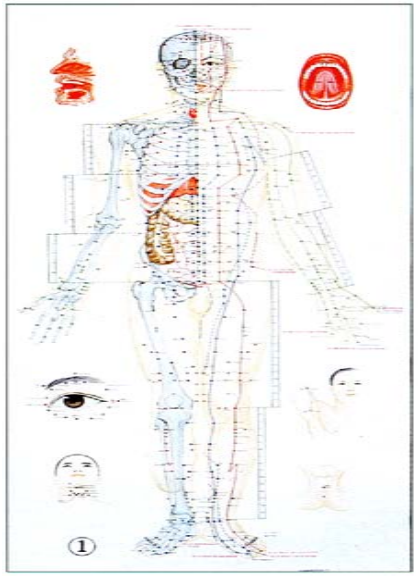
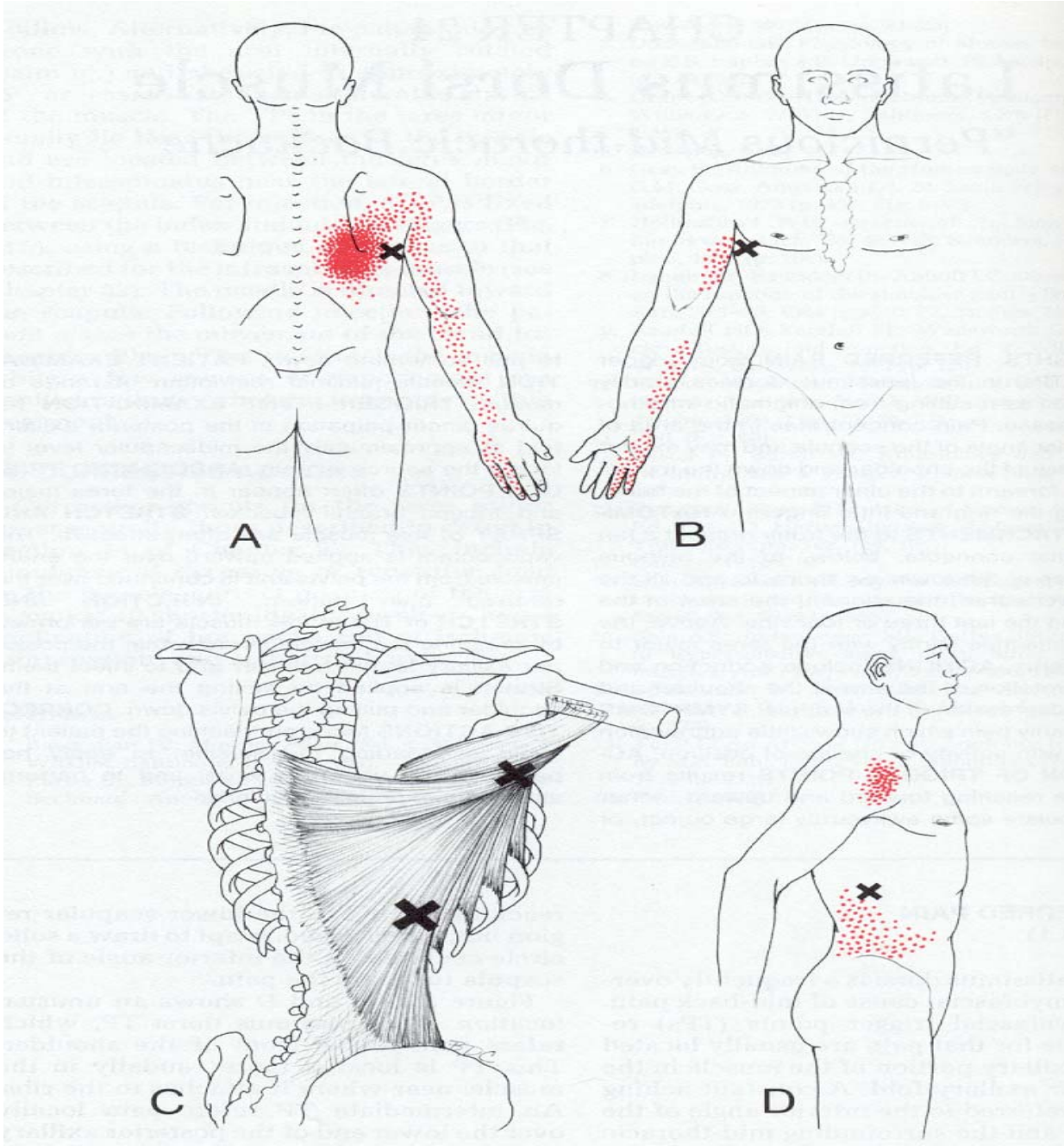

①

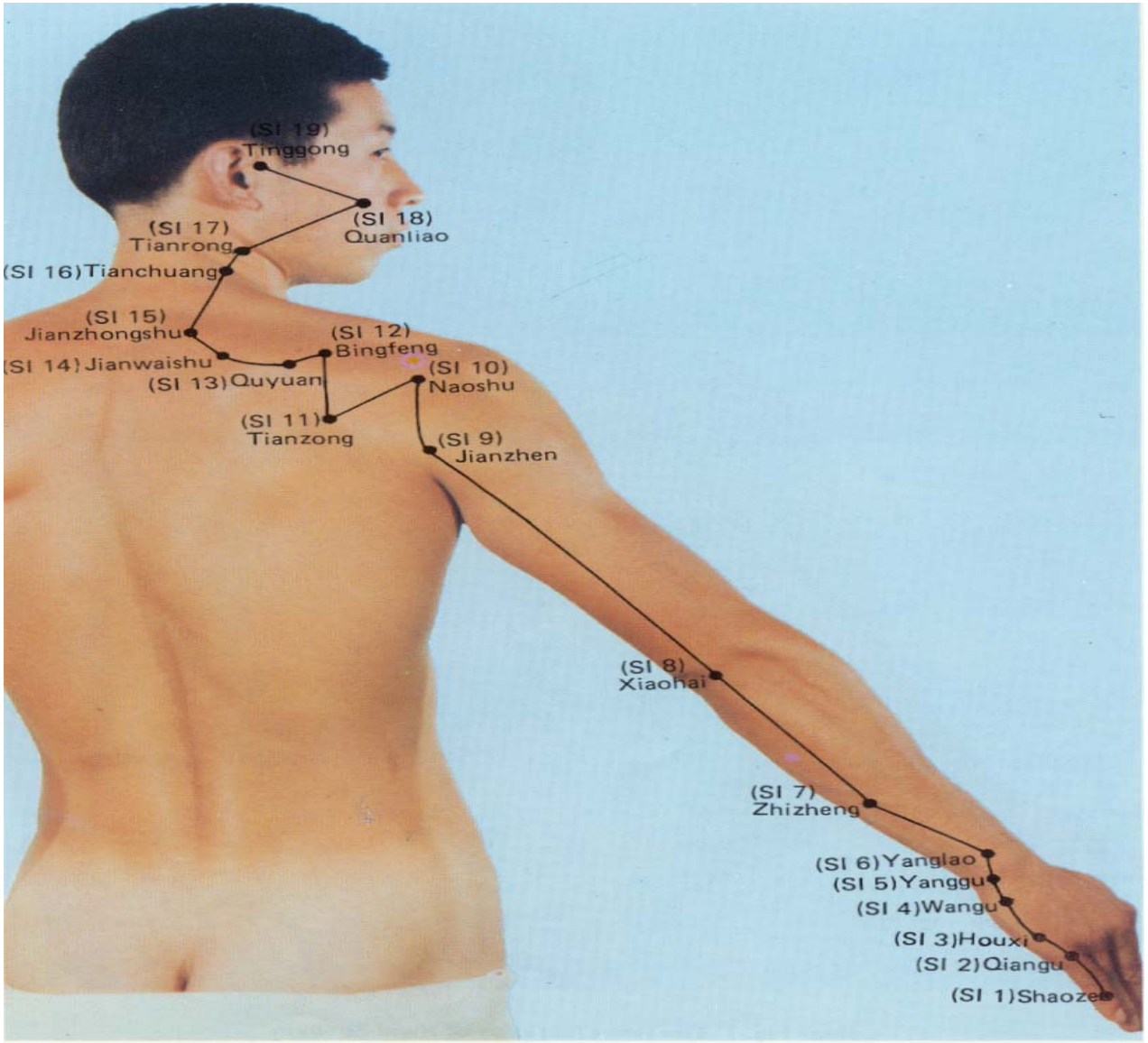
Historical Descriptions

- **Samuel Solly, Esq., F.R.S. (1863) description of *Scriveners' Palsy***
  - *The pain was a burning, uncomfortable feeling between the knuckles... extending occasionally to the shoulder after writing about an hour...At times, the symptoms were very much more violent, and I frequently...had to put down my pen, feeling it quite impossible to continue work in that state*....[Even after an extended rest] ...*the burning sensation returned with great force, and extended all over the back part of my shoulder, and when I wrote I could feel it creeping down my side and under my shoulder-bone....accompanied by the old symptoms of burning and bursting..... it troubled me in the night, frequently keeping me awake for hours....*

