Chapter 4

Principles of pain generation and distribution

Pain sensitive structures, nociceptors and referral patterns.
The physiological generation of pain is dependant on its origins, derived either from somatic or visceral structures. The tissues involved in the generation of the pain include connective, epithelial and neural tissues. There are many different types of nociceptors involved in the production of pain, including thermal, mechanical, chemical, polymodal and sleeping/silent receptors.

An example of visceral referred pain could be cardiac pain referring to the medial border of the left hand, produced by ischemia of cardiac vessels, causing stimulation of chemical nociceptors. The referral pattern is a result of the association or proximity of afferent neurones into the dorsal horn of T1 which receives stimuli both from the heart and the skin of the medial left arm.

Visceral pain is mostly generated by stretch receptors which are found widely within connective tissues and within the many tubular structures of the thoracic and abdominal cavity. They are stimulated by stretching, lack of blood flow, smooth muscle spasm and inflammation.

The pain generated by the viscera also has characteristic qualities, such as:

- **Poorly localised**
- **Diffuse**
- **Dull deep ache**
- **Burning**

In contrast somatic pain tends to be:

- **Well localised**
- **Unilateral**
- **Quick or slow onset**
- **Various, with qualities depending on the connective tissue involved (muscle, ligaments, tendons, bone)**

Radicular (nerve root) referral pain will conform to the distribution of that particular nerve root and it does not cross the mid line of the body. It can be described as:

- **Sharp**
- **Stabbing**
- **Electric-like**

In formulating your differential diagnosis getting the patient to describe in their own words how they perceive their pain is vital. Ask them a simple question; "can you describe your pain?" or "what does the pain feel like to you?". If they cannot volunteer any descriptions then offer them as many choices as possible and not just "is your pain sharp or dull?" Better to say "is your pain sharp, dull, deep, shallow, boring, burning, stabbing, tearing, twinge-like…"

When evaluating a patient's symptomatic area attempt to ascertain if the painful region conforms to the distribution of:

- **Nerve root**
- **Peripheral nerve**
- **The type of sensory modality conveyed by a specific spinal tract**
- **Whether the pain or symptoms relate to areas of the central nervous system**
- **Confined to a particular structure, e.g.**
    - **Muscle**
    - **Bone**
    - **Joint**
    - **Ligament, tendon, bursa**
    - **Vessel (artery, vein lymphatic)**

If the patient presents symptoms that do not conform to any of the above qualities or distribution patterns then consider the possibility of a disseminated multi-system disorder. Examples are autoimmune connective tissue disease, endocrine conditions and neoplasias.

References, Bibliography and Recommended reading

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Beck R, et al (2003), Tutorials in Differential Diagnosis, 4th edn., Churchill Livingstone. ISBN: 978-04430615-7-8

DVD-VIDEO recordings
Syrimis A (2007), Clinical Examinations DVDs, Bloomsbury Educational Ltd,
ISBNs:

- Respiratory system examination: 978-0-9551291-0-0
- General system examination: 978-0-9551291-1-7
- Cardiovascular system examination: 978-0-9551291-2-4
- Abdominal system examination: 978-0-9551291-3-1
- Peripheral nervous system examination: 978-0-9551291-4-8
- Cranial nerves examination: 978-0-9551291-5-5
- Musculoskeletal examination: 978-0-9551291-6-2
- Case History Taking: 978-0-9551291-7-9
- Clinical Examinations: Complete DVD series: 978-0-9551291-9-3

http://www.clinicalexams.co.uk/student-resources-section.htm
(For additional lecture notes, Q&As and images, Username & Password provided in class)

Boon N A, Colledge N R, Walker, B & Hunter J A A (2006), Davidson's Principles and Practice of Medicine. 20th Edition, Churchill Livingston ISBN: 978-0-4430703-5-8

Bickley, L. S.; Szilagyi, P. G.; 2003; ***Bates' Guide to Physical Examination and History Taking****;* (8th Ed); Lippincott; New York.

Epstein, O.; et al.; 1997; *Clinical Examination;* (2nd Ed.); Mosby; London. (similar to Bates but presents the information in a different but equally good way. Some very good photographs and is user friendly).

Marsh J; 1999 *History and Examination;* Mosby London. (a great 'crash course' book with sample questions. Very user friendly. I recommend it).

Forbes, C. D.; Jackson, W. F.; 1998; *Color Atlas and Test of Clinical Medicine;* (2nd Ed.); Mosby; London. Excellent reference book for photographs of various pathologies.

Haslett, C.; et al.; 1999; *Davidson's Principles and Practice of Medicine;* (18th Ed.); Churchill Livingstone; Edinburgh. (Use to put your clinical findings into context of general medicine).

Bradley J, Rubenstein D, Wayne D, The Clinical Manual, Blackwell Scientific publications. ISBN 0-632-03312-6. This is another very good pocket size book but you may have to order it. I find this book very useful because it also had a summary of the main pathologies and their signs and symptoms.