The debate on the effective use of corticosteroids as adjunctive therapy for neonatal patients affected with meningitis has continued to be a topic of discussion between physicians. While research exploring viral meningitis, including similar infections such as herpes simplex encephalitis, has demonstrated support for corticosteroid use as adjunctive therapy, bacterial meningitis has presented variable outcomes depending on species. In the literature reviewed, the aspect of corticosteroid use and effectiveness in pain management for the neonate has yet to be documented or discussed further in detail. As a motion forward, the research community must first recognize, document and assess our current efforts of pain management and resultant comfort for the neonate affected for examples with and without the use of corticosteroids. Once explored, the medical community may then criticize whether our current management strategies are enough or they place our neonatal patients in the most comfortable environment.

**INTRODUCTION & BACKGROUND**

It is well known that pain is a subjective experience by our patients of which we depend on their explanation and description, including its scale, to quantify and assess improvements in management [1].

This is with the assumption that our patient is able to communicate this information; this presents a vulnerable group of patients including those with compromising disability as well as neonates and young babies.

Indication for pain in neonates and young babies is inferred by signs of irritability, particularly when feeding. The baby cannot describe their pain or level of pain experienced and likewise is unable to describe their pain improvement. Methods used to quantify pain in the neonate patient include the use of the Modified Pain Assessment Tool (mPAT), which includes various parameters such as the neonates tone, cry, sleep pattern, expressions, vitals and nurse’s perception of the baby [2,3]. Displayed in Table 1, the score can total a maximum of 20, as they can only be assessed based on physiologic changes; recommended methods of intervention based on mPAT are listed in Table 2 [2,3]. These scores are used for assessment of the neonate post-operatively every 4 hours, however this method may also be a useful tool to be applied to assess pain of neonates admitted for treatment of acute meningitis [2,3].

**ABSTRACT**

The debate on the effective use of corticosteroids as adjunctive therapy for neonatal patients affected with meningitis has continued to be a topic of discussion between physicians. While research exploring viral meningitis, including similar infections such as herpes simplex encephalitis, have demonstrated support for corticosteroid use as adjunctive therapy, bacterial meningitis has presented variable outcomes depending on species. In the literature reviewed, the aspect of corticosteroid use and effectiveness in pain management for the neonate has yet to be documented or discussed further in detail. As a motion forward, the research community must first recognize, document and assess our current efforts of pain management and resultant comfort for the neonate affected for examples with and without the use of corticosteroids. Once explored, the medical community may then criticize whether our current management strategies are enough or they place our neonatal patients in the most comfortable environment.

**KEYWORDS**

**INTRODUCTION & BACKGROUND**

It is well known that pain is a subjective experience by our patients of which we depend on their explanation and description, including its scale, to quantify and assess improvements in management [1].

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**Table 1. The Modified Pain Assessment Tool and Scale [2,3].**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posture/ton e</td>
<td>Relax, normal, some flexion</td>
<td>Extended, digits widespread, trunk rigid, limbs abducted, shoulders raised off bed</td>
<td>Flexed and/or tense, lists clenched, trunk guarded, limbs drawn to midline, head/shoulders resist posturing</td>
</tr>
<tr>
<td>Cry</td>
<td>No</td>
<td>Yes, consolable, can be settled</td>
<td>Yes, when disturbed, does not settle after handling, loud, whimpering, whining</td>
</tr>
<tr>
<td>Sleep pattern</td>
<td>Relaxed</td>
<td>Easily woken</td>
<td>Agitated or withdrawn, wakes with startle, restless, squirming, no clear sleep/wake pattern, eye aversion or “shut down”</td>
</tr>
<tr>
<td>Expression</td>
<td>Relaxed, normal</td>
<td>Frown, shallow furrows, eyes lightly closed</td>
<td>Grimace, deep furrows, eyes tightly closed, pupils dilated</td>
</tr>
<tr>
<td>Colour</td>
<td>Pink, well perfused</td>
<td>Occasionally mottled or pale</td>
<td>Pale/dusty/flushed, palmar sweating</td>
</tr>
<tr>
<td>Respiration</td>
<td>Normal baseline rate</td>
<td>Tachypnea, at rest</td>
<td>Apnea, at rest with handling</td>
</tr>
</tbody>
</table>

