The Effectiveness of the Saint John Rehabilitation Protocol Following Zone II Flexor Tendon Repair

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BACKGROUND

Zone II Flexor Tendon Injuries

Flexor tendon injuries are rare and are one of the most difficult orthopedic conditions to manage.[3] Flexor tendons are divided into 5 zones which identify different regions of the tendons. Zone II is the region from the proximal aspect of the A1 pulley to the insertion of the flexor digitorum superficialis muscle.[3] This area is referred to as “no man’s land” because there is increased risk for poor outcomes in this region due to higher risk of adhesion formation and rupture at repair site.[3]

Flexor Tendon Rehabilitation Protocols

Rehabilitation protocols following flexor tendon repairs in zone II incorporate various proportions of active and passive motion in order to increase tendon excursion.[3] Common protocols for flexor tendon rehabilitation include Kleinert and modified Duran protocols. The Kleinert protocol incorporates passive flexion and active extension with the use of rubber bands attached to the patient’s fingers.[3] The modified Duran protocol involves full passive flexion and active extension of the fingers within the constraints of a dorsal block splint (DBS).[3] There are other protocols as well. With methods of tendon repair becoming more advanced, improvements are being seen in the quality and strength of tendon repairs in the hand.[6] Studies have begun investigating the benefits of flexor tendon rehabilitation protocols incorporating early active flexion with hopes to increase tendon glide and excursion, but there is limited high level evidence available to support it.[6]

The Saint John Protocol

The Saint John protocol is a rehabilitation protocol for zone II flexor tendon repair.[2] From 4 days to 2 weeks after surgery, patients “warm up” their finger with passive flexion and active extension within their DBS.[2] Then the patient completes true active flexion up to one half of a fist initiating movement at the distal interphalangeal joints.[2] While most protocols require use of a forearm-based DBS for about 6 weeks, the Saint John protocol requires the splint to be shortened into a hand-based Manchester short splint allowing 45 degrees of active wrist extension at 2 weeks after the repair. [2] At this time in the protocol, the patient’s goal is to work up to active half to full fist with wrist extended at 45 degrees.[2] At 6 weeks after the repair, the Manchester splint is discontinued and blocking exercises are initiated. [2] There is limited evidence supporting the use of this protocol and its components.

FOCUSED QUESTION

What is the effectiveness of Saint John’s rehabilitation protocol on functional use of the hand for adult patients following zone II flexor tendon repair?

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METHODS

Methodological Process

1. A focused question including a chosen population, intervention, and outcome was created:
   - Population: Adults with zone II flexor tendon injuries
   - Intervention: Saint John rehabilitation protocol
   - Outcome: Functional use of hand
2. A thorough literature search of databases on the topic of the effectiveness of the Saint John rehabilitation protocol following zone II flexor tendon repair was conducted.
3. The literature search resulted in 5 articles of level of evidence I-III. All articles that did not fit within the inclusion criteria were excluded.
4. Findings were reported in poster format.

Data Bases Searched: Cochrane Library, CINAHL Complete, Directory of Open Access Journals (DOAJ), EBSCOhost, Medline Complete, PubMed

Keywords Used: Saint John protocol, controlled active motion, early active motion, Manchester short splint, zone II flexor tendon repair, flexor tendon rehabilitation, early passive motion

Inclusion Criteria: Outcomes-based research, evidence level I – III, articles published in a peer reviewed journal, written in English, address all three elements of research focus question (population, intervention, and outcome), articles published between 2010 and 2020

Exclusion Criteria: Evidence level IV-V, dissertations or theses, published before year 2010, not written in English, does not address all three elements of research focus question (population, intervention, and outcome)

RESULTS

Functional Grading

70.7% of patients who completed early active controlled motion on day 4 following flexor tendon repair had “Excellent” Strickland gradings after 3 months.[8] Patients who completed flexor tendon repair rehabilitation protocols with early active flexion and extension demonstrated higher functional gradings using the Strickland criteria that those who completed early passive motion or Kleinert protocols.[1,6] At 12 weeks following surgery, patients who were fit with a Manchester short splint had more “Excellent” and “Good” grades and less “Fair” and “Poor” grades using the Strickland criteria compared to those in a DBS. [5]

