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Outpatient Physical Therapy Following Surgical Repair Of A Left Patellar Tendon Rupture: A Case Report

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27 **Abstract**

28 **Background/Purpose**

29 Patellar tendon tears often occur in patients less than 40 years old during physical activity with forced
30 flexion of the knee. Surgical repair of the tendon is often the treatment following a tear; additionally,
31 performing surgery to repair the tendon in a timely fashion is an important prognostic factor. The
32 purpose of this case report is to outline the deficits following surgical repair of a left patellar tendon
33 rupture, describe specific physical therapy interventions used during 12 weeks of outpatient
34 rehabilitation, and report the outcomes of physical therapy.

35 **Case Description**

36 Patient DH presented to physical therapy with restricted range of motion, pain, weakness, and swelling
37 to his left knee following surgical repair of a left patellar tendon rupture. DH was originally diagnosed
38 with a lateral patellar dislocation; therefore his surgery was delayed 6 weeks due to the false diagnosis.
39 He began physical therapy 8 weeks following surgery.

40 **Outcomes**

41 DH displayed exceptional results in 12 weeks of PT including increasing knee flexion range of motion by
42 55 degrees and nearly normalizing his gait pattern. Although he failed to meet several of his goals, he
43 had a strong likelihood of a full recovery.

44 **Discussion**

45 There is little available evidence regarding physical therapy and prognosis of a patient following delayed
46 surgery of a torn patellar tendon. Evidence will become available when future errors are made regarding
47 the diagnosis of a torn patellar tendon, subsequently delaying surgery. If available, future studies should
48 be performed to assess outcomes obtained greater than 12 weeks following the beginning of therapy to
49 further gauge the patient's potential recovery.

50 **Manuscript word count: 3668 words**

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74 Background and Purpose

75 The incidence of patellar tendon rupture is not known, but it is relatively infrequent and much less
76 common than dislocation of the patella.¹ A partial tear can occur anywhere throughout the length of the
77 patellar tendon, or a full tear can occur in which the patellar tendon is completely torn from its insertion
78 at the tibial tubercle.¹ Common symptoms of a patellar tendon rupture include inability to actively
79 extend the knee, patella alta, or a patella displaced superiorly relative to the femur, and a palpable
80 defect of the patellar tendon.¹ Diagnosis of a patellar tendon rupture can often be made through
81 palpation of the patellar tendon during physical examination, by using an x-ray to determine patella alta,
82 or an MRI to show the extent of damage to the tendon.¹ Patellar tendon tears often occur in patients
83 less than 40 years old during physical activity with forced flexion of the knee.² Prior injuries to the
84 patellar tendon such as patellar tendonitis, which causes microtrauma and inflammation of the tendon
85 acquired from over-use, may also contribute to rupture of the tendon.²

86 Surgical repair of the tendon as well as the medial and lateral retinaculum is often the treatment
87 following a tear as the tendon is not likely to heal on its own.² Most patients who undergo surgical repair
88 in a timely fashion will achieve nearly complete knee range of motion (ROM) and quadriceps strength.³
89 Following surgery, 6-8 weeks of restricted ROM using a knee immobilization brace is often necessary to
90 allow the tendon to heal without re-injury.³ Once the surgeon has determined that the tendon is strong
91 enough for therapy, physical therapy begins in order to regain motion of the knee, strength throughout
92 the hip, knee, and ankle musculature, and correct any gait abnormalities that have resulted from
93 prolonged immobility or weakness.²

94 Although many scientific articles have been published regarding symptoms, surgical treatments, and
95 therapeutic interventions following patellar tendon ruptures, there are currently no case reports

96 regarding the evaluation and treatment of a patient following surgical repair of a patellar tendon
97 rupture that was delayed delayed 6 weeks following injury.

98 The purpose of this case report is to outline the deficits following surgical repair of a left patellar tendon
99 rupture, describe specific physical therapy interventions used during 12 weeks of outpatient
100 rehabilitation, and report the outcomes of physical therapy.

