The Effectiveness of the Lateral Retinacular Release on Decreasing Pain and Increasing Stability in the Patellofemoral Joint

Celeste M. Hansen
University of North Dakota

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THE EFFECTIVENESS OF THE LATERAL RETINACULAR RELEASE ON DECREASING PAIN AND INCREASING STABILITY IN THE PATELLOFEMORAL JOINT

by

Celeste M. Hansen
Bachelor of Science in Physical Therapy
University of North Dakota, 1997

An Independent Study
Submitted to the Graduate Faculty of the Department of Physical Therapy School of Medicine
University of North Dakota
in partial fulfillment of the requirements for the degree of Master of Physical Therapy

Grand Forks, North Dakota
May
1998
This Independent Study, submitted by Celeste M. Hansen in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

(Faculty Preceptor)

(Graduate School Adviser)

(Chairperson, Physical Therapy)
PERMISSION

Title The Effectiveness of the Lateral Retinacular Release on Decreasing Pain and Increasing Stability in the Patellofemoral Joint

Department Physical Therapy

Degree Master of Physical Therapy

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Date 12-15-97

Colbert M. Hansen

iii
TABLE OF CONTENTS

List of Figures .............................................................................................................. v
List of Tables ................................................................................................................ vi
Acknowledgements ......................................................................................................... vii
Abstract .......................................................................................................................... viii
Chapter One: Introduction ............................................................................................... 1
Chapter Two: Literature Review ......................................................................................... 3
Chapter Three: Methodology .............................................................................................. 14
Chapter Four: Results ......................................................................................................... 16
Chapter Five: Discussion .................................................................................................. 23
Chapter Six: Conclusion .................................................................................................... 27
Appendix A: Research Questions ...................................................................................... 28
Appendix B: Agreement .................................................................................................... 30
Appendix C: Human Subjects Review Forms .................................................................... 32
Appendix D: Survey .......................................................................................................... 37
Appendix E: Permission Forms ......................................................................................... 39
Appendix F: Tables A-G .................................................................................................... 42
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Compression Forces with Knee Flexion</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Q angle</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>Lateral Glide</td>
<td>9</td>
</tr>
<tr>
<td>4.</td>
<td>Lateral Tilt</td>
<td>9</td>
</tr>
<tr>
<td>5.</td>
<td>Anteroposterior Tilt</td>
<td>9</td>
</tr>
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</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
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<tbody>
<tr>
<td>1. Age of Subjects</td>
<td>17</td>
</tr>
<tr>
<td>2. Gender of Subjects</td>
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</tr>
<tr>
<td>3. Rest Low Pain</td>
<td>18</td>
</tr>
<tr>
<td>4. Rest High Pain</td>
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</tr>
<tr>
<td>5. Work Low Pain</td>
<td>19</td>
</tr>
<tr>
<td>6. Work High Pain</td>
<td>19</td>
</tr>
<tr>
<td>7. Comparison of Pain Ratings</td>
<td>20</td>
</tr>
<tr>
<td>8. Paired t-tests for Rest High and Work High</td>
<td>20</td>
</tr>
<tr>
<td>9. Reason for Surgery Compared with Return to Previous Activity</td>
<td>22</td>
</tr>
<tr>
<td>10. Work High Pain Compared to Reason for Surgery</td>
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ABSTRACT

The lateral retinacular release is one of the most commonly performed surgical procedures used to treat patellofemoral pain and instability. The purpose of this pilot study is to provide insight into the effectiveness of the lateral retinacular release for decreasing patellofemoral pain with activity and increasing knee stability. A survey was sent to 21 patients who had undergone the LRR that addressed the following issues: reason for surgery, stability and pain following surgery, return to prior activities, and the presence of physical therapy before and after surgery. The results from this pilot study identified the following areas of concern: a 27.2% rate of redislocation, 45.5% hadn’t returned to their previous activity level, and a statistical difference was found between pain ratings at rest and with activity. These findings suggest a need for future research into this area, including a successful presurgical evaluation that would identify patients likely to experience good surgical outcomes.
CHAPTER ONE
INTRODUCTION

"Patellofemoral pain (PFP) is one of the most frequently encountered problems in clinical orthopedics." It is one of the most common complaints among young patients, especially females, and it has been shown to have the ability to significantly limit their daily activities. Patellar instability is another common knee problem often associated with subluxation or dislocation of the patella. Unfortunately, studies have reported high numbers of recurrent dislocations or instability and persistent patellofemoral pain following initial injury or onset of symptoms. A study researching the optimal treatment for primary patellar dislocations found that whether the patients were treated operatively or nonoperatively, 40% to 70% experienced residual anterior knee pain and 20% to 30% experience symptoms of instability.

Until recently, most people who complained of anterior knee pain, or PFP, were diagnosed with chondromalacia patella which is defined as softening of the patellar articular cartilage. Patients with PFP experience the following symptoms: pain around and under the patella, pain with prolonged sitting, crepitation, and giving way. It has been discovered that these patients with PFP often have articular cartilage that is intact. On the other hand, chondromalacia patella (in which the cartilage is described as having an appearance like crab meat) is often asymptomatic and age-related. It is now known that there are a number of causes of PFP. This recent shift in diagnosis of patellofemoral disorders makes categorizing them difficult. The first thing to consider when categorizing patellofemoral disorders is the origin of the PFP. It may originate from a number of structures including the articular patellofemoral joint surface of the
surrounding retinacular soft tissues. Several disorders including patellofemoral arthrosis, chondrosis, or retinacular pain can all be the result of patellofemoral malalignment. This malalignment can be described as rotational or translational and can result in patellar dislocation, subluxation, or tilt. Dislocation is described as complete displacement of a bone from its normal position in the joint. Subluxation is defined as partial or incomplete dislocation.

