

Pathogenesis and Conservative Management of Low Back Pain and Sciatica

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Abstract

Since mechanical low back pain affects at least four out of five adults and is the cause of the maximum lost hours of work, it is necessary to understand its pathophysiology and find a solution. The first part of this article elaborates on the 'why' of low back pain. This in turn leads to the management of this condition by addressing the contributing factors. The mainstay of treatment is posture since that is what is adopted throughout the day. Exercises are next. Some of the postures (e.g. sitting) and exercises (e.g. flexion instead of extension) are contradictory to standard teaching. This article is mainly an educational one, backed by 38 years of using this method in about 15000 patients. Surgery by way of laminectomy and discectomy has a high rate of recurrence of problems (about 63%) because of the tough fibrous tissue which replaces the lamina and squeezes the underlying tissues, including neural. Also the disc does get absorbed over time. "Standard lumbar discectomy frequently leads to long-term degenerative changes on imaging tests. The presence of moderate to severe degeneration is associated with self-reported pain" [1]. "Long-term improvement was not better after instrumented transpedicular fusion compared with cognitive intervention and exercises" [2]. "Minimally invasive surgery for the excruciating back pain that can be caused by sciatica didn't work as well as the conventional procedure in a Dutch study" [3]. Each patient is given a full education along the lines given in this article. This is done by the doctor or therapist for individual patients or in a group as needed. Each patient is also supplied with literature. Simple line diagrams are used which speak more than words. Such an education goes a long way in empowering the patient life-long. "Different aspects of psychosocial functioning are best accounted for by diverse patterns of psychological factors, which suggests involvement of different psychological mechanisms in development of LBP-related disability" [4]. The contribution of mental problems is mentioned briefly but is outside the scope of this article.

Keywords: *Low Back Pain (LBP); Sciatica*

Understanding of low back pain and sciatica

Low back pain (LBP) occurs in 80% to 97% of the adult population, disabling enough to prevent normal routine, as reported by different workers on the subject. It is the commonest cause of man-hours of work lost in industry.

The spine, developmentally, was never meant to take weight; but only to protect the spinal cord. However, it was forced to take upon the former function ever since man evolved from a quadruped to a biped. It would probably take millions of years for the spine to adapt itself to this new weight-bearing function.

Up to teenage years and even early childhood, the bones have a layer of cartilage, which, being resilient, acts as a buffer, absorbing shock of weight bearing, walking, running etc. By the age of 22 to 25 years, most of the cartilage is absorbed into relatively harder bone. Buffering action no longer occurs effectively and bone impacts against bone, causing inflammation in the joints, especially the weight bearing ones, adhesions, outgrowing of the ends etc., namely osteoarthritis. The cumulative effect of this shows up as stiffness and pain.

The spine if seen from front backwards is meant to be in a straight line (Figure 1). However, in many people, it might be curved. The vertebrae are the building blocks of the spine. In a curved spine, the inter-vertebral space opens up on the convex side and gets closer on the concave side as in a bent rod. This causes unevenness of pressures on the vertebral articulations, predisposing to osteoarthritis. Note that, in between vertebrae, spinal nerves coming from the spinal cord, exit. These may get compromised, stretched or compressed, giving rise to pain radiating from the low back to the lower limbs, usually at the back of the limb, referred to as sciatica.

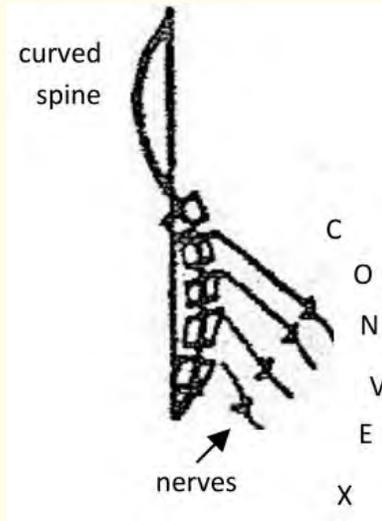


Figure 1

When viewed from the side, the spine has natural forward and backward curves as shown (Figure 2).

