

## Why Pain Arises

Patients are always eager to understand why pain has arisen, and rightly so; in this article, therefore, I'm going to discuss some of the ways in which long periods of sitting in a slouched position can bring about pain. Please understand that this mechanism does not account for all the presentations of pain that I see, although it does underlie quite a lot of them.

For the most part, the joints between the various bones in our bodies are held together by a fibrous joint capsule and ligaments. Ligaments are essentially the glue that binds the bones together and are generally quite stiff - due to their having a high collagen content – although they have elastic qualities too. The vertebrae that make up the spine – of which there are 24, excluding the sacrum and coccyx – are also bound by the inter-vertebral disc between them. Inter-vertebral discs themselves are tough and fibrous, although they have a centre which is gelatinous (discs don't actually slip, by the way, rather, the gelatinous part seeps out of damaged discs through cracks and fissures, and then irritates the nerves passing in close proximity).

When we sit for long periods in a slouched or less than optimal position, the ligaments, joint capsules and inter-vertebral discs, collectively holding together the joints at the base of the lumbar spine, are stretched (under strain).

It would take quite a few more lines than I have here to explain the biomechanical properties of soft tissues such as ligament, muscle and disc when under strain, suffice it to say that they are subject to two important phenomena. The first is creep – the tissue gives/elongates when a constant force is applied (you may notice this happening when you stretch – after a while you can go further). The second is hysteresis, whereby once the applied force that is stretching the tissue is removed, the tissue doesn't return to its original length. The latter is to do with energy loss during the stretching process and the breaking of bonds that form between collagen (hysteresis may be temporary if bonds reconstitute), and accounts for the improved length of muscle with stretching (or is one of mechanisms at least).

Although these phenomena are used therapeutically to elongate shortened tissues – often without knowledge of the underlying mechanism – they are also of particular relevance to the interpretation of sustained insults to ligaments and joint capsules. If a ligament is placed under prolonged stress, well within its load-bearing capacity (think prolonged slouching) then it will creep, and because of hysteresis, will not immediately return to its pre-load form. The mechanical properties of the ligament will have been altered, at least temporarily, and in the meantime it cannot sustain reapplied loads in the normal, or accustomed way. It is, therefore, liable to injury. We call this fatigue failure: if forces are repeatedly applied to a tissue, it may not have the opportunity to recover fully. Each application of force weakens the tissue only slightly – and the weakness might not be apparent at this stage – but following many repetitions, the weakness accumulates and the tissue may fail at a stress substantially less than that required to damage it following a single application of force. A common analogy is the ability to break a paper clip, not by bending it once, but by repeatedly bending it. It is in this way that damage to tissues can occur without a history of major or obvious trauma.

Muscle also fatigues, but because of its contractile ability, muscle tends not to fail in the same way as the above tissues, and therefore rarely accounts for those very acute episodes of neck and low back pain that occur usually on some trivial movement. Muscle will immediately spasm, on the occurrence of joint capsule, ligament or disc damage, to brace and protect the area, and in doing so contribute to the pain and stiffness experienced. Muscle fatigue, which also results from poor posture – think shoulders and upper back after long periods at the laptop - is slightly easier to explain and understand. It results from muscles overworking to support the body in a less than optimal upright position, and is due both to a build up of metabolites, and ischaemia - which means lack of blood. Quite literally, the constant contraction prevents the free flow of blood through the muscle belly, and a lack of blood will trigger pain receptors. Hence if you get up,

move about and stretch a bit, the blood flow is improved and the muscle pain relieved - unless you've really damaged yourself, in which case you may need a good pummelling! Shortened tight muscles will also restrict the joints and bones that it moves and lead to problems with them too. And so it goes on .....

I hope this gives some insight into how pain can come about for apparently no reason, other than perhaps that you spent a bit too long sitting at the laptop on a none too comfy dinning room chair over the weekend. Of course there are many other reasons why pain befalls us. One of these is due to the effect of stress on our musculoskeletal systems; you can access another of my articles on this subject also in the articles section of the website.