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THE FACTORS AFFECTING PHYSIOTHERAPY REHABILITATION IN PATIENTS FOLLOWING AN OPEN ROTATOR CUFF REPAIR

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Physiotherapy

Johannesburg, 2010

DECLARATION

I, Tamarin Claire Chivers, declare that this research report is my own work. It is being submitted for the degree of Master of Science in Physiotherapy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

_____

Tamarin Claire Chivers

_____ day of _____ 2010

DEDICATION

To my parents for their endless support;

To my brother and friends for their continual encouragement

ABSTRACT

Introduction

Rotator cuff tears can cause great impairment of the shoulder joint with debilitating pain and dysfunction. The surgical repair of rotator cuff tears result in an extensive rehabilitation being required. This process can be affected by various demographic, surgical and rehabilitative factors. There appear to be no studies relating these factors to the rehabilitation process. The aim of this study was to determine the prevalence of partial and full thickness tears seen in one physiotherapy practice over the period of four and a half years. It also was to identify and analyse the factors affecting the amount of physiotherapy following a rotator cuff repair.

Methods

This was a retrospective record review. It was also a cross sectional correlational study.

Results

The prevalence of partial and full thickness rotator cuff tears seen over a period of four and a half years in one physiotherapy practice is very similar. Partial thickness tears constituted 46% of the entire sample and full thickness made up 54% of the sample. Four out of eleven factors were found to be associated with the amount of physiotherapy received after a rotator cuff repair. These factors included the age of the patient, whether the patient was injured on duty,

preoperative physiotherapy and additional procedures after surgery such as a revision of the repair or a manipulation of the shoulder.

Conclusion

There are only a few factors shown to be associated with the rehabilitation process after a rotator cuff repair. These factors would need to be correlated against outcome in future studies.

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CHAPTER 1

1.0 INTRODUCTION

In the orthopaedic physiotherapy setting, patients are commonly seen following a rotator cuff repair. The prevalence of rotator cuff tears ranges from 5%- 33% (Fukuda 2003, Pai et al 2001). The most common lesion of the rotator cuff occurs in the supraspinatus muscle (Fukuda 2003; Lam et al 2004). Lesions can be subdivided into partial and full thickness tears.

It is generally accepted practice that patients undergoing surgical repair of a rotator cuff tear, will require post operative physiotherapy. To date, there are few studies evaluating the effectiveness of physiotherapy after a rotator cuff repair. There are many studies on the outcome of a rotator cuff repair, however, very few relate to the specific factors that may influence the rehabilitation process. This study will endeavour to identify specific factors and their influence on the rehabilitation process.

In today's current economic situation, cost to the patient or a loss of productivity in the case of a workman's compensation claim, is an important issue. Hayes et al (2004) investigated the difference between an individualised physiotherapy rehabilitation programme and an unsupervised standardised home exercise regime following a rotator cuff repair. It was found in the long term that passive shoulder range of motion, muscle strength and the patient's functional ability was much the same irrespective of the rehabilitation method. However, a substantial

number of patients from the unsupervised group requested additional physiotherapy involvement indicating a preference to more individualised supervision.

Many studies have been done investigating a patient's preoperative expectation and final outcome following joint arthroplasties and spinal surgery (Mahomed et al 2002; Lutz et al 1999; Iversen et al 1998). It is accepted that clinicians should discuss expectations with the patients pre-operatively as this is shown to have positive associations with their recovery. A recent study by Henn et al (2007) to determine whether this holds true for rotator cuff repairs as well, concluded that a patient's preoperative expectation is significantly correlated with their actual self assessed outcome.

This confirms the importance of this study. Knowledge of the factors affecting the physiotherapy rehabilitation will allow the treating physiotherapist to better inform the patient at the commencement of rehabilitation of expected time frames and outcomes and as such improve their preoperative expectations. This may also lead to a more cost effective service to the patient as a positive expectation may improve compliance to physiotherapy as well as any home exercise programme given.

1.2 PROBLEM STATEMENT

The influence of demographic, surgical and rehabilitative factors on the physiotherapy rehabilitation in patients following an open rotator cuff repair has not yet to be established.

1.3 AIM OF THE STUDY

The aim of this study is to identify and analyse the factors affecting the amount of physiotherapy following an open rotator cuff repair.

1.3.1 OBJECTIVES OF THE STUDY

The objectives of this study were:

- To identify the prevalence of partial and full thickness tears seen in one physiotherapy practice over the period of four and a half years.
- To identify demographic, surgical and rehabilitative factors in patients following a rotator cuff repair
- To establish whether there is a relationship between these factors and the amount of physiotherapy received.

It is hoped that the significance of this study will be to identify the demographic, surgical and rehabilitative factors that influence the rehabilitation of rotator cuff repairs and thus lead to improved pre-operative counselling of the patient with the ultimate goal of more effective rehabilitation.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will review current literature regarding the factors chosen to be analysed in this study. The factors were chosen based on common findings in the literature although not yet explored in relation to the rehabilitation of rotator cuff repairs.

Rotator cuff injuries are a common orthopaedic condition seen in physiotherapy practice with patients complaining of pain and the inability to move the shoulder. After surgical repair of a rotator cuff tear, pain, stiffness and muscle weakness often result in a substantial amount of rehabilitation being required.

The prevalence of rotator cuff tears, partial or full thickness, appears to be very similar. Pai et al (2001) reported an incidence of full thickness rotator cuff tears as ranging from 5% - 33%. This is comparable to that shown for partial thickness rotator cuff tears, with an incidence of 10%-32% (Fuduka 2003). However, one study reported that the incidence of partial thickness rotator cuff tears can be double that of full thickness rotator cuff tears (Matava et al 2005). This is due to the increased awareness of the condition, better diagnostic methods and hence more diagnoses of partial thickness tears.

When related to outcome, rotator cuff repairs are primarily successful as seen in many studies (Porat et al 2008; Lahteenmaki et al 2007; Pai et al 2001). Henn et

al (2007) investigated outcome further and discovered that a patient's preoperative expectation is associated with their actual self assessed outcome.

It is generally accepted practise that patients undergoing a rotator cuff repair will require rehabilitation after surgery, with few studies investigating the rehabilitation process. Hayes et al (2004) evaluated the difference in outcome between patients who received physiotherapy on an individual basis versus purely a home exercise programme. It was concluded that all patients included in the study showed consistently favourable results regardless of the method of rehabilitation. An earlier study by Roddey et al (2002) made a similar discovery. In this study, instructions to the exercise programme were either given through a videotape or the patients were personally instructed. It was again found that both groups of patients reported equal outcomes.

There are many studies that have aimed at determining the factors affecting outcome in patients who have undergone a rotator cuff repair. Pai et al (2001) made a comment that these prognostic factors in the literature are often conflicting and confusing. However, none of these factors have been related to the amount of physiotherapy that the patient receives.

The literature review was conducted under the following subheadings:

2.2 Gender

2.3 Age

2.4 Injury on duty

2.5 Dominant side and side of the operated shoulder

2.6 Mechanism of injury

2.7 Type of tear: partial or full thickness

2.8 Type of sling: Barford Jones or Abduction sling

2.9 Timing of the surgery and duration of symptoms

2.10.1 Additional procedures: preoperative physiotherapy

2.10.2 Additional procedures: revision of surgery

2.10.3 Additional procedures: manipulation following primary repair

2.11 Infection after repair

2.2 GENDER

There are various theories when considering gender and rotator cuff tears. Gender on its own is seldom investigated, rather, it is in comparison with other factors. Numerous studies have shown a similar finding in that females tend to have poorer outcomes following shoulder surgery, however, this was found generally with advancing age (Lam et al 2004; Romeo et al 1999). This is in comparison to males where age at the time of surgery showed no relationship to final outcome. Males also had less postoperative pain compared with females as well as better postoperative active range of movement of abduction (Cofield et al 2001). The authors have no reasonable explanation for the adverse effects of the female gender on the outcome measures. Excluding the objective outcome, it was found that demographic variables, including gender, showed no significant impact on patient satisfaction post rotator cuff repair (O' Holleran et al 2005). There have been no studies investigating the effect of gender on rehabilitation.

