Technical Report

"Superhero" concept to avoid anesthesia for daily radiation treatment in childhood cancer

ABSTRACT

Advancements in therapeutic interventions have led to significant improvement in the overall management of childhood cancer. Radiotherapy forms an important component of their treatment. Modern radiotherapy technique where an optimal therapeutic ratio can be obtained demands proper and adequate immobilization of the child. This can be technically challenging sometimes, particularly when the child is noncompliant. To address this hurdle, we have used this concept of "Superhero," where we have decorated and painted the thermoplastic masks that often used in the head and neck and cranial irradiation. We have received adequate compliance for this method, and the need for anesthesia was slackened.

KEY WORDS: Anesthesia, childhood cancer, radiotherapy

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The global estimated age-standardized incidence of childhood cancer is 16.2% (95% uncertainty interval 15.0%–17.2%),[1] and the incidence is found to be variable throughout the world. Ninety percent of children with cancer reside in low-income and middle-income countries (LMICs).[2] In India, the incidence of childhood cancer is reported in the range of 1.6%–4.8% of all cancers, with an overall incidence of 38–124/million children, per year.[3,4]

Advancements in therapeutic interventions along with evidence-based standardized treatment protocols have improved the overall management of paediatric cancer.[2] Radiotherapy, where a controlled dose of radiation is used to kill proliferating cancer cells, plays a critical role in the management of childhood cancer.[5] With the technological evolution and improvements in radiation dose delivery, it is now technically feasible to achieve an optimal therapeutic ratio of maximal coverage of the target alongside significant sparing of adjacent normal organs. However, the success of high precision radiation depends on the appropriate and reproducible immobilization of the patient with restriction in unnecessary movements. This task might be difficult sometimes, particularly when a child is noncompliant and apprehensive for his treatment. To overcome, various interventions such as the use of sedation,[6] general anesthesia,[7] educational psychotherapy,[8] play therapy[9] have been utilized with an acceptable success.

General anesthesia or some form of sedation is being used extensively to achieve adequate positioning of the child. Sedation using chloral-hydrate or paraldehyde has been tried historically with mixed results.[7,8] Although being a relatively easier and cost-effective method, it is not that popular when compared with other modalities. The reasons behind this are the bitter taste of the drugs leading to poor tolerance, unpredictable efficacy, and weaning off the effect in between the treatment.[7,8,10] Whereas, general anesthesia using propofol to anesthetize the patient followed by sevoflurane for the maintenance appears to be a reliable intervention owing to a higher efficacy (achievement of adequate anesthesia in more than 95%),[11] rapid postanesthesia recovery (within 5–10 min),[10] and lesser anesthesia-associated complications (1%–2%).[6,12] Various factors, including the age of the child, previous experience, level of understanding, and the duration of radiotherapy, determine the usage

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of general anesthesia.[13] Patient preparation issues in the form of the necessity of venous access with preferably a central line for a protracted period and preanesthesia fasting,[11] along with the availability of the infrastructure, inter-disciplinary co-ordination, and an additional cost of anesthesia may downgrade this modality.

Most of the children of age <3 years certainly need anesthesia, whereas children in the age group of 8–14 years who develop the comprehension and understanding of the treatment often getaway. However, children of the age group of 3–8 years sometimes may respond to other interventions, and the use of anesthesia at all times may not be warranted. In this age group, effective use of play preparation program[14] and utilization of audio-visual equipment[9] has been associated with a significant reduction in need of anesthesia/sedation. These interventions may demand involvement of trained experts, who may not be available at all times and all places.

In children, primary central nervous system tumors and head and neck cancer are the most commonly observed nonhematological malignancies, where radiation is often used.[15] Thermoplastic masks appear to be the most reliable form of immobilization for these sites of radiotherapy.[16] Relative ease of handling, user friendly nature, and high sustainability are the advantages of using thermoplastic masks over the other methods.[13] However, the temperature used for molding the thermoplastic mask may not be acceptable for children and may result in noncompliance with the treatment. Furthermore, some children may feel claustrophobic, particularly when immobilized in a tight thermoplastic mask.

To overcome the above-mentioned hurdles and to avoid daily anesthesia, we worked on the concept of "Superhero" in achieving daily anesthesia-free radiation treatment. We decorated and painted the thermoplastic mask so that it resembles the mask worn by the superhero, cartoon, and Disneyland characters that have impressed them in movies or animated films. In our institute, a team of dedicated radiographers has been utilizing their free time decorating thermoplastic masks as per the demand of our patients. In a short period of introducing this idea in our practice, we have received the orders for the masks of Spiderman, Superman, Doraemon, and Thor from our patients. These requirements were successfully accomplished [Figure 1]. We have treated five children so far of the age group of 4–8 years with a diagnosis of brain tumors in four cases and mandibular Ewings sarcoma in one case, by using decorative thermoplastic masks [Figure 2]. The compliance to this concept of "Superhero" was excellent. None of these children required any form of anesthesia or sedation during the entire course of radiotherapy.

This concept of "Superhero" is easy to manage, even in a busy setup. It is very much cost-effective and is child-friendly. Even a nonartistic person can be involved in the basic drawing and decoration of the thermoplastic masks. This can improve the compliance when used along with other interventions such as play therapy and education psychotherapy. Even though a few noncompliant children may need anesthesia/sedation for initial radiotherapy planning and thermoplastic mask molding, but once getting familiar with the departmental procedure, they cooperate excellently.

Along with this, a significant importance should be given toward the participation of parents in the preparation of child for radiotherapy. Parents can motivate their children with the most effective way and can gain their confidence for the procedure. First of all, they should be counselled in detail regarding the treatment protocol, steps associated in the treatment, and the necessity of their involvement in the entire process of radiotherapy. They should be actively involved from the beginning of the process, where they can help the radiographers in moulding the thermoplastic masks. Furthermore, during day-to-day treatments, they can communicate with their children through a voice intercom and encourage them for the treatment.

CONCLUSION

The "Superhero" concept can be used as a complimentary technique to other interventions in childhood cancer radiotherapy to gain the compliance. Particularly, In LMICs, where a cost of treatment matters, this simpler method will definitely benefit some children.

Figure 1: Decorated thermoplastic masks for childhood cancer treatment

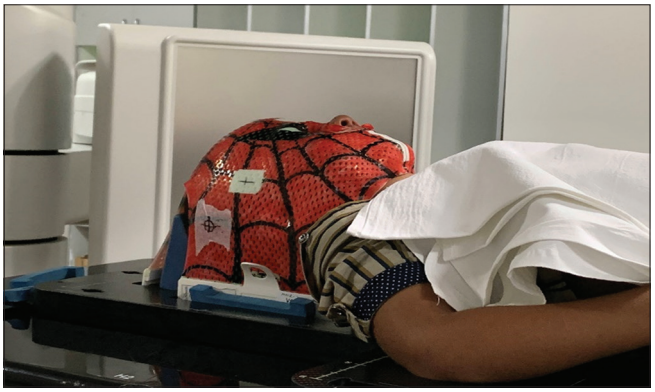

Figure 2: Immobilization of the child in the thermoplastic mask

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Conflicts of interest
There are no conflicts of interest.

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