Some of the differential diagnoses for PFP include inflamed plica, osteochondritis dissecans, synovitis, referred pain, retinacular pain, loose body, meniscus tear, reflex sympathetic dystrophy, arthritis, and trauma. Numerous treatment programs have been developed to combat patellofemoral problems including lateral retinacular release (LRR), distal realignment, proximal realignment, medial retinacular tightening, quadriceps extensor mechanism retaining procedures, quadricepsplasty, patellectomy, and combinations of these procedures.

"Lateral retinacular release is the most commonly performed surgical procedure used to treat anterior knee pain that has not responded to conservative treatment." Due to the frequency with which this surgical technique has been utilized, studies are necessary to determine its effectiveness. The purpose of this study is to provide insight into the effectiveness of the lateral retinacular release for decreasing patellofemoral pain and increasing knee stability, and to examine the role of physical therapy in the long term outcomes of this procedure. Due to the high occurrence of patellofemoral pain and its common persistence, along with the high number of redislocations or instability following a primary patellar dislocation, this is an important area of study. This study can serve as a guide for future research, and research in this area could help free many patients from constant or frequent pain, and allow them to return to their prior level of function.
LITERATURE REVIEW
CHAPTER TWO

There are several anatomical features that have been found to predispose a person to PFP and patellar instability.\textsuperscript{9,10} Some of these features include genu valgum, external tibial torsion, internal femoral torsion, increased quadriceps Q angle, generalized ligamentous laxity, laxity of medial retinaculum, hypoplasia of the vastus medialis oblique, retraction of the lateral retinaculum, flat femoral trochlea, patella alta, lateralization of the tibial tuberosity, excessive pronation, and tight iliotibial band.\textsuperscript{3,9,10,11} Occurrence of these features in isolation or in combination can lead to varied levels of PFP and patellar instability.\textsuperscript{12}

The knee joint is a unique joint. All three major lower extremity joints support full body weight in an upright position, but the knee is anatomically more vulnerable than either the hip or the ankle.\textsuperscript{12} A direct blow or indirect forces such as twisting readily act on the knee and can alter its structure and function.\textsuperscript{12} The knee is a relatively weak joint, and it relies heavily on ligamentous structures for strength.\textsuperscript{13} These ligamentous structures are more flexible but weaker than bone.\textsuperscript{13}

The knee itself consists of two joints, the tibiofemoral joint and the patellofemoral joint. This study focuses on the latter. The articular surfaces that make up the patellofemoral joint are the patella, which is a triangular sesamoid bone, and the femoral sulcus on the distal femur.\textsuperscript{12,14} The posterior surface of the patella is divided by a vertical wedge into medial and lateral facets. These facets are flat to slightly convex.\textsuperscript{12} The femoral sulcus is concave medial to lateral and convex superior to inferior with the lateral facet of the femoral sulcus typically having a more highly developed lip than the medial
facet. The patella is covered on its posterior surface with articular cartilage, and its relationship to the femoral sulcus forms the least congruent joint in the body.\textsuperscript{12,14} This congruence can be measured clinically by the index of Insall and Salviti.\textsuperscript{12} This index is the ratio formed by the length of the patellar tendon to the length of the patella. This number is considered abnormal if it exceeds 1.3 and is classed as patella alta.

The main roles of the patella are to reduce friction between the quadriceps tendon and the femoral condyle and to dissipate some of the compressive forces acting on the knee by acting as a pulley.\textsuperscript{12} This is a difficult task that involves an intricate balance of mobility and stability. The patella must be able to move in the femoral sulcus without becoming unseated.

The motion of the patella along the femoral sulcus will be described in order to further understand the complexity of the patellofemoral joint and its potential problems. In full extension the patella sits loosely in the femoral sulcus. This is the most unstable position for the patella and offers the greatest chance of subluxation or dislocation. Typically, the patella can be moved both medially and laterally half the width of the patella in this extended and relaxed position.\textsuperscript{12} When the knee goes into flexion the patella slides down the femoral sulcus, and in full flexion the patella sinks into the intercondylar notch between the femoral condyles.\textsuperscript{12,14} In this position of complete flexion, the patella is in its most stable position. The patella must undergo rotation about a vertical and an anterior/posterior axis during flexion and extension. This accommodates, respectively, the asymmetry of the surfaces of the condyles and the rotational forces acting on the femur.\textsuperscript{12}

The resultant force acting on the patella is derived from the combination of the superior pull of the quadriceps and the inferior pull of the patellar tendon. The patella makes little or no contact when the force vectors of these two tendons are nearly parallel, as they are with contraction of the quadriceps in full knee extension.\textsuperscript{12} Compressive
forces increase, however, with increased knee flexion because the vector angles of the tendons become increasingly oblique (figure 1). The amount of force is determined by the active and passive tension and the degree of knee flexion. These compressive forces make the joint more stable, but the body compensates for the potential damage from these forces with a thick layer of hyaline cartilage on the medial facet. It is this surface that is the first to come in contact with the femoral surface during knee flexion. The patella operates most effectively as a pulley to maximize quadriceps activity between 30 degrees and 70 degrees, the range of knee flexion with the most femur to patella contact.

There are two stabilizing systems present in the patellofemoral joint. These are the transverse stabilizers, consisting of medial and lateral retinacula, which join the vastus medialis and lateralis muscles to the patella, and the longitudinal stabilizers, consisting of the quadriceps and patella tendons. The medial/lateral position and mobility of the patella determine the tension in the two separate stabilizing forces. These structures also play a major role in the tracking of the patella along the femoral sulcus during knee flexion and extension.

