Title: Tale of dexmedetomidine: could be an alternative choice for pediatric's mri sedation?

Authors

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ABSTRACT

Background: Dexmedetomidine is an high selective alpha2 adrenergic agonist on locus ceruleus with sedative, anxiolytic and analgesic effects. Compared to convetional anesthetic agents, patients sedated with Dexmedetomidine remain arousable.
In the last few decades intranasal dexmedetomidine has been studied for Pediatric's MRI sedation. It is a relative non-invasive, convenient and easy route.

Objective: Our primary aim was to demonstrate that high doses of intranasal Dexmedetomidine could be a solo sedative agent for successful MRI sedation.
Our secondary aim was to determinate if intranasal Dexmedetomidine could reduce the amount of additional sedative needed for MRI sedation with no adverse events.

Methods: A retrospective study was performed from October 2018 to April 2019. Our patients between 6 months to 8 years of age who received 4mcg/kg of intranasal Dexmedetomidine for MRI were included in the analysis. Accordingly to UMSS (University of Michigan sedation scale), sedation level > 2 was considered adequate to perform the scan; if UMSS level was < 2 , a bolus of 0,05 mg/kg MDZ IV and/or 1mg/kg Propofol IV was administrate in order to maintain the sedation. Vital signs (heart rate, respiratory rate, non invasive blood pressure, oxygen saturation, end-tidal carbon dioxide) and level of sedation were recorded throughout the procedure.

Results: A total of 71 patients were included in our study, median age was 3,3 (1,9-5,3).
51 (71,83%) of them arrived in MRI room with a sedation level > 2.
Anyway only 7 patients maintained the same level of sedation after being moved into MRI bed.
The number of patients who required the rescue drug was significantly high (90.14%).
Despite of the high number, we observed an important reduction in the total dose of MDZ and Propofol.
None of them manifested adverse effects. Specifically no-one needed ventilation support.

Conclusions: Intranasal Dexmedetomidine is not enough as a SOLO sedative to perform the MRI scan in pediatric patients but in the era of multimodal anesthesia we provide, the use of more than one sedative agents can be the safer way for sedating pediatric patients undergoing MRI.

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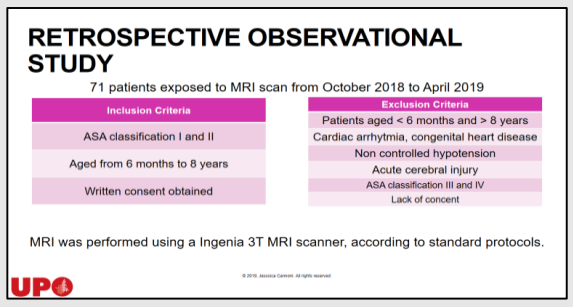
Background: Magnetic resonance imaging (MRI) has become a critical diagnostic imaging tool in a host of pediatrics disease. MRI is non-invasive, but deep sedation is frequently required in children to remain motionless and to achieve quality diagnostic images. Dexmedetomidine is an high selective alpha2 adrenergic agonist on locus ceruleus with sedative, anxiolytic and analgesic effects. Compared to conventional anesthetic agents, patients sedated with Dexmedetomidine remain arousable.
In the last few decades intranasal dexmedetomidine has been studied for Pediatric's MRI sedation. It is a relative non-invasive, convenient and easy route.

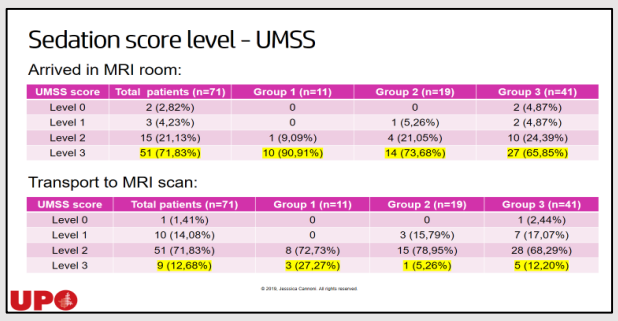
Objective: Our primary aim was to demonstrate that high doses of intranasal Dexmedetomidine could be a solo sedative agent for successful MRI sedation.
Our secondary aim was to determinate if intranasal Dexmedetomidine could reduce the amount of additional sedative needed for MRI sedation with no adverse events.