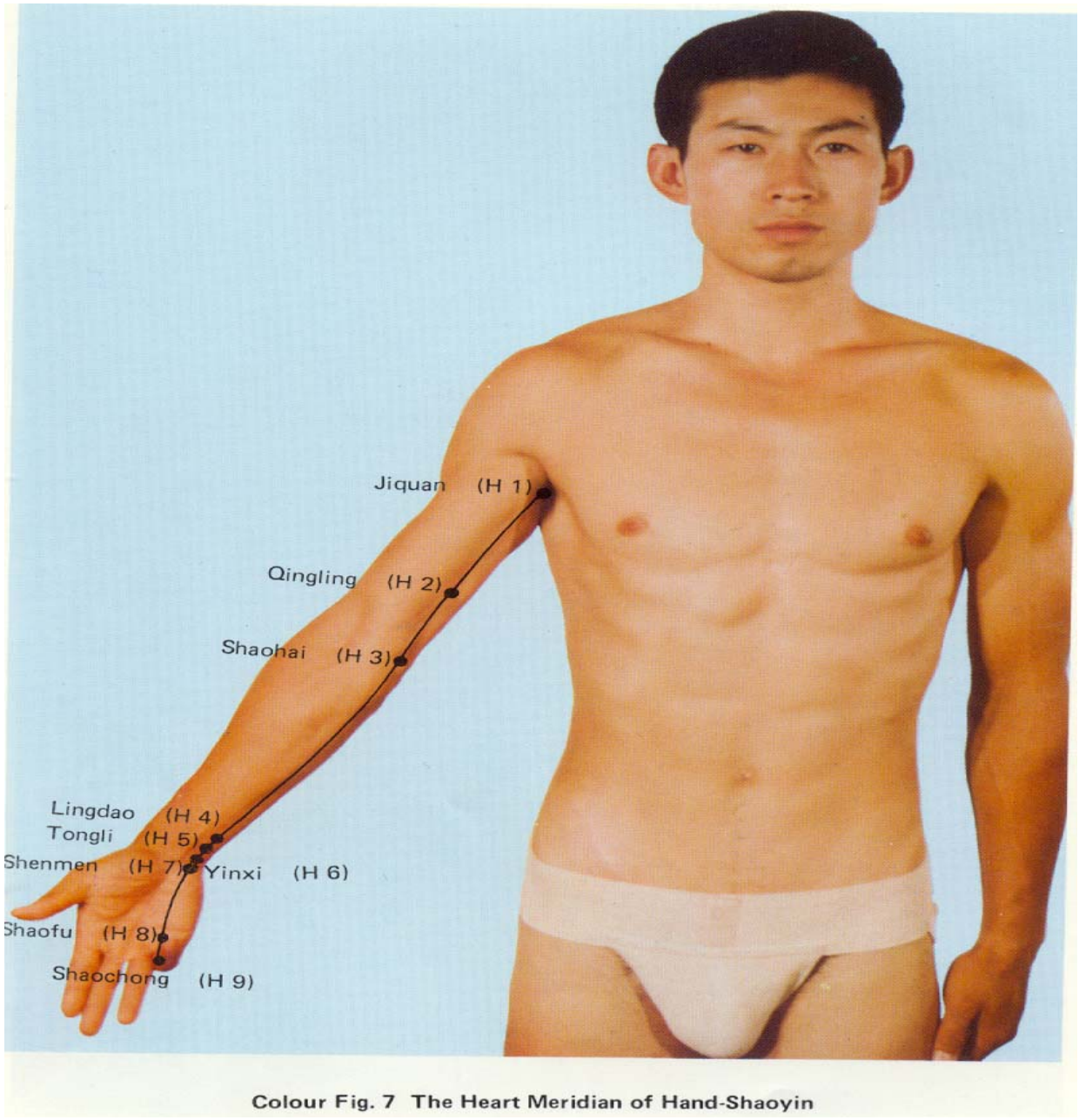
INTRODUCTION

- Historical Context
- Ronald Melzack in 1977 recognized strong correlation between TrP’s and AP
- 71% correspondence based on spatial location and referral pattern

