

**A study to determine the Practices, Attitudes and Experiences of Public Sector
Physiotherapists and Occupational Therapists in the post operative
rehabilitation of flexor tendons of the hand**

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE;
MASTERS IN HAND REHABILITATION

Nomzamo Mncube (9701290)

Supervisor: Prof.T Puckree

DECLARATION

I, Nomzamo Mncube, hereby declare

that the work on which this thesis is based on is my original work (except where acknowledgements indicate otherwise), and that neither the whole work, nor any part of it has been, is being, or to be submitted for another degree in this or any other University.

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SIGNATURE

05 March 2013

ABSTRACT

The management of flexor tendon injuries in the hand is complex and requires skill not only on the part of the surgeon but also the rehabilitation therapists and compliance on the part of the patient. Anecdotally it is clear that therapists (occupational therapists and physiotherapists) gain their skills and knowledge as practitioners through hands-on experience, since very little specialized training is available in the field of hand therapy. Therapists should equip themselves with the knowledge of the surgical management of the patient, since post-operative rehabilitation depends on it. Ideally the hand surgeons should advise the therapists or dictate the post-operative management based on the surgical technique performed. The actual practices, attitudes and experiences of South African therapists in the management of flexor tendons are not known.

The purpose of this study was to determine the practices, attitudes and experiences of the public sector physiotherapists and occupational therapists in the postoperative rehabilitation of patients post repair of flexor tendons surgery in the hand. The first part of the study consisted of a cross sectional survey which explored the postoperative rehabilitation practices, attitudes, and experiences regarding flexor tendon rehabilitation. The second part which was a focus group discussion sought in depth information on the attitudes and experiences of the therapists.

Sixty three therapists from different public hospital settings in two districts of KwaZulu-Natal completed a validated questionnaire. The therapists were accessed from

randomly selected hospitals located in two conveniently selected health districts in KwaZulu- Natal.

The findings suggest that the use of the Kleinert-type and immobilisation protocols is widely used. Overall there was no significant differences in the choice of rehabilitation protocol, but this differed by hospital setting. Therapists in the tertiary hospital preferred the Duran protocol (53.6%, $p = 0.003$). Regional hospitals utilized the immobilization protocol (74.1%, $p=0.045$) and district hospitals treated presenting postoperative symptoms mostly (20% $p=0.75$). There was no statistical ($p=0.196$) difference on the decision to initiate therapy amongst different hospital settings. Frequency of therapy visits varied, but was not statistically different ($p=0.16$) amongst different hospital settings.

More respondents (29.2%) reported typically initiating active ROM exercises on the fourth post-operative week. There was a significant difference ($p=0.002$) in the initiation of active range of movement amongst different hospital settings. Approximately 37% of the respondents discontinue protective splinting at five weeks. There was a significant difference ($p=0.004$) by hospital setting regarding when the protective splinting should be discontinued. Initiation of resistance exercises varied between four and six weeks.

Nearly half (49%) of the therapists reported that they are sometimes apprehensive about how to progress patients through rehabilitation. The focus group revealed that there is poor communication between therapists and surgeons, lack of protocol

guidance, lack of knowledge of the flexor tendon protocols of the newly qualified therapists and doctors.

During the focus group discussion therapist's attitudes and experiences were revealed through the eight themes that emerged namely challenges experienced during flexor tendon (FT) rehabilitation, the patient's socio-economic background, patient's home environment, compliance with flexor tendon rehabilitation protocol, multidisciplinary team approach, clinical experience, university undergraduate curriculum on flexor tendon rehabilitation, outcomes of flexor tendon postoperative rehabilitation.

Conclusion

The rehabilitation protocols that are commonly used include the Kleinert -type and the immobilisation protocols. Duran type protocol was used less frequently, only when it was the best option for that particular patient according to the surgeon or the surgical management of that patient. The focus group discussion revealed that rural hospital therapists modify the protocols, due to lack of resources and the poor compliance of the patients.

Key words: Flexor tendon rehabilitation, hand flexor tendons, flexor tendon rehabilitation practices, flexor tendon experiences, hospital settings

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6. LIST OF ABBREVIATIONS OR GLOSSARY

Abbreviation	Meaning
FT	Flexor tendon
PIPJ	Proximal interphalangeal joint
MCPJ	Metacarpophalangeal joint
DIPJ	Distal interphalangeal joint
ROM	Range of movement
Hospital setting/level	level of care of the hospital: Tertiary, Regional and District

CHAPTER 1

INTRODUCTION AND SCOPE OF THE THESIS

1.1 Introduction

Flexor tendon injuries are a common, but sometimes complex problem that can lead to significant functional disability unless dealt with appropriately (Jones, 2006). Successful outcomes are dependent not only on skillful surgical technique but also on the subsequent rehabilitation and compliance of the patient.

No conclusive evidence for the prevalence of flexor tendon injuries or the surgical management thereof is available for South Africa. The incidence of flexor tendon injuries in the UK is over 3200 per annum (Torie et al 2010). Injured flexor tendons are generally managed surgically. The specific protocols used are dependent on the surgeon, as is the post-surgical management.

Achieving normal function post repair remains a continuous challenge to hand surgeons around the world (Torie et al 2010). Dobbe et al (2002) also highlighted that flexor tendon repair in zone II of the hand is often complicated by formation of adhesions between the two flexor tendons, adhesions to the sheath enveloping these tendons, and the rupture of tendons when the injured finger is actively bent. Since the 1960s the surgical technique, the basic science and the rehabilitation of the flexor tendons post repair have been the subject of numerous scientific studies. Yet, despite the vast volume of literature and the advances made in all aspects of repair, a widely accepted definitive management protocol leading to predictable results, has yet to be established (Torie et al 2010).

Tang (2007) agrees with Torie et al (2010) highlighting the fact that considerable research and clinical effort had been expended, and the number of reports on the subject of flexor tendon repair, probably surpasses those on any other single topic in 'Surgery of the hand' during this period. While the overwhelming number of investigations reflect the complicated nature of the basic science and clinical practice regarding digital flexor tendon repairs, the volume of work also indicates that a path leading to satisfactory and predictable treatment outcome has not yet been identified (Tang, 2007).

Even though advancements in the management of flexor tendon repairs have been made in recent years, surgeons and therapists are still confronted with unacceptable functional impairments which have adverse effects on patients' activities and participation (Oltman et al 2008). This is a challenge that surgeons and therapists experience, it is a battle that is being fought through research, using different types of protocols. Groth (2005) argues that the rehabilitation of persons with repaired lacerations of their finger flexor tendons requires a precise therapeutic approach.

The management of the flexor tendons (FT) post repair is a challenge for both therapists and surgeons, with the resultant complications ranging from adhesion formation, metacarpophalangeal joint (MCPJ) and proximal interphalangeal joint (PIPJ) contractures which lead to poor hand function and frustrated therapists. Mackin et al (2002) believe that adhesion formation can be limited by increasing the excursion of the repaired tendon throughout the healing period by using different systems of protection of the suture, like the splints of Kleinert or Duran.

Mackin et al (2002) in their extensive work on physiotherapy and occupational therapy related to flexor tendon rehabilitation reported that there are three approaches to tendon management. Each postoperative tendon management protocol falls within one of the three approaches, namely, immobilization, early passive mobilization and early active mobilization. The immobilization protocol calls for a complete immobilization of the repaired tendon, generally for three to four weeks before active and passive mobilization can start.

The early passive mobilization protocol involves passively mobilizing the repaired tendon early (usually within the first week, often within 24 hours), either manually or by dynamic flexion traction. The early active mobilization protocol mobilizes the repaired tendon within a few days after the repair, through active contraction of the involved flexors, with caution and within carefully prescribed limits (Mackin et al 2002).

Braga-Silva and Kuyven (2005) state that the therapist treating a flexor tendon following primary repair can easily feel daunted, confused, and apprehensive because of the amount of presenting information, leading to a textbook or cookbook approach. This implies that there is a need for the flexor tendon rehabilitation protocols to be available for easy reference. This is confirmed by Groth (2008) who suggested that the use of established protocols such as the Modified Kleinert or Duran protocols to make clinical decisions is the most commonly reported clinical reasoning strategy. This could simplify the task of clinicians who manage flexor tendons postoperatively.

Early physiotherapy is a very important factor in the essential treatment of a patient after tendon repair. The goal of treatment is to restore an optimal range of motion of the injured finger which enables the patient to have unrestricted finger motion with optimal function to

follow optimal participation. Therapists also face the problem of having to comply with specific protocols determined by hand surgeons who wish to also achieve maximum success. In these cases, hand clinics provide a suitable alternative where inputs by all team members who manage the patient develop the optimal protocols which are individualized.

In KwaZulu-Natal, South Africa, some hospitals, especially in the rural areas, have junior therapists managing complicated postoperative flexor tendons. Some junior therapists may not understand the delicacy and the need for precision when dealing with flexor tendons. Although most referrals to hand therapists include at least an element of “evaluation and treatment” (usually abbreviated as: "eval and tx"), there is an expectation that therapists will make autonomous clinical decisions regarding optimal rehabilitation interventions (Groth, 2008).

Lilly and Messer (2006) reported that despite advances in the materials and methods used in surgical repairs and postoperative rehabilitation, or even by experienced surgeons and therapists, complications following flexor tendon injuries continue to occur. Meticulous surgical technique and early postoperative tendon mobilization in a well-supervised therapy program can minimize the frequency and severity of these complications. This is anecdotal and still needs to be empirical.

Edinburg et al (1987) suggested that there are different practices or modifications of the existing protocols in different hospital settings. The protocols that are advocated by Mackin et al (2002) can be modified according to the environment that patients come from. However, this poses a challenge to the public sector therapist in South Africa when referring patients from one hospital to another, without being aware of the flexor tendon management protocol

of the receiving hospital.

Groth (2005) conducted a survey of flexor tendon rehabilitation: practice patterns, attitudes and autonomy reported that therapists allocate 30% of their time to rehabilitation of flexor tendon disorders and have identified this area as a research priority. Clearly the need to know the current practices in different hospital settings in the public sector is crucial. Bouglas and Strickland (1993) noted that flexor tendon rehabilitation is a challenge that needs precision (Groth, 2005) and good knowledge of the different postoperative rehabilitation protocols.

Based on the above, as well as anecdotal information from practices in KwaZulu-Natal hospitals, the following with regard to the management of flexor tendon injuries is unknown:

1. The current practices of therapists in the rehabilitation of flexor tendon patients who have had flexor tendon surgery.
2. Success and failure rates of rehabilitation following flexor tendon repair.
3. The modifications that have been made to the existing protocols.
4. The compliance of patients with the flexor tendon rehabilitation program.
5. The impact of socioeconomic status on the flexor tendon rehabilitation program.
6. The experiences and challenges faced by the public sector therapist in the rehabilitation of flexor tendon injuries.

This study will try to address some of the challenges identified above through the following aims and objectives.

1.2 Aims and Objectives

The post-operative management of patients with flexor tendon injuries is very important, as it will determine their long term functional independence. According to Tidsskr (2008) the treatment of flexor tendon in the hand requires a combination of experienced surgeons and well-organized post-operative rehabilitation protocols with dedicated therapists.

The aim of this study was to determine the practices, attitudes and experiences of public sector therapists in the rehabilitation of flexor tendon postoperatively. The study objectives are:

1. To determine the practices of public sector therapists in the postoperative management of repaired flexor tendons in different hospital settings. Public sector, in the South African Health care system, refers to therapists who work in Government hospitals.
2. To determine the attitudes and knowledge of the therapists towards postoperative management of flexor tendons.
3. To determine the experiences including challenges experienced by the public sector physiotherapists (PTs) and occupational therapists (OTs) in the rehabilitation of flexor tendon injuries postoperatively.

1.3 Significance

This research is important for a number of reasons which form the major part of the aims and objectives of this study:

It will provide a baseline for more research to be conducted in the area of flexor tendon rehabilitation because there is a paucity of studies in this area. Through the focus group discussions the therapists who are treating patients with flexor tendon surgery will have a voice to air their views and provide inputs with regards to the protocols that are relevant for

the patients in the rural and urban environments. It will also reveal the different practices in different levels of hospitals.

In the public sector, patients with flexor tendon injuries are surgically managed at regional or tertiary hospitals and once stable are referred back to their base hospitals. The South African literature does not have any publications reporting on practices of the public sector physiotherapists and occupational therapists in the postoperative rehabilitation of flexor tendon injuries, in different public hospital settings.

The challenges and experiences that the therapists face during flexor tendon rehabilitation will provide guidance for the improvement of the quality of care for patients. The aims of this research are similar to what the National Department of Health (NDOH) is trying to achieve through clinical audits. A clinical audit is defined as a clinically led initiative that seeks to improve the quality and outcome of patient care through systemic review of care against explicit standards.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The reviewed literature will introduce the main issues surrounding the management and rehabilitation of repaired flexor tendons, including current practices of physiotherapists and occupational therapists (therapists) in the rehabilitation of these patients. An extensive search of available literature using SUMMON, Web of knowledge, Google Scholar, PubMed (Medline), EBSCO Host, Science Direct, PEDro and the Cochrane database was undertaken. The search strategy included the following search terms: flexor tendons, rehabilitation, occupational therapy and physiotherapy (spelling variation: e.g. physical therapy), practices, attitudes and experiences. The terms were for 'postoperative flexor tendon rehabilitation' or 'post-surgical flexor tendons rehabilitation'.

The other important aspect of investigation is the in depth understanding of the attitudes and experiences of therapists in the management of patients following repair of their flexor tendons. In effect the value of studying the aforementioned literature has provided a meaningful discussion and analysis of the practices and attitudes in a structured way, and has facilitated a critical understanding of the practices and the experiences of therapists in the rehabilitation of flexor tendon injuries.

At the end of this section it is hoped that a critical understanding of the key issues are exhibited and that there will emerge a clear focus and justification for empirical research in the field of flexor tendon rehabilitation in the public sector.

Bouglas and Strickland (1993) lament that restoring digital function after tendon injuries continues to be the greatest challenge following hand surgery. Groth (2008) concurs with Bouglas and Strickland (1993) stating that the successful rehabilitation of flexor tendon injuries is a complex process that requires numerous clinical decisions and actions by the physical and occupational therapist over a minimum of a 12 – 16 week period.

Mackin et al (2002) stated that the postoperative management of the repaired flexor tendon requires substantial preparation by hand therapists. A well prepared therapist should understand the anatomy, physiology, biomechanics, and healing process, not only of the flexor tendons but also of all the adjacent structures. Scar adhesion between adjacent structures can occur very easily after injury or surgery to the hand because so many structures lie in such a constricted space.

If subjected to excessive stress during the early phases of healing, the repaired tendon may rupture or the tendon ends may pull apart without complete rupture. Patience and experience are needed to accurately assess tendon glide (Mackin et al 2002).

