ASSESSMENT OF DEGREE OF PAIN EXPOSURE IN AN EGYPTIAN NICU

Thesis

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By

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ABSTRACT

In this study, we tried to show how frequent neonates are exposed to painful procedures during their intensive care stay, the majority of which were not accompanied by analgesia despite the fact of their hypersensitivity to pain which is exacerbated in preterms. Also we aimed to outline various methods of assessment of pain in neonates as well as numerous pharmacological & non pharmacological lines of treatment than can alleviate procedural pain in neonates.

Key words: Pain – neonates – assessment - management

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LIST OF ABBREVIATIONS

CAAS : Cardiac Analgesic Assessement Scale

Cca : Corrected chronological age

Cm : Centromedian

CRIES : Crying, Requires increased oxygen, Increased vital signs, Expression, Sleeplessness

DAN : Douleur Aigue du Nouveau-ne'

Dm : Dorsomedial

DSVNI : Distress Scale for Ventilated Newborn Infants

ECMO : Extra-Corporeal Membrane Oxygenation

EDIN : Echelle Douleur Incomfort Nouveau-ne'

EMLA : Eutectic Mixture of Local Anesthetics

FLACC : Face, Legs, Activity, Cry, Consolability

Ga : Gestational age

GABA : Gamma amino butyric acid

Hpa : Hypothalamic-pituitary-adrenal

Iml : Internal medullary lamina

Lc : Locus coerulus

Ld : Lateral dorsal

LIDS : Liverpool Infant Distress Scale

Lp : Lateral posterior

MIPS : Modified Infant Pain Scale

NBRS : Neuro-biological Risk Score

NFCS : Neonatal Facial Coding system

NICU : Neonatal intensive care unit

NICUPAT : Neonatal Intensive Care Unit Pain Assessement Tool

NIPS : Neonatal Infant Pain Scale

N-PASS : Neonatal Pain Agitation and Sedation Scale

NSAIDS : Non-Steroidal Anti-Inflammatory Drugs

Pag : Periacqueductal grey matter

PAIN : Pain Assessement In Neonates Scale

PAT : Pain Assessement Tool

PIPP : Premature Infant Pain Profile

RIPS : Riley Infant Pain Scale

Rn : Red nucleus

Sc : Superior colliculus

SUN : Scale for Use in Newborns

Va : Ventral anterior

Vl : Ventral lateral

Vpm : Ventral posteromedial

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INTRODUCTION AND AIM OF WORK

The International Association for the Study of Pain has defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage".

Many invasive procedures are routinely performed at the bedside in neonatal intensive care units (NICU) such as; heel sticks, arterial and venous punctures, suctioning.

Assessment of pain presence in neonatal period is often difficult. As a newborn is incapable of self-reporting the painful event, several neonatal pain scales based on physiological, behavioral and hormonal indicators were developed. None of them is ideal for every situation, type of pain or age group.

Despite the accumulating evidence that neonates can experience pain and that procedural pain have potential long term adverse effects on sensation and behavior, analgesic treatment for procedural pain is still limited.

The aim of this work was to analyze the type and frequency of painful procedures performed to the studied population during the first 14 days of their life in NICU, to assess the degree of pain exposure resulting from I.V. cannula and venipuncture using NIPS scoring system (**Laurence et al, 1993)** and to assess the nature of analgesia given to such babies.

CHAPTER I
Neuroanatomy of Pain

The "standard" definition of pain is that of the International Association for the Study of Pain:

"*An unpleasant sensory or emotional experience associated with actual or potential tissue damage. Each individual learns the application of the word through experience related to injury in early life. Many people report pain in the absence of tissue damage or any likely pathophysiological cause; usually this happens for psychological reasons. There is no way to distinguish their experience from that due to tissue damage, if we take this subjective report*". ***(Kenny, 2001)***

Pain Pathways

Pain in the Cortex

Major cortical players are, the primary sensory cortex (S I), the secondary sensory cortex (S II), the anterior part of the insula and the cingulated gyrus.

S I is concerned with localisation of pain, while the other three structures are concerned with the motivational-affective aspects which we call "affective" pain. ***(Bingel et al., 2002)***

Figure 1: The human brain seen from the side, showing the SI and SII sensory cortex. SI is a thin strip made up of Brodman areas 3,1 and 2 posterior to the central suclcus, while SII lurks just above the lateral sulcus.

