بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا إلا ما علمتنا
إنك أنت العليم الحكيم

صدق الله العظيم

Management of Acute Pain in Thoracic Surgery

Essay

Submitted in Partial Fulfillment to the Master Degree in Anaesthesia

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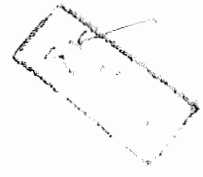

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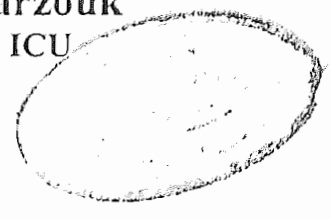

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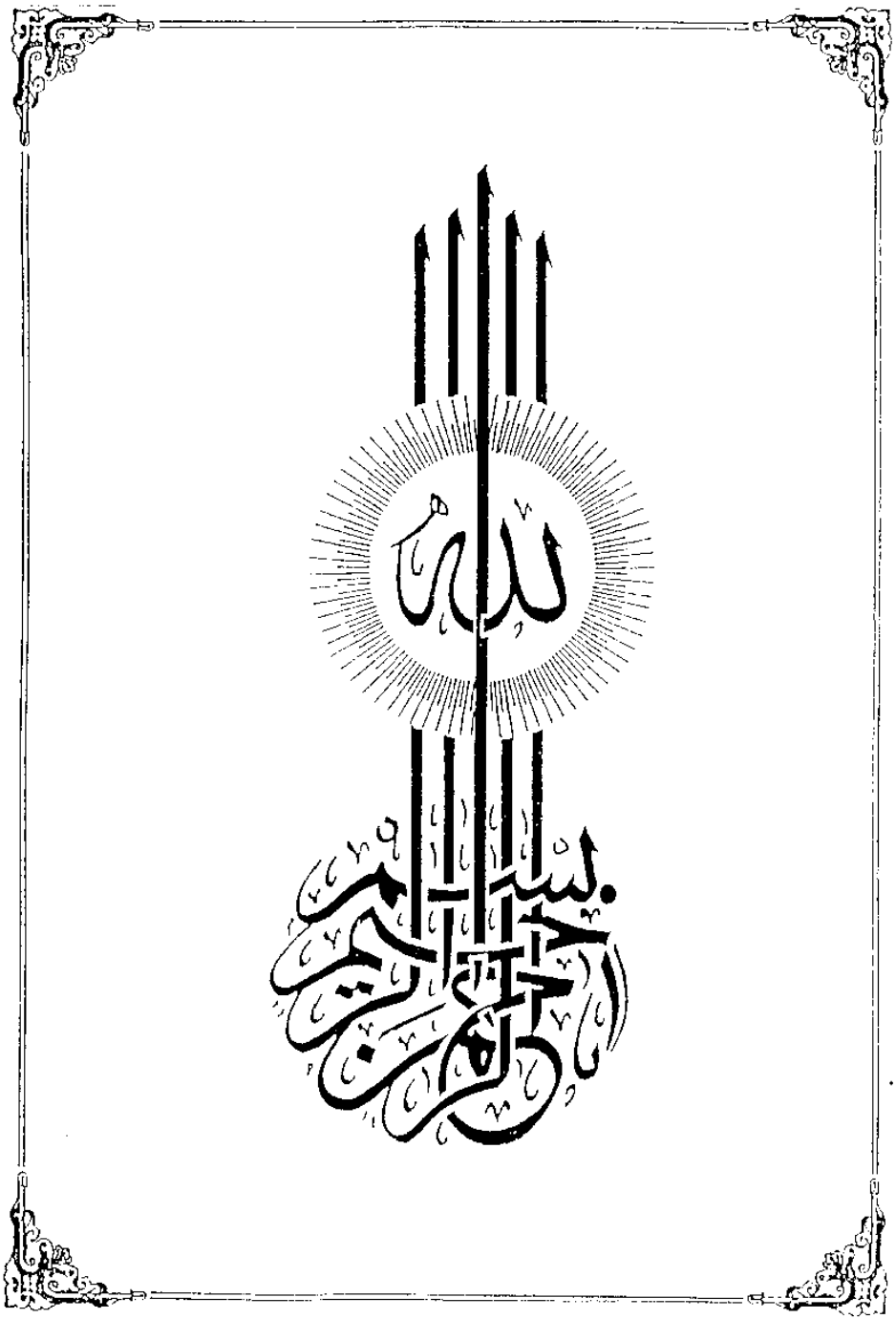

