Intervertebral Differential Dynamics (IDD) Therapy® Spinal Decompression; dressed up traction or a new opportunity for back pain sufferers?

By Stephen Small

Introduction

Spinal decompression is most commonly thought of in surgical terms. Non-surgical spinal decompression or Intervertebral Differential Dynamics Therapy (IDD) is a distinct category of treatment which is emerging from the periphery of conservative back and neck pain care and is becoming more widely available in the UK.

Non-surgical spinal decompression was developed in the USA in the late 1990s to address the shortcomings of traditional mechanical traction by providing segment specific vertebral distraction and has evolved to include longitudinal joint mobilisation for lumbar and cervical pathologies.

In the UK, traction as a single modality is not indicated for low back pain. With a pulling force component to IDD Therapy, this article examines the distinctions which separate IDD Therapy treatment from traditional traction and explores what opportunities the new treatment offers for the health of the intervertebral disc and chronic back pain sufferers.

![Figure 1 SPINA machine, FDA-cleared Class II medical device licensed to deliver IDD Therapy treatment.](image)

IDD Therapy Treatment Programme

IDD Therapy treatment was developed to provide solutions for back and neck pain patients who had not responded to standard manual therapy treatments; who may have been regularly taking pain medication and/or who may have been considering invasive procedures.

The IDD Therapy treatment protocols detail a programme of up to, but not limited to, 20 treatments scheduled over a six to eight week period combined with a graded exercise regime. The three key goals of IDD Therapy treatment are to improve the health of targeted intervertebral discs; to re-educate soft tissues to give greater range of motion and to re-align spinal structures.
Origins & Evidence of IDD Therapy Treatment

Traction as a treatment for back pain has always been popular in principle, however, results of clinical trials have shown inconsistent results\(^2\). In 1991 a lumbar distraction device called the VAX-D became popular in the US and Canada and was reported to improve lumbar disc injuries and neurological symptoms in some patients.

In 1995 Ramos and Martin directly measured the effects of vertebral axial decompression and recorded a significant reduction in intradiscal pressure of up to -100 mm Hg with applied tension in the upper range.\(^3\)

The absolute measurement of a fall in intradiscal pressure raised important questions of new treatment possibilities to promote fluid and nutrient diffusion and therefore to improve disc health.

In 1997 Shealy and Borgmeyer studied the findings of Ramos and Martin and the shortcomings of traditional traction, and performed a single blind, randomised controlled trial comparing traditional traction with distraction decompression techniques. The study used new computer directed technology which allowed the clinicians to change and accurately measure angles of application of a variable distraction force.

Trial patients had been suffering from various lumbar pain syndromes including lumbar radiculopathy, disc degeneration, herniation and facet syndrome. With fluoroscopy, a 7mm distraction at L5 was observed in several patients and distraction was observed at different lumbar spinal levels by altering the angle of application and the amount of distraction force.

86% of patients treated with *decompression* for disc herniation enjoyed good to excellent results whilst only 55% of *traction* patients enjoyed good outcomes and none had an excellent outcome.\(^4\)

Eyerman found that mechanical decompression distraction not only provided symptomatic improvements in patients with lumbar pain syndromes, but also improvement in MRI findings from pre-to post treatment showing reduced disc herniation and improved hydration after only 11 sessions.\(^5\)

Schimmel et al carried out a randomised controlled trial combining IDD with a course of rehabilitation, with two groups of 30 patients who had non-specific low back pain. The results of this study did not show a significant difference between IDD Therapy and a sham treatment.\(^6\)

McClure and Farris examined the results of 415 patients treated over a two year period using IDD Therapy protocols. The study showed a 79% success rate for patients with lumbar back pain and interestingly, a 92% success rate in 129 patients previously categorised as surgery candidates.\(^7\)

There are now over 800 clinics providing IDD Therapy treatment. Case studies from individual clinics show positive treatment outcomes for patients where available conservative treatments
have proved insufficient, particularly for disc-related pathologies. As more clinics in the UK adopt the treatment, opportunities for further clinical research will be developed.

Case Study 1

September 2010, 46 year old male with three month history of severe, sudden onset back and leg pain with numbness. Had been receiving physiotherapy treatment but when no signs of progress was referred for physiotherapy incorporating IDD Therapy treatment.

MRI confirmed an L4-L5 disc protrusion with L5 nerve root compression. Significant loss of lumbar range of movement with pain radiating from his left low back, down the posterior aspect of his left leg accompanied by numbness and pins/needles in his left foot. Patient described his problem as severely debilitating with significant loss of function; he was only able to walk short distances before the pain became unbearable and he had to rest.

