From the Book:

Chronic Pain: Reflex Sympathetic Dystrophy Prevention and Management

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Referred Pain

Referred pain usually accompanies RSD. The acute non-RSD (somesthetic) type of pain usually is not accompanied by referred pain.

Referred pain is quite common in visceral pathology. Whereas burning, crushing, and cutting of skin cause severe pain, the same stimuli do not cause any sensation in the gut.[432] The noxious stimuli that cause pain and referred pain in viscera distention, [431] anoxia, [436] and acidity.[434]

Lewis[433] demonstrated that stimulation of "myofacial" structures, i.e., muscle, periosteum, and ligaments, cause pain quite similar to visceral pain. Lewis[433] stimulated referred pain in 94% of experimental injection of 6% normal saline into deep skeletal structures of 28 normal volunteers. The pattern of referred pain was quite consistent, although not confined to the injected dermatomal segment.

Cohen, [429] Theobald[437] and White and Sweet[438] demonstrated that superficial stimulation of peripheral lesions (e.g., a fracture elbow or a stump neuroma) can instigate recurrence of angina pectoris. It is obvious that cutaneous stimulation causes efferent visceral changes such as vasoconstriction. This referred pain, typical of the function of the sympathetic system, is quite common in RSD (e.g., shoulder-hand syndrome). It may explain the higher incidence of heart attack in RSD patients. Obviously stress-induced pain (SIP) is another feature of RSD that results in distressful strain on the cardiovascular system.

Sterling phenomenon[435] has been experienced by the majority of normal population. This referred pain is a sharp pain - always ipsilateral and in a distant dermatome - after scraping the skull with a fingernail or pulling of an unwanted hair (e.g., nostril hair). The same phenomenon is noted pathologically on dilatation of abdominal aneurysm, which can cause pain in the testicle prior to sudden death. Squeezing the testicle can cause excruciating pain in the nipple.

Most commonly, referred pain occurs in cervical spondylosis (see Etiology of RSD) and cervical sprain with complex symptoms outline in the section of cervical spondylosis in Table 13.

The two factors that are important in the development of referred pain are (1) wide dynamic range(WDR) distribution of c fibers at the point of input in the spinal cord and (2) Sherrington's phenomenon[573] (Figure 16).

As the physiologist Sherrington demonstrated,[573] referred pain is principally caused by the input of multiple sensory nerves from different dermatomes and different parts of the body (skin as well as viscera) into substantia gelatinosa in the dorsal horn of the spinal cord (Figures 10,11,13,and 16).

The large number of sensory nerve endings entering the substantia gelatinosa stimulate fewer number of internuncial nerve cells. This results in an overlap of sensory input - be it proprioceptive or nociceptive - on the same secondary neurons (Figure 16).

The overlap results in the stimulation of one nerve cell by multiple nerves. For example, a nociceptive input from an inflamed appendix may overlap the proprioceptive input of proximal portions of the ileum. As a result, the appendicitis pain may be felt in the epigastric region.

The dorsal branches of the posterior cervical nerve roots overlap the distal branches of the same nerve roots at the area of entrance to the substantia nigra. As a result, a patient who has nerve root irritation may not feel the pain in the hand or arm, but in the posterior aspect of the shoulder (Figure 16). This results in mistaken diagnoses such as bursitis of the shoulder or rotator cuff injury.

The same principle of referred pain can result in an increase or decrease in temperature in the trigger points in the remote areas of sensory nerve endings. For example, damage over the dorsum of the hand to the radial nerve many cause increased temperature in the distribution of sensory nerve fibers of the radial nerve in the dorsum of the hand, and may also cause a trigger point of hot or cold nature in the posterior aspect of the shoulder.

Usually the trigger point is cold (Figure 2a and 3). It is commonly seen in the posterior aspect of the shoulder, trapezius muscle, scalene muscle, sacroiliac joint region, or frontal region of the head in the case of upper cervical nerve irritation (Figure 5) where they are cold rather than hot spots. The cold trigger point is formed by longstanding myofascial reaction to the accumulation of substance P and other irritants in the area of referred pain.

Message or insertion of a needle in the cold spot results in release of the entrapped irritants. The superimposed skin becomes reddish, and after several minutes the irritants are absorbed. This may be the reason for therapeutic effects of massage.