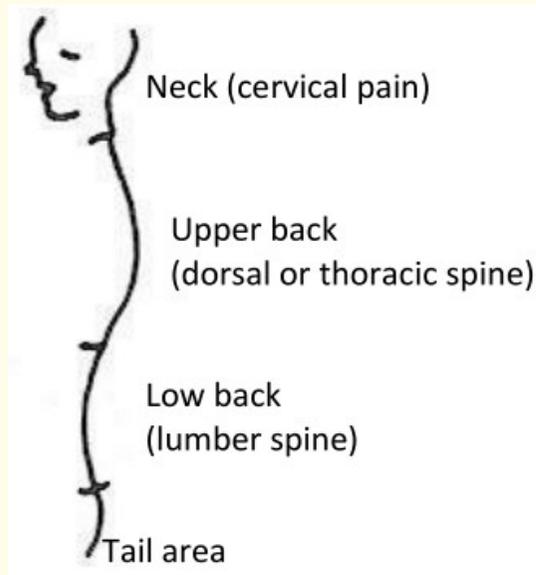


Figure 2

The low back is a forward curve and consists of 5 vertebrae (Figure 3). Each vertebra throws out a pair of upper and lower processes on either side of the midline. The lower processes of the upper vertebra articulate with the respective upper processes of the lower vertebra to form joints called facet joints. The facet joint is a lubricated joint and with constant rubbing of the joint surfaces predisposes to inflammation.

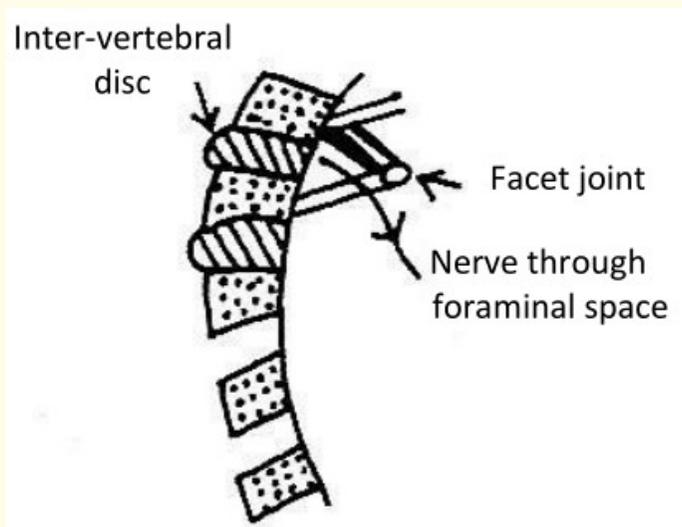


Figure 3

From the accompanying diagram, it is clear that if the facet joints become arthritic or if there is protrusion of the disc sandwiched between vertebrae, the exiting nerve roots in the foramen (hole) as shown may get compromised giving sciatica in addition to LBP.

The greater the depth of the forward curve, the greater the chances of inflammation in the facet joints. When such inflammation (I) occurs, it gives rise to pain (P), which causes spasm (S) of the muscles on either side of the spine (the spine is felt as a longitudinal groove in between two longitudinal bulges on either side formed by the muscles) which gives further pain (Figure 4).

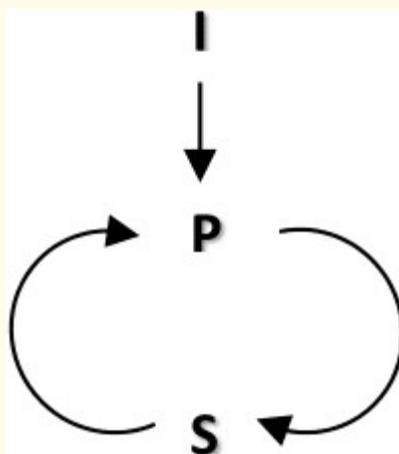


Figure 4

Thus a vicious cycle is set up which can manifest as chronic, grumbling LBP, with or without acute exacerbations and radiation to lower limbs.

What increases the normal forward curvature of the lumbar spine? (Figure 5).

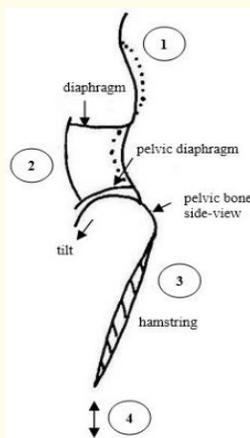


Figure 5

1. An increased backward curve, a hump, of the upper back (shown by dotted lines in the figure).
2. Abdominal bulge due to weak abdominal musculature, a paunch, pregnancy, carrying of weights in the front as by librarians, will cause a forward drag on the low back.
3. Tight hamstring muscles: These muscles are attached from the back of the pelvis to the back of the knee. If tight, they cause a tilting of the pelvis to which the spine is attached and a consequent increased forward bend.
4. High heels: It is common knowledge that high heels produce a strutted gait. This is because the pelvis is tilted forwards from above and carries with it the lower spine.