Commencing treatment with IDD he had a pain score (VAS) of 8/10 with almost complete numbness in his left foot. His first ten IDD sessions were concentrated into the first two weeks of treatment. Over this time he responded well and started to feel his pain levels lessen although his numbness was still significant. He then had three IDD treatments per week over the next two weeks and began to see improvements in his walking distance; his pain score reducing to 3/10 (VAS). In addition, the numbness in his foot improved significantly.

In the following two weeks he had four more IDD treatments. On completion of treatment he had no sciatic symptoms and his foot numbness was almost completely resolved. Patient is now following an exercise regime.

Case Study 2

40 year old male book keeper began osteopathy treatment in August 2009 presenting with neck pain and stiffness. He had previously had osteopathic treatment for a year; this alleviated some of the stiffness but had little effect on the pain.

Fig 2 Example of patient having IDD cervical treatment
Before starting the IDD treatments his symptoms included sharp pain in the upper neck which occasionally woke him at night and was aggravated by driving, eating and dressing. He also had stiffness throughout the neck, crepitus with most movements, and a ‘catching feeling’ when extending the head.

An MRI showed there to be two medium sized cervical spine disc bulges, one at C4-C5 and C5-C6. After 30 IDD sessions (15 on each disc) patient showed a marked improvement; no longer presenting with the same symptoms. He no longer had any neck pain, ‘catching’ sensations or crepitus in his neck, and the range of movement had greatly improved.

The MRI post treatment showed there to be a marked decrease in disc bulges, suggesting that intra-disc material may have had been re-positioned as a result of IDD. Three months follow up, patient is still pain free and has been able to resume exercise at the gym.

Case Study 3

68 year old male, former SAS soldier suffering recurrent back pain caused by his career, including as he later recalled a certain parachute landing. He had received osteopathic treatments and acupuncture over a seven year period which had kept the pain manageable.

However the pain progressively increased to such an intolerable point that despite pain killers and muscle relaxants, he had not slept properly for three months.

An MRI scan revealed severe degeneration in the L4-L5 disc causing severe narrowing between the vertebrae. Patient began a course of 20 IDD Therapy treatments with an initial pain score of five (VAS), which could be expected to be higher for people less accustomed to pain.

Within a few sessions, the vice grip around his calf began to ease and he was managing to sleep normally. Gradually he was able to resume walking and was soon walking 40 minutes a day. After completion of a course of twenty treatments, he cycles one and a half hours a day and can walk as frequently as he likes. He only needs a top up treatment every few months and has a low Oswestry score of 0-1.

IDD Therapy Treatment Components

Having achieved joint distraction at different spinal levels by changing the angle of application of force, Shealy developed the IDD Therapy treatment protocols which direct clinicians to treat targeted spinal segments using new computer directed equipment.

The principle of measuring a specific angle to apply controlled forces to distract targeted segments is based on vectors.
As the angle which a pulling force makes with the horizontal increases, the component of force in the horizontal direction ($F_x$) decreases and the vertical component of force ($F_y$) increases.

This causes the relative direction of the pulling force to change and therefore the focus point of application of the pulling force to move progressively along the x-axis.

Measured changes in angle of applied pulling force enable clinicians to distract targeted spinal segments.

**Sinusoidal Waveform**
Traditional traction uses a mechanical linear pulling force (Figure 5) which is unnatural to the body.

![Linear pulling force](image)

**Figure 6**

IDD Therapy devices now use a unique sinusoidal waveform to apply a slow stretch gradually with a goal to avoid muscle spasm and allow distraction forces to be applied comfortably. Applying a slow stretch to the Golgi Tendon Organ (GTO) causes it to fire and inhibit tension in the muscle, allowing the parallel elastic component (sarcomere) of the muscle to remain relaxed and lengthened.

![Non-linear pulling force](image)

**Figure 7**

The IDD Therapy protocols use cycles of tension force with a high distraction applied for one minute with 30 seconds at a lower tension. During a 25 minute treatment there are typically 13 complete minutes when the joint is under maximum distraction. Importantly soft tissues remain under a minimum constant tension for the entire treatment.

One minute is enough to effect an autogenic inhibition on the multifidi and erector spinae muscles. Using a continuous cycle of inhibition for 15 minutes will result in a relaxed muscular state and better trunk range of motion.

Tight ligaments, especially the posterior longitudinal ligament, can also benefit. Collagen fibres exposed to continuous stretch can increase in length by up to 10% of the original length.

Ligaments including the anterior longitudinal ligament, interspinous ligament and supraspinous ligament may also loosen to de-restrict the joint and increase mobility.

**IDD Therapy Distraction and Joint Mobilisation**
Distraction forces are progressively built up over a course of IDD Therapy treatments with a goal to improve range of motion.

The initial pulling force is equal to half body weight minus 10-15lbs. The distraction force is increased in 5lb increments with successive treatments as VAS pain levels decrease, until the patient may enjoy distraction forces equal to half body weight plus 10 to 15 lbs and a wider range of motion.

