



Low-back pain is a common presentation in primary care, affecting approximately 80% of the population at some time in their lives.<sup>1</sup> Research on single and multimodal therapies for acute and chronic lower-back pain has shown that none are significantly better than paracetamol.<sup>2,3</sup> Recent assessments of occupational health and safety training have not shown a significant drop in the incidence of back pain in the workplace.<sup>4</sup>

Studies with good follow-up protocols show only a 21% recovery from low-back pain in three months and 25% recovery after 12 months.<sup>5</sup> In addition, recent studies have also shown a recurrence rate of 84% after one year and 75% after 2–3 years.<sup>6</sup>

This article explains the pathophysiology of the 97% of back-pain cases that have no known aetiology as classified by the National Health and Medical Research Council, as well as the 2% with red flags that are checked out and found not to warrant surgery.<sup>7</sup>

### Uncertain causes

Many factors have been attributed to be the cause of low-back pain, ranging from depression and job dissatisfaction to the more anatomical causes of zygapophysial joint pain, sacroiliac joint pain and vertebral disc disruption. Lumbopelvic instability, postural muscle dysfunction and myofascial trigger points have also been implicated in the aetiology of low-back pain.

Until we know the exact pathophysiology of low-back pain and modify our preventive and management models accordingly, we will be unable to better manage this problem. I propose that ilio-costal impingement is the most significant mechanism in the aetiology of low-back pain.

### What is ilio-costal impingement?

This causative mechanism of pain was first

# Treating low-back pain

**Dr Chris Chin proposes a new biomechanical hypothesis for the aetiology of back pain, and explains how the common presentation can be confirmed and managed.**

Chris Chin, MBBS, FAMAC, is a practising GP and laser acupuncturist. He thanks Dr Caroline Bulsara, Department of General Practice, University of Western Australia, for her kind assistance in the preparation of this article

described by Gaenslen in 1922, who found that it occurred in five of his patients over five years.<sup>8</sup> In over 20 years of practice as a GP and laser acupuncturist, I have found that ilio-costal impingement has been the most significant factor in the cause and perpetuation of pain in almost all my patients with low-back pain.

There has been an assumption that there is a space between the lower ribs and the iliac crest wide enough to provide a safe margin in most people. In 2003, I performed a biometric survey of 50 patients (aged between 15 and 76 years) presenting to a general practice with low-back pain. The measurements showed that the average gap between the inferior margins of the 11th rib to the iliac crest in the supine position was only 5cm [Figure 1]. This would be even less with increased lordosis in the erect position.

With such a small space between these two structures, poor postures that are commonly observed, such as slouching, sway back, squatting or bending over, can cause the ribs to move towards the iliac crest and cause impingement of the lateral abdominal muscles. Depending on the size of the ribs in relation to the hips, lateral

bending or bending and twisting can also cause ilio-costal impingement [Figures 2–4].

Studies by Panjabi *et al* have shown that the spine — inclusive of intervertebral discs, facet joints and all the attached ligaments — is not capable of holding the body in the upright position. It also requires the action of the neuromuscular complex to support the osteo-ligamentous structures.<sup>9</sup> Ilio-costal impingement disrupts this complex interaction by causing the development of myofascial trigger points that lead to neuromuscular dysfunction and, if not checked, degeneration of the osteo-ligamentous components.