**Table 2. Scoring and Intervention with the use of the Modified Pain Assessment Scale [2,3].**

<table>
<thead>
<tr>
<th>mPAT Score</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>Nursing Comfort Measures (NCM)</td>
</tr>
<tr>
<td>&gt;5</td>
<td>Paracetamol/Clonidine/Other Non-Opioid Analgesia with NCM</td>
</tr>
<tr>
<td>&gt;10</td>
<td>Opioids with Non-Opioid Analgesia/Analgesia Dose Adjustment with NCM</td>
</tr>
</tbody>
</table>

In effort to reduce inflammation, corticosteroids have been used. The use of corticosteroids in the management of pain for neonates with meningitis has been discussed with much debate on the validity of its use in management with respect to acute meningitis depending on the type of meningitis or organism as well as the presence of additional immune compromising infections [4,6,7,8]. Corticosteroids have been shown to decrease pain sensation by inhibiting prostaglandin synthesis [5]. This reduces further inflammation cascade, as well as edema, contributing to a decrease in overall intracranial pressure; the result is a decrease in visceral pain experienced [5]. It is important to note that the use of corticosteroids is meant to be used for a short term, as recommended 1-3 weeks of treatment [5,9].

**Review**

**SEARCH STRATEGY:**

Search engines including PubMed Central were used with the following key words:

- “meningitis” and “corticosteroids” (1998)
- “Viral” and “meningitis” and “corticosteroids” (98)
- “neonate” and “pain” (8321)
- “neonate” and “pain” and “corticosteroids” (139)
- “neonate” and “pain” and “corticosteroids” and “meningitis” (2)

**FINDINGS:**
As meningitis is inflammation of the meninges of the brain, the pathophysiology includes compression of the brain within the skull compartment, leading to neurological sequelae, some of which lead to irreversible neurological damage [10]. The pathogenesis may be viral or bacterial, and although they result in similar clinical manifestations, theories and research regarding the outcome of corticosteroid use has also varied [4].

With regards to viral causes of meningitis, literature review has demonstrated support for the use of corticosteroids as adjunctive therapy with cases of viral CNS infections in addition to antiviral therapy, including cases of herpes simplex encephalitis [7,11]. The current debate with respect to the use of corticosteroids refers mainly to bacterial causes. Interestingly, variability between the species of bacteria causing meningitis seem to present a different prognosis with respect to mortality and morbidity. Some examples include infections due to Tuberculous Meningitis which has shown favorable clinical outcomes for the use of corticosteroids as adjunctive treatment, whereas Streptococcus Suis has not; similarly, cases due to Haemophilus Influenza, Neisseria Meningitidis and Streptococcus Pneumonia infection have also shown contradictory results [4,6,7,8]. Those which did not show positive results with the use of adjunctive corticosteroid treatment, however, were also associated with a higher prevalence of human immunodeficiency virus (HIV) and low socioeconomic status in the community and sample size [4,6]. Though the results are varied, the data does support the early use of corticosteroids as being essential in preventing neurologic sequelae, specifically for hearing loss [4,6,8,9,12,13].

Within the literature, some discussion has included the suggestion to wait for culture confirmation of bacterial species prior to the admission of corticosteroids as adjunctive therapy [4]. However, others argue that delayed use of corticosteroids may not be effective in reducing inflammation [9]. Limitations discovered within the literature search demonstrated a lack of studies which specifically adhered to treatment of neonates as well as a lack in assessment of their pain status or use of pain assessment tools, such as the Modified Pain Assessment Tool while being treated for acute meningitis. As a proposed movement forward, analysis of parameters, such as assessment of the neonate's pain upon admission and time of treatment, with or without corticosteroids, may allow us to understand the potential benefit of corticosteroid use in management of neonatal meningitis and whether its use is of significant benefit to the neonate.

CONCLUSIONS

Currently within the literature there are no description or use of variables to demonstrate the sensation of pain or improvement of pain during treatment of neonates diagnosed with meningitis. Scales such as the mPAT should be applied to neonatal care and research regarding the efficacy to reduce pain with the use of corticosteroids should be evaluated based on the associated mPAT scores. Without such an approach, the use of dexamethasone for pain management, and its debate, cannot be justified appropriately or in further detail without the describing or quantifying pain experienced to demonstrate any potential improvement.

REFERENCES