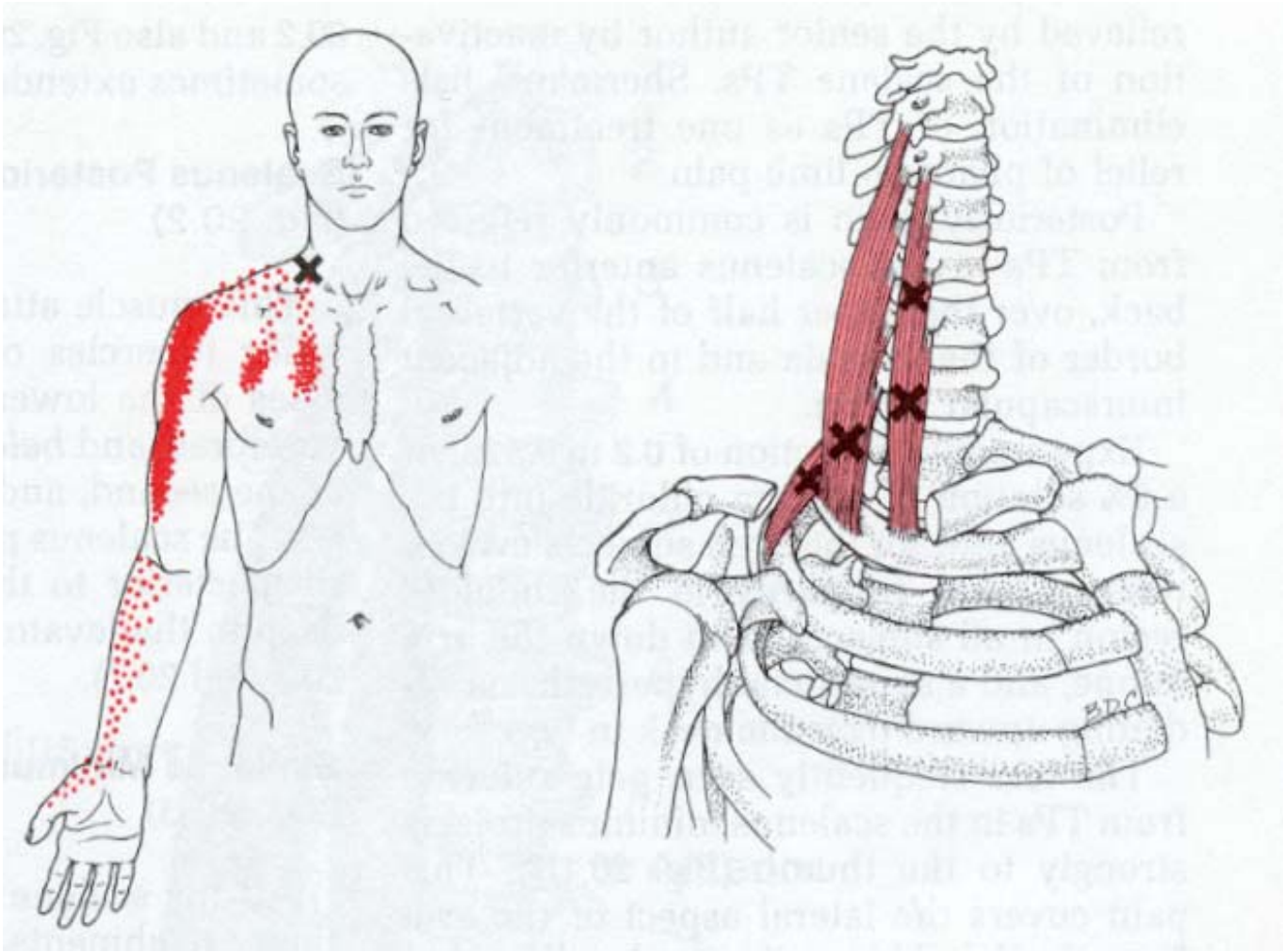

A
B
C
D

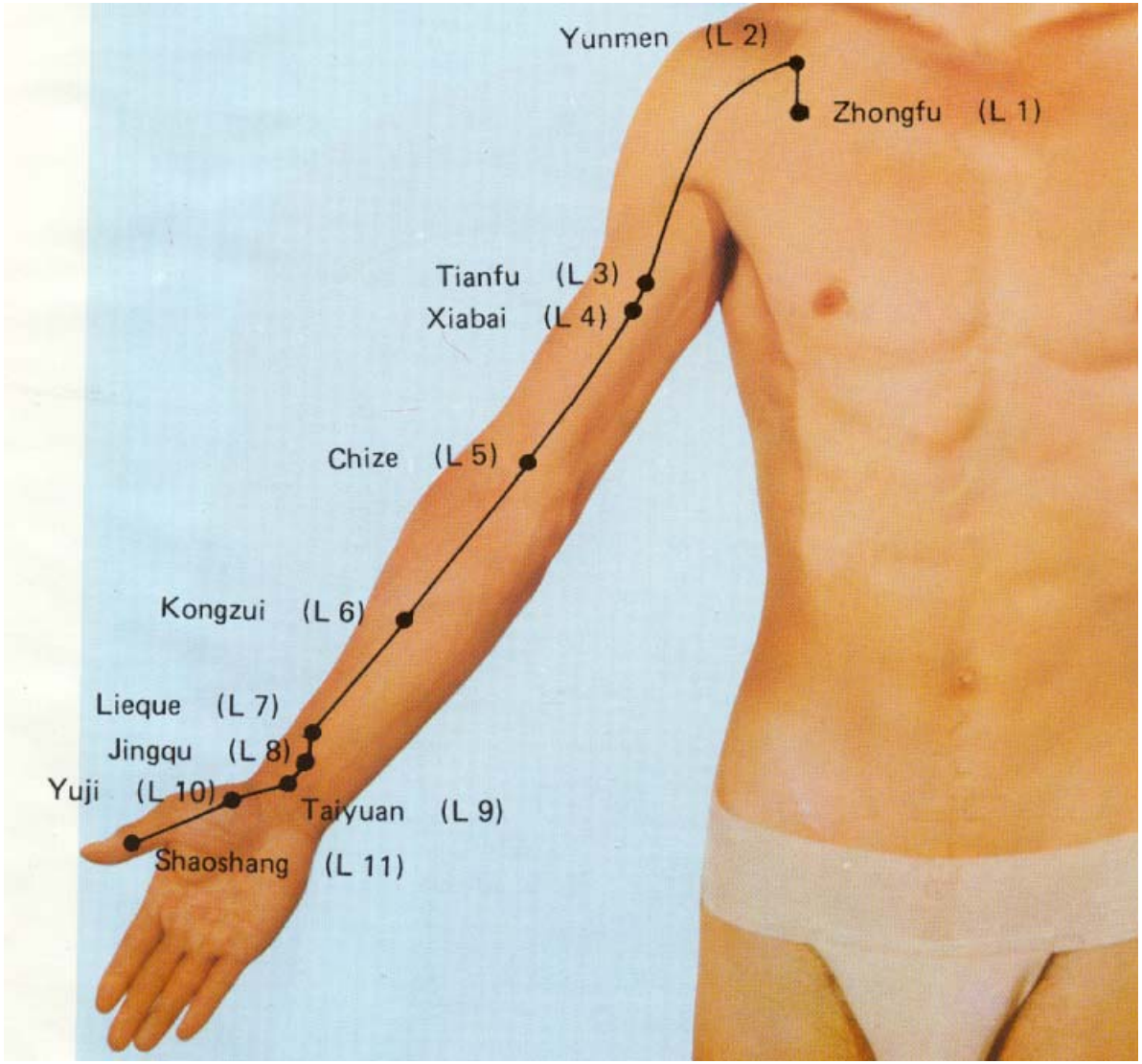


Colour Fig. 8 The Small Intestine Meridian of Hand-Taiyang



Colour Fig. 7 The Heart Meridian of Hand-Shaoyin



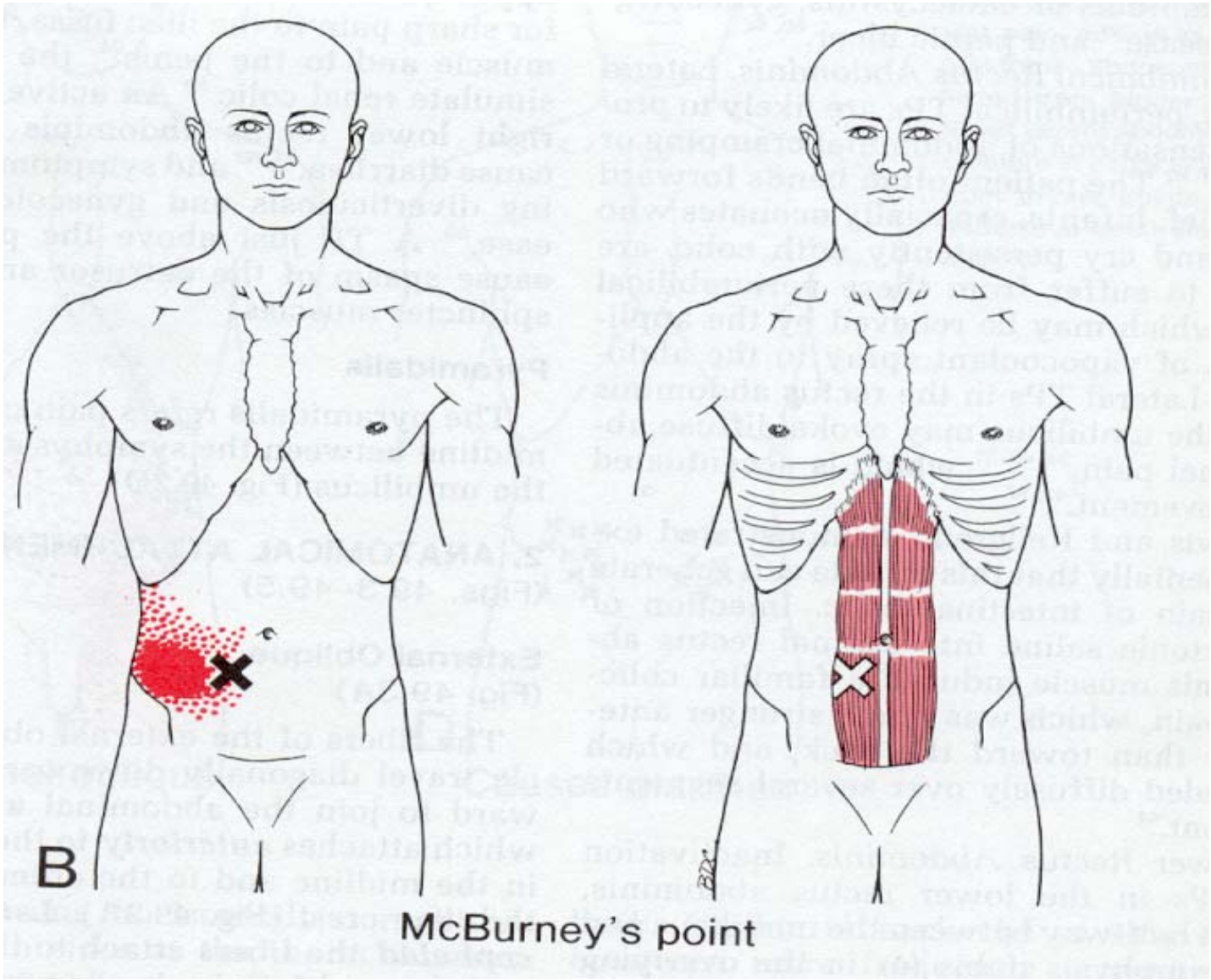

Yunmen (L 2)
Zhongfu (L 1)
Tianfu (L 3)
Xiabai (L 4)
Chize (L 5)
Kongzui (L 6)
Lieque (L 7)
Jingqu (L 8)
Yuji (L 10)
Taiyuan (L 9)
Shaoshang (L 11)

FURTHER CORRESPONDENCES

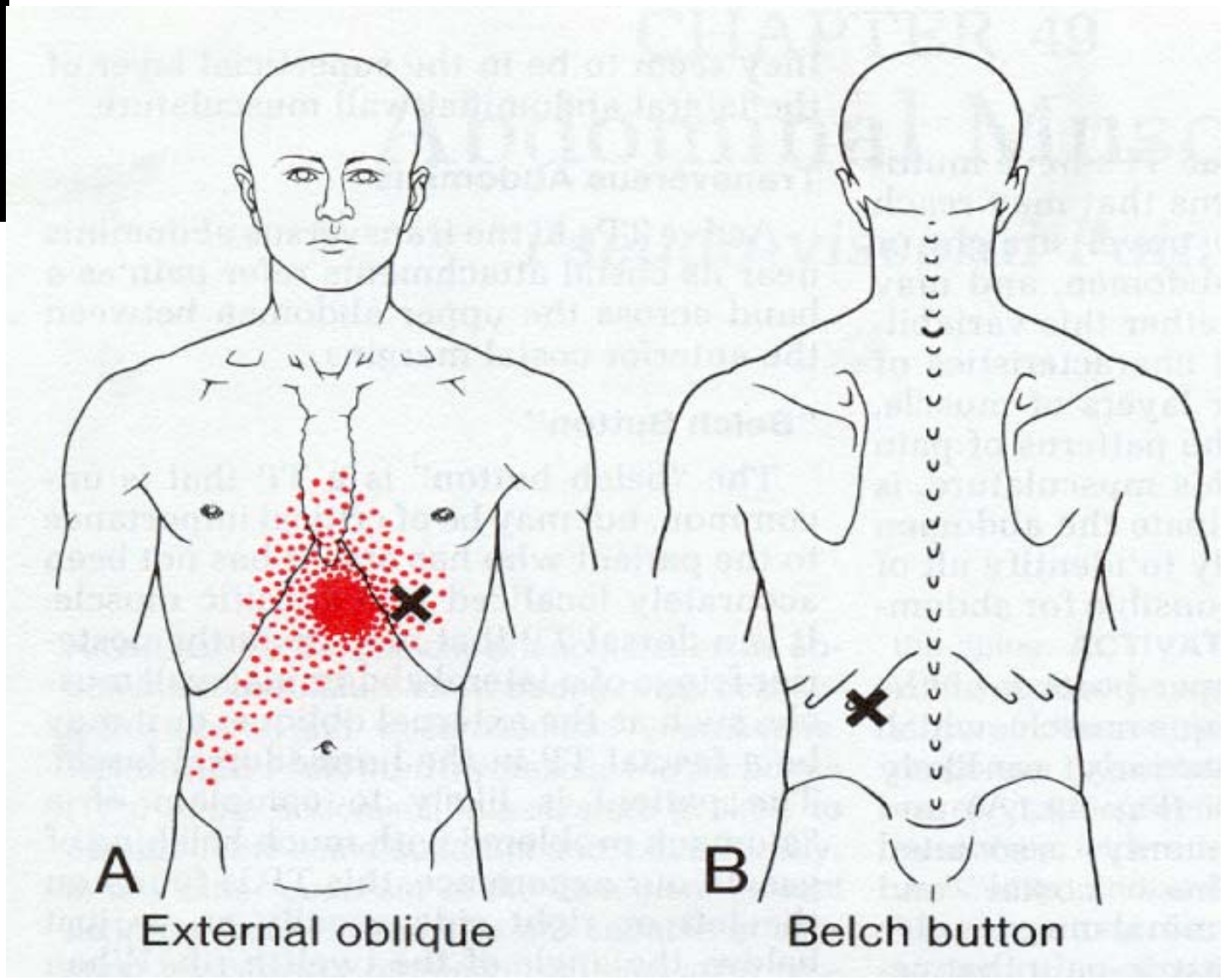
- Stimulation of TP and AP provide sustained pain relief for both somatic and visceral conditions.
  - Pelvic Pain
  - Gastrointestinal Issues
  - Other