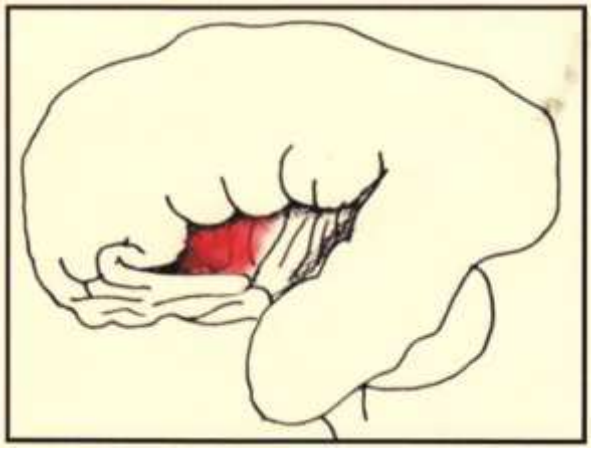

Figure 2: The temporal lobe has been retracted to reveal the insula in all its splendour, the anterior portion is probably concerned with pain perception

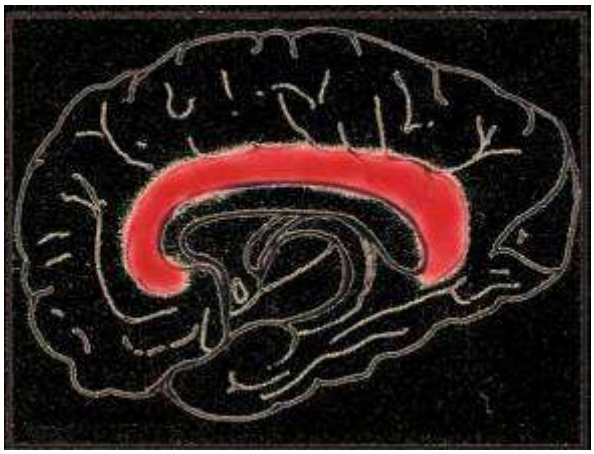

Figure 3: The medial aspect of a hemisphere, showing the cingulated gyrus. ***(Cross, 1994)***

The Thalamus

The thalamus is the 'central switching station' of the brain. Several of its multiple nuclei are concerned with pain. The lateral nuclei deal mainly with sensory/discriminative aspects, the medial ones with 'affective' pain.

Medially there is the poorly-defined midline nuclei. Lateral to these are the dorsomedial nucleus (dm) and, more anteriorly the anterior nuclei (ant).

The internal medullary lamina bounds the dorsomedial nucleus laterally, and separates it from the anterior nuclei.

Within the internal medullary lamina are the intralaminar nuclei, including the centromedian (cm) and centrolateral nuclei.

Lateral to the internal medullary lamina (iml) lies the ventral posteromedial nucleus (vpm) and anterior to this is the ventral anterior nucleus (va).

Further laterally there is the lateral dorsal (ld), lateral posterior (lp), ventral lateral (vl) and ventral posterolateral nuclei. The pulvinar (grey) is situated posteriorly.

Midline nuclei include; nucleus reunions, rhomboidal nucleus and submedius nucleus ***(Fitzgerald, 2005)***

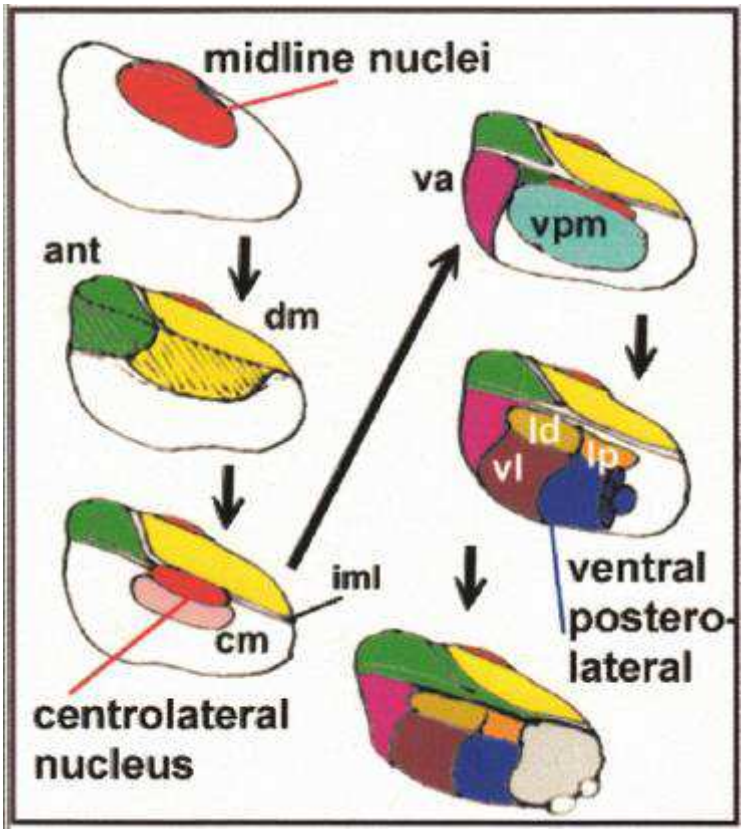

Figure 4: A Diagram of the Thalamic nuclei. The lateral thalamus is thought to be mainly concerned with 'discriminative' pain, the medial with "affect / motivation" ***(Fitzgerald, 2005)***

Midbrain There is a host of pain-related structures in the midbrain. Most of this circuitry is involved in 'affective' pain, with extensive connections to the reticular system of the brainstem. Important components are; the peri-aqueductal grey matter (PAG), Deep layers of the superior colliculus, the red nucleus, the pre-tectal nuclei (anterior and posterior), the nucleus of Darkschewitsch, the interstitial nucleus of Cajal and the intercolliculus nucleus, nucleus cuneiformis and even the Edinger-Westphal nucleus. ***(Afridi, 2005)***

