EUR MED PHYS 2004;40:21-7

Towards a model of back pain

The 3 circles of pain

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A new model for back pain is introduced. Three major groups (or "circles") of pain are described for the use of clinicians. The 1st circle is comprised of patients with pain from genuine spinal (mainly discs or facets) origin. The main feature identifying this group is the organic pattern of pain, a concept which is described and discussed, and which is based on the history, the clinical signs, imaging tests and response to treatments. The 2nd circle consists in patients with diffuse and permanent back pain, without any organic pattern. The pain, presumed to be not spinal in origin, is attributed to a dysfunction in the pain pathways. The 3rd circle is comprised of patients with clear psychosocial risk factors and no evidence for a spinal origin of their pain. This model applies for lumbar or cervical pain, with or without radiculopathy. Classifying a given patient in one of the 3 circles is relatively easy. It should allow an easier management of the back pain patients.

Key words: **Low back pain, diagnosis - Low back pain, classification - Low back pain, therapy.**

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In France, back pain accounts for 50% of the work load of rheumatologists, and for an even larger share of the activity of physiatrists and practitioners of manual medicine/osteopathy. In the general practice context, the figure is generally thought to be 5%. Treating these numbers of patients obviously entails high health care costs. Furthermore, the chronic back pain and attendant disability seen in some patients will increase the social cost of the condition. The desire to improve the management of these patients and to reduce the costs involved has been the driving force behind the development of a new approach to the description of the condition, known as the psychosocial model. This model put the emphasis on the psychologic and social factors leading to chronicity. Our purpose is to summarize and to discuss it and to introduce a new model for the management of back pain.

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The Cartesian model

Description

The simplest way to view pain is the way in which it was described by the French philosopher René Descartes, who considered pain to be a signal of actual or potential tissue damage. This entirely mechanical concept is referred to by Waddell as the "Cartesian model", or, because pain is attributed exclusively to tissue damage, as the "disease model".[1] If a patient is in pain, all that needs to be done to provide total pain relief is to find the anatomical source of the pain, if need be with an array of imaging techniques, and to treat the cause thus found. If the pain has been severe or long-lasting enough to affect function (impairment, disability, etc.) or the patient's mood (depression), the treatment of the causative lesion would relieve the pain and, thereby, restore normal function and relieve the low mood. In the Cartesian model, the only thing that counts is the tissue injury, which needs to be diagnosed and treated.

Criticism of the Cartesian model

The disease model may not be appropriate for nonspecific low-back pain where, in many cases, no causative structural lesion (intervertebral discs, facet joints, etc.) can be identified either clinically or by imaging techniques.[2] Incidental asymptomatic abnormalities are commonplace. Above all, once pain becomes chronic, it often appears to become independent of any tissue injury and develop, under its own momentum, into "pain disease". For these reasons, the Cartesian model cannot work, and is detrimental in that it entails inflated expenditure on useless surgery visits, imaging, treatments, and surgery. Lastly (and most significantly) it does not prevent the development of chronic pain, which is the worst aspect of lowback pain.

The psychosocial model

The psychosocial model was introduced and developed by Waddell.[3] It is now widely accepted and recognized as a standard. It has influenced the major clinical guidelines for low back pain.

Origin of the back pain

The key concept is dysfunction of the soft tissues (muscles, fascia, etc.), which gives rise to back pain. Under the influence of osteopathic theory, the psychosocial model denies any major role of the spinal motion segment (*i.e.* intervertebral discs or facet joints). A "dysfunction" occurring in tissues that are structurally normal is responsible for the acute pain. It may reverse spontaneously, or persist and cause chronic pain. Strictly speaking, dysfunction is inherently reversible. Any chronicity would be attributable to the pain itself, and, largely, to psychological and social factors affecting the patient.

Pain and chronicity

In the long run, pain will involve functional changes in the sensory part of the central nervous system the CNS is rather plastic in nature. Thus, in the posterior horn of the spinal cord, the synapses connecting the interneurons will multiply and proliferate. This will result in peripheral hypersensitivity (or, at least, peripheral sensitization). Under these circumstances, even normal stimuli will produce pain. At the higher levels of the CNS, in the brain, painful stimuli, motor responses, and emotions are intimately linked. These mechanisms contribute, in the first instance, to the development of chronic pain.

