The Use of CMMS (Casting Motion to Mobilise Stiffness) to Regain Digital Flexion Following Dupuytren's Fasciectomy

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Abstract

A principle priority of hand therapy following Dupuytren's Fasciectomy is to regain and maintain extension of the Proximal Interphalangeal Joint (PIPj). Historically this has been achieved through the application of mechanical stress to the affected digit with splinting and exercise. However, loss of a normal pattern of digital flexion in both the operated and non-operated digits is a common complication of this procedure. This case series report demonstrates the effectiveness of using the Casting Motion to Mobilise Stiffness Technique (CMMS) to manage post-operative Dupuytren's Fasciectomy complications when traditional treatment has failed. Four patients who underwent a Dupuytren's Fasciectomy and presented with generalised stiffness and swelling of the operated hand were treated with traditional therapy, which was ineffective. The CMMS technique was therefore applied. The type of casts that were applied, the duration of casting, duration of sessions and cast exercises are described. The outcomes indicate that all patients regained normal digital flexion. The use of the CMMS technique is beneficial as it provides a means to regain digital flexion without the loss of PIPj extension and is successful even when traditional therapy has failed.

Summary

The surgical management of Dupuytren's disease can be considered to be effective if there is a satisfactory correction of joint contracture(s) as well as the ability to regain full digital flexion of the joints. To a certain degree, a loss of extension following surgery is inevitable. However loss of digital flexion is reported to occur in 40% of patients who have undergone surgery (1) and

can be more disabling than their original deformity. There is limited evidence in the literature to suggest that post-operative splinting and therapy regimes are effective (2). Overly aggressive therapeutic regimes that are enforced by therapists could contribute to poorer immediate results and to the extension of the disease (3). The question that therefore arises is- what role does splinting have in the post-operative management of Dupuytren's Fasciectomy?

Introduction

Current literature does not provide an accepted protocol that describes the most effective post-operative management of Dupuytren's Disease (2, 4). Concern has been raised with regards to the use of mechanical stress in the form of splinting and exercise. Mechanical force can increase flare-up and possibly advance the disease process (3). The aim of hand therapy is to provide a post-operative regime that maintains extension of the operated digit and regains digital flexion in a manner which prioritises wound healing over joint motion in the early stages of treatment. There are no reported studies that offer an alternative to the use of traditional therapy in the treatment of complications that arise following a Dupuytren's Fasciectomy. This case series report describes the benefits of applying the Casting Motion to Mobilise Stiffness Technique when traditional therapy has failed to adequately reduce post-operative joint stiffness following Dupuytren's Fasciectomy.

Materials

Table 1 refers to the patient profile, medical, surgical and therapeutic history. Each patient underwent a Dupuytren's Fasciectomy using the open palm technique with standard wound closure, with the exception of Patient B who had a split skin graft (SSG) over the 4th metacarpal and a flap over the

Table 1: Patient Profile, Medical, Surgical and Therapeutic History

Patient	Age	Sex	History of Dupuytren's Disease (Years)	Risk Factors	Operated digit (s)	Traditional Therapy (Weeks)	No of Session	CMMS (Weeks)	No of session
A	78	Male	5	None	Left RF	4	14	5	7
B	62	Male	8	Type II Diabetic Smoker Alcohol	Left RF	11	18	18	9
C	57	Male	10	Type I Diabetic High B.P.	Right RF, LF	18	15	6	4
D	63	Female	5	None	Right RF, LF	5	13	15	8
Mean	**65**		**7**			**9.5**	**15**	**11**	**7**
Ratio		**3:1**							

proximal phalanx to attain wound closure. Patient B developed an infection post operatively. Patient B and C both had delayed wound healing of 10 and 32 weeks respectively. All patients presented with post-operative complications of oedema, multiple joint stiffness, adherent scar tissue and a dominant intrinsic pattern of motion, which was initially, managed using the traditional approach of resting (splinting), icing, compression and elevation along with active and passive mobilisation of the joints. The CMMS technique was applied with patient consent following the failure of traditional therapy. This technique involves the use of a plaster of Paris cast, which selectively immobilises proximal joints in an ideal position whilst constraining distal joints in order to direct the desired joint motion over a long period of time (5). The cast prevents the application of excessive mechanical stress to the diseased tissue and allows for an appropriate stress to be applied through active motion only (see Figure 1). A reduction in collagen cross linking is therefore facilitated, which enables an elastic tissue response (5). Oedema is reduced by the cast as the combined skin motion and tissue compression that is created by digital flexion provides physical stimulation of the superficial lymphatics. Scar healing is also enhanced as the cast provides pressure and warmth to the scar, which reduces scar adherence and results in a lubricated scar that is tolerant to frictional forces (5).