In opening the disc space, pressure differentials are created to promote diffusion of fluid and nutrients as well as to decompress neural structures. The forces used to distract spinal segments are at levels which cannot be continuously replicated manually, e.g. 100lbs pulling force and in a longitudinal plane.

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Figure 8

Figure 8 shows a 25 minute treatment using IDD Therapy. Note, there is an oscillatory component to mobilise the joint at the point of highest tension when the joint is distracted. Such oscillation capability at the point of maximum joint distraction is absent from traditional traction and is impossible to achieve manually in a precise, measurable and duplicable manner.

Applying passive and accessory oscillating movements to vertebral joints helps to treat pain and stiffness of a mechanical nature, in line with Maitland principles of joint mobilisation.\(^{10}\)

IDD Therapy enabled devices such as the SPINA systems, allow the operator to adjust the frequency and amplitude of the oscillation, as well as the degree of joint distraction. A clinician may in principle apply Grade I, Grade II, Grade III and Grade IV mobilisations by altering the amplitude or frequency of the oscillation and the level of distraction force.
Joint mobilisation needs to be performed parallel or perpendicular to the joint. Unlike mobilisation of the joints of the limbs, mobilising vertebral segments manually in a parallel plane is a challenge, particularly with simultaneous joint distraction. IDD Therapy treatment devices give clinicians the ability to distract targeted vertebral segments and at the point of maximum distraction, to apply a controlled mobilisation in a longitudinal plane, rather than an anterior-posterior plane.

The advantages of mobilising a joint in a longitudinal plane are that problems associated with repeated frictioning of the facet joint surfaces are avoided through a gliding action.

The mobilisation may also create pressure differentials to further assist diffusion of fluid and nutrients into the disc space, to create micro-trauma in the soft tissues for re-education and, theoretically, to break adhesions between fascia to further improve range of motion.

**IDD Therapy Spinal Decompression Significance**

Early discussions surrounding the new category of non-surgical spinal decompression and IDD Therapy treatment were very much focused on the ability to create negative pressure at a targeted vertebral level.

Observed changes in disc hydration following treatment suggested that the creation of negative pressure may contribute to the retraction of bulging nucleus pulposus and the diffusion of fluid and nutrients into the disc space.

As understanding of the treatment has developed at a clinical level, other aspects of IDD Therapy treatment have attracted interest. Whilst traditional traction and individual manual therapy techniques have been applied consecutively, during IDD Therapy treatment, distraction and mobilisation of the joint and the stretching and working of soft tissues occur simultaneously for the entire duration of a treatment.

The effects on increased joint mobility and soft tissue function (flexibility with strengthening) raises important implications for impaired nutritional pathways to be improved and for compressive loads to be eased to facilitate improved hydration.
It may be impossible to measure the significance of the individual components of treatments, since each element is symbiotic to another. However, with recordable, measurable and duplicable treatment parameters; by pathology and with treatment progression based on outcomes from consistent research tools (including the Oswestry Disability Index and VAS), a large pool of data will be available to refine treatment delivery further as part of multi-centre research.

**Conclusion**

The scale of the back pain problem in society is well documented and many patients suffering with chronic back pain and neck pain fail to find adequate relief from existing manual therapy treatments.

Non-surgical spinal decompression appears to offer safe, measurable opportunities for clinicians from a cross-section of professions to do more for patients suffering with back pain and neck pain.

The ability to decompress and mobilise targeted vertebral segments has hitherto not been possible with mechanical traction. Combining IDD Therapy with exercise and manual therapy techniques brings new tripartite solution possibilities for many patients who previously may have felt limited to pain medication, injections or in extreme cases surgery.

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1 Department Of Health, NICE, Low Back Pain, CG88 May 2009

Case studies submitted by:
David Brogan MCSP, The Buckingham Clinic, Glasgow, October 2010
Carla Pozner, M.Ost Bsc(Hons) ND DO, Back Into Shape, London, October 2010
Simon Litchtenstein DO ND MRN The Leominster Osteopathic Clinic, Leominster, October 2010

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David Brogan MCSP, The Buckingham Clinic, Glasgow
Carla Pozner, M.Ost Bsc(Hons) ND DO, Back Into Shape, London
Simon Litchtenstein DO ND MRN The Leominster Osteopathic Clinic, Leominster

Conflict of interest: The author is employed by the European representatives of North American Medical Corp, manufacturers of IDD Therapy licensed spinal decompression equipment.

Address for Correspondence: Stephen Small, Steadfast Corporation Ltd, 1 Bourne Court, Southend Road, Woodford Green, Essex IG8 8HD, UK. stephen.small@steadfastcorp.com