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Psychological aspects of interventional therapy

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> Let nothing slip by you; the ordinary humdrum cases of the morning routine have been accurately described and pictured but study each one separately as though it were new—so it is, so far as your special experience goes; and if the spirit of the student is in you the lessons will be there.
>
> Sir William Osler, Medical News, 1894.

The scope of interventional pain management [1] could hardly have been predicted from its meager beginnings. The days of directed lumbar epidural blocks strategically positioned between operating room anesthesia have all but vanished. Various procedures have been used for diagnostic, prognostic, and therapeutic purposes. The developing specialty of interventional pain management has paralleled, or perhaps been propelled by, significant advances in medical technology. Caution, however, must be observed, remembering that, just because a thing can be done, does not mean that it should be done. The less invasive, ie, less anatomically destructive, a procedure the greater risk of it being done with impunity. In such cases, the impact of, and on psychosocial variables is often ignored. Witness the low frequency with which lectures on relevant psychosocial issues are present at the plethora of ''interventional workshops''. Dismissing these issues by simply encouraging a pre-procedure psychologic evaluation seems inadequate. Another ''red flag'' is the relative paucity of controlled studies examining these variables. The study by Wallis, Lord and Bogduk [2] is the exception to the rule and provides a fine example of how pain, psychologic and procedural variables can be studied simultaneously.

This article presents various definitions of pain along with several classification systems used when describing and evaluating pain. Although seemingly elementary, highlighting the basics including a comprehensive framework within which to function, helps to insure the implementation of therapy versus merely performing

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procedures. Outcomes are as often influenced by the psychology of the clinician as that of the patient.

Definitions

There are many definitions of "pain." Perhaps the most frequently quoted is that of the International Association for the Study of Pain (IASP), "... an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" [3]. However unfamiliar they may be, there are many other definitions. These include that of the United States Congress Office of Technological Assessment that declares pain to be "... the awareness of discomfort resulting from injury, disease, emotional distress and evidenced by biologic and behavioral changes." Webster's Third New International Dictionary defines pain as "...a state of physical or mental lack of well-being or physical or mental uneasiness that ranges from mild discomfort or dull distress to acute often unbearable agony, may be generalized or localized, and is the consequence of being injured or hurt physically or mentally or of some derangement of, or lack of, equilibrium in the physical and mental functions and that produces a reaction of wanting to avoid, escape, or destroy the causative factor and its effects" (page 1621) [4].

Price [5] proposed "...a somatic perception containing (a) a bodily sensation with qualities like those reported during tissue-damaging stimulation, (b) an experienced threat as associated with this sensation, and (c) a feeling of helplessness or other negative emotion based on this experienced threat (page 1, 2) as a definition of pain. In attempting to identify the term, particularly as it relates to animals, Zimmerman [6] proposed pain to be "...an aversive sensory experience caused by actual or potential injury that elicits progressive motor and vegetative reactions, results in learned avoidance behavior, and may modify species behavior"(page 16). McCaffery [7] suggested that pain should be conceived of as ... whatever it is the patient defined it to be at whatever moment it is defined by the patient. In his book, apparently written for the general public, Sarno [8] declares pain to be ... a response to maladaptive, repressed, or unresolved negative emotions. Barkley [9] noted that a sensory experience such as pain could be described in words but that "...it is life that decides what the intensity of the meaning is" (page 44).

Components of pain

Having considered the definition of pain, it is important to understand the components and processes that combine to make up the experience of pain. Loeser [10] noted pain, particularly chronic pain, to be a product of (1) nociception, (2) perception, (3) suffering, and (4) pain behavior. Pain processing can be viewed by examining activity in the (1) periphery, including peripheral nervous system, (2) spinal cord, including dorsal horn and segmental activity, (3) impulse propa-

gation in spinal-thalamic tracts, and (4) supraspinal activity. A modified version of this scheme identifies the constituent parts as transduction, transmission, modulation, and perception.

Supraspinal or cortical processing of nociceptive information involves an intricate interaction among somatosensory cortex, thalamic/limbic structures and frontal cortex. These areas of the brain roughly correlate to the sensory or discriminative, affective or motivational, and cognitive or evaluative aspects of pain. While frequently discussed as distinct entities, it is clear that pain is a product of a dynamic and complex interplay among these areas [11].

