**Pros and Cons of Pediatric Sedation in Magnetic Resonance Imaging**

**Abstract**

The purpose of the present review is to analyze the advantages and the disadvantages of pediatric sedation in magnetic resonance imaging. The study also aims to elaborate more on how the increased demand for the use of MRI examination on most of the pediatric patients has met the need to safely use pediatric sedation options. The benefits and the risks involved in pediatric sedation in MRI are evaluated in regards to the current literature. The review is considered to be timely because there is an increasing demand for the provision of anesthetic services and sedation services. Most health practitioners should have appropriate skills in the monitoring and rescue their patients through sedation. There is an increasing knowledge of the practitioners on several ways in which they can administer sedatives effective and what they can achieve with them as well as what can be done without the use of sedatives. The benefit and risk analysis, therefore, has to be taken into consideration when performing most magnetic resonance imaging and that can be used in the determination of services provided and requirements for using sedations. The data used in the research was carefully searched and obtained in order to get the most recent literature on the advantages and disadvantages of sedation services.

Magnetic resonance imaging is a technique which is widely used in radiology. Using the MRI technique can be uncomfortable at times and that can make the children fail to maintain their position while the administration is taking place. With the increasing use of MRI machines, the need for administration of sedations has increased. According to Arthurs and Sury (2013), the movement of the people within the MRI machine prevents extraction of quality images and therefore, the patients require sedation in order to maintain their immobility while the MRI is being done. This helps in preventing anxiety of the patients while the MRI is being done. A proper selection of medication has to be selected in order to assist in keeping the patients in position and also maintaining the safety of the patients under the machine (Mason, Fontaine, Robinson and Zgleszewski, 2012). The aim of the article is to elaborate more on the advantages and the disadvantages of using pediatric sedatives in the administration of magnetic resonance imaging. The study also aims to elaborate more on how the increased demand for the use of MRI examination on most of the pediatric patients has met the need to safely use pediatric sedation options. The various disadvantages of using different sedatives and the advantages it brings are discussed in this article with a closer focus on the recent developments in the MRI technique. The research is spearheaded by the desire to understand the negative effects of sedatives while carrying out MRI and the positive effects they bring to the children and patients when they undergo magnetic imaging.

**Methods**

Secondary data was the major source of information in the research because the information was extracted from the recent literature on the use of sedatives in MRI. Peer-reviewed articles and academic articles are the major sources of data to be reviewed. This is because most of the data extracted and found in these sources is credible and reliable to conduct research. With the help of search engines from the internet, a lot of information was extracted in order to formulate an appropriate literature on the advantages and disadvantages of sedatives in conducting MRIs. Some of the keywords used in order to extract quality information to conduct the research include Pediatric, Magnetic resonance imaging, imaging, and sedation. Most information was extracted from Google scholar articles which encompasses information from credible sources like the radiology technology website. Various journals in medicine were used in the extraction of information and that helped in getting more relevant information on the disadvantages and the advantages of sedation in magnetic resonance imaging.

**Discussion**

**Advantages of pediatric sedation in MRI**

Demand for MRI examinations has increased recently and that has made the demand for safe pediatric sedation to also increase. According to Brittney Del Pizzo (2016), sedation helps in decreasing the patient’s motion and providing better care of the patients when the examination is being carried out. In sedation, physical discomfort of the patient and pain of the patient is also reduced and that leads to the controlled anxiety of the children and minimization of trauma (Del Pizzo, 2016). The patient's movement is controlled effectively using the pediatric sedation and that helps in safety in the completion of most procedures. This shows that the use of pediatric sedation can be effective in carrying the MRI activities effectively. According to Ustun et al. (2017), the use of sedation in MRI is necessary but the intensity of application of the sedations differ according to the health conditions of the patient or the expected outcome after carrying out the sedation to the various patients.

The administration of sedatives reduces the risk of contracting adverse reactions in the body. With the increasing demand of using MRI examinations, the sedatives have been considered to be safe according to several researchers. Despite the risks some of the sedatives may cause in the body, pediatric sedation is considered to be safe depending on the conditions of the patients. With the use of sedatives, the patients can be effectively returned to a state whereby discharge from medical supervision can be done effectively (Kedareshvara, Dhorigol, Mane and Gogate, 2016). This shows that the use of sedatives can prevent the occurrence of various discomforts. The safety accorded to the use of sedatives helps in showing that traumatic behaviors disorders are minimized after the safe use of sedatives and therefore they are effective to use when doing most MRI examinations.

