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Recovery outcome of Thiopentone vs. Propofol as anaesthetic agent in pediatric patients of 2-10 years age group undergoing magnetic resonance imaging (MRI)

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Abstract

Background: Children between 2-10 years age group who undergo magnetic resonance imaging (MRI) requires sedation/ general anaesthesia for good quality images, as immobility is very essential. Providing sedation/GA in an MRI suite is quite different than in operation theatre. This study is undertaken to compare two drugs Propofol and Thiopentone as anaesthetic agents to provide sedation and immobilization during MRI and to compare their recovery time and recovery characteristics in children between age 2-10 years undergoing MRI.

Aims and objectives: To compare the recovery outcome of Thiopentone and Propofol as an anaesthetic agent in children undergoing MRI of age 2-10 yrs. Objectives: to assess the recovery by Glasgow coma scale (GCS) immediately after the procedure, at the end of 15mins, 30mins and 1hour.

Methodology: This Quasi Experimental study was conducted on 40 children who were undergoing elective MRI for various reasons, were divided into two groups, using sealed envelope method.

Group T (Thiopentone): n=20 Group P (Propofol): n=20, A detailed preanaesthetic evaluation was done. Instructed NPO guidelines were followed and premedication with Triclofos 50mg/kg and Atropine 0.02mg/kg was given 60 minutes before the scheduled time. Patients in the T group were induced with inj. Thiopentone 4mg/kg, and maintained with 0.5-1mg/kg/min. patients in group P were induced with inj. Propofol 1mg/kg and maintained with 100-150mcg/kg/min. Study begins at the end of the procedure, where parameters like response to oral commands, and GCS assesment immediately, at 15min, 30 min and at the end of 1 hour are noted.

Results: GCS assessment in Propofol group was better statistically as the p value was 0.002, 0.013, 0.00 and 0.00 at various time interval.

Conclusion: The Propofol group had faster and complete recovery, when compared to Thiopentone group.

Keywords: MRI, GCS, GA, Propofol, Thiopentone

Introduction

With the increasing use of imaging modalities for the purpose of diagnosing various conditions, there has been a drastic increase in the number of MRI procedures that have been performed globally.

Children between 2-10 years age group who undergo magnetic resonance imaging (MRI) requires sedation/ general anaesthesia for good quality images, as immobility is very essential. Providing sedation/GA in an MRI suite is quite different than in operation theatre.

Most of the time children between 2-10 years of age undergo this procedure by inhalation induction followed by intubation with an endotracheal tube and controlled ventilation. At the end of procedure reversal of muscle relaxant done, extubated and sent to recovery for observation.

Some anesthesiologists conduct this procedure without intubation, by giving intravenous premedication followed by induction agent and the same is used for maintenance of anaesthesia, spontaneous ventilation with the supplementation of oxygen. Children are kept immobile without muscle relaxants. When the procedure is about to over the anaesthetic infusion is stopped and allowed the child to recover well after the MRI, observed and sent to ward, ready to discharge as a daycare procedure.

Thiopentone sodium was the only intravenous anaesthetic agent available and was used in these kinds of procedures. Thiopentone produces sufficient depth of anaesthesia to take good MRI images. But, the problem was a delay in recovery and many at times children require admission to the hospital. Propofol is widely used as an induction agent for almost all cases who require daycare procedures in adults. It can be considered as the agent of choice in daycare procedures where muscle relaxation is not required, but an immobile child during the procedure, and quite awake child after the MRI, so that it can be used for the daycare procedure.

Hence the present study is undertaken to know the recovery characteristics of Thiopentone anaesthesia and Propofol anaesthesia in children between 2-10 years of age, as they require sedation or general anaesthesia for proper magnetic resonance imaging.

The present study was undertaken to find out the recovery time and recovery characteristics using both intravenous induction agents.

Materials and Method

Methodology

After approval from the ethical committee children of ASA physical status I and II between the age two to ten years scheduled for elective MRI at Yenepoya Medical College Hospital Deralakatte, Mangalore are studied prospectively. Informed written consent from the parent obtained. Patients were divided in to two groups based on randomisation by closed envelop method.

Two groups:

Group T Thiopentone
Group P Propofol

Study Design

Quasi experimental study

Sampling technique: randomization in to two groups using sealed envelope method

Group T (Thiopentone is used during the MRI procedure): n=20

Group P (Propofol is used during the MRI procedure): n=20

Inclusion Criteria

- Children between age of 2-10years who are cooperative and clinically with normal central nervous system function undergoing elective magnetic resonance imaging (MRI) under anaesthesia.
- ASA physical status I and II.