Pain types

Pain has been conveniently divided into acute and chronic. Chronic pain is generally considered to be that which lasts beyond the expected healing time. A further subdivision involves cancer versus non-cancer pain. Recent work by Honroe et al [12] has presented preliminary data indicating that, at least at the molecular and cellular level, inflammatory, neuropathic and cancer pain (created by implanted tumor in the mouse hip) demonstrate quite unique chemical signatures. It is, however, well recognized that these types of pain frequently coexist.

Pain can be examined from the perspective of its type and location. Generally it is segregated into nociceptive or neuropathic pain. Visceral pain has occasionally been classed separately or included as a subtype of one of the previous. The location or body site can be relevant and meaningful. It is easy to imagine that nociception originating from the pelvis versus low back versus head may evoke different responses and interpretations in the patient, practitioner, and immediate social unit.

Pain is often described in terms of its temporal pattern. Some pains appear to persist with minimal or little variation in intensity. Other types seem to be responsive to certain movement, diurnal patterns, and changes in the weather. In some cases one can identify a recurrent acute pattern such as in ‘‘migraine headache’’. More often than not there are periods of exacerbations superimposed on a baseline level of chronic pain as frequently found in patients manifesting ‘‘failed back surgery syndrome’’.

Treatments for pain are sometimes viewed in the context of their anticipated duration of effect. For example, blocks using short acting opioids or local anesthetics are limited in duration by the pharmacologic properties of the medicine. However, for reasons yet unclear, this may not always be the case. Adding steroids is intended to alter the pathological process—inflammation—and therefore produce a more prolonged effect. Some treatments (ie, radiofrequency denervation) produce a prolonged effect by presumably altering the ‘‘pain’’ transmission process. A more or less continuous disruption can be created by using neuroaugmentation devices, including spinal cord stimulation (SCS) or drug administration systems (DAS). Occasionally, ablative procedures are performed in the hopes of permanently altering ‘‘pain transmission’’.

The measurement of ‘‘pain’’ is no less complex. Pain has been ‘‘operationalized’’ in a variety of ways. Some have declared it as whatever the patient says it is existing whenever the patient says it does. Others have used various rating scales including a visual analog scale (VAS), numerical rating scale (NRS) or the Faces Scale. Other attempts to quantify the experience of pain have relied on verbal descriptors such as the McGill pain questionnaire, the recording of ‘‘pain behaviors’’ including grimacing, posturing, etc. and the assessment of the affective or unpleasant nature of the pain experience [5]. The more basic science researchers have examined animal responses including tail flick or paw withdrawal and alterations in the chemical milieu and activation of specific nerve pathways and brain structures.

Each of these approaches to assessment is believed to capture, to one degree or another, the experience of ‘‘pain’’. As with most operational definitions there is a tendency toward a reductionistic view in search for that which is most parsimonious though not necessarily the most generalizable or comprehensive. Einstein is noted to have indicated that . . .not all important things can be measured and that all things that can be measured are not always important.

The component of pain that is the most influential at any given time may vary. It is not difficult to imagine scenarios in which the ‘‘nociceptive’’ component of the pain experience might dominate, while under other circumstances the affective or evaluative component take on greater ‘‘meaning’’. There is, therefore, an inherent danger in pursuing a one-to-one correspondence of the relative contributions of these various components of pain in the acute versus chronic state. For example, it is frequently assumed that the ability to provoke or reproduce the patient’s ‘‘complaint of pain’’ is tantamount to the identification of the ‘‘pain generator’’. Alternatively, such maneuvers could be interpreted as having located a ‘‘nociceptive generator’’ whose contribution to the overall experience of pain can range from negligible to profound. If ‘‘negligible’’, silencing the ‘‘nociceptive generator’’ would be expected to produce minimal long term or clinically significant changes. If ‘‘profound’’ eliminating or suppressing activity of the offending structure should be associated with significant relief.

The role of psychologic or emotional factors has been firmly established. States such as depression, anxiety, fear, to name a few, are known to contribute to the overall experience of ‘‘pain’’. Fortunately, these states can be modified, at least in the motivated patient, leading to a reduction in pain or an increased ability to cope. Evidence suggests that one can decrease the unpleasantness or affective component of pain independent from the sensory component [11].

