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RESEARCH ARTICLE

COMPARISON OF DEXMEDETOMIDINE AND CLONIDINE AS ADDITIVE WHEN GIVEN SEPARATELY, PREMIXED WITH 0.25% ROPIVACAINE IN PEDIATRIC CAUDAL BLOCK, ON INTRA OPERATIVE ANESTHETIC/ ANALGESIC DRUG REQUIREMENT AND DURATION OF POST OPERATIVE ANALGESIA IN HYPOSPADIAS REPAIR SURGERIES

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Abstract

Aim: Comparison of dexmedetomidine and clonidine as additive when given separately, premixed with 0.25% ropivacaine in pediatric caudal block,on intra operative anesthetic/ analgesic drug requirement and duration of post operative analgesia in hypospadias repair surgeries.

Methods and Materials: Children,whose parents or guardians,were willing to give consent and fulfilled inclusion criteria were selected for the study.Thepatients were randomly allocated, by double blinding into two groups. Group RD received 0.25% ropivacaine 1 ml/kg +2µg/kg dexmedetomidine (in 0.5 ml volume).Group RC received 1 ml/kg of 0.25% ropivacaine + 1 µg/kg of clonidine (in 0.5 ml volume).

Results: Mean age of patients receiving dexmedetomidine and clonidine was 3.20±1.821 and 4.47±1.727 years respectively. No significant difference was obtained in terms of mean age.Blood pressure,Heart rate and Saturation was maintained by both dexmedetomidine and clonidine similarly as revealed by the insignificant p value of >0.05 across the time points during hypospadias repair surgeries.Requirement of adjuvant analgesics intraoperativery and post operative complicationsand was found to be similar in both the groups as revealed by the insignificant P value of 0.309. Time for rescue analgesic postoperatively (min) was significantly ($p<0.001$) longer among patients receiving dexmedetomidine (706.73±107.428) than clonidine (504.33±97.573).

Conclusion: We observed that a single caudal injection of dexmedetomidine (2µg/kg) added to ropivacaine 0.25% offers an advantage over a similar injection of clonidine (1µg/kg) added to ropivacaine 0.25% for postoperative pain relief in children undergoing hypospadias repair surgeries without increase in post operative complications.

Introduction:-

The caudal epidural blocks is one of the most common, dependable, and secure techniques used in paediatric analgesia. It is capable of delivering analgesia for a wide range of infra umbilical surgeries. The limited duration of effect that follows a single injection of caudal analgesia is the primary drawback of this method of pain relief. It is

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not common practise to utilise caudal catheters in order to provide repeated doses or infusions of local anaesthetics. One reason for this is because there is a risk that infections may result from their usage. The use of different adjuvants, such as epinephrine, opioids, ketamine, and alpha 2 agonists, has prolonged duration of caudal analgesia to be obtained by the use of a single-shot approach. There are three potential processes that might explain the activity of clonidine, which is analogous to the action of local anaesthetics, as well as its interaction with local anaesthetics. First, clonidine inhibits A-delta and C fibres by increasing the potassium conductance in neurons that are separated, which heightens the conduction block caused by a local anaesthetic. [3] Secondly, clonidine has the potential to promote local vasoconstriction, which reduces the amount of local anaesthetic that spreads to and is removed from neural regions. While there is limited evidence of this mechanism at therapeutic dosages, this effect is mediated through pharmacological action on postsynaptic alpha 2 receptors. [4] Thirdly, when combined with a spinal local anaesthetic or utilised in peripheral blocks, clonidine amplifies the effects of analgesia and extends their duration. [5] Spinal alpha-2 adrenergic agonists have the potential to cause analgesia by activating cholinergic neurons in the spinal cord, which then results in the release of acetylcholine. [6] Compared to clonidine, dexmedetomidine has an affinity for alpha 2 adrenergic receptors that is eight times higher and a much smaller effect on alpha-1 receptors. The greater selectivity of dexmedetomidine towards alpha 2a receptors in comparison to that of clonidine for alpha 2a receptors, a significant benefit of dexmedetomidine. [7]

Methods and Materials:-

This analytical cross sectional study was done in the Department of Anaesthesiology and Critical Care, SAMC & PGI, Indore (M.P.) approved by the institutional ethical committee. Patient whose parents or guardians are willing to give consent and fulfilled inclusion criteria were selected for the study. The patients were randomly allocated, by chit system, into two groups. Group RD received 0.25% ropivacaine 1 ml/kg + 2 µg/kg dexmedetomidine (in 0.5 ml volume). Group RC received 1 ml/kg of 0.25% ropivacaine + 1 µg/kg of clonidine (in 0.5 ml volume). Drugs were prepared by the same person throughout the study, who was involved only in group allocation. Data recording and drug administration[wasdone by another person, not aware of the group of patients (double blinding).]