Methods: seventy-one patients who were exposed to MRI examination for various reasons (oncological diseases, seizures, genetic syndrome, developmental and/or language delay, autism spectrum disorder, cerebrovascular disease) were included in this study from October 2018 to April 2019.
Intranasal Dexmedetomidine at 4mcg/kg was administered by atomization with the Mucosal Atomization Device,at least 30 minutes before the scheduled procedure time.
Accordingly to UMSS (University of Michigan sedation scale), sedation level > 2 was considered adequate to perform the scan; if UMSS level was < 2 , a bolus of 0,05 mg/kg MDZ IV and/or 1mg/kg Propofol IV was administrate in order to maintain the sedation. Vital signs (heart rate, respiratory rate, non invasive blood pressure, oxygen saturation, end-tidal carbon dioxide) and level of sedation were recorded throughout the procedure.
Patients were discharged from MRI room and, for safety reason, they were observed at least 2- 4 hours after the end of MRI scan in pediatrics department (vital signs and sedation's score were taken on hourly basis until the complete wake-up).

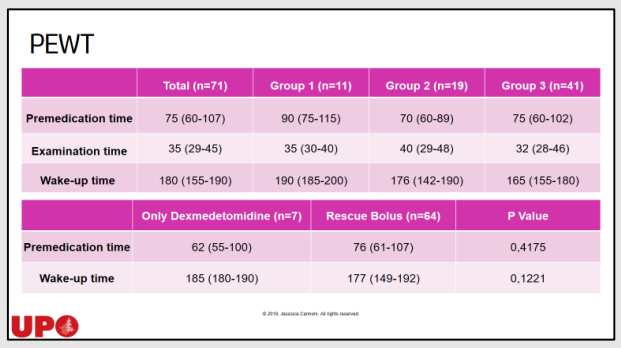


RESULTS

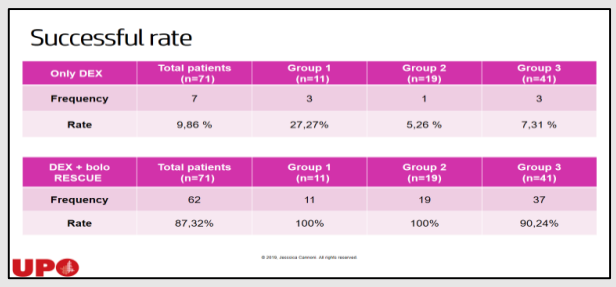
A total of 71 patients were included in our study, median age was 3,3 (1,9-5,3).
We know from other studies that the sedative effects of Dexmedetomidine is increased with young age (especially under 1-year-old due to a decreased clearance of Dexmedetomidine in neonates and infants) ,so we divided the all patients into 3 different groups to compare the level of sedation with age.
The sedation score recorded when the patients arrived in MRI room was > 2 in 71,83% of the total patients (and it was 90,91% in the first group, it was 73,68% in the second group and 65.85% in the third group).