Many other conditions can also cause LBP (e.g. infections) sciatica (e.g. diabetes). These are not being dealt with in this article which concentrates on the usual mechanical LBP. Also, mental and emotional stresses are known to cause pain in the spine. This is due to a state of chronic tensed muscle and a symbolic translation of carrying a 'load' on the back or keeping problems behind one as it were.

Low back care

Having understood the 'why' of low back pain (LBP), the 'how' of low back care becomes easy to follow. However, one could proceed to do this even without understanding the mechanics of LBP.

One has to be realistic in expectations. Since total prevention of chronological ageing of the spine is not possible, one can only retard it and its effects. Hence one would prevent pain relatively, or decrease its amplitude and frequency (Figure 6).

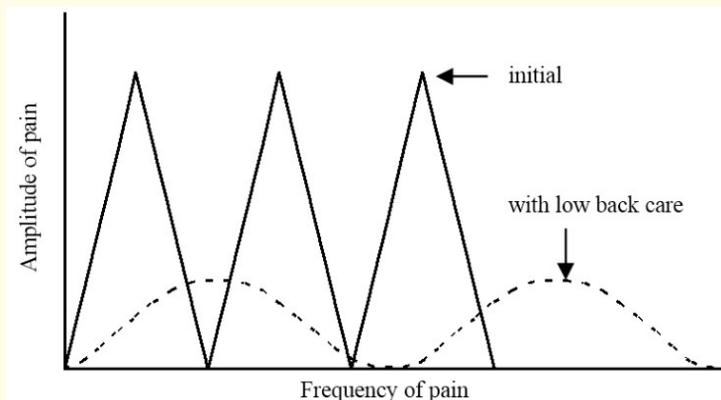


Figure 6

If the lumbar spine is unbalanced, curved, as viewed from front backwards or vice-versa, it is simply corrected by raising the footwear on the convex side of the curve. To see imbalances for yourself, stand in under-clothes with feet together, upper limbs hanging down, in front of a tall mirror. There is a natural gap between the elbows and waist. This is equal in a straight spine, but decreased on the convex side with increase on the concave side in a curved spine. To balance this, keep increasing the footwear by 1 cm. each time on the convex side (one can use wooden planks or footwear with different sized heels) till the gap is equal. This can be confirmed by having another person or doctor viewing the spine from the back.

Obliteration of the increased forward curve of the lumbar spine would involve tightening the abdominal musculature, loosening the hamstrings, stretching the paraspinal muscles spanning the spine to relieve spasm, and doing away with or reducing high heels if any, especially during pain episodes. Half to three-fourth inch heels might be alright. If one wants additional height, it is best to use a platform raise.

The vicious cycle of inflammation, pain, spasm, needs to be broken by use of posture, exercises, heat, medications, and surgery (which is not being dealt with). Most LBPs can be dealt with by conservative means.

Medications would be of the anti-inflammatory group primarily, supplemented if necessary with pain killers. Medications are best taken with food and antacids to prevent irritation of the stomach lining.

Heat, short of short wave diathermy given by a physiotherapist, can be applied at home by means of hot, wet, towel application. Cover the back with it, cover over with plastic to retain moisture and heat. When pain decreases with muscle relaxation, use the opportunity to practice exercises. Note that infra-red lamps do not provide penetrating heat and as such are useless.

Posture

Sitting: One should not sit on the chair right at the back, as usually taught, which will increase the forward curve of the lumbar spine. Sit somewhat in the front, with knees raised, allowing the low back to slouch. One could cross the ankle or knee over the opposite knee (Figure 7). While sitting at a table, pull the chair close to the table and use the foot-bar which should be close to your side of the table (Figure 8). If there is no bar, use a box or draw to rest the feet. The idea is to raise the knees, if possible higher than the hips, thereby tilting the pelvis forward from below and pushing the low back backwards. At home one could choose to sit on a low surface (Figure 9) so that the knees are automatically high or sit atop any surface with feet on it (Figure 10).



Figure 7



Figure 8



Figure 9



Figure 10

While in a road vehicle however, sit at the back of the seat and use a small pillow to fill up the gap between the lower spine and back rest. This will help in absorption of the vertical shocks through the spine. If driving, in addition to the above, keep your seat comfortably close to the foot-panels so that the knees are sufficiently elevated.

Lying down: On a wooden surface use a firm mattress. A thick , cotton one is the best. The spine can now be adjusted against it. Hard ground is unnecessary and hurts the bony prominences.

