

Sri Aurobindo College of Dentistry

Indore, Madhya Pradesh
INDIA



MODULE PLAN

- TOPIC :PAIN
- SUBJECT:ORAL SURGERY
- TARGET GROUP: UNDERGRADUATE DENTISTRY
- MODE: POWERPOINT – WEBINAR
- PLATFORM: INSTITUTIONAL LMS
- PRESENTER: DR.NIKIT AGRAWAL

- Definition

Unpleasant emotional experience

initiated by noxious stimuli

Transmitted by specialized neural network

To the central nervous system

Where it is interpreted as such

Dual nature of pain

Pain perception- physioanatomical process

Impulse is generated-transmit-CNS/ similar.

Pain reaction- psychophysiological process

Hyporeactive/hyperreactive/variable pain threshold

Emotional state, fatigue, age, racial and nationality characteristics, sex, fear and apprehension.

Theories of pain

- Specificity theory
 - Descartes 1644-straight channel
 - Muller -19th century-sensory nerves
 - Von frey-free nerve endings/pain center in the brain.
- Pattern theory
 - Goldscheider 1894 –stimulus intensity/central summation ex; touch+pressure+heat=pain

- Gate control theory-Melzack & Wall 1965
 - Injury signals- peripheral nerves
 - Other types of afferent impulses- temperature, pressure
 - Descending control- ability of nervous system located within the brain to either facilitate or inhibit neural transmission.

Peripheral nerves

Pain impulse \longrightarrow central nervous system

A delta fibres-----3 to 20 micra in diameter

Large/myelinated-----100m/sec

Conduct fast or first pain(sharp, localised)

B fibres -----3 micra in diameter/3-14 m/s-
confined to preganglionic autonomic fibres-
no afferent function

- C fibres-----0.05-1 micron in diameter
unmyelinated----0.5-2m/sec
conduct slow or second pain

A nerve fibre— separate afferent pathway to
CNS

Each pathway-separate unit unto itself

Gathering of thousands of units constitutes an
afferent nerve trunk

They may be stimulated individually or in
varying numbers

SUBSTANTIA GELATINOSA

facilitation /inhibition of impulse occur

dorsal horn of spinal cord/nucleus of V Nr

six laminae → laminae II & III (S.G.)

terminate in this area


large aff.fbrs also

UNIQUE SYSTEM

MODULATING EFFECTS ON INPUT

The theory proposes

The large diameter fiber input
Modulate synaptic transmission
of small diameter fibres
(within the dorsal horn)



Lrg fbrs----- transmit at greater rate
-----pressure ,vibration,temperature
Small fbrs----noxious or painful stimulus.

Activation of large fibre system

inhibits

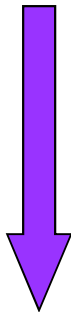


closes gate to CNS

Progression of impulse carried by small fbrs.

Substantia Gelatinosa

Determines
Before



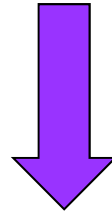
afferent patterns
they influence

T Cell

(II nd order neurons that transmit impulse to higher nervous systems)

T cell activation activation exceeds critical level

activation



of

ACTION SYSTEM

(complex interconnection of higher nervous system that subserves)

- **Attention**
- **Memory**
- **Spatiotemporal analysis**
- **Several motor mechanisms**

Also intimately involved with subcortical areas(including limbic system,thalamus,hypothalamus,reticular activating system.)

Sensory discriminative system

Activation of of T-cell → impulse →

Higher nr.system → identification of pain
duration/location.

Secondary input → classic pain pathway →

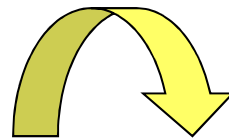
Alternate pathway → discriminative
somatosensory functions (does not respond
primarily to noxious stimuli)

Motivational – affective system

Reticular formation of brain system; regulates vasomotor & autonomic system

This complex system → pathway for aversive/motivational component of pain

When pain does not evoke --- fear/anxiety/suffering



Ability to tolerate pain is enhanced

Activation of motor mechanisms

motor mechanism  spatiotemporal
analysis

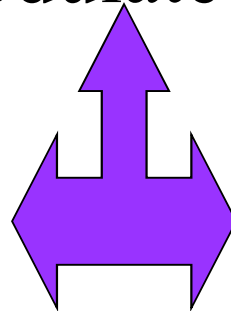
interrelated

integrated and modulated within CNS

impulse

triggers

Startle response



flexion reflex

Postural readjustment

vocalisation

Orientation

recalling similar expr.