Exclusion Criteria

- Mentally retarded children
- Children who require endotracheal anaesthesia
- Children with the cardio-pulmonary illness.
- History of allergy to anaesthetic drugs

Method

On the day of the procedure, all the patients received premedication with syrup Triclofos 50mg/kg (Pedichloryl syrup) and Atropine 0.02mg/kg orally 90 minutes before the scheduled time.

The patients were shifted to the anaesthesia procedure room and will be positioned in supine position. Standard ASA monitors were connected (3 lead ECG, NIBP, Pulse Oximetry), baseline readings were taken and Intravenous access was secured. All the Patients were pre-oxygenated with 100% oxygen for 3-5mins.

In Group T (Thiopentone): 2.5% dilution of Thiopentone was used

- Patients induced with Inj Thiopentone 4mg/kg.
- Maintenance was done with 0.5-1mg/kg/min. Total of 40ml solution made of Thiopentone 2.5% and normal saline this was infused over 1hour. Maintenance was done with Oxygen and Nitrous oxide at 30:70%

In Group P (Propofol)

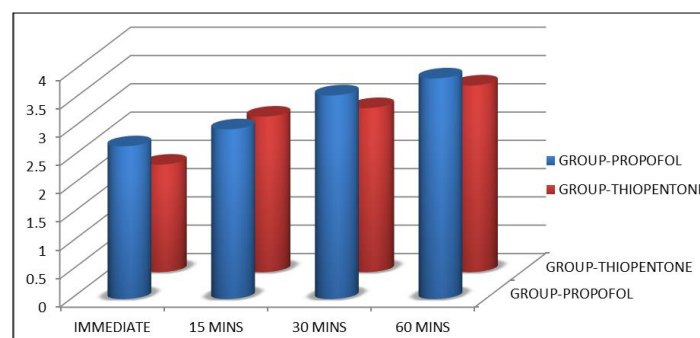
- Patients induced with Inj Propofol 1mg/kg.
- Maintained with Propofol 100 mcg/kg/min, Total of 40ml solution made of Propofol and normal saline was infused over 1hour and Oxygen and nitrous oxide at 30:70%.
- Study begins at the end of the procedure.
- Parameters assessed are, response to oral commands and GCS (Glasgow coma scale) immediately after the procedure, at 15mins, 30mins and at the end of the 1 hour.
- Patients will be shifted to recovery room after the procedure and vitals are monitored.
- Any adverse effects like nausea or vomiting will be treated accordingly.

Results

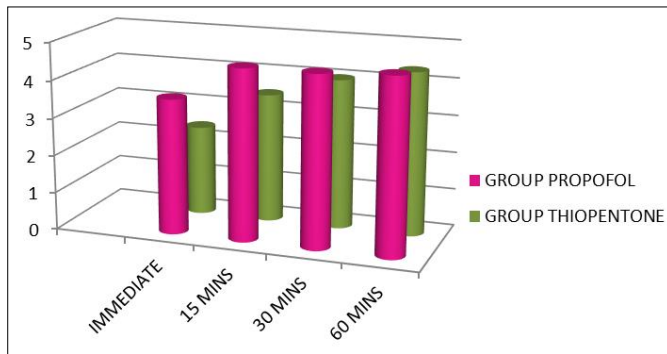
Data was collected in both the groups and observations of the analysed data are presented as mean and standard deviation in the tabular form.

Results were compared using Mann-Whitney U test.

The mean values are plotted on bar graph and presented below.

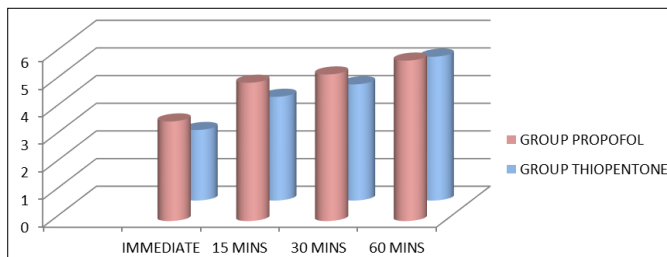


Graph 1: Comparison of eye opening eye opening time immediately after the procedure, eye opening at 15minutes, 30minutes and after 60 minutes in Propofol group was better with significant p value of 0.002, 0.013, 0.00 and 0.00 respectively.