"TO MY FATHER"

I would like to thank him for his kind advice and meticulous revision of this work.

Besides, I would not forget to tell him that no matter how many lines I wrote would never ever be enough to express my deepest love and gratitude

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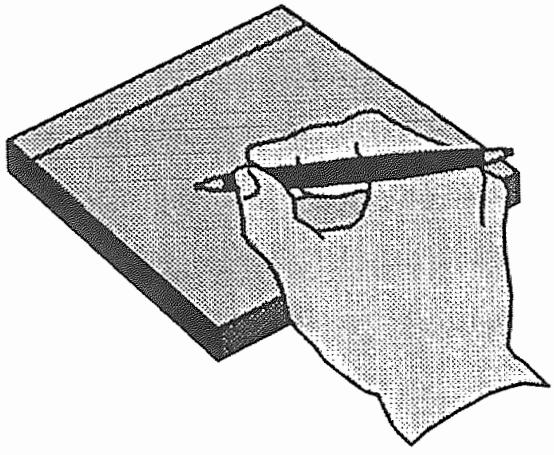
List of Contents



Review of Literature

Management of acute pain in thoracic surgery

Introduction:

Pain is undoubtedly the most taught, the least understood and the most neglected subject in medicine today, inspite of being the most complex yet certainly the most fascinating medical problem. It is significant that opium was first used in the third century BC is still in 1994 the most commonly used analgesic. In recent years, some progress has been made although it is not a field for the occasional dabbler. Total involvement is necessary for any degree of success.

This work is a trial to provide an overview of the subject and to give a practical guide to the different ways of management of acute pain in thoracic surgery. It is the responsibility of the anaesthetist to be familiar with particular drugs and techniques he is going to employ including any side effects and possible complications and their treatment.

Effective analgesia improves and even reverses the adverse effects of surgery on the pulmonary mechanics. It may also reduce the endocrine and metabolic response to surgical trauma.

This topic will end in a way to show how acute pain service could be organized and can be well established in our hospitals ***(Robert, 1984).***

Thoracic surgery results in severe pain and change in ventilatory mechanics and pulmonary gas exchange. It can lead to atelectasis, pulmonary collapse and hypoxia which may continue for some days. The reduction in lung volumes especially the functional residual capacity and impaired ventilatory mechanics and oxygenation are the result of shallow monotonous breathing without periodic maximal inflation as a result of pain ***(Gibbson, 1973).***

Hypoxaemia result from venous admixture from regional ventilation perfusion inequality and shunting of pulmonary capillary blood through closed alveoli. Mucus plugs and infection develop secondarily to alveolar collapse and airway closure. Hypoxaemia itself can lead to complications such as cardiac insufficiency, thromboembolism, delayed wound healing and prolonged convalescence. All these changes are much exaggerated in the elderly, the obese, heavy smokers and those with pre-existing cardiopulmonary disease. Effective analgesia can inhibit all such changes in forced ventilatory variables and prevent onset of hypoxia ***(Melzack and Wall, 1984).***

There are many ways to treat post-thoracotomy pain. Systemic narcotics can be administered intravenously by continuous infusion or intermittent bolus intramuscularly (IM), transdermally, subcutaneously, subligually or sometimes rectally.

Cryoanalgesia and transcutaneous electric nerve stimulation (TENS) have been used as an adjuvant to narcotics and non narcotic analgesic therapy.