Methods

On average patients received 9,5 weeks of traditional therapy before the CMMS technique was applied. Patients B and C received an extended period of traditional therapy as a result of delayed wound healing and patient B's

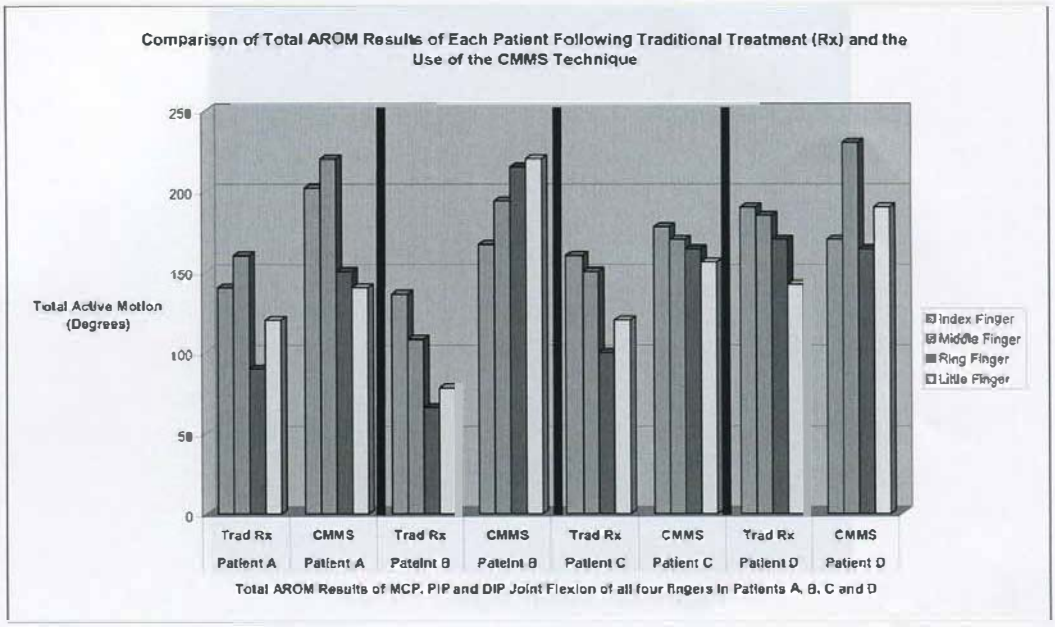
Figure 1: Cast Design to block MP Joints in extension while allowing active IPj flexion to elongate the intrinsic muscles

wound infection. Active range of motion was measured at each joint in the affected hand using a Goniometer and recorded before, during and after cast application. The Total Active Motion (TAM) values were then calculated. In addition, the pattern of active digital flexion was observed. Objective means of quantifying the changes in pattern of movement or changes in soft tissue do not currently exist. Direct palpation is the only means of demonstrating the quality of soft tissue change (5). However, digital photography and video recording can be used to assure observations are accurately recorded.

The presence of Dupuytren's Disease restricts full Metacarpophalangeal joint (MPj) extension for prolonged periods of time resulting in the development of adaptive intrinsic muscle tightness. When the MPj is released surgically and extension is regained, the patient continues to have difficulty initiating digital flexion with Flexor Digitorum Profundus due to the intrinsic muscle tightness. This leads to an abnormal pattern of movement whereby the MP joints initiate flexion. Therefore an appropriate cast design that blocks the MP joints in extension yet allows active PIPj flexion to elongate the intrinsic muscles is required. Patients were instructed to mobilise actively within the cast with regular rest periods. The duration of time spent in a cast depends on two factors, firstly the length of time it takes for the new 'normal' movement pattern to be re-patterned within the motor cortex and secondly the amount of time it takes for the tight intrinsic muscles to reach their maximum length (5). Patients had to demonstrate the desired motion within the cast for approximately 2 weeks and spontaneously demonstrate a normal tenodesis pattern out of the cast prior to the cast being removed. Slow weaning of the patient out of a cast is imperative as this prevents the recurrence of dominate MPj flexion pattern and joint stiffness.