According to Sethi, Gupta, and Subramanian (2014), using sedation can be advantageous to the patient because it can assist in reducing the time and cost incurred while carrying out examinations. Hasani, Gjonbalaj, and Ustalar-Ozgen (2012) further support that the increasing demand of using MRI machines in several examinations has shown that the used of sedation can lead to minimization of costs used because quality images are taken with restricted movements of the patients under study. According to Selçuk et al. (2013), the cost associated with repeated examination is reduced with the increased use of sedation to the patients. According to Miner et al. (2015), the average number of hours taken for the sedated patients was 3.6 hours as compared to 4.1 hours which are used for anesthesia. This shows that pediatric sedation is time-saving and makes sure that the patients get the same services within a short period of time while under the MRI examination.

According to Wu, Mahmoud, Schmitt, Hossain, and Kurth (2014), there are various types of sedatives which can be used including ketofol, thiopental, ketamine, and propofol. The increased demand of MRI exams on the various pediatric patients have been met with the variety of sedatives used. Having the several options of drugs ensures that sedation can be done effectively on several individuals. This shows that the safety of the examinations has been increased with the high levels of sedation options. The use of the sedatives can lead to cardiovascular stability and preservation of the airway. For instance, according to Alletag, Auerbach, and Baum (2012), the use of a combination of ketamine and propofol can cause stability of the patient while doing the MRI. This is because the heart rates of the patients and their recovery periods of the patients is minimized to the most manageable levels.

Sedation can have amnesia effects to the patients and this can lead to a decreased memory of the various occurrences (Arlachov and Ganatra, 2012). During the MRI procedures, the patients can be very uncomfortable and therefore using pediatric sedatives can lead to decreased memories of the activities and also lessen the number of appointments required in order to undertake a complete examination. This can be effective for most patients because it reduces the worries they have while undergoing the MRI examinations. This shows that the use of MRIs is becoming safe with the introduction of sedative options for the various patients. The MRI machine usually produces a noise which can make the patient be uncomfortable while undertaking the MRI procedures. The patients may also fear the environment inside the MRI machines and therefore undertaking sedation can make the patient be comfortable while undertaking the examination. Through sedation, the patient is exposed to a good environment whereby successful examination can be done.

**Disadvantages of pediatric sedation in MRI**

Sedation in MRI has some disadvantages to most patients. For instance, the sedation can fail as a result of the patient’s factors and this requires calling for a second examination (Cravero, 2012). In such cases of failure of sedation, anesthesia can be used in order to make sure the same procedures are carried out. Assessment of the patients has to be carried out in order to determine the appropriate form of sedation to be done on the patients. It is recommended that before carrying out any sedation services to the patients, pre-assessment has to be carried out in order to determine the patient’s degree of tolerance to the sedation and also to find out any health defects which can lead to an unsuccessful sedation process. This shows the use of sedatives can be effective for patients of any kind because the risk can be managed effectively and easily.

According to Jain et al. (2013), most often sedations being carried out may not be covered by the insurance provided and therefore they can be an expense to the parents who opt to use the methods for the well-being of themselves and their children. The parents may be forced to cater the sedation services using their earnings. This increases the cost of medication as compared to undergoing an MRI test without being sedated. However, sedation is taken to be cheaper as compared to anesthesia and therefore it is more preferred to use for most patients. This shows that it is the better option to prefer with the increasing demand of using MRI examinations.

Viggiano et al. (2015) indicated the safety of using sedation to most patients. However, sedation can lead to some of the most life-threatening situations including respiratory depressions which can get serious and cause death to the patients. There can be mistakes during sedations like over sedation and under sedation. Over sedation can lead to increased monitoring of the patients and under sedation can lead to increased movement of the patients while the activities are being carried out. The patients can face some of the adverse effects such as experiencing nausea, extreme vomiting and also it leads to patients having paradoxical reactions during the treatment process. Therefore, it is important to use some of the trained manpower in order to carry out effective sedations of the patients. Also, it is important to carry out pre-assessment of the patient’s conditions in order to eliminate this risk (Lavoie et al., 2012). This shows that the increasing demand of using MRI examination can be met easily through the use of various sedatives after the examination has been carried out on the several patients.

**Suggestions for future research**

The gaps existing in the previous researches can be used as a basis of formation of future research. In order to analyze the use of sedation in MRI well, a lot of information is needed on sedation and its effects alone without analysis of anesthesia because of the increasing demand of using MRI examinations. This can form a basis for future research. There is much-published information in relation to sedation in most of the radiology but there is less information researched on the MRI alone. Therefore additional research has to be conducted in order to determine the effects of using MRI and how it differs from other methods. Since the research is based on advantages and disadvantages of pediatric sedation on MRI, there is little information regarding the parents of the various patients as well as the supporting staff used in the administration of the MRI. Therefore, the inclusion of this information can be very important because it can assist in improving the experience of various patients.