2.3 AGE

Regardless of the type of tear, the prevalence of a rotator cuff tear is shown to increase with age (Fehringer et al 2008; Oh et al 2007; Sorensen et al 2007), considerably so after the age of 40 years (Fukuda 2003). Lam et al (2004), reported that 28% of patients with full thickness tears were over the age of 60. The question under much debate is whether surgical repair of a tear in the elderly is worthwhile considering there are often associated co-morbidities with increasing age and fragility. Lam et al (2004) comments that the patient's age is an unreliable predictor of outcome when comparing his results with other studies. Pai et al (2001) reported no poorer outcome as a result of advancing age as is confirmed by Grondel et al (2001) who reported an 87% rate of good or excellent results with patients over the age of 62 years. Watson et al (2002) reported that patients younger than 55 years of age surprisingly showed poorer results based on patient self assessments. They considered this result to be due to the younger patient's higher expectation and higher demands for ADLs and work related activities.

Therefore, age as its own entity should not be a determining factor when deciding on surgical repair of a rotator cuff tear rather other factors need to be considered as well. These might include activity level, vocational use of the shoulder and independence during activities of daily living. There is also little evidence on the effect of age on the rehabilitation process.

2.4 INJURY ON DUTY

This factor was included on the basis that the physiotherapy practice chosen for the purpose of this study treats relatively equal numbers of medical aid and

workman's compensation patients. Rotator cuff injuries are rated second compared to back and neck pain when assessing injuries in the workplace (Largacha et al 2006). Rotator cuff tears that result in surgical repair, require a prolonged recovery and rehabilitation time (Van Linthoudt et al 2003; Rokito et al 1999). This can greatly affect work productivity, especially in the South African labour force where there potentially could be a greater risk for such an injury. This could be due to the high demands placed on the shoulder during heavy duty physical manual work often seen in construction workers or the like thereof.

Watson et al (2002) showed a significantly lower satisfaction rate with regards to overall outcome with patients who have a workman's compensation claim. This is confirmed in a study by Henn et al (2008) who reported not only poor satisfaction levels, but generally worse outcomes too. Interestingly, in a more recent study by Tashjian et al (2007), there was a significant correlation between satisfaction after surgery and working status especially in patients who were currently employed. It was suggested that this may be due to the fact that patients who are employed may have a better emotional view on life with a good social support system and this positively influences their outcome. It was not specified whether these patients were injured at work and thus receiving workmans compensation or whether the injury was unrelated to their work. Several other studies have reported a significantly longer recovery time for patients with a workman's compensation claim to return to work as well as returning to a lower activity level (Iannotti et al 1996; Hawkins et al 1985) however these studies are rather dated and this has not been confirmed in more recent studies.

2.5 DOMINANT SIDE AND SIDE OF OPERATED SHOULDER

There are very few studies evaluating dominance and the influence of the side of the operated shoulder on outcome. Lahteenmaki et al (2007) reported that 73-77% of patients had tears of their dominant side. This is confirmed by Sorensen et al (2007), but he further commented that although there was a tendency towards the dominant side being more affected, it was not of any significant value. In a study investigating the ultrasonographic changes of the rotator cuff in veteran tennis players, it was found that any abnormalities found in the rotator cuff was predominantly in the dominant shoulder. This may suggest that abnormalities could be related more so to the side of the shoulder used more frequently (Brasseur et al 2004). Although this is an extreme population, it may suggest some evidence for injury where the dominant shoulder is used in other unilateral activities.

With particular reference to the side of the operated shoulder, Sorensen et al (2007) found an equal distribution of injuries to the left and right shoulder with no significant influence. No other relevant articles were found regarding side of the operated shoulder.

2.6 MECHANISM OF INJURY

Disorders of the rotator cuff are generally thought to be multifactorial in aetiology. It can be either from intrinsic tendon degeneration or extrinsic mechanical factors.

It is often considered that rotator cuff tears are due mainly to degenerative changes whereby there are chronic attritional changes as a result of impingement

as described by Neer (1972). However, direct trauma, as the mechanism of injury, is as high as 77% (Lahteenmaki et al 2007). Sorensen et al (2007) state that 40-72% of patients report trauma to the shoulder in their history. At the time of trauma, they did not realise the severity of the injury nor its potential as the cause of their problems. Furthermore, tears of the rotator cuff are often missed in traumatic cases when the more common pathology such as a fracture or dislocation is excluded thereby delaying the repair of the tear.

Braune et al (2003) compared the postoperative shoulder function in traumatic and non-traumatic rotator cuff tears. They found that generally the repair of both these groups was successful, however, the younger traumatic group showed significantly better postoperative results with reference to the Constant-Murley Functional Assessment of the Shoulder Score (1987) as well as range of movement. Further consideration in non-traumatic tears, besides the potential for poorer outcome with regards to range of movement, particularly external rotation, is that an intact rotator cuff is crucial to prevent cuff arthopathy and subsequent glenohumeral arthritis and is therefore important to repair anyway (Braune et al 2003).

2.7 TYPE OF TEAR: PARTIAL OR FULL THICKNESS

Following on from the mechanism of injury, is whether the tear is partial or full thickness and how this relates to its rehabilitation.

Partial thickness tears are when there is a disruption of fibres within the tendon but the tear does not extend to the subacromial bursa or the glenohumeral joint. These tears can be graded according to the depth of the tear from grade I to grade

III whereby a III involves more than half of the thickness of the tendon. Partial thickness tears are generally found in the supraspinatus muscle, however, they may extend to infraspinatus muscle as well. An interesting point made by Fukuda (2003) is that there appears to be no spontaneous healing of a partial thickness tear and that 80% of these tears will progress to become full thickness tears.

In a full thickness tear, the continuity of the muscle fibres is disrupted often resulting in retraction of the proximal fibres (Solomon et al 2005). A full thickness tear may result as a complication of a partial rupture. Full thickness tears involve the entire depth of the tendon and can be classified as either small to massive in size. There may or may not be detachment from its insertion on the humeral head. As a result of this, it is possible to have an asymptomatic full thickness tear, however, the proportion of this is not known (Lahteenmaki et al 2007). The size of the tear has often been stated as being the dominant factor affecting the final outcome of surgery (Lahteenmaki et al 2007; Pai et al 2001). Many studies advocate the surgical repair of rotator cuff tears, particularly full thickness, regardless of the tear size, and more importantly when the predominate factor is pain. However, Braune et al (2003) found that the type of tear, partial or full thickness, did not influence the postoperative shoulder function. A limitation was that this was found to be true only in traumatic tears.

Regardless of the type of tear, most articles recommend the surgical repair of rotator cuff tears (Porat et al 2008, Lahteenmaki et al 2007, Pai et al 2001), however, none comment on the effect of the type of tear on the rehabilitation process.

2.8 TYPE OF SLING

Immobilisation and limited use of the operated arm is required to allow for adequate healing and protection of the soft tissues (Maxey & Magnusson 2007). The sling will decrease the forces acting on the supraspinatus tendon to minimise pain. An interesting concept is the existence of the critical zone as described by Lohr et al (1990). It describes the vascular pattern on the supraspinatus tendon where there is an anastomoses between the osseous vessels and vessels within the supraspinatus tendon. This critical zone is an area of hypovascularity and is evident when the arm is in a resting dependent position. It is therefore suggested that in order to reduce shoulder discomfort after surgery and to put the arm in the optimal position allowing for the best vascular supply, an abduction sling is the preferred choice. Considering these conclusions, it has yet to be investigated whether the use of an abduction sling affects the recovery during the rehabilitation process.