A soft mattress does not allow adaptation of the spine against it. Prone lying , on the stomach , is to be avoided since the low back remains backward bent with a forward curve. If lying on the back, bend knees, feet flat on the bed, and use a bolster or two pillows under the knees for support. This posture flattens the lumbar spine against the bed (Figure 11). If side-lying (left is more comfortable if sleeping on a heavy stomach which receives support), the hips and knees are bent, pulled up towards the chest, one may be more than the other (Figure 12).



Figure 11



Figure 12

Standing: Intermittently, consciously sitting or bending forward and springing, when possible, takes a lot of strain off the spine. When standing straight on both feet, the pelvis remains in a locked position.

Intermittent unlocking, by slightly bending one knee and mildly swaying the pelvis to the opposite side helps (Figure 13).



Figure 13

Working in a standing position, as in cooking, ironing etc. can be very demolishing for the low back. The do's and dont's are shown (Figure 14). Keep the work surface and body close to each other. Space below the work surface, for the feet, helps. Use a foot stool under one foot and keep alternating from foot to foot at intervals of time.

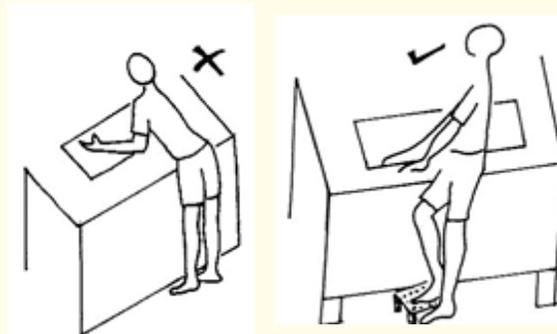


Figure 14

Walking: Again, intermittently sitting or bending forward and springing is very good.

Lifting weights: The spine is at its weakest in a forward, bent position. Imagine children's play blocks placed exactly vertically over each other. A knock from the top does not topple them. However, if placed in a curved fashion, they would easily fall when knocked.

When weights are carried from the front with lower limbs straight more or less and spine bent forward, the fulcrum is in the spine and the weight far away thus giving no mechanical advantage and thereby straining the back. Whenever possible, keep the weight close on the side. Bend the lower limbs, keep the spine relatively straight and use the thigh muscles to help lift the weight as one straightens the lower limbs (Figure 15).

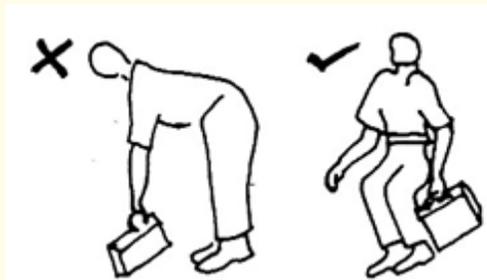


Figure 15

Exercises

These along with posture form the mainstay of low back care. The exercises are meant to stretch the paraspinal spasmodic muscles, tighten the abdominal musculature, loosen the hamstrings, break adhesions in the synovial joints and help self-manipulation of the spine.

Standing exercises

- 1) **Toe-touching:** Feet near together. Try to touch the toes by bending forward. Do not bend from the hips and reach down. Take care to bend the spine by keeping the head close to the body and rolling the vertebrae one over the other. Reaching the toes or ground is not important but doing the maximum one can. Avoid gross jerky forward bending. Springing is however good. Breathing out helps as one bends down (Figure 16).

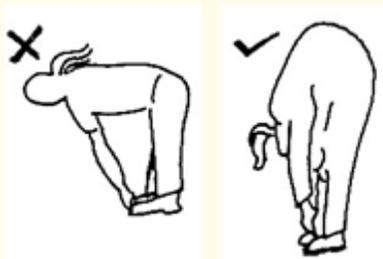


Figure 16

- 2) **Twist and jerk:** Feet apart one to 1.5 ft., hands on hips, twist maximum to the left (Figure 17). Then slightly derotate and gently jerk to maximum again. Jerk twice. Then back to neutral position. Now twist and repeat the manoeuvre to the right. If one has knee problems, this exercise is best done in a sitting position at the edge of an armless chair or bed. This will avoid twisting at the knee.



Figure 17

- 3) **Cross toe-touch:** Feet wide apart. With the right hand fingers try and cross over to reach the left toes (Figure 18). Come up to neutral. Then vice-versa.



Figure 18

- 4) **Alternate toe-heel-touch:** Feet wide apart. With the left hand fingers, attempt to touch the toes of the same side. To neutral. Now try to reach with the right hand fingers the right heel (Figure 19) to neutral. Then vice-versa.