101 Patient History and Systems Review

102 DH was a happily married 54 year old male with 3 adult children. He had worked 33 years as a telephone
103 lineman, and was satisfied with his career path. He reported he was in overall good physical health prior
104 to the injury as he participated in recreational physical activities 3-4 times per week, including soccer,
105 hockey, skiing, cycling, golf, hiking, mountain biking, and jogging. DH reported he was a social drinker,
106 but did not consume more than 2-3 drinks per week. He reported both he and his wife tried to take care
107 of their bodies, both physically and mentally; they maintained a healthy diet and managed stress
108 through exercise. He had two previous nasal sinus surgeries in the last five years, and also had a 25 year
109 history of the autoimmune lung disease Churg Strauss, which is characterized by inflammation of small
110 and medium sized blood vessels, and generally includes some form of asthma, paranasal sinusitis, and
111 pulmonary infiltrates.⁴

112 DH presented to physical therapy with restricted ROM, pain, and swelling to his left knee following
113 surgical repair of a patellar tendon rupture. He stated he was sprinting during a soccer game and
114 planted his left leg in order to make a hard right turn and his knee gave out. DH originally went to the
115 emergency room, and because no specific diagnostic tests were performed, he was diagnosed with a
116 lateral patellar dislocation. DH then completed 6 physical therapy visits over a 4 week period in order to
117 treat the suspected patellar dislocation, and when he failed to progress he was sent for an MRI of his

118 knee. The MRI revealed a fully torn patellar tendon, and DH had surgery 2 weeks later (figure 1).
119 Therefore, DH's surgery was delayed approximately 6 weeks due to the initial false diagnosis, and he did
120 not begin physical therapy again until 8 weeks following surgery. Following surgery, DH was restricted to
121 a knee immobilization brace locked in full extension and was instructed to perform weight bearing as
122 tolerated for the 8 week period until he began physical therapy. At the time of his first physical therapy
123 appointment, his brace was set to allow up to 30 degrees of knee flexion.

124 Additionally, DH also reports that due to his 25 year history of Churg Strauss, he was taking the
125 corticosteroid Prednisone orally for approximately 4 years prior to his injury. This may have contributed
126 to DH's injury as long term use of corticosteroids such as Prednisone are shown to contribute to muscle
127 mass loss, particularly of the shoulders and quadriceps musculature, and also to weakening of soft tissue
128 such as tendons.⁵

129 See Table 1 for a detailed description of the systems review.

130 DH states that his short term goal is to return to work pain free within 4 weeks. After further discussion,
131 he also stated that he would like to be able to walk without "limping" within 2 weeks.

132 As a long term goal, DH wishes to nearly return to his prior level of functioning within 1 year of his
133 injury, or about 9 months from now. He reports that he will no longer be participating in hockey, but
134 hopes to be able to jog, cycle, golf, ski, and play soccer by this time.

135 Clinical Impression 1

136 DH's primary problems include restricted ROM, antalgic gait, and pain. As DH was referred to physical
137 therapy post-operatively with a known diagnosis, no differential diagnoses were needed. The referral
138 also included a rehabilitative protocol including passive knee flexion as tolerated to a maximum of 30
139 degrees, and strengthening exercises of the hip and ankle musculature.

140 As I was given a protocol for DH's initial therapy sessions until he had a 3 week checkup with his
141 surgeon, no further consultation or referral was necessary and at this point I began the interventions.
142 DH is an excellent candidate for a case report as there are no current case reports regarding outcome
143 measures and prognosis of a patient following surgical repair of a ruptured patellar tendon that was
144 delayed 6 weeks following the injury.

145 Exam – Tests and Measures

146 Following the history, goniometry of passive knee flexion and extension, a pain scale, and gait analysis
147 were performed. Manual Muscle Testing (MMT) of the hip and ankle was performed at a later date
148 (Table 2). No MMT of the knee was performed as post-operative contraindications prevented DH from
149 performing active range of motion (AROM) at the knee.