There is not very much literature supporting the use of one type of sling over the other. Cofield et al (2001) suggest that the type of sling used is based on the amount of tension on the repaired tendon as seen at the time of the surgery. In their study, three types of slings were used: a standard shoulder immobiliser, a low angled (30º) humeral abduction splint and a low angled shoulder spica cast. It was concluded that the type of post operative immobilisation has no significant effect on outcome. This is confirmed by Pai et al (2001) who also further commented that the problem with an abduction sling is the discomfort for the patient and many cannot tolerate it.

2.9 TIMING OF THE SURGERY AND DURATION OF SYMPTOMS

It has been suggested that failure of three to six months of conservative treatment is the threshold for considering surgery (Matava et al 2005), however, there is still much debate about the timing of surgery with little consensus on the optimal duration of a nonoperative treatment trial (Oh et al 2007). Early surgery has been suggested for full thickness rotator cuff tears as being more favourable allowing for faster return of muscle function and tendon elasticity. This is of particular importance in large and massive tears (Lahteenmaki et al 2007). However, in a study by Pai et al (2001) and Duralde et al (2008), the authors found there to be no significant difference between the timing of the surgery and hence the duration of the symptoms and outcome, whether it be satisfactory or unsatisfactory. This is negated by Bassett and Cofield (1983) who suggested that early repair is associated with better outcome and greater range of movement. The problem with determining the exact duration of symptoms is that the aetiology of the rotator cuff tear is often degenerative in nature rather than due to a single traumatic event and therefore difficult to establish the time of onset. Therefore, often the timing of surgery is based more on the preferences of the surgeon as solid evidence based data regarding guidelines for treatment are limited. One would need to investigate the history of the shoulder pathology to get an idea of the time the shoulder was injured initially thereby determining the duration of the symptoms. Once this has been determined, one can make an association between the time to surgery and its effect on the rehabilitation.

2.10 ADDITIONAL PROCEDURES

2.10.1 PREOPERATIVE PHYSIOTHERAPY

Many surgeons initially opt for conservative management of rotator cuff pathology before performing surgery. Successful non-operative treatment includes physiotherapy and medication and ranges from less than 50% to greater than 90% (Oh et al 2007). Preoperative physiotherapy is not advocated in younger age groups and in patients who present with a limited range of movement and weak abduction (Pai et al 2001). There are further suggestions on the negative effects of initial conservative management. During conservative treatment and as a result of the tension of the tendon, the rotator cuff may slowly retract and result in a further loss of elasticity. This may cause a more difficult repair and a resultant impairment in outcome should the need arise for surgery at a later stage (Lahteenmaki et al 2006). With a partial thickness tear, the remaining intact fibres are thought to potentially be of poor quality depending on the mechanism of injury, particularly if the aetiology was degenerative in nature, and therefore it is suggested that there is a much higher possibility of re-rupture (Parat et al 2008). Yamanaka et al (1994) investigated patients in a two year period who were treated conservatively and found that 80% progressed to full thickness tears. This is of obvious concern when considering the optimum management including preoperative physiotherapy. Oh et al (2007) reported that there are certain predictive factors when conservative management might fail. These include: tears greater than 1 cm^2, a history of symptoms longer than one year and severe limitation of functional abilities. However, Pai et al (2001) was in agreement with many other studies saying that limited preoperative range of movement and strength can result in a higher risk of a poorer outcome and therefore one can assume the benefit of preoperative

physiotherapy. In light of these statements, it needs to still be explored whether preoperative physiotherapy treatment can result in a reduced rehabilitation time post surgery.

2.10.2 REVISION OF SURGERY

Persistent pain is often the primary indication for patients to undergo a revision of a rotator cuff repair, however, a re-tear rate as high as 90% has been reported but, on average, most studies report a re-tear rate ranging from 25% to 35% (Cummins et al 2003).

Failure of the primary repair could be the result of poor quality cuff tissue or atrophy, larger tears, persistent impingement, non compliance with physiotherapy or inadequate immobilisation (Djurasovic et al 2001; Bigliani et al 1992). Mechanical faults as potential causes of re-tearing include anchors pulling out of the bone and inferior suture material resulting in breakage or loosening of the surgical knot. Cummins et al (2003) concluded in his study that the tendon pulling through the sutures is the most common mechanism of failure. In a study by Sherman et al (2008), who identified the risk factors for revision surgery following a rotator cuff repair, it was found that the independent risk factors for a revision include increasing age, additional comorbidities and lower surgeon volume. This latter factor can be related to a study by Dunn et al (2005) who found that surgeons with a lower procedure volume are more pessimistic about the results of surgery.

Failure of revision surgery could again be from poor quality cuff tissue, deformity of deltoid muscle as a result of the deltoid detachment performed during the lateral acromionectomy, trauma and infection. Cofield et al (2001) and Bigliani et al (1992) found that most revision of repairs was done in patients who had massive tears initially.

There is conflicting evidence concerning revision of a rotator cuff repair and its outcome. Many studies have reported a poorer outcome with repeated surgery (Cummins et al 2003, Djurasovic et al 2001) and a deterioration in clinical results with repeated attempts. However, Watson et al (2002) in part disagrees. The fact that there was a great improvement in the reduction of pain was considered a satisfactory result.

Satisfactory results are associated with an intact deltoid origin, good quality of the remaining cuff tissue, preoperative active range of movement above shoulder height and only one prior surgery (Djurasovic et al 2001).

2.10.3 MANIPULATION FOLLOWING PRIMARY REPAIR

There is much literature on the success of rotator cuff tears, whether it be through the open technique or done arthroscopically, but there is little regarding the management of shoulder stiffness associated with a rotator cuff tear. In this context, shoulder stiffness is defined as a passive limitation in range of movement of flexion and external rotation (Cho & Rhee 2008). This poses a challenging task as some authors suggest that shoulder stiffness be treated first because a rotator

cuff repair may further increase stiffness postoperatively, however, due to the rotator cuff lesion, this may not always be possible (Hsu et al 2007).

The pathogenic mechanism for the development of secondary shoulder stiffness is similar to those for the primary frozen shoulder, including tissue contracture in response to cytokines, inflammatory cell products and platelet derived growth factor. Soft tissue contracture can be intra-articular (contracture of the capsule or shortening of the tendon) or extra-articular (subacromial or subdeltoid scarring) and can occur in isolation or in combination. Treatment can involve various methods: physiotherapy, systemic or local medication, manipulation and surgical release of adhesions or contracted structures (Cho & Rhee 2008).

It is common for patients with a rotator cuff tear to have some level of preoperative stiffness however, this generally resolves after surgery and physiotherapy (Tauro 2006). In patients with severe stiffness, a 89.4% satisfactory result was reported in a study which combined rotator cuff repair with gentle manipulation (Hsu et al 2007) and this was further confirmed in a study by Cho & Rhee (2008).

2.11 INFECTION AFTER REPAIR

A potentially devastating complication following any type of surgery is infection. After a rotator cuff repair, the incidence of infection is relatively rare and ranges from 0.27% to 1.9% (Saltzman et al 2009; Athwal et al 2007). Infection can be a superficial wound complication such as focal stitch abscess or a deep infection. Infection can result in various amounts of pain and limitation of movement resulting in stiffness of the shoulder (Mirzayan et al 2000). Minor infection can often be treated with antibiotics. A serious complication of deep infection in the shoulder, with the management often being an aggressive debridement, is that the

surgery may compromise other stabilising structures in the shoulder and with an already poor rotator cuff, this may result in a very unstable joint (Cuff et al 2008).

