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**Who:** 51-year-old active male s/p intramedullary rod for L femur ORIF.

**What:** The AlterG Anti-Gravity Treadmill™ was used in the post-operative rehabilitation program with this patient.

**Why:** Body weight support was used to help normalize gait mechanics and with return to running progression. Allowed patient to perform gait training and closed-kinetic activities painfree, when overground activities caused hip, leg, and knee pain.

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## Introduction

51 year old active male, s/p intramedullary rod for Left femur with proximal and distal locking screws. Injury sustained while patient was playing softball September 11, 2009. As he was running to catch a fly ball in the outfield he stepped on some uneven grass and felt his leg give out. He was taken to the emergency room immediately and underwent emergency surgery the next morning. The patient was diagnosed with a comminuted complex fracture of the proximal left femur diaphysis. He was non-weightbearing until October 22, 2009. The patient is active and healthy and enjoys various activities such as softball, hiking, tennis, golf, pilates, yoga, frisbee and other beach activities. His past medical history was negative. His general screening questions were also all negative. He works as an accountant. Aggravating activities at time of evaluation (10/22/09) were having his leg in a dependent position, flexing his hip past 90 degrees, laying on his R side. Easing factors were elevation. Patient's goal was to be able to walk normally and return to recreational activities.

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## Goals

- Increase ROM of hip and knee
- Increase lower extremity and core strength
- Normalize gait within weightbearing limitations
- Independent HEP

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## History

### Plan

Initial findings at start of physical therapy (postop week 7):

- No femoral shaft fracture bone growth on x-ray at 6 weeks postop
- Hip flexion 90 degrees, hip extension 5 degrees, knee flexion 95 degrees, knee extension -3 degrees, hip ER 20-25 degrees, hip IR 20-25 degrees, ABD 25 degrees, ADD 10 degrees

- MMT: hip flexors 4/5, knee ext 3-/5, knee flexors 4/5, TFL 3-/5, hip extensors 3/5, 5 degrees SLR lag, minimal quad contraction noted
  - Sensation and circulation intact
- Began physical therapy with PROM, Non-weightbearing exercises, and water therapy with water at shoulder height, stationary bike with no resistance. After approximately 4 weeks of physical therapy (postop week 10):
- Hip and knee flexion were 110 degrees, -1 or 2 degrees of knee extension, improved quad

# AlterG Case Study

contraction

- Increased complaints of knee pain with limited left lower extremity weight bearing due to knee pain
- X-ray showed early minimal periosteal new bone growth across comminuted fracture, distraction was still significant
- MD increased weightbearing to 50 pounds or approximately 33% body weight
- Left knee MRI showed chondromalacia patella and quad atrophy

At approximately 11 weeks post-op, the patient ceased water therapy and began a walking program on the AlterG Anti-Gravity Treadmill, at 30% of his body weight, 1.5 to 2.0 mph, 0% incline and normal gait pattern. See Table 1 for progression. 4 months (16 weeks) post-op:

- Slightly more bone formation but no significant change, well maintained alignment of intramedullary rod
- Diagnosed with delayed union
- MD ordered bone stimulator, ok to use 1 crutch and continue AlterG and physical therapy
- Gait pattern with 1 crutch was antalgic and demonstrated a significant limp 6 months (about 23-24 weeks) post-op:
- Continued very slow bone growth with marginal callus formation
- Soreness with walking and bending on land, no pain in the AlterG at 85% body weight

### 31 weeks post op:

- Increased callus formation and periosteal reaction indicating healing
  - Essentially normal ROM of hip and knee
  - MMT grossly 4/5 at hips and knee
  - Continued antalgic gait on land without assistive device
- On 4/20/10 pt underwent another operative procedure - dynamization of L femoral nail with removal of distal interlocking screw. Resumed physical therapy on 4/27/10:
- Increased pain with weight bearing and with muscle contraction
  - Burning pain in ITB
  - Pain and difficulty going from sit to stand
  - Increased stiffness
  - Pain scale 0-8+/10
  - Aggravating factors: lifting leg, standing, walking, bending knee

