Pain

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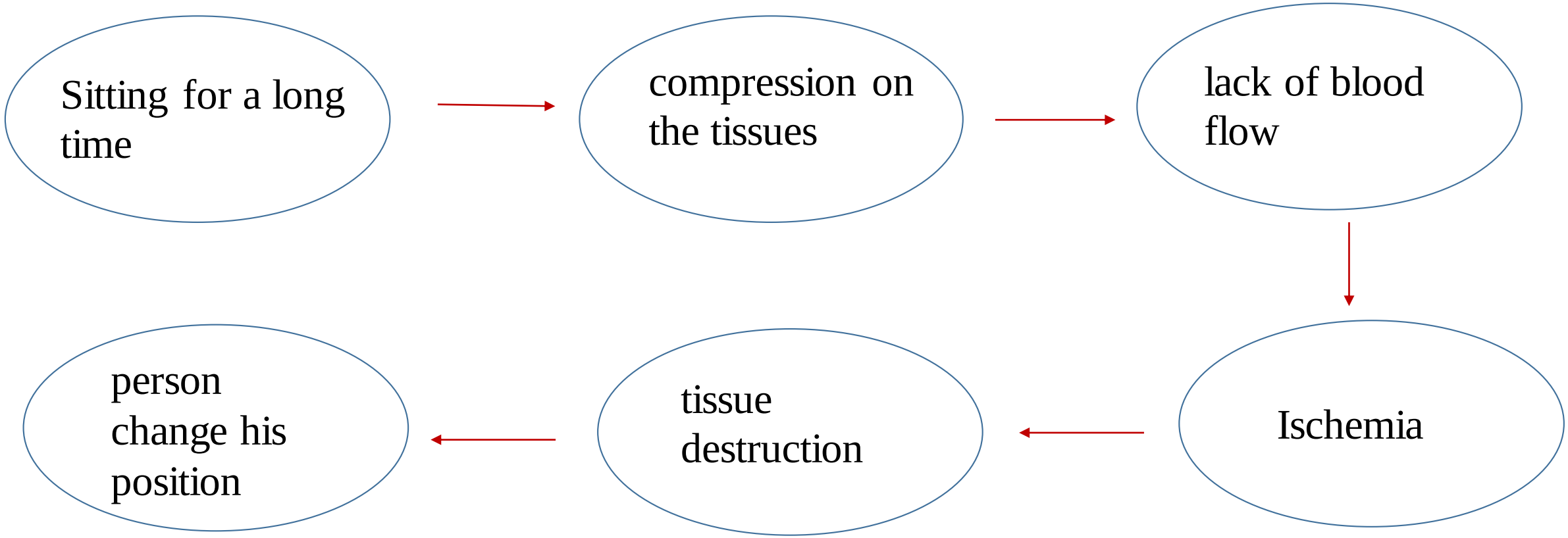
Objectives

1. What is pain?
2. Types of painful stimuli.
3. Pain receptors
4. Nerve fibers that transmit pain signals.
5. Classification of pain
6. Pain analgesia system

Pain is a protective mechanism which occurs when tissues being damaged.

In response to:

1. Painful stimuli
2. Even by simple activation , like sitting , in sitting in the same position for a long time.


Sitting for a long time
compression on the tissues
lack of blood flow
Ischemia
tissue destruction
person change his position

Painful stimuli

3 Types of Stimuli

. Mechanical

. Thermal

. Chemical

How theses Stimuli Produce pain??

pain receptors

Are all free nerve endings
They are widespread in the superficial layers of the skin as well as in certain internal tissues

Three Types of pain receptors

1. Mechanical nociceptors

Strong pressure (e.g from a sharp object)

2. Thermal nociceptors

Skin temperatures above 45c

Severe cold

3. Chemically sensitive nociceptors

Various agents like bradykinin , histamine, high acidity and environmental irritant.

Classification of pain

Fast pain :

Bright, sharp localized pain.

Plays an important rule in making the person react immediately to remove himself or herself from the stimulus.

Slow pain :

Painful stimuli followed by a dull intense, diffuse, and unpleasant feeling (slow (chronic) pain)

Tends to become greater overtime and makes the person keep trying to relieve the cause of the pain .