The net pull of the longitudinal stabilizers is assessed clinically using the Q angle of the knee (figure 2). It is measured as the angle formed by a line between the anterior superior iliac spine and the midpoint of the patella and a line connecting the tibial tuberosity to the midpoint of the patella. An angle of 15 degrees is considered normal, with anything greater than 20 degrees considered to create abnormal, excessive lateral pull on the patella. An abnormal Q angle measurement is not a definite indicator that there are problems with the patellofemoral joint, but a high Q angle is useful in diagnosing structural malalignment.

The patellofemoral joint is complex, and patellar positioning can be affected by other structures in the lower extremity than those previously mentioned. Structural
Figure 1: Compressive Forces with Knee Flexion. The combined pull of the quadriceps ($F_Q$) and the patellar ligaments ($F_{pl}$) can be composed into a single resultant vector ($R$) that will clearly compress the patella into the femur. The magnitude of $R$ will increase with an increase in magnitude of ($F_Q$) and ($F_{pl}$) and with increased knee flexion. (Reproduced with permission from Norkin CC, and LeVangie PK. *Joint Structure & Function: a comprehensive analysis, 2nd ed*, p. 369. Philadelphia, PA: F.A. Davis Company.)
Figure 2: Q Angle. The pull of the quadriceps (FQ) and the pull of the patellar ligament (Fpl) lie at a slight angle to each other, producing a slight lateral force on the patella. (Reproduced with permission from Norkin CC, and LeVangie PK. Joint Structure & Function: a comprehensive analysis, 2nd ed, p. 371. Philadelphia, PA: F.A. Davis Company.)
abnormalities such as shortening of the lateral retinaculum, hypermobility of the medial retinaculum, hypoplasia of the vastus medialis oblique (VMO), or tightness of the iliotibial band may increase compression on the lateral facet of the patellofemoral joint. These forces increase the likelihood of dislocation or subluxation, but these forces can be decreased by a highly developed lateral lip on the femur. Changes in these passive structures may be primary or secondary to the changes in dynamic stabilizers mentioned previously.

Conservative treatment for PFP or patellar instability is the first choice for most patients and physicians. For one approach, an assessment of patellar orientation is the first step to setting up a successful treatment program. This involves assessing the medial/lateral glide component (figure 3), the medial/lateral tilt component, the longitudinal axis (figure 4), and the anteroposterior tilt component (figure 5). If abnormal positioning of the patella is found, Jenny McConnell's approach may be used. McConnell is an Australian physiotherapist who promotes regaining biomechanically optimal patellar positioning and tracking by the use of taping techniques. Her technique involves using a base tape and a secondary tape to hold the patella in a better position during activities. If a glide component abnormality is found, it should be corrected first, followed by the most excessive component. The activity that increases the patient's symptoms should be used following taping to assess the effectiveness of the treatment. If a significant decrease in symptoms is not reported, the order or the way the patella is taped should be changed. The goal of this technique is to alter the forces acting on the patella, usually to decrease lateral pull. The tape is left in place 24 hours per day initially, and the patient is weaned from the tape as increased vastus medialis oblique control is demonstrated. This combined with strengthening of the vastus medialis oblique are the main components of Jenny McConnell's techniques. The mechanisms behind this are not completely understood, because a study has shown that radiographic studies taken before


and after taping do not show a change in patellofemoral congruency or patellar rotations associated with the decrease in pain.  

The conservative, nonoperative treatment of patellofemoral disorders may typically include VMO strengthening, hamstring stretching, correction of excessive foot pronation, mobilization of a tight lateral retinaculum, weight reduction to decrease forces at the patellofemoral joint, and anti-inflammatory medications in addition to patellar taping. Some conservative treatment approaches to PFP are favoring closed-kinetic training over open kinetic exercises. Closed kinetic activities are thought to be better tolerated by the patient with PFP because the contact area between the patella and the femur increases as the compressive forces that increase symptoms increase with greater degrees of knee flexion. This controls the increase in force per unit area by spreading it out over a larger surface area.

From a surgical standpoint, the arthroscopic lateral retinacular release typically involves three small incisions; anterolateral, anteromedial, and superomedial. The inflow cannula is inserted into the superomedial opening, and its purpose is to ensure constant pressure in the knee throughout the procedure to keep the structures separated. The diagnostic arthroscopy is typically performed from the anterolateral portal. Once the diagnosis is confirmed, the LRR is begun. The scope is moved to a medial portal, and the electrosurgical knife is used to perform the release through the anteromedial or anterolateral portal. The LRR typically extends approximately from the superolateral border of the patella at the musculotendinous junction of the vastus lateralis to near Gerdy’s tubercle. The release should include the synovium, lateral capsule ligaments, and the capsular and ligamentous structures connecting the inferolateral patella to the lateral tibial plateau. The LRR is considered complete when the patella can be everted 90 degrees, such that the lateral border points straight up from the femoral notch. One common complication of this procedure is hemarthrosis. This is because of the rich
blood supply in the patellofemoral joint and consequent postoperative bleeding. This problem has decreased with the move from an open procedure to electrosurgery, and with early introduction of ROM and quadriceps strengthening programs.

A study by Nonweiler and DeLee\textsuperscript{18} reported on five patients that experienced the postoperative complication of medial subluxation of the patella following LRR. The diagnosis was made by clinical examination involving medial passive patellar mobility, gravity subluxation test, and medial apprehension test. These patients did not respond to conservative treatment, and consequently underwent reconstruction of the lateral retinaculum with good results.