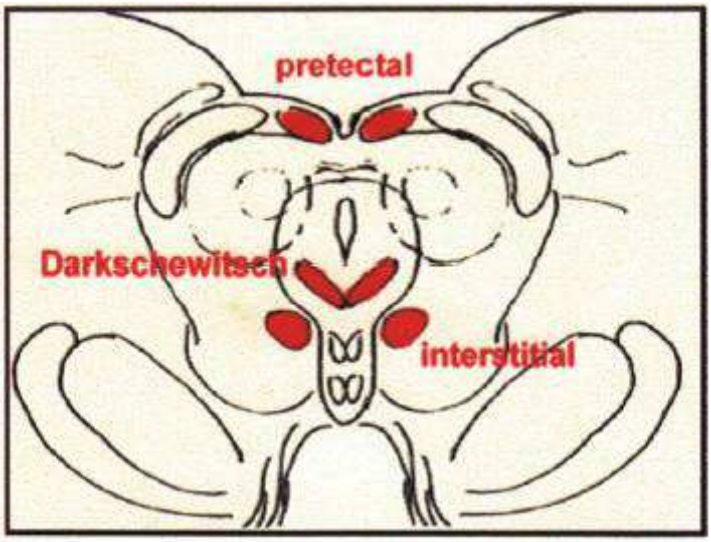

Figure 5 Rostral midbrain, with the anterior pretectal nucleus, interstitial nucleus of Cajal, and nucleus of Darkschewitsch in red.

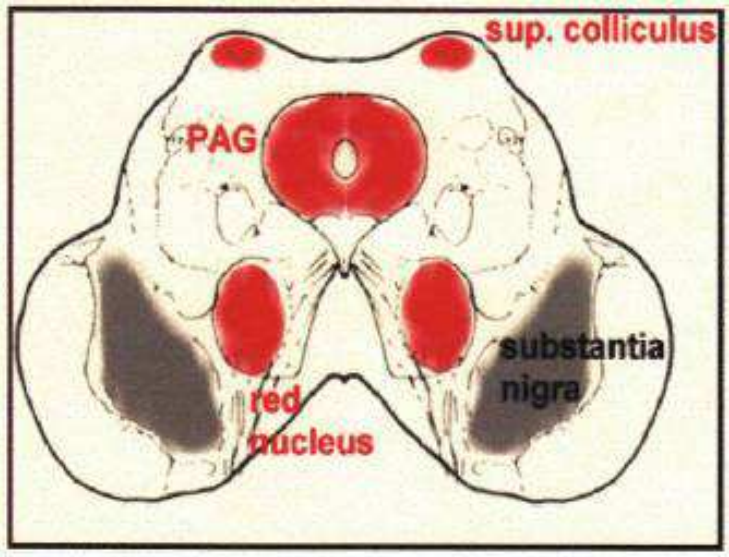

Figure 6: A more caudal section through the midbrain, showing the superior colliculus (SC) periaqueductal grey matter (PAG), and red nucleus (RN) ***(Afridi, 2005)***

The Pons

The most important pain-related nucleus in the pons is probably the locus coeruleus. This is jam-packed with noradrenaline-containing neurons, and projects to a variety of brainstem structures that modulate pain through pathways that descend to the spinal cord. Another notable group is the parabrachial nuclei, which receive a vast number of ascending spinoreticular fibres. ***(Afridi , 2005)***

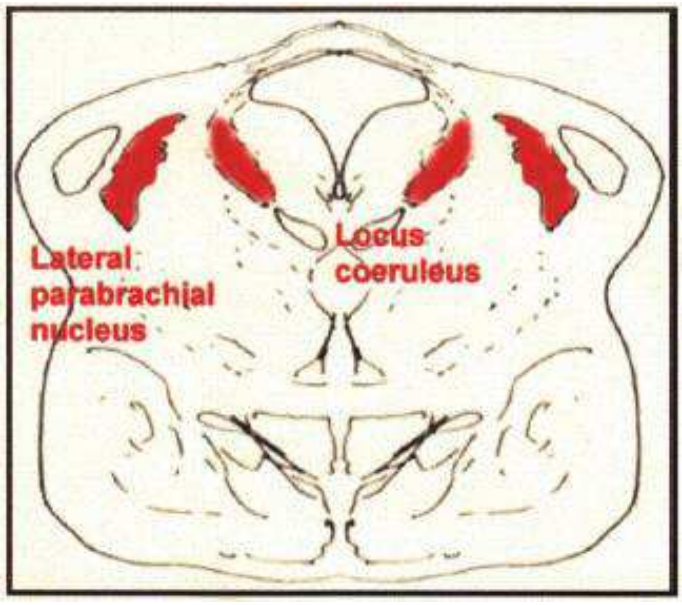

Figure 7: A cross-section through the pons, showing the locus coeruleus (LC) and the lateral parabrachial nucleus (PB) ***(Afridi , 2005)***