Fast pain

- Mechanical, thermal nociceptors
- Type Aδ fibers
- Neurotransmitter: Glutamate.

Slow pain

- Mechanical, thermal, chemical
- Type C fibers
- Neurotransmitter is : substance p

Nerve fiber types in mammalian nerve.[a]

Fiber Type	Function	Fiber Diameter (μm)	Conduction Velocity (m/s)
A			
α	Proprioception; somatic motor	12–20	70–120
β	Touch, pressure	5–12	30–70
γ	Motor to muscle spindles	3–6	15–30
δ	Pain, cold, touch	2–5	12–30
B	Preganglionic autonomic	<3	3–15
C			
Dorsal root	Pain, temperature, some mechano-reception	0.4–1.2	0.5–2
Sympathetic	Postganglionic sympathetic	0.3–1.3	0.7–2.3

[a]A and B fibers are myelinated; C fibers are unmyelinated.

Pain also classified in to

- Superficial pain
- Visceral pain
- Deep pain

Deep pain

- Come from deep tissues like fascia, muscles and bones
- There is little rapid , bright pain , because of relative deficiency of A delta nerve fibers in deep structures.
- Deep and visceral pain are poorly localized , nauseating, and frequently associated with sweating and changes in blood pressure

Visceral pain

- Come from the viscera of the body
- Poorly localized unpleasant and associated with nausea and autonomic symptoms
- Visceral pain often radiates or is referred to other areas.
- Highly localized types of damage to the viscera seldom cause severe pain.(surgeon can cut the gut entirely)
- Conversely, any stimulus that causes diffuse stimulation of pain nerve endings throughout a viscous causes severe pain e.g ischemia.

Nociceptors

a. Can be activated by strong pressure, severe cold, severe heat and chemicals

b. Are specialized structures located in the skin and joints only.

c. Are innervated by Type B nerve fibers

d. All of the above

Referred pain

A person feels pain in a part of the body that is fairly remote from the tissue.

- Best known examples:

1. Referred of cardiac pain to the inner aspect of the left arm
2. Pain in the tip of shoulder caused by irritation of the central portion of the diaphragm

