Historic overview of Pain Medicine and research into human pain

Dr.med. Konrad Maurer

Pain Research Unit
Institute of Anesthesiology
University Hospital Zürich
Switzerland
Ancient cultures

- Egypt
- Greek
- Roman
- Indian

→ Center of sensation was believed to be in the heart
Mechanistic Views of Pain

Galen
130 - 201 A.D.

Avicenna
980 – 1037 A.D.
Mechanistic Views of Pain

Intellectual basis for pain as an actual physical sensation

Concepts
Mechanistic Views of Pain

René Descartes
1596 - 1650

William Harvey
1578 - 1657
Mechanistic Views of Pain

Concepts
Specifity Theory

Charles Bell
1774 - 1842

Pain has a real physical basis,
Specifity Theory

François Magendie
1783 - 1855
Specifity Theory

(T)he same cause, such as electricity, can simultaneously affect all sensory organs, since they are all sensitive to it; and yet, every sensory nerve reacts to it differently; one nerve perceives it as light, another hears its sound, another one smells it; another tastes the electricity, and another one feels it as pain and shock. One nerve perceives a luminous picture through mechanical irritation, another one hears it as buzzing, another one senses it as pain. . . He who feels compelled to consider the consequences of these facts cannot but realize that the specific sensibility of nerves for certain impressions is not enough, since all

Johannes Müller
1801–1858
Specifity Theory

Georg Meissner 1829 - 1905
Filippo Pacini 1812 - 1883
Friedrich Merckel 1845 - 1919

Specific receptors
Specificity Theory

- Innocuous
- Noxious

- Intensity
- Skin
- DRG nociceptors
- Dorsal horn nociceptive neurons

- Noxious stimulus
Pattern Theory

Wilhelm Erb
1840 - 1921

Alfred Goldscheider
1858 - 1935

Concepts
Pattern Theory
Intensity Theory (Summation)

Concepts

Concept of polymodal nociceptor and WDR neurons still valid today

Charles Sherrington
1857 - 1952
Intensity Theory (Summation)

- Innocuous stimulus
- Noxious stimulus

Skin

Low threshold DRG neurons

WDR dorsal horn projection neurons

Impulses

Intensity
Gate Control Theory

Ronald Melzack 1929
Pat Wall 1925-2001
Neural Plasticity and Central Sensitization

Clifford Woolf 1956*

The capacity of neurons to change their structure, function or chemical profile via activation, modulation and modification contributing to pain hypersensitivity.
Pharmacological Milestones
Pharmacological Milestones

Thomas Sydenham
1624 - 1689
Pharmacological Milestones

„...into the arm of morpheus..‘

Friedrich Sertürner
1783 - 1841
Pharmacological Milestones

"Gentlemen, this is not a humbug"

William T.G. Morton
1819 - 1868
Pharmacological Milestones

Charles von Gerhardt
1816 - 1856
Pharmacological Milestones

Albert Niemann
1834 - 1861

cocaine
Pharmacological Milestones

Carl Koller
1857 - 1944
Anatomically Specific Treatments of Pain
Anatomically Specific Treatments of Pain

- Spinal anesthesia
- Surgical sympatheticectomy
- Nerve blocks/ablation procedures
- Spinal cord stimulation

August Bier
1861 - 1949
Anatomically Specific Treatments of Pain

• Spinal anesthesia
• Surgical sympathectomy
• Nerve blocks/ablation procedures
• Spinal cord stimulation

"Medical scientists are nice people, but you should not let them treat you!"

August Bier
1861 - 1949
Anatomically Specific Treatments of Pain

- Spinal anesthesia
- Surgical sympathectomy
- Nerve blocks/ablation procedures
- Spinal cord stimulation

René Leriche
1879 - 1955
Anatomically Specific Treatments of Pain

- Spinal anesthesia
- Surgical sympathectomy
- Nerve blocks/ablation procedures
- Spinal cord stimulation

Gaston Labat
1876 - 1934
Anatomically Specific Treatments of Pain

- Spinal anesthesia
- Surgical sympathectomy
- Nerve blocks/ablation procedures
- Spinal cord stimulation
René Descartes
1596 - 1650

Pain Medicine in the early 21st Century
René Descartes
1596 - 1650

Pain Medicine in the early 21st Century
Pain Medicine in the early 21st Century
Pain Medicine in the early 21st Century
Pain is generated in the periphery
CNS: Inhibiting and facilitating mechanisms

Pain is generated in the periphery
CNS: Inhibiting and facilitating mechanisms

Central sensitization: 2 Hyperalgesia, Allodynia

Pain is generated in the periphery

Peripheral sensitization: 1 Hyperalgesia
Mechanism-based pain management

• Many diagnostic tools available:
  – X-ray, CT, MRI, fMRI, PET
  – Immunohistology
  – Diagnostic nerve blocks
  – Neurophysiology:
    • EMG, EEG, SSEP, QTRAC, QST
  – Pharmacological tests
  – Genetic tests
Mechanism-based pain management

Many diagnostic tools available:

- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- Neurophysiology:
  - EMG, EEG, SSEP, QTRAC, Q
- Pharmacological tests
- Genetic tests
• Many diagnostic tools available:
  – X-ray, CT, MRI, fMRI, PET
  – Immunohistology
  – Diagnostic nerve blocks
  – Neurophysiology:
    • EMG, EEG, SSEP, QTRAC
  – Pharmacological tests
  – Genetic tests
Mechanism-based pain management

- Many diagnostic tools available:
  - X-ray, CT, MRI, fMRI, PET
  - Immunohistology
  - Diagnostic nerve blocks
  - Neurophysiology:
    - EMG, EEG, SSEP, QTRAC, QST
  - Pharmacological tests
  - Genetic tests
Many diagnostic tools available:

- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- Neurophysiology:
  - EMG, EEG, SSEP, QTRAC, QST
- Pharmacological tests
- Genetic tests
Mechanism-based pain management

- Many diagnostic tools available:
  - X-ray, CT, MRI, fMRI, PET
  - Immunohistology
  - Diagnostic nerve blocks
  - Neurophysiology:
    - EMG, EEG, SSEP, QTRAC, QST
  - Pharmacological tests
  - Genetic tests
Pain Medicine in the early 21st Century
Mechanism-based pain management in a multidisciplinary pain unit
John J. Bonica
1917 - 1994