150 ROM of passive knee flexion and extension was measured goniometrically in the initial evaluation in
151 order to determine a baseline of available joint ROM and record progress, and was also reassessed
152 periodically throughout therapy. Nussbaumer et al.⁷ found that goniometric measurements of hip ROM
153 demonstrated a validity ranging from .88 - .94, and test-retest reliability ranged from .82 - .90,
154 respectively. Based on these statistics, both reliability and validity of goniometric measurements of the
155 hip are excellent, and I believe these statistics can be applied to the knee joint.

156 MMT of the hip and ankle were not performed until the 5th week of therapy, but both are necessary to
157 assess if strength issues are responsible for recurring gait abnormalities. MMT of the knee was not
158 performed at all during DH's 12 weeks of physical therapy because the surgeon never authorized DH to
159 perform maximum strength knee flexion or extension as he was still in danger of re-injury. MMT of the
160 biceps and external rotator cuff musculature was reported to have a test-retest reliability of .97 - .98.⁸
161 Similarly, Noreau et al.⁹ assessed the correlation between MMT and myometry and determined the

162 validity to range from .26 - .95, respectively. Based on these statistics, the test-retest reliability of MMT
163 is excellent, and the validity ranges from poor to excellent.

164 The Visual Analog Scale (VAS) was used during the initial evaluation in order to assess DH's level of pain
165 and to record progress. Boonstra et al.¹⁰ found the test-retest reliability of the VAS to range from .60 -
166 .77, and the validity to range from .16 - .51, respectively. Based on these statistics, the reliability of the
167 VAS for pain is moderate to good, and the validity of the VAS is highly questionable.

168 Clinical Impression 2

169 Based on the examination, DH displays the typical symptoms following surgical repair of a patellar
170 tendon, and therefore continues to be appropriate for the case. Following the examination, I made a
171 quick evaluation of the information obtained and then began DH's plan of care. DH's pain, decreased
172 ROM, antalgic gait, and suspected weakness stem from his surgical procedure, knee immobilization
173 brace, and weight bearing precautions.

174 Strength of knee extension was not assessed as forced use of the quadriceps muscle shortly following
175 surgery can cause unwanted stress to the sutures that are in place in order to restore the patellar
176 tendon and re-align the patella, and could cause re-rupture.¹¹ ROM of the knee was restricted to a
177 maximum of 30 degrees flexion at the initial evaluation, which is also due to the recent nature of the
178 surgery and the delicacy of the sutures put in place. DH was able to achieve 30 degrees of passive knee
179 flexion, although it caused significant pain. In order to regain knee flexion ROM, some authors suggest a
180 slow rehabilitative protocol to minimize the risk of re-rupture. However, other authors suggest that an
181 accelerated post-operative protocol does not affect the likelihood of re-rupture, and is necessary to
182 ensure there is no loss of ROM.¹¹ In this case, a slower rehabilitative protocol was planned per the
183 surgeon's orders.

184 Based on DH's impairments, his functional limitations include the inability to perform many daily
185 activities including tying his left shoe, mowing the lawn, and cleaning the house. He is also unable to
186 participate in any of the sports activities he normally does. His disability includes the inability to work.
187 DH's medical diagnosis was rupture of a patellar tendon, medical code 727.66. His physical therapy
188 Practice Pattern is 4I: Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of
189 Motion Associated With Bony or Soft Tissue Surgery.

190 Prognosis following a patellar tendon repair depends largely on severity of the injury, prior level of
191 function, and age of the patient; although perhaps the most important prognostic factor for recovery is
192 the time from the injury to surgery, and surgery delayed beyond a few weeks can limit recovery ability.
193 Research indicates most patients with patellar tendon repairs will return to their prior activities.¹¹ The 6
194 week delay of DH's surgery due to the initial clinical diagnosis of a lateral patellar dislocation will likely
195 have a negative aspect on DH's recovery. However, based on the discussion with my CI, and consultation
196 with the surgeon, we believe our patient will have a full recovery within the scope of normal activities of
197 daily living of a 54 year old male. Based on our patient's compliance during therapy and with his home
198 exercise program, we believe that at the conclusion of therapy he will reach full passive and active ROM,
199 as well as full strength of knee and hip musculature. We do not believe he will be able to safely play
200 contact sports such as hockey or soccer without significant risk of re-injury. We do believe he will be
201 able to perform all of his activities of daily living and work activities free of pain and difficulty, as well as
202 participate in other recreational activities such as jogging, cycling, and golf. We will again consult with
203 the surgeon following DH's 4 week checkup per his orders for the direction of physical therapy at that
204 time. No additional testing or referral is needed at this time. My CI and I will regularly re-assess gait
205 analysis, ROM, pain, and provide sufficient documentation.

