ABSTRACT PAPER PRESENTED TO THE AMERICAN SOCIETY OF NEUROIMAGING MEETING IN ORLANDO FLORIDA, 2-26-98

EDWARD L. EYERMAN, MD, ST. LOUIS MISSOURI

Topic

Simple pelvic traction gives inconsistent relief to herniated lumbar disc sufferers.

A new decompression table system applying fifteen 60second tractions of just over one half body weight in twenty 1/2 hour sessions was reported to give good or excellent relief of sciatic and back pain in 86% of 14 patients with herniated discs and 75% of 8 with facet joint arthrosis. (Shealy,C.N.,Borgmeyer, V., AMJ. Pain Management 1997,7:63-65).

Herniated and degenerated discs can be shown at discography-discomanometry to have elevated intradiscal pressures made even worse by sitting and standing, thus preventing proper disc nutrition. Therefore decompressing the over pressurized disc should allow for healing and repair of disc prolapse, herniation and annulus tears.

Serial MRI imaging of 20 patients treated with the decompression table shows in our study up to 90% reduction of subligamentous nucleus herniation in 10 of 14. Some rehydration occurs detected by T2 and proton density signal increase. Torn annulus repair is seen in all. Transligamentous ruptures show lesser repair. Facet arthrosis can be shown to improve chiefly by pain relief. Follow up studies for permanency or relapses are in progress.

The DRS Mechanical Decompression-Distraction System was described by Shealy and Borgmeyer (1) to give relief of lumbar herniated disc and facet joint arthrosis superior by 50% to conventional pelvic traction. Twenty DRS treatments produced on midsagittal MRI a 50% reduction in one case, and a 7mm distraction of L5 on SI was shown on lateral x-ray. (2) Clinical improvement in 75 to 85% of subjects was reported.

Does clinical betterment correlate directly to improvement in MRI image and can MRI shed any light on the mechanism of improvement?

That the abnormal disc has an elevated pressure can be appreciated at discogram. It is postulated that this elevated pressure interferes both with diffusion of nutrients from surrounding vessels into the nucleus and with adequate patching or repair of the tom annulus.

Nachemson's group has emphasized lowering intradiscal pressure for 30 years. (3) & (4) Neurosurgeons Ramos and Martin (5) at operation on a similar decompression table measured in an L4-5 herniated disc a lowering of intradiscal pressure from 30 to 50 mm above the normal 90 to 100 mmHg into the negative range of minus 100 to 150 mmHg during 90 to 95 LB traction. Will such negative pressures heal the annulus, rehydrate the nucleus?

The aim of the present study was to do before and after MRI to correlate clinical improvement with any MRI evidence of disc repair in annulus, nucleus, facet joint or foramen as a result of DRS treatment.

A course of 20 DRS Lumbar De-compression treatments were given in 4 to 5 weeks to 18 patients, and a double course of 40 in 10 weeks to 2 more.

Pull of distraction was adjusted to one half-body weight plus IO lbs.

Each session consisted of 20 repetitions in 30 minutes of full distraction for 60seconds and 30 seconds of relaxation to 50 lbs.

Distraction angle on pelvic harness was varied from 10% for L5-S I to 20 to 25% for L4-5 herniations and above.

Subjects comprised 12 males and 8 females from age 26 to 74.

Radiculopathy in 14 patients was from herniated discs of varying sizes. (L5-S I level in 6, L4-5 in 6, and 1 each at L3-4 and L2-3).

Radiculopathy without disc herniation was present in 6 patients from foraminal stenosis facet arthropathy and lateral spinal stenosis.

EMGs confirmed radiculopathy in all.

MRI's before and after were obtained on high and mid field units.

Clinical status was assessed before, during, and after treatment with standard analog pain rating scale of 0- I0 and neuro exam.

Range of motion for spinal mobility (initially impaired in all), myotomal weakness reflex and dermatomal sensory loss were tested.

A) MRI OUTCOMES

a) Disc Herniation: 10 of 14 improved significantly, some globally, some at least local at the site of the nerve root compression. Measured improvement in local or general disc herniation size varied in range of 0% in 2 patients, 20% in 4 patients, 30 to 50% in 4 patients and a remarkable 90 % in 2 patients who had the number of treatments at 40 sessions in 8 weeks.

Fig. 1 shows an example of a local left lateral recess disc herniation reduced over 40% completely relieving root compression when the midline portion was a little changed.

Fig. 2 shows on axial view at L5/S1 retraction of a far left lateral herniated disc pulling it away from impingement on the S1 and probably L5 roots with complete relief of radicular signs and symptoms. Mid sagittal components was unchanged.

Figs. 3 A & B & Fig. 4 show remarkable effects of 90% global disc reduction, perhaps due to extended course of treatments. Note the unique "empty pouches" left by the persistently bowed-out ligament at L4-5. Also some early rehydration of the degenerated nucleus is shown in Figs. 3, A & B and 4 by T2 and proton signals.

b) Facet joint arthropathy and foraminal compression cases showed no demonstrable change save 2 cases with slight increase in height but not in hydration.

B) CLINICALOUTCOMES

Irrespective of MRI status all but 3 patients had very significant pain relief, complete relief of weakness when present, and of immobility and of all numbness (save in 1 patient with herniation and 2 with foraminal stenosis without herniation). With disc herniation, 10 patients of 14 had 10 to 90% improvement in pain and disability. Two had 40 to 50%, one had only 20% with foraminal syndrome without herniation, 4 had 70 to 100 % improvement, one had 40 to 50 %, one with severe spinal stenosis had only 25% and was sent for surgery. Degree of clinical improvement roughly followed MRI changes but not totally with full correlation.

Improvement from DRS treatment clinical outcome of radiculopathy whether from disc herniation or foraminal syndromes is more impressive than most improvement shown consistently by MRI, at least with today's techniques and short time of follow-up.

Relief of pain and disability by reduction of disc size is easy to argue in a small majority of this series. A few patients have dramatic anatomic improvement. The others with minimal or no significant MRI improvements are harder toexplain. Also, many patients improved very early in treatment, probably before MRI change could be seen.

Nutrient diffusion increase and torn annulus healing resulting from lowering intradiscal pressures are likely causes of clinical improvement when MRI anatomy is not much altered by distraction. Leaking of important sulfates and carboxylates from the nucleus and posterior annulus have been shown in recent studies (6) and (7) lowering of intradiscal pressure by DRS treatment likely can start to reverse these processes by allowing fibroblast repair of the annulus outer layers and some nutrition to the nucleus.

Also penetration of nerves into inner annulus and nucleus of degenerated prolapsed discs has been recently demonstrated and could play a role in pain production. (8) Mechanical intradiscal pressure relief may help this feature as well as giving structural stability.

(1) DRS distraction treatments afforded good or excellent relief of pain and disability whether from herniated disc or foraminal or lateral spinal stenosis.

(2) MRI showed imperfect correlation with degree of clinical improvement but 10 to 90% reduction in disc herniation size could be seen at least at the critical point of nerve root impingement in 10 of 14 patients.

(3) Two patients with extended courses of treatment showed 90% disc reduction and one of these had early rehydration of the degenerated disc at L4-5. An "empty pouch" sign on MRI at the site of previous herniation was seen in these 2 patients.

(4) Foraminal and lateral spinal or facet arthrosis cases causing radiculopathy without herniation also improved but without MRI change.

(5) Annulus healing or patching in the herniated disc can be shown by MRI and is postulated to be a primary factor in clinical and MRI improvement.

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