Settecerri et al (1999) reviewed the clinical course, treatment and outcome after rotator cuff surgery complicated by deep infection. It was suggested that a prolonged operative time may have a role in developing an infection and there was no association between the size of the tear and infection. Multiple debridements may be necessary to eradicate the infection and this may result in a poorer outcome, although this was found to be not uniformly so.

2.12. CONCLUSION

The prevalence of rotator cuff tears is variable depending on various factors in its aetiology. The surgical management is largely dependent on the orthopaedic surgeon and there is little evidence based literature on its post surgical management. Despite this, the repair of rotator cuff tears is mostly successful. On reviewing the relevant literature, this study will now determine whether the specific demographic, surgical and rehabilitative factors discussed above will influence the amount of rehabilitation received following a rotator cuff repair.

CHAPTER 3

3.0 MATERIALS AND METHOD

3.1 Introduction

The methodology is described under the following headings:

3.2 Study Design

3.3 Study Population

3.4 Surgical Technique

3.5 Physiotherapy protocol

3.6 Ethical Consideration

3.7 Procedure

3.8 Statistical Analysis

3.2 Study Design

This is a retrospective record review. It is also a cross sectional correlational study.

3.3 Study Population

3.3.1. Source of Subjects

All records of patient files from one physiotherapy practice at a private clinic in Johannesburg Clinic who had undergone a rotator cuff repair between the period January 2005 – May 2009 were selected for review.

3.3.2. Sample Selection and Size

A sample size of 100 subjects was initially chosen so that the power of the study was set at 80% with the required prevalence of rotator cuff tears lying between 0.12 and 0.22 (Fukuda 2003, Pai et al 2001).

3.3.2.1 Inclusion Criteria

- 25-70 years of age and present with a rotator cuff tear
- Surgical repair of the rotator cuff by one of two surgeons at the same institution. This was to ensure that patients had undergone the identical surgical procedure: an open surgical technique to repair either a partial or full thickness rotator cuff repair, performed under general anaesthesia. The orthopaedic surgeons confirmed that all materials used during the procedure including the anchors and suture material, were identical.

3.3.2.2. Exclusion Criteria

Any additional or pre-existing injuries of the shoulder resulted in exclusion of the patient.

3.4 Surgical technique

In consultation with the orthopaedic surgeons that were used as part of this study, the following procedure was described to surgically repair the rotator cuff tears. The patient is placed in a beach chair position under general anaesthesia. An oblique incision is made extending anteriorly from the acromion. The anterior deltoid is partially split in line with its fibres and the coracoacromial ligament is released. The anterior acromion is osteotomised and the undersurface of the

acromion is flattened. The arm is rotated to visualise and mobilise the tendon. A bony trough 4 mm wide and 25 mm long is made in the space between the greater tuberosity and the articular surface of the humerus. The rotator cuff is repaired to the bone using suture anchors in as close a normal anatomic position as possible. The anterior deltoid is repaired back onto the acromion and routine skin closure is performed.

3.5 Physiotherapy protocol

The patients who were included in the study had all received physiotherapy by one physiotherapy practice which used a standardised protocol for its rehabilitation regardless of whether the tear of the rotator cuff was partial or full thickness.

The patients were immobilised in either a Barford Jones or abduction sling, depending on the surgeon's preference, immediately post surgery. Physiotherapy was commenced 10 days to two weeks post operatively, once the clips were removed. In this first week, passive forward flexion, abduction and external rotation was started. Scapular retraining was initiated in the neutral position. Techniques for pain, swelling and spasm were also introduced. This included soft tissue massage, electrotherapy using ultrasound and/or TENS and heat therapy. Pendular exercises were given as a home exercise programme and the patient was advised on how to wash and dress. At week three, the amount of passive range of motion was increased dependent on pain and the patient was started on active assisted exercises using a stick for forward flexion, abduction and external rotation. At week four, passive range of motion continued and short lever active exercises were started. Included at this stage was internal rotation behind the back and stretches of the capsule. At week five, the patient was started on long lever

active exercises. At week six, the patient was weaned out the sling increasing by hourly increments every day. At week seven, light strengthening exercises were started using theraband. Strengthening was then progressed to functional and plyometric exercises until the patient was discharged. (Lahteenmaki et al 2007; Maxey & Magnusson 2007; Hayes et al 2004; Fukuda 2003; Rokito et al 1999)

3.6 Ethical Consideration

Ethical clearance was obtained and granted from the Committee for Research on Human Subjects, University of the Witwatersrand, (M090538) prior to commencement of this study (Appendix 1)

Permission to conduct this study and review the patient records was obtained from the CEO of the clinic (Appendix 2) as well as from the orthopaedic surgeons (Appendix 3) and owner of the physiotherapy practice (Appendix 4)

3.7 Procedure

The patient files that satisfied the inclusion criteria were analysed. These files were divided into three groups based on the number of physiotherapy sessions that were given. As calculated within the physiotherapy department and in agreement with the orthopaedic surgeons, the standard amount of physiotherapy is 16-20 sessions. Thus the groups were:

- **Group 1** - patients who received less than the standard amount of physiotherapy (<16)

- **Group 2** - patients who received the standard amount of physiotherapy (16-20)
- **Group 3** - patients who received more than the standard amount of physiotherapy (>20).

In each group, the following factors were assessed

- Gender
- Age
- Injury on duty
- Dominant side and side of the operated shoulder
- Mechanism of injury: traumatic or chronic non traumatic
- Type of tear: partial or full thickness
- Type of sling
- Timing of the surgery and duration of symptoms
- Additional procedures: preoperative physiotherapy
- Additional procedures: revision of surgery
- Additional procedures: manipulation following primary repair
- Infection after the repair

3.8 Statistical Analysis

Initial data were captured using an Excel spreadsheet. Descriptive statistics were used to describe the frequency, distribution and percentage of the various factors chosen to be analysed. The population of the sample could not be guaranteed to be normally distributed and using non-parametric data, the most appropriate statistical method is the Chi Square test.

The Chi Square test, a test designed to determine whether there is a significant difference between the expected frequency and the observed frequency in one or more categories, was used to assess the degree of association between the treatments groups and the chosen factors. Kruskal Wallis test was used to confirm the results of the Chi Square test. The software programme used was Stata 10.2. A p value of < 0.05 was considered significant.

CHAPTER 4

4.0 RESULTS

4.1 Introduction

The results will be described under the following sub headings:

4.2 Sample Size

4.3 Distribution of sample

4.4 Selected factors and their relationship to the rehabilitation process

4.5 Conclusion

4.2 Sample Size

All the files of patients who underwent a rotator cuff repair were reviewed. This totalled 107. Of the 107, 22 were excluded for the following reasons: 15 were operated on by surgeons other than those listed in the methodology, four did not fit the age category as per the inclusion criteria (> 70 years old) and three had other associated shoulder injuries. This left a total of 85 subjects with all the pertinent information available and who fell within the inclusion criteria.

The subjects were then grouped as follows to illustrate the amount of physiotherapy received:

Group 1 (< 16 treatments) consisted of 13 patients, 15.3% of the entire sample

Group 2 (16-20 treatments) consisted of 64 patients, 75.3% of the entire sample.

Group 3 (>20 treatments) consisted of 8 patients, 9.4 % of the entire sample.