206 The initial prescription included a diagnosis and a rehabilitative protocol included from the surgeon for
207 passive knee flexion to 30 degrees only, with no resistive exercises across the knee joint, and hip and
208 ankle strengthening exercises. DH also received his own instructions from the surgeon which were to
209 maintain weight bearing as tolerated in full extension, with his knee immobilization brace set to restrict
210 maximum knee flexion to 30 degrees. Therefore, initial interventions included myofascial release
211 techniques to decrease inflammation and muscle guarding of the quadriceps musculature and passive
212 ROM to a maximum of 30 degrees knee flexion, in addition to hip and ankle strengthening exercises.

213 Short term goals: DH will reach 110 degrees passive knee flexion within 2 weeks. DH will walk without
214 circumducting the hip, and perform heel strike and toe off during the normal gait cycle within 2 weeks.
215 DH will return to work on July 22nd (11 days from today).

216 Long term goals: DH will be able to actively flex his knee 120 degrees within 6 weeks. DH will be able to
217 perform all normal activities of daily living including tying his shoes, getting on and off the toilet, and
218 push-mowing the lawn without pain or difficulty within 6 weeks.

219 As rehabilitation following surgical repair of a patellar tendon rupture can take up to 1 year, and DH's
220 surgery was delayed 6 weeks already, my CI and I did not have any plans for discharge during the 12
221 weeks of my internship. DH was scheduled to return to work 10 weeks following his initial evaluation,
222 and we planned on continuing treatment following his return to work as well. Approximately 6 months
223 of rehabilitation was expected overall.

224 Interventions

225 As previously stated, my CI and I were given explicit orders from DH's surgeon concerning the direction
226 of physical therapy, and we communicated with him as necessary regarding DH's plan of care. As DH's
227 insurance company only authorized six visits at a time, following the initial evaluation I consulted with

228 them three additional times to describe our progress and request additional visits. I also regularly
229 communicated with DH regarding his progress and the performance of his home exercise program
230 (HEP). DH rarely missed therapy sessions and rescheduled his appointments when he did. I believe he
231 completed his HEP daily based on his attitude toward recovery and the progression of his exercises.

232 DH received physical therapy (PT) two times per week for 12 weeks. He also performed a daily HEP
233 which consisted of the same therapeutic exercises that he performed in the clinic, followed by icing his
234 knee two to three times per day for 20 minutes. Initially the main focus of therapy was to increase knee
235 flexion ROM and begin strengthening of ankle and hip musculature. Manual therapy included myofascial
236 release (MFR) techniques to decrease muscle guarding, improve soft tissue extensibility, and improve
237 motion at the knee joint.¹² Scar massage (SM) was performed over the surgical area to increase ROM
238 secondary to skin and scar tissue pliability. PROM into flexion was also performed to increase ROM, and
239 combined with an inferior patellar glide as DH exhibited limited inferior patellar mobility associated with
240 decreased knee flexion.¹³

241 Therapeutic exercises were performed and progressed as tolerated. These initially included:
242 strengthening exercises of the hip abductors, hip adductors, ankle dorsiflexors, and ankle plantar
243 flexors. At the end of each treatment session, ice and electrical stimulation were utilized to decrease
244 swelling. At the beginning of the fourth week DH met with his surgeon, and we received authorization to
245 begin light quadriceps strengthening exercises and perform PROM into as much flexion as tolerated by
246 DH. Therefore, DH began the following exercises during the 4th week: terminal knee extension, hip and
247 knee extension, straight leg raises, short arc extensions, and hamstring curls. Gait analysis and cueing
248 was added during the fourth week as DH was instructed to begin ambulating without his knee brace
249 locked in full extension. A moist hot pack (MHP) was also added prior to therapy at the surgeon's

250 request, to improve flexibility and assist with stretching.¹⁴ The initial six weeks of treatment sessions are
251 detailed in Table 3, and the final six weeks are detailed in Table 4.

