



NEURO-ANATOMICAL EXPLANATION OF THE MODE OF ACTION OF AGNI KARMA IN PAIN MANAGEMENT OF MUSCULOSKELETAL DISORDERS

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ABSTRACT

AgniKarma is a para-surgical procedure, *Agni* and *Karma* which means the *Karma* accomplished by the application of *Agni* (heat). According to *Acharya Sushruta* "The procedure in which the *Samyaka Dagdha Vrana* is produced by *Agni* is called the *Agni Karma*.

It is frequently indicated in many musculoskeletal disorders like pain. Pain is a vital function of the nervous system in providing the body with a warning of potential or actual injury. Nociceptors are the free nerve endings of primary afferent A δ and C fibres. A δ and C fibres synapse with secondary afferent neurones in the dorsal horn of the spinal cord. Glycine and gamma-aminobutyric acid (GABA) are important neurotransmitters acting at inhibitory interneurons. The spinothalamic tract and the spinoreticular tract are the two main pathways that carry nociceptive signals to higher centres in the brain. On the basis of Ayurvedic Classics pain is caused by vitiated *Vata Dosha* and *Agni Karma* counter acts on it due to its *Ushna Guna*, as it is exactly opposite to *Sheetaguna* of *Vata*. This is supported by quotation of *Yajurveda* "*Agni Himasya Bhaishja*".

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INTRODUCTION

Agni Karma is a para-surgical procedure, which has been advocated for the treatment of various *Vatika* and *Vata-Kaphaja* disorders in the literature. *Agni Karma* word is formed by the combination of two words *Agni* and *Karma* which means the *Karma* accomplished by the application of *Agni* (heat). In *Sushruta Samhita* the most ancient text book of *Shalya Tantra* a complete chapter has been devoted for the description of this important procedure. This emphasizes the importance of that treatment in *Shalya Tantra*. According to *Acharya Sushruta* "The procedure in which the *Samyaka Dagdha Vrana* is produced by *Agni* is called the *Agni Karma*¹. It has been stated that the diseases treated by this particular procedure do not recur and the diseases which cannot be treated by medicines, surgery and *Kshara Karma* can be treated by the *AgniKarma*². It is frequently indicated in many musculoskeletal disorders. The effect of this procedure in various painful conditions is very well known but the mode of action of this procedure is suspicious, which should be understood with the knowledge of modern neuro-anatomical knowledge.

Objective of Study

- To evaluate the mode of action of *AgniKarma* with the help of the neuro-anatomical knowledge.

Material and Methods

- Review of *Ayurvedic* literature about the *Agni Karma*.
- Review of neuro-anatomy related to pain and pain relief.

Review of Ayurvedic literature about the *Agni Karma* Procedure of *Agni Karma*

Agni Karma is a para surgical measure and requires all the principles to be observed carefully which are mentioned in ancient *Ayurvedic* texts.

Purva Karma (Pre-operative preparation)

- Patient and attendants should be counselled and explained about the procedure in order to make them mentally aware about the procedure. Because *Agni Karma* being a pain full therapeutic procedure can create a fear or anxiety in the patient.
- *Agropharaniya*- Before starting the procedure, a *Panchdhatu Salaka*, artery forceps, sponge holding forceps, gauge piece, cotton, *Gritkumari* pulp, *Murchhit Til-Tail*, adhesive tape, cotton bandage etc. all should be kept ready.
- Most tender spot should be thoroughly cleansed and gentle *Abhyanga* should be done with *Murchhit Til-Taila* for 10 minutes in the direction of hairs. This served the purpose of both *Snehana* and *Svedana*, as *Til-Taila* provides *Snehana* and *Abhayanga* is a variety of *Anagni Swedana* mentioned by *Acharya Charaka*.
- Patient is advised to take some *Pichhila* (unctuous) diet.

Pradhana Karma (Main procedure)

Patient was kept in suitable position before starting the procedure. Then the *Panchdhatu Salaka* should be heated up to red-hot and *Bindu* type *Dagdhas* were made on the most tender spot of the painful area, till the *Samyaka Twaka Dagdha Lakshana* occur i.e. *Shabdapradurbhava, Durgandhata*³. During the procedure patient kept being consoled and held comfortably by the assistants. In case patient get frighten or not co-operate the procedure so stop the procedure immediately.