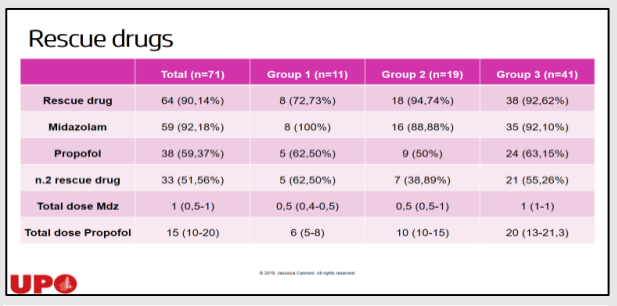


Our premedication time defined as the time between the time of administration dose and the time of the beginning of the scan was 75 min (60-107), no difference between the three groups were found. The median wake up time was 185 min (180-190) in the patients with only Dexmedetomidine and 177 min (149-192) in the patients who require also other drugs. Again no statistically significant difference was found (p= 0,1221)

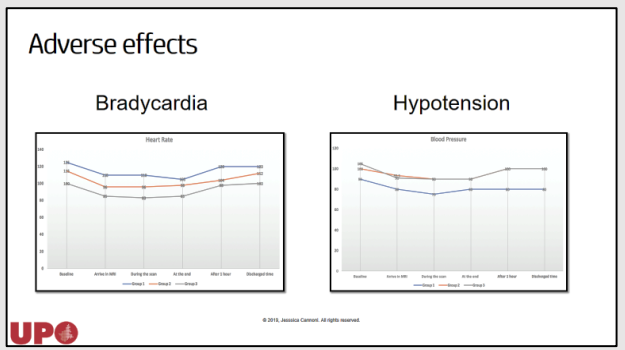


Anyway only 7 patients maintained the same level of sedation after being moved into MRI bed.The number of patients who required the rescue drug was significantly high (90.14%). Despite of the high number, we observed an important reduction in the total dose of MDZ and Propofol.





In our study we observed a reduction in HR (less than 20%) in 24 patients (33,8%) post administration of Dexmedetomidine, and it was increased to 36 patients (50,7%) during the procedure.
Hypotension (mean blood pressure less 20% baseline) was observed in 10 patients (14,1%) after intranasal Dexmedetomidine and it increased to 12 patients (16,9%) during the scan. Hypertension weren't observed in any patient.
Only two patients on 71 had an oxygen saturation of 94% when they arrived in MRI room. Specifically no-one needed ventilation support



DISCUSSION

In our study only 7 patients (9,86%) performed the procedure with Dexmedetomidine as the solo sedative.
All subjects required rescue drugs during the transport into the scanner. To minimize the need of additional sedation at this point, it would be worthwhile to wait until the patients again calm down on the MRI bed. Unfortunately, this was not always possible due to hospital and radiologic team schedule. Compared with this low successful rate, the number of patients who required rescue drugs was significantly high. Only 2 patients (4,35%) needed a Propofol continuous infusion to complete the procedure (2 patients were in the third group).
Despite the number of patients that required rescue drugs, what we observed is an important decrease in the total dose of drugs such as Midazolam and Propofol administered, compared to those that would have been served without Dexmedetomidine.
We found a common decrease in heart rate and blood pressure after the administration of intranasal Dexmedetomidine in all the three groups, but we didn't found a median heart rate and a median blood pressure above the minimum value to be treated base on the age of the patients. No one had an important desaturation (SpO2 less the 90%). No respiratory depression was reported, we did not have cases of laryngospasm, airway obstruction or apnea, and no one needed ventilation support.

CONCLUSIONS

Based on collected data, intranasal Dexmedetomidine 4 mcg/kg can be the alternative drug for MRI scan premedication/sedation even if is not enough as a SOLO sedative BUT, in the era of multimodal anesthesia we provide, the use of more than one sedative agents can be the safer way for sedating pediatric patients undergoing MRI.
According to this, intranasal Dexmedetomidine was associated with a bold reduction of Midazolam or Propofol dosage needed for procedure completion. This may help to prevent the most important adverse effects such as the respiratory depression. In fact, we didn't found any respiratory depression or bigger adverse events.
In our experience, the use of intranasal Dexmedetomidine has greatly simplified the procedure, reduced the timing of the procedure itself, and allowed to carry out a greater number of procedures on the same day, compared to the ones obtained with Propofol IV.

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