Psychosocial influences and chronicity

The psychological state of an individual, and certain social factors, play a role in the development of chronic pain. The social factors have been studied in considerable detail, and their role is well documented.[4] They range from the secondary gain the patient may expect from the benefit system (a gain that should not be overestimated) to more personal, and more important, factors: low educational attainment; job dissatisfaction (monotonous work, low control and little autonomy, unsupportive work environment, etc.); poor family or personal relationships; an overprotective partner or spouse, who may confirm the patient in his belief that he is severely disabled.

These factors often lead to abnormal behaviour patterns collectively termed illness behaviour by Waddell.[1] These expressions and body actions are used, often unconsciously, by the patients to communicate that they are in pain, and to convince their health care providers that their pain is real: vocal complaints, sighing, grimacing, rubbing of the painful area, and the use of visible aids such as a corset or walking aids. The patients may complain of chronic fatigue, depressive symptoms, withdrawal, loss of interest, aches and pains, etc. Waddell also emphasizes the detrimental effect of what he calls beliefs about back pain such as "there is no real treatment for back trouble", "back trouble will eventually stop you from working" or "back trouble gets progressively worse". These beliefs may be inadvertently reinforced by the treatment provider, if, for instance, the patient is told that the pain means that there is something seriously wrong with his spine and that he must stop working until the pain is better. Some X-ray reports that stress such terms as osteoarthritis or degenerative disease are harmful, for the same reason.

As a result of these beliefs, the back pain patient may consider himself to be severely disabled and suffering agonizing pain. The impairment resulting from pain may lead to varying degrees of disability. The social costs engendered are enormous.

The opposite is also true: some individuals develop a strategy for coping with their pain, which protects them against becoming chronic pain patients. This

positive behaviour of coping and living with one's pain as best as one can should be developed in all patients as it could be one of the best way of preventing pain from becoming chronic.

Implications of the psychosocial model

Since, according to this model, any back pain may give rise to disability, everything should be done to manage things in such a way as to prevent this disability. To prevent disability, it is necessary to prevent the pain becoming chronic. The health care provider's role is clearly defined. The doctor must perform diagnostic triage, to separate the pain patients into 3 groups: those with simple backache, those with nerve root pain, and those with warning signs of possible serious spinal pathology ("red flags"). The psychosocial model concentrates upon the first of these groups, in which screening must identify patients at risk of chronic pain, and where psychological approaches to pain management will have to be adopted.

Simple backache

Patients without any specific risk factors should be managed by general practitioners, physiotherapists, osteopaths, or chiropractors. Local heat or cold, and a few pain-killers are all that is required, since there is no injury, just "dysfunction". Patients should even be discouraged from seeing a doctor, since medical intervention would be useless and expensive. Neither should X-rays be performed, since they, too, are wasteful and non-contributive. At most, patients should be advised to take simple analgesics, NSAIDs, and to go for manipulation: these treatments are said to be backed by at least moderate research evidence for improvement, although it would appear that Waddell considers them to work in a nonspecific way.[1] The overwhelming majority of patients would be cured by this approach. However, the main benefit of the psychosocial model is the screening for patients at risk of developing chronic pain.

Screening for patients at risk of developing chronic pain

The main clue to threatening chronicity is the persistence of the pain beyond 4-6 weeks, especially where the patient is also off work with back pain. At this stage, psychological factors may be identified: fear of being severely disabled; reduced activity levels, from expectation of increased pain with activity; low mood and withdrawal from social interaction; an expectation that passive treatments rather than active participation will help. These symptoms are called "yellow flags", by analogy with the "red flags" that act as warning signs of serious physical pathology (Table I). Yellow flags may be assessed using ready-made questionnaires or during an in-depth clinical interview. However, our knowledge concerning the screening for psychosocial factors is still limited.

