External beam radiation therapy treatment interruptions associated with change in airway management in pediatric radiation oncology
A 4-year retrospective cohort study

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Abstract

• Children undergoing external beam radiation therapy (EBRT) for cancer often require general anesthesia (GA).
• EBRT protocols vary in complexity ranging from 3-40 sessions.1
• The patient’s position must be replicated each EBRT session in order to deliver radiation accurately to the targeted area.
• Positioning devices such as molded thermoplastic masks are used to ensure accurate positioning.
• Failure to achieve the prescribed position may interrupt EBRT while a new EBRT protocol is configured.
• EBRT interruptions are associated with poor tumor control.2,5

Primary aim

• The primary aim of this study was to determine whether altering airway management during the course of EBRT was associated with prolonged EBRT interruptions.
• The secondary aim was to describe patient characteristics associated with the airway management-related treatment delays.

Methods

• With IRB approval, we performed a retrospective cohort study children younger than 18 years of age who underwent GA (minimum 4 sessions) for photon or proton beam therapy at a single institution between 7/1/2011 and 6/30/2014.
• We identified the airway management device (natural airway, laryngeal mask airway, oral endotracheal tube, or tracheostomy) used for each EBRT session.
• Patients were classified in three EBRT groups:
  o Group A) supine without a thermoplastic mask; or
  o Group B) supine with a thermoplastic mask; or
  o Group C) prone with a thermoplastic mask.
• Prolonged interruptions defined as 5 or more days and evaluated for co-occurrence with airway management device change.
• We designed a visual analytics dashboard to evaluate the relationship between treatment interruptions and airway device change. (Figure 1)

Results

• 182 EBRT courses (Group A: 57, Group B: 106, Group C: 19) were included in the study. (Table 1)
• Interruptions to EBRT occurred in 11 courses (17.2%) in Group A, 58 courses (54.2%) in Group B, and 11 courses (57.9%) in Group C.
• Three patients in Group B required unplanned CT simulation to make a new thermoplastic mask and EBRT protocol (Fig 1).
• Two of these patients required a new airway device and received photon EBRT while a new proton EBRT plan was finalized (Fig 1a, 1b).
• The third pt (Fig 1c) did not require a new airway device and resumed EBRT with the original EBRT protocol.
• There was an association between unplanned CT simulation and airway device change during EBRT in Group B (Fisher’s exact test w-sided p=0.045, odds ratio 9.4, confidence interval [0.407-501.190]).
• All patients with prolonged EBRT interruptions were scheduled to receive more than 20 EBRT sessions, and occurred within the first 10 EBRT sessions.

Discussion

• Patients that require different airway devices during the course of EBRT may experience prolonged EBRT interruptions due to failure to achieve the prescribed position with a thermoplastic mask.
• Anesthesiologists caring for children undergoing EBRT should carefully consider the length of the treatment protocol when designing the anesthetic plan.
• Airway management should focus on optimizing the patient’s position and ventilation at the time the thermoplastic mask is made.

Table 1

<table>
<thead>
<tr>
<th>Number of EBRT Courses</th>
<th>Unplanned CT Simulation</th>
<th>Airway Device Change</th>
<th>Interruption Concurrent with Airway Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>57</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Group B</td>
<td>11</td>
<td>5</td>
<td>45.5%</td>
</tr>
<tr>
<td>Group C</td>
<td>11</td>
<td>1</td>
<td>9.1%</td>
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</tbody>
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References


Figure 1

- General Anesthesia
- CT Simulation
- Photon EBRT
- Proton EBRT

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