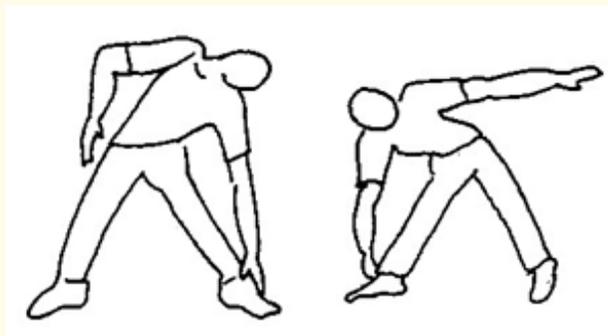


Figure 19

- 5) **Side-bending:** Feet wide apart. Upper limbs outstretched on the sides. Bend sideways to left taking the left upper limb along the leg. Stretch the right upper limb upwards and look towards it (Figure 20). To neutral. Repeat to the right side.



Figure 20

- 6) **Kick:** Take one or two steps forward and swing the left lower limb straight up to touch the fingers of the outstretched left upper limb held at about shoulder height (Figure 21). Take care not to slip and fall backwards by avoiding slippery ground or footwear. Then repeat with the right side. Lying down exercises: (On a firm or hard surface e.g. groundsheet on the floor).

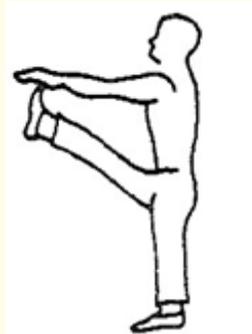


Figure 21

- 7) **Hands behind head:** Feet together. Outstretched lower limbs. Breathe in, hold. Raise feet a few inches till there is maximum strain in the midline of the abdomen, hold to a count of ten (this may require building up to ten over some time), then lower (Figure 22).



Figure 22

- 8) Repeat the above with feet wide apart. The strain is mainly felt in the lower and outer part of the abdomen.
- 9) Lie flat on the back, arms on the side. Bend the left hip and knee and clasp just below the knee with hands. Bring the knee towards the right shoulder which can be arched forwards. Keep the right lower limb straight (Figure 23). Exhalation helps. Repeat with the opposite sides.



Figure 23

- 10) Lie flat, arms outstretched above and behind the head. Get up and try and reach the toes (Figure 24). Breathing out helps. If you cannot get up, ask someone to hold the legs down, or hook your toes under heavy furniture, say a cupboard, to help you. If you cannot reach the toes, grasp whatever part of the leg you can reach and pull yourself down attempting to bury your head between the lower limbs.

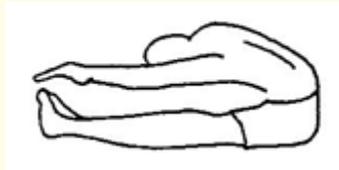


Figure 24

All of the above exercises are to be done three times each. It takes about 7 minutes. Once a day is usually enough. Twice is recommended when there is pain.

Note that forward bending of the spine is known to increase the spinal canal space in the vertebrae, through which the spinal cord descends from the brain. It also increases the foraminal space thus taking pressure off the nerves. This is an additional benefit in neural radiating pain.

A word of caution. Many other conditions can also give rise to LBP or sciatica. These need to be ruled out by simple investigations, most often blood tests and x-rays. However, most backaches fall under the category of a strain phenomenon and can be taken care of by low back care.

Finally, psychological stresses need to be taken care of by learning relaxation techniques and understanding the art of living [5].

Conclusions

1. About 15000 patients were treated as above with gratifying results. (Surgery was needed in one patient who had scoliosis with spondylolisthesis with about 25% slip compromising the neural spaces beyond what was possible to open up with flexion).
2. Education of the primary care providers, therapists, and the masses will prove to be preventive in addition. Talks, literature, and use of the media will help a lot towards achieving this.

Bibliography

1. Mariconda M., *et al.* "Frequency and clinical meaning of long-term degenerative changes after lumbar discectomy visualized on imaging tests". *European Spine Journal* 19.1 (2009): 136-143.
2. Jens Ivar Brox., *et al.* "Four-year follow-up of surgical versus non-surgical therapy for chronic low back pain". *Annals of the Rheumatic Diseases* 69.9 (2009): 1643-1648.
3. Ed Edelson. "Minimally Invasive Surgery Not Better for Sciatica". *HealthDay Reporter* (2009).
4. Janowski., *et al.* "Factors accounting for psychosocial functioning in patients with low back pain". *European Spine Journal* 19.4 (2009): 613-623.
5. Mittal VA. "Low back pain and low back care, book" (1993).

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