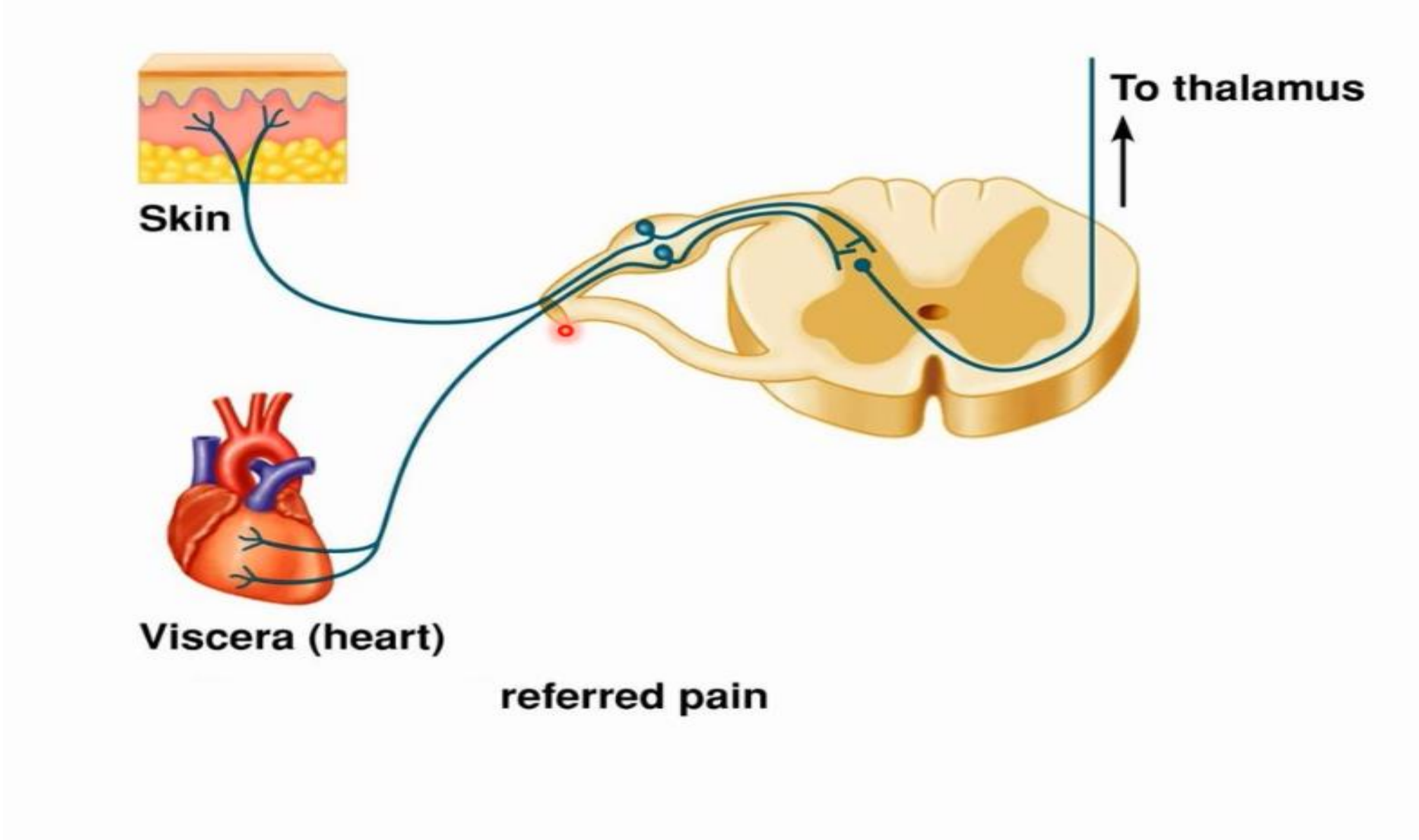
Mechanism of referred pain