Graph 2: Response to verbal commands.

Children in group Propofol had better verbal response immediately after the procedure and at 15 minutes with p values of 0.00 and 0.00 respectively which is very significant when compared to Thiopentone group.



Graph 3: Comparison of motor response

Propofol had better response to motor commands immediately, at 15 minutes, 30 minutes and 60 minutes with p values of 0.00, 0.00, 0.00 and 0.001 respectively which very significant when compared to Thiopentone group

Discussion

In our present study we compared the two anaesthetic agents for their recovery outcome. We compared Glasgow coma scale (GCS) between the two groups. GCS includes 3 components- eye opening, verbal response and motor response. We assessed eye opening, verbal response and motor response immediately after the procedure, at 15 minutes, 30 minutes and at 60 minutes.

We found that, eye opening time immediately after the procedure, eye opening at 15 minutes, 30 minutes and after 60 minutes in Propofol group was better as GCS was low and with significant p value of 0.002, 0.013, 0.00 and 0.00 respectively.

P values are very significant at 30 minutes and 60 minutes when compared with Thiopentone group.

When we evaluated the Glasgow coma scale following the procedure to find out the response to verbal commands in both the groups, we found that children in group Propofol had better verbal response immediately after the procedure and at 15 minutes with p values of 0.00 and 0.00 respectively which is very significant when compared to Thiopentone group. Whereas, response to verbal commands was similar in both group at 30 mins and at 60 minutes with p values of 0.053 and 0.147 respectively.

When we evaluated Glasgow coma scale following the MRI procedure to know recovery outcome in both the groups, we found out that, children who received Propofol had better response to motor commands immediately, at 15 minutes, 30 minutes and 60 minutes with p values of 0.00, 0.00, 0.00 and 0.001 respectively which very significant when

compared to Thiopentone group.

In a prospective randomized study that was done in the year 2017 by Kirti Kamal on sixty children where they compared safety and efficacy of Inj dexmedetomidine versus Inj Propofol stated that the average recovery time was much lesser in Inj Propofol group when compared to dexmedetomidine group.

In a study done by Raafat S. Hannallah *et al.*, in 100 children also showed similar findings that are comparable to our study. They compared Propofol/halothane and Thiopentone/halothane they stated that children who received Propofol recovered faster (22 vs 29–36 min) with significant p value ($P < 0.05$).

In a study done by Kedareshwara *et al.* in 2015 they compared Inj Thiopentone and Inj Propofol along with Inj ketamine.

In a study done in the year 2017 by Yunus O. Atalay on 300 children who underwent MRI received intravenous Thiopentone for sedation. They found that average recovery time was 11 ± 5.6 min.

In a study done in the year 2015 by Kedareshwar. K.S *et al.* on 50 children of age 3-5 years they compared between two group, Thiopentone-ketamine and Propofol-ketamine for recovery time. They found out similar results to our study that recovery time was significantly shorter in Propofol-ketamine group with a p value of < 0.001 .

Raafat S. Hannallah *et al.*, in 100 children also showed similar findings that are comparable to our study. They stated, who received Propofol were discharged home sooner (101 vs. 127–144 min) ($P < 0.05$), There was faster recovery. (22 vs. 29–36 min) ($P < 0.05$), with Propofol as compared to Thiopentone sodium.

Study done by Bhuvaneshwari *et al.* in 2019 on 88 children undergoing MRI compared Dexmedetomidine and Propofol and found the results similar to our study. Recovery time and discharge time were significantly lesser with Propofol group with p value of 0.001, 0.000 respectively. So they concluded that Propofol provides faster recovery.

Conclusion

This study of ours was a Quasi experimental study in which we compared the recovery outcome of Thiopentone and Propofol as an anaesthetic agent in paediatric patients undergoing MRI procedure.

This study was carried out in children aged 2-10 years who were electively posted for MRI for various reasons.

We concluded in our study that

1. Majority of children had good quality of MRI in both the groups.
2. The quality of image was not satisfactory in 22.5% of children due to minimal movement, 5% of children required repeat MRI hence achieving 100% immobility during procedure was not possible in both groups.
3. The Propofol group had faster and complete recovery, when compared to Thiopentone group.
4. Incidence of side effects like nausea and vomiting were same in both groups.
5. The depth of anaesthesia was satisfactory in both groups as majority had good quality MRI images.

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