Results

Graph I demonstrates the improvements made in the overall AROM values of the MCP, PIP and DIP joints of all four fingers in each patient when the traditional treatment had failed and after the CMMS technique was applied. All patients regained digital flexion with a normal pattern of motion without compromising improvements made in PIPj extension. In addition, the scar condition improved significantly in each patient, which appears to be a due to the constant pressure and warmth that the cast provided (Figures II a and b). Figures III and IV provide an example of improvements made in digital flexion through the use of the CMMS technique in Patient B. All patients were highly satisfied with the outcome of their intervention, as their hand function had been restored. On average patients attended 7 CMMS sessions over an average period of 11 weeks compared to an average of 15 traditional therapy sessions over 9,5 weeks. The advantage of the CMMS technique is that patients do not have to endure painful and extensive home exercises programs and require fewer hand therapy sessions than those receiving traditional hand therapy (Table I).



Graph I

Figure II a Initial Scar Condition

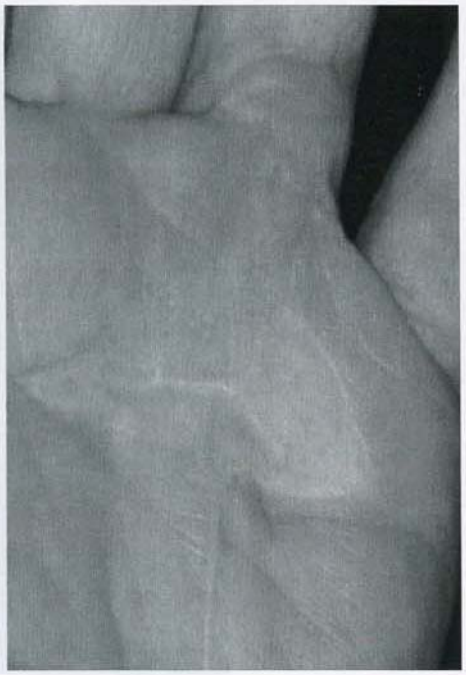


Figure II b Final Scar

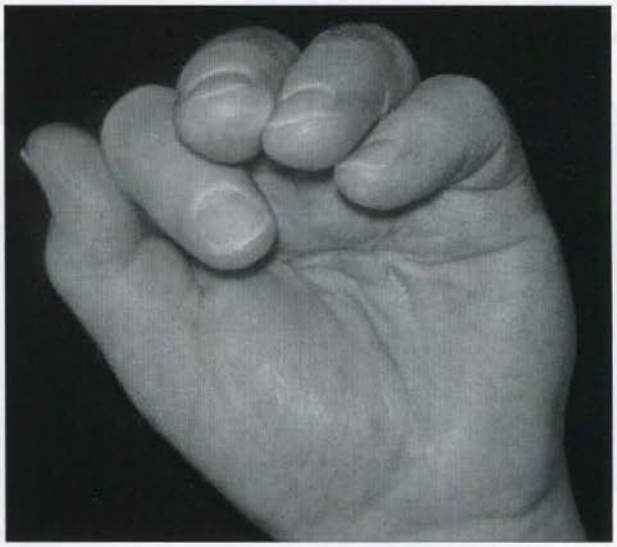


Figure III: Initial Digital Flexion

Conclusion

This paper demonstrates the effectiveness of the CMMS technique in the presence of unresolved post-operative complications following Dupuytren's

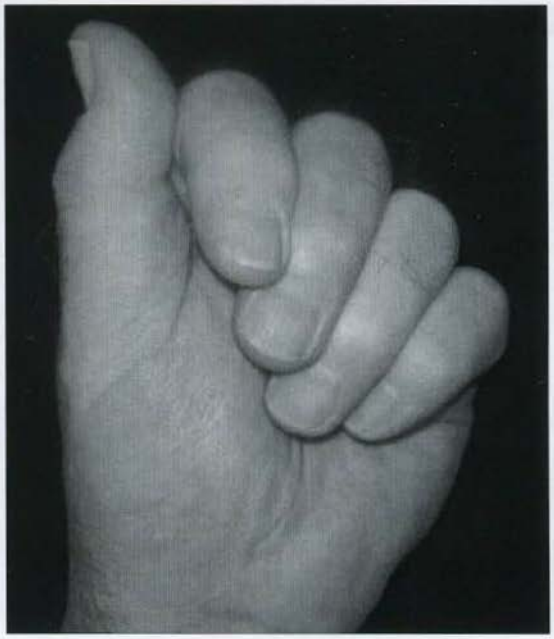


Figure IV: Final Digital Flexion

Fasciectomy, without the need to apply a mechanical force in the form of splinting and without the risk of losing PIPj extension. It is suggested that the CMMS technique be applied earlier as it promotes the release of joint tightness and scar tissue adherence so that joint motion can be restored. Delayed wound healing should not prevent the application of a cast, but caution is warranted in the presence of a wound infection.

Key: RF: Ring Finger, LF: Little Finger, B.P: Blood Pressure

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