The existence of psychologic factors, however, should not be assumed as evidence that they are functionally related to the pain experience. If related to pain, they could serve as mediators, modulators, or maintainers [13]. Additionally, their influence may vary over time and depend on situational variables (ie, the presence of a solicitous spouse) [14].

The psychologic or emotional states mentioned earlier are not simply exercises in semantic contortions or gymnastics. The clinician’s individual concept of pain will determine which, if any, of the above approaches that clinician selects to its

assessment, the ''meaningfulness'', and significance that is attributed to each type of assessment and outcome, and, ultimately, how the patient is treated. Some will approach the problem in an effort to reduce the patient's verbal complaints, others a number on an NRS, still others improvement in functioning. A reduction in concomitant psychologic states including stress, depression, anxiety, the ability or willingness of the patient to ''cope'' with their experience of pain, or a decrease in relief seeking behavior may be the end point of treatment for other clinicians. Some will give stronger emphasis to the elimination of presumed ''causes'', others to altering the patient's response to the pain experience.

Technologic advances, available pharmaceutical preparations, insurance reimbursement patterns, and societal norms and values will each exert their influence, often at a stronger than suspected level, in the unwary clinician or patient. Although there is a general emphasis on multi or interdisciplinary approach to the problem of pain, therapeutic sub cultures and disciplinary narcissism are easily noted by the independent gathering of interventionalists, implanters, surgeons, ''alternative'' medicine practitioners, and mental health practitioners. Each group contains its own unique body of knowledge and biases. The integration of this information is hampered by its sheer volume.

It is in the context of this complex multidimensional and dynamic setting that we must consider the topic at hand. To do otherwise, or to pretend pain to be less integrative, is to betray the accumulated science and knowledge of countless researchers and clinicians. The consequence of which would be to propel us back to an era of Descarte; a posture, unfortunately, that too many in society, insurance industry, medicine, and mental health seem willing to assume.

Literature review

Blocks

There are a variety of blocks performed by the interventional therapists including peripheral nerve blocks, lumbar epidural blocks, transforaminal blocks and sympathetic blocks. Many of these, such as a peripheral nerve block, are uncomplicated. In essence, this setting mimics a single subject or N = 1, experimental design [15]. In this type of experimental design the subject serves as his or her own control. One establishes baseline information and monitors the change as a function of some intervention [16]. When performed in the quiescence of the procedure room or fluoro suite, the effect is more likely to be purely physiologic addressing predominantly the sensory or discriminative aspects of the pain problem.

As other variables are introduced, the ''experimental design'' becomes more complicated. For example, the presence of a solicitous spouse, the patient's expectations regarding outcome of the procedure, the consequences to the patient psychologically, economically and physically, as a result of a ''successful'' or ''failed'' procedure may each impact on the outcome. One anesthesiologist, a close colleague of one author (DMD) noted a substantial increase in the percent of

patients returning for epidural blocks when light sedation became routine. This interventionalist is now convinced that the reprieve, however brief, from pain brought about by the sedation has become one of the most rewarding aspects of the procedure. This might be particularly true for the highly anxious patient wherein sedation functions as a ''tranquilizer''.

The outcome of any particular study exploring different types of blocks may depend on the type and range of dependent measures used. A rather interesting study by Arnhoff et al [17] examined 151 patients receiving epidural or subarachnoid blocks for low back pain. They considered pain frequency or intensity, days in bed, walking, bending, working, recreational or social activities, medication use, overall effect, and subsequent operations. The degree of improvement depended on the measure being examined. Although most patients reported improvement in pain, only 44% noted improvement in recreational activities. Overall the outcomes seem to be better among females than males. Interestingly, 27 of 151 patients reported they were worse. Other researchers have noted that the outcomes do not seem to be enhanced by performing ''numerous'' blocks [18].

Decisions regarding additional procedures often depends on patients' reports of the effect of a previous intervention. When memory and apparent memory distortions for the effects of blocks was examined [19] over 34% of patients recalled a different post block pain level than they reported immediately after the block at 2 days recall. Two weeks after the block, 45% recalled a different pain level than reported immediately post block.