Stegink (2002) noted that Edinburg et al (1987) reported results for patients who were treated by a program of protective range of motion exercises after flexor tendon surgery in zone II of the hand. The 42 participating patients were manual laborers living far from the hospital. The

surgical repairs were performed by junior surgeons. For the mobilization program, the authors used a cast rather than thermoplastic splints. The hand of the patient was placed in a dorsal plaster splint, with the wrist in 60 degrees of flexion, metacarpophalangeal joint (MCPJ) in 40 to 60 degrees of flexion, and the interphalangeal joints in a neutral position. A Steinmann pin was embedded in the cast to serve as a palmer bar for the achievement of full finger flexion when rubber band-traction was applied. They achieved good results indicated by good functional outcomes.

Stegink (2002) criticized the above study because there was no control group. However the treatment was praised by the authors in that it allowed patients to be more independent, requiring fewer hospital visits and less supervision by therapists. Braga-Silva et al (2005) also stated that in order to improve rehabilitation, several early postoperative motion regimens have been developed in the past. Long periods of immobilization following flexor tendon repair in zone II, have produced unacceptable levels of adhesions.

Lund (2000) agrees with Braga- Silva et al (2005) stating that there are several existing post-surgical protocols for the rehabilitation of flexor tendons. In order to understand the trials and tribulations associated with the rehabilitation of flexor tendons indicated above a thorough knowledge of the anatomy of flexor tendons is essential.

2.2 Anatomy of the Flexor Tendons

In the first instance, a sensible starting point will be to outline briefly the anatomy of the flexor tendons. Tendons are fibrous connective tissues designed to transmit the force of muscle contraction to bone, to effect muscle contraction (DeLee and Drez, 2003).

Mackin et al (2002) reported that the appreciation of the anatomy of flexor tendons is critical. The three main flexor tendons include: flexor digitorum profundus (FDP), flexor digitorum superficialis (FDS) and the flexor pollicis longus (FPL). Since the focus of this study is on the rehabilitation of FDP and FDS, the functional anatomy associated with these tendons will be discussed. Mackin et al (2002) explained the anatomy of flexor tendons by stating that the FDP arises from the proximal volar and medial surface of the ulnar, the interosseous membrane, and occasionally the proximal radius. Along with the FPL, the FDP forms the deep muscle layer in the flexor component of the forearm.

The flexor digitorum superficialis (FDS) originates from the volar surface of the humerus, ulnar, and radius. Mackin et al (2002) described the flexor tendon zones according to the International Federation of the Society for Surgery of the Hand (IFSSH) Committee on tendon injuries. There are described below:

- a) Zone I extends from the insertion of FDS to insertion of FDP at the base of the distal phalanx including A4, C3 and A5 pulleys. The synovial sheath ends in this zone. Overlying the synovial sheaths is the fibroosseous tunnel, with thickened portions called pulleys: annular pulleys A1, through A3 and pulleys C1 and C2.
- b) Zone II is bounded proximally by the beginning of the separate digital synovial sheath and distally by the FDS insertion. Injuries in this zone may involve lacerations or avulsions of the FDP. This zone has previously been described as a no man's land because of the poor prognosis associated with treatment of flexor tendon injuries in this zone. Mackin et al (2002) suggest that a more descriptive term may be 'some person's land' because the more experienced hand surgeons obtain satisfactory results with appropriate care.

c) Zone III lies distal to the carpal tunnel. While in zone III the synovial sheaths of FPL and of FDP and FDS to the fifth digit continue (known respectively as the radial and ulnar bursae), and the flexors to the second, third, and fourth digit merge to form the synovial sheath as they pass from beneath the flexor retinaculum. At this zone the lumbricals take their origin from the FDP tendons of the second through to the fourth digit. In zone IV, the tendons pass through the carpal tunnel. Here the tendons are surrounded by synovial sheaths that provide lubrication, nutrition, and protection from the overlying flexor retinaculum, which holds the tendons within the carpal canal. Zone V is the musculotendinous junction in the distal third of the forearm

Torie et al (2010) in their mini symposium of the hand also described the classification of flexor tendon injuries of the hand (Verdan, 1960) (figure 1) stating that there are five distinct zones of injury, which are routinely utilized by hand surgeons. The zone of injury has relevance in relation to the propensity for adhesion formation, maximally seen in zone I and IV. Zone I is distal to the insertion of superficialis, just proximal to the distal interphalangeal joint, therefore profundus is the only tendon that is affected in this zone.

Zone II is the region from the metacarpal head to the middle of the middle phalanx with the FDP and the FDS lying within one flexor tendon sheath. Zone III is the region between the transverse carpal ligament and the proximal margin of the tendon sheath. Zone IV is deep in the transverse carpal ligament, and Zone V is at the wrist proximal to the transverse carpal ligament.

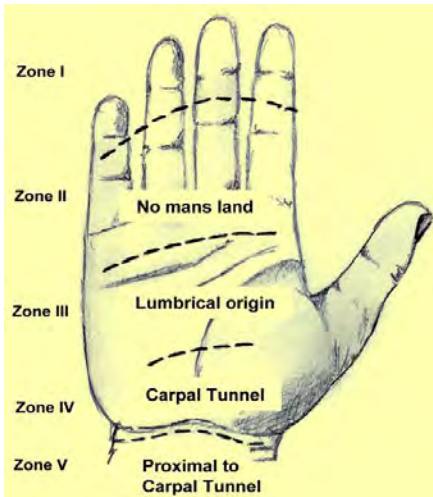


Figure 1 Verdan's Flexor zone (Torie et al 2010)

This description of the different zones of the hand by Torie et al (2010) is much simpler and less detailed than the one explained above by Mackin et al (2002) which were described according to the International Federation of Societies for surgery of the Hand (IFSSH) committee. However these descriptions are similar as both authors are in agreement about the tendons that pass in each zone as well as the location of the different zones of the hand. While this is true it should also be importantly remembered that the rate of healing is also different at the different zones.

It is imperative that the therapists who rehabilitate patients with flexor tendon injuries know all the different classifications of the zones of flexor tendon injuries. This is important because the rehabilitation and positioning of the splints with some protocols differ at different zones. The focus of this study is on zone II flexor tendon injuries of the hand. Braga-Silva and Kyven (2005) stated that it is in this Zone II that peritendinous scarring is particularly evident following tenorrhaphy.

2.3 Mobility of Flexor Tendons (Pulley System)

Mackin et al (2002) explain that the fibroosseous tunnels with thickened portions are called pulleys: annular pulleys A1 through to A3 and cruciate pulleys C1 and C3 overlie the synovial sheath in zone II. The pulleys act as restraints or guides for the tendons, preventing bowstringing of the FT tendon. A2 and A4 pulleys are the most important for achieving normal tendon function. As the tendons enter zone II, FDS overlies FDP and FDS splits to allow FDP to pass through. Two slips of the FDS merge deep to FDP and split again before inserting on the middle phalanx.

Jones (2006) reported that the flexor tendons run in a fibro-osseous canal within the digits: the metacarpal and phalanges form the dorsal wall, and the fibrous pulley system and synovial sheath form the volar and lateral wall. The sheath is divided into five thick annular pulleys (A1 to A5) and three thinner cruciate (C1 to C3) pulleys between them. Torie et al (2010) explained that the A1, A3, A5 (figure 2) originates from the palmar plates of MCP, PIP, and the DIP joints, respectively. The A2 and A4 pulleys (figure 2) are continuous with the periosteum of the proximal half of the proximal phalanx and the middle third of the middle phalanx respectively. The cruciform pulleys are located between the A2 and A3 pulleys (C1), between A3 and A4 pulleys (C2), and between A4 and A5 pulleys (C3) (figure 2). The annular pulley arrangement provides tendon constraints with an optional moment arm to maximize joint motion for a given amount of tendon excursion.

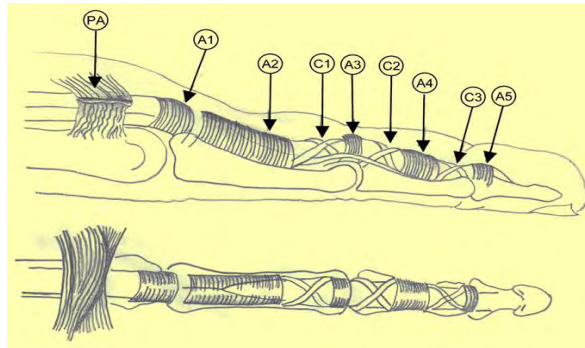


Figure 2 Picture of the arrangement of pulleys in the flexor sheath (Torie et al 2010)

The nature of the tendon healing affects the rehabilitation process and the eventual outcomes.

2.4 Tendon Healing

There are different theories of flexor tendon healing which led to the development of different post-operative protocols. Mackin et al (2002) reported two theories: The first, the extrinsic healing theory, suggests that tendon healing occurs through cells extrinsic to the tendon through a fibroblastic response from surrounding tissue. This theory presupposes the necessity of surrounding peritendinous adhesions to allow complete healing of the tendon: thus immobilization after tendon repair was encouraged.

The second theory of intrinsic healing suggests that healing is possible in the absence of cells and tissue extrinsic to the tendon. It is further reported that more recent experimental and clinical evidence to support this concept includes rounded ends of unreparable tendons, tendons healing in an absence of adhesions, and in vitro healing of tendons in an isolated, cell free environment. Controlled mobilization of repaired tendons to allow healing but prevent adhesion was the stated advantage of this theory.

2.5 Surgical Repairs

Optimal timing of the surgical repair has not been determined and with evidence being anecdotal, some has claimed that it should be done as soon as possible post injury, while others suggest surgery within 72 hours but the more recent opinion suggest a delay of 4-7 days, to allow the swelling to decrease. Torie et al (2010) continue to highlight that the outcomes are improved if an appropriately trained surgeon undertakes the procedure even if it is performed several days post injury as opposed to an inexperienced surgeon attempting repair immediately after injury.

The time frame beyond which primary repair is not recommended is equally unclear. Any delay beyond seven days is not advisable due to the potential risk of tendon ends becoming rounded and possibly adherent. The sheath may also collapse and fibrosis as well as myotendinous retractions, may occur, all of which make the procedure technically more demanding (Torie et al 2010).

The initial strength of the tendon repair depends on the material properties and knot security of the sutures as well as on the holding capacity of the suture grips of the tendon. Two strand repair techniques have been generally used in flexor tendon repair. The strength of the locking configuration of the modified Kessler repair (also known as Pennington modified Kessler or Penning tone repair) is strong enough to withstand the forces of passive rehabilitation, but not early active motion, clinically seen as increased rupture rates. The multi strand suture repair incorporates six suture strands across the repair site and demonstrates improved grasp resistance and ultimate force sufficient to withstand the estimated forces of early active mobilization (Viinikainen et al 2008).

2.6 Postoperative FT Practices and Therapist Experiences

It is clear that there are three types of protocols that are used by therapists and surgeons. Tang (2007) explained their own protocol (Fig 3) which was designed to actively flex the finger in a controlled manner and incorporates a number of manoeuvres based on conclusions derived from mechanical studies. Essentially, the hand was protected in a dorsal thermoplastic splint, with the wrist in slight flexion (20 to 30 degrees), the metacarpophalangeal joints (MCPJ) in slight flexion and the interphalangeal joints in extension (or normal flexion), for the first two and half (2.5) weeks (Fig 3).

Patients were not encouraged to move the finger during the first few postoperative days, because, at this time, the hand is painful, oedema is more prominent and, more importantly, adhesions do not form. The advice on correct positioning and elevation of the hand can be given to reduce oedema. Exercises were commenced at three to five days or at four or five days in most cases, after surgery. Before each episode of active digital flexion, the fingers were passively flexed ten, or more times to lessen the overall resistance of the finger joints and soft tissues-though a "warm up process" 'In this way active flexion should encounter lower resistance. The patient was then instructed to flex the fingers actively with gentle force twenty to thirty times during each morning, noon, evening and before sleep, up to the range with which the patient feels comfortable.

The range of motion is usually from full extension to one-third, or half, of the full flexion range, although this may even increase to two-thirds of the full range if this can be achieved with ease. Active flexion over the full range is not encouraged, unless it can be achieved very

easily. Patients could increase the number of motion episodes up to five or six per day. In this two and a half week period, full active extension is particularly encouraged and the fingers are passively stretched against the splint if full extension is not achieved (fig 3).



Figure 3: Illustration of the positions of splinting of the hands and postoperative exercise.

Protocol developed by Tang (2007).

As shown in the picture above (fig.3), in the first two and half week's active flexion to the mid-range with no forceful active flexion is encouraged. However the fingers should be flexed

passively over the full range. In the second two and a half weeks, the wrist is splinted in extension and MCPJ are maintained in functional position. Active and passive finger flexion is emphasized during this period. Full passive flexion is ensured and active finger flexion is encouraged, but not forced to the final flexion range. The thumb is included in the splint to prevent unintended pinch or other uses of the hand, so protecting against rupture of the repairs. This was not a requirement for cooperative patients who follow the guidelines of therapies (Tang, 2007).

Kitis (2009) reported the results after a primary repair of zone two flexor tendon injuries which were evaluated in 263 fingers in 192 patients using different early controlled mobilization programmes. There were 126 men and 66 women (age range 18 to 57 years) divided into two groups. Ninety-eight patients with 137 fingers were treated by early active mobilization with the dynamic splinting method according to a modified Kleinert regimen (Washington regimen), and 94 patients with 126 fingers were treated with a controlled passive movement regimen postoperatively. During their evaluation patients were evaluated for total active movement (TAM), grip strength, and disabilities of arm, shoulder and hand (DASH) questionnaire. All patients were reviewed 12 weeks after operation and results were assessed using the Buck-Gramcko- II system.

Their findings were excellent for the Kleinert regimen group (n=119, 87%) and were also found in the controlled passive movement group (n=94, 75%). They concluded that controlled active mobilization with dynamic splinting improves the outcome in the upper extremity, including range of movement, grip strength, and functional state of the hand in repairs of flexor tendons.

These practices were similar to the ones that were studied by Groth (2005), who conducted a survey in which 199 therapists responded, reporting on the current practices of FT rehabilitation in the United States of America (USA). She found that the Kleinert-type protocols were more popular than the Duran type protocol. The majority of therapists (83%) initiated therapy within the first week for most of their patients. Most (96%) therapists reported that therapy be scheduled between once to three times a week for nearly all of their patients (Groth, 2005).

Sueoka et al (2008) reported that early passive and active mobilization regimens are used exclusively after flexor tendon repairs. Passive postoperative approaches are used by approximately 75% of hand therapists and typically result in good-to -excellent clinical outcomes.

Groth (2005; 2008), has clarified current international practices together with attitudes and experiences of therapists in this area of health care. The practices included initiation of active range of movement (ROM) exercises, initiation and frequency of rehabilitation, initiation of resistive exercises, discontinuation of protective splints, and presence of PIPJ contractures, surgical suture, protocol.