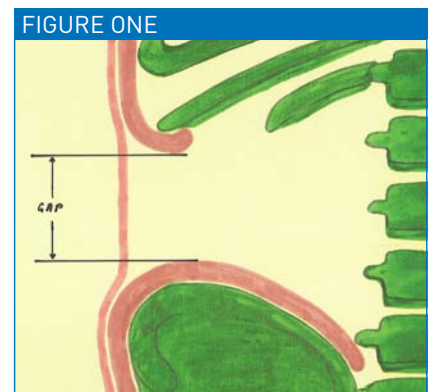




FIGURE TWO

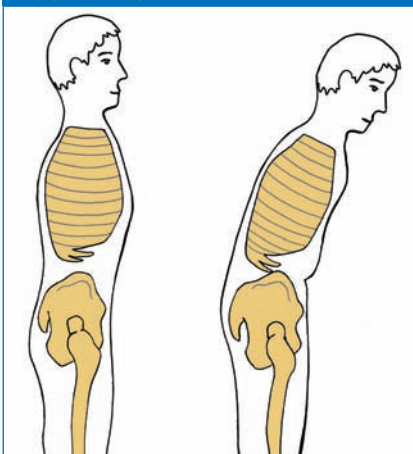


FIGURE THREE

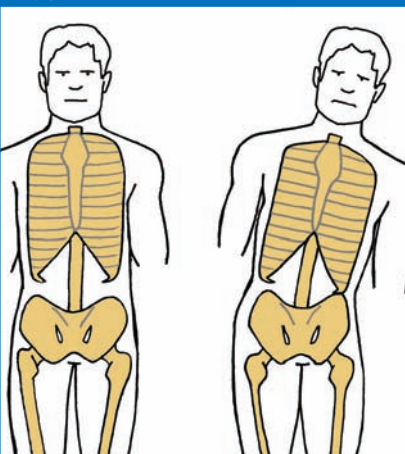
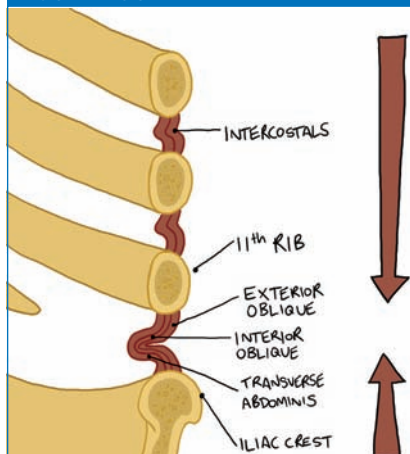


FIGURE FOUR



### Myofascial pain

The myofascia is the connective tissue matrix that envelops muscles and groups of muscles. It has structural and conductive properties. One of the functions of the myofascia is to transfer contractile forces from muscle activity to the tendons. When an exercise program is started, muscle growth occurs within a matter of weeks while myofascia development can take months. Thus, there is a lag between the ability of the muscles to develop and the ability of the myofascia to handle the increase in load.

Myofascial trigger points occur where the nerve passes through the myofascia before it reaches the neuromuscular junction [Figure 5]. When these points are dormant, they do not cause pain. When they are

active, they classically produce referred pain or dysfunction.<sup>10</sup> There are many factors that cause the development or activation of myofascial trigger points but, in the context of lower-back pain, ilio-costal impingement is the major factor. Impingement would also cause the development of tender points at the musculo-tendinous junctions or tendeno-periosteal junctions (enthesopathy), which in turn activate trigger points in the associated muscles.

Poor seating, poor sitting postures and getting in and out of a seat is a major cause of ilio-costal impingement. With the ever-increasing amount of time the average person spends sitting at home, work or travelling, posture and ergonomics are important. Sliding or slouching in the seat, as well as being

hunched over when getting up, are commonly observed behaviours [Figure 6].

Apart from the development of myofascial trigger points in the lateral abdominal muscles, impingement also leads to myofascial trigger points in the numerous other muscles that attach to the lower ribs and the iliac crest. These trigger points cause the common pain patterns we see in lower-back pain. Apart from local pain, they cause referred pain down the legs and mimic sciatica. The number and severity of the myofascial trigger points will contribute to uncoordination of the diaphragm, lateral abdominal muscles and pelvic floor muscles, commonly known as core stabiliser dysfunction [Figure 7].

Ilio-costal impingement also imparts additional forces on the surrounding structures, including tensile forces on the