Prediction of consequence

Neurophysiology

- Fibre class-A ; α, β , gamma , ∞ .
-B
-C; sC ,d gammaC.
- Nerve cell membrane- 70 to 80 \AA ⁰ ; **bilipid layer of phospholipids;polar(h-philic)/nonpolar(h-phobic) ends.**
proteins-organisational element –transport proteins; receptor sites;

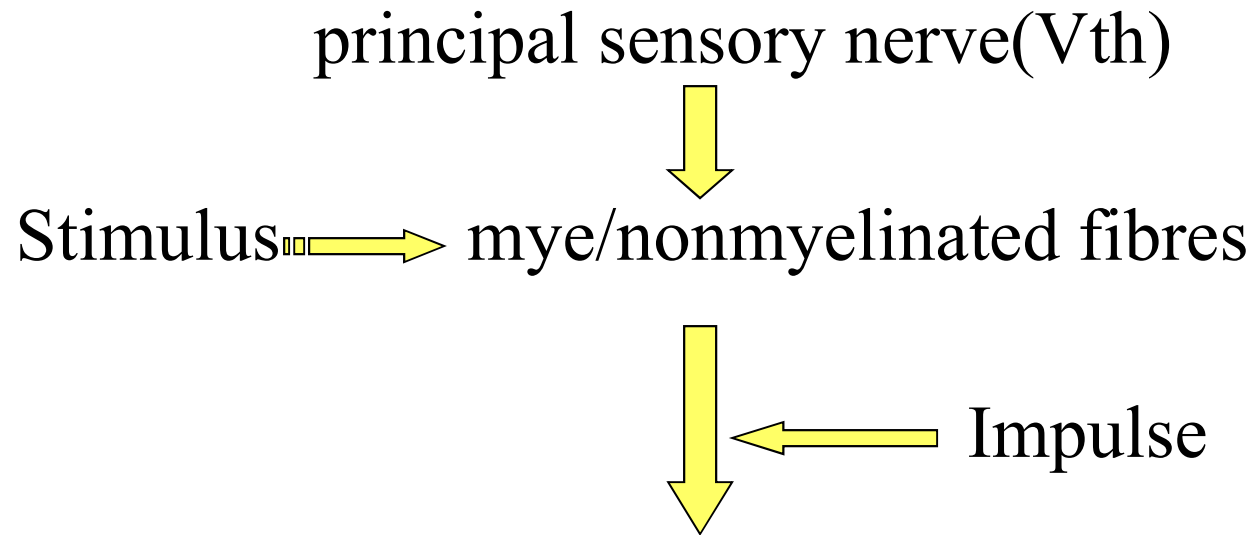
Electrophysiology

- Resting state (-70mV)
- Membrane excitation
 - Depolarisation;-slow (-50 TO-60 mV)
;-rapid (+40 mV)
- Repolarisation