2.6.1 Initiation of Active Range of Movement (ROM)

In the Groth (2005) study, therapists reported that active ROM exercises were typically initiated approximately three weeks postoperatively. There was also an increasingly greater use of active finger flexion exercises within the first postoperative week (33%). The top three

reasons cited for initiating active ROM demonstrated external attributions. This finding was consistent between the three key elements (initiation of active ROM, discharge of protective splint and initiation of resistance) that had a similar question. The reasons to initiate active ROM (in descending order) were established as protocol, number of postoperative days, doctors' orders, suture technique, compliance issues, and ROM measurements. The last three reasons demonstrated internal attributions.

These two attributions were identified by Groth, (2005). These included external and internal attributions. External attributions were explained as locus of control on the part of the respondents, which included; established protocols, number of days post operatively, MD (Medical Doctor) order. Internal attributions included; suture technique, compliance issues and ROM measurements. These attributions were identified as decision making tools that were used by therapist to initiate the key elements in flexor tendon rehabilitation.

Positions of custom made splints were widely utilized with little variations in positioning (wrist in 20-30 degrees of flexion, MPs in 50 -70 degrees of flexion). The use of these protective splints was discontinued at a mean of five and a half weeks post-surgery. Resistance exercises were initiated at a mean of six coma four (6.4) weeks after surgery (Groth, 2005).

Braga-Silva and Kyven (2005) evaluated the early mobilization regimen in the public hospitals in Brazil. One hundred and thirty six flexor tendon repairs were performed in zone two in 82 patients. Post operatively, patients were managed using early mobilization program, which incorporated immediate active flexion and extension (12 hours post operatively). Results were based on the International Federation of Society for Surgery of the Hand (IFSSH) and the

Strickland system of evaluation.

The functional outcomes for the thumb and long fingers were evaluated separately. The study produced good results. The outcome for the long fingers group were excellent (72%), good (26%), and fair (1.9%) according to Strickland's standards and were good (81%), fair (16.6%) and poor (1.9%) according to IFSSH standards.

Tang (2007) agrees with Braga-Silva and Kyven (2005) citing a number of studies (Amadio et al., 2005; Baktir et al., 1996; Elliot, 2002; Pettengill, 2005) which highlight that currently, early controlled active finger flexion is becoming the mainstay of motion exercise and early passive flexion by rubber band traction may be on its way to being abandoned. Their own clinic shifted from passive flexion to early controlled active finger flexion.

2.6.2 Postoperative Rehabilitation Protocols

The postoperative rehabilitation technique must be selected with care to match the needs of the patient. Not every tendon injury can be treated with a standard protocol, and often the best approach is a combination of techniques from various protocols. The therapist's expertise comes into play in the selection of therapy protocols (Mackin et al 2002).

In deciding which protocol to use, Rosenthal and Stoddard (2005) suggested that both the surgeon and a therapist need to be communicative, flexible and open minded. There is specific information regarding the patient, injury and operative treatment that the therapist needs, to make a decision. The therapist must know the mechanism of injury, date of injury and repair, details of injured structures, and technical specifics of the repair(s).

Rosenthal and Stoddard (2005) also confirmed what Mackin et al (2002) said, in that there are currently three available protocol options which include immobilization, early controlled mobilization and early active mobilization. There is still a role for postoperative immobilization, without controlled motion, until a tendon is sufficiently healed to permit active motion. This approach is appropriate for children or patients who are non-compliant.

However Rosenthal and Stoddard (2005) continued to emphasize that the early active exercise protocol is the most sophisticated and potentially risky of all protocols. It should be reserved for the ideal patient in an ideally proficient therapy setting after a strong, a traumatic and technically strong tendon repair. Tang (2007) also highlighted that ruptures of primarily repaired tendons have been noted in almost all case series incorporating early active finger mobilization.

Lund, (2000) reported that there are several existing protocols for the rehabilitation of flexor tendons. She presented three of the protocols. The first one which was introduced by Harold Kleinert uses a dorsal blocking splint combined with dynamic traction to hold the digits in flexion, within the confines of the dorsal block splint that positions the wrist and the MCPJ in flexion (45 & 40 degrees respectively), the digits are held in passive flexion by rubber band-traction, which is secured proximally at or near the wrist.

Hourly exercises consist of passive flexion and active extension of the digits to the limit of the splint. Mackin et al (2002) also reported that early passive mobilization protocols involve

passively mobilizing the repair early (usually within the first week, often within 24 hours), either manually (by therapist/patient) or by dynamic flexion traction.

The second protocol reported on by Lund (2000) was the one produced by Duran and Hauser which was based on their studies of the amount of tendon gliding needed to prevent adhesions. Their protocol involved positioning of the wrist at 20 degrees, MCPJ in comfortable flexion and PIPJ in neutral. A new modified version of the Duran splint used by many therapists, places the wrist and MCP joints in a more flexed position, approximately 40 degrees each.

Exercises included passive flexion of individual finger joints, passive flexion of joints in a composite fist and active extension of the finger joints. The surgeon may allow for place and hold exercises, in which digits are passively placed in a composite fist and the patient is told to hold the fingers in this position.

Horri et al (1992) however criticized these passive movement protocols highlighting that traditional passive movement protocols can cause buckling of the repaired tendon within the synovial sheath. Some studies (Edinburg et al., 1987; Lund, 2000) indicate that surgeons and therapists feel that this is a less complicated protocol and it permits less hospital/clinic visits. The big question that arises is whether this protocol is also less complicated for the patient? Lund (2000) reported that compliance and the ability to fully comprehend postoperative restrictions vary greatly from patient to patient and recommended the Kleirnert type protocol as the one that minimizes the risk to the healing tendon.

Dobbe et al (2002) also reported that the main advantage of this dynamic mobilization technique is that the amount of tension placed on the repair site is kept to a minimum, and that previous studies showed improved clinical results with the use of early controlled motion.

Lund (2000) reported on the third protocol that can be used with great caution which uses early active motion. Exercises should begin within the first 48 hours after surgery, the use of tenodesis type of motion (wrist extension with fingers falling into flexion, fingers then allowed to extend with wrist flexion) when doing place and hold exercises or direct active flexion of fingers.

It is not recommended that patients with significant edema use this type of protocol. This is because edema reduces the strength of the repair, by increasing the amount of resistance on the tendon, requiring forces that are too high for the repair to withstand.

2.6.3 Outcomes

Groth (2005) stated that therapists reported that they measure outcome of flexor tendon rehabilitation by utilizing methods such as ROM, grip and pinch strength and the Strickland's formula (Strickland, 2000). Total active motion (TAM) of the proximal interphalangeal joint (PIP) and the distal interphalangeal joint (DIP) is the sum of flexion at the two joints minus the extension lag in both joints. This method was regarded by Strickland as the most demanding set of criteria for evaluation of performance after flexor tendon repair (Chow, 1988). Written comments for 'other' included the key word 'function' in 28 of the 33

comments. However Oltman et al (2008) disagrees with these evaluation methods, highlighting that despite all developments regarding the change in perspective of health conditions, studies focusing on flexor tendon rehabilitation mainly describe body function and body structure, e.g. range of motion and the measurement of grip strength for the evaluation of flexor tendon repairs.

Oltman et al (2008) further state that functional outcome alone does not represent the true impact of flexor tendon injuries on patients. Even minor functional loss of hand function may have adverse effects on patients and their emotions regarding their abilities to cope with tasks of daily living. Oltman et al (2008) promote the use of ICF (International Classification of Function) which focuses on function and body structure, activities and participation, as well as factors such as environmental and personal.

Rehabilitation of flexor tendons repair remains challenging and requires experienced professionals as well as interdisciplinary approaches incorporating all health professionals concerned (Oltman et al 2008). Therefore proper evaluation of the outcomes gives a true reflexion of the impact of the flexor tendon injury and the complications that arise from such an injury even postoperatively.

2.7 Post-Operative Flexor Tendon Complications

Flexor tendon repairs in zone II of the hand are often complicated by the formation of adhesions between the two flexor tendons (FDS and FDP), adhesions to the sheath enveloping these tendons, and rupture of the injured finger when it is actively bent (Dobbe et al 2002).

Lilly and Masser (2006) agree stating that the most common complication is adhesion

formation, which limits active range of motion. Less common problems include quadriga, swan neck deformity, and lumbrical plus deformity. Prompt recognition of problems and treatment with hand therapy, splinting, and or surgery may help minimize recovery time and improve function (Lilly and Masser, 2006). Rosenthal and Stoddard (2005) explained quadriga as a syndrome that occurs as a result of the FDP tendon scarring proximally within its fibrous sheath, retraction and adherence after laceration.

Management of flexor tendon injuries is the most demanding task in hand rehabilitation. Despite substantial improvement in surgical technique and post-operative rehabilitation protocols, functional outcomes may still be somewhat unreliable. It is well known that the functional outcome of zone II tendon injuries is poor and is associated with a complication greater than that of injuries in other zones. Although excellent to good outcomes have been reported in more than 75% of adults and paediatric patients, poor functional outcome continues to frustrate hand surgeons, therapists and patients, in a significant number of cases (Momeni et al 2009).

There are four main complications (tendon adhesions, joint contractures, tendon rupture and patient compliance) that are experienced by hand surgeons and therapists treating flexor tendon hand injuries worldwide. These complications will be discussed individually below.

2.7.1 Tendon adhesions formation

Mackin et al (2002) reported that despite the use of early controlled mobilization, adhesion formation remains the most common complication after tendon surgery. Tenolysis is the treatment of choice if an appropriate period of therapy has failed (3 – 6 months).

Several strategies have been proposed to reduce adhesion formation and hence improve functional outcome. The two most important aspects of treatment seem to be atraumatic tissue handling and early rehabilitation. Atraumatic tissue handling is crucial, as adhesion formation has been found to be proportional to the degree of tissue crushing and manipulation of the tendon and sheath during repair. Early motion protocols post repair have been demonstrated not only to decrease adhesion formation through improved tendon excursion and promotion of intrinsic healing but also to improve recovery of tensile strength. Although an early motion rehabilitation program seems to be the only measure that is critically justified in the postoperative care of patients with flexor tendon injuries, the best method of mobilization remains to be identified (Momeni et al 2009).

Rosenthal and Stoddard (2005) stated that the diagnostic hallmark of restrictive adhesions is a disparity between active and passive motion. These restraints are treated with active ROM, tendon gliding and blocking exercises, resistive exercises, custom made splints, ultrasound, heat modalities, and electrical stimulation.

Resistive exercises require both resistance throughout the range and sustained end of range muscle contraction. Active and resistive flexions are the most effective means of altering adhesions and improving excursion. These cannot be implemented until the tendon is sufficiently healed. Active flexion usually begins at three to four weeks; resistance begins later at five to eight weeks.

Rosenthal and Stoddard (2005) further state that the persistent, significant difference between

active and passive motion after competent therapy of sufficient duration is one of the diagnostic hallmarks of intractable tendon adhesions that may indicate the need of surgical tenolysis.

2.7.2 Joint Contracture

Momeni et al (2009) reported that despite optimal management, functional outcome is compromised by the occurrence of joint contractures in the PIP and DIP joints in 17% of patients. Momeni et al (2009) concur with Lilly and Messer (2006) stating that multiple causes of joint contractures have been described, including tendon bowstringing as a result of pulley failure, injuries to the volar plate, flexor tendon adhesions, and skin contracture.

It was very interesting to learn that the most common cause of the development of joint contracture is postoperative protective splinting, and that surgical repair itself is rarely primarily responsible for the occurrence of joint contractures. Attention to detail when molding a splint is therefore critical in preventing significant joint contracture. PIP joint contracture was also reported fairly common to treat (Groth, 2005).

The timing of the repair is very important as reported by Mackin et al (2002) indicating that delay in repair leads to shortening of the injured tendon and also increase the risk of flexion contractures.

2.7.3 Rupture

Rupture of the repair has been reported to occur in 4% to 30% of patients. The most common cause for the rupture is the unplanned high load that exceeds the tolerance of the repaired

tendon. The other predisposing factors that lead to tendon rupture include poor surgical technique, poor patient compliance, overzealous therapy, and early termination of post-operative splinting. A decrease in the incidence of tendon rupture may be achieved by the establishment of practitioner-led hand therapy clinics (Momeni et al 2009).

Adolfsson et al (1996) reported a rupture rate of three to 15% after primary repair in zone II. Compared with the findings of Momeni et al (2006), this shows an increase in the rupture rate. Adolfsson et al (1996) also highlighted that regardless of the technique used, the intensity of the postoperative mobilization must be related to the risk of rupture and gap formation of the repair site.

The ruptures were reported by Harris et al (1999) to occur between zero and nine weeks after surgery, which was a longer period than the five weeks after repair previously reported by Elliot et al (1994). The experimental work by Pruitt et al (1996b) supports a five week splinting time however the timing of the ruptures in the study that was conducted by Harris et al (1999) shows that a real risk of rupture is still present after five weeks period.

In the Groth (2005) study over half of the therapists (56%) reported that their patients had experienced a postoperative complication of tendon rupture. However Mackin et al (2000) disagrees with this, stating that tendon rupture after primary repair is uncommon.

Harris et al (1999) tried to establish causes of flexor tendon rupture in the early postoperative period that might be avoidable by modifications to their techniques of surgery and or rehabilitation. The study was conducted over a period of seven years and six months. Five

hundred and eight patients with 840 acute complete flexor tendon injuries in 605 fingers in zone I and II underwent surgery and postoperative mobilization in a controlled motion (active flexion-active extension) regimen. Sixty eight patients with 79 finger flexor divisions who did not complete the rehabilitation program were excluded. Of the 440 patients with 728 complete tendon divisions in 526 fingers included in their study, 23 patients' ruptured 28 tendon repairs in 23 fingers, an overall rupture rate was 4%.

It was discovered that approximately half of the patients ruptured the repairs by acts of stupidity in which their hand was used, with or without the splint in place, for activities that they had been warned, would transmit a force through the repair that might rupture it. There was no significant relationship between tendon rupture and age or sex of the patient, smoking or delay between injury and tendon repair (Harris et al 1999).

A number of modes of rupture were discovered by these authors. Using the hand without a splint on, falling without the splint on, ruptured during sleep, using hand to dress, over exercised without the splint on, stretched on waking, used hand to take lid off, used hand to lift wardrobe, used hand to take off bra, picked up newspaper, climbing fence, doing exercises in splint and doing resisted the exercises without wearing the splint. It was also indicated that most ruptures occurred with the splint in place.

Mackin et al (2002) highlighted that by two weeks after the injury, the cut tendon ends will have scarred down to surrounding tissues, shortening, and must be dissected free before repair. In addition, the entire musculotendinous unit shortens and pulls the tendon proximally; this may place tension on the repair and increase the risk of gapping or rupture. Mackin et al

(2002) further states that an immobilized tendon loses strength initially, whereas early mobilization strengthens the repair. Therefore, if early mobilization is to be used, therapy should begin as soon as possible. If mobilization begins at one week after the repair, the repair will already have weakened enough to be greatly at risk for rupture or deformation. Adhesions also will have begun to form, adding to the stress placed on the weakened repair.