Some patients, referred to as ''shifters'', tend to recall, or at least report, higher levels of post procedure pain than was noted immediately after the procedure. High degrees of affective and evaluative responses to pain, more emotional distress, interpersonal conflicts, high degree of inactivity, and a reliance on medications tend to be associated with inaccurate recall. Erskine et al [20] noted recall for pain to be moderately accurate for acute pain versus chronic pain. Recall for pain seemed to be influenced by mood states. This resulted in Blaney [21] proposing a ''mood congruence theory'' suggesting that the more similar a patient's mood at the time of recall to that at the time of the procedure, the greater the accuracy. A ''state-dependent'' hypothesis noted accuracy of recall to be dependent on the degree to which the salient features existing at the time of the procedure are present at recall.

For reasons that are yet unclear, as many as 85% of patients will report a return of pain 1 to 3 weeks before a scheduled return visit to the clinic [22]. This may be done in an attempt to secure additional intervention, to please the interventionalist, to reenforce the recalcitrant nature of the pain. It may also represent a degree of ''painsmanship'' on the part of the patient [23].

The placebo effect [24] has been a source of ongoing investigation and concern. Brena et al [25] performed lumbar sympathetic blocks on patients with low back pain and compared the effects of blocks using bupivacaine versus saline. Significant decrease in pain was noted for up to a month in both groups. Lilius et al [26] examined the outcome of lumbar facet injections. Cortisone injections were either given ''into'' the joint, or ''around'' the joint. In other groups a local anesthetic or saline was injected ''into'' the joint. Seventeen of 109 patients had an initial

response. There was no significant difference among the groups. At 3 months, 34% (16/47) of the cortisone or local anesthetic group, and 39% (9/23) of the saline group were still reporting benefit. For reasons that are unclear, the percent of patients reporting benefit at 3 months was remarkably higher than at 2 months for both groups. In a double blind randomized placebo controlled study involving radiofrequency neurotomy [2] the percent of ''placebo responders'' was substantially less (3/l2 versus 7/l2) than the active group. In addition, the improvement in the placebo responders diminished more rapidly.

The degree to which psychologic variables are affected by interventional therapy has been the subject of some investigation. Depression and the ability to cope with the pain as measured by the Minnesota Multiphasic Personality Inventory (MMPI) improved when pain was reduced by either saline or bupivacaine lumbar sympathetic block. However, there was no identifiable change in paravertebral muscle activity as measured by surface integrated electromyographic studies (sEMG), range of motion, or daily activity [25]. Wallis et al [2] demonstrated that psychologic distress as measured by the Symptom Checklist 90 was directly related to the presence or absence of pain following radiofrequency neurotomy. Their experimental design seemed to show a functional relationship between pain and psychosocial factors.

Hammer and Doleys [27] reported a case study on the use of SCS therapy in the treatment of occipital neuralgia. The investigators noted a similar architecture in pre and post treatment MMPI profiles despite the resolution of pain. There was a significant reduction in the Beck Depression Inventory (29 versus 2) and the Oswestry Disability Questionnaire (46% versus 0%). This finding may be a case of the MMPI reflecting a well-established personality style unaltered by the presence or absence of pain.

Sympathetic blocks are a popular and common diagnostic, prognostic, and therapeutic intervention. Winnie and Collins [28] noted as many as 74% of l00 patients eluding a specific diagnosis, were found to have a strong sympathetic component to their pain as determined by differential neural blockade. Brena, Sanders, and colleagues [25,29,30] examined some of the variables involved in responses to lumbar sympathetic blocks. One study comparing sympathetic blocks using bupivacaine versus saline in 20 low back pain patients using a double blind crossover design showed significant reduction in pain in response to bupivacaine and saline injections.

A second study again compared bupivacaine with saline in 67 low back pain patients. The degree of pain relief at 24 hours, but not 30 minutes post injection, correlated with the degree of pretreatment pain behaviors and the absence of disability claim status. Again, there was no difference between bupivacaine and saline.

A third study [29] examined the relationship of overt pain behaviors measured from the time the patient entered the procedure room until they were asked to sit up after the procedure, and cognitive coping strategies to the outcome of lumbar sympathetic blocks and interdisciplinary pain rehabilitation. Cognitive coping strategies did not predict pain relief following sympathetic blocks. Higher overt pain

behaviors noted during the first block tended to be predictive of less subjective pain relief in response to sympathetic blocks and interdisciplinary treatment.