**Conclusions**

From the findings of this research, sedation in MRI has more advantages than its disadvantages because it assists the patients to relax and helps in making them comfortable while having the MRI. With the increasing demand of using MRI examinations, there are a lot of sedative options generated in order to meet the demand. This has helped in improving the convenience of using MRI machines to do varies examinations. It is effective to recommend the use of sedation while doing MRI because its effects are minimal and they can manage various MRI examinations effectively. However, the few disadvantages of sedation in MRI are dangerous and therefore, minimization of the effects through pre-assessment of the patients and post assessment of the patients before and after the sedation in MRI is done.

 **References**

Alletag, M. J., Auerbach, M. A., & Baum, C. R. (2012). Ketamine, propofol, and ketofol use for pediatric sedation. *Pediatric emergency care*, *28*(12), 1391-1395.

Arthurs, O. J., & Sury, M. (2013). Anaesthesia or sedation for paediatric MRI: advantages and disadvantages. *Current Opinion in Anesthesiology*, *26*(4), 489-494.

Arlachov, Y., & Ganatra, R. H. (2012). Sedation/anaesthesia in paediatric radiology. *The British journal of radiology*, *85*(1019), e1018-e1031.

Cravero, J. P. (2012). Pediatric Sedation with Propofol—Continuing Evolution of Procedural Sedation Practice. *The Journal of pediatrics*, *160*(5), 714-716.

Del Pizzo, B. (2016). Advantages and Disadvantages of Pediatric Sedation in Magnetic Resonance Imaging. *Radiologic technology*, *87*(3), 329-332.

Hasani, A., Gjonbalaj, A., & Ustalar-Ozgen, S. (2012). Thiopentalvs. propofol during magnetic resonance imagining in children: something old, something new: 10AP3‐6. *European Journal of Anaesthesiology (EJA)*, *29*, 161.

Jain, R., Petrillo-Albarano, T., Parks, W. J., Linzer, J. F., & Stockwell, J. A. (2013). Efficacy and safety of deep sedation by non-anesthesiologists for cardiac MRI in children. *Pediatric radiology*, *43*(5), 605-611.

Kedareshvara, K. S., Dhorigol, M. G., Mane, R., & Gogate, V. (2016). Comparison of propofol and thiopentone along with ketamine for paediatric MRI sedation. *International Journal of Research in Medical Sciences*, *4*(2), 381-384.

Lavoie, L., Vezina, C., Paul-Savoie, E., Cyr, C., & Lafrenaye, S. (2012). Procedural pediatric sedation by nurses: available, competent, and safe. *International journal of pediatrics*, *2012*.

Mason, K. P., Fontaine, P. J., Robinson, F., & Zgleszewski, S. (2012). Pediatric Sedation in a Community Hospital–Based Outpatient MRI Center. *American Journal of Roentgenology*, *198*(2), 448-452.

Miner, J. R., Moore, J. C., Austad, E. J., Plummer, D., Hubbard, L., & Gray, R. O. (2015). Randomized, double-blinded, clinical trial of propofol, 1: 1 propofol/ketamine, and 4: 1 propofol/ketamine for deep procedural sedation in the emergency department. *Annals of emergency medicine*, *65*(5), 479-488.

Selçuk, O., Hancı, A., Selçuk, E., Türk, H. Ş., Türk, B., & Atalan, G. (2013). Comparison of sedative effects of midazolam-ketamine combination and thiopental in pediatric patients undergoing magnetic resonance imaging. *Medical Bulletin of Sisli Etfal Hospital*, *47*(3), 122-129.

Sethi, D., Gupta, M., & Subramanian, S. (2014). A randomized trial evaluating low doses of propofol infusion after intravenous ketamine for ambulatory pediatric magnetic resonance imaging. *Saudi journal of anaesthesia*, *8*(4), 510.

Ustun, Y. B., Atalay, Y. O., Koksal, E., Kaya, C., Ozkan, F., Sener, E. B., & Polat, A. V. (2017). Thiopental versus ketofol in paediatric sedation for magnetic resonance imaging: A randomized trial. *JPMA. The Journal of the Pakistan Medical Association*, *67*(2), 247.

Viggiano, M. P., Giganti, F., Rossi, A., Di Feo, D., Vagnoli, L., Calcagno, G., & Defilippi, C. (2015). Impact of psychological interventions on reducing anxiety, fear and the need for sedation in children undergoing magnetic resonance imaging. *Pediatric reports*, *7*(1).

Wu, J., Mahmoud, M., Schmitt, M., Hossain, M., & Kurth, D. (2014). Comparison of propofol and dexmedetomedine techniques in children undergoing magnetic resonance imaging. *Pediatric Anesthesia*, *24*(8), 813-818.