Quantitative Sensory Testing in Gynaecology: Improving Preoperative and Postoperative Pain Diagnosis

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Abstract

Chronic pelvic pain presents difficulties for women suffering its complex presentation. It also presents difficulties for clinicians involved in diagnosing and managing the problem. We review here clinically relevant information related to visceral pathology and its association with peripheral and central aspects of pain hypersensitivity. We address why surgery appears to be successful in some cases but less than successful in others, and what cautionary indicators should be taken into account. A categorization of chronic pelvic pain based on our understanding of pain physiology and mechanisms involved is proposed. The benefits of multidimensional sensory and pain testing in gynaecological care are reviewed.

Résumé

La douleur pelvienne chronique cause des difficultés aux femmes qui sont victimes de sa présentation complexe. Elle cause également des difficultés aux cliniciens qui participent à son diagnostic et à sa prise en charge. Nous analysons ici des renseignements cliniques pertinents en ce qui concerne la pathologie viscérale et son association aux aspects périphériques et centraux de l'hypersensibilité à la douleur. Nous traitons des raisons pour lesquelles la chirurgie semble plus réussie dans certains cas que dans d'autres et nous nous prononçons quant aux indicateurs de prudence qui devraient être pris en considération. Nous proposons une catégorisation de la douleur pelvienne chronique fondée sur notre compréhension de la physiologie de la douleur et des mécanismes mis en cause. Les avantages du dépistage multidimensionnel sensoriel et de la douleur dans le cadre des soins gynécologiques sont analysés.

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INTRODUCTION

A significant proportion (12% to 20%) of the adult population suffers from chronic pain. Many individuals develop or continue to have chronic pain after a surgical procedure. The phenomenon can be associated with a variety of surgical procedures, most likely involving nerve damage and hence resulting in neuropathic-like pain and associated symptoms. The incidence of postoperative pain may vary from 10% to 50% depending on the surgical procedure.[1] Many factors have been implicated in the generation of persistent postoperative pain, but a critical factor is the intensity of pain in the preoperative state, or the indication for surgery in the first place. In this review the preoperative state in relation to gynaecological surgery will be explored in light of emerging information regarding mechanisms of pain sensitization. Several reviews on this issue have recently been published.[2–4]

PAIN FOLLOWING SURGICAL PROCEDURES

The area of postoperative pain is extensive and encompasses the fields of epidemiology, experimental pain testing, innovations in surgical and anaesthetic technique, and peripheral and central pain physiology. With regard to the types of surgery, postoperative pain has been reviewed extensively, and reports indicate significant pain commonly occurs following breast surgery, thoracotomy, hernia surgery, back surgery, arthroplasty, and hysterectomy.[4] The predisposing factors associated with such pain have been related to age, gender (being more common in women), tissue injury, surgical procedure (open vs. minimally invasive), psychological status, and hormonal status. Preoperative pain intensity and pain sensitization have been identified as important predictors of chronic postoperative pain.[4]

The focus of this review is pain associated with pelvic surgery. Pain due to common non-malignant conditions such as dysmenorrhea, endometriosis, and adenomyosis is a common indication for pelvic surgery. In these instances the pain evoked initially is visceral in nature and related to the sympathetic segments of T10–L1 and the parasympathetic segments S2–4. Studies of visceral disease have shown in animal and human studies that pain can evoke changes in these spinal segments that innervate the respective organs.[5] Extended duration and repetition of a painful peripheral visceral stimulus leads to increased painful or nociceptive impulses directed to the spinal cord.[6–9] Clinically this leads to increased pain and larger areas of referred pain. This peripheral stimulus has been shown to be related to the release of various substances (e.g., glutamate, prostaglandins, bradykinin, potassium) that activate the nociceptors and generate an afferent barrage.[10–14] Intense and repetitive pain or prolonged afferent nociceptive input may induce a reversible increase in the excitability of networks of central sensory neurons at the dorsal horn of the spinal cord, via activation of the *N*-methyl-D-aspartate receptor.[14] This development is called central sensitization.[14]

Clinically, this development in the pelvis is commonly marked by the appearance of continuous or persistent pain, cutaneous allodynia, and reduced pain thresholds in the dermatomes and myotomes related to the respective pelvic organs (viscero-somatic convergence). Among pelvic diseases, endometriosis is considered one of the more common conditions that demonstrate these clinical findings.[15] Interactions and co-sensitizations between two visceral structures are also observed and termed viscero-visceral pain (e.g., facilitated response to colonic distension in patients with dysmenorrhea). Others include painful bladder syndrome, dysmenorrhea, vulvodynia, and irritable bowel syndrome. Among women with chronic pelvic pain, the changes associated with central sensitization are highly correlated with the presence of current or pre-existing visceral disease.[16] This important interaction between urogenital organs and somatic structures has been shown systematically in animals.[7,17]

Abdominal and vaginal hysterectomies are commonly undertaken for both painful and non-painful conditions. Pain had been reported to be present in 32% of a large sample of women who had undergone a hysterectomy in Sweden.[18] One of the common tests for central sensitization is mechano-sensory testing, which includes tests of cutaneous allodynia (pain in response to a non-painful stimulus), thermal hyperalgesia, reduced pain thresholds in muscles (palpation or pressure pain thresholds), and myofascial trigger points. In a prospective study of preoperative mechano-sensitivity pain testing, women who had painful indications for the surgery were more likely to have an increase in early (acute) pain after surgery, but the relationship was not as strong at four months postoperatively.[19] It has also been shown that trophic skin changes can occur over the referred pain areas following cholecycstectomy.[20]

CLINICAL SIGNS AND SYMPTOMS OF SENSITIZATION IN THE PELVIS

Chronic pelvic pain occurs as a consequence of common visceral diseases such as endometriosis, dysmenorrhea, painful bladder syndrome, and irritable bowel syndrome. It can also occur as a consequence of non-visceral conditions, or of somatic conditions such as sacroiliac dysfunction, osteitis pubis, motor vehicle accidents, or lower genital tract surgery such as episiotomy and surgery for urinary incontinence. The clinical picture is complicated by the complex interaction between the nociception for these different structures.

Central sensitization has been studied in relation to pelvic disease states.[21] Further, a video presentation of testing for the presence of cutaneous allodynia in the presence of visceral disease has been peer reviewed and published.[22] In a cross-sectional study of 81 women with chronic pelvic pain due to visceral and non-visceral conditions, the presence of cutaneous allodynia and abdominal myofascial trigger points within the areas of allodynia were highly predictive of current or previous visceral disease. The odds ratio of a woman having had or currently having visceral pelvic disease in the presence of cutaneous allodynia was 10.41 (95% CI 2.72 to 39.79).[16] Another study evaluated women with severe cyclic pain, women with continuous pain, and normal control subjects to establish the validity and reliability of tests for cutaneous allodynia. When two examiners undertook independent tests, the degree of agreement was highly significant (98%). Further, the rate of allodynia detection was 0% in normal control subjects, 8% in women with severe cyclic pain and 73% in women with continuous pain. The clinical test for cutaneous allodynia was valid and reproducible between examiners.[23]

However, it should be noted that while these are promising tests they are rudimentary for central sensitization, because this is only one pain modality and one mechanism. The nature of the conclusive diagnostic criteria has been outlined in a review of the topic by Woolf,[2] in which he noted that in the presence of dynamic tactile allodynia, secondary punctuate/pressure hyperalgesia, temporal summation, and sensory after-effects, central sensitization