In summarizing their findings, Brena et al [31] emphasized the role of psychologic and conditioning factors in patients' response to sympathetic blocks. Pinsky [32] found the data neither compelling nor convincing. In so doing, he did emphasize the importance of any initial patient bias toward sympathetic blocks. That is, did the patient present as a self-referral seeking the treatment, were they directed by their physician to "submit" to these blocks, or perhaps mandated to treatment under worker's compensation.

Derby [32] interpreted these and other data related to lumbar sympathetic blocks to yield four conclusions/recommendations. First, consider the advantage of a dose-response relationship using anesthetics of different durations versus placebo control. Second, observe overt pain behaviors, but realize there may be a variety of explanations for these behaviors. Third, there may be a number of psychophysiologic aspects involved in pain perception, as emphasized by the work of Schofferman [33] and Rome and Rome [34] regarding early childhood traumas. Finally, that blocks, particularly those intended for therapeutic purposes, not be performed in isolation of other interventions. There should always be some concern at using an acute treatment to predict long term outcome of a chronic problem.

These issues surrounding sympathetic blocks take on more importance when considered in the context of evaluating and treating complex regional pain syndrome (CRPS). Under the previous label, reflex sympathetic dystrophy (RSD) substantial controversy was created over the role and value of sympathetic blocks. Ochoa [35,36] has been particularly vocal on these matters. He considers most of the previously referred to RSD patients to manifest psychogenic symptoms. Psychiatric or psychologic evaluations aimed at uncovering psychopathology are neither sensitive nor specific enough to reveal the true nature of the problem. Instead, he emphasized a detailed neurologic and neurophysiologic assessment.

The role of psychologic factors in RSD or CRPS-I and causalgia (CRPS-II) remains unclear. However, the preponderance of the data does support the existence of significant psychologic distress and pathology generally believed to be a consequence of rather than a cause of the disorder [37–40]. Whether a cause or consequence of CRPS-I or II, the coexistence of significant psychosocial variables can clearly confound and introduce an element of ambiguity in the interpretation and outcome of interventional procedures.

The dynamic interplay between psychosocial variables and interventional therapies is convincingly demonstrated in the following three cases. Parisod, Murray, and Cousins [41] describe the case of a 43-year-old suffering CRPS of the left upper extremity secondary to an on the job injury. Following a successful trial of SCS and subsequent implantation, the patient presented with rather unusual symptoms including hemibody paralysis. These symptoms were ultimately determined to be "conversion symptoms" related to a series of recent psychosocial stresses. The introduction of physiotherapy and aggressive cognitive behavioral therapy including relaxation, pacing, cognitive restructuring, and so forth, help to bring about a resolution. Indeed, 1 year after treatment the patient

remained at full time work taking no medications and using the SCS an average of 1 hour per day.

In the presence of sudden onset conversion symptoms the investigators recommended: (1) removing the patient from the situation that has overwhelmed usual coping strategies, (2) reassuring the patient that recovery will be soon, (3) minimize secondary gain by way of inadvertent reinforcement of prolonged recovery, and (4) reinforce alternative coping strategies. Reliance on a single dimensional approach (SCS therapy alone) would likely have resulted in treatment failure. One can only guess at the number of SCS or DAS ''failures'' that could have been rescued by incorporating appropriate and timely psychologic therapies.

In a related case, Labovits [42] described the treatment of a 15-year-old girl suffering from ''RSD'' as a result of five gunshot wounds inflicted at the time that her boyfriend was fatally shot by intruders. As might be expected, she was diagnosed with ''psychologic factors affecting physical condition'', and ''post-traumatic stress disorder (PTSD)''. Successful therapy consisted of 13 stellate ganglion blocks over 15 weeks, the replacement of narcotics with amitriptyline and ibuprofen, physical therapy, and 20 individual behavioral or psychologic therapy sessions over 20 weeks, and the inclusion of her mother in treatment.

