Evaluation of Pain Assessment in Our Neonatal Intensive Care Unit

Thesis

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List of Abbreviations

Abb.	Meaning
ACTH	Adrenal corticotropin hormone
CNS	Central nervous system**.**
CRH	Corticotropin releasing hormone.
DMPP	Descending modulatory pain pathways**.**
FSH	Follicle stimulating hormone.
GRH	Gonadal releasing hormone.
HPATG	Hypothalamic–pituitary–adrenal–thyroid–gonadal System.
IASP	International Association for the Study of Pain.
LH	Luteinizing hormone.
NCM	Nursing Comfort Measures.
NDHN	Nociceptive dorsal horn neurons**.**
NFCS	Neonatal Facial Coding System.
NICU	Neonatal Intensive Care Unit
NIPS	Neonatal Infant Pain Scale.
N-PASS	Neonatal Pain, Agitation, and Sedation Scale.
NSAIDs	Nonsteroidal anti-inflammatory drugs.
PAIN	Pain assessment in Neonates.
PAT	Pain Assessment Tool.
SUN	Scale for Use in Newborns.
T_3	Triiodothyronine.
T_4	Thyroxin.
TRH	Thyroid releasing hormone.
TSH	Thyroid stimulating hormone.

Abstract

Background: The assessment of pain in newborns represents a great challenge. Two of the major limitations to achieving pain relief in clinical practice include: The lack of a reliable biomarker. The absence of a gold standard scale that is capable of measuring the intensity of the pain.

Aim of the work: in this study we will use clinical pain assessment scales and compare it by non-invasive measure the salivary cortisol level to evaluate the accuracy of our clinical skills in evaluating neonatal pain.

Patients and Methods: This study was carried out at the Neonatal Intensive Care Unit (NICU) of Ain Shams University. A cross sectional study of 50 full term infant gestional age between 37:41 weeks of both sexes from our NICU. Patients will be enrolled after consideration of inclusion and exclusion criteria.

Results: There is a significant linear relationship between salivary cortisol level and PAT score in assessment of pain in newborn. The PAT score is easy and reliable tool to assess neonatal pain. The PAT score must be done to evaluate pain in NICUE and mange it in collaboration with the Nursing team to reduce the suffering of the infant in the NICU.

Conclusion: Concluded that Pain assessment tool (PAT score) is a useful easy, non- invasive screening method for assess neonatal pain. There was highly statistically significant positive correlation between PAT score and salivary cortisol level.

Key words: PAT score - .salivary cortisol – Triiodothyronine- Thyroxin

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INTRODUCTION

Starting at birth, critically ill newborn babies undergo repetitive, painful stimuli as part of diagnostic and therapeutic procedures that are necessary for their survival ***(Slate et al., 2010).***

In the neonatal intensive care unit (NICU) during the first two weeks after birth, newborns are exposed to approximately 16 invasive procedures per day, of which only one-third are completed under analgesia ***(Carbaja et al., 2008)***.

Some common painful procedures include:

- Heel prick. - Intubation.
- Arterial or venous line insertion. -Chest drain insertion.
- Inserting naso-gastric tube - Pulling off tape.

Common false beliefs

" Preterm infants don't feel pain"

"Preterm infants don't remember pain and it Has no long term effects"

"It is too dangerous to give anaesthesia or analgesia"

Guiding Principle

Neonates, term and preterm, do experience pain and have the right to- receive effective and safe pain relief.

We all react to pain with behavioral, physiological and biochemical and hormonal change.

The cardiovascular and respiratory effects associated with the endocrine-metabolic response to acute nociceptive stimuli may increase neonatal morbidity and mortality ***(Johnston et al., 2011)***.

The assessment of pain in newborns represents a great challenge. Two of the major limitations to achieving pain relief in clinical practice include:

- The lack of a reliable biomarker.
- The absence of a gold standard scale that is capable of measuring the intensity of the pain.

Although there are more than 30 scales for assessing pain in newborns, no specific scale has demonstrated superiority. Most of these instruments rely on physiological and behavioral parameters, which are indirect responses to the painful stimulus ***(Carbajal et al., 2008)***.

Physiological parameters, including

Respiratory rate, Heart rate, Oxygen saturation, Intracranial and blood pressure. among others, have the

advantage of being objective measures, but changes in these parameters are not specific to painful phenomenon ***(Raeside, 2011).***

The main behavioral responses to pain in preverbal infants are Crying and body and facial movements.

The facial expression reflects the painful experience effectively and specifically indeed, facial movements correlate best with cortical activity during a painful stimulus in comparison with physiologic indicators ***(Grunau, 1987)***.

Salivary cortisol: Cortisol level test which is the main adrenal glucocorticoid and plays a central role in glucose metabolism and in the body's response to stress.