4.3 Distribution of sample

Of the cases reviewed, the following proportion estimations and number of subjects of the entire sample were found (Table 4.1)

Table 4.1 Proportions of Factors Assessed (n=85)

Factor Assessed		**Proportion (%)**	**Number (n)**	**95% Confidence Interval**
Gender	Male	64	54	0.53-0.74
	Female	36	31	0.26-0.47
Injury on duty	Yes	31	26	0.21-0.41
	No	69	59	0.59-0.79
Dominant shoulder	Yes	60	51	0.49-0.70
	No	40	34	0.29-0.51
Side of affected shoulder	Left	34	29	0.24-0.44
	Right	66	56	0.56-0.76
Mechanism of injury	Non traumatic	35	30	0.25-0.46
	Traumatic	65	55	0.54-0.75
Type of sling	Barford Jones	85	72	0.77-0.93
	Abduction sling	15	13	0.74-0.23
Duration of symptoms	Less than one month	34	29	0.24-0.44
	1-6 months	41	35	0.30-0.52
	More than six months	25	21	0.15-0.34
Type of tear	Partial thickness	46	39	0.35-0.57
	Full thickness	54	46	0.43-0.65
Preoperative physiotherapy	Yes	16	14	0.84-0.25
	No	84	71	0.75-0.92
Infection	Yes	6	5	0.01-0.11
	No	94	80	0.89-0.99
Revision of surgery		5	4	0.00-0.09
Manipulation		4	3	0.00-0.08
No additional procedures		92	78	0.86-0.98

Males were far more affected than females. Although a traumatic mechanism of injury was more prevalent (65%), only 31% occurred in the workplace.

The prevalence of partial and full thickness tears is very similar (46% partial thickness : 54% full thickness) while the type of sling most commonly used being the Barford Jones sling (85%)

4.4 Selected factors and their relationship to the rehabilitation process

4.4.1 Gender

Table 4.2 below shows the number and percentages of males and females in each of the three groups.

Table 4.2 Frequency of gender within each treatment group (n=85)

Gender **n (%)**	**Group 1** **n (%)**	**Group 2** **n (%)**	**Group 3** **n (%)**
Male 54 (63.5)	7 (8.2)	40 (47.1)	7 (8.2)
Female 31 (36.5)	6 (7.1)	24 (28.2)	1 (1.2)
Total n (%) 85 (100)	13 (15.3)	64 (75.3)	8 (9.4)

The majority of both sexes fell into Group 2 (75.3%). More males were affected than females (63.5%)

With p = 0.24, there was no association between gender and the amount of physiotherapy received.

4.4.2 Age

Table 4.3 below shows the association between the age of the patients and the amount of physiotherapy received.

Table 4.3 – Distribution of age relative to treatment groups (n = 85)

Age Group **n (%)**	**Group 1** **n (%)**	**Group 2** **n (%)**	**Group 3** **n (%)**
Below 35 years of age 5 (5.9)	1 (20)	4 (80)	0 (0)
36 – 50 years of age 20 (23.5)	0 (0)	20 (100)	0 (0)
51 – 60 years of age 28 (32.9)	6 (21.4)	16 (57.1)	6 (21.4)
> 60 years of age 32 (37.7)	6 (18.8)	24 (75)	2 (6.3)
Total n (%) 85 (100)	13 (15.3)	64 (75.3)	8 (9.4)

There was an association between the number of treatments the patient received and the age of the patients ($p = 0.006$).

Across all age groups, most patients had the average amount of physiotherapy (75.3%). The majority of the patients were over the age of 50. Very few patients were below the age of 35 (5.9%)

No patients who were younger than 50 years of age, received the above average amount of physiotherapy and a very small percentage of patients had less than the

average amount of physiotherapy. Therefore, one can deduce that up until middle age, most patients are likely to receive the average amount of physiotherapy.

With advancing age, there was an equal distribution between patients who received more and patients who received less than the average amount of physiotherapy. As age increases (> 60 years of age), fewer patients now had the above average amount of physiotherapy and more received less than the average amount of physiotherapy. This showed that older patients were less likely to fit into the average amount of physiotherapy group.

4.4.3 Injury on duty

Table 4.4 below shows the association between whether the patient was injured on duty or not and the amount of physiotherapy received.

Table 4.4 Distribution of whether the patient was injured on duty or not relative to the treatment groups (n=85)

Injured on duty n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
No 59 (69.4)	10 (17)	47 (79.7)	2 (3.4)
Yes 26 (30.6)	3 (11.5)	17 (65.4)	6 (23.1)

There was an association between the number of treatments the patient received and whether the patient was injured on duty or not ($p = 0.02$).

The majority of patients who were injured on duty received the average amount of physiotherapy. Of those who were not injured on duty, more patients received

fewer treatments (17%) as opposed to the above average amount (3.4%). This is in contrast to patients who were injured on duty where a higher percentage of patients had more than the average number of treatments (23.1%).

4.4.4 Hand Dominance

Table 4.5 shows the frequency of hand dominance relative to the entire sample.

Table 4.5 Frequency of dominance relative to the entire sample (n=85)

Dominance n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
Non dominant arm 34 (40)	5 (14.7)	26 (76.5)	3 (8.8)
Dominant arm 51 (60)	8 (15.7)	38 (74.5)	5 (9.8)

With p = 0.98, there was no association between hand dominance and the amount of physiotherapy received.

4.4.5 Side of the operated shoulder

Table 4.6 shows the frequency of the side of the operated shoulder relative to the entire sample.

Table 4.6 Frequency of side of the operated shoulder relative to the entire sample (n=85)

Side of the operated shoulder n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
Right 56 (65.9)	10 (17.9)	41 (73.2)	5 (8.9)
Left 29 (34.1)	3 (10.3)	23 (79.3)	3 (10.3)

There was no association between side of the operated shoulder and the amount of physiotherapy received (p = 0.64)

4.4.6 Mechanism of injury

Mechanism of injury was classified as being either traumatic or non traumatic.

Table 4.7 shows the frequency of the mechanism of injury relative to the amount of physiotherapy received

Table 4.7 Frequency of mechanism of injury relative to the amount of physiotherapy received (n=85)

Mechanism of injury n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
Non traumatic 30 (35.3)	7 (23.3)	22 (73.3)	1 (3.3)
Traumatic 55 (64.7)	6 (10.9)	42 (76.4)	7 (12.7)

With p = 0.13, mechanism of injury was shown to have no association with the amount of physiotherapy received.

4.4.7 Type of tear

The type of tear was classified as either partial or full thickness. Table 4.8 shows the frequency of the type of tear relative to the amount of physiotherapy received.

Table 4.8 Frequency of the type of tear relative to the amount of physiotherapy received (n=85)

Type of tear n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
Partial thickness 39 (45.9)	4 (10.3)	31 (79.5)	4 (10.3)
Full thickness 46 (54.1)	9 (19.6)	33 (71.7)	4 (8.7)

With p = 0.48, the type of tear was shown to have no association with the amount of physiotherapy received

4.4.8. Type of sling

This was chosen according to the surgeon's preference, either a Barford Jones sling or an abduction sling was used. Table 4.9 shows the frequency of the type of sling used relative to the amount of physiotherapy received

Table 4.9 Frequency of type of sling used relative to the amount of physiotherapy received (n=85)

Type of sling n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
Barford Jones 72 (84.7)	11 (15.3)	56 (77.8)	5 (6.9)
Abduction sling 13 (15.3)	2 (15.4)	8 (61.5)	3 (23.1)

With p = 0.25, the type of sling was shown to have no association with the amount of physiotherapy received.

4.4.9 Timing of surgery and duration of symptoms

This is the time frame in months from the time when the patient was initially injured to when the patient had surgery.