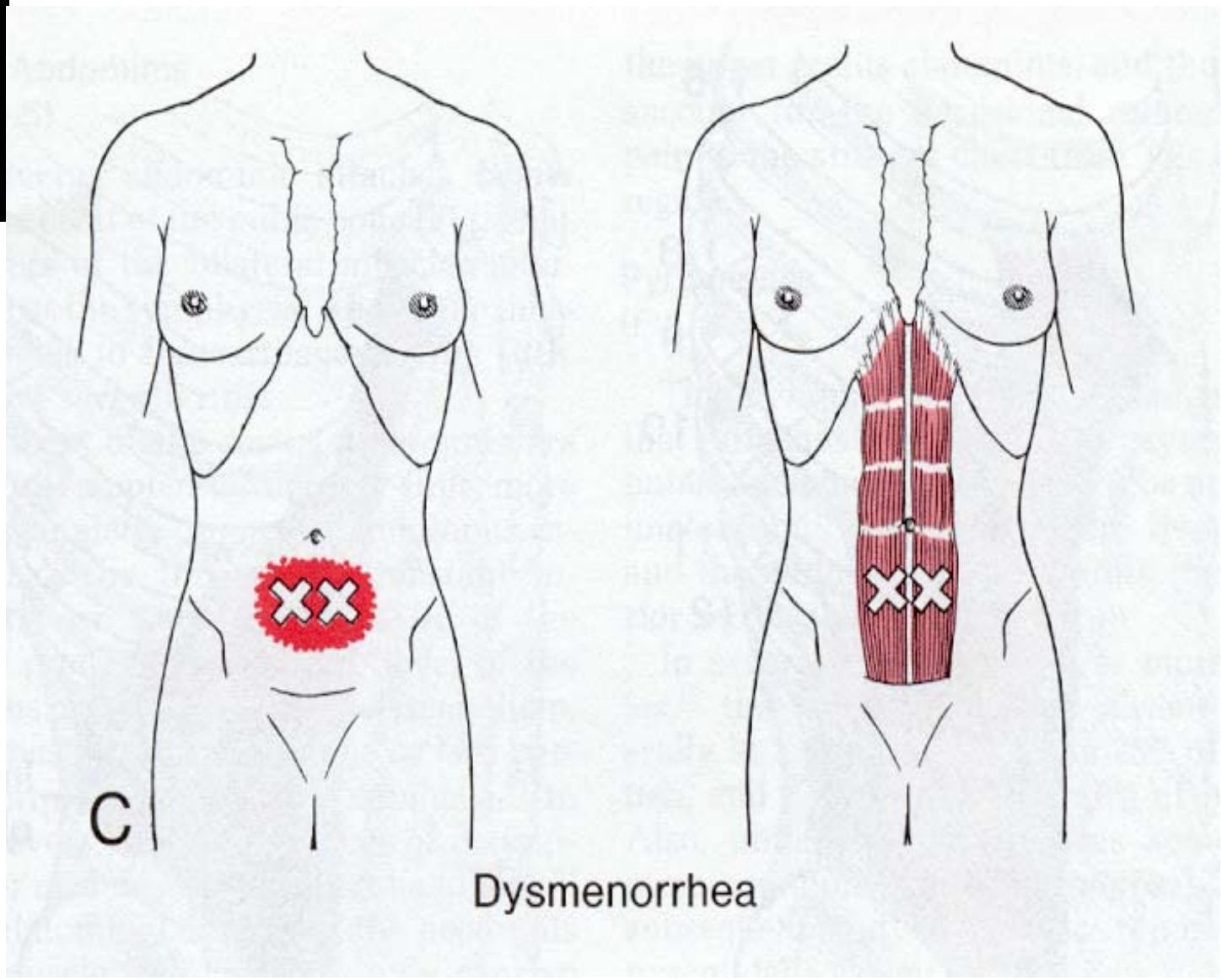
MYO-VISCERAL RELATIONSHIPS

- McBurney's point and appendicitis
- Angina and shoulder and arm TrP's identified
- Pelvic Organ Dysfunction and TrP's in Lower Abdomen
- Liver/Gallbladder disease and TP in right trapezius (GB21)



McBurney's point


A
External oblique
B
Belch button


C
Dysmenorrhea

HYPERSTIMULATION ANALGESIA

- Acupuncture and Trigger Point stimulation techniques can be painful
- Analgesia based on overstimulation of the peripheral nociceptive system, inducing a self-regulating pain modulating effect
- Fine et. al. (Pain 1988) found pre-injection with naloxone could partially reverse benefit of TPI
  - Suggests activation of Diffuse Noxious Inhibitory Control System vs. Acupuncture-like activation of endogenous opioid system

DEEP ORGANIZATION

- Observed relationships between trigger points and acupuncture points and the common finding of relationships between anatomically distant points and their effect on local painful sites on the surface of the body represents important clues about the deep organization of the central nervous system.

GOALS OF DISCUSSION

- *Observed phenomenon seen with needle insertion into a muscle or tendon.*
- *Detail Acupuncture theory on the effect of needle stimulation on the neuromuscular system*
- *Outline basic neuromuscular physiology involved with needle insertion.*
- *Relate TrP's literature to amplify our understanding of the acupuncture neurophysiology.*
- *Outline an integrated hypothesis of action.*
- *Future research*

LOCAL POINTS IN ACUPUNCTURE

- Careful palpation of the surface of the body reveals distinct differences in the quality and density of the underlying tissue. Many of these areas or points will be tender. These are the local points.
- A Shi points in TCM
- Kori in Japanese system

ACTIVE LOCAL POINTS

- More sensitive to light palpation (allodynia?)
- Correlation with changes in skin impedance (Low Impedance, High Conductivity)
- Palpation produces hyperemia of skin (Sympathetic response?, Mast cells?)
- Local trophedema
- Affect on distant areas of pain
- Radiation with prolonged palpation in non-dermatomal or myotomal distribution

INTERNAL EXTERNAL RELATIONSHIPS

- *Active* points relate to internal organ dysfunction
  - Active points on lung meridian with bronchitis or asthma
  - Active points along gallbladder meridian with liver and gallbladder dysfunction.

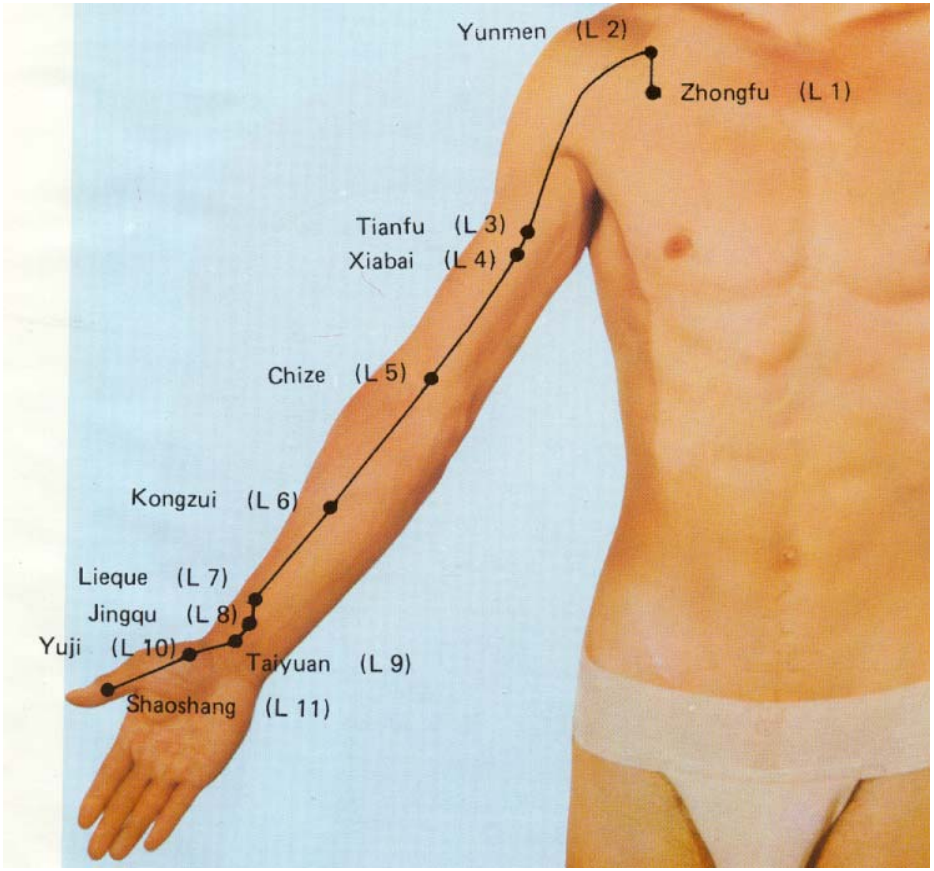
ACTIVE POINTS AND MERIDIANS

- Local points may or may not be directly on a classical acupuncture meridian or acupoint.
- Seem as well as others theorize that acupuncture grid of points illustrates much as does Travell's grid of myofascial TrP's where to begin looking for active points. Points not in static locations.