Paschata Karma (Post-operative measures)

Immediately after completion of the procedure *Gritkumari* pulp should apply over the *Vrana* and gauge impregnated with *Madhuyastichurna* kept and bandaged. Patient should advise to take rest for about 10 minutes on the operation table and not to get up promptly just after the completion of the procedure.

Patient should instructed not to remove the bandage on the day of procedure and to keep the area dry and clean.

Review of neuro-anatomy related to pain and pain relief

Neuro-anatomy of Pain Pathways

Pain is a vital function of the nervous system in providing the body with awarning of potential or actual injury.

Nociceptors

Nociceptors are the specialised sensory receptors responsible for the detection of noxious (unpleasant) stimuli, transforming the stimuli intoelectrical signals, which are then conducted to the central nervous system. They are the free nerve endings of primary afferent A δ and C fibres. Distributed throughout the body (skin, viscera, muscles, joints, meninges) they can be stimulated by mechanical, thermal or chemical stimuli.

Primary afferent fibres

In addition to the A δ and C fibres that carry noxious sensory information, there are primary afferent A β fibres that carry non-noxious stimuli. Each of these fibre types possesses different characteristics that allow the transmission of particular types of sensory information

Table 1- Characteristics of primary afferent fibres

	Aβ fibres	Aδ fibres	C fibres
Diameter	Large	Small	Smallest
Myelination	Highly	Thinly	Unmyelinated
Conduction Velocity	>40 ms-1	5-15 ms-1	<2 ms-1
Receptor activation threshold	Low	High and low	High
Sensation on stimulation	Light, touch, non-noxious	Rapid, Sharp, Localised Pain	Slow, defused, dull pain

Dorsal horn of the spinal cord

A δ and C fibres synapse with secondary afferent neurones in the dorsal horn of the spinal cord. The dorsal horn can be divided histological into ten layers called Rexed laminae. A δ and C fibres transmit information to nociceptives specific neurones in Rexed lamina I and II (substantia gelatinosaronaldo), in addition to projections to other laminae. Primary afferent terminals release a number of excitatory neurotransmitters including glutamate and substance P.Complex interactions occur in the dorsal horn between afferent neurones, interneurones and descending modulatory pathways (see below). These interactions determine activity of the secondary afferent neurones.

Glycine and gamma-aminobutyric acid (GABA) are important neurotransmitters acting at inhibitory interneurons.

Ascending tracts in the spinal cord

There are two main pathways that carry nociceptive signals to higher centres in the brain.

- **The spinothalamic tract:** secondary afferent neurones decussate within a few segments of the level of entry into the spinal cord and ascend in the contra lateral spinothalamic tract to nuclei within the thalamus. Third order neurones then ascend to terminate in the somatosensory cortex. There are also projections to the periaqueductal grey matter (PAG).The spinothalamic tract transmits signals that are important for pain localisation.

- **The spinoreticular tract:** fibres also decussate and ascend the contralateral cord to reach the brainstem reticular formation, before projecting to the thalamus and hypothalamus. There are many further projections to the cortex. This pathway is involved in the emotional aspects of pain.

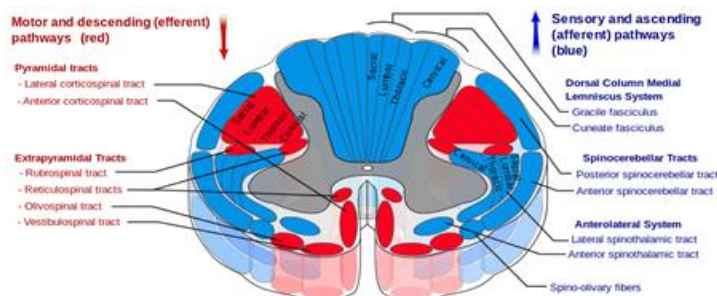


Figure 1. Showing Motor and Sensory Pathways

Discussion

Probable Mode of action of Agni Karma

The probable mode of action of *Agni Karma* can be explained on the following basis:

1. Ayurvedic Basis

Pain is caused by vitiated *Vata Dosha* and *Agni Karma* counter acts on it due to its *Ushna Guna*, as it is exactly opposite to *Sheetaguna* of *Vata*. This is supported by quotation of *Yajurveda "Agni Himasya Bhaishja"*.