TABLE I.—*Some psychosocial risk factors (yellow flags). Modified from Waddell.*[1]

— Presence of a belief that back pain is potentially severely disabling
— Fear-avoidance behaviour and reduced activity levels
— Tendency to withdrawal from social interaction
— Overprotective partner or spouse
— Belief that work will be dangerous
— Passive attitude to rehabilitation

Management of at-risk patients

The 2 mainstays of the management of at-risk patients are well supported by research evidence: the health professional must convey a positive message; and the patient must be encouraged to remain active and to strengthen his muscles. The main thrust of the message is that everything will be all right; that it is normal for a little pain to persist (do not ask: "How much do you hurt?" but "How much more have you managed to do this past week?"); that having more time off work will reduce the likelihood of a successful return to work; etc. The way the questions are asked will affect the patient's attitude to his pain (Table II). At this stage, physical exercise regimes (walking, cycling, swimming, back muscle conditioning) involving sessions of a least 30 min duration may also be recommended. These measures may not be very effective, but they do produce some benefit, and may be initiated by the family doctor.

Critique of the psychosocial model

While the Cartesian model is unipolar (everything is due to tissue damage), the psychosocial model may be said to be bipolar: there is acute pain, and chronic pain; and the passage from one form of pain to the other is governed by psychosocial factors.

TABLE II.— *"Role-reversing" questions: the treatment provider expects something from the patient, not the other way round. Modified from Waddell.*[1]

— What do you understand is the cause of your back pain?
— What are you expecting will help you?
— What are you doing to cope with your back pain?
— When do you think you will return to work?

To our way of thinking, the chief weakness of this model is the fact that psychosocial factors are held solely responsible for the development of chronicity. It could also be argued that the model is incapable of suggesting which patients should be more comprehensively investigated, to detect a possible organic vertebral pathology. Also, no room is left for non-psychological treatment approaches. For these 2 last-mentioned reasons, an unduly strict application of the model may, paradoxically, give rise to chronic pain.

Development of chronic pain

Obviously, psychological and social factors play a role in the development of chronic pain, especially in severe chronic low back pain (our suggested term to replace the overly general term chronic low-back pain: there are forms of chronic lowback pain that are easily cured or improved; what concerns us here is the more severe form, where relief is difficult to impossible to obtain). This form of lowback pain is expensive in terms of social costs; however, it does not affect a very large number of patients: at most 10-15% of all cases of chronic lowback pain will be of this severe type. Many patients have no, or not very marked, psychosocial factors. Also, there is no evidence that the psychological management of at-risk patients, as described by Waddell, can prevent the development of the severe chronic form of back pain. It should also be remembered that research, by ourselves and by other authors, points to the existence of at least 2 other risk factors for chronic pain: inflammation, and the presence of a severe structural lesion. These factors are important, because they are amenable to treatment.

Inflammation as a risk factor for chronic pain

Inflammation may involve the discs,[5, 6] the facet joints [7] or the nerve roots.[8, 9] It is a misconception that simple backache is always mechanical. From our patients, we have learnt that many may be suffering from so-called simple backache, but have more pain during the night and the morning than during the day. In selected cases, the effectiveness of NSAIDs,[10] infiltration (Maigne, unpublished data) or oral steroids in cervical radiculopathies shows that this pain is kept going by inflammation. In chronic lowback pain, we have shown that a short course of oral steroids can provide relief in over 60% of patients selected on the strength of simple clinical criteria.[11]

Inflammation is a chemical process, which will not remit spontaneously. NSAIDs may not be strong enough to control the process, and it is not uncommon to see patients relieved by NSAIDs but in pain again once the medication is discontinued.

Inflammation can make pain become chronic. Neglecting to treat the condition can, paradoxically, produce chronic pain in patients who could easily have been cured.

Severe structural lesions as risk factors for chronic pain

Some structural lesions of the motion segment causing chronic pain appear to be incapable of being cured, at least in the medium term. This is true of some forms of severe disc disease, segmental instability, spondylolisthesis, tight stenosis, etc. The presence of a severe structural lesion can make pain become chronic. The psychosocial model does not state when such lesions should be actively searched for, *e.g.* with imaging techniques. In fact, these lesions are neglected, and their role is denied.