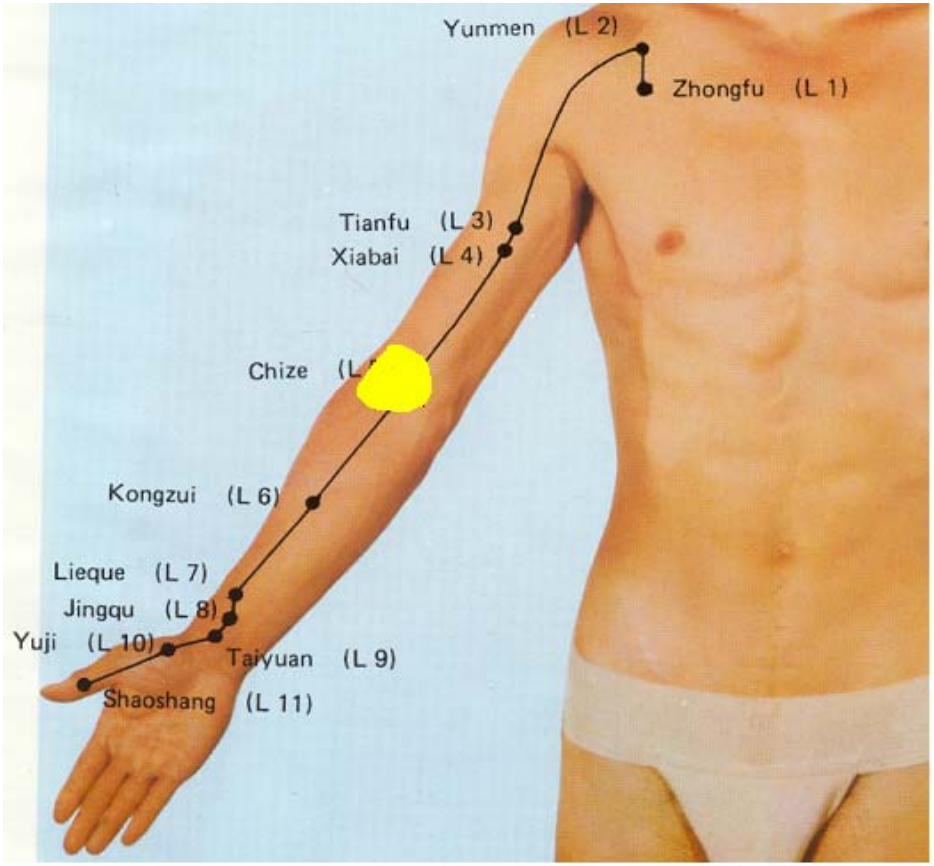

足の太陰脾經の圖

肩中兪
天窓
天容
顴髎
聴宮

Point Location Fiasco



Point Location Fiasco



PHENOMENOLOGY OF NEEDLE INSERTION

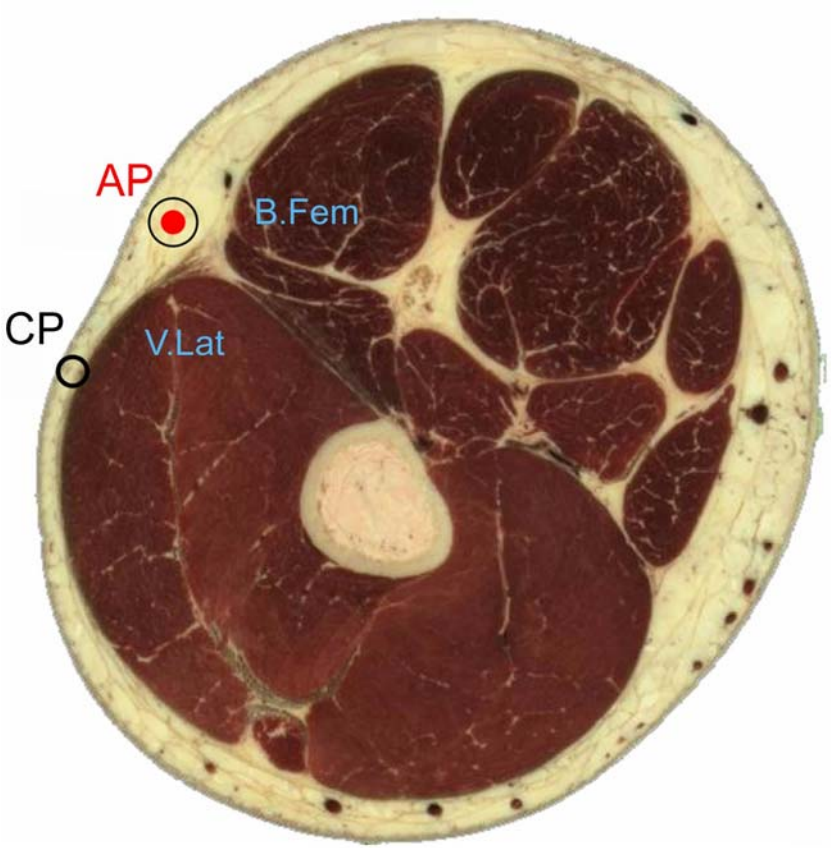
- *Into skin over active point*
  - Twitch response of underlying muscle.
  - Surrounding erythema.
  - Reflexive reduction of spasm underlying muscle in myotome often unrelated to dermatome of stimulation.
- *Into active point of muscle or tendon*
  - Transient increase in muscle tension.
  - Needle *grabbed* by the muscle.

TWITCH vs De Qi

- Phenomenon of “Qi rushing to the needle” with acupuncture stimulation was in fact a local twitch response of the underlying muscle and fascia. (Seem *A New American Acupuncture* Blue Poopy Press, 1993).
- De Qi response obtained with rapid twisting of needle in muscle or tendon
  - Described as painful, cramping, or full feeling

Biomechanics of Needle Response

- Grasp of Muscle increased by twisting needle
  - Unilateral twisting> Bilateral twisting >No twisting
  - True Acupoints required 18% greater pull force than Sham points


AP
B.Fem
CP
V.Lat

Immediate vs. Delayed Effect of Dry Needling

- Randomized Controlled trial comparing local tender point acupuncture needling using a pecking technique in muscle DDN vs. Sham superficial needling on skin SDN (n = 34)
- Treatment once per week for 3 weeks
  - Significant immediate effect in reduction of pain on VAS with DDN ($p < 0.01$)
  - No significant difference 9 days after conclusion of treatment period

Superficial vs. Deep Needle Stimulation

- Randomized trial comparing superficial acupuncture SDN with deep acupuncture DDN in shoulder and neck myofascial pain (n = 44)
  - 13 points needled in each group
  - 2 treatment per week for two weeks followed by 1 treatment per week for 4 weeks
  - Assessment of pain pre and post intervention and at 1 and 3 month follow up

- Significant improvement in pain measured by the McGill pain questionnaire with Deep Needle stimulation of acupuncture points when compared to superficial needling at completion of treatment course and at both follow up assessment times
  - Significance between methods did not occur until after the 8th treatment

LOCAL TWITCH RESPONSE

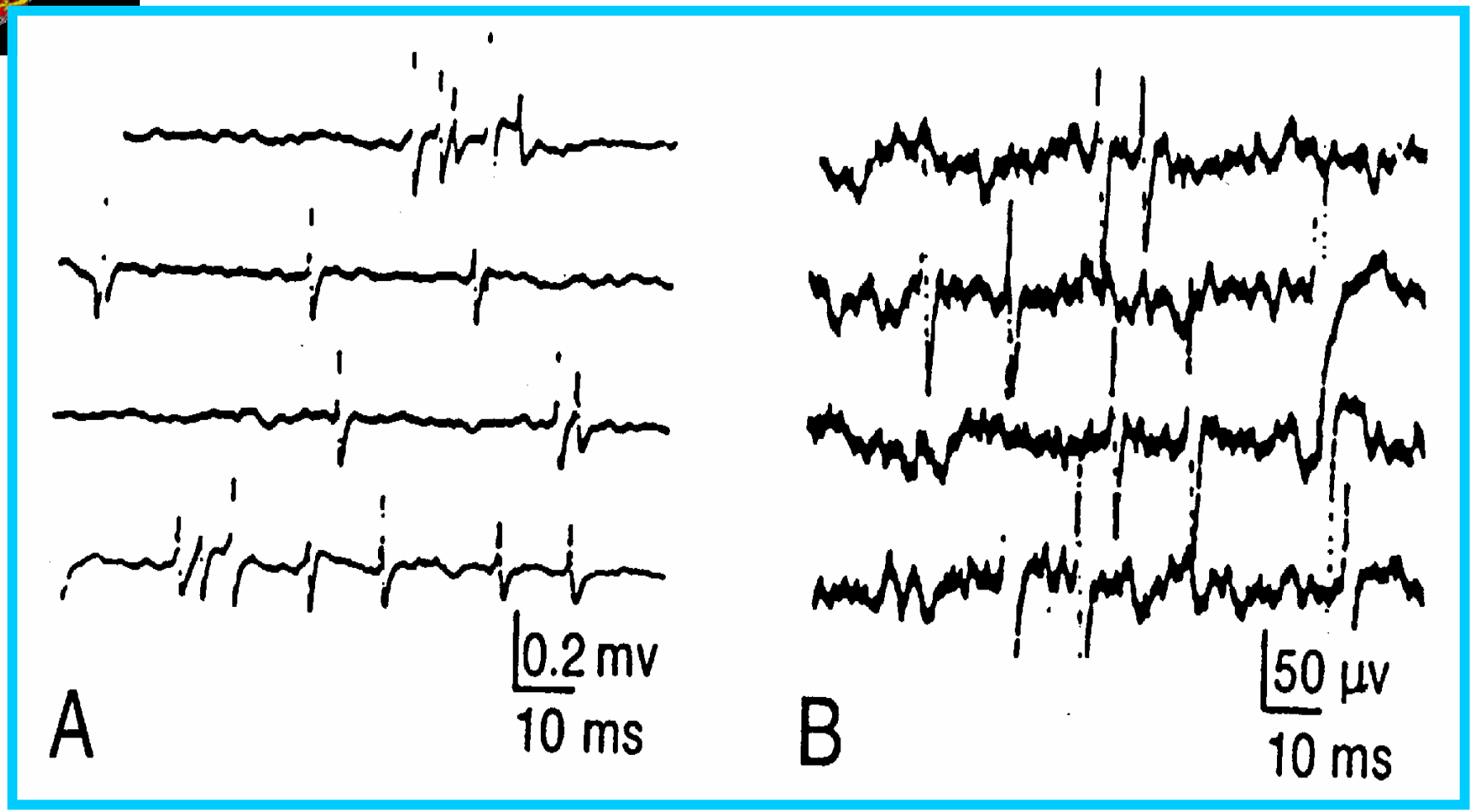
- Occurs with repeated pecking of needle
- Continues until palpable change in tension of the muscle.
- Induces referral pattern of sensation or pain in non-dermatomal and non- myotomal pattern.