252 According to Jorge et. al.¹⁵, a progressive resistive exercise program involving strengthening of the knee
253 extensors, knee flexors, hip abductors, and hip adductors is effective at improving strength, function,
254 quality of life, and decreasing pain associated with osteoarthritis of the knee. I believe these results can
255 be applied to DH post-operatively. Additionally, all quadriceps strengthening exercises were performed
256 to improve stability of the knee and prevent further patellar tendon damage.² Greenberg et al.¹⁶ reports
257 that circumduction of the affected limb may occur due to weakness of the knee flexors or ankle
258 dorsiflexors, causing foot drag. Therefore, strengthening of the hamstrings and ankle dorsiflexors was
259 performed in an attempt to prevent circumduction and normalize DH's gait. Strengthening of the hip
260 extensor musculature was performed in an attempt to maintain an upright posture during gait and allow
261 enough hip extension to facilitate toe-off and prevent circumduction.¹⁷ Strengthening the plantar flexor
262 musculature was performed to provide enough toe-off force to begin the swing phase.¹⁷

263 Ankle dorsiflexion was discontinued after week 3 as DH's strength had returned to 5/5. A prone quad
264 stretch was added during the 6th week when tightness of the rectus femoris was determined to be a
265 significant limiter of knee flexion. Ice and electrical stimulation were also discontinued following the 9th
266 week of therapy when swelling and muscle guarding was no longer deemed an issue.

267 At the end of 12 weeks, DH had not begun any dynamic exercises as he had not yet received
268 authorization from his surgeon to do so. At that point his therapy sessions consisted mainly of PROM
269 and gait cueing.

270 Outcomes

271 DH displayed exceptional results in 12 weeks of PT, and remains on track for a full recovery according to
272 his surgeon. Although DH failed to meet several of his goals, he remained optimistic about his future PT
273 and his eventual outcome, and reported he was satisfied with therapy. Prior to therapy, DH was unable
274 to work or perform nearly any of his normal daily activities and ambulated with his knee locked in full
275 extension. After therapy, was able to return to work entirely pain free when he was expected, and has
276 been able to perform the majority of his normal activities of daily living without pain. He did not reach
277 the goal of 120 degrees of passive knee flexion, although he did make a 55 degree improvement. His leg
278 strength has improved considerably, however, at the end of 12 weeks DH continued to walk with minor
279 hip circumduction and a lack of complete toe-off. With continued therapy, DH is likely to see further
280 improvements and meet all of his goals.

281 Discussion

282 This case report clearly demonstrated the physical therapy interventions and outcomes following
283 surgical repair of a left patellar tendon rupture. DH made exceptional progress during 12 weeks of PT in
284 knee flexion ROM and strength of hip, knee, and ankle musculature. This has allowed him to improve his
285 gait, perform many normal daily activities, and begin working again.

286 There is little available evidence regarding therapy and prognosis of a patient following delayed surgery
287 of a torn patellar tendon. Therefore, additional evidence will likely become available only when errors
288 are made regarding the diagnosis of a torn patellar tendon, subsequently delaying surgery. DH was a
289 particularly interesting patient considering his athletic prior level of functioning and his age, which is
290 older than most patients who sustain a patellar tendon rupture. In retrospect, MMT of the hip and ankle
291 should have been performed on the initial evaluation to better record progress throughout DH's entire
292 12 weeks of treatment. Positive factors in DH's progress include his dedication to rehabilitation and
293 motivation to return to his prior level of functioning.