Other causes of chronic pain

In some cases, hypersensitivity to stimuli can form the substrate for pain to become chronic, without any lesion of the spinal motion segment.[12] Masked depression, pathological anxiety, and fibromyalgia are frequently seen conditions in our back pain clinic. These patients tend to respond well to simple treatments, but would be upset if their condition were to be regarded as "psychosocial".

The 3 circles of pain model

While the psychosocial model emphasizes a major back pain problem (found in 10% of the back pain

patients, who are responsible for 75% of the expenditure on the management of the condition), it cannot be used as it stands in an ordinary back pain clinic. A structural vertebral cause (or, rather, an abnormality of the motion segment) must be searched for, at least in some patients with chronic pain. We are proposing a model, first described in 2001,[13] that is felt to be more representative of what happens in a back pain clinic. This model comprises 3 circles (Figure 1), and is, thus, tripolar. It applies to all patients with back pain, regardless of whether the pain is at the lumbar, the cervical, or the nerve root level.

Generally speaking, our model is designed to answer the question of what to do when a patient presents with back pain. The accepted principle is that, when a patient is first seen, a search must be made for warning signs of major structural disease ("red flags"). However, these signs will be present in fewer than 1% of the patients.[14] Obviously, the search will need to be made; however, it will not provide a solution for 99% of the patients. Waddell has added "yellow flags", the psychosocial risk factors.[15] Assuming that these yellow flags are present, in a major way, in 10-20% of the patients, this would still leave 80% of the patients without a solution. Our model allows the treatment provider to classify the patient into 1 of the 3 groups proposed in the model, and to decide on the most appropriate treatment. This would not preclude the treatment provider from applying Waddell's recommendations. The model is of major utility in everyday practice.

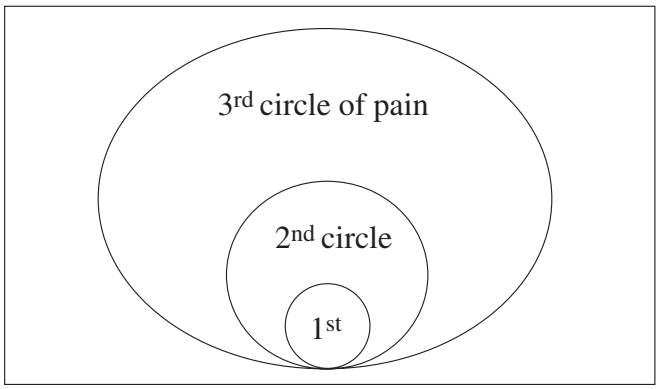

Figure 1.—The 3 circles of pain. The 1st circle represents pain from the motion segment (genuine spinal pain). It is the smallest. The 2nd represents pain from a dysfunction of the pain pathways. The 3rd circle is the largest and represents back pain (likely of non spinal origin) associated with psychosocial risk factors.

The 1st circle of back pain: pain of spinal origin

It is a truism that most cases of back pain, whether acute or chronic, are attributable to the spine — the discs, facet joints, nerves, sacroiliac joints, etc. The important point to realize is that this pain, whatever structure is involved, will have certain typical features — an "organ pattern"— depending on the actual structure that is causing the pain. To illustrate this principle, one could cite pain in other (non-vertebral) parts of the body: in peptic ulcer disease, the pain is located to the epigastric area and is relieved by food; in heart disease, the pain is exacerbated by exercise. Pain caused by spinal structures has certain characteristic features.

First, the pattern is precise, since it reflects an underlying structural cause, and not diffuse. The pain may be triggered by an otherwise harmless wrong movement of the spine. It is not permanent, and may, in fact, be relieved or aggravated by certain positions or movements; also, the pain pattern may vary with the time of day when the causative structure is being subjected to particular stress. Thus, prolonged sitting will make discogenic pain worse; walking will aggravate the pain due to spinal stenosis; inflammatory pain will be worse in the small hours; and certain well-defined movements will temporarily stress the motion segment. Second, it is (at least theoretically) possible to demonstrate the source of the pain with imaging techniques or anaesthetic blocks. In chronic cases, these modalities will need to be resorted to, although they are obviously without use in recent cases. Third, and as far as the management of the cases is concerned, specific treatments (infiltration of the causative structure, anti-inflammatories, manipulation, surgery) are efficacious overall.