Local anaesthesia can be given through a lumbar or thoracic epidural, by intermittent intercostal nerve blocks and via intercostal or intrapleural catheters.

Finally, epidural and intrathecal narcotics may be used for post-thoracotomy analgesia. (Fig. 1)

Definition of acute pain:

It is the pain of recent onset and probable limited duration, it usually has an identifiable temporal and causal relationship to injury or disease. It is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage *(Brian et al., 1992).* This is in distinction to chronic pain which is defined as pain lasting for long periods of time.

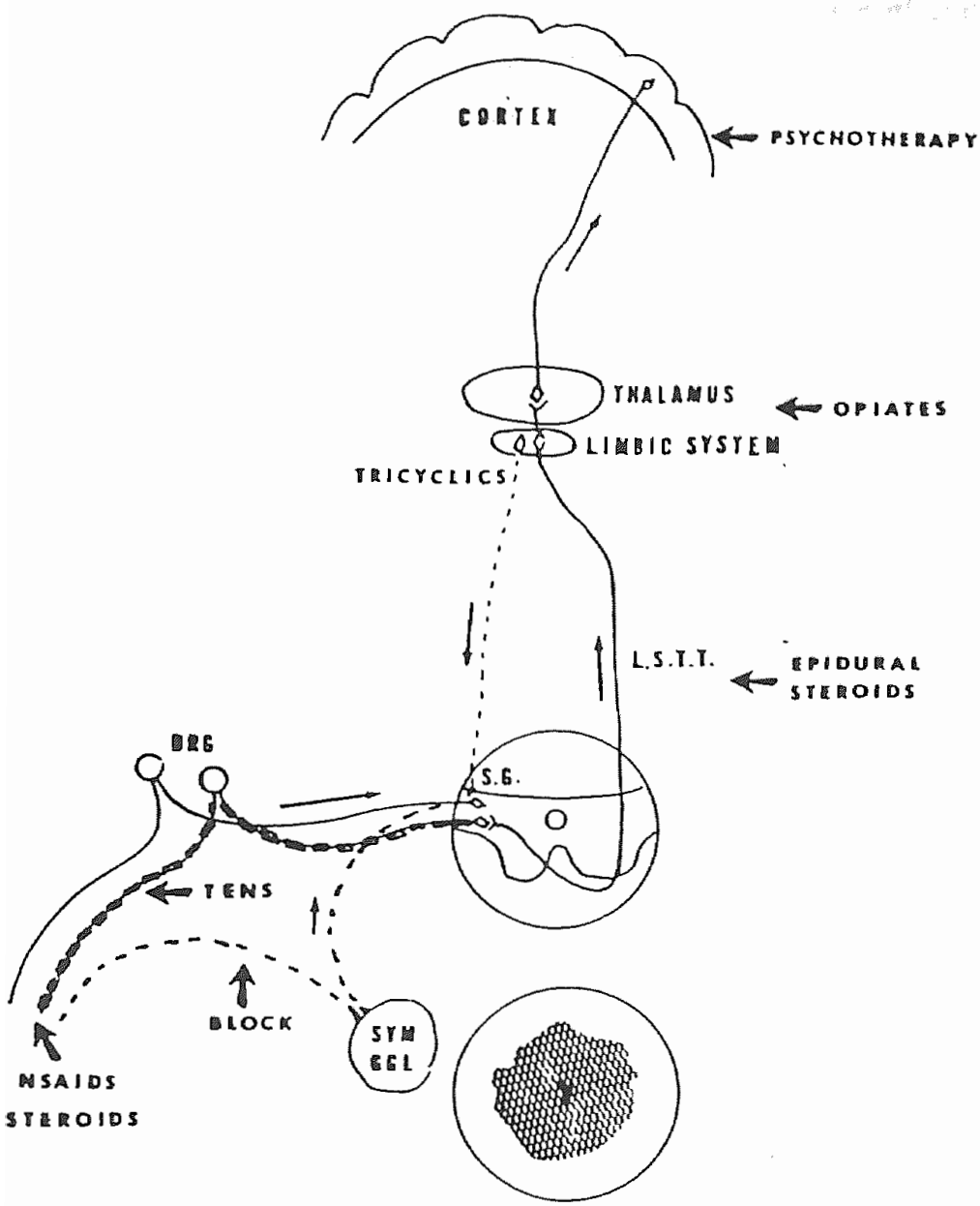


Figure (1) Sites of action in the treatment of pain

Acute pain begins with an insult to integumentary structures associated with some organ system. Algogens (pain causing substances) are locally elaborated or released and stimulate nerve endings (noicireceptors) of small thinly myelinated or unmyelinated fibres, the signal generated is carried along these noicireceptors fibres into the dorsal horn of the spinal cord. A modulation (amplification or suppression) of the signal may take place before it is projected into pain specific areas of the cerebral cortex resulting in a variety of possible responses to it. All along "the pain pathway" reflexes are generated which result in responses which may be both beneficial (withdrawal from maximum stimulus) and deleterious (sympathetic discharge and certain endocrine changes to the injured organism) ***(Brian et al., 1992).***

The natural history of acute pain is spontaneous remission. Pain intensity is greatest at the onset but, at healing and stabilization of the injured parts take place, there is reduction in the amounts of algogens released while the intrinsic pain modulation systems continues to be active. This results in gradual reduction in the pain sensation. This is true for most types of simple "acute pain" such as post-surgical trauma or burn pain ***(Brian et al., 1992).***

Pain sensation and those aspects of the behavioral responses to pain that depends upon neural processing in the brain require nociceptive signals to be transmitted through ascending pathways from the spinal cord and the trigeminal nuclei to appropriate nuclei in the

brain stem and thalamus.