294 Although scar massage was utilized often, Shin et. al.¹⁸ suggests that the evidence for the use of scar
295 massage post-operatively is weak. Scar massage was performed, however, as my CI believes it is an
296 effective intervention, which he has learned through 30 years of clinical experience.

297 If possible, a future study could include the differences between rehabilitation following immediate
298 surgery of a ruptured patellar tendon and rehabilitation following delayed surgery, to assess the
299 difference in outcome measures. A study should also be performed which assesses patient outcomes
300 until they are discharged from PT, rather than just 12 weeks.

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400 **Table 1 – Systems Review**

Cardiopulmonary	Pitting edema present superior and inferior to knee joint (not measured). The patient reports he has a 25 year history of the autoimmune lung disorder Churg Strauss.
Integumentary	Vertical incision beginning approximately 2 inches above the patella and ending 1 inch below the tibial tubercle. Scar appears healthy and is healing normally.
Musculoskeletal	Height 5’8”, weight 200 pounds, BMI 28.7. No manual muscle testing was performed on the knee as post-operative contraindications prevented strength testing. No manual muscle testing was performed at the hip or ankle originally either. Range of motion impairments of the left knee. Gait is impaired due to knee immobilization brace and weight bearing precautions. The patient ambulates with his left knee locked in full extension, a prominent left hip hike and circumduction, and lack of heel strike and toe off.
Neuromuscular	Balance likely impaired, but not tested.
Communication, Affect, Cognition	Not impaired

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419 **Table 2 – Outcome measures at admission, 5 weeks, and discharge**

Outcome Measure	Admission	5 weeks	Discharge
ROM – knee flexion	30 degrees		85 degrees
ROM – knee extension	Neutral		Neutral
MMT – knee	Not tested		Not tested
VAS	5/10		0/10
Gait analysis	The patient ambulates with his left knee locked in full extension, a prominent left hip hike and circumduction, and lack of heel strike and toe off on the left.		The patient performs 20 degrees of hip flexion, mild circumduction, lands with heel strike, and performs 50% toe off.
MMT – hip		4-/5 abduction 4/5 extension 4+/5 flexion and adduction	4+/5 abduction and extension, 5/5 flexion and adduction
MMT – ankle		4/5 plantar flexion 4+/5 dorsiflexion, inversion, eversion	5/5 plantar flexion, dorsiflexion, inversion, eversion

420 ROM – Range of Motion; MMT – Manual Muscle Testing; VAS – Visual Analog Scale

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434 **Table 3 – Interventions of initial 6 weeks of therapy**

Intervention	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Manual Therapy						
Myofascial Release	Distal quads, ITB, SGT	Distal quads, ITB, SGT	Distal quads, ITB, MAdd	Distal quads, ITB, MAdd	Distal quads, ITB	Distal quads, ITB
Scar Massage		x	x	x	x	x
Passive Range of Motion	Knee flexion	Knee flexion	Knee flexion	Knee flexion with inf pat glide	Knee flexion with inf pat glide	Knee flexion with inf pat glide
Gait Analysis with cueing	x			x	x	x
Therapeutic Exercises						
Quad sets	6"x10x2	6"x10x2	6"x10x2	D/C		
Plantar flexion	GTB – 2x10	BTB – 3x10	GrTB – 3x10	Heel raises 2x10	Heel raises 3x10	Heel raises 3x10
Dorsiflexion	BTB – 2x10	GrTB – 3x10	Gr – 3x10	D/C		
Hip abduction	BTB – 2x10	GrTB – 3x10	GrTB – 3x10	Gravity – 2x10	Gravity – 3x10	Gravity – 3x10
Hip adduction	BTB – 2x10	GrTB – 3x10	GrTB – 3x10	Gravity – 2x10	Gravity – 3x10	Gravity – 3x10
Terminal Knee Extension				GrTB – 2x10	GrTB – 3x10	GrTB – 3x10
Hip/knee extension				GrTB – 2x10	GrTB – 3x10	GrTB – 3x10
Straight Leg Raise				Gravity – 2x10	Gravity – 3x10	Gravity – 3x10
Short Arc Extension				Gravity – 2x10	1# - 3x10	1# - 3x10
Prone HS curl				AAROM – 2x10	AAROM – 2x10	AAROM – 2x10
Prone quad stretch						30"x3
Modalities						
Ice and E-stim	20 minutes	20 minutes	20 minutes	20 minutes	20 minutes	20 minutes
MHP				20 minutes	20 minutes	20 minutes