The most frequent causes are discogenic pain (which may be purely mechanical, or with an inflammatory component), facet pain and sacroiliac joint pain. However, many cases of vertebral pain cannot be classified under any of these headings, even though they appear to be definitely structural. This is true especially of some forms of acute pain.

These pain patterns must be recognized, since, in chronic cases, an in-depth investigation must be performed, using such modalities as imaging, anaesthetic blocks, or trial treatments, in order to identify the source of the problem.

The 2nd circle of pain: pain pathway dysfunction

An appreciable proportion (20% in our experience) of patients have back pain that does not reflect an "organ pattern". In particular, the pain is diffuse, or will rapidly recur in different territories; and it is permanent, in the sense that it cannot be relieved by changes in position, movement, or relief of physical stress. It has been shown that these 2 features are suggestive of a "non-organic" condition, which means that there is no structural vertebral cause.[16, 17] There are other clues as well, such as refractoriness to the usual treatments, and the failure to find a vertebral abnormality that could account for the pain. In these patients, the pain tends to be in the cervical and/or the thoracic region rather than in the lumbar region; it may interfere with sleep and is frequently associated with low mood. A majority of the sufferers are female, but occurrence in males is not infrequent.

The general cause of this type of pain should be sought in a disturbed function of the pain pathways, as found in fibromyalgia, masked depression, and some neurotic patterns (pathological anxiety, stress reactions). Tricyclic antidepressants are often effective (especially in fibromyalgia). In milder cases, reassurance and simple treatments, especially manual therapy, may suffice.

The 3rd circle of pain: the psychosocial circle

A small number (around 15% in our experience) of pain patients do not fit either of the 2 categories described above. In these cases, the pain is comparatively localized (usually at the lumbar or lumbosciatic level, sometimes in the cervical region, but distressingly chronic. Frequently, compensation issues are involved, *e.g.* following industrial accidents, whiplash injury, disputes with insurance companies or employers, etc. There is no evidence whatsoever of an "organ pattern". The pain is constant and cannot be relieved. Despite a comprehensive array of tests, no causative spinal lesion can be demonstrated. In these cases, psychosocial factors will be present: low educational or occupational attainment, poor relationships with peers or supervisors, disputes with the employer, psychological trauma following road traffic accidents, lack of social interaction, etc. The pain pattern is marked, not only by chronicity, but by the way in which the pain affects the patient, and by the disability associated with it. As suggested above, in a case of lowback pain, the condition should not be described simply as "chronic low-back pain" (an unduly vague term that may stand for very different clinical patterns), but as "severe chronic lowback pain".

The pain is perceived as back pain, but does not come from the spine. At the present state of our knowledge, we do not, in fact, know where it comes from. All we can do is analyze it in terms of pain behaviour associated with adverse psychological and social factors.

Treatment is difficult. Analgesics, reconditioning, and workplace-related measures have shown a certain degree of effectiveness. However, while early detection of the patients at risk, at or shortly after the time when the pain is first felt, may be a possibility, there is no evidence that chronic pain can be efficaciously prevented.

Conclusions

The 3-circle model fits in well with everyday clinical practice. It applies, not only to lowback pain, but to any form of back pain, with or without nerve root pain.

The main question is no longer whether the pain is acute or chronic. What matters is to establish whether the pain may reasonably be assumed to be of spinal original (1st circle) or not (2nd and 3rd circles). If there is a detectable organ pattern (1st circle), the question to be answered is whether it is acute or chronic. If it is chronic, supplementary imaging investigations, anaesthetic blocks, etc. may be requested, in order to find the cause of the pain. Surgery is a reasonable option if a definite cause has been identified, and if the condition is amenable to surgical treatment.

If there is no organ pattern, the pain is unlikely to come from the spine. In such cases, it is generally unavailing to perform or repeat imaging investigations. This is back pain, not spinal pain, and should be treated accordingly.

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