Saliva tests are reliable indicators of the levels of all steroid hormones in our body. In fact, Salivary cortisol testing is covered by Plan B medicare. The National Institutes of Health (NIH) and the World Health Organization (WHO), recognize saliva cortisol testing as being very accurate ***(Elias, 2008).***

AIM OF THE WORK

In this study we will use clinical pain assessment scales and compare it by non-invasive measure the salivary cortisol level to evaluate the accuracy of our clinical skills in evaluating neonatal pain.

Chapter One
NEONATAL PAIN

Definition of pain

Pain is defined by the International Association for the Study of Pain (IASP) as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage" ***(Merskey & Bogduk, 1994).***

However, the inability to communicate verbally does not negate the possibility that an individual is experiencing pain and is in need of suitable pain-relieving treatment ***(Craig, 2006).***

Acute pain is defined as 'pain of recent onset and probable limited duration. It usually has an identifiable temporal and causal relationship to injury or disease'. **Chronic pain** 'commonly persists beyond the time of healing of an injury and frequently there may not be any clearly identifiable cause' ***(Ready & Edwards, 1992).***

Pain is not only an unpleasant sensation, but a complex sensory modality essential for survival ***(Nilesh Patel, 2010).***

The term nocicetion (Latin nocere, "to hurt") refers to the sensory process that is triggered, and pain refers to the perception of a feeling or sensation which the person calls pain, and describes variably as irritating, sore, stinging, aching, throbbing, or unbearable.

These two aspects, nociception and pain, are separate ***(Bear, 2001).***

Neurodevelopmental Changes of Fetal Pain

Pain in the developing fetus is controversial because of the difficulty in measuring and interpreting pain during gestation. It has received increased attention lately because of recently introduced legislation that would require consideration of fetal pain during intentional termination of pregnancy. ***(Semin Perinatol, 2007).***

Figure1:pain pathway.

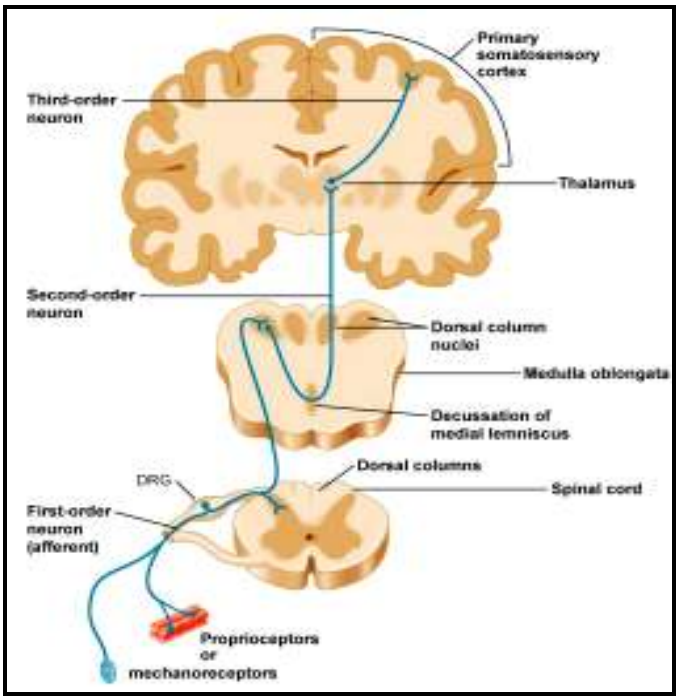

Figure (1): Pain pathway.

During development, sensory fibers are abundant by 20 weeks; a functional spinal reflex is present by 19 weeks; connections to the thalamus are present by 20 weeks; and connections to subplate neurons are present by 17 weeks with intensive differentiation by 25 weeks. These cells are important developmentally, but decline as a result of natural apoptosis. Mature thalamocortical projections are not present until 29 to 30 weeks, which has led many to believe the fetus does not experience emotional "pain" until then ***(Semin Perinatol, 2007).***

Table (1): Development of Nociception and Pain Perception Pathway by Gestational Age ***(JAMA, 2005)***

Anatomical/ Functional Characteristic	Description	Gestational Age, wk	Source
Peripheral cutaneous sensory receptors	Perioral cutaneous sensory receptors Palmar cutaneous sensory receptors Abdominal cutaneous sensory receptors	7.5 10–10.5 15	Humphrey, 1964
Spinal cord	Spinal reflex arc in response to nonnoxious stimuli neurons for nociception in dorsal root ganglion	8 19	Okado and Kojima, 1984 Konstantinidou et al, 1995

Thalamic afferents	Thalamic afferents reach subplate zone Thalamic afferents reach cortical plate	20–22 23–24	Kostovic and Rakic, 1990 Hevner, 2000 Kostovic and Rakic,1984 Kostovic and Goldman-Rakic,19 1983
Cortical function*	Somatosensory evoked potentials with distinct, constant components First electrocardiographic pattern denoting both wakefulness and act	29 30	Klimach and Cooke,1988 Hrbek et al,21 1973 Clancy et al,2003 Torres

Fig.1: Embryology of Nociceptors

weeks 3)***15 week***

2)***11 weeks*** 4) ***20 weeks***

(Anand & Hickey, 1987)