Several studies were found that involve the lateral retinacular release. One study by Hawkins et al\textsuperscript{2} compared conservative treatment consisting of immobilization and aggressive physical therapy once pain subsided to surgical intervention involving lateral retinacular release, vastus medialis advancement, and repair of the medial retinaculum for primary patellar dislocations. The effectiveness of each approach was examined regarding patellar instability and PFP, and the relationship between predisposing factors of patellar malalignment and occurrence of redislocation was addressed. They recommended conservative treatment for primary patellar dislocations without predisposing factors and surgical intervention for patients exhibiting predisposing factors or an osteochondral fragment.

A study by Fu and Maday\textsuperscript{7} indicated that the lateral release was "primarily indicated for patients with symptomatic lateral patellar compression syndrome with a normal Q angle that does not respond to three months of appropriate, supervised physical therapy." They noted that a properly performed lateral release can successfully denervate a painful lateral retinaculum and correct mild malalignment, determining it was not appropriate in isolation for patients with patellar instability.
Fulkerson and Schutzes\(^8\) had similar findings that LRR can be used to correct mild malalignment and decrease painful retinaculum and patellar tilting following failure of conservative treatment. They stressed the importance of careful preoperative evaluation including assessment of back and hip, foot mechanics, computed tomography, and a detailed clinical exam to determine candidates for surgery that have a high chance for success.

Vahasargi et al\(^{11}\) agreed that the LRR is the appropriate choice for correcting mild malalignment, and that LRR combined with medial reefing is best for correcting patellar tilting. CT scans can be used when malalignment is suspected to give more information for planning treatment.\(^9,11,15\) Patellar tilt that is proven by CT is considered by some physicians to be an indication for LRR.\(^{15}\)

It has been reported that the pain involved with patellofemoral disorders is related to peripheral nerve injury in the lateral retinaculum.\(^7,16\) This information came from a study involving adolescents undergoing LRR to correct anterior knee pain with or without an unstable patella.\(^{16}\) Degenerative neuropathy was found in 29 of the knees examined suggesting that this may be an important cause of PFP in patients with patellofemoral disorders.

Dandy et al\(^{18}\) completed a study on the outcome of the LRR using the criteria of Crosby and Insall to address success of the surgery. Only patients undergoing LRR for recurrent complete dislocations of the patella were included. Forty-one knees were examined after 4 years and 33 knees after 8 years. Thirty-nine had excellent results at 4 years with 30% at 8 years. The results were poor in the patients who experienced subluxation with extension of the knee. Excellent results increased to 50% after 4 years and 37% after 8 years with these patients excluded. They concluded that the LRR is the treatment of choice for patients with recurrent complete dislocation of the patella in the absence of abnormal ligament laxity or subluxation on extension.
A study by Fabbriciana et al.\textsuperscript{1} showed surgical success with patients with PFP, tight retinaculum, patellar instability, and/or subluxation, but showed unsatisfactory results when severe chondromalacia is present or rehabilitation is insufficient.

Brief\textsuperscript{10} found that many patients with lateral patellar instability also exhibit patellar hypermobility. He indicated that lateral release alone doesn't sufficiently address this hypermobility. Lateral retinacular release and medial tethering of the patellar tendon is his recommendation for patients with lateral patellar instability and patellar hypermobility.

Agliette et al.\textsuperscript{9} focused on patients with recurrent patellar dislocations. The subjects underwent a lateral release, or a variety of realignment procedures. They found that the lateral release group had a 40\% redislocation rate following surgery. They recommended that the LRR should be performed only on occasion when the patient refuses open realignment and accepts the risk of recurrent dislocations. It was stated that the high rate of redislocation could be due to the severe dysplasia of the extensor mechanism in the patients used for the study.

Some studies have been conducted to find predictors to the success of the lateral retinacular release.\textsuperscript{15,17} Preoperative findings that correlate with good outcomes include biomechanical peripatellar pain, and a positive patellar apprehension test. Intraoperative findings such as evidence of patellar maltracking and an abnormally toughened lateral retinaculum are also associated with good outcomes.\textsuperscript{17}
CHAPTER THREE
METHODOLOGY

This project was designed to be a pilot study to investigate the need for research into the effectiveness of the LRR to decrease anterior knee pain, increase knee stability, and return patients to their prior level of function. The survey used in this study was put together using a multi-step approach. First of all, Brian Briggs, MD was approached about cooperating in a study on long term patient satisfaction with the LRR. He gave the project his approval and agreed to cooperate by providing the patients, and mailing out and receiving the surveys. The study was then approved by United Hospital’s Institutional Review Board. After gaining board approval, the survey was developed with input from Dr. Briggs, Bruce Johnson, ATC, and UND PT faculty. An effort was made to keep the survey easy to understand, easy to complete, and concise. This survey was approved by the UND PT Department and Dr. Briggs.

The survey was sent out to 23 patients who underwent a LRR by Dr. Briggs between January 1991 and October 1996. This survey was designed to assess patient satisfaction with the surgery. Subjects that underwent total knee arthroplasty along with a LRR were excluded from this study, and all subjects that returned a completed survey by 10-31-97 were included in the study. The subjects included six females and four males ranging in age from 16 to 45 years. Consent forms were sent with the surveys, and will be kept on file at Dr. Briggs’ office for three years. The surveys were sent out and mailed back to the clinic to protect patient confidentiality. Only the data was examined, and the researcher had no actual contact with the subjects.
The survey asked the patient to rate their pain with activity and at rest using a 0 – 10 scale. In this scale, 0 is no pain and 10 is the worst pain imaginable. Reliability and validity tests are especially important with this type of subjective data. A study by Jensen et al\textsuperscript{19} examined 6 different pain scales to predict their validity. Their findings showed numerical rating scales to be valid measures of pain.