Tang (2007) disagrees with Mackin et al (2002) regarding the timing of the primary repair stating that he has found no clinical investigation which actually validates the textbook concept of the best time for primary repair. All estimates of the 'best time' to carry out the primary FT repair suggested so far have not been empirical. Tang (2007) further states that rupture of the repair seen within one month after the initial repair is always worth an attempt at re-repair. However after one month from the primary repair, re-repair is rarely indicated as ruptured tendons one month after the primary surgery are likely to be surrounded by adhesions and their healing potential is limited.

Dowd et al (2006) agree with Tang (2007) and quoted a statement that was made by Leddy (1982) which said rupture of the tendon repair, or detachment of the reinserted tendon, if recognized immediately, should be treated with prompt re-exploration and repair. Dowd et al (2006) further highlights that the literature (Allen et al 1987; Small et al., 1989; Elliot et al., 1994; Harris et al 1999; Moiemmen and Elliot, 2000) agrees with what was suggested by Leddy (1982).

Rosenthal and Stoddard (2005) emphasized that there is specific information regarding the patient, injury and operative treatment that the therapist needs in order to make a correct decision about which protocol to use. Figure 4 gives a clear indication of what was done

operatively. Such clarity provides guidelines to postoperative rehabilitation. Rosenthal and Stoddard (2005) continue to state that the therapist must know the details of the injured structures and the technical specifics of the repair. This includes the number and caliber of suture technique, where the suture knots were placed and the condition of retinacular structures such as fibroosseous sheath and dorsal carpal ligament (fig4).

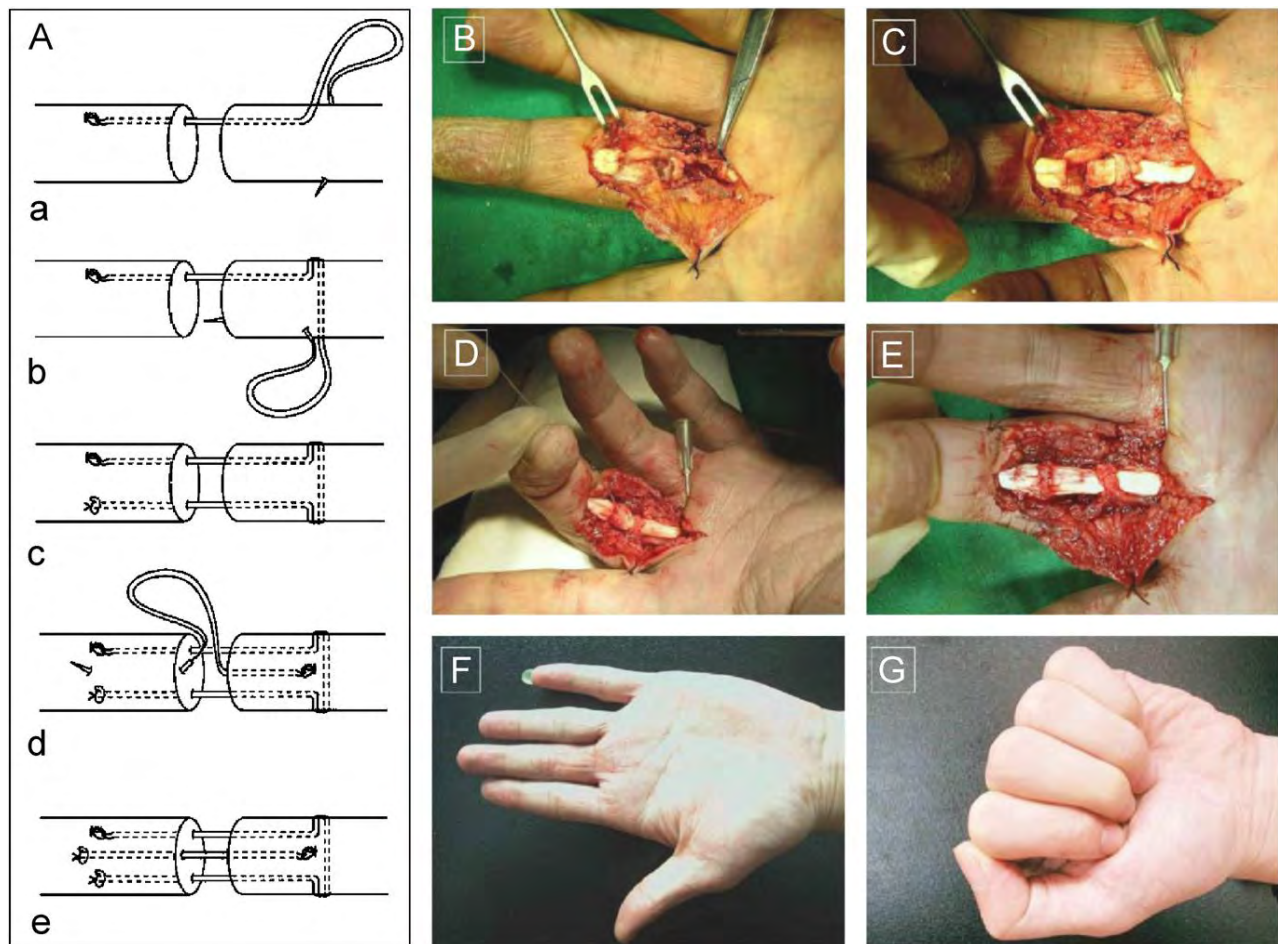


Figure 4 Tang (2007) shows their method of making a six strand repair:

As shown above (fig.4) two separated looped nylons are used to make M-shaped repair configuration within the tendon (shown in A); cross-sectional these suture strands are evenly

placed and form the points of a triangle. These graphics are just one example of many flexor tendon rehabilitation protocols to highlight the importance of knowing the surgical management as postoperative rehabilitation depends on it.

Patient compliance, the ability to comprehend the postoperative precautions, flexion joint contractures, tendon adhesions, tendon ruptures (Mackin et al 2002; Vucekovich et al 2005; Lilly et al 2006), are some of the contributions to the frustrations and negative attitudes experienced by therapists in the rehabilitation of these patients.

2.7.4 Compliance

Dobbe et al (2002) reported that the final recovery seems to depend greatly on the compliance of patients with the rehabilitation program by participating fully and following exercises as instructed. Mackin et al (2002) highlighted the impact of socioeconomic factors stating that a patient's family life, his or her economic status and other socioeconomic factors can help or hinder rehabilitation and if these factors are not taken into account in planning treatment, therapy may fail.

Thomas et al (1996) as quoted by Harris et al (1999) agrees with what Mackin et al (2002) highlighted about socioeconomic factors in that while it is tempting to postulate that smoking slows tendon repair, making rupture more likely during early mobilization. It is probable that the high rate of smoking in patients with flexor tendons ruptures reflects a similar, high rate of smoking in all patients who cut flexor tendon as this injury is commonest in the lower social class, who have a higher incidence of smoking than the population of the UK overall (Mackin et al 2002).

2.8 Hypothesis.

Ha: The hospital setting / level significantly affects the management of postoperative flexor tendons.

Ho: The hospital setting / level does not affect the management of postoperative flexor tendons.

CHAPTER 3

MATERIALS AND METHODS

3.1. Research Design

Both qualitative and quantitative approaches were used to achieve the aims and objectives of this study. A cross sectional survey and focused group discussions allowed for the collection of data from the therapists involved in hand rehabilitation. The use of both approaches were of great benefit in obtaining the in depth and qualitative responses in understanding the attitudes and experiences of the therapists.

3.2 Population and sampling

The population included all therapists that have treated patients with flexor tendon injuries in the public sector hospitals of selected districts in KwaZulu-Natal. In South Africa the majority of the therapists are generalists and there are few therapists that are hand rehabilitation specialists. The therapists employed in the public sector have to rotate through different specialties in the hospital. Since districts, hospitals and therapists had to be sampled, the process to determine the population and sampling strategy at each level is described below.

At the first level, districts were sampled, at the second level hospitals were sampled and at the third level therapists were sampled as described below:

First level: Districts

KwaZulu-Natal is one of the nine provinces in South Africa. It is divided into eleven health districts. To include both urban and rural input, two districts in KwaZulu-Natal were conveniently selected. One was eThekweni which is urban and the other district was Ugu which is rural. This assisted in obtaining a cross sectional picture of practices and experiences across hospitals and districts in the province.

Second Level: Hospitals

In both the districts saturation sampling was used to select hospitals. There are only five hospitals in the Ugu District with one regional hospital in which the flexor tendon operations are performed. One hospital was excluded from the study as it caters for patients with tuberculosis (TB). In the eThekweni district there are sixteen public sector hospitals. Seven hospitals from eThekweni district were excluded from the study. The seven non-participating hospitals in eThekweni district included a Psychiatric hospital, four that cater for tuberculosis patients and one that caters for patients with chronic diseases only. One hospital did not participate because the therapist reported that they do not see patients following flexor tendon repairs. Therapists from three hospitals in eThekweni district did not return the questionnaires.

Third level: Therapists

Saturation sampling was used to select therapists from the participating hospitals since the numbers of therapists in each hospital was small and all therapists are expected to treat all types of conditions. Therefore all physiotherapists and occupational therapists working in the

public sector participating hospitals and who have treated flexor tendon patients were sampled. Student physiotherapists and occupational therapists and assistant therapists were excluded from the study. Table 1 shows the sample by district, hospital and therapist.

TABLE1: Number of districts, hospitals, and therapists selected for the study

Districts	Total number of hospitals	Number of participating hospitals	Number of hospitals excluded	Total number of therapists	Number of participating therapists
District one	05	4	01	19	17
District two	16	6	10	49	46
Total	21	10	11	68	63

3.3 Data gathering instrument

There are existing international/basic guidelines for the postoperative rehabilitation of flexor tendons which served as a national gold standard against which reported practices were compared, as described by (Lund, 2000). These include the three categories of postoperative management protocols that have been explained in the above background and literature review: immobilization, early passive mobilization and early active mobilization. Lund (2000) reported that these protocols have remained as standards of treatment, providing conservative guidance for the management of tendon injuries.

To determine the practices of the therapists a questionnaire (Appendix III) was used and

supported with focus group discussions to determine attitudes and experiences of the therapists.

3.3.1 Questionnaire:

A questionnaire expanded from the one used by Groth (2005) was used for the purpose of this study, to obtain information about the attitudes, practices and experiences of therapists regarding the rehabilitation of repaired flexor tendons in different hospital settings. The questionnaire comprised of both open and closed ended questions. Groth (2005) is one of the few published articles on this topic. In collaboration with Groth (2005), the key elements on which questions were included are:

1. Initiation and frequency of rehabilitation
2. Initiation of active movement exercises
3. Initiation of resistive exercises
4. Discontinuation of protective splints
5. The use and presence of flexor tendon protocols in the department
6. PIP joint contractures
7. Suture technique

Several questions aimed at achieving the aims and objectives of this study were included under each theme above (Appendix III). This questionnaire was expanded by the addition of section A: work experience or protocol and section K which was not in the original questionnaire used by Groth (2005). These additions were done to suit the South African setting. However Groth (2005) provided advice on these sections. To determine the knowledge

of therapists the responses to the questions on initiation of active movement, frequency of therapy visits, initiation of therapy, initiation of resistance and discontinuation of protective splinting were analyzed. These sections had specific questions on what the therapists think the practice should be and what was actually practiced (Appendix III questions B3, C3, D3, E3, and F3)

To ensure that the questionnaire did indeed achieve its purpose, it was validated as described below.

3.3.1.1 Validity of the questionnaire

The questionnaire was piloted on a small group of non-participating therapists to improve and refine its contents. The non-participating therapists were not from the two districts (eThekweni and Ugu) that were used for the study. They were conveniently identified as they were also working in the public sector in KwaZulu-Natal. Content validity was assured by having it appraised by selected experts in the field. The results of the focus group are included in the results section. The experts in the field were selected according to their experience and knowledge of flexor tendon rehabilitation. One of the experts is the author of several articles (Groth, 2005; Groth, 2008) that have been published on flexor tendon rehabilitation. The other expert was the surgeon who was performing flexor tendon repairs.

Groth (2005) conducted a similar study in the United States of America on the current practice patterns of flexor tendon rehabilitation. The questionnaire once compiled and modified to suit the South African setting was then emailed to her for expert advice. Two physiotherapists who completed their master's program and have significant experience in rehabilitation also participated in the group.

3.3.1.2 Reliability of the data

The questionnaires were administered by the same therapist in the same way in the participating hospitals. After the approval was received from the Department of health, hospital managers and the different physiotherapy and occupational therapy heads of departments, the questionnaires were then hand delivered to these departments. The physiotherapists and Occupational Therapists who were interested to participate in the study were given the questionnaire to complete at the same time and then put all completed questionnaires in a sealed envelope. The heads of departments were asked to keep the questionnaires in the department and ensure safety and confidentiality of the documents. All completed questionnaires were then collected by the researcher from the departments.

3.3.2 Focus Groups

This qualitative part of the study was designed to provide an in- depth understanding of the experiences and attitudes of the public sector therapists in the management of the flexor tendon injuries postoperatively. Two focus groups were convened, one in each district. Each focus group consisted of between seven to ten randomly selected participants. These were the therapist who had already received the information sheet (Appendix II) which explained the whole research including this second phase of the research (focus group) and the consent was given. The names of therapists from each hospital were separated into physiotherapy group and occupational therapy group then put in a hat. Two occupational therapists and two physiotherapists were then randomly selected from each hospital.

Focus groups were also used as a means to delve deeper into core issues arising from the

questionnaire analysis. The duration of each focus group was an hour. The issues/themes that were structured are described in the focus group schedule (Appendix IV). The questions were semi structured, and they emanated from the questionnaire analysis. The focus group was facilitated and managed by the researcher. The researcher organized the venue for the focus group. The participants were then notified in advance to join the focus group discussion and all details (date, time, and venue) were given, as it was explained in the information sheet (Appendix II). The transcripts were captured by the researcher under the guidance of the statistician. They were checked by the supervisor, statistician and the observer/reviewer for the true responses of the participants.

This method was selected in order to gain an in depth understanding of attitudes and experiences of therapists that could not be expressed in writing and to observe non-verbal communication (Appendix IV).

3.3.2.1 Validity and reliability of focus group

The focus group discussions were audio taped and analysed with a second reviewer to ensure accuracy and reliability.

Triangulation to improve reliability of data was ensured by:

1. The presence of an observer to check for representation of the true responses of the participants and to assist the researcher with writing of the field notes.
2. The extensive field notes and audio tapes
3. The transcripts submitted to the supervisor to check for the representation of the true responses of participants.