Inclusion criteria

1. Patient undergoing hypospadias repair surgery
2. American Society of Anesthesiologists (ASA) grade 1 and 2 patients.
3. Age upto 8 years

Exclusion criteria

1. Parent or Guardian refusal for consent.
2. History of developmental delay and mental retardation.
3. Patient with known allergy to any drug or infection at the local site.
4. Children with coexisting medical illness (preexisting neurological disease, coagulation disorder)
5. Anatomical abnormalities of Spine and Sacrum and Failed single shot caudal block

An informed written consent was obtained from parents or guardians were taken before the procedure. Detailed pre-anesthetic evaluation was done. Before shifting them to the operating room, intravenous glycopyrrolate 0.01mg/kg, intravenous midazolam 0.1mg/kg and intravenous ketamine 2mg/kg was administered as pre-medication according to body weight to all the patients in both the groups. The patient was then shifted into the operating room and monitors (electrocardiogram, non-invasive blood pressure and pulse oximeter) were connected and baseline values were recorded. Anesthesia was induced using an inhaled technique of sevoflurane in oxygen via a pediatric circuit system. A proper size Laryngeal mask airway (LMA) insertion was done. Spontaneous ventilation was maintained throughout the surgical procedure maintaining a Minimum Alveolar Concentration (MAC) value of one. Caudal block was administered under general anesthesia.

Statistics Analysis

Descriptive statistics was used to show the characteristics of the collected sample.The observation between groups was compared by using student P' test.The association between qualitative parameters was shown by using Pearson's chi square test/ Fisher's exact test and P value (probability value) <0.05 will be considered as significant.

Results:-

In the current study,mean age of patients receiving dexmedetomidine and clonidine was 3.20±1.821 and 4.47±1.727 years respectively. No significant difference was obtained in terms of mean age between the groups as revealed by the insignificant p value of 0.061.
Vitals were recorded pre-operatively,before induction and intraoperatively after caudal block at 1 minute,3 minute,5 minute,10 minute,20 minutes,30 minutes, 45 minute and after an hour.

Systolic blood pressure,Diastolic blood presssure, Heart rate, Mean arterial pressure and Saturation(Sp02) was maintained by both dexmedetomidine and clonidine similarly as revealed by the insignificant p value of >0.05 across the time points during hypospadias repair surgeries.

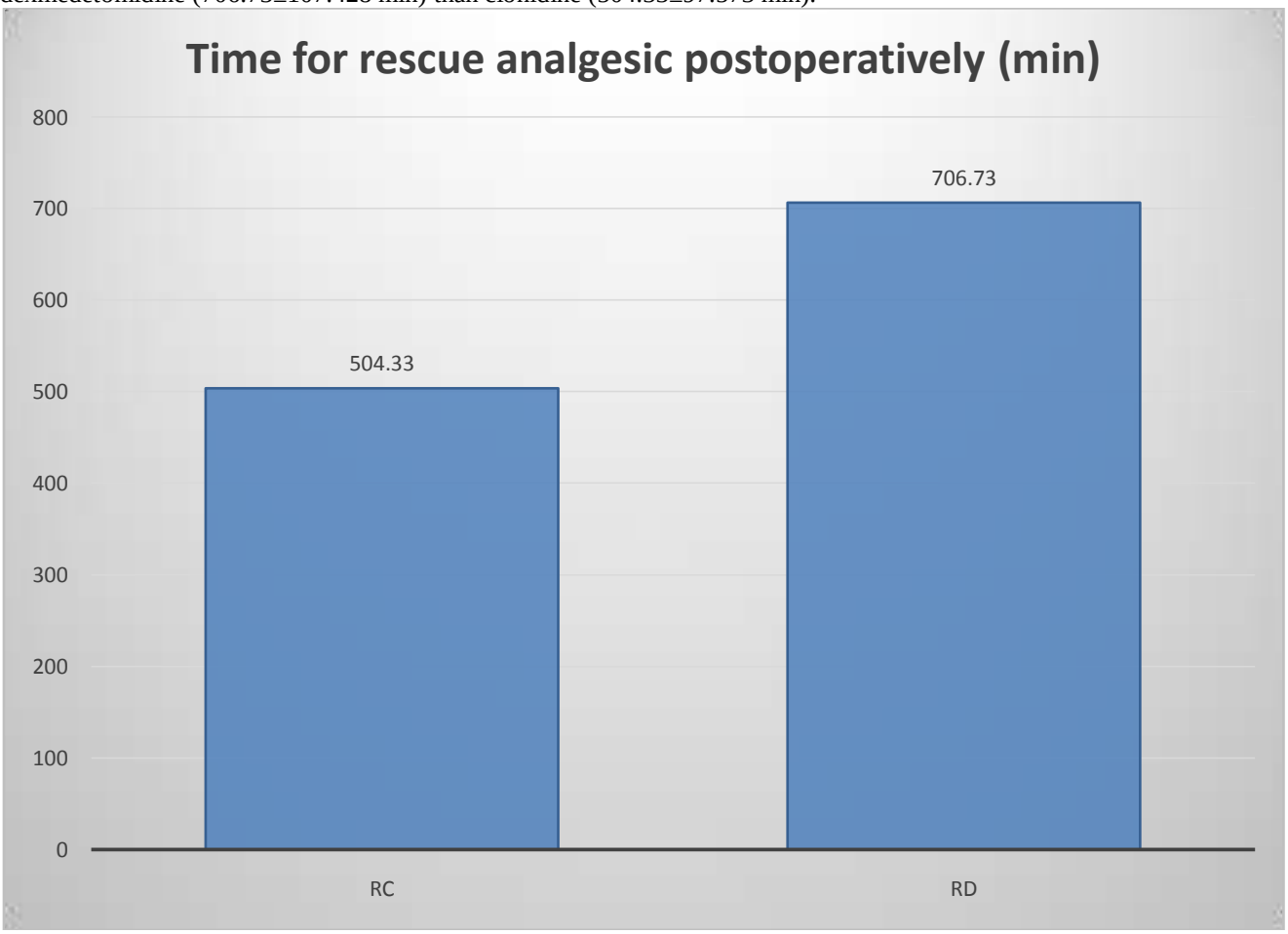
Requirement of adjuvant analgesics was found to be similar in both the groups as revealed by the insignificant P value of 0.309.