A copy of the survey that had been approved by the UND Physical Therapy Department and Dr. Briggs’ office was delivered to Grand Forks Clinic for mailing. This survey was mailed to patients who underwent a lateral retinacular release by Dr. Briggs. The data was entered into Microsoft Works SPSSX for IBM Software for analysis, and any significant findings of the effectiveness of the lateral retinacular release on decreasing pain and increasing stability of the knee in regards to returning to prior level of function were reported. Pain values for the subjects were described by mean, median, and standard deviation. Rest and work pain values for each subject were compared using a paired t test with an alpha of .01 and two tails to determine any significant increase in pain with activity. Crosstabs were run to determine significant connections between two individual factors from the survey.
CHAPTER FOUR
RESULTS

Eleven completed surveys (52.4% return rate) were returned to Dr. Briggs' office and used in this study. Data on the age and gender of the subjects are in Tables 1 and 2. Forty-five percent (n=5) of the respondents had undergone LRR due to recurrent dislocation, 36.4% (n=4) due to knee pain, 9.0% (n=1) due to one dislocation, and 9.0% (n=1) had a bone growth caused by a patellar fracture (Table A, see Appendix F).

The data on pain rating is presented in tables 3 through 8. The paired t test for rest pain high and work pain high reveals significant correlation. The trend identified is that pain increased with work (m=3.0; SD=2.108) in the subjects used in this study. This increase was statistically significant, t(10)=-4.50, p<.01, two-tailed.

The respondents were asked if their knee felt stable after surgery and the following results were gathered (Table B, see Appendix F): 36.4% (n=4) responded no, 27.3% (n=3) responded yes, and 36.4% (n=4) stated that it was not applicable. Twenty-seven point three percent (n=3) noted they had experienced dislocations following surgery, 27.3% (n=3) stated they had no further dislocations, and 45.5% (n=5) indicated the question wasn't applicable to their case (Table C, see Appendix F). In regards to activity limitations following LRR (Table D, see Appendix F), 54.5% (n=6) indicated they experienced no activity limitations, while 45.5% (n=5) had some residual activity limitations. Fifty-four point five percent (n=6) of the respondents had returned to their prior activities, while 45.5% (n=5) had not (Table E, see Appendix F).

Forty-five point five percent (n=5) did not receive physical therapy prior to surgery, while 54.5% (n=6) underwent preoperative therapy (Table F, see Appendix F).
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Valid cases 11 Missing cases 0

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Total 11 100.0 100.0

Valid cases 11 Missing cases 0
Table 3: Rest Low Pain

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Total 11 100.0 100.0

Mean .636 Median .000 Std dev 1.027
Kurtosis 1.744 S E Kurt 1.279 Skewness 1.584
S E Skew .661 Minimum .000 Maximum 3.000

Valid cases 11 Missing cases 0

Table 4: Rest High Pain

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<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
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Total 11 100.0 100.0

Mean 1.182 Median .000 Std dev 1.537
Kurtosis -.981 S E Kurt 1.279 Skewness .842
S E Skew .661 Minimum .000 Maximum 4.000

Valid cases 11 Missing cases 0
### Table 5: Work Low Pain

<table>
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<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
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Mean 2.909  Median 3.000  Std dev 2.071  Kurtosis -0.755  S E Kurt 1.279  Skewness 0.065  S E Skew 0.661  Minimum 0.000  Maximum 6.000

Valid cases 11  Missing cases 0

### Table 6: Work High Pain

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<th>Percent</th>
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</table>

Mean 4.182  Median 4.000  Std dev 2.676  Kurtosis -1.015  S E Kurt 1.279  Skewness 0.031  S E Skew 0.661  Minimum 0.000  Maximum 8.000

Valid cases 11  Missing cases 0
### Table 7: Comparison of Pain Ratings

Number of valid observations (listwise) = 11.00

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<tr>
<th>Variable</th>
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<th>Std Dev</th>
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<th>Maximum</th>
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### Table 8: Paired t-tests for Rest High and Work High Pain

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of pairs</th>
<th>Corr</th>
<th>2-tail Sig</th>
<th>Mean</th>
<th>SD</th>
<th>SE of Mean</th>
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<tr>
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Paired Differences

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<th>SE of Mean</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Sig</th>
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<td>-3.0000</td>
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<tr>
<td>95% CI (-4.344, -1.656)</td>
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</table>
Ninety point nine percent (n=10) of the respondents followed surgical treatment with physical therapy, while 9.1% (n=1) did not (Table G, see Appendix F).

A crosstab was run comparing the reason for surgery to return to previous activity, and it was found that 80% (4 of 5) of the respondents that had not returned to previous activity stated recurrent dislocation as the reason for surgery (Table 9). Another crosstab was run comparing the reason for surgery to the high pain rating with activity, and 5 of the 8 (62.5%) of the work pain ratings of 3.0 or greater were recorded by respondents with recurrent dislocations (Table 10). The subjects with recurrent dislocations make up 45% of the subject population.
Table 9: Reason for Surgery Compared with Return to Previous Activity

<table>
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Number of Missing Observations: 0

Table 10: Work High Pain Compared to Reason for Surgery

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Number of Missing Observations: 0
CHAPTER FIVE

DISCUSSION

The 52.4% (11 of 21) survey return rate suggests that the survey was perceived as easy to complete and answer by a high percentage of the participants. This study only included 11 respondents, so the conclusions drawn from these results are only trends that may direct future research. The levels of pain noted by the respondents during rest and at work indicates that pain is still an issue for a number of these patients. The paired t test results reveal that there is a significant difference between the mean rest high pain rating and the mean work high pain rating. This indicates that these respondents experience a statistically significant increase in pain with activity. Some respondents had rest pain too, including a 16 year-old female who complained of significant pain with prolonged standing.