The third case involves a middle-aged woman diagnosed with mixed CRPS-I-II of the right upper extremity being treated in part by the first author (DMD). The patient was hospitalized with an epidural catheter receiving combination of fentanyl and bupivacaine. Symptom improvement was realized until she had a prolonged, and by her interpretation, intrusive and traumatic visit by her immediate supervisor from work. During this visit the patient felt that she was being interrogated and, of course, hopelessly trapped in her room attached to the catheter. There was, as easily documented by monitoring devices, nurses reports, and the patient's reports, a reduction in the analgetic effect provided by the catheter, increased manifestations of sympathetic components of her pain, and a concordant ''spreading'' of symptoms to other parts of her body. Since that time, revisiting this situation even in casual conversation or guided imagery, has reliably produced reports of symptom enhancement characteristic of PTSD.

The autonomic arousal created by PTSD may strongly influence physical symptoms and the experience of pain. The presence of PTSD, particularly if undiagnosed, could mitigate against a positive response to sympathetic blocks resulting in the erroneous conclusion that the pain is ''sympathetic independent''. Psychologic techniques such as thermal biofeedback, systematic desensitization, eye movement desensitization reprocessing (EMDR), and cognitive behavioral therapies have been used successful in treating PTSD. Reduction in PTSD or other stress related symptoms does not always result in a reduction in pain [43]. Thus, the necessity of using combined therapies.

Obviously, the persistence of PTSD would impact on long-term efficacy of any intervention including implantable technologies. Given the fact that CRPS-I or II frequently followed some type of ''trauma'' it would seem reasonable to be mindful, and to investigate, the possibility of coexisting PTSD or other anxiety disorders. Indeed, PTSD may be present in a higher than expected percentage of

chronic pain patients [44,45]. There seems to be similar alterations in brain functions and neurochemical activity in pain patients and PTSD patients [46,47]. Individuals with chronic pain tend to demonstrate a cluster of symptoms that may in fact be ''low grade PTSD''. The anachronism MARCHES may be useful in summarizing this symptom cluster: M = problems with memory, attention, and concentration; A = affective changes including depression and anxiety; R = rumination surrounding pain, pain treatments and prognosis; C = tendency toward catastrophizing; H = hyper arousability. E = decreased energy and functional losses; S = sensory changes including chronic pain. When viewed in this fashion, the overlap between a subclass of chronic pain patients and PTSD symptoms seems apparent.

Differential spinal blocks

Differential spinal blocks (DSB) have been used in attempts to clarify or establish the diagnosis of pains of different etiology including ''psychogenic'', sympathetic, somatic, and ''central''. The procedure has been well described and detailed by Winnie and colleagues [28,48,49]. Winnie has taken great care to define the procedure and diagnostic conclusions.

The implications of identifying a patient as having ''psychogenic pain'' are obvious. A study by Ghia et al [50] noted a link between pain mechanisms and psychosocial factors. For example, patients with psychogenic or central pain tended to be more focused on bodily functions and manifest higher scores on scale 3 (hysteria scale) of the MMPI. Patients determined to have a sympathetic pain mechanism were noted (1) to display less obsessive or compulsive behaviors (lower score scale 7 of the MMPI), (2) less depressed compared with other types of pain, (3) lower psychopathic deviant scale (scale 4), and (4) lower levels of acute anxiety and less frequent experience of life stresses. This was a correlational study and did not endeavor to establish a cause-effect. That is, are patients with ''hysterical features'' more likely to respond with reports of pain relief to one aspect of the procedure (ie, saline, altered sympathetic activity, or sensory or motor changes) than another?

The obvious importance of psychosocial factors including demand characteristics of the situation, instructions given to the patient regarding the procedure, questions asked after each injection, and other confounding variables have caused some to question the validity and reliability of DSBs [51,52]. In rebuttal, Winnie and Candido [49] emphasized the importance of combining data from DSB with that obtained from other tests, physical examination, and careful history. This is especially true in the context of cautionary notes by pain societies regarding the use of placebos and the ever changing and broadening interpretation of the ''placebo effect'' or ''placebo response'' [24,53].

Psychologic issues in discography

Discography is a common diagnostic procedure performed by the interventional anesthesiologists. The identification of a ''positive'' or abnormal disc is often used

to support the need for other interventional therapies or even spine surgery. Ideally, the patient will report concordant pain in a morphologically abnormal disc in the presence of a non-painful ''control'' disc for comparison. Because of the significant consequences of a positive discography it seems useful to consider variables that may influence the outcome.