2. Modern Basis

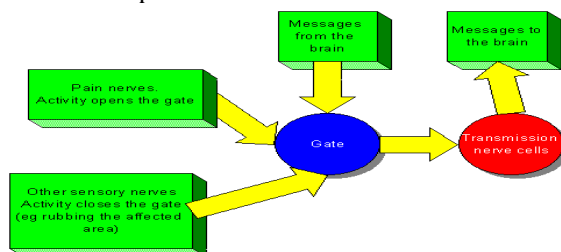
Inhibition of pain transmission

Intensity of injury may remain same, but different persons or the same person at different times may feel the pain differently. This is because our body has endogenous pain inhibiting system. If this system is over active, pain perception may be abolished altogether. The endogenous pain inhibiting system consist of

1. Gate control mechanism.
2. Descending pain inhibiting system.

1. Gate control theory of pain

The gate control theory of pain was proposed by Melzack and Wall in 1965 to describe a process of



Anatomy, physiology and pharmacology of pain by MacIntyre PE& others

2. Descending pain inhibiting system

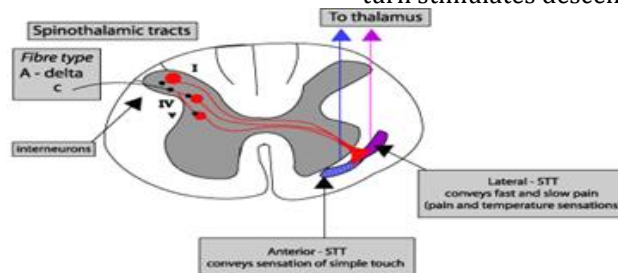
- PAG (periaqueductal gray) is an area round the aqueduct of Sylvius in the mid brain. From PAG a bunch of descending fibres arise which relays in magnus raphe nucleus (situated in the middle at the junction of pons and medulla). Next order neurons terminates at SGR (substantia gelatinosa Ronaldo situated at the tip of posterior horn of the spinal cord). This is descending pain inhibiting pathway.
- The first order neuron, which carries pain from the periphery is terminates at substantia gelatinosarolando. From SGR the second order neuron emerges and constitutes the lateral STT (spinothalamic tract) to terminate in the thalamus. The neurotransmitter (NT) at the synapse between terminal part of APC and beginning of STT is substance P.

inhibitory pain modulation at the spinal cord level. When the painful stimulus alone is applied the pain is more intensely felt than the stimulus of same intensity is applied concomitantly with the tactile stimulus e.g. application of heat in the form of *Agni Karma*, in this case.

Let a painful stimulation be applied in the periphery. the pain is carried by primary afferent which terminates in substantia gelatinosa Rolando. From here second order neurons emerges to constitute spinothalamic tract.

Also, tract of Goll and Burdach (lemniscal fibres) carrying tactile sense (coming from periphery) passes through the dorsal column remaining close to the Substantia Gelatinosa Rolando. While the tract of Goll and Burdach ascend upwards, it gives collaterals to the termination of primary pain carrying afferent at SGR. When a tactile sensory stimulus is applied in the periphery, the tract of Goll and burdach is stimulated and via the collateral mentioned above it effect presynaptic inhibition on the primary pain carrying afferent and pain sensation is inhibited.

- When descending pain inhibiting system is stimulated the terminal part of descending pain inhibitory fibres release some endogenous opioid peptides as neurotransmitter at SGR. These endogenous opioid peptides cause inhibition of substance P, leading to transmission blockade of pain sensation, hence no pain is felt.
- Descending pain inhibitory fibres are stimulated with the stimulation of limbic system and with the mechanism of auto feedback i.e. when spinothalamic tract is stimulated collaterals from spinothalamic tract can stimulate the descending pain inhibiting system. On *Agni Karma* the lateral spinothalamic tract get stimulated as this is concerned with the transmission of temperature sensations and this in turn stimulates descending pain inhibition system.



An introduction to pain pathways and mechanisms by Dr Danielle Reddi

CONCLUSION

Agni Karma is a procedure frequently indicated in many *Vata* and *Kapha* predominant conditions. It is very effective procedure for pain management by inhibiting the pain pathways. By knowing the mode of action of *Agni Karma* it is possible to use it in many unexplained musculoskeletal problems more effectively.

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