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Who: 37-year-old female 6 months s/p ankle inversion injury that progressed to Complex Regional Pain Syndrome (CRPS) rendering her unable to weight bear on her Left foot

What: The AlterG Anti-Gravity treadmill helped this patient with her gait mechanics, self-limited to TTWB by patient secondary to sensitivity. Pt. was able to decrease assist from 2 crutches to 1 crutch, restore full active ankle DF, and decreased sensitivity with regular footwear.

Why: Body weight support allows precise progressive loading of the hypersensitized limb, preventing aggravating the patient's symptoms. Limiting the risk of exacerbation allows the patient to stay consistent with treatment sessions to work on weight shifting, stance time, and gait kinematics.

Introduction

A 37 year old lady presented to the lower limb rehabilitation team at the Royal Bournemouth Hospital In July 2011 with complex regional pain syndrome (CRPS) in her left foot, a condition that the patient had already experienced in her left wrist and hand. This started following a simple ankle inversion injury six months previously. She developed marked hypersensitivity of particularly her heel and was unable to weight bear through her left foot.

She was non-weight bearing with elbow crutches and unable to wear shoes other than "Crocs". The patient was unable to dorsi ex her foot further than 20 degrees of plantar exion. She had attended a two-week chronic pain residential program at the Royal National Hospital for Rheumatic Diseases, Bath. She was not taking any signi cant medications. The patient was managing to remain at work as a family support worker, and drove an automatic car.

Goals

- Restore foot / ankle range of movement.
- Wear any shoe.
- Mobilise without aid using an acceptable gait.
- Ride a standard cycle outside.

History

This patient's initial treatment consisted of desensitization of her heel, active range of movement of her foot and ankle, and seated proprioception work using various balance aids. She was attempting to wean herself into different

footwear throughout the early therapy and over 4 months managed to wear shoes all day. She consistently struggled to achieve heel strike, by six months she was still walking on the ball of her foot. At this time, it was possible to add the use

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of a static exercise cycle and a cross trainer to her weekly program. This was the first time that she was able to manage some general exercise and was now 12 months after onset.

The AlterG Anti-Gravity Treadmill became available to us 14 months after onset. At this point, the patient was still walking with two elbow crutches and no heel contact. Initial trials of the machine required bodyweight to be reduced to 30% to enable her to walk at 2KPH for 10 minutes. The patient was taught to use the machine independently and on average attended 3 times per week. Her initial goals were to increase her speed to 4KPH and to increase her time on the AlterG to 20 minutes. This was achieved over a three-week period. Throughout this time it was made clear that progression had to be achieved with respect to pain and latent pain.

For the second three weeks, her goal became incremental increases in bodyweight she was found to be able to tolerate a maximum of a 5% increase at any one time. At the end of this second period the patient had increased the bodyweight to 45%.

During weeks seven to nine the patient was not able to attend physiotherapy as often and therefore remained static at 45% bodyweight for 20 minutes at 4KPH.

Weeks ten to twelve the patient attended 4 times per week and progressed up to 55% body weight. Weeks thirteen to fifteen BW was again increased to 60%.

Weeks sixteen to eighteen, progression was deliberately held at 60%. The patient had experienced an increase in her pain, particularly at weekends when she was not working or using the AlterG.

Following a second three-week cycle of acclimatization (weeks nineteen to twenty-one) to 60% bodyweight, it was possible to again add progression. Body weight was increased to 65%. The patient has remained at 65% up to the present day (6 weeks).

Throughout the process the patient has tried to achieve an average of three sessions per week for 20 minutes at 4KPH without incline. She has persisted with some other gym activities including static cycling (20 minutes) and cross-training (10-20 minutes). During weeks sixteen to eighteen some proprioceptive exercise involving wobble and rocker boards were added, but reduced significantly following the increase in the patient's pain.

Progression Table

Weeks	Program (% Body Weight and Speed)	Incline (%)	Speed (kph)	Time	Frequency
<i>Week 1-3</i>	Walking at 30% BW	0	2.5 aiming for 4	10 minutes aiming for 20	3x/week
<i>Week 4-6</i>	Walking at 30 - 45% BW	0	4	20 min	3x/week
<i>Week 7-9</i>	Walking at 30 - 45% BW	0	4	20 min	Reduced attendance
<i>Week 10-12</i>	Walking 45 - 55% BW	0	4	20 min	4x/week
<i>Week 10-12</i>	Walking 60%	0	4	20 min	3x/week
<i>Week 13-15</i>	Walking 60%	0	4	20 min	3x/week
<i>Week 16-21</i>	Walking 65%	0	4	20 min	3x/week

Results

Selection of a starting point for this patient was based upon reducing sufficient bodyweight to allow her to walk with as normal gait as possible and with pain controlled. With a gait speed of 2.5 KPH, stride lengths were short and steps were deliberate. It became apparent that her gait would need to be improved before body weight could be increased. The easiest way to achieve this was by increasing the speed of the treadmill. This appeared to engage a more natural sub-conscious gait pattern. Perhaps overriding learnt walking patterns and restoring suppressed central patterns. A similar scenario has been observed in other chronic lower limb pain disorders treated with AlterG.

Once an acceptable gait pattern had been achieved it was felt that increasing session time to ensure enough use to develop a training effect. The patient increased the time up to 20 minutes within three weeks, as her bodyweight had been reduced sufficiently to control pain this was achieved relatively easily. She suffered no latent effects.

Three week progression cycles were used to give the patient sufficient time to acclimatize to each body weight. In the very early stages increasing bodyweight was relatively straightforward. 5% changes were selected as the patient was able to perceive the difference but were not so significant that their pain was uncontrolled or gait suffered. The patient would increase bodyweight using intervals, she would start at the higher percentage

bodyweight for the first 10 minutes then would reduce 5% to the lower bodyweight for the second ten minutes. This eased the transition to the higher bodyweight.

One of the benefits of using the AlterG with this patient has been the consistency in treatment that can be achieved. The precise prescription of 'treatment dose' reduces the risk of exacerbation. This has led to a relatively smooth and measurable improvement. As bodyweight on the machine has increased it has been possible for the patient to reduce her use of walking aids and she is now capable of mobilizing with one elbow crutch. Carryover appears to occur in this patient over long periods of time and not immediately after a session. Improvement in CRPS is classically achieved this way. As her therapeutic bodyweight on the AlterG increased beyond 60%, it was possible to speculate that she would tolerate use of proprioceptive aids. She can now stand on both feet and use wobbleboards or BOSUs. Interestingly these were added in the 13-15 week period which certainly led to a reduction in her ability to progress bodyweight on the AlterG. The time spent on the use of proprioceptive aids was subsequently reduced to allow bodyweight progression. This further demonstrates how even subtle changes in the patient's daily exercise routine can