3.4 Procedure of data collection

3.4.1 Ethical Considerations

Ethical approval from the Biomedical Research Ethics Committee from the University of KwaZulu-Natal was received (Appendix VI).

3.4.2 Permission and consent forms

Permission was sought from the Kwazulu-Natal Department of Health, individual hospital managers and Heads of departments in various therapy departments (Appendix I). All participants were asked to read the information letter, and complete a consent form (Appendix II) prior to answering the questionnaire (Appendix III)

3.4.3 Consultation

A letter explaining the purpose of the study was written to all physiotherapists and occupational therapists heads of departments of the selected hospitals.

3.4.4 Participant protection

The autonomy of the participants was protected and confidentiality assured through the informed consent form which specified that: participation was voluntary, that responses would be treated in a confidential manner and all questionnaires were coded and all information would be pooled and statistically analyzed.

Participants could withdraw from the study at any time if they wished to do so without any negative or undesirable consequences to themselves. There were no institutional sanctions if participants chose not to participate in the study. The researcher had no conflict of interest in

conducting the study. Under no circumstances the researcher fabricated data to support a particular conclusion.

The questionnaires were hand delivered to the various hospitals. The questionnaires were distributed to all selected physiotherapists and occupational therapists who are employed at the selected public sector hospitals of the eThekweni (urban) and Ugu (rural) districts. The therapists were given one week to complete the questionnaire, and it was collected by the investigator after completion. They were given information sheets which explained everything that the participants needed to do, and highlighted the importance of the study, what was expected of them and the benefits to them as participants, where they could gain the highlighted areas regarding the rehabilitation of flexor tendons, where more physiotherapy and occupational therapy is needed (Appendix II).

At the onset of each focus group the aims and objectives of the study were explained and the different themes were discussed. Confidentiality was assured through the informed consent form that specified that the responses were treated in a confidential manner. The observer also had to sign a confidentiality agreement/consent form (Appendix II). The audiotapes and transcripts were stored in a safe and lockable place.

1. All the proceedings of the meetings were explained:
2. the venue was confirmed closer to the time with the participants
3. completion of consent forms and demographic information sheet
4. the use of a tape recorder to capture the details of the meeting
5. the anticipated duration of the meetings

6. answering of questions for record purposes and that they did not have to answer any questions that they didn't feel comfortable with
7. refreshments were served after the meeting

3.5. Data Analysis

The quantitative data from the questionnaires was captured and subsequently analyzed using the Statistical Package for Social Sciences (SPSS version 19). The data was analyzed using descriptive statistics such as proportions, mean, and standard deviations to summarize the data. Pearson Chi-square test was used to test for association between practices and districts. Two independent samples t-tests were used to tests for differences in continuous variables between districts. Analysis of variance (ANOVA) was used to test for differences in continuous variables among hospitals. Tables, bar charts and pie charts were used to present the results. The probability was set at $p < 0, 05$.

Thematic analysis was used to analyze data which was collected during focus group discussions. This qualitative data was collated, analyzed and presented under themes. The data was interpreted using the Grounded Theory.

3.5.1 Grounded theory

Grounded theory is defined as research method that seeks to develop theory that is grounded on data. The proponents of grounded theory method urge researchers to use the method flexibly (Glaser and Strauss, 1967) and more strongly supported by Charmaz (2006), who refuses to accept any prescriptive way of using this method. Instead she regards this method as a guiding framework, that is a set of principles and practices which any researcher can fine

tune to suit the context of the particular research project. The basic tenet of the grounded theory method is to allow free discovery of theory (Mavetera et al 2009)

3.6 Limitations of the design

Most therapists in the public sector do not have access to the internet or the computer while on duty. The researcher had to travel to all these hospitals which are too far apart. The data analysis would have been easier if the responses were done electronically, thus reducing human error.

CHAPTER 4

RESULTS

The results of the cross-sectional survey are approached in a structured way. Firstly a description is provided of the flexor tendons rehabilitation practices and knowledge of the therapists are shown under the key elements linked to the purpose of this study. This is followed by the results of the experiences, and attitudes towards flexor tendon management which is presented by theme as obtained from the focus group discussions.

Prior to a description and analysis of the practices, attitudes and experiences of therapists in flexor tendon rehabilitation, a profile relating to the demographics and hospital settings of the participants is provided to set the study in context. The transcripts of the focus group discussions can be found in appendix IV. The questionnaire data is attached as Appendix III.

4.1 Response rate (Table2)

A 100% response rate was obtained through a return of 63 completed questionnaires. Of these, 77.8% of the therapists indicated that they had treated patients presenting with flexor tendon repairs in the past five years. The remaining 22.2% reported that they had no exposure to patients with repaired flexor tendons in the same period. Five of the 22.2% of therapists were from district hospitals and seven were from a tertiary institution. The rural district one has only one regional hospital that performs flexor tendon surgery, and in the urban district five of the participating hospitals perform these operations.

TABLE 2. Number and percentages of respondents who worked at the different levels of hospitals

Level of Hospital	N (%)	Therapists seeing FT patients (%)	Therapists not seeing FT patients (%)
Tertiary	20 (31.7)	13 (26.5)	7 (50)
Regional	30 (47.6)	28 (57.1)	2 (14.3)
District	12 (19.0)	7 (14.3)	5 (35.7)
Other	1 (1.5)	1 (2.1)	0
Total	63	49 (77.8)	14 (22.2)

4.2 Demographic profile of participants

The respondents were primarily physiotherapists (75.8%). Occupational Therapists made up the remaining 24.2%. Participants worked in a variety of hospital environments, which included tertiary, district and regional hospitals (Table 2). Thirty seven point seven percent of the respondents reported that they have more than five years of general hand therapy experience. Significantly more therapists saw adult outpatients (91.9%; $p < 0.05$).

TABLE 3: Therapist's years of experience in General Hand Therapy

Years in Hand Therapy	N (%)
<1	14 (23.0)
1- 4years	17 (27.9)
>5 years	23(37.7)
none	7(11.5)
missing	2 (3.2)

The majority of participants had more than five years of experience in hand rehabilitation in general but not specifically in flexor tendon rehabilitation.

4.3 Rehabilitation protocols used

The rehabilitation protocols chosen were based on the needs of particular patients. As shown in Table 4, therapists did not adhere to the use of a single protocol but chose protocols based on the needs of the individual patient.

A significant proportion (61.2%, $p < 0.05$) of respondents used predominantly early passive mobilization (Kleinert protocol) with Kleinert splints with rubber bands when rehabilitating patients with flexor tendon injuries. Fifty five percent of the respondents used immobilization (Duran protocol) with no active/passive movement for the first three weeks while 30.6% used passive mobilization using Duran splints without rubber bands when it was the best option for

a particular patient. Twenty percent of the therapists (20.4%) indicated that they do not follow any protocol but treat presenting symptoms. Overall there was no significant differences in the therapist choice of rehabilitation protocol, but this differed by hospital setting. Therapists in the tertiary hospital preferred the Duran protocol (53.6%; $p = 0.003$) compared to regional hospitals where the immobilization protocol (74.1%; $p=0.045$) was utilized and district hospital in which the Duran protocol was mostly used (0%; $p= 0.003$) but therapists in the latter mostly (20%; $p=0.754$) treated presenting symptoms (Table 4).

Table 4: Protocols used in different hospital settings

FT Protocol	Different hospital settings: Therapists			Totals	P Values
	Tertiary	Regional	District		
Kleinert Protocol	26.7	63.3	10.0	100	0.387
Duran Protocol	53.6	40.0	0	93.6	0.003*
Immobilization	18.5	74.1	7.2	99.8	0.045*
Treat symptoms	30	50	20	100	0.754

*Indicate a significance difference between different hospital settings

The data in Table 4 indicates that there is a significance difference between tertiary, regional and district hospitals in the use of Duran protocol ($p=0.003$) and immobilization ($p=0.045$) protocols.

A significant proportion (84.8%) of the respondents reported that they have access to flexor tendon clinical guidelines/protocols in their departments. Protective splints were commonly

fabricated by the occupational therapists, and molded to fit a particular patient. Thirty one point eight percent (31.8%) of the respondents placed the wrist in a static wrist position of 20 to 30 degrees of flexion. The metacarpophalangeal joint (MPJ) were reported to be placed at 60-70 degrees by 24% of the respondents. Forty two percent of the physiotherapists supplemented mobilization with ultrasound therapy and transcutaneous nerve stimulation (TENS).

4.4 Initiation of therapy

As shown in Table 5, initiations of therapy occurred significantly more frequently as a collaborative decision between the therapists and doctor. There was no statistical difference ($p=0.196$) on the decision to initiate therapy amongst different hospital settings. The decision to initiate active movement was usually decided by the therapist and or the therapist and doctor. The frequency of visits to therapy, discontinuation of splinting and initiation of resistance were decided by the therapist independently, significantly more frequently.

A significant proportion of respondents (83%) reported that they initiated rehabilitation between day one and day three of the repair. However there was no statistical difference ($p=0.430$) in the initiation of therapy amongst the different hospital settings. Seventy nine point two percent (79.2%) felt that therapy should begin between day one and day three post operatively. Significantly more of the respondents (70.2%) reported that they initiated therapy only on orders from the doctor. Sixty eight percent (68.8%) reported that the doctor and the therapist decided on when therapy should begin compared to 44.7% who initiated therapy using established protocols.

TABLE 5: Health care professionals who decide on the key elements regarding therapy: in percentage.

Key element	Doctor %	Therapist %	Doctor &Therapist%	P Values
Initiation of therapy	31.3	0	68.8	0.196
Frequency of therapy visits	2.1	85.1	42.9	0.438
Initiation of active movement	12.2	44.9	42.9	0.568
Discontinuation of splinting	0	56.5	43.5	0.092
Initiation of resistance	2.2	69.6	28.3	0.010

The above table shows that the therapist plays a major role in the decisions regarding the postoperative rehabilitation of the flexor tendons.

4.5 Frequency of Therapy visits

A significant proportion of the respondents (85%) reported that the therapist decides on the frequency of therapy visits. Thirty seven and a half percent reported that they typically see their patients once per week. Twenty five percent (25%) of the therapists indicated that they see flexor tendon patients twice a week. Very few saw their patients only once a month. Thirty nine percent (39.6%) thought that patient's appointments should be scheduled twice a week in the first month.

There was no statistical difference ($p=0.161$) on the frequency of therapy visits amongst

different hospital settings (tertiary, regional or district hospital level of care). There was a significant difference ($p=0.013$) between the frequency of therapy sessions and the incidence of PIPJ contractures. However it was an interesting finding that therapists reported sometimes seeing patients with PIPJ contractures even though therapy visits occurred once and twice a week. The reported occurrence of contractures was more often in patients who were seen once or twice a week than in those patients who were seen once a month.

4.6 Initiation of active range of movement

Most respondents (29.2%) reported typically initiating active range of movement (ROM) exercises on the fourth post-operative week. Twenty point eight percent (20.8%) reported commencing these exercises on the 1st and 3rd week postoperatively. Fewer therapists (12.5%) reported starting on the 5th week and on the second week (16.7%). There was a significant difference ($p=0.002$) in the initiation of active range of movement amongst different hospital settings. Fifty percent (50%) of the therapists from tertiary institutions initiate active ROM between day seven and thirteen, Eighty percent (80%) from regional hospitals initiate active ROM between day zero and six. Forty percent (40%) from the district hospitals initiate active ROM between fourteen and twenty days postoperatively.

TABLE 6: Responses (%) regarding external and internal attribution factors in decisions on the use of specific protocols

Attribution	Factors	Three key elements: therapists responses in %		
		Initiation of Active ROM %	Discontinuation of protective Splint %	Initiation of Resistance %
External attribution	Established protocol	61.2	56.3	66.7
	No. of postoperative .	38.8	47.9	45.8
	Doctor's order	32.7	20.8	14.6
Internal attribution	Suture technique	12.2	8.3	12.5
	Compliance issues	16.3	20.8	10.4
	ROM measurement	8.2	18.8	14.6
	Other	4.1	2.2	4.2

Participants were instructed to tick all applicable choices

ROM= range of movement

As shown in Table 6, external attributions such as established protocol, was cited as significant for initiating active ROM. This external attribute was also important in decisions which concerned discontinuation of protective splint and initiation of resistance.

4.7 Discontinuation of protective splinting

When asked about when a splint should be discontinued, approximately 37% of the respondents indicated five weeks and 31% stated six weeks. A significant number of respondents (56.5%) felt that the therapist should decide when to discontinue protective

splinting.

Twenty two percent of therapists thought that protective splinting should be typically discontinued at four, five and six weeks postoperatively. There was a significant difference ($p=0.004$) by hospital setting regarding when the protective splinting should be discontinued. Significantly more of the therapists from regional hospitals (80%) discontinue splinting at six weeks while significantly more tertiary hospital therapist (55%) discontinue splinting at five weeks, compared to 33.3 % of therapists at district hospitals who discontinue splinting at eight weeks.

4.8 Initiation of Resistance

When asked about when resistant exercises should begin, 18.4% indicated 4 weeks, 30.6% indicated five weeks, 22.4% indicated six weeks, 26.6% indicated seven weeks, and 2.0% indicated eight weeks. The majority of therapists (28.6%) felt that these exercises should begin at five weeks. There is a statistical difference ($p=0.010$) in the initiation of therapy amongst different hospital settings.

4.9 PIPJ Contracture

A significant 52.1% of the therapists managed PIPJ contractures sometimes compared to 8.3% who treated these contractures nearly always. Thirty one point three percent of the therapists seldom saw patients with PIPJ contracture. Therapists also stated that PIPJ contractures were uncommonly seen both during inpatient management and at discharge (45.8%).

4.10 Outcomes

Table 7 shows the proportion of therapists who measured specific rehabilitation outcomes. Functional independence (n=34, 70.8%) was used most commonly, compared to grip and pinch strength. None of the respondents use the Strickland's formula. Thirty four respondents completed the open ended questions, that asked them to estimate the final outcome of their last patient as specifically as possible. Written responses included a key word "function" in 18 of the 34 comments.

TABLE 7: Numbers and percentages of therapists who measured different outcomes

Measurement of outcome	Number (%) of therapists
Functional independence	34 (70.8)
ROM	30 (62)
Grip strength	18 (37.5)
Pinch strength	14 (29.2)
Stricklands formula	0 (0)
Other	6 (12.5)

**Participants were instructed to tick all applicable choices

All the therapists measured at least one or more of the above outcome parameters. The majority of the therapists measured more than one parameter and included functional

independence.

4.11 Rupture

Fifty six point eight (56.8%) percent of the respondents reported that they had never encountered a patient who suffered a postoperative tendon rupture.

4.12 Attitudes

Nearly half (49%) of the therapists reported that they are sometimes apprehensive about how to progress patients through rehabilitation.