LTR AND NEUROPLASTICITY

- What does the presence of the LTR at *active* points suggest about central neuroplastic changes
- Borrow from the Myofascial Literature

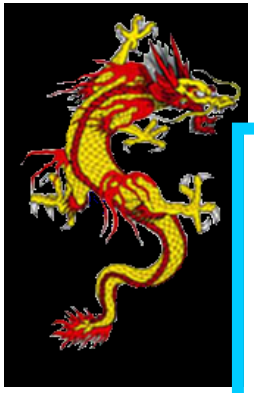
ABNORMAL EMG FINDINGS

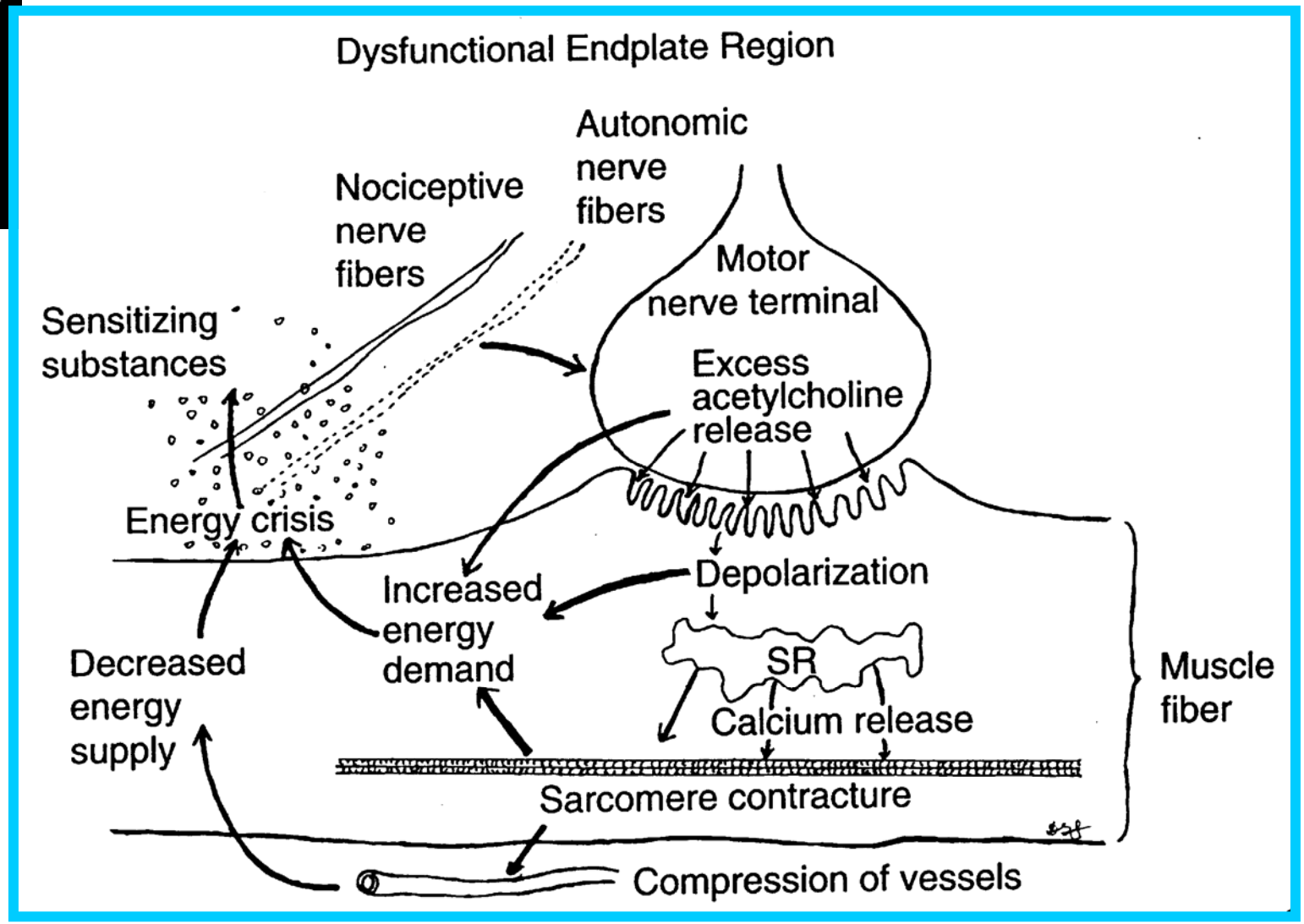
- Spontaneous activity 50-700uV (SEA)
  Hubbard D, Berkoff G. *Spine* 1993;18:1803.
  - Not blocked by curare (?Endplate Activity?).
  - Blocked by phentolamine (sympathetic blockade).
- Confirmed in Animal Studies. Chen JT, et al. *Arch Phy Med Rehab* 1998;79:790.


0.2 mv
10 ms
A
50 µv
10 ms
B

IRRITABLE ENDPLATE THEORY

- SEA is evidence of excessive release of ACh from endplate
- LTR due to mechanical disruption of endplate
- Repetitive local depolarization's of muscle fiber leads to energy crisis in contractile unit and observed contraction knot
- Loss of local capillary blood flow leads to ischemia and pain





Travell, J.G., Simons, D.G., & Simons, L.S. (1999)
Myofascial pain and dysfunction: The trigger point manual: Volume one, Upper half of body (2nd ed.)
Baltimore, MD: Williams & Wilkins

MUSCLE SPINDLE DYSFUNCTION

- SEA is abnormal firing of muscle spindle
  - Not blocked by curare (?Endplate Activity? Hubbard *J Musculoskel Pain* 4:124-43 1996)
  - Blocked by phentolamine (sympathetic input found in intrafusal fibers, Santini *Brain Res* 33:289-302 1971)
  - Confirmed in Animal Studies (Chen and Hong; *Arch Phys Med Rehab* 79:790, 1998)
- LTR due to lowered stretch reflex threshold
- Taut Band due to increase in set-point of gamma motorneuron pool
- Recent evidence suggest Sympathetic nervous system also interacts with motor endplate increasing release of ACh

BACKGROUND ON LTR

- LTR is a spinal reflex
- LTR potentials have been shown to be ablated with peripheral nerve sectioning but not by spinal cord lesioning cephalad to the segment where the LTR is produced. Hong CZ. Arch Phys Med Rehab 1994;75:12.
- Bilateral LTR's observed with unilateral needling of *active* TrP

HYPOTHESIS

- Is there a difference in the LTR response to needle stimulation in Active TrP's vs. Latent TrP's ?
- Null Hypothesis
  - LTR will have same pattern in both

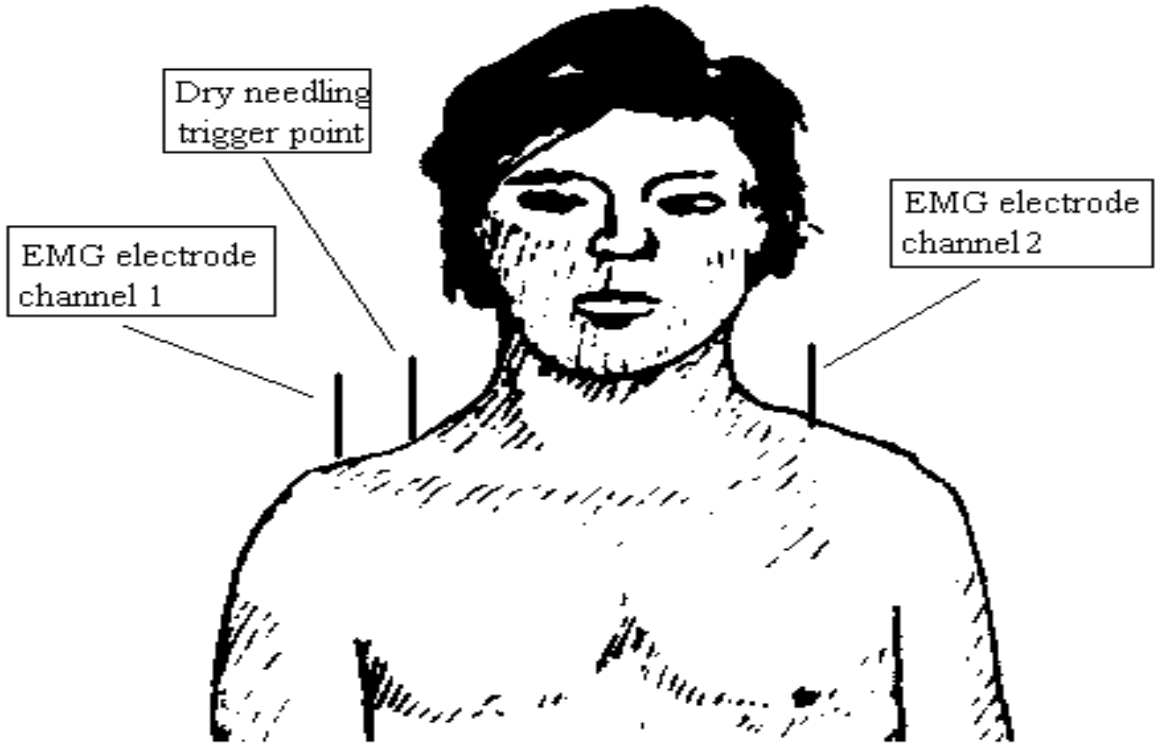
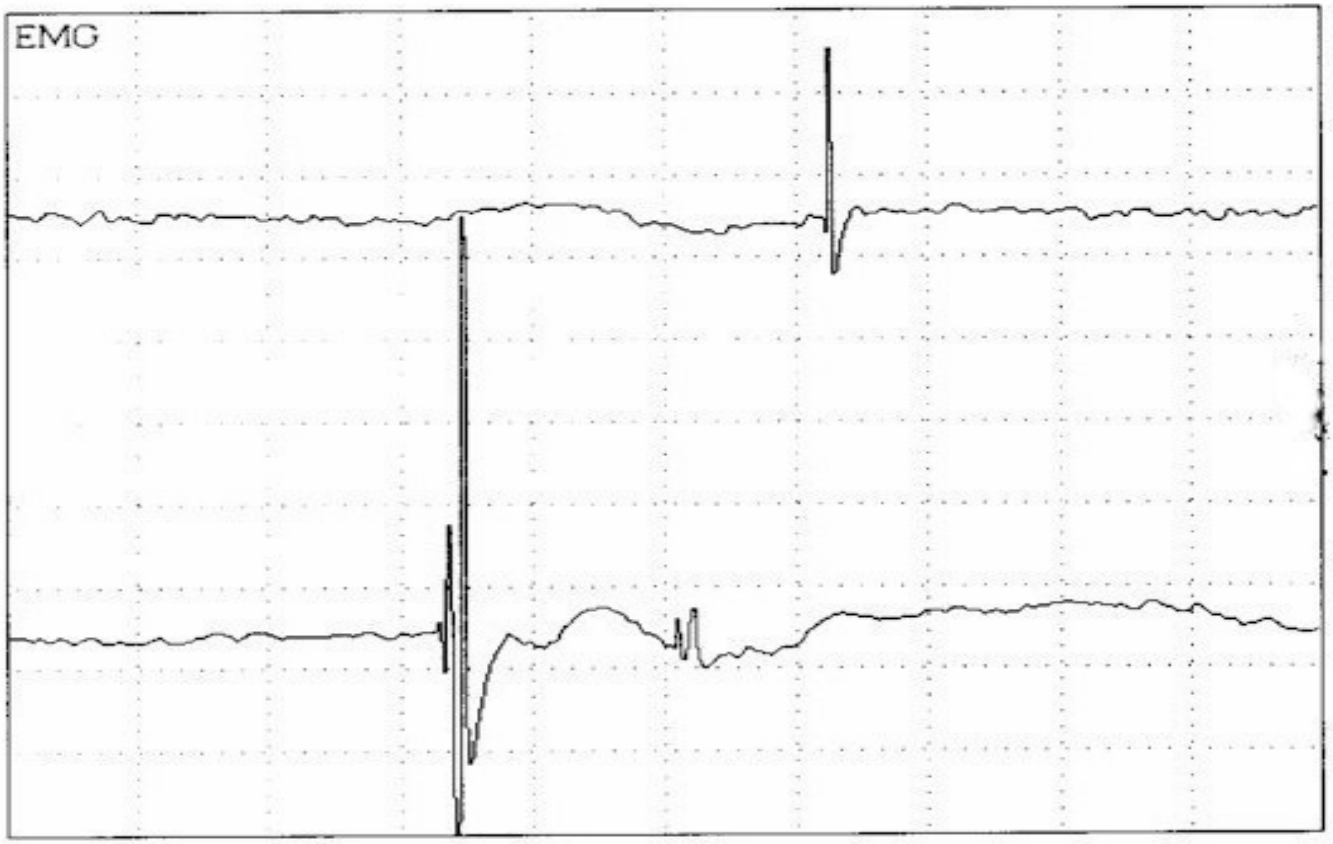