435 Quads – Quadriceps muscle; ITB – Ilio-Tibial Band; SGT – Sartorius/Gracilis/Semitendinosus muscle
 436 complex; MAdd – Medial Adductors; Inf Pat Glide – Inferior Patellar Glide; Quad sets – Quadriceps
 437 muscle sets; HS –Hamstring; E-stim – Electrical stimulation; GTB – Green Theraband; BTB – Blue
 438 Theraband; GrTB – Gray Theraband; D/C – Discontinue; AAROM – Active Assistive Range of Motion;
 439 MHP – Moist Hot Pack; x – this means the exercise was performed that day with no strict parameters

440 **Table 4 – Interventions of final 6 weeks of therapy**

Intervention	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Manual Therapy						
Myofascial Release	Distal quads, ITB	Distal quads, ITB	Distal quads, ITB	Distal quads, ITB	Distal quads, ITB	Distal quads, ITB
Scar Massage	x	x	x	x	X	x
Passive Range of Motion	Knee flexion with inf pat glide	Knee flexion with inf pat glide	Knee flexion with inf pat glide	Knee flexion with inf pat glide	Knee flexion with inf pat glide	Knee flexion with inf pat glide
Gait Analysis and Cueing	x	x	x	x	x	x
Therapeutic Exercises						
Plantar flexion	Heel raises – 3x15	Heel raises – 3x15	Heel raises – 3x15	Heel raises – 3x15	Heel raises (SL) – 3x10	Heel raises (SL) – 3x10
Hip abduction	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10
Hip adduction	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10
Terminal Knee Extension	GrTB – 3x10	GrTB – 3x10	GrTB – 3x10	GrTB – 3x15	GrTB – 3x15	GrTB – 3x15
Shuttle	4 bands – 3x10	4 bands – 3x10	5 bands – 3x10	5 bands – 3x15	5 bands – 3x15	6 bands – 3x15
Straight Leg Raise	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10	Gravity – 3x10
Short Arc Extension	1# - 3x10	2# - 3x10	2# - 3x10	2# - 3x10	3# - 3x10	3# - 3x10
Prone HS curl	AAROM 3x10	3x10	3x10	1# - 3x10	1# - 3x10	1# - 3x10
Prone quad stretch	30"x3	30"x3	30"x3	30"x3	30"x3	30"x3
Modalities						
Ice and E-stim	20 minutes	20 minutes	D/C			
MHP	20 minutes	20 minutes	20 minutes	20 minutes	20 minutes	20 minutes

441 Quads – Quadriceps muscle; ITB – Ilio-Tibial Band; SGT – Sartorius/Gracilis/Semitendinosus muscle
 442 complex; Inf Pat Glide – Inferior Patellar Glide; Quad sets – Quadriceps muscle sets; HS –Hamstring; E-
 443 stim – Electrical stimulation; GTB – Green Theraband; BTB – Blue Theraband; GrTB – Gray Theraband;
 444 D/C – Discontinue; AAROM – Active Assistive Range of Motion; MHP – Moist Hot Pack; x – this means
 445 the exercise was performed that day with no strict parameters

446

447 **Figure 1**



448

Figure 1: Picture of DH's knee post-operatively. 7 sutures were put in place which began at the tibial tubercle and were anchored into the femur 1 inch above the patella. 3 sutures were threaded through 3 holes which were drilled vertically throughout the patella, 2 were threaded throughout the medial retinaculum and 2 throughout the lateral retinaculum.