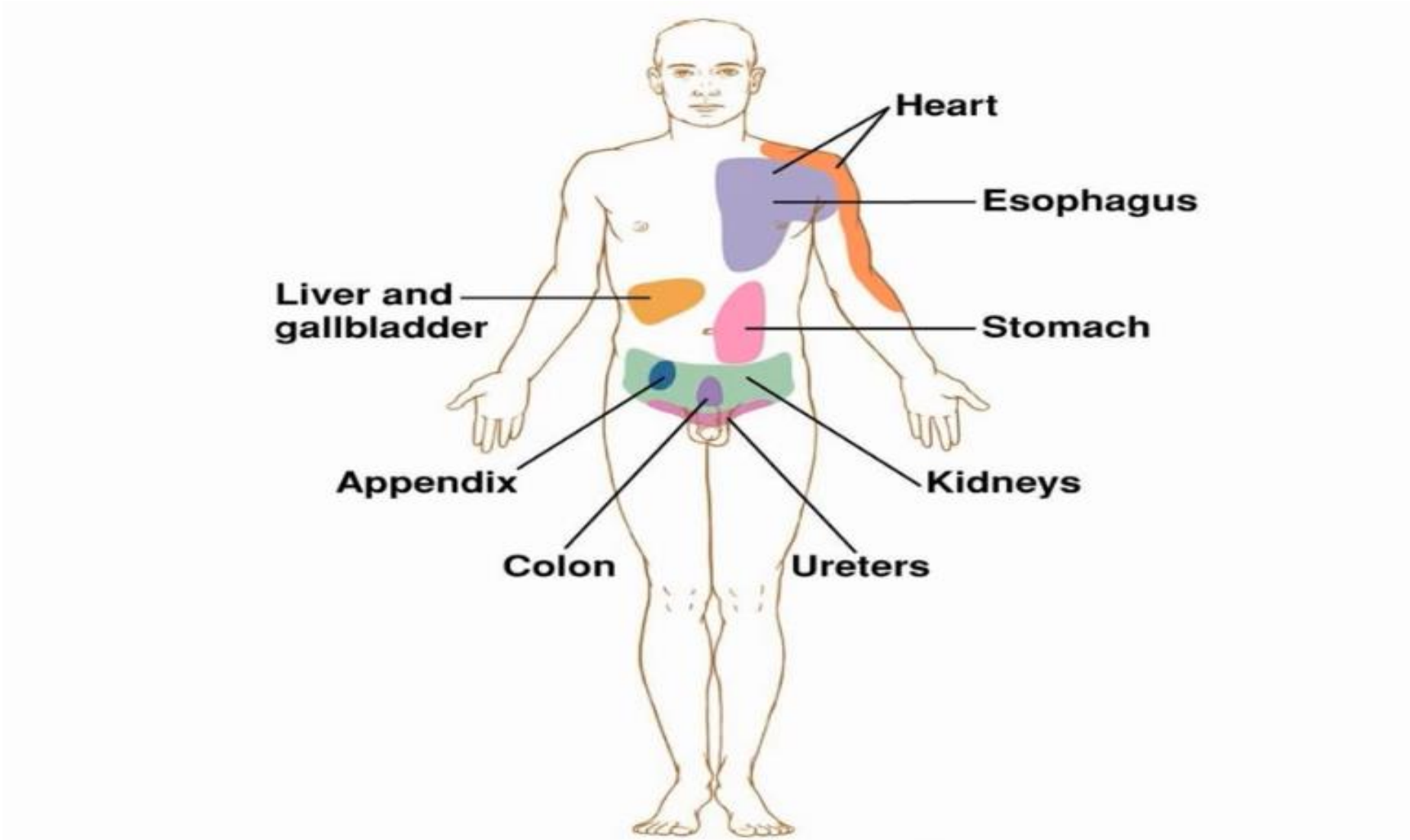
The Dermatomal rule:

Pin is referred to structures that developed from the same embryonic segment or dermatome.

Convergence_ projection theory:

Convergence of somatic and visceral pain fibers on the same second order neurons.

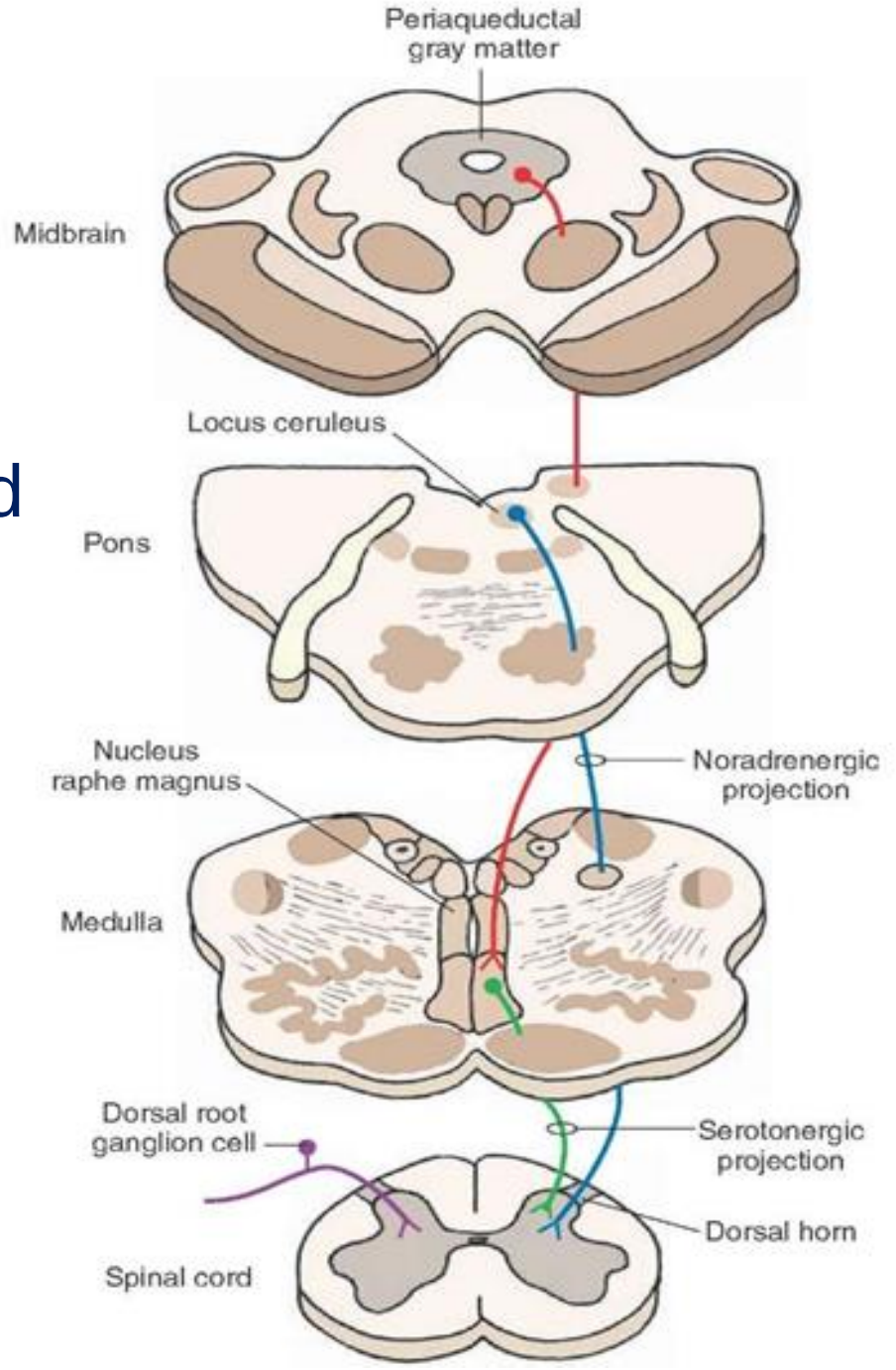

To thalamus
Skin
Viscera (heart)
referred pain



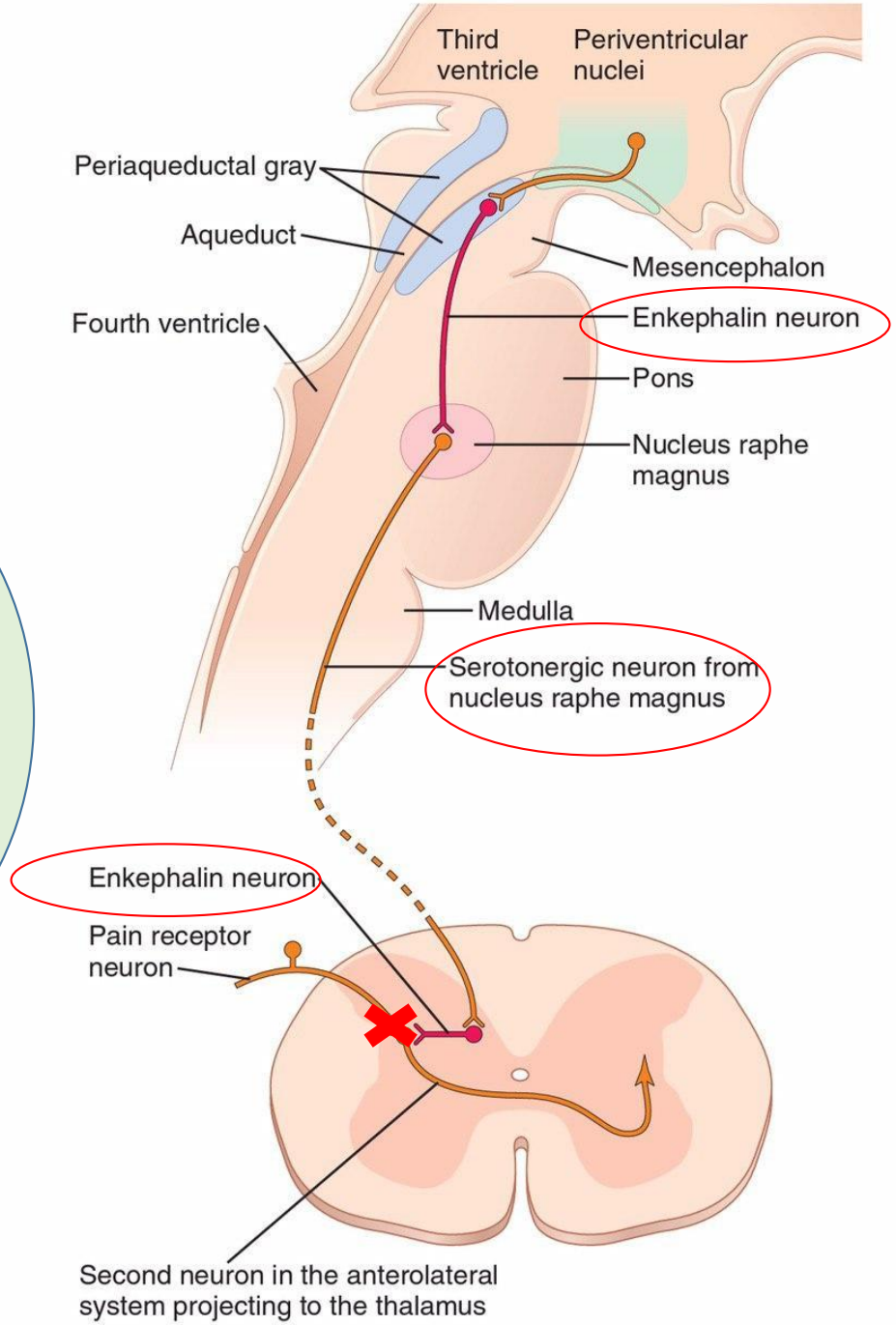
Clinical map of referred pain

Analgesia System

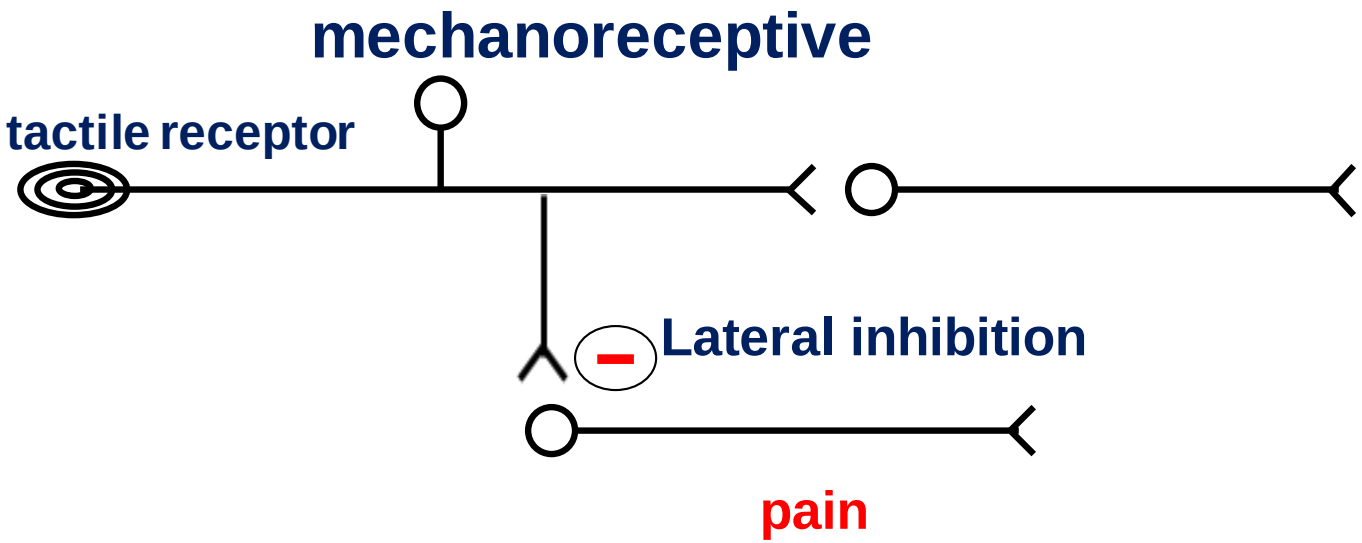
1. Periaqueductal gray and periventricular areas
2. Raphe Magnus nucleus and nucleus reticularis paragigantocellularis
3. Pain inhibitory complex



Enkephalin cause inhibition of incoming type C and type A δ pain fibers



Inhibition of Pain Transmission by Simultaneous Tactile stimulation



Some Clinical Abnormalities

Hyperalgesia

an exaggerated response to a noxious stimulus

Allodynia

a sensation of pain in response to a stimulus, that dose not normally elicit pain.

Thank You