalanx using pull out suture technique.

Proximally, the graft was sutured to the proximal FDP stump using Pulvertaft weaving technique, with 3-0 ethibond suture. The tension was mildly overcorrected.

Post-operatively, the patient was put on a splint with wrist in 30º flexion and the MCP joint in 70º flexion and extended fingers. Protected passive range of motion started on day 5 post-operatively two weeks after place and hold flexion exercises added to the therapy program. Resistance was added to the exercise regimen at 4 to 6 weeks post-operatively.

The patients' last follow-up was one year post-operatively with full active flexion of both distal and proximal interphalangeal joints with nail to palm distance of zero Figs. (1,2).

![Fig. (1): One year post-operatively showing full extension.](image1)

![Fig. (2): One year post-operatively showing full flexion.](image2)

**Discussion**

Our case of a neglected flexor tendon injury was operated upon four years after injury. The boy's injury was neglected although he was seen early after injury by surgeons at a secondary care hospital. However, the surgeons missed the diagnosis of flexor tendon injury and their surgical management for the case was limited to suturing his skin laceration.

Early primary repair of flexor tendon injuries (i.e., within days) often gives the best result. However, this may not always be possible for different reasons. Sometimes the injury is simply missed initially (as in our case), the primary repair failed for any reason, the general condition of the hand or the patient was not suitable for immediate or early repair [6,7].

In addition to the above-mentioned obstacles for early primary repair of flexor tendon injuries, the current case report adds an additional obstacle for delayed repair, i.e., the unavailability of some necessary tools (e.g., Hunter rods).

To the best of our knowledge, this is the first report of using an infant size nasogastric tube as a substitute for the Hunter rods. The used nasogastric tube is available in all centers, cheap and does not provoke foreign body reactions.
A two-stage tendon reconstruction, 6 months apart has been performed to restore the function of the hand of our case.

Ahed et al., [8] noted that, if primary repair was not done or was unsuccessful, the flexor tendons will retract to the palm or to the wrist and the flexor tendon sheath will collapse making a delayed direct repair nearly impossible. Therefore, to restore the function of the hand, it has been advocated by most hand surgeons to perform a two-stage tendon reconstruction. First a smooth tunnel that permits free gliding path for the graft must be created to simulate the collapsed flexor tendon sheath [7].

Bassett and Carroll [9] created a “pseudo-sheath” using silicon rods was initially attempted by. Afterwards, Hunter and Salisbury [3] in 1971 described a successful clinical usage of silicon rods usage in flexor tendon reconstruction. Since then, it simply became known as “Hunter rods”. This Pseudo-sheath that forms around the silicon sheath has mesothelium cells lining that allows free gliding of the tendon graft when inserted later.

Elliot [2] stated that the second stage of flexor tendon reconstruction usually takes place 3 to 6 months after the first stage. In the second stage, the silicon rod is removed and replaced by an autologous tendon graft.

There have been multiple options for the tendon grafts. Palmaris longus (when present) is the most commonly used tendon graft. Other options include flexor carpi radialis, plantaris longus and toe extensors [10].

In our case, the described alternative technique of using a nasogastric feeding tube in the first stage instead of using the conventional hunter rods proved to be effective, safe and affordable. One year post-operatively our patient regained full active flexion of both distal and proximal interphalangeal joints with nail to palm distance of zero.

Several studies reported comparable clinical results and proper pseudo-sheaths for tendon grafting. Kuran et al., [11] and Atik et al., [4] reported using a silicon urinary catheter, which is fifty times less costly than Hunter’s rod, in staged tendon reconstruction.

Functional results after delayed two-stage tendon reconstruction are variable. A large series of cases by specialized centers reported excellent range of motion in about 80% of patients [1]. Nevertheless, delayed reconstruction cases tend to have worse results compared with early primary repair [2,6,7].

In conclusion, the use of a nasogastric tube instead of Hunter rods for flexor tendon reconstruction is a cheap, easily obtainable and effective alternative in hand surgery. Surgeons should be trained on the diagnosis of flexor tendon injury and their early surgical management.

References

ترميم الوتر القابض على مرحلتين
باستخدام أنبوب تغذية أنفي معوى

الغرض: إن خفض التكاليف ومحاولة إيجاد بدائل أمنة وفعالة للأدوية المرتفعة الثمن، وغير المتوفرة بعد من أهم الأدوار التي يجب عليها.

الطبيب أن يقوم بها لخذه مرضى.

عرض الحالة: أصيب مريض بقطع قديم في الوتر القابض في اليد، وقد استخدمت أنبوب تغذية أنفي معوى لإجراء المرحلة الأولى من ترميم الوتر كبديل رخيص لما يعرف ب"عصيان هونتر السيليكونية" باهظة الثمن. بعد إنتهاء المرحلة الثانية من العلاج وكذلك العلاج الطبيعي.

تمكن المريض من استعادة حركة الأصابع بشكل كامل.

الاستنتاجات: إن استخدام أنبوب تغذية أنفي معوى بدلا من عصيان هونتر السيليكونية لترميم الوتر القابض باليد هو بديل رخيص وفعال.

ويلز تدريب الجراحين على تشخيص حالات قطع الوتر، والبدء في علاجها في حدوثها.