The results of the questions regarding knee stability and future dislocations following surgery suggest that a number of these patients are still experiencing significant difficulties following surgery. The respondents that answered “not applicable” to these questions had no problems with stability or dislocations prior to surgery. A 45 year-old female with recurrent dislocations that continued after surgery stated she had “lots of clunking and some catching” following surgery. A 21 year-old female with recurrent dislocations that continued after surgery stated that the dislocations had decreased in severity and degree after the LRR.
The lateral retinacular release had slightly higher ratings in the percentage of current activity limitations but failed to return greater than half of the respondents back to their prior activity level. Two respondents stated that they had returned to activity with limitations but not to the same level as before surgery. One 16 year-old male who had the surgery due to knee pain has had no further problems and is very active in sports.

Comparisons between subjects that received physical therapy and those that did not were not possible in this study due to the fact that only one respondent had not received therapy.

The results of the two crosstabs suggest a poorer prognosis for patients undergoing a LRR for recurrent dislocations. The patients had a low return to prior activity level and a greater percentage of high pain ratings with activity.

Results were similar to the similar studies in basic ways, but differed in a fundamental sense. The redislocation rate recorded in the study by Aglietti et al\textsuperscript{9} was 40\% following surgery, but his study only included patients with recurrent dislocations prior to surgery. This study’s rate was 27.3\%, but included only five such respondents out of eleven (45.5\%) and one patient with one dislocation (9.1\%). Therefore, 3 of the 6 patients (50\%) with prior dislocations continued to be unstable following surgery.

Several of the studies recommended the LRR for the following diagnoses: lateral patellar compression syndrome, mild malalignment, complete recurrent dislocation, PFP, tight retinaculum, patellar instability, or subluxation.\textsuperscript{1,7,8,11} LRR was not recommended for patients with patellar instability, abnormal ligamentous laxity, or subluxation on extension.\textsuperscript{7,18} This study’s subjects were not broken into these specific categories, but the
respondents with PFP did have decreased work pain and increased return to prior activity level compared to the patients with recurrent dislocation.

This study was the result of a survey completed by patients, and the researcher had no contact with their medical records or with the patient themselves for examination. This caused the results to differ from researchers that used examination and further medical knowledge of their subjects in their research. Therefore, this study was not able to be specific about diagnoses or use physical measurements. It was designed as a pilot study to rate patient satisfaction with the LRR to determine a need for future research.

This study was limited by a low number of subjects due to time constraints and resources, the subjectivity of the patient survey, and not having any actual patient contact. If this study were repeated, it could be improved by involving more physicians doing this procedure to increase the number of respondents and by involving patient contact. The pain rating scale might be more effective if one involving a visual component were used. An example is the scale which uses an 11 point box diagram where the subject puts an ‘x’ in a box from 0 to ten to denote their level of pain (0=no pain, 10=worst imaginable pain). This scale has been proven effective in a study by Jensen et al.19

Future studies should focus on the pain level at rest and at work, and the patellofemoral stability of these patients after surgery. Some ideas to improve the outcomes of the LRR are to study the effects of an aggressive presurgery strengthening program emphasizing the VMO; to study further markers for good surgical outcome, including CT scans, and clinical measurements (Q angle, patellar mobility, and obliquity of the patellar tendon); to study outcomes using evaluations involving the back, hips, and
foot mechanics; and to study the effect of adding medial tethering to the LRR to increase patellofemoral stability.

I feel that the results of this study regarding continued pain with activity and persistent instability are especially important due to the age of the respondents, because many of the subjects were in their twenties or younger. This warrants further research into this area due to the extent of persistent problems and the low rates of return to prior activity noted in the trends in this study.
CHAPTER SIX

CONCLUSION

This pilot study showed several areas of concern regarding the effectiveness of the LRR. There was a 27.2% rate of redislocation, 45.5% of the respondents hadn’t returned to their previous activity level, a statistically significant difference was found between pain ratings at rest and pain rating with activity, and subjects with prior recurrent dislocations experienced increased work pain levels and decreased ability to return to previous activities compared to subjects with PFP. The age range of the subjects in this study was 16 to 46 years, so these results are especially disturbing due to the relatively young age of the respondents.

These findings indicate a need to further research the effectiveness of the LRR in decreasing pain, increasing stability, and returning the patient to a prior level of activity. Predictors of surgical outcomes must be determined to identify appropriate patients for surgery. Incorporating a more extensive patient evaluation prior to surgery involving these predictors would likely increase the success rate of the LRR while decreasing the overall number of surgical procedures.
APPENDIX A
Research Questions:

1. "Does the lateral retinacular release significantly decrease anterior knee pain with activity?"
2. "Does the lateral retinacular release significantly increase knee stability?"
3. "Are patients able to return to their prior level of function following a lateral release?"
4. "Does receiving physical therapy increase the effectiveness of the lateral retinacular release?"

Null hypothesis: The lateral retinacular release performed alone is significantly effective on decreasing patellofemoral pain with activity and increasing knee stability for return to prior level of function.

Alternative hypothesis: The lateral retinacular release performed alone is not significantly effective on decreasing patellofemoral pain with activity and increasing knee stability for return to prior level of function.
APPENDIX B
Celeste Hansen will be conducting a physical therapy graduate project for the University of North Dakota. She will be putting together a survey for patients who have had knee surgery involving a lateral retinacular release. The survey will be used to evaluate the effectiveness of this technique in regards to decreased pain and increased stability.

Celeste will be working closely with Dr. Briggs and his staff, including Bruce Johnson, ATC. They will be responsible for providing a list of patients who have had a lateral retinacular release, sending out the surveys, and returning the completed surveys to Celeste. Celeste will get approval of the study through the IRB board, compose the survey, provide it to Bruce Johnson for review and mailing, and interpret the results. She will have no direct contact with or knowledge of the identity of the patients.