FIGURE FIVE

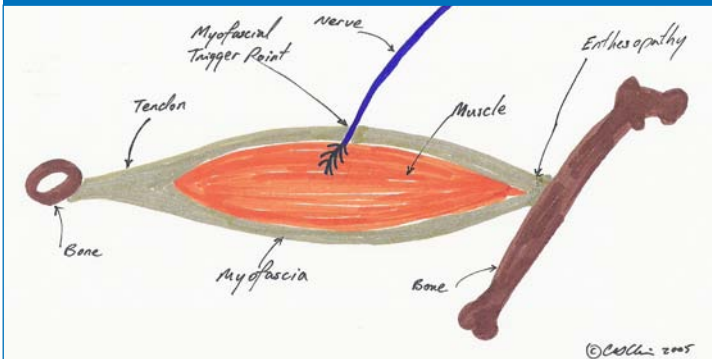


FIGURE SIX

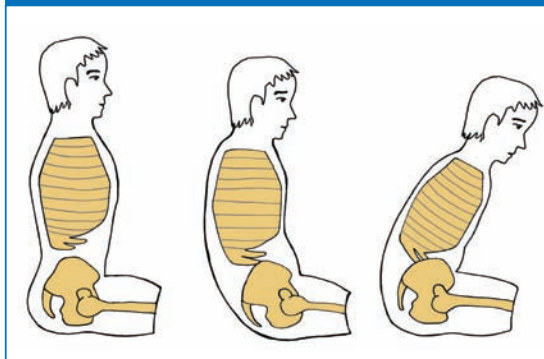




FIGURE SEVEN

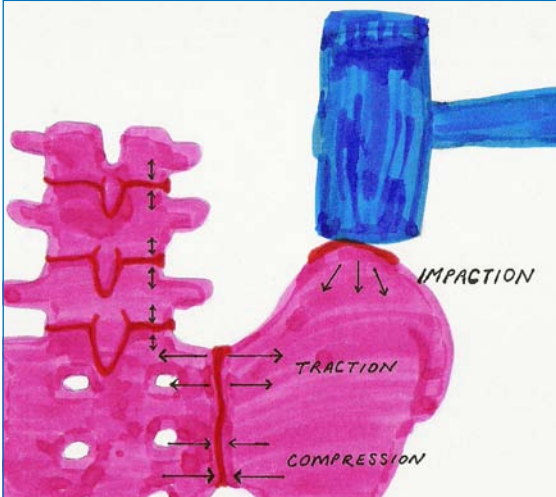
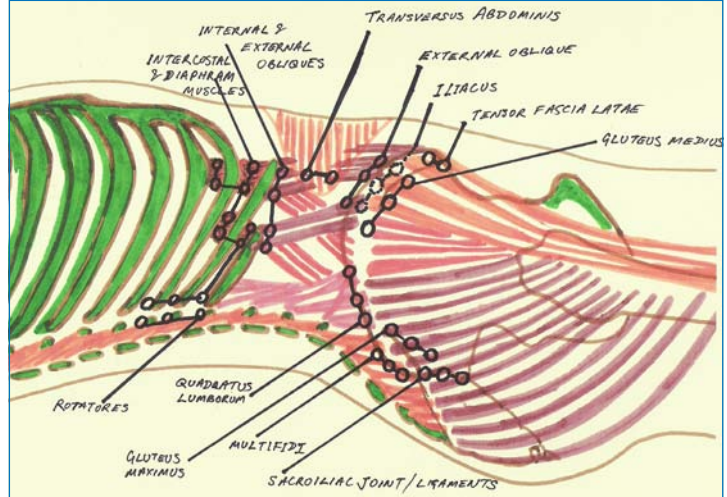


FIGURE EIGHT



sacroiliac joints, facet joints, vertebral discs and the para-spinal muscles. This explains the radiological changes most commonly seen in patients with low-back pain. Unfortunately, there is little correlation between severity of radiological changes and the presence or intensity of pain. The ilio-costal impingement theory explains this phenomenon by exposing the sources of the pain as myofascial trigger points and not the radiological changes. Patients with disc protrusions of up to 8mm can be managed conservatively.

### The pain factor

The presentation of pain depends on genetic as well as environmental factors. The genetics of pain are complex but can be roughly divided into three groups: those who feel a lot of pain with only a small stimulus; those who feel little pain with large stimuli; the majority being between these polarities. This is then compounded by environmental factors, including the yellow flags such as problems at work, psychosocial problems and secondary weight gain. Low mood or anxiety prior to injury may increase pain but severe, chronic and unexplained pain would also lead to depressive symptoms. Food intolerances, and patients with diets high in amines and

fructose, may also contribute to muscle tension and pain.

Many patients with ilio-costal impingement may not complain of pain but fatigue, stiffness in the back, poor gait or difficulty getting out of a chair. They may even present with a fall. Muscular dysfunction may lead to osteoarthritis of the hips, knees or ankles. Myofascial trigger points may cause referred pain to surrounding areas, such as groin, pelvis, sciatic nerve or abdomen, especially in children. Severe myofascial pain mimics and has some of the characteristics of neuropathic pain.

### Taking a history

When taking the patient's history, it is useful to ask about the original incident or incidents which have caused the presenting episode of pain. Sometimes the patient is unable to remember a specific incident and then it is up to the clinician to ask specifically about major events, such as shifting house, garbage pick-up, change of occupation or jobs at work and even change of exercise routine. Sometimes, in severe cases, the patient can describe two events in close succession, such as they bend down once and feel a 'twinge' of pain and then they do something else a few days later and

develop an excessively severe exacerbation of the pain, inconsistent to the nature of the activity. I call this a 'double whammy' whereby the first incident caused a dysfunction of the neuromuscular structures and the second incident caused damage to the deeper structures, such as discs or facet joints, as the spinal structures have lost the support of the neuromuscular structures.

It is also worth asking about the postures or movements that aggravate the pain or gives them relief and seeing if their history is consistent with ilio-costal impingement. Commonly getting out of a chair, prolonged sitting and lifting from ground level may cause a noticeable exacerbation of pain. Sometimes the patient has exacerbations but has not noticed any relationships with particular postures or movements. This occurs when ilio-costal impingement does not cause immediate pain but sets off a chain reaction, with progressive muscle tightening until the pain threshold is reached three-to-six hours later. Commonly, this occurs in the middle of the night when the patient is woken by their pain and will blame the mattress or their sleeping position but it is actually a result of how they sat on the couch the previous evening.