Therapists indicated the top three factors contributing towards poor and unsuccessful patient outcome as: non-compliance with home program (83.7%), injury severity (55.1%) and poor attendance to therapy sessions (40.8%). Patients with successful outcomes were: compliant with the home exercise program (89.8%), with splinting (42.9%) and individualized rehabilitation (38.8%). A significant number (86.6%) of therapists reported that the place of patient's employment affected the frequency of therapy visits.

4.13 Comparison between the two districts

4.13.1 Response rate from the two districts

There were 17 therapists (26.9%) from the rural district and 46 (73%) from the urban district. Only 5 (35.5%) of the therapists from the rural district and 9 (64.2%) from the urban district indicated that they have not seen flexor tendon patients in the past five years (Table 8).

TABLE 8. Number and percentages of therapists who worked at the two districts

District	N (%)	Therapists seeing FT patients (%)	Therapists not seeing FT patients (%)
Rural	17 (26.9)	12 (24.4)	5 (35.7)
Urban	46 (73)	37 (75.5)	9 (64.2)
Total	63	49 (77.8)	14 (22.2)

4.13.2 FT Rehabilitation practices between two districts

The utilization of the different flexor tendon protocols between the two districts (rural and urban) is similar. Therapists from both districts used mostly the Immobilization (58% from rural and 54.8% from urban) and Kleinert protocols (50% from rural and 64.8% from urban). Therapists were given an option of choosing more than one protocol. The majority of the therapists from the rural district (58%) and only (5.4%) from the urban district indicated that they do not have flexor tendon protocols/clinical guidelines in their departments

TABLE 9: Comparison of the initiation of the key elements in the two districts

Key element	Rural district (%)	Urban district (%)
Initiation of therapy: day 1-3	10 (83)	28 (75.6)
Frequency of therapy visits: 1x/week	7 (58.3)	11 (29.7)
Initiation of active movement: day 0-6	5 (41.6)	5 (13.5)
Discontinuation of splinting: 6 th week	2 (16.6)	7 (18.9)
Initiation of resistance: 6 th week	1 (8.3)	8 (24.6)

As indicated in the table above most of the therapists from both districts initiates therapy between day one and three posts operatively. Therapists from the rural district (58.3%) schedule therapy visits once a week compared to the 29.7% of the urban therapists. A large number of rural therapists (41.6%) reported initiating active ROM between day zero and day six post operatively compared to the 13.5% of the urban district therapists. Most of the therapists from the rural district (66.6) discontinue protective splinting on the 8th week post operatively compared to the urban district therapists (51.3%) who discontinue splinting at six weeks postoperatively.

Rural therapists (41.1%) initiate resistance from the 8th week and 24.6% of the urban therapists initiate resistance from the 6th week post operatively. Therapists from both districts reported that they 'sometimes' experience the PIPJ flexion contracture.

4.14 Focus group discussion results

The experience of therapists in flexor tendon rehabilitation is presented by theme. The grounding included causal conditions and action strategies.

Response rate:

The first discussion was conducted in a rural district one, where eight therapists attended the discussion. Six of the therapists were physiotherapists of whom, three were doing community service and had eight months of experience. Of the remaining three, one had 14 years' experience; the other five years and the last one had four years. Of the two occupational therapists who attended, one had six years of experience and the second one had four and a half years of experience.

The second discussion was conducted in the urban district two: seven therapists attended the discussion. Five were physiotherapists, two of whom had more than five years of experience; one had four years and the remaining two had more than ten years (15 and 11) of experience. Two occupational therapists attended: both had more than ten years of experience (16 and 14).

Phenomenon:

The phenomenon investigated was the flexor tendon post-operative rehabilitation practices and experiences in the public sector physiotherapists and occupational therapists.

Causal conditions:

The causal conditions identified included: different rehabilitation protocols in different hospital settings:

1. Challenges during flexor tendon rehabilitation.
2. Therapists' experiences and attitudes during flexor tendon rehabilitation.
3. Multidisciplinary team approach: communication between doctors, therapist and nurses.
4. Compliance of patients with home program and therapy appointments.
5. University undergraduate curriculum on flexor tendon rehabilitation and hand specialization.
6. Outcomes of flexor tendon postoperative rehabilitation.

Action strategies:

The action strategies identified were: availability of appropriate flexor tendon protocols in the therapy departments:

1. Knowledge and compliance with flexor tendon protocols.
2. Good communication between members of the multidisciplinary team.
3. Patient compliance.

4.14.1. District one (Rural) and District two (Urban)

There were seven themes or categories that emerged from the discussions and were identified as:

4.14.1.1 Challenges experienced during Flexor Tendon rehabilitation

When asked about the barriers/obstacles that they encounter during flexor tendon rehabilitation, district one therapists highlighted the patient related challenges in the rural districts. One therapist explained saying 'first of all it is the patients understanding of the treatment and you cannot plan according to what you want, you want to make a follow up appointment on a weekly basis and you find that the patient cannot attend because they stay far away in the rural areas'.

Most of the therapists seemed to agree with the above statement, but another therapist interjected stating that 'it's not just a 12 week follow up where you will have to see a patient every week, it doesn't work like that, it's very individualized and there are many challenges which are patient related, it's the patient's age, understanding of the importance and value of following the home exercise program, mental state of the patient, difficulty during assessments, poor patient education and the awareness of the degree of the injury.'

Patients from the urban district differed in that they were reported to have 'unrealistic expectations', but there were similarities that were highlighted by urban therapists such as 'lost

in the follow up', 'poor compliance with exercise program' and the waiting time for follow up appointments was too long.

Trends and commonalities in data were identified in both the districts; therapists expressed similar challenges and frustrations. The challenges were related to patients, doctors, therapists and nurses.

4.14.1.2 Socio-economic background

In both districts therapists expressed frustration about patients who do not want to get better, in order to receive disability grants (DG). Rural therapists emphasized that most patients come from a poor background and therefore have difficulty attending rehabilitation. The same was true for the therapists from an urban district.

One concerned therapist from the rural district expressed her frustration saying 'some patients if they see that they are getting better they stop coming for rehabilitation and come back after six months when the disability grant needs to be renewed. It's frustrating because you know that this young man can go back to the community and be a better person'. Another one agreed saying 'as a therapist you don't get the results that you want. Some patients they don't want to get better regain their function because they will stand a chance of losing the disability grant'. Another therapist felt very strongly about the issue of DG and said: 'Personally I get irritated, I grab a chair sit down with the patient and ask the patient, do you want to get better or do you want a disability grant ?'.

4.14.1.3 Environment

Therapists from both districts reported that the distance traveled by patients to attend rehabilitation at the hospital was too far. However the rural district therapists felt that the travel distance is not the main issue because patients 'can be seen at their local clinics closer to their homes and the home program needs to be thoroughly explained, but the main issue was patient compliance'.

Another therapist said 'it is frustrating for the occupational therapist to work in the rural areas because you work alone with not enough resources' some of the resources that were lacking included splinting materials. Another physiotherapist interjected and they both agreed that sometimes you work alone with no clinical supervision or equipment. There are no senior therapists to provide clinical guidance and supervision in some hospital. The equipment that was indicated as lacking some areas included electrotherapy that is mostly used by physiotherapists.

4.14.1.4 Compliance with FT rehabilitation protocols

Therapists from both districts expressed poor patient compliance to the rehabilitation protocol, mainly because of the disability grant benefits. Therapists from the rural district felt very strongly about this issue of disability grant and expressed their frustrations: One therapist said 'Sometimes patients purposely default treatment because they want to retain the disability grant, therefore they do not want to get better. This is frustrating for you as a therapist because the patient will complicate and end up with contractures'.

4.14.1.5 Multidisciplinary team (MDT) approach

Therapist from both districts expressed that there was a poor communication amongst the multidisciplinary team members.

One therapist from a rural district who works in a rural hospital said 'communication between doctors and therapists is a bit tricky because patients have surgery at a regional hospital and then referred to the outpatient department (OPD) doctor, then to rehabilitation. You don't get to communicate with the surgeon directly, you get the second hand information which is vague if you know what I mean'.

Another therapist agreed with this saying that 'sometimes after OPD the patient will not get to the Physio department'. But another therapist seemed to disagree saying 'depends on the experience of the doctor in OPD at that time, new community service doctors or interns will send a patient home without rehabilitation referral because he does not know referral procedure. Urban district therapists highlighted that there was: 'poor communication between patients and therapists because of the language barrier, 'no pre-operative counseling to tell the patient about post-operative expectations to prepare the patient for the realistic outcome', and 'unilateral selection of protocols' on the side of the doctors, meaning that doctors do not communicate the protocol to the therapist.

4.14.1.6 Clinical Experience

Two therapists from different rural hospitals agreed that some doctors do not know how to manage these injuries, 'they don't know the guidelines and who to refer to and there is no proper communication between doctor and therapist regarding the protocols to be used'.

One of the two therapists said 'sometimes you receive the referral indicating that the flexor tendon was repaired but when you assess, you discover that it was not repaired and 'there is no movement 'and when you contact the referring practitioner you are told that the surgery was done therefore 'do your part 'as a therapist. Most therapists agreed that there is poor referral by the doctors.' Some of the community service therapists are not experienced enough to treat these injuries'. Experienced therapists help to provide guidance to the junior therapists about the appropriate protocol to follow. One therapist said 'some patients presents to rehabilitation with no active movement after surgery, a therapist is expected to rehabilitate back to function.'

Urban district therapists raised concerns that are similar to the rural district therapists namely: poor hand rehabilitation experience, skill of the surgeon and unilateral selection of protocols.

4.14.1.7 University Curriculum

Therapists from both district felt that there was not enough hand rehabilitation covered at undergraduate level. One therapist from a rural district said 'somehow I feel that our curriculum is not talking to what is happening out there' in the community. Another one said 'it was just one day just to show you what splints to do, with no practical. Another one agreed saying they only spent three weeks of lectures with no practical. However another one interjected saying it depends on the university that you go to, we only had three basic dynamic splints, we definitely didn't have enough experience on the flexor tendon protocols and how to deal with it in the community. Another said 'you learn for yourself during ward rounds and own literature search'. One therapist from a rural district strongly recommended than 'someone needs to re look at the curriculum seriously'.

4.14.1.8 Outcomes

Early mobilization using the Kleinert and Duran protocol was reported to produce good outcomes (functional independence). One therapist from a rural hospital said 'successful outcome depends on the patient's attitude 'towards rehabilitation and 'what he wants. Another one said successful outcomes depends on the skill of the surgeon and the zone of the injury'. A rural therapist from a district hospital said 'the frustration for us in the rural hospital is that sometimes we get referrals where it says flexor tendon repair but when you check nothing was repaired. I don't know if the rural hospitals are allowed to repair tendons because there are no specialist, they just do what needs to be done at that time to help the patient'. Knowledge of the surgical technique and the post-operative management on the side of the therapists is important for the good outcomes.

CHAPTER 5

DISCUSSION

This study sought to determine the practices, attitudes and experiences of the public sector physiotherapists and occupational therapists in the postoperative rehabilitation of the flexor tendons.

5.1 Response rate

There was a good response from the therapists in the public sector. The findings of this study revealed that a majority of the flexor tendon repairs are seen by therapists who work at regional hospitals. Only 14.3% therapists from a regional hospitals revealed that they do not see flexor tendon patients compared to 50% from tertiary and the 35.7 % from district hospitals who indicated that they do not see flexor tendon patients. This response rate is very concerning because it could indicate that most patients are lost in the follow up or they are not referred to the therapists for rehabilitation.

5.1.1 Reasons for low number of therapists that see flexor tendon patients

The focus group discussion revealed that some patients are not compliant with rehabilitation therefore do not attend. The major concern that was also reviled during focus group discussion is the poor communication between members of the multidisciplinary team. Surgeons and therapists need to communicate the surgical management to the therapists because that guides the post-operative rehabilitation management. These reasons could be contributing to why

some therapists do not see these patients. The majority of the therapists from both rural and urban therapists indicated that they do see patients with flexor tendon injuries. This shows that this is the problem that needs to be resolved both in the rural and urban hospitals, as this could lead to major functional impairment and disability for patients who have had this operation.

5.2 Demographic profile of participants

The participants in this study were predominantly physiotherapists compared to the only study in this area, by Groth (2005). The participants in Groth's study were predominantly occupational therapists. Groth is an occupational therapist compared to the principal researcher of the current study who is a physiotherapist. The current study did not use a quota approach to sampling but included all therapists who were involved in hand rehabilitation in the selected hospitals and districts.

Groth (2005) used a sample of convenience to select participants for the survey compared to the saturated sample in this study. This study is not biased by the fact that the principal investigator is a physiotherapist. It must also be noted that hand rehabilitation therapists function as a community of therapists and do not differentiate themselves by their primary occupation (anecdotal). Few occupational therapists participated in the study due to the fact that typically more physiotherapists are appointed per hospital, in KwaZulu-Natal.

5.3 Therapists by district and level of hospital

Although the number of hospitals invited to participate in the study in the two districts was similar, the total number of hospitals in each district may reflect the demand for health care in each type of district. In the urban district there were more participating hospitals (5) that

provide a higher level of health care including the flexor tendon surgery compared to the rural district which had only one regional hospital that performs these operations. This could be one of the reasons that contributed to the delay in the repair of tendons that was highlighted by the rural district therapists during the focus group discussion.

The findings of this study also revealed that 23% of the therapists that are involved in hand rehabilitation have less than one year of experience. Six of those therapists came from a rural district compared to the four from the urban district. These are the therapists who have just graduated and are doing community service.

5.4 Rehabilitation Protocols used

The postoperative management of flexor tendon injuries has a controversial history, characterized by surgeons debating the mechanism of healing, the role of tendon excursion, optimal suture technique, and optimal force application (Groth, 2005) in optimizing outcomes. The findings of this study demonstrate that the actual use of different protocols in different hospital settings is diverse. The lack of communication between multidisciplinary team members revealed during focus group discussion could contribute to this. The current study showed a significant difference between the use of the Duran and immobilization protocols in the different levels of hospitals. However there was no statistical difference in the use of Kleinert protocol amongst the different hospital settings.

The findings of this research concur with the literature (Mackin et al 2002; Rosenthal et al 2005; Groth, 2005) in that therapists in different hospital settings use different protocols to treat patients with flexor tendon injuries postoperatively. Mackin et al (2002) suggests that

every tendon management is unique and often the best approach may include a combination of techniques from various protocols.

In regional hospitals where the majority of flexor tendons are repaired on site, therapists use either the immobilization or Kleinert protocols more than the other protocols. This is also reflected in the comparison between the rural and urban district. Therapists from both districts seem to favor the use of these two protocols. This practice is different from the reported literature (Amadio et al 2005; Baktir et al 1996; Elliot, 2002; Pettengill, 2005; Tang 2007; Braga-Silva, 2005) where early controlled active finger flexion is becoming the mainstay of motion exercise and early passive flexion by rubber band traction is reported to be on its way to being abandoned.