We agree to the above conditions and are looking forward to working together on this project.

Celeste Hansen  
Bruce Johnson, ATC  
Dr. Brian Briggs, MD  
UND PT Faculty Advisor

Date  
4-29-97  
4-16-97  
4-10-97  
5-19-97
EXPEDITED REVIEW REQUESTED UNDER ITEM __ (NUMBER(S)) OF HHS REGULATIONS
EXEMPT REVIEW REQUESTED UNDER ITEM __ (NUMBER(S)) OF HHS REGULATIONS

UNIVERSITY OF NORTH DAKOTA
HUMAN SUBJECTS REVIEW FORM
FOR NEW PROJECTS OR PROCEDURAL REVISIONS TO APPROVED
PROJECTS INVOLVING HUMAN SUBJECTS

PRINCIPAL INVESTIGATOR: Celeste Hansen TELEPHONE: (701) 780-9345 DATE: 4/15/97

ADDRESS TO WHICH NOTICE OF APPROVAL SHOULD BE SENT: 2100 29th Street South #121, Grand Forks, ND 58202


PROJECT TITLE: The Effectiveness of the Lateral Retinacular Release on Decreasing Pain and Increasing
Stability in the Patellofemoral Joint

FUNDING AGENCIES (IF APPLICABLE): N/A

TYPE OF PROJECT:
- X NEW PROJECT -- CONTINUATION -- RENEWAL
- _ THESS RESEARCH
- _ STUDENT RESEARCH PROJECT
- _ CHANGE IN PROCEDURE FOR A PREVIOUSLY APPROVED PROJECT

DISSERTATION/THESIS ADVISER, OR STUDENT ADVISER: Mark Ramaciek

PROPOSED PROJECT: _ INVOLVES NEW DRUGS (IND) _ INVOLVES NON-APPROVED USE OF DRUG
- X INVOLVES A COOPERATING INSTITUTION

IF ANY OF YOUR SUBJECTS FALL IN ANY OF THE FOLLOWING CLASSIFICATIONS, PLEASE INDICATE THE
CLASSIFICATION(S):
- X MINORS (<18 YEARS) _ PREGNANT WOMEN _ MENTALLY DISABLED _ FETUSES _ MENTALLY RETARDED
- PRISONERS _ ABORTUSES _ UND STUDENTS (>18 YEARS)

IF YOUR PROJECT INVOLVES ANY HUMAN TISSUE, BODY FLUIDS, PATHOLOGICAL SPECIMENS, DONATED ORGANS, FETAL
MATERIAL, OR PLACENTAL MATERIALS, CHECK HERE ___

1. ABSTRACT: (LIMIT TO 200 WORDS OR LESS AND INCLUDE JUSTIFICATION OR NECESSITY FOR USING HUMAN SUBJECTS.

The lateral retinacular release is one of the most commonly performed surgical procedures used to treat patellofemoral pain and instability. The purpose of this study is to provide insight into the effectiveness of a lateral retinacular release for decreasing pain and increasing stability in the patellofemoral joint. This is an important area of study due to the high occurrence of patellofemoral pain and its common persistence, along with the high numbers of redislocations or instability following a primary patellar dislocation. This project will help to establish direction and guidelines for future research. If research in this area is not pursued, many patients may undergo unnecessary or ineffective surgical procedures and rehabilitation.

PLEASE NOTE: Only information pertinent to your request to utilize human subjects in your project or activity should be included on this form. Where appropriate attach sections from your proposal (if seeking outside funding).

2. PROTOCOl: (Describe procedures to which humans will be subjected. Use additional pages if necessary.)

1. The subjects will be sent a survey regarding their current level of function and discomfort following a lateral retinacular release, and a consent form to be voluntarily completed.
2. They will be asked to mail back the documents if they choose to participate in the survey.

3. BENEFITS: (Describe the benefits to the individual or society.)
This type of survey will establish a level of patient satisfaction with the outcome of their knee surgery. It is a non-intrusive technique to investigate the need for further research in this area. The results can also be used to better direct the course of future research.

4. RISKS: (Describe the risks to the subject and precautions that will be taken to minimize them. The concept of risk goes beyond physical risk and includes risks to the subject's dignity and self-respect, as well as psycho-logical, emotional or behavioral risk. If data are collected which could prove harmful or embarrassing to the subject if associated with him or her, then describe the methods to be used to insure the confidentiality of data obtained, including plans for final disposition or destruction, debriefing procedures, etc.)

The only risk to the subject is loss of patient confidentiality. To protect this, the facility I will deal with will send out and receive the completed surveys. I will only get numbered surveys without the subjects names, addresses, or other personal information.

5. CONSENT FORM: A copy of the CONSENT FORM to be signed by the subject (if applicable) and/or any statement to be read to the subject should be attached to this form. If no CONSENT FORM is to be used, document the procedures to be used to assure that infringement upon the subject's rights will not occur.

Describe where signed consent forms will be kept and for what period of time.

A consent form will be mailed out with the surveys, and will be kept in Dr. Briggs office for 3 years.

6. For FULL IRB REVIEW forward a signed original and thirteen (13) copies of this completed form, and where applicable, thirteen (13) copies of the proposed consent form, questionnaires, etc. and any supporting documentation to:

Office of Research & Program Development
University of North Dakota
Box 8138, University Station
Grand Forks, North Dakota 58202

On campus, mail to: Office of Research & Program Development, Box 134, or drop it off at Room 101 Twamley Hall.

For EXEMPT or EXPEDITED REVIEW forward a signed original and a copy of the consent form, questionnaires, etc. and any supporting documentation to one of the addresses above.