## Patient examination

Observation of the patient starts in the waiting room. Observe how the patient gets up from the seat, their gait and any walking aids. On the examination table, with the patient laying face down, look for signs of scoliosis, kyphosis, excessive lordosis and leg-length inequalities, as these contribute to narrowing of the ilio-costal gap.

In the study of 50 patients with low-back pain, the locations of tender points were mapped. Some of these points were classic myofascial trigger points where palpation could induce the pain, as confirmed by the patients.

Apart from the usual examination of the lumbar and pelvic structures, I palpate the muscles around the spine, especially the para-spinal muscles around L3 to S1, and their insertions on the iliac crest and sacro-iliac joints, and the interspinal muscles. Palpate for tender and trigger points around the lower three ribs and the iliac crest as per Figure 8. With the patient laying on the back, it is easier to palpate the muscles around the 11th and 10th ribs and to roughly measure the ilio-costal gap by seeing how many fingers you can place between them.

With practice, you should be able to palpate the tender points on all of your patients with low-back pain. Sometimes you can illicit the referred pain pattern, which further confirms the pathophysiology. The presence of these tender and trigger points do not exclude serious pathology but, on the other hand, I would be more inclined to investigate or refer if I don't find any trigger points.

I tend to avoid asking the patient to bend forward at the waist, bend to the sides, perform the slump test or push their knees to the chest because all these manoeuvres can result in immediate or delayed worsening of their pain, which will not help if you are giving treatment later.

Remember to look for red flags to exclude serious pathology and I would also

investigate or refer anyone who has sudden difficulty walking.

## Pathology investigation

The majority of patients with low-back pain do not require investigations on the first visit. Blood tests may be helpful if you suspect an inflammatory process, systemic illness or malignancy. CT and bone scan may be used to exclude serious pathology, as subsidised MRI is not available to most GPs.

## Management

In regard to all patients without red flags and the ones with red flags but no serious pathology or where the need for immediate surgery has been excluded, offering reassurance is paramount. Confidently explain to the patient that your findings on history and examination are consistent with ilio-costal impingement as the cause of their low-back pain and that serious pathology is unlikely. At this stage you can reinforce the message by palpating the tender areas you have found on their lower ribs or iliac crests and demonstrating how small the gap between the two structures is.

Passive treatments may include analgesia starting with paracetamol, acupuncture/dry needling, acupressure, local anaesthetic injections to the trigger points, or heat packs. You may refer patients to various allied health professionals and massage therapists who could provide relief by treating these tender points. Communicate to them the location of the points you have found and the ilio-costal impingement so that they do not inadvertently aggravate symptoms.

Active treatments begin by informing the patient that they have become fully involved in striving to get themselves better. Before starting exercise, patients need to be able to perform their daily activities without aggravating their pain. Despite the current consensus on neuropathic pain, pain is their guide and not their enemy, and it should be possible to go through a whole day without

aggravating their pain. They also need to find by trial and error their limitations and what can be modified so that they minimise risks of flare-ups. The main advice I provide in the first few consults are:

- 1 Airbag Technique: by breathing in slowly and holding their breath, the patient can avoid ilio-costal impingement when sitting, standing, walking and when changing postures such as getting out of a chair, dressing or undressing
- 2 avoid lateral and forward bending at the waist and pulling the knees up higher than the hips when sitting. Forward bending at the hips is permitted
- 3 sit on dining chairs, office chairs or Swiss balls and avoid seats or recliners that are too low or have lost support
- 4 avoid lying in bed but walk around in the house, progressing to the back yard while performing the Airbag Technique.

## Conclusion

By being aware that ilio-costal impingement is the causative mechanism in the vast majority of patients with low-back pain, we will be more successful in managing this common condition. We can therefore reduce the number of patients that need strong narcotic analgesia, see specialists or emergency departments. When we have a patient who *does* need to see the specialist, we have a better chance of getting them an appointment without undue delay. ▀

## References

- 1 Slater H, et al. Arthritis WA Magazine 2008(4):5–8.
- 2 Bogduk N, et al. MJA 2004;180(2):73–83.
- 3 Hancock MJ, et al. Lancet 2007;370:1638–43.
- 4 Martimo KP, et al. BMJ 2008;336:429–31.
- 5 Croft PR, et al. BMJ 1998;316:1356–9.
- 6 Hides JA, et al. Spine 2001;26(11):243–8
- 7 Hoogan HJM, et al. Ann Rheumatic Dis 1998;57:13–9.
- 8 Panjabi MM. J Spinal Disorders 1992;5:383–96.
- 9 Simons DG, et al. Travell and Simons' Myofascial Pain and Dysfunction Vol 1, 2nd edn. Lippincott Williams & Wilkins, 1999:11–14.