However the findings of this study are similar to the findings of Groth, (2005) who also found that Kleinert- type of exercises are used more than the other protocols. Groth's study looked at the current practices of occupational therapists and physiotherapists in flexor tendon rehabilitation. The literature still emphasizes that a definitive management protocol has yet to be established, (Torie et al 2012; Tang, 2007).

The literature also shows that modifications to the established protocols are common, in order for the protocol to suit a particular clinic or setting (Tang, 2007; Kitis, 2009; Sueoka, 2008; Groth, 2008; Groth, 2005). More research is needed to discover different approaches and modifications that can be made to the established protocols, to be relevant and suitable for the South African community.

A study on success rates following flexor tendon surgery and rehabilitation is warranted in South Africa. It cannot be confirmed why practices revealed from this study are slightly different from international practices in the management of flexor tendon injuries. Therapists interviewed suggested that some hospital settings are staffed by junior therapists who are not sufficiently trained or experienced to treat these injuries. As indicated above, the literature recommends the use of early controlled finger flexion exercises by experienced therapists.

In addition the focus group discussions revealed that the undergraduate curriculum does not equip graduates sufficiently to manage patients following flexor tendon surgery. Rosenthal and Stoddard (2005) stated that the early active protocol is the most sophisticated and potentially risky of all protocols. It should be reserved for the ideal patient in an ideally proficient therapy setting after a strong, atraumatic and technically strong tendon repair. This indicates a need for the therapists to be sufficiently trained so that they will be able to manage these conditions, should a surgeon decide to follow this early active sophisticated protocol. Post-operative rehabilitation management is guided by the surgical technique; the surgeon will expect a therapist to know the post-operative flexor tendon management of all patients that they refer to the therapist. There is therefore a need for an in depth investigation into identifying the postoperative outcomes following flexor tendon surgery and the rehabilitation thereof.

5.5 Decisions on the postoperative rehabilitation

The findings of this study revealed that therapists are the ones who are making decisions regarding the key elements in the rehabilitation of flexor tendons, such as the initiation of resistance, discontinuation of protective splinting, frequency of therapy visits. These findings

concur with the findings by Groth (2008) who highlighted that there is an expectation that therapists will make autonomous clinical decisions regarding the optimal rehabilitation interventions. Protocols or clinical guidelines that are developed and approved by the surgeons can assist the therapists in these decisions even if the surgeon is not there during rehabilitation. This was supported by Groth (2008) who suggested that established protocols are the most commonly reported clinical reasoning strategy.

The above is also confirmed by the results of this study which found that external attributions such as established protocols are cited as significant for the initiation of active movement, and also important in the decisions which concerned discontinuation of protective splinting and initiation of resistance.

5.6 Initiation of therapy

The findings of this study regarding the initiation of therapy on the first week (between day one and three) after the repair were similar to the findings of Groth (2005). Groth also reported that this practice fluctuated quite frequently. The findings of this study show that therapists from both districts (rural 83.3% and urban 75.6%) initiate therapy between day one and day three postoperatively.

5.7 Frequency of therapy visits

Therapists reported that they typically see their patients once (37.5%) and twice (35%) per week. According to the therapists knowledge therapy visits should be scheduled twice a week. This finding of this study was similar to the findings of Groth (2005) who also found that 'physician -owned or hospital-owned settings were more likely to schedule patient's

appointments twice a week.

It was interesting to find that therapists reported 'sometimes' seeing patients with proximal interphalangeal joint contractures even though therapy visits occurred once and twice a week. The reported occurrences of contractures were more often in patients who were seen once or twice a week than in those patients who were seen once a month. The incidence of proximal interphalangeal joint contracture is almost similar in both districts. Fifty four percent of the therapists for the urban district and 41.6% from rural district reported 'sometimes' seeing this proximal interphalangeal joint complication. This finding was similar to the finding of Groth (2005) who also found that patients who were seen three or more times a week have more occurrences of contractures than do those who were seen once or twice a week.

5.8 Proximal interphalangeal joint (PIPJ) flexion contracture

A significant percentage (52.1%) of therapists reported that sometimes they do face the complication of PIPJ contracture during the course of postoperative management. However PIPJ contracture was reported as fairly common to treat, but fairly uncommon at discharge. The finding in this study about the frequency of occurrence of PIPJ contracture is similar to that reported by Groth (2005) in that PIPJ contracture was fairly common to treat but fairly uncommon at discharge. The focus group discussion results revealed that some patients do not comply with the rehabilitation program because of poor socio background and the wish to access disability grant benefits, and then they end up with this complication of PIPJ contractures.

5.9 Discontinuation of protective splinting

The findings of this research also show that the customized splints are widely used with the wrist positioned at 20-30 degrees of flexion, metacarpophalangeal joint (MCPJ) in 60 – 70 degrees in flexion, as typically recommended in the literature (Tang 2007; Groth, 2005).

Regional hospital therapists discontinue splinting at six weeks, and district hospital therapists discontinue splinting at eight weeks. This is in line with international practices cited in the literature (Pruitt et al 1996; Harris et al 1999) that support a five week and more splinting time to avoid the risk of rupture. Groth (2005) also highlighted that discontinuation of splinting varies significantly from the literature (Groth, 2005).

5.10 Initiation of active movement

The current practice patterns for the initiation of active movement vary significantly from the literature as stated by Groth (2005). The findings of this research shows that there was a significant difference ($p=0.002$) in the initiation of active range of movement amongst different hospital settings.

The finding in this study show that active range of motion exercises are initiated in different time frames by therapists in each of the categories of hospitals requires further exploration. However it could be due to the fact that patients present at different hospital settings at different points in their trajectory of post-operative recovery. An additional factor could be that most of the tendon surgeries are performed at regional hospitals and patients are then referred to district hospitals for further rehabilitation. Groth (2005) stated that active flexion began at a

mean of 18.6 postoperative days and the literature typically recommends 28 days. The findings of this study indicate that 29.2% of therapists typically initiate active ROM exercises in the 4th post-operative week. Twenty eight percent (28%) reported commencing these exercises in the 1st and 3rd week post operatively. Fewer (12.5%) therapists reported starting in the 5th week and 2nd week (16.7%).

5.11 Initiation of resistance

This study found that therapists begin resistance exercises at five weeks. This finding was in line with what was reported in the literature by Rosenthal and Stoddard (2005) that resistive exercises need to be implemented later at five to eight weeks once the tendon is sufficiently healed.

5.12 Relationship between years of experience and observation of tendon rupture

As years of hand specialty experience increased, respondents were progressively more likely to have a patient experience a tendon rupture indicating some level of inevitability to experiencing this complication (Groth, 2005). This finding by Groth (2005), gives us an indication that sometimes specialization in hand rehabilitation cannot necessarily guarantee good flexor tendon outcomes. The burden that was expressed by therapists during the focus group discussion about the lack of experience of the community service therapists can be alleviated by the solution that transpired from the same focus group discussions that the curriculum at the universities needs to improve. However 56.8% of therapists had never experienced a complication of a tendon rupture.

5.13 Outcomes

The findings of this study shows that therapists measure flexor tendon rehabilitation outcomes using mostly functional independence (70.8%) and ROM (62%). These findings were similar to the findings of Groth (2005) who also found that therapists reported that they measure the outcomes using methods such as ROM, grip and pinch strength, and Strickland's formula and function. However Oltman et al (2008) highlight that functional outcome alone does not represent the true impact of flexor tendon injuries on patients.

5.14 Attitudes

The findings of this study revealed that nearly half (49%) of the therapists are sometimes apprehensive about how to progress patients through rehabilitation. This was also evident during the focus group discussion where therapists expressed their frustrations and challenges during flexor tendon rehabilitation. Therapists from both urban and rural districts experience similar challenges such as poor compliance of patients with rehabilitation programmes, poor communication between the members of the multidisciplinary team which include doctors, nurses and therapists, and poor socioeconomic background which contribute to the poor compliance because of disability grant benefits.

5.15 University Curriculum

Concerns were raised during the focus group discussions that the undergraduate curriculum is not sufficient to equip therapists to manage flexor tendons. The truth of the matter is that in South Africa there are very few therapists who are trained in this area as it is a specialty internationally. However since most newly qualified therapists are expected to manage these

conditions specifically flexor tendon rehabilitation, maybe a provision can be made for the universities to put more emphasis and add more practical sessions in this area of flexor tendon rehabilitation including the surgical management. More studies are required to determine the number of operations that are performed and the number of those patients that are referred to rehabilitation and seen by the therapists.

CHAPTER 6

CONCLUSIONS LIMITATIONS AND RECOMENDATIONS

6.1 Conclusions

The overall aim of this research was to investigate the practices, attitudes and experiences of public sector therapists in the rehabilitation of flexor tendons postoperatively. This section will offer conclusions based on the findings. Recommendations for future research will be discussed, in terms of how to progress this research study. The important contribution of this study in the postoperative management of flexor tendon injuries in the public sector hospitals, the practises, attitudes, experiences and knowledge of public sector therapists in the postoperative rehabilitation of flexor tendon will be revealed. This structure is adopted so that the research work will be concluded in order to reflect on whether or not the objectives stated at the start of this research have been met.

Public sector therapists in different hospital settings use different protocols to treat patients with flexor tendon injuries postoperatively. In regional hospitals where the majority of flexor tendons are repaired on site, therapists use either the immobilization or Kleinert protocols more than the other protocols. This practice is similar in both rural and urban districts.

Therapist's management of patients with flexor tendon surgery depends on whether they are located at a district, tertiary or regional level hospital due to the timing of referral of patients for rehabilitation. Therapists also choose protocols based on the needs of a particular patient and they do not adhere to the use of a single protocol.

Therapists in the rural hospitals modify the protocols due to the lack of resources and poor compliance of the patients. Splinting is the main aspect that is modified. The findings also indicate that therapists in the public sector have a good knowledge of the post-operative rehabilitation of flexor tendons. Even though therapists experience many challenges as reported during the focus group discussions, they are able to see the need to modify protocols to suit a particular patient.

Most therapists are apprehensive about how to progress patients through rehabilitation. The top three reasons contributing to unsuccessful outcomes are non-compliance with home program, injury itself and poor attendance to therapy sessions. The non-compliance of patients to the flexor tendon rehabilitation program was highlighted during the focus group discussions by therapists in both urban and rural districts. This was caused partly by the poor socioeconomic background of most patients who presented with these injuries. This non-compliance contributed to the frustrations that are experienced by the therapists which lead to the negative attitudes, especially when a disability grant is sought by the patient.

6.2 Limitations of the study

Some hospitals did not return the questionnaires, reducing the participation rate. Only two districts were studied, thereby reducing the generalizability of the results.

A limitation of this survey was that specific proportional utilization of each protocol was not elicited.

6.3 Recommendations

6.3.1 Recommendations to improve the study

More research is needed to look at the outcomes of postoperative rehabilitation in order to determine the success and failure rate of rehabilitation following flexor tendon repair.

Studies need to be done at the public sector hospitals in this area of flexor tendon injuries.

6.3.2 Recommendations to improve practice

Social workers need to be involved in the management of these patients to assist in reducing the social burdens experienced by the majority of the patients, which cause most of them to be non-compliant with the flexor tendon rehabilitation protocol in order to receive the disability grant.

More research is needed in this area regarding the benefits of disability grant and the dependence that develop from receiving this disability grant. The therapist, who is referring a patient, must include in the referral letter the protocol that they used in order for the receiving therapist to continue with the same protocol. All therapy departments need to have flexor tendon rehabilitation protocols or clinical guidelines to guide their clinical practice, especially the rural districts because the majority of the therapists indicated that they do not have these protocols in their departments.

Hand clinics that involve multidisciplinary teams can improve communication between the therapist, doctors and nurses. The undergraduate curriculum for therapists should include more flexor tendon rehabilitation theory and practical. Studies can be done to evaluate the effectiveness of the current curriculum

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APPENDIX I

University of Kwa-Zulu Natal
Private Bag X 54001
Durban
4000
01 July 2011

Dear Hospital Manager/ Therapy HOD
RE: Physiotherapy and Occupational Therapy Services

My name is Nomzamo Mncube. I am currently studying towards a Masters in Hand Rehabilitation at the University of Kwa-Zulu Natal. I am conducting research to determine the practices, attitudes and experiences of public sector physiotherapists and occupational therapists in post-operative rehabilitation of flexor tendon injuries. I would be grateful if your staff could participate in this study, although they are free to elect not to participate should they so wish.

This phase of the research requires completion of a questionnaire. The questionnaire takes about fifteen minutes to complete and contains mostly multiple choice answers.

(The second phase of the study will be in a form of 1 hour focus group discussions). You will be notified in advance if any of your staff are selected to join this discussion, at which time further details will be included).

Kindly keep all the completed questionnaires in your department. The questionnaires will be collected from you by the researcher. The time frame for completing the documentation is one week.

Included in this letter are the short information sheet, consent form and relevant questionnaire.

Thanking you in advance for your time and participation in this research study. Please feel free to contact me if you have any queries.

Sincerely,

Nomzamo Mncube
B Physiotherapy
zamamnc@yahoo.com

APPENDIX II

Information Sheet

Good day

My name is Nomzamo Mncube. I am a post graduate student doing a research on the practices, attitudes and experiences of the public sector physiotherapists and occupational therapists in management of flexor tendon injuries post operatively. This research is in partial fulfillment of the requirements for the Masters in Hand Rehabilitation at the University of Kwa-Zulu Natal

Why is this study important?

Flexor tendon injuries are reported as the most complicated and difficult injuries to manage surgically and postoperative rehabilitation is a challenge. It is therefore important to know the current practices for consistency in application of the protocols. This information will assist with the increase of knowledge of the possible relevant protocols to be used for our patients. This information will also assist in planning for future studies related to therapist management of these injuries.

What would you be expected to do?

You will be required to fill in and sign a consent form and complete the attached questionnaire. The completed consent form must be kept separate from the questionnaires. Physiotherapists and occupational therapists working in the public sector will be given the opportunity to participate in this study. This phase of the research requires completion of a questionnaire. The questionnaire takes about fifteen minutes to complete and contains mostly multiple choice answers.

The second phase of the study will be in a form of 1 hour focus group discussions. You will be notified in advance if you are one of those randomly selected to join this discussion, at which time further details will be included.

Kindly keep all the completed questionnaires in your department. The questionnaires will be collected by the researcher. The time frame for completing the documentation is one week.

Participation is completely voluntary and you may withdraw at any time. You will not suffer any consequences and you do not have to provide a reason should you decide not to participate.

What are the benefits to the participants?

Information collected will be analyzed. It could highlight areas regarding the rehabilitation of flexor tendon injuries where more physiotherapy and occupational therapy is needed. Feedback on the findings will be shared with the therapists in a form of a presentation where therapists will be invited to attend in one venue and also a possible publication.

Will information be handled as confidential?