Figure 1: Dry needling and electode placements



Ch	Hicut	Locut	Gain (μV/div)	Sweep (ms/div)
1	10000	10.00	200.0	20.0
2	10000	10.00	200.0	20.0

Ch	Hicut	Locut	Gain (μV/div)	Sweep (ms/div)
1	10000	10.00	200.0	20.0
2	10000	10.00	200.0	20.0

RESULTS

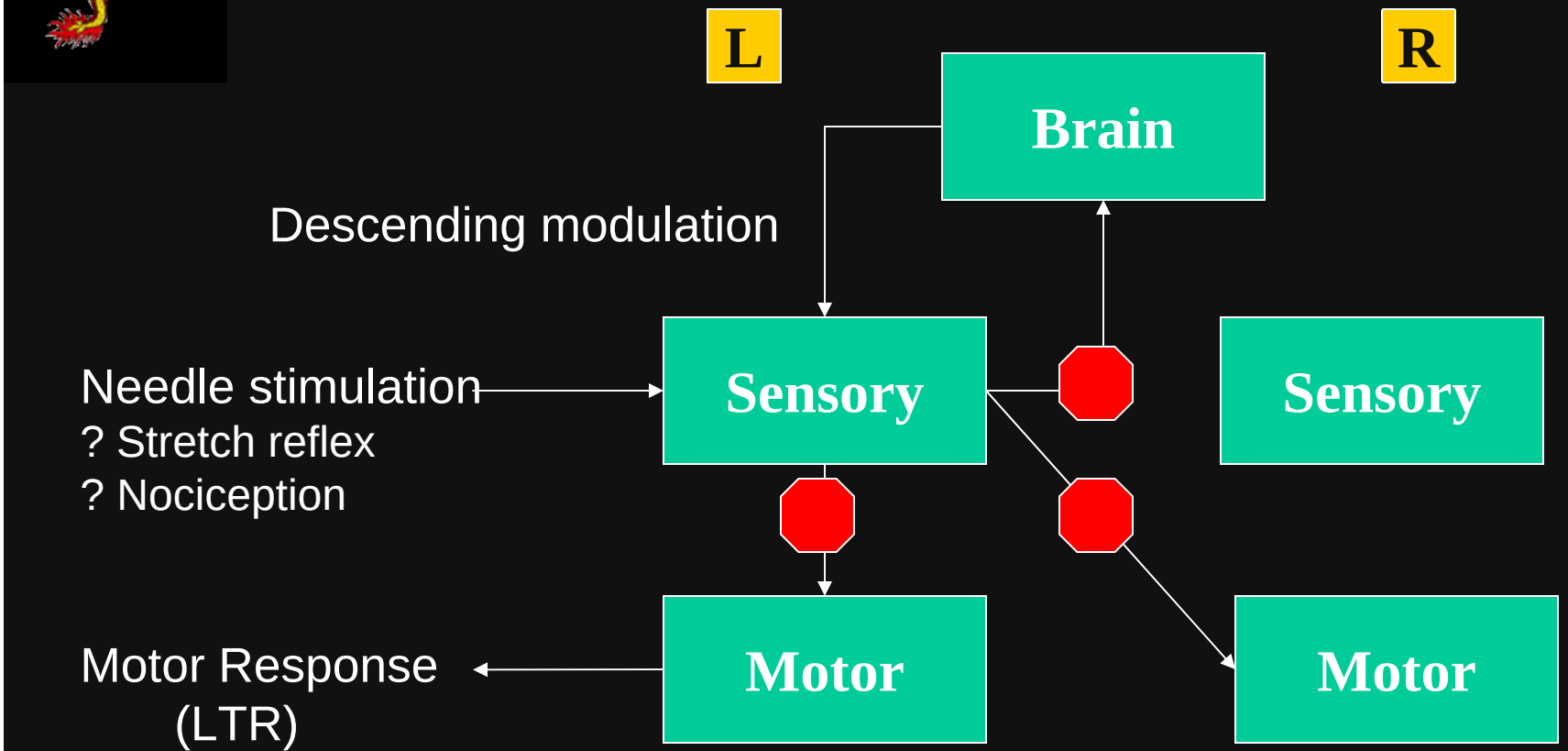
	Bilateral MUP	Ipsilateral MUP only	Total
Control (Latent MTrP) row %	**0**	**8** **100.00%**	**8** **100.00%**
Patients (Active MTrP) row %	**8** **61.54%**	**5** **38.46%**	**13** **100.00%**

61.5% of subjects with ***active*** MTrP had bilateral motor unit potentials while none in 8 control subjects with ***latent*** MTrP

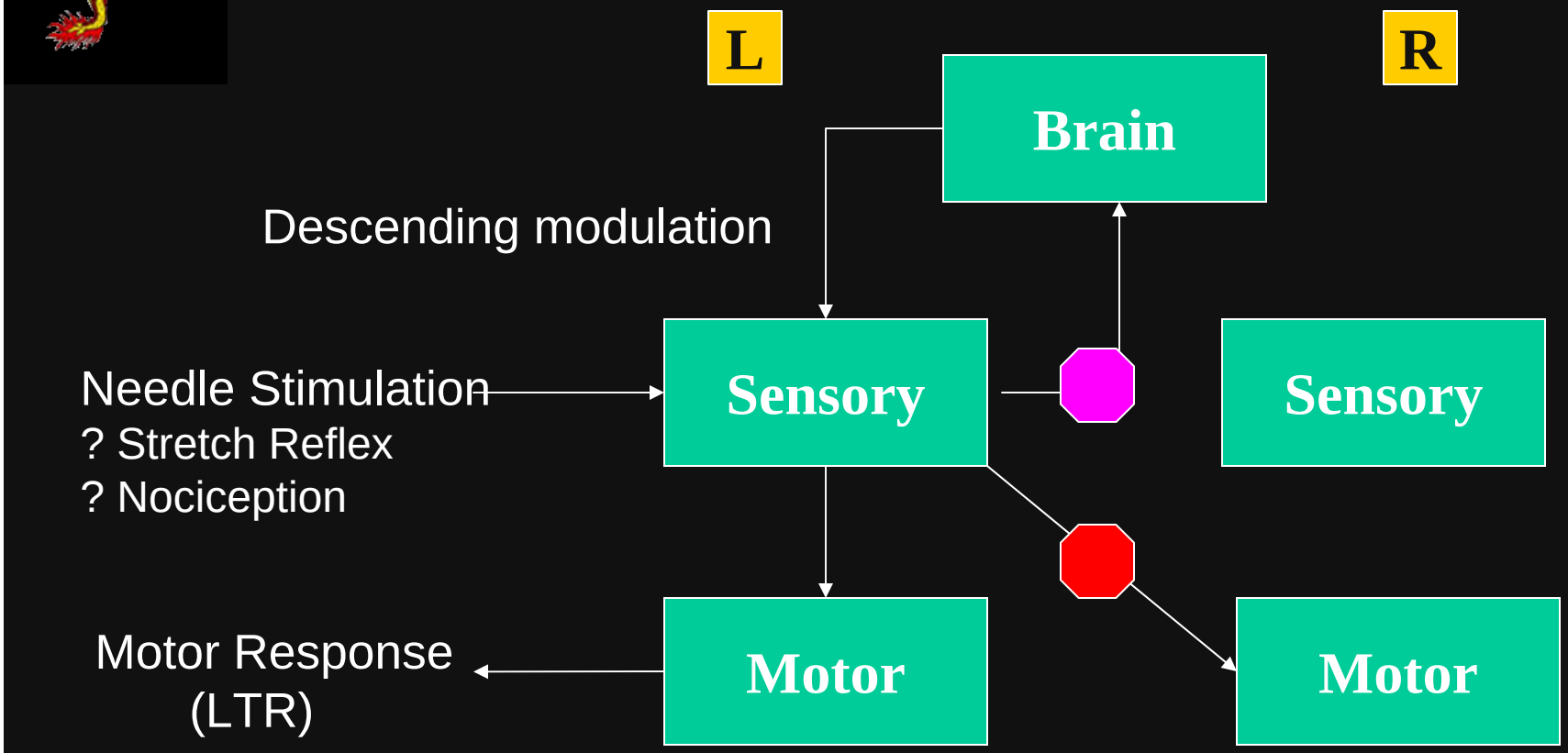
NEUROPLASTICITY and LTR

- Difference between Active vs Latent TrP due to maladaptive neuroplastic changes in CNS of both sensory and motor arms of system
- Mense has demonstrated such changes in experimental model of muscle pain (Pain 1994)