- Easing factors: ice
  - MMT - hip flexors 5/5, knee flexors 4+/5, knee extensors 4/5, glutes 4+/5
- 37 weeks post-op initial surgery (6 weeks from screw removal) • Increased compression across fracture site, but a gap is still noted, some increase in callus formation 42 weeks post-op initial surgery (10 weeks from screw removal) • Initiated running progression on AlterG treadmill - See Table 2 for details
- 44 weeks post-op (12 weeks from screw removal)
- X-ray showed: increased callus formation, residual fracture line still noted, moderate bridging callus, unchanged alignment

## Considerations

Pain and soreness were considered when progressing ambulation on the AlterG. Patient was initially increasing body weight and speed and was experiencing significant pain, advised patient to increase body weight first and then we can increase speed. Time in AlterG was progressed last.

Days	Program (% Body Weight and Speed)	Speed (mph)	Frequency
<i>Week 11</i>	30% at 1.5 -2.0 mph	10 min	1 x daily
<i>Week 12</i>	30-34% at 2.0 mph	10 min	1 x daily
<i>Week 13</i>	34% at 2.0 mph	10 min	1 x daily
<i>Week 14</i>	34% at 2.0 mph	10 min	1 x daily
<i>Week 15</i>	35-40% at 2.0 mph	10 min	1 x daily
<i>Week 16</i>	45-50% at 2.0 mph	10 min	1 x daily
<i>Week 17</i>	50 – 60% at 2.0-2.5 mph	10 min	1 x daily
<i>Week 18</i>	68-70% at 2.5 mph	10 min	1 x daily
<i>Week 19</i>	70% at 2.5 mph	10 min	1 x daily
<i>Week 20</i>	80% at 2.5 mph	10–15 min	1 x daily
<i>Week 21 - 24</i>	85% at 2.5 mph	20 min	1 x daily

**Progression Table 2**

Days	Program (% Body Weight and Speed)	Speed (mph)	Frequency
<i>Week 42/10</i>	55% at 5.1 mph	10 min	1 x daily
<i>Week 43/11</i>	58% at 5.5 mph	10 min	1 x daily
<i>Week 44/12</i>	60% at 6.3 mph	10 min	1 x daily
<i>Week 45/13</i>	65-68% at 6.3 mph	10 min	1 x daily
<i>Week 46/14</i>	Pt out of town	10 min	1 x daily
<i>Week 47/15</i>	68% at 6.2 mph	10 min	1 x daily
<i>Week 48/16</i>	68% at 6.2 mph	10 min	1 x daily
<i>Week 49/17</i>	72% at 6.2 mph	10 min	1 x daily
<i>Week 50/18</i>	75% at 6.2 mph	10 min	1 x daily
<i>Week 51/19</i>	80% at 6.2 mph	10 min	1 x daily
<i>Week 52/20</i>	80-85% at 6.5 mph	10 min	1 x daily
<i>Week 53/21</i>	80-90% at 6.5 mph	20 min	

## Results

The patient was seen initially for about a week on land to establish an HEP. He was then seen 2x/week in the pool until his weight bearing precautions were increased to 30%, then he was seen 2x/week on land. Progression was limited initially by patient's complaints of knee pain. Between weeks 24 and time of second surgery (week 31) patient was independent with a walking program on a treadmill or outside. The patient was discharged early April and resumed physical therapy one week after his screw removal. He was then seen 1x/week. The patient also supplemented bone healing with a bone stimulator, which he wore from 16 weeks post op until discharge.

The AlterG Anti-Gravity Treadmill was initiated early to help the patient achieve a normal gait pattern on land, and then used again to eventually progress the patient to running. If the body weight on the AlterG was not increased each week, it was due to pain complaints from the patient in either his knee or leg. The patient was able to walk and run in the AlterG Anti-Gravity Treadmill painfree, while walking and running on land caused hip, leg and knee pain. The patient was discharged when he was able to run on land and return to doubles tennis. All of his goals have been met and he is able to walk and run with a normal gait pattern, painfree.