Table 4.10 shows the frequency of duration of symptoms relative to the amount of physiotherapy received

Table 4.10 Frequency of the duration of symptoms relative to the amount of physiotherapy received (n=85)

Duration of symptoms n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
Less than one month 29 (34.1)	3 (23.1)	24 (37.5)	2 (25)
1-6 months 35 (41.2)	7 (53.9)	24 (37.5)	4 (50)
More than 6 months 21 (24.7)	3 (23.1)	16 (25)	2 (25)

The was no association between duration of symptoms and the amount of physiotherapy received ($p = 0.78$)

4.4.10 Additional procedures

4.4.10.1 Preoperative physiotherapy

Table 4.11 shows the association between whether the patient received preoperative physiotherapy or not and the amount of physiotherapy received

Table 4.11 **F**requency of whether the patient received preoperative physiotherapy relative to the amount of physiotherapy received (n=85)

Preoperative physiotherapy n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
No 71 (83.5)	11 (15.5)	58 (81.7)	2 (2.8)
Yes 14 (16.5)	2 (14.3)	6 (42.9)	6 (42.9)

With p = 0.00, there was an association between whether the patient received preoperative physiotherapy and the amount of physiotherapy received.

Of the entire sample, 71 patients (83.5%) did not have preoperative physiotherapy and of this group, the majority of patients still received only the average amount of physiotherapy (81.7%). Of the remaining subjects who did not receive preoperative physiotherapy, most received less than the average amount of physiotherapy (15.5%).

In comparison to the patients who did receive preoperative physiotherapy, there was an equal distribution between patients who had the average number of treatments and patients who had more than the average number of treatments (42.9%). It is also shown that far fewer patients who received preoperative physiotherapy had below the average amount of physiotherapy.

4.4.10.2 Revision, manipulation or no additional procedures

This factor looked at whether the patient had either no additional procedures during the rehabilitative process or underwent a revision of the repair or a manipulation of the shoulder.

Table 4.12 shows the association between each of these procedures relative to the amount of physiotherapy received.

Table 4.12. Frequency of additional procedures relative to the amount of physiotherapy received (n=85)

Additional procedure n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
None 78 (91.8)	11 (14.1)	62 (79.5)	5 (6.4)
Revision 4 (4.7)	1 (25)	2 (50)	1 (25)
Manipulation 3 (3.5)	1 (33.3)	0 (0)	2 (66.7)

An association was found between additional procedures and the amount of physiotherapy received ($p = 0.02$).

Overall, the majority of patients did not receive any additional procedures (91.8%). Of these patients, again a similar trend emerges that most patients received the average amount of physiotherapy (79.5%). However, when a patient underwent an additional procedure, the trend changed. For patients who had a revision of the repair, 50% received the average amount of physiotherapy and in addition there was an equal distribution between the below average group and the above average group. In comparison when patients had a manipulation of the shoulder,

none had the average amount of physiotherapy and the majority of patients had above the average amount of physiotherapy (66.7%).

4.4.11. Infection after the repair

Table 4.13 shows the frequency of infection relative to the amount of physiotherapy received

Table 4.13 Frequency of infection relative to the amount of physiotherapy received (n=85)

Infection after repair n (%)	**Group 1 n (%)**	**Group 2 n (%)**	**Group 3 n (%)**
No 80 (94.1)	11 (13.8)	62 (77.5)	7 (8.8)
Yes 5 (5.9)	2 (40)	2 (40)	1 (20)

With p = 0.22, infection was shown to have no association with the amount of physiotherapy received.

4.5 Conclusion

The prevalence of partial and full thickness tears was very similar as seen in one physiotherapy practice over a period of four and a half years. Partial thickness tears (46%) versus full thickness tears (54%).

Of the eleven factors analysed, only four were shown to have an association with the amount of physiotherapy received. These included

- the age of the patient,

- whether the patient was injured on duty or not,
- whether the patient had preoperative physiotherapy
- whether the patient had any additional procedures after the surgery including a revision of the repair or a manipulation of the shoulder.

CHAPTER 5

5.0 DISCUSSION

5.1 Introduction

This chapter will focus on the research findings with particular reference to the factors found to have an association with the rehabilitation process under the following headings:

5.2 Prevalence of rotator cuff tears

5.3 Associated factors and their relationship with the amount of physiotherapy received

5.3.1 Age

5.3.2 Injury on duty

5.3.3 Additional procedures

5.4 Limitations of the study

5.5 Conclusion

Rotator cuff tears often lead to great impairment of the shoulder joint with debilitating pain and dysfunction. Successful management of such a condition is often a result of effective communication between the surgeon and the treating physiotherapist and education of the patient regarding their rehabilitation process.

Considering the prevalence of rotator cuff tears, better evidence is needed to guide the optimal treatment of this condition. There is little consistency in the decision-making regarding the surgery and rehabilitation of rotator cuff tears. With

reference to the surgical approach, management is often based on the surgeon's personal experience. Dunn et al (2005) conducted a survey analysing orthopaedic surgeons' perceptions regarding the indications for rotator cuff surgery and the variation in the management thereof. It was found that there was significant variation in the decision making and a lack of clinical agreement in the surgical management. There also appears to be a limited number of studies regarding the post surgical rehabilitation.

5.2 Prevalence of rotator cuff tears

The incidence of partial thickness tears is unclear however several studies have shown an incidence ranging from 10% up to 32% in some cadaveric shoulders (Matava et al 2005, Fukuda 2003). Matava et al (2005) also states that often the incidence of partial thickness tears are double that of full thickness tears. The literature shows there is limited evidence on the spontaneous healing of partial thickness tears, and there may be an 80% progression to becoming a full thickness tear should it not be surgically repaired (Fukuda 2003). The vast majority of full thickness tears have been shown to be attributed mainly to the chronicty of intrinsic degenerative factors (Pai et al 2001) and therefore the prevalence tends to increase further with age (Fehringer et al 2008; Sorensen et al 2007). This study found the prevalence of partial and full thickness tears to be fairly similar. Partial thickness tears constituted 46% of the sample versus 54% of the sample being full thickness tears. This may be because the average age of the entire sample was 55.5 years of age indicating perhaps a higher possibility of intrinsic degenerative factors in aetiology.

5.3 Associated factors and their relationship with the amount of physiotherapy received

The results of this investigation identified four factors that were associated with the rehabilitation process and more specifically the number of treatments. These included the age of the patient, whether the patient was injured on duty, preoperative physiotherapy and additional procedures including a revision of a repair or manipulation of the shoulder.

5.3.1 Age

In this study 60 patients (71%) were found to be over the age of 50 whilst 25 patients (29%) were under the age of 50. With particular reference relating age to the rehabilitation process, there seemed to be a trend showing that most patients are likely to receive the average amount of physiotherapy, however, in the middle age group some patients now required more than the average amount of physiotherapy. At the extreme age groups, less than 35 years old or more than 60 years old, a percentage of the group received less than the average amount of physiotherapy (20% and 18.8% respectively). Age is a much debated topic in most studies of shoulder repairs. It has been reported that the prevalence of rotator cuff tears increases with age (Fehringer et al, 2008; Oh et al, 2007; Sorensen et al, 2007) and this seems to be the trend in this study.

Trauma, whether it be from the cause of the injury itself or the surgery, and the immobilisation period after a rotator cuff tear, changes the histology and normal mechanics of connective tissue. Communication between the surgeon and treating physiotherapist is important as the surgeon is more aware of the state of the torn

tendon and can therefore advise regarding adequate healing time with supervised remobilisation of the affected tissue. In the older patient, the rehabilitation process may need to be adjusted due to a common phenomenon seen in the aging adult called senile sarcopenia. This is a loss of muscle mass resulting in muscle weakness and is the result of loss of motorneurons and of muscle cell apoptosis. This process is mainly driven by neuropathic changes as well as physical activity related changes, nutritional, hormonal and immunological factors (Narici et al 2008).

