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Original Article

Radiotherapy in Children without Anesthesia: A Feasibility Approach Using Distraction

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Abstract

Context: Radiotherapy is an important component of treatment of children with cancer. However, delivery of radiotherapy to children is challenging because of the requirement of sedation or anesthesia for immobilization. The present study attempts to highlight our experience of successful delivery of radiotherapy to children with cancer without the use of sedation or anesthesia. **Subjects and Methods:** The study included pediatric patients <12 years who were treated with radiotherapy at our center between January 2015 and June 2017. Retrospective analysis of patient case records was performed to obtain the treatment details. **Results:** During the study, 50 children received radiotherapy, among them, 44 (88%) were treated without sedation or anesthesia. The most common diagnosis was acute lymphoblastic leukemia (25%) followed by Ewing's sarcoma (16%) and rhabdomyosarcoma (14%). About 56% of the children belonged to the age group of 1–5 years and 44% belonged to 6–12 years. The latter age group were cooperative and completed the treatment without anxiety. Although the children belonging to 1–5 years age group had anxiety in the commencement of treatment, they completed it without anesthesia, using distraction techniques. There were no treatment delays or physical trauma sustained due to nonusage of sedation or anesthesia. **Conclusions:** The study shows that with adequate counseling and use of distraction techniques it is possible to deliver radiotherapy to children without the requirement of anesthesia. This practice will be useful for settings were the availability of staff and equipment for anesthesia is limited.

Keywords: *Anesthesia, chemotherapy, distraction techniques, pediatric, radiotherapy*

Introduction

Treatment of pediatric cancers is challenging and involves a multidisciplinary approach. Younger children usually <12 years of age have apprehension and anxiety regarding diagnostic and therapeutic procedures performed on them. Therefore, it becomes necessary to give them sedation or general anesthesia to successfully perform the recommended procedure. A proportion of pediatric tumors, especially solid tumors require radiotherapy as an integral part of their management. Radiotherapy is delivered in daily fractions usually over a period of 4–6 weeks. Patients need to be immobilized to achieve accurate delivery of planned radiotherapy dose. Any movement during radiotherapy delivery can be proved to be deleterious. Young children can be intimidated by the radiotherapy room, machine, and the staff. Therefore, to alleviate their anxiety and immobilize them, either sedation or general anesthesia is needed daily during the next few weeks. However, this leads to increased occupancy of radiation machine, thereby decreasing in the number of patients treated in that machine. Furthermore, there is an inherent risk in the daily delivery of general anesthesia/sedation. Hospitals in resource challenge settings may not have availability of an anesthetist/anesthetic equipment in radiation department or facilities to monitor a child during and after anesthesia. The study looks at the delivery of radiation to young children without the use of sedatives or general anesthesia.

Subjects and Methods

The study included children <12 years of age with malignancies treated at the radiotherapy department in our institute from January 2015 to June 2017. The data were collected retrospectively by evaluating the patients' case records. Before initiation of planned radiotherapy treatment, the parents were counseled regarding the treatment and the need for immobilization.

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The treating radiation oncology consultant met the children and their parents and decreased their anxiety and fear. The children were made to visit the department multiple times and visualize the procedure starting from immobilization to treatment execution.

During immobilization and simulation, parents were made to stand by the side of the child with the provision of adequate shielding techniques. Parents were not allowed to be present during treatment execution. All treatment decisions were made based on multidisciplinary tumor board. None of the children were given any sedative before immobilization/treatment. Immobilization was done using mold/Vac-Lok. Children were also not kept nil by mouth before radiotherapy delivery.

Radiation was delivered using linear accelerators (VARIAN CLINAC 600 and 2100). To alleviate anxiety, children were treated in the same machine and by the same team. During the delivery of radiation, children were monitored using closed-circuit television and two-way audio communications. Precise delivery of radiotherapy and adequate immobilization were confirmed by pre- and post-treatment images. Supports on the sides were provided in the couch and straps were made available to prevent any falls.

Results

During the study, 50 children received radiotherapy in our institute. Among 50 children, 44 children were treated without anesthesia/sedation and 6 children required anesthesia. The mean age of children treated without anesthesia was 5.56. Among 44 children, 26 (59%) were male and 18 (41%) were female. The malignancies include acute lymphoblastic leukemia (25%), ewing's sarcoma (16%), rhabdomyosarcoma (14%), lymphoma (11%), Wilm's tumor (11%), neuroblastoma (10%), brain tumours (5%), primitive neuroectodermal tumor (2%), retinoblastoma (2%), nasopharyngeal carcinoma (2%), and fibromatosis (2%) [Table 1]. Among the 6 children who received general anesthesia, 5 out of 6 were initially tried for treatment without general anesthesia. However, it was not successful. We did not find any discrepancy between the planned and the executed treatment. Table 2 provides treatment details and patient characteristics.

Figure 1: Treatment setup of a child without anesthesia

Discussion

Our study shows that 88% of children can be treated safely without general anesthesia/sedative. Children as young as 2 years can be treated without anesthesia. This is especially important in resource challenge setting as it leads to decreased utilization of machine time, need for anesthetist, equipments, and avoids the risk of use of anesthetic agents/sedatives for a prolonged period. Another significant perspective is that there is no need to follow nil per oral for treatment execution and patients need not stay in the hospital. The need for postprocedure monitoring is also avoided. In our study, children were more cooperative for Vac-Lok immobilization [Figure 1] devices when compared to thermoplastic head and neck mold, but with the help of distraction aids, they cooperated for the immobilization.

There is paucity of data in literature on the treatment of children with radiotherapy without the use of sedation or anesthesia. Similar to our study, Ayan *et al*. have reported successful treatment of eleven children without

Table 1: Distribution of pediatric malignancies

Malignancy	Number of children (*n*=44), *n* (%)
ALL	11 (25)
Ewing's sarcoma	7 (16)
RMS	6 (14)
Lymphoma	5 (11)
Wilm's tumor	5 (11)
Neuroblastoma	4 (10)
Brain tumors	2 (5)
PNET	1 (2)
Retinoblastoma	1 (2)
Nasopharyngeal carcinoma	1 (2)
Fibromatosis	1 (2)

ALL – Acute lymphoblastic leukemia; RMS – Rhabdomyosarcoma; PNET – Primitive neuro ectodermal tumor

Table 2: Patient and treatment characteristics

Parameter	*n*	Percentage
Age (years)		
1-5	29	66
6-12	15	34
Immobilization device		
Thermoplastic mould	34	77
Vacloc	10	23
Treatment technique		
Conventional	24	55
Conformal	11	25
IMRT	8	18
V-MAT	1	2
Number of fractions		
Minimum	7	Not applicable
Maximum	33	Not applicable

anesthesia.[1] Anghelescu *et al*. observed that the rate of anesthesia related complication during radiotherapy delivery for children was 1.3%.[2]

The study has shown that with the help of proper counselling, distraction aids, spending time with children, explaining the procedure, making them to visualize the procedures executed on other children made them comfortable for undergoing radiotherapy without the use of anesthesia/sedatives.

Conclusions

Radiotherapy can be safely and successfully delivered without anesthesia or sedation in children. Our study findings will be useful for centers were facilities to give anesthesia to children are limited or not available.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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