The emphasis in this chapter will be upon the spinal cord pathways that appear to participate in such signalling. Several cautions should be kept in mind, there are probably several different nociceptive long pathways including components of the spinothalamic, spinoreticular, spinomesencephalic, spinocervical and second order dorsal column tracts *(Willis, 1984).*

Acute pain mechanisms and pathways

Pain nerve endings:

Painful stimuli are carried by a network of non myelinated (undifferentiated) or poorly myelinated (differentiated) nerve fibres which ramify in the superficial, deep or visceral tissues.

Receptors can be divided into three types:

1. Nociceptors which only respond to noxious stimuli, that is to levels of activity which are damaging to the organism.
2. Thermoreceptors which are excited by high and low skin temperatures.
3. The mechanoreceptors: These are of two types:
    a. A slowly adapting receptors.
    b. Rapidly adapting receptors. ***(Lipton, 1978).***

The cell body of the pain nerve fibres is in the posterior root ganglion, its peripheral axon subdivide into many small peripheral branches to supply an area of skin, the dermatome. There is overlap between the dermatomes, so that every spot of the skin lies within the domain of few neurones.

Pain could be felt through stimulation of other types of sensory eceptors such as Krause end bulbs, Pacinian corpuscles and the Ruffinian corpuscles.

The free nerve endings are the only receptors in the cornea by which other types of sensations are felt including pain.

Pain pathway (afferent tracts):

* The cutaneous primary afferent fibres may be divided into two groups:

1. Unmyelinated (C or group 4) and small myelinated (A or group 3) which when stimulated cause a sensation of pain. When they are stimulated at a lower intensity, tickling and itching are the sensations conveyed. Some of the small myelinated fibres in this category convey impulses generated by stimuli warmer or colder than skin.
2. Large myelinated fibres (group 2) when stimulated alone, they give sensations of touch and pressure.

The grey matter in the spinal cord is arranged in 10 laminae, the lamina 10 is around the central canal, lamina 9 is the motor neurons 7 and 8 are interneurones. The dorsal horn is from 1 to 6. The lamina 1,2 and 3 from the substantia gelatinosa of Rolandi and 4,5 and 5 from the nucleus proprius with Clark's column in 6. The sensory fibres of pain enter the spinal cord through