This process could explain the extended rehabilitation needed in older patients as they not only have already compromised muscular strength as a result of their age but this is further exacerbated by the trauma of the surgery and the immobilisation period. Lahteenmaki et al (2006) comments on muscle atrophy resulting in unpredictable rehabilitation. Of further consideration in older patients as regards prolonged rehabilitation, is the addition of other associated co-morbidities such as the quality of the bone eg.in osteoarthritis, poor blood supply as a result of the degenerative process or even other systemic conditions such as diabetes which may hinder the healing process (Grondel et al 2001). Cho et al (2008) reported that there is a 36% chance of insulin-dependent diabetic patients developing shoulder stiffness compared with three percent of the general population. This makes patients living with diabetes at risk for poorer outcome in their rehabilitation. Lohr et al (1990) reported on the importance of an adequate vascular pattern for proper healing of an injured tendon and therefore a potential delay in the older population with a potential compromised blood supply.

However, as age continues to increase, a larger percentage of patients now received less than the average amount of physiotherapy. A possible explanation could be that this group of patients are now starting to reach retirement age and therefore being pensioners, may have financial constraints limiting the amount of physiotherapy they can afford.

A further consideration is that not only is age as a single entity necessarily a factor, but often funds can be a limiting cause in determining the amount of physiotherapy that a patient receives. For example, less funds available in a certain medical aid could limit the number of times a patient is able to attend physiotherapy.

With advancing age, a patient's functional outcome may not be as important as in a younger patient who may require the optimum functional ability of his shoulder in order to continue with his general activities. Watson et al (2002) reported that younger patients are often more dissatisfied with the results of surgery as a result of their higher demands and expectations. Therefore, this may be a further reason as to a lower requirement of physiotherapy in the older age group as related to the decreased use of their arm. However, in the middle age group a higher percentage of patients required more than the standard amount of physiotherapy. This may be due to the effects of aging on a tendon, the possibility of overuse injuries and still being in the employed category, thus increased rehabilitation may be required in order to achieve the most functional outcome.

5.3.2 Injury on duty

Several studies have investigated the relationship between workman's compensation status and rotator cuff tears, whether it be preoperative functional status or outcome and satisfaction following surgery. Successful rehabilitation can be observed in an early return to function and normal duties at work. The earlier a patient can resume duties, the greater the benefit to the company as well as a reduction in loss of income for the employee. This study found that of the patients who received more than the average amount of physiotherapy, more were injured on duty (23.1%) as opposed to those patients who were not (3.4%).

A possible explanation for extended rehabilitation can be that many labour related work places do not offer light duty and therefore require the patient to have a sufficient amount of range of movement and strength in order to resume his duties at the same level as prior to the injury. This can be seen in studies where it was shown that patients with a workman's compensation claim took longer to return to work and in some cases, returned to a lower activity level (Iannotti et al, 1996; Hawkins et al, 1985). Henn et al (2008) confirmed that patients with workman's compensation claims have worse outcomes after a rotator cuff repair. This could explain why these patients potentially have a lengthier rehabilitation. It has also been suggested that a potential reason for a longer rehabilitation process could have something to do with the individual who files for claims, with the hopes of some sort of secondary gain rather than purely based on an objective measure (Henn et al 2008). In contrast, Tashjian et al (2007) found a positive correlation between patients who are employed and their outcome by suggesting that patients who are employed tend to have a more positive outlook with better social support

structures thereby positively influencing their rehabilitation. Although this study did not look at outcome, the results in this study also showed that when comparing all the patients who were injured on duty, 65.4% still only required the average amount of physiotherapy, possibly suggesting a positive rehabilitation process as in agreement with Tashjian et al (2007).

5.3.3 Additional procedures

This study, although not comparing outcome, did find that 91.8% of patients did not require any additional procedures indicating that rotator cuff repairs are primarily successful. Many studies in the literature have confirmed the satisfactory results of a primary rotator cuff repair (Porat et al 2008; Lahteenmaki et al 2007; Pai et al 2001).

Studies have shown some reasonable benefit with initial conservative treatment of rotator cuff tears, particularly of symptomatic full thickness tears (Oh et al 2007). This includes preoperative physiotherapy and usually a course of anti-inflammatory medication. The biggest debate is over the management of partial thickness tears and there are various studies examining the issue of early surgical treatment versus delayed surgery with initial conservative treatment (Oh et al 2007; Fukuda 2003).

This study found an association with preoperative physiotherapy. The benefit of preoperative physiotherapy could be to achieve reasonable range of movement and strength to reduce the negative effects of immobilisation post surgery and

therefore, in theory, a faster recovery. It was however found, in this study, that preoperative physiotherapy had no benefit in reducing the total amount of physiotherapy received. There was an equal distribution between patients who received the average amount of physiotherapy and those who received more than the average amount of physiotherapy when patients had preoperative physiotherapy. This leads one to question whether preoperative physiotherapy is of much benefit at all then, when relating it to the extent of rehabilitation required, a faster recovery period and ultimately a reduction in cost to the patient. A limitation to this reasoning is that the final functional outcome and patient satisfaction were not taken into consideration. There can be other reasons for rehabilitation being extended post surgically that were not included in this study, including poor adherence to exercises given and other associated co-morbidities eg diabetes and hence the potential for delay in recovery. A further limitation was that this study did not compare whether preoperative physiotherapy reduced post operative physiotherapy. It only looked at the overall amount of physiotherapy.

When additional procedures were performed after surgery namely a revision of a repair or a manipulation of the shoulder, a higher percentage of patients now received more than the average amount of physiotherapy. When comparing patients who underwent a manipulation versus a revision of the repair, 66.7% of patients who had a manipulation received more rehabilitation as opposed to only 25% who had a revision.

In a case control study by Cho et al (2008), 45 patients were enrolled presenting with rotator cuff tears, some of whom had associated shoulder stiffness as well. All

variables including pain, range of motion, muscle strength and function were all significantly improved after the repair. However, although all results were favourable, there was a definite finding that the patients in the group who also underwent a manipulation, took much longer to regain range of motion. A possible explanation for a prolonged rehabilitation in patients who received a manipulation is the presence of more frequent and severe pain experienced post manipulation (Cho et al 2008).

Sherman et al (2008) identified increasing age as a risk factor for revision surgery. This is confirmed in this study where 75% of the patients who had a revision were over the age of 50 however due to the small numbers in this category, this would have to be confirmed in future studies.

5.4 Limitations

There were potential limitations to this study. The study design was retrospective whereas a prospective study design taking into account functional outcomes as well relative to the number of physiotherapy treatments may have given a more holistic representation of the rehabilitation process. However, Tashjian et al (2008) did a study comparing prospective and retrospective assessments of functional outcome after a rotator cuff repair and it was concluded that patient satisfaction had a greater correlation with retrospective outcomes. Therefore, a retrospective study often supplements a prospective evaluation particularly when considering patient's perceptions as long as a subjective evaluation is included in the study.

Being retrospective, also limited the number of records available for inclusion in the study and thus leading to a restricted though adequate sample size.

5.5 Conclusion

This study showed in a series of rotator cuff repairs performed by two surgeons using the same open technique and following a largely uniform physiotherapy rehabilitation programme, most patients only required the average number of treatments. There were relatively few factors that were associated with the rehabilitation of rotator cuff tears with particular reference to the amount of physiotherapy received. With the factors that were shown to be related to the rehabilitation, this information could be useful as a guide to the treating physiotherapist in adjusting expectations preoperatively in order to gain a more successful rehabilitation of rotator cuff tears.

CHAPTER 6

6.0 CONCLUSION AND RECOMMENDATIONS

This chapter will be discussed under the following headings:

6.1 Conclusion

6.2 Recommendations

6.2.1 Study design

6.2.2 Clinical recommendations

6.1 Conclusion

The aim of this study was to determine the prevalence of partial and full thickness tears seen in one physiotherapy practice over the period of four and a half years. It also was to identify and analyse the factors affecting the amount of physiotherapy following a rotator cuff repair.

