

Case Report

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Simulated consult and treatment exercise improves radiation oncology trainee confidence and knowledge

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Abstract:

Malignant epidural spinal cord compression (MESCC) represents the most common indication for emergent radiotherapy. First-year residents must quickly gain competence in managing this condition prior to taking call for the department. We sought to develop a hybrid didactic/simulation exercise to assist first-year radiation oncology residents in developing a skillset relevant to treating a MESCC case in an emergency situation. This was a prospective, qualitative survey study conducted at the University of California, Los Angeles, during the years 2014–2016. Following an introductory lecture during orientation for academic years 2014–2016, residents completed a simulated consultation on a patient with suspected MESCC. Subsequently, they worked with radiation therapists to complete the clinical treatment procedure (including field placement and manual calculation of monitor units needed to deliver the prescribed dose) to a phantom placed on a linear accelerator. Residents were then surveyed about whether the exercise increased confidence in their ability to successfully complete a consult, and urgent treatment if needed, for MESCC. All residents agreed or strongly agreed that this exercise had improved this ability, and all agreed or strongly agreed that the exercise was valuable and should be retained in the curriculum. Simulated consultation and treatment of MESCC provides new residents with increased confidence and knowledge regarding this relatively common indication for emergent radiation.

Keywords:

Education, radiation, residency, simulation, training

Introduction

Malignant epidural spinal cord compression (MESCC) is the most common indication for an emergency referral to radiation oncology,^[1] and it is therefore critical that radiation oncology residents quickly become facile with not only the clinical aspects of diagnosis and treatment but also with the practical and technical aspects of treatment delivery. In general, formal didactic instruction in radiation oncology is sparse prior to beginning

focused residency training.^[2–4] While the acute medical management and triage of MESCC builds upon the foundations laid by undergraduate medical education, concepts such as treatment portal design and monitor unit calculation are not within the scope of preresidency training.

Simulation can be utilized as an important educational aid for incoming residents, who may otherwise feel unprepared for the full scope of on-call responsibilities in radiation oncology. Indeed, simulation has been widely demonstrated to show utility

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for both education^[5,6] and assessment.^[7] Recently, Brown *et al.* reported positive resident feedback following the institution of a half-day workshop divided into didactic, experiential/simulation, and feedback sessions focusing on four on-call cases.^[8] Holliday *et al.* also reported favorable resident and faculty experiences following the development of a comprehensive resident didactic curriculum.^[9] While these reports are invaluable, the overall dearth of such publications underscores the need for further education-based research in radiation oncology.

We developed a hybrid didactic/simulation exercise to assist 1st-year radiation oncology residents in developing a skillset relevant to treating a MESCC case in an emergency situation. Feedback was solicited from both the residents and the radiation therapists participating in the exercise over a 3-year period.

Materials and Methods

We performed a prospective qualitative survey study evaluating the pedagogic efficacy of our hybrid didactic/simulation exercise. During orientation for new residents for the academic years 2014–2016, a series of didactic lectures covering common emergency scenarios was presented. One lecture was devoted to MESCC, with emphasis on clinical aspects of management and decisions regarding surgery and radiation. Learning objectives included a review of anatomy and the pathophysiology of MESCC, basic treatment approaches for urgent versus nonurgent cases, spinal cord tolerance to radiation, and a suggested approach for emergent indications for treating MESCC.

A volunteer 1st-year resident was then led through a simulated telephone consult regarding a patient with known metastatic lung cancer and new-onset back pain, with or without additional neurological findings, who just presented to the emergency room. Trainees were expected to elicit key aspects of the clinical history and physical examination and deliver appropriate recommendations for corticosteroids, whole-spine imaging, and surgical consultation. If surgery could not be performed, the trainee was asked for a recommendation regarding appropriate dose and fractionation given the simulated patient's prognosis.

On a separate date, trainees were tasked with managing a simulated treatment with a clinical linear accelerator (TrueBeam, Varian Medical Systems, Inc., Palo Alto, CA, USA). An Alderson Radiation Therapy phantom (Radiology Support Devices, Long