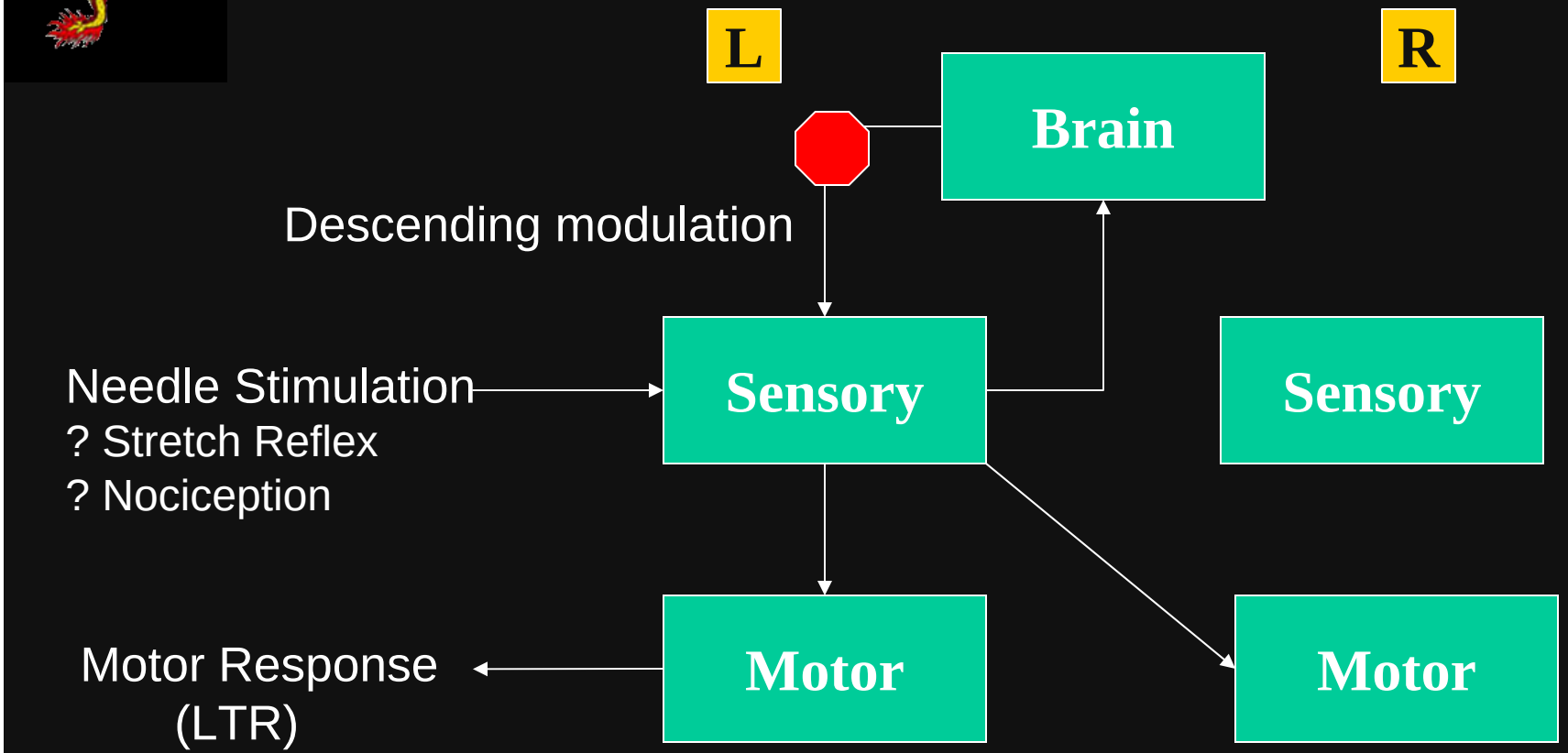
NORMAL


L
R
Brain
Descending modulation
Needle stimulation
? Stretch reflex
? Nociception
Sensory
Sensory
Motor
Motor
Motor Response
(LTR)

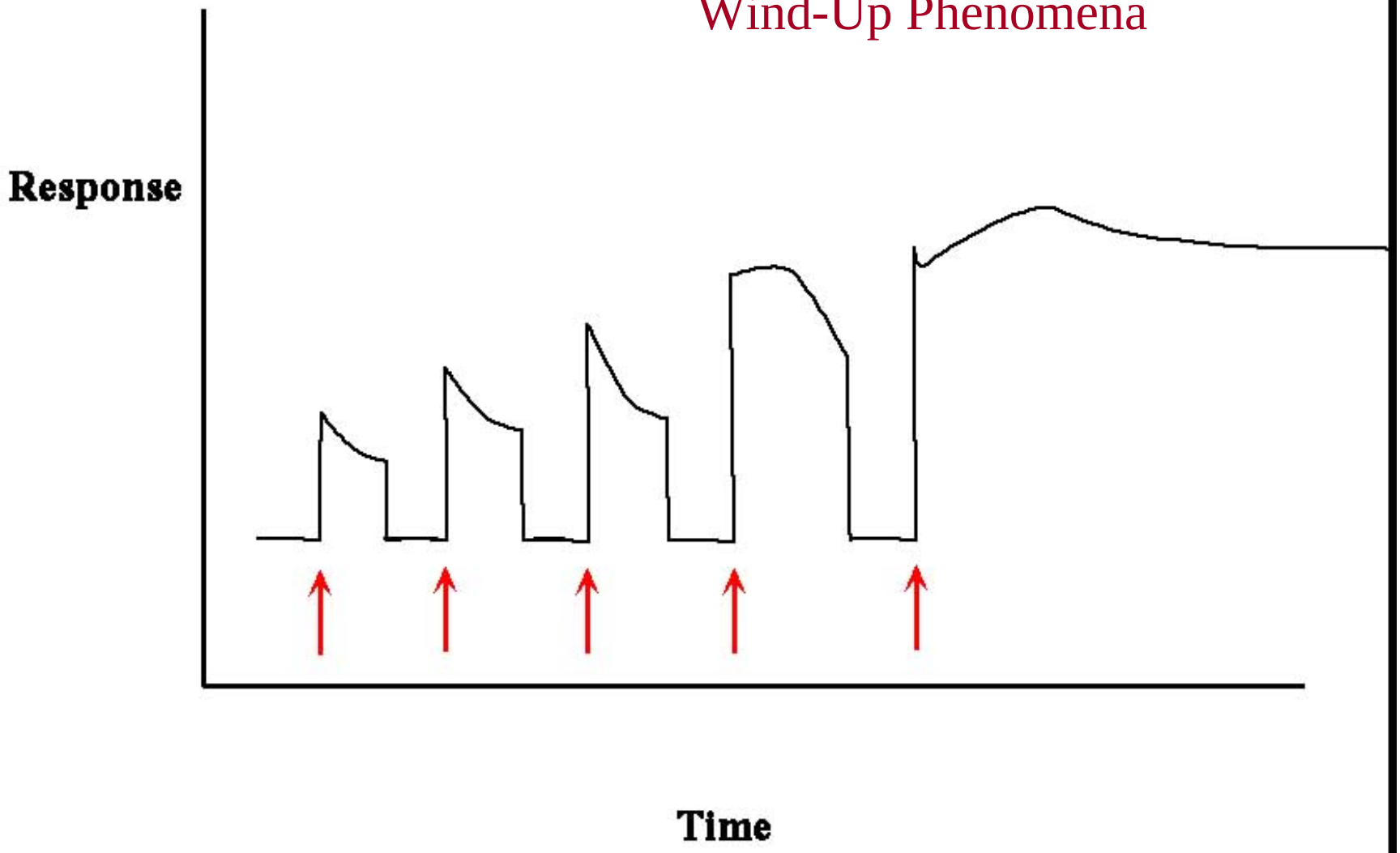
LATENT TrP


L
R
Brain
Descending modulation
Needle Stimulation
? Stretch Reflex
? Nociception
Sensory
Sensory
Motor Response
(LTR)
Motor
Motor

ACTIVE TrP


L
R
Brain
Descending modulation
Needle Stimulation
? Stretch Reflex
? Nociception
Sensory
Sensory
Motor Response
(LTR)
Motor
Motor

Wind-Up Phenomena



Spinal Memory System

- Transcription-independent:
  - Wind-up
  - LTP – NMDA linked
- Transcription-dependent
  - New receptors
  - Membrane response enhancers

INTEGRATED NEUROMUSCULAR THEORY

- Pain associated with *active* TrP depends on both peripheral muscle abnormalities and central changes in CNS
- Evidence pathology not solely peripheral
  - SEA and LTR present in *active* **(painful)** and *latent* **(nonpainful)** TrP's
- Pathology depends on central changes
  - Bilateral LTR obtained with unilateral needle stimulation in *active* but not *latent* TrP's