The results of this study showed that the prevalence of partial and full thickness rotator cuff tears seen over a period of four and a half years in one physiotherapy practice is very similar. Partial thickness tears constituted 46% of the entire sample and full thickness made up 54% of the sample.

It was found that that four of the eleven factors analysed were associated with the amount of physiotherapy received:

- Age of the patient. It was deduced that most patients received the average amount of physiotherapy, particularly up until middle age. As age increases,

less patients are likely to have the average amount of physiotherapy and more likely to have less than the average amount of physiotherapy.

- Whether the patient was injured on duty or not. Of the patients who received more than the average amount of physiotherapy, it was more likely for these patients to be injured on duty. In contrast to patients that received less than the average amount of physiotherapy where the majority were then not injured on duty.
- Preoperative physiotherapy. This was found to not be very common. If patients did not receive preoperative physiotherapy, the majority of patients received the average amount of physiotherapy. However, if the patients did receive preoperative physiotherapy, a much higher percentage of patients now required more than the average amount of physiotherapy.
- Additional procedures namely revision of the repair or manipulation of the shoulder. Overall, the majority of patients did not require any additional procedures. Patients who underwent a manipulation required more than the average amount of physiotherapy, a much higher percentage of which when compared to patients who had a revision.

6.2 Recommendations

This study could be used as a baseline study from which further studies may be carried out. The following ideas would lend themselves to further investigation.

6.2.1 Study design

A prospective study design relating the amount of physiotherapy to function and final outcome could be performed.

6.2.2 Clinical Recommendations

From the results of this study which showed that older patients received less physiotherapy, a more comprehensive home exercise programme should be implemented, if necessary, in the beginning to ensure that these patients are still given all the relevant exercises despite their limited supervised rehabilitation. Hayes et al (2004) confirmed that a standardised unsupervised home exercise regime can be just as effective as supervised physiotherapy treatment.

Preoperative counselling should be incorporated for all patients, particularly those who are injured on duty. This study showed that patients who are injured on duty received more than the average amount of physiotherapy. This would need to be conveyed to the employer to make any necessary adjustments at work whilst the employee is undergoing rehabilitation. As the patient, preoperative counselling would give the patient goals to work towards and the expectation that despite the length of the rehabilitation, if compliant to instructions given, should be able to return to his normal duties. Henn et al (2007) confirmed the importance of preoperative expectations as it related to an improved postoperative performance in patients following a rotator cuff repair.

Included in the preoperative counselling of the patient, the patient should be informed of the risks of additional procedures which may hinder their outcome and extend their rehabilitation. Therefore adherence to any home exercise programmes should be taken into serious consideration.

A further clinical recommendation would be to perform a similar study, however, comparing the different surgical techniques. For example, open repair versus arthroscopic repair. Surgery via arthroscopy is gaining popularity due to its lower post operative morbidity and being relatively noninvasive (Maxey & Magnusson 2007).

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8.0 APPENDICES

APPENDIX 1

UNIVER ITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Ms TC Botha

CLEARA ICE CERTIFICATE	M090538
PROJEC	The Factors Affecting the Rehabilitation Process in Patients following a Rotator Cuff Repair
INVESTI GATORS	Ms TC Botha.
DEPART MENT	Department of Physiotherapy
DATE C NSIDERED	09.05.29
DECISIO N OF THE COMMITTEE*	Approved unconditionally

Unless ot erwise specified this ethical clearance is valid for 5 years and may be renewed upon applicati n.

DATE 09.06.19 CHAIRPERSON .....
(Professor PE Cleaton-Jones)

*Guidelin s for written 'informed consent' attached where applicable

cc: Supe visor : Mrs W Wood

DECLA ATION OF INVESTIGATOR(S)

To be co pleted in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate H use, University.
I/We full understand the conditions under which I am/we are authorized to carry out the abovementioned research nd I/we guarantee to ensure compliance with these conditions. Should any departure to be contempl ted from the research procedure as approved I/we undertake to resubmit the protocol to the Committ e. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

.....

APPENDIX 2

Information letter to CEO

Dear Dr _____

CEO ROSEACRES CLINIC

I am a final year Masters Physiotherapy student from the University of Witwatersrand undertaking a research study. I am trying to determine what factors affect the amount of physiotherapy received in patients following a rotator cuff repair.

As part of my investigation, I will be assessing the records of patients that will have undergone surgery and rehabilitation for the repair of the rotator cuff at Roseacres Clinic. Personal information will be kept confidential.

The results of the study will be of great value in the future to allow the treating physiotherapist to give the patients a more goal orientated expectation at commencement of their rehabilitation process.

I would be very grateful if you consent to the undertaking of my research study. If you have any queries, please feel free to contact me at the above listed telephone number

Yours Sincerely,

Tammy Chivers

BSc (Physiotherapy)

CONSENT FORM

I, _____ (full names),

CEO of Roseacres Clinic

ADDRESS _____

CONTACT TELEPHONE NUMBER _____

hereby give permission for Tammy Chivers, Masters Physiotherapy student, to undertake her study entitled: “The factors affecting the rehabilitation process in patients following a rotator cuff repair” at Roseacres Clinic.

_____ _____

SIGNATURE OF CEO DATE

APPENDIX 3

Information letter to Orthopaedic Surgeon

Dear Dr _____

I am a final year Masters Physiotherapy student from the University of Witwatersrand undertaking a research study. I am trying to determine what factors affect the amount of physiotherapy received in patients following a rotator cuff repair.

As part of my investigation, I will be assessing the records of patients that will have undergone surgical repair of the rotator cuff performed by yourself. Personal information will be kept confidential. It would be greatly appreciated if I could use your records from the surgery if necessary.

Once the study is completed, all results will be made known to yourself.

The results of the study will be of great value in the future to allow the treating physiotherapist to give the patients a more goal orientated expectation at commencement of their rehabilitation process.

I would be very grateful if you consent to make your records available for my research study. If you have any queries, please feel free to contact me at the above listed telephone number

Yours Sincerely,

Tammy Chivers

BSc (Physiotherapy)

CONSENT FORM

I, _____ (full names),

Orthopaedic Surgeon

ADDRESS _____

CONTACT TELEPHONE NUMBER _____

hereby give permission for the records of the relevant patients to be assessed by Tammy Chivers, Masters Physiotherapy student.

_____ _____

SIGNATURE OF ORTHOPAEDIC SURGEON DATE

APPENDIX 4

Information letter to Physiotherapist

Dear Mrs _____

I am a final year Masters Physiotherapy student from the University of Witwatersrand undertaking a research study. I am trying to determine what factors affect the amount of physiotherapy received in patients following a rotator cuff repair.

As part of my investigation, I will be assessing the records of patients that will have undergone rehabilitation for the repair of the rotator cuff at your physiotherapy practice. Personal information will be kept confidential. It would be greatly appreciated if I could use your records of the appropriate patients.

Once the study is completed, all results will be made known to yourself.

The results of the study will be of great value in the future to allow the treating physiotherapist to give the patients a more goal orientated expectation at commencement of their rehabilitation process.

I would be very grateful if you consent to make your records available for my research study. If you have any queries, please feel free to contact me at the above listed telephone number

Yours Sincerely,

Tammy Chivers

BSc (Physiotherapy)

CONSENT FORM

I, _____ (full names),

Physiotherapist

ADDRESS _____

CONTACT TELEPHONE NUMBER _____

hereby give permission for the records of the relevant patients to be assessed by Tammy Chivers, Masters Physiotherapy student.

_____ _____

SIGNATURE OF PHYSIOTHERAPIST DATE