- **Na⁺, Cl, K⁺,**

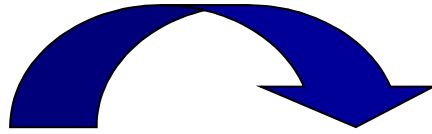
Selective and variable permeability

Pain pathway

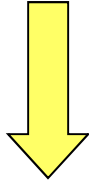


AFFERENT FIBRES of

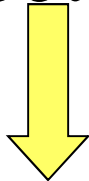
- Ophthalmic
- Maxillary
- mandibular



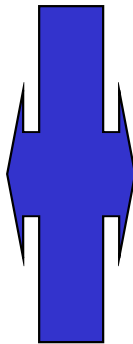
SEMILUNAR GANGLION



sensory root of the nerve



PONS



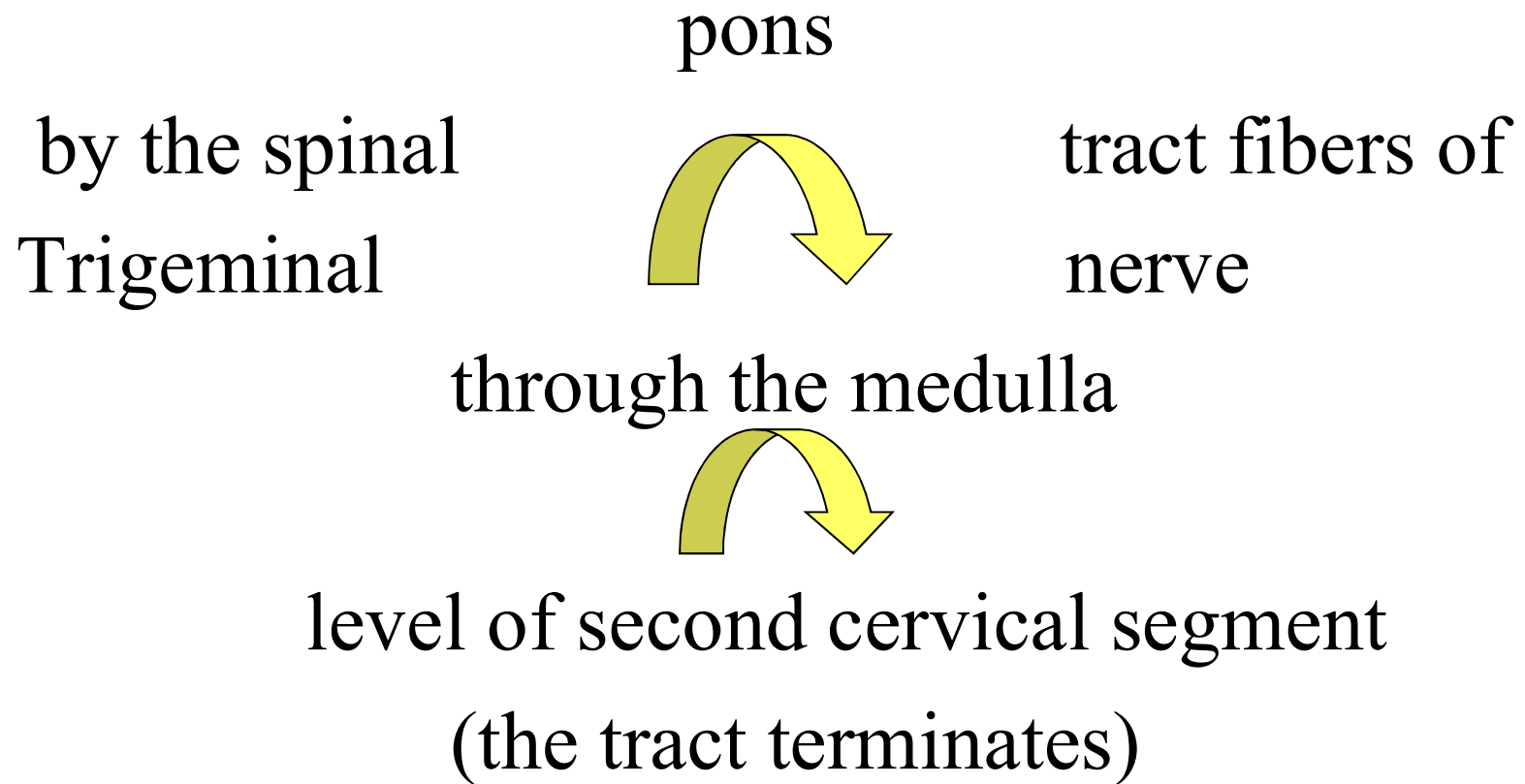
Main sensory nucleus

Bifurcates

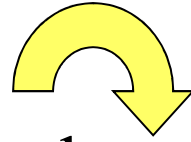
✓ **Ascending fibres**

✓ **Descending fibres**

- Ascending fibers –general tactile sensibility
- Descending fibers –pain and temperature



axons of the secondary neurons



Emerge from the spinal nucleus

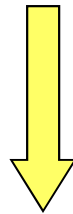
Cross the
Ascend



midline and

join with fibers of mesencephalic
nucleus

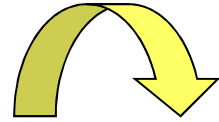
to form



Trigeminal leminiscus, or spinothalamic tract of

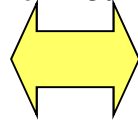
Fifth nerve

these tracts continue upwards



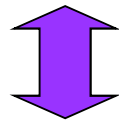
terminate in the postventral nucleus

of the thalamus

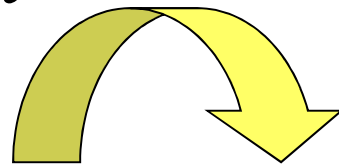


impulse on

reaching



secondary connecting neurons



to posteroconvoluted convolutions of cerebral cortex

- Not entirely a anatomic continuity
- Physiologic process involved as well
 - Chemical neurotransmitters

Methods of pain control

- Removing the cause –pain perception
- Blocking pathway of painful impulses
 - Local anaesthesia
 - Pain perception

- Raising pain threshold
 - Drugs with analgesic properties
 - Centrally acting
 - Stimulus present
 - Neuroanatomical pathways intact
 - Pain perception--?
 - Pain reaction -----decreased

 - limitation

- Preventing pain reaction by cortical depression
 - General anaesthesia

Using psychosomatic methods

- pain reaction/pain perception
- faith and confidence
- honesty/sincerity
- well informed
- patients frame of mind.