The policies and procedures on Use of Human Subjects of the University of North Dakota apply to all activities involving use of Human Subjects performed by personnel conducting such activities under the auspices of the University. No activities are to be initiated without prior review and approval as prescribed by the University's policies and procedures governing the use of human subjects.

SIGNATURES:

Collect M. Hamen
Principal Investigator

DATE: 5-5-97

Fred Leunig
Project Director or Student Adviser

DATE: 5-19-97

Training or Center Grant Director

DATE: ____________

(Revised 3/1992)
You have been invited to participate in a survey conducted by Celeste Hansen, SPT in cooperation with Dr. Briggs. Selection for this survey is based on the type of surgery you had performed on your knee. Your participation in this survey is completely voluntary. Please feel free to discontinue at any time without consequences. Your name or other identifying information will not be used in the reports or results of this study. These consent forms will be kept on file in Dr. Briggs’s office.

Signature

Date
Grand Forks Medical Park

Institutional Review Board

Research Project Action Report

Date: May 29, 1997

IRB#: PT-003

Principal Investigator: Celeste Hansen
Department: Physical Therapy Phone #: 780-9345

Research Coordinator: ____________________________ Phone #: ____________________________

Project Title: The Effectiveness of the Lateral Retinacular Release on Decreasing Pain and Increasing Stability in the Patellofemoral Joint

The above referenced project protocol and informed consent was reviewed by the Medical Park Institutional Review Board on 5-30-97 and the following action was taken:

☐ Project approved. Next Scheduled review is on __________

If no date is given, then review will be required in 12 months. (See REMARKS SECTION for any special condition.)

☐ Project approved. EXPEDITED REVIEW NO. ____________________________

Next scheduled review is on __________

☐ Project approved. EXEMPT CATEGORY NO. ____________________________

No periodic review scheduled unless so stated in REMARKS SECTION.

☐ Project approval deferred. (See REMARKS SECTION for further information.)

☐ Project denied. (See REMARKS SECTION for further information.)

☐ Amendment approved

REMARKS:

Any changes in protocol, adverse occurrences or deaths in the course of the research project must be reported immediately to the IRB chairperson or the IRB office (780-6161).

Signature of Chairperson/Designated IRB Member
Medical Park Institutional Review Board

30 May 1997

If the proposed project is to be part of a research activity funded by a federal agency, a special assurance statement or a completed 506 Form may be required. Contact IRB office to obtain the required documents.
You have been selected to participate in a survey regarding the effectiveness of the type of surgery (lateral release) that you had performed on your knee. This survey is part of my research project as a student physical therapist, and its purpose is to assess patient satisfaction in regards to decreased pain, increased stability, and return to prior activities following surgery. Your response to this survey would be greatly appreciated, and may lead to future scientific advances in this area. For this survey, a dislocation is defined as the kneecap leaving its groove and traveling outward or inward.

1. What was the reason for your surgery (please circle your choice)?  
   - knee pain
   - accident
   - recurrent dislocations
   - one dislocation
   - other (please list)__________

2. If you did dislocate your kneecap, have you had any further dislocations following surgery?  
   - Yes  
   - No  
   Do you feel that your knee is stable?  
   - Yes  
   - No  
   Please feel free to explain__________________________

3. On a scale of 0 - 10 (0 = no pain, and 10 = pain so severe that you would go to the emergency room) please rate you current knee pain at rest _____, and with activities _____.

4. Have you returned to your activity level prior to injury/surgery?  
   - Yes  
   - No

5. Are there things you were able to do before surgery that you are no longer able to do?  
   - Yes  
   - No  
   If yes, please give an example__________________________.

6. Did you receive any physical therapy prior to surgery?  
   - Yes  
   - No  
   after surgery  
   - Yes  
   - No.

Please fill in the following information. It will be used only for analysis purposes. Please DO NOT put your name on this survey.

Age: _______  
Sex _______ (M or F)  
Approximate date of surgery: ____________

38
APPENDIX E
2100 29th Street South #121  
Grand Forks, ND 58201  
October 26, 1997

Attn: Permissions Department  
F. A. Davis Company  
1915 Arch Street  
Philadelphia, PA 19103

To Whom It May Concern:

I am a physical therapy student at the University of North Dakota, and I am currently working on my graduate project involving the patellofemoral joint and the lateral retinacular release. I would like to use the following figures from Joint Structure & Function: A Comprehensive Analysis Second Edition by Cynthia C. Norkin and Pamela K. LeVangie to help explain the forces acting on the patellofemoral joint; figure 11-35 (p. 369) and figure 11-36 (p. 371). Credit would be given to the publisher where the diagrams are placed, and they will be used without any changes. These figures would be included in the bound copies of my independent study, along with your permission form. Please respond with a written response at your earliest convenience in the enclosed envelope if this is approved. Any questions can be addressed to Celeste Hansen at # (701) 780-9345.

Thank you for your consideration of this request.

Sincerely,

Celeste M. Hansen, SPT

*Credit must also be given to author and title.

Permission granted as requested.

Jean-Francois Vilain  
Publisher
The McGraw-Hill Companies

TO: Celeste M. Hansen
2100 29th Street South #121
Grand Forks, ND 58201

Date: November 05, 1997

Fee: $0.00

The McGraw-Hill Companies material requested:

Title: Rehabilitation Techniques in Sports Medicine, 2E (1994)
Author(s): Prentice, W.E.,
Specific material: Figures 23.8-23.12 as outlined in your request.

Number of copies: 3

Purpose of reproduction: One-time use in your graduate thesis for the University of North Dakota Physical Therapy Department.

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By: ______________________
Thomas Mayo
Permissions Department

Agreed and accepted by:

Name and title: ______________________
College, University, or Company: ______________________
Authorized Signature: ______________________
Date: ______________________

Form D
APPENDIX F
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REFERENCES