Strickland’s evaluation systems [4]

Score	Original Strickland %	Adjusted Strickland %
Excellent	85-100	75-100
Good	70-84	50-74
Fair	50-69	24-49
Poor	< 50	0-24

$$\text{Strickland} = \frac{\text{(active flexion PIP + DIP) – (extension deficit PIP + DIP)}}{175°} \times 100\%$$

RESULTS cont.

Motion

Patients with zone I-II flexor tendon repairs who completed early active flexion exercises in their forearm based DBS at 3-5 days after surgery had significantly better total active motion at 4 weeks compared to patients who completed an early passive motion protocol consisting of passive mobilization and place and hold exercises during the first 3 weeks after surgery and active motion at about 22 days.[1] After 12 weeks post-surgery, there were no significant differences in total active motion between these two groups.[1] At 6 weeks, patients following zone II flexor tendon repairs who were fit with a Manchester short splint demonstrated significantly less extension deficit at the proximal interphalangeal (PIP) and distal interphalangeal (DIP) joints and a significantly larger total arc of flexion than those fitted with a forearm based DBS. [5] At 12 weeks, patients fit with a Manchester short splint demonstrated significantly reduced PIP joint extension deficit compared to those fit with a forearm-based DBS, but there was no significant difference between the two groups’ DIP joint extension deficits. [5]

Strength

Patients with zone I-III flexor tendon injuries who completed the Kleinert protocol with added active flexion and extension had significantly higher pinch strength at 6 months than those who completed the Kleinert protocol without active flexion. There was no significant difference between pinch strengths at 3 and 12 months after surgery.[6]

Scar Adhesion

Patients who completed an early active motion protocol involving place and hold exercises had lower adherent scar rates than those who underwent an early passive rehabilitation program. [7]

Rupture Rate

There was a lower rupture rate in the group that followed a controlled active motion protocol than those who followed an early passive motion protocol.[1] There are similar rupture rates between patients fitted with Manchester short splints and patients fitted with forearm based dorsal block splints. [5]

Summary

- Patients’ motion and strength progressed quicker after completing half a fist of active flexion and extension within their splint 3-5 days after surgery than those who completed just early passive flexion and active extension.[1,6]
- Early controlled active flexion and use of the Manchester short splint do not increase risk of tendon rupture.[1,5]
- Controlled active flexion leads to better function of the fingers than early passive flexion and active extension.[1,6,8]
- Early active motion leads to less scar adhesions in comparison to early passive motion protocols.[7]

Limitations

- Use of different surgeons
- Use of different surgical techniques
- Strict compliance with rehabilitation protocols at home was not guaranteed
- Injuries took place in a mixture of different flexor tendon zones
- Not all patients were present at time of follow up visits

BOTTOM LINE FOR OT

Occupational therapists in hand therapy settings treat patients following zone II flexor tendon repairs. Occupational therapists work to help patients regain functional use of their hands following injury as quickly and safely as possible. The Saint John rehabilitation protocol incorporates active flexion and extension to a half a full fist starting at 4 days post surgery and use of the Manchester short splint at 2 weeks post surgery. Literature supports that these two components of this protocol lead to quicker return of motion and strength along with high functional grades. A concern of occupational therapists following flexor tendon injury is the risk of the repair rupturing. Literature supports that there is no increased risk of tendon rupture with completion of active flexion and extension to half fist and use of the Manchester short splint which supports the use of the Saint John protocol. Literature supports that the Saint John rehabilitation protocol is safe and may potentially allow patients to regain functional use of their hand at a quicker rate than other more commonly used flexor tendon rehabilitation protocols. This allows patients to return to completing functional and leisure tasks at a quicker rate.

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