The sensitivity and specificity of discography has been reviewed by Saal [54]. He correctly notes that, ''. . .like diagnostic blocks, discography makes certain assumptions about. . .the ability of the patient to isolate different painful areas and to differentiate between significant. . .and insignificant pain relief'' (pg. 2540) or in this case, pain increase.

Carragee and colleagues [55–57] performed several studies involving a mixture of subjects. Some were pain free. Others had pain in areas remote to the lumbar discography, that is, chronic neck or arm pain, and still other subjects were diagnosed with a primary somatization disorder without low back pain. Collectively, the investigators found that subjects with ''abnormal psychometric testing'', disability or compensation issues, or a diagnosis of somatization disorder, were much more prone to report pain at one or more levels during discography. In many cases, the disc was found to be morphologically normal. Somewhat unexpectedly, patients in the somatization group, although denying any history of low back pain before discography, complained of back pain after discography. These complaints were noted for up to 1 year following the procedure.

Block et al [58] examined the relationship of elevated scores on the MMPI and the pain response to discography. The investigators found statistically significant elevations in the hysteria (scale 3) and hypochondriasis (scale 1) scales in patients reporting reproduction of their clinical pain on injection of a non-disrupted disc. The depression scale (scale 2) showed similar tendencies. They concluded that such elevations on the MMPI identified a group of ''over sensitive'' patients more likely to report pain in the presence of, and in the absence of, disc abnormalities. They cautioned against any interpretation about proceeding with spine surgery based solely on a positive discogram in this patient population if a primary goal was pain reduction.

As is often the case, when examined critically, the assumptions and methodology of these studies can be questioned. In fact, Wetzel [59] questioned the meaningfulness of a pain response in an asymptomatic patient. If the report of concordant pain is fundamental to interpreting the results of discogram, how would one describe concordance in the absence of any baseline pain?

Notwithstanding the obvious and possible criticisms, these works do highlight the potential role of psychosocial factors in the patient's response and interpreting the outcome of discography. Careful consideration should be given to terms such as ''pain generator'', ''false negative'', ''false positive'', ''concordant-discordant positive''. Psychosocial distress may correlate with general sensitivity to stimulation of peripheral and central structures. It may be that only a small percentage of patients, perhaps l0% to 20%, manifest this sensitivity. However, it is these patients that present for and are often subjected to repeated procedure or surgery.

The innocuousness of a procedure is not necessarily defined by only the degree of tissue damage it causes but by the overall impact on the organism. It is a remarkable though not necessarily unexpected, observation that performing discography in a patient with somatization disorder can provoke a heretofore unreported pain that can persist for at least a year. One can only wonder about the potential effect that knowledge of the consequence of a positive response would have on the outcome. For example, what impact would knowing that spine surgery would likely follow a positive outcome have on the patient's report? Furthermore, what about "pre procedure cognitions"? That is, is there likely to be a difference in the patient approaching the testing wherein the basis for the pain, and therefore the need for the procedure, is rooted in some perceived or real negligence as might occur in an on the job injury?

Implantable therapies

Doleys et al [60] reviewed the literature on psychologic variables related to SCS. In general, studies lacked uniformity in patient selection, trialing mechanism, criteria for proceeding to implant, duration of followup, and outcome measures. Elevation on MMPI scales measuring hypochondriasis (scale 1), hysteria (scale 3), depression (scale 2), were among those most frequently cited as correlating with less favorable outcome. Elevations on hypochondriasis and hysteria relative to depression, forming a commonly referred to "conversion V", were found in some studies to be associated with less favorable outcome. A study by Olson et al [61] indicated that certain elevations on measures of depression and mania (scale 9) correlated with outcomes. Anderson et al [62] appropriately pointed out that not all patients view traditional outcome measures, such as improvement in functioning, adjustments in medicine, improvement in sleep, etc. to be equally important. Indeed, no one outcome measure was universally accepted as the most important. North et al [63], in fact, questioned the prognostic value of psychologic testing.

The following would seem to represent the most conservative and appropriate conclusions. First, there seems to be a set of psychologic states such as suicidal depression, schizophrenia, severe personality disorders, and so forth, that are commonly agreed on to represent poor candidates for SCS therapy despite the absence of any empirical validation of the assumption. Second, although no single, or set of psychologic factors, predict SCS outcome, evaluating the psychologic makeup of the patient is an important aspect of patient selection. Third, the complex relationship between psychosocial variables or states, types of pain, location of pain, and other as yet unidentified situational variables, may preclude the identification of psychosocial factors that will accurately "predict" outcomes. As the application of SCS therapy expands to conditions such as peripheral vascular disease, angina, and headache; to name a few, psychosocial variables heretofore overlooked or found to be non-significant may play a more predominant role.