We found no statistically significant difference between incidence of post operative complication between both the study groups.

Table 1:- Time for rescue analgesic postoperatively (minutes).

	Groups	N	Mean	Std. Deviation	Std. Error Mean	P value
Time for Rescue Analgesic	RC	15	504.33	97.573	25.193	<0.001
	RD	15	706.73	107.428	27.738	

Time for rescue analgesic postoperatively (min) was significantly (p<0.001) longer among patients receiving dexmedetomidine (706.73±107.428 min) than clonidine (504.33±97.573 min).



Discussion:-

Pain is an unpleasant feeling that can only be perceived and not communicated, particularly in children who are wholly dependent on their parents or other caretakers for their overall health and well-being. During the last few years, there has been a significant advancement in both the idea of postoperative pain reduction and the utilisation of it in the paediatric age range. To this day, several techniques have been developed in order to alleviate post-operative pain in children; however, these techniques all have some undesirable side effects, which prevent them from being used on children. For instance, narcotics have the potential to cause respiratory depression in children; oral analgesics cannot be administered for a period of time following general anaesthesia due to the fear of vomiting and aspiration; and when it comes to parenteral analgesics, there is a fear of getting pricked by a needle.[7]

In clinical trials for the first time in 1984, the analgesic effect of clonidine administered intrathecally or epidurally was demonstrated. Due to the positive results obtained from the administration of epidural clonidine in adult patients, this medication was investigated for use in paediatric caudal block. Following surgery, caudal clonidine has been shown in numerous studies to lengthen the period during which patients experience reduced levels of pain. On the other hand, although dexmedetomidine is only available for intravenous use at the moment, it has been given epidurally to humans as a postoperative analgesic in clinical trials. Despite this, there are some concerns that remain regarding the matter of its safety. [8]

Clonidine is being progressively employed now a day for potentiating the analgesic activity of several local anaesthetics delivered locally. The primary objective of our research was to determine whether or not caudal administration of dexmedetomidine was more effective than caudal administration of clonidine, when combined with the 0.25% solution of ropivacaine,

The primary take away from the current research is that a caudal bolus injection of a combination of ropivacaine 0.25% and dexmedetomidine 2µg/kg offers superior postoperative analgesia when compared to a combination of ropivacaine 0.25% and clonidine 2µg/kg. The search for the perfect mix of medications to provide during caudal anaesthesia in children is an endeavour that will never be completed; nonetheless, the attempts to administer comparably safer drugs in lower concentrations are increasing day by day. Ropivacaine is one such medicine that seems to be linked with larger safety margin and lower systemic toxicity, but such toxicity has been recorded in adults after other regional anaesthetic procedures. [9,10] Clonidine induces analgesia through a nonopioid mechanism. [11] Klimscha et al. conducted research on the efficacy of caudal clonidine in potentiating the postoperative analgesic effect. They discovered that in young children with a mean age of 3 years who underwent an elective lower abdominal day care surgery, the addition of 1-2 µg/kg of clonidine to ropivacaine 0.25% significantly prolonged the median duration of analgesia and reduced the total dose of postoperative analgesia[12] The results of our investigation are nearly identical to the observations made by Klimscha et al., in that the duration of postoperative analgesia was considerably increased in patients who received dexmedetomidine or clonidine in addition to ropivacaine as an adjuvant.

Clonidine administered via the neuraxial route has the effect of reducing the production of impulses by preganglionic sympathetic nerves. In a similar manner, the predominance of the parasympathetic nervous system is associated with an increase in vagal tone, which is associated with bradycardia.[13] The mean arterial pressure (MAP) was kept stable by both dexmedetomidine and clonidine in a comparable manner, as shown by the non-significant value of p (>0.05) during the hypospadias correction procedures. Both dexmedetomidine and clonidine were successful in maintaining HR during all of the hypospadias correction procedures, as seen by the non-significant p value of >0.05.Similar results was studied by Klimscha et al.[12]

Conclusion:-

Our findings lead us to the conclusion that a single caudal injection of dexmedetomidine (2µg/kg) added to ropivacaine 0.25% offers an advantage over a similar injection of clonidine (1µg/kg) added to ropivacaine 0.25% for postoperative pain relief in children undergoing hypospadias repair surgeries. This was the case even though the incidence of complications was not increased.

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