Names of participants will only be written on the consent form not on the questionnaire. Consent forms will be kept separately from the questionnaires. All information will be confidential and will only be used as part of this study. Participants will receive a copy of the consent form.

For more information, or if you have any questions, please do not hesitate to call or email me. Thank you for your participation.

Kind regards

Nomzamo Mncube
Principal Investigator

Prof T.Puckree
Supervisor

Nomzamo Mncube, Masters Student at UKN
Cell: 0731 3369 44, fax: 0867305618 Email: zamamnc@yahoo.com

For further information contact Nomzamo (Zama) Mncube the Principal Investigator, or her supervisor, Prof T.Puckree (pukcree@dut.co.za), or Biomedical Research Ethics Committee of UKZN (031-260 4769) brec@ukzn.ac.za : Faculty of Health Sciences, Westville Campus, P/Bag X 54001, Durban 4000

APPENDIX II

Consent Form (Questionnaire)

I _____ hereby agree to participate in the study as described to me in the information sheet. By signing this form I am agreeing to filling in the questionnaire seeking information on the physiotherapy and occupational therapy postoperative flexor tendon rehabilitation.

I understand that there are no monetary rewards for my participation and that I am not obliged to take part and can withdraw from the study at any given time.

Signature: _____

Date: _____

Nomzamo Mncube, Physiotherapist, Masters Student at UKZN
Cell: 0731 3369 44, fax: 0867305618 Email: zamamnc@yahoo.com

For further information contact Nomzamo (Zama) Mncube the Principal Investigator, or her supervisor, ProfT.Puckree (pukcree@dut.co.za) or Biomedical Research Ethics Committee of UKZN (031-260 4769) brec@ukzn.ac.za : Faculty of Health Sciences, Westville Campus, P/Bag X 54001, Durban 4000

APPENDIX II

Consent Form (Focus group)

I _____ hereby agree to participate in the study as described to me in the information sheet. By signing this form I am agreeing to participate in a focus group discussion that is seeking in depth information on the physiotherapy and occupational therapy postoperative flexor tendon rehabilitation.

I understand that there are no monetary rewards for my participation and that I am not obliged to take part and can withdraw from the study at any given time.

Signature: _____

Date: _____

Nomzamo Mncube, Physiotherapist, Masters Student at UKZN
Cell: 0731 3369 44, fax: 0867305618 Email: zamamnc@yahoo.com

For further information contact Nomzamo (Zama) Mncube the Principal Investigator, or her supervisor, ProfT.Puckree (pukcree@dut.co.za) or Biomedical Research Ethics Committee of UKZN (031-260 4769) brec@ukzn.ac.za : Faculty of Health Sciences, Westville Campus, P/Bag X 54001, Durban 4000

APPENDIX III

Dear Participant

Your participation in this study will be appreciated. This questionnaire is based on the standardised questionnaire developed by Gail Groth 2005.

QUESTIONNAIRE FOR PHYSIOTHERAPISTS AND OCCUPATIONAL THERAPISTS

Guidelines for completing the questionnaire

I am collecting information on practice patterns of therapists who rehabilitate persons with flexor tendon (FT) injuries, specifically, [**typical patient**] uncomplicated tendon lacerations to the FDP and FDS without digital nerve injury in one or more digits in adult patients. This information will assist in planning for future studies related to therapist's management of these problems.

1. Please answer the following questions by marking your choice with a cross (x) in the appropriate block or space provided next to your answer.
 2. Please circle the correct answer for yes/no(Y/N) questions
 3. Anonymity is assured as your name or the name of your hospital is not required
 4. All raw data will be treated confidentially
 5. Please complete all questions and only Section F if you have not done FT rehab in the last 5 years.
 6. Thank you for participating in the study
-

SECTION A: WORK EXPERIENCE/PROTOCOL

A1. How many patients with flexor tendon repairs have you dealt with in the past five years, please estimate:

A:Estimate no.	<input type="text"/>
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If your answer to A1 is zero, please answer section K only.

A2.Do you have flexor tendon rehab clinical guidelines /protocols in your department? Y/
N

A3. Which protocol or protocols do you follow when rehabilitating flexor tendon patients?

A: Early passive mobilization using Kleirnert splints with rubber bands	
B: Early passive mobilization using Duran splints, without rubber bands	
C: Immobilization-no active /passive ROM 1 st 3 weeks	
E: Treat representing symptoms	
Other	

A4 The typical patient (see intro.to survey) is rehabilitated in a faster or slower time from that recommended in his/her protocol.

A: Never	B: Seldom	C: Sometimes	D: Nearly always	E: Always
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A5. When, post operatively do you typically commence the following exercises?
(Week= wk)

	Day 1	Day 2	Day 3	1 st wk	2 nd wk	3 rd wk	4 th wk	5 th wk	6 th wk	7 th wk	Other	Comment
A: Passive finger flexion												
B: Active finger extension												
C: Passive finger extension												
D: Place and hold												
E: Active finger flexion												
F: Resisted extension												

A6. How many degrees of flexion is the wrist normally splinted in? _____

A7. In what position is the MPJ normally splinted (incl. degrees)? _____

A8. **PTs ONLY:** Do you use electrotherapy in the management of FT injuries? Y / N

A9.If yes, which modalities do you usually use:

SECTION B: INITIATION OF THERAPY.

B1.On what post-operative day is rehabilitation typically initiated?

A:1-3	B:4-6	C:7-10	D:11- 14	E:>15
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B2.This (these) professional(s) decide when therapy should be initiated:

A:Doctor(Dr)	B:Therapist	C:Dr&Therapist	D:Other
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B3. How many days postoperatively do you think therapy should begin?

A:1-3	B:4-6	C:7-10	D:11- 14	E:>15
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B4.The reason(s) therapy is initiated in the typical patient includes:

A:number of days post op	B:Drs order	C:ROM measurement s	D:Suture technique	E:established protocol	F:compliance issues	G:other
--------------------------	-------------	------------------------	--------------------	------------------------	---------------------	---------

SECTION C: FREQUENCY OF THERAPY VISITS

C1.This (these) professional(s) decide the frequency of scheduled therapy visits

A:Doctor(Dr)	B:Therapist	C:Dr&Therapist	D:Other
--------------	-------------	----------------	---------

C2. How often do you typically see your patients for rehabilitation in the first month?

A:1x/week	B: 2x/week	C:3x/week	D:1x/month	E:other
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C3How many times do you think patients should be scheduled for ,in the first month?

A:1x/week	B:2x/week	C:3x/week	D:1x/month	E:other
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C4.The reason(s) the frequency of therapy visits is decided in the typical patient includes:

A:number of days post op	B:Drs order	C:ROM measurement s	D:Suture technique	E:established protocol	F:compliance issues	G:other
--------------------------	-------------	------------------------	--------------------	------------------------	---------------------	---------

SECTION D: INITIATION OF ACTIVE MOTION (defined as contraction of the flexor muscle(s) sufficient to produce some amount of active flexion of the involved digit; differentiated from place and hold [passive flexion followed by active hold]).

D1. This (these) professional(s) decide when to initiate ROM exercises for my patients:

A: Doctor(Dr)	B: Therapist	C: Dr & Therapist	D: Other
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D2. How many days post operatively do you typically begin active ROM exercises?

A: 0-6	B: 7 - 13	C: 14-20	D: 21 - 27	E: Other
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D3. How many days after surgery do you think active ROM exercises should begin?

A: 0-6	B: 7 - 13	C: 14-20	D: 21 - 27	E: Other
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D4. The reason(s) active ROM exercise is initiated in the typical patient includes:

A: number of days post op	B: Drs order	C: ROM measurement s	D: Suture technique	E: established protocol	F: compliance issues	G: other
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SECTION E: DISCONTINUATION OF PROTECTIVE SPLINT

E1. This (these) professional(s) decide when to discontinue protective splinting for my patients:

A: Doctor(Dr)	B: Therapist	C: Dr & Therapist	D: Other
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E2. How many weeks (wks) post op is the protective splinting typically discontinued?

A: 4wks	B: 5wks	C: 6wks	D: 7wks	E: other
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E3. How many weeks post op do you think protective splinting should be typically discontinued?

A: 4	B: 5	C: 6	D: 7	E: Other
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E4. The reason(s) protective splinting is discontinued in a typical patient includes:

A: no. of days post op	B: Drs order	C: ROM measurement s	D: Suture technique	E: established protocol	F: compliance issues	G: other
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SECTION F: INITIATION OF RESISTANCE

F1.This (these) professional(s) decide when to initiate resistive exercises for my patients:

A:Doctor(Dr)	B:Therapist	C:Dr&Therapist	D:Other
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F2 How many weeks post op do patients typically begin resistive exercises?

A: 4	B:5	C:6	D:7	E:8
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F3. How many weeks post op do you think resistive exercises should begin?

A: 4	B:5	C:6	D:7	E:8	E:other
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F4.The reason(s) resistive exercises in initiated in a typical patient includes:

A:no.of days post op	B:Drs order	C:ROM measurement s	D:Suture technique	E:established protocol	F:compliance issues	G:other
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SECTION G: PIP FLEXION CONTRACTURE

G1.I rehabilitate PIP flexion contractures of >20 degrees during the course of therapy

A:Never	B:Seldom	C:sometimes	D:Nearly always	E:always
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G2.My typical patient has a PIP joint flexion contracture at discharge.

A:Never	B:Seldom	C:sometimes	D:Nearly always	E:always
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SECTION H: OUTCOMES

H1.I typically measures the outcome of flexor tendon rehabilitation with:

A:ROM measures	B;Strickland's formula	C:Grip	D:Pinch	E:Functional independence	F:Other _____ _____ _____
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H2.Estimate the final outcome of your last patient as specifically as possible:

SECTION I: RUPTURE

I1.How many year(s) ago did your most recent case of tendon rupture occur?

A:Never	B:1	C:2	D: >3	E:other
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I2 Briefly describes the cause of that rupture from the perspective of:

The

patient _____

Yourself _____

Surgeon _____

SECTION J: GENERAL ATTITUDES

J1. I am apprehensive about how to progress these patients through rehabilitation

A:Never	B:Seldom	C:Sometimes	D:Nearly	E:Always
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J2. My next patient is likely to experience a poor outcome.

A:strongly disagree	B:disagree	C:uncertain	D:agree	E:strongly agree
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J3. My next patient is likely to experience a successful outcome.

A:strongly disagree	B:disagree	C:uncertain	D:agree	E:strongly agree
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J4. I occasionally prescribe therapy that the referring physician might disagree with

A:strongly disagree	B:disagree	C:uncertain	D:agree	E:strongly agree
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J5. When a patient experiences a poor outcome this is most likely due to **(please rank the top 3 factors)**:

Non-compliance with HEP	Insurance/DG issues	Poor attendance
Non-compliance with splints	Poor Dr-therapist communication	Socio-economic factors
Inadequate patient education	Multiple therapists	Biophysical factors
age	General health of patients	Severity of injury
other		

J6. When a patient experiences a successful outcome this is likely due to (rank top 3 factors)

Compliance with HEP	age	Experienced therapist
Compliance with splint	Good Dr/therapist communication	Biophysical factors
Adequate patient education	Individualized rehab	Socio-economic factors
General health of the patient	Other	

J7. Does the place of your patients employment affect the frequency of the therapy visits Y/
N

J8. How often do you receive disability grant requests from post op flexor tendon patients?

A:Never	B:Seldom	C:sometimes	D:Nearly always	E:always
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J9. Do you think that disability grants help with patient compliance to scheduled treatment?

A:Never	B:Seldom	C:sometimes	D:Nearly always	E:always
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SECTION K: BIOGRAPHICAL INFORMATION

K1. What year were you born: _____ K2. Gender: _____

K2. Select the appropriate answer by making a cross (x) on the appropriate box

A:Physiotherapist	B:Occupational therapist
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K3 How long have you worked as a PT/OT _____

K4. What is your highest qualification?

A: Bachelor's degree	B: Master's degree	C: PHD	D: Other _____
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K5. Do you have any additional training in hand rehabilitation? Y / N

K6. Which hospital environment/setting do you work in?

A: Tertiary	B: Regional	C: District	D: other _____
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K7. How many years (yrs) of hand therapy practice experience do you have?

A: <1	B: 1- 4	C: >5	D: none
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K8. Do you see adult hand rehab out patients in your hospital Y / N

THANK YOU



health

Department:
Health
PROVINCE OF KWAZULU-NATAL

Health Research & Knowledge Management sub-component
10 – 103 Natalia Building, 330 Langalibalele Street
Private Bag x9051
Pietermaritzburg
3200
Tel.: 033 – 3953189
Fax.: 033 – 394 3782
Email.: hrkm@kznhealth.gov.za
www.kznhealth.gov.za

Reference : HRKM160/10
Enquiries : Mrs G Khumalo
Telephone : 033 – 3953189

20 May 2011

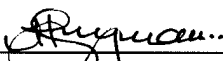
Dear Ms N Mncube

Subject: Approval of a Research Proposal

1. The research proposal titled '**A study to determine the practices, attitudes and experiences of public sector physiotherapists and occupational therapists in the post operative rehabilitation of flexor tendons**' was reviewed by the KwaZulu-Natal Department of Health.
The proposal is hereby **approved** for research to be undertaken at selected hospitals at **eThekwini and Ugu Districts**.
2. You are requested to take note of the following:
 - a. Make the necessary arrangement with the identified facility before commencing with your research project.
 - b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.
3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mrs G Khumalo on 033-3953189.

Yours Sincerely



Mrs E Snyman

Interim Chairperson, Health Research Committee
KwaZulu-Natal Department of Health

Date: 25/05/2011

uMnyango Wezempilo. Departement van Gesondheid

Fighting Disease, Fighting Poverty, Giving Hope



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KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

RESEARCH OFFICE
Biomedical Research Ethics Administration
Westville Campus, Govan Mbeki Building
Private Bag X 54001
Durban
4000

KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609

Email: BREC@ukzn.ac.za

Website: <http://research.ukzn.ac.za/ResearchEthics/BiomedicalResearchEthics.aspx>

09 June 2011.

Ms N Mncube
PO Box, 423
Uvongo
4270

Dear Ms Mncube

PROTOCOL:A study to determine the practices, attitudes and experiences of public sector physiotherapist and occupational therapist in management of flexor tendon injuries post operatively. REF:BE218/010

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application dated 28 October 2010.

The study was provisionally approved pending appropriate responses to queries raised. Your responses final responses dated 09 June 2011 to final queries raised on 07 June 2011 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 09 June 2011.

This study is approved for the hospitals in the Ethekewini and Ugu district.

This approval is valid for one year from **09 June 2011**. To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at <http://research.ukzn.ac.za/ResearchEthics11415.aspx>.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its next meeting taking place on **12 July 2011**.

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

A handwritten signature in black ink, appearing to read 'D.R. Wassenaar', written in a cursive style.

Professor D.R Wassenaar
Chair: Biomedical Research Ethics Committee