For reasons that are yet unclear, little attention has been given to exploring the role of psychosocial variables in the outcome of intrathecal therapies using DAS.

One might expect there to be some differences when compared with SCS given the lack of any need to consider the tolerability of concordant stimulation, positional sensitivity, and so forth. Doleys and Brown [64] examine pre and post 4-year DAS therapy MMPIs. Patients were separated according to those that showed the most positive change, as measured by pre-post MMPIs, and those that revealed the most negative change. Somewhat surprising, those patients with the more ''normal'' profiles did not fare as well as those with the mildly abnormal profiles. The investigators concluded that this finding might indicate the importance of the consistency across various types of information, that is, patient complaints, psychometric testing, clinical interview, behavioral observation, and so forth as being more critical than any single source of data. The broad variety of patient selection criteria and pre implant trialing methodologies [65] make it difficult to evaluate existing data in any standardized fashion.

The precise definition of ''psychologic clearance'', the role of patient preparation or education, and the impact of combining implantable technology with other proven behavioral or cognitive behavioral therapies remains unexamined. The latter may be particularly relevant to DAS if a mechanism can be found to enhance pain control while minimizing dose escalation thus potentially extending the overall impact of the therapy while minimizing the likelihood of side effects associated with increased dosages.

There may be some wisdom in shifting from a ''prediction'' to ''description'' model. That is, rather than attempting to identify a set of variables that seems to be correlated with a positive outcome, an approach that would exclude those patients not demonstrating these characteristics, emphasis should be placed on developing mechanisms or therapies that will enhance the efficacy of SCS or DAS. A philosophy of ''successes are created not just discovered'' may be more in keeping with the generally acceptable biopsychosocial approach to the understanding of pain and expand the applicability of technology to a broader variety of patients. This latter approach may help distinguish the ''clinician'' from the ''technician''.

Summary

This discussion is not, nor could it hope to be, an exhaustive examination of all of the various interventional therapies. Instead, it is intended to highlight the potential contribution of psychosocial factors. These factors may vary to some degree or another depending on the specific procedure, but clearly play a role whenever the desired outcome involves a reduction in subjective pain, alteration in the adaptiveness with which the patient responds to the experience of pain, and quality of life. Many notables, including Dr. Michael Cousins, have echoed the importance of incorporating interventional therapies into an interdisciplinary approach. Yet, there seems to be a preponderance of ''block shops''. Even when used for diagnostic or prognostic purposes, the impact of psychosocial variables and the potential relevance of a meaningful behavioral or psychologic evaluation cannot be overstated.

It is easy to understand how the reader might conclude that immersing oneself in the minutiae of all these variables could lead to a feeling of intellectual paralysis when it comes to evaluating the data and arriving at a conclusion or diagnosis. However, ignoring these psychosocial variables and their complex interaction does not constitute a solution. This is particularly true in considering discography where, depending on the criteria applied, the percent of "false positives" can vary from 0% to as much as 40%. The implication for the performing of "unnecessary" spine surgery is obvious. The thoughtful practitioner will be mindful of the role of psychosocial variables in so far as they are thought to be relevant in a particular case.

The overall contribution of psychosocial variables to the application of interventional therapies for the diagnosis and treatment of pain can be overlooked and ignored, but not denied. A certain percentage of patients will respond in a predictable, desirable or positive fashion purely on a statistical basis. Historically, and there seems to be no reason to believe this will change in the immediate future, the degree to which the psychosocial variables are considered is left up to the interventionalist. Some are content to perform a directed procedure or therapy concerned only, and sometimes to a less than sufficient degree, with the technical adequacy of the procedure. Others will appreciate the role of human factors including those of the practitioner and patient alike, and strive not only for a statistically derived outcome but the best possible outcome for a given patient. Psychosocial factors can sometimes take on the character of "nuisance variables". However, it is hard not to wonder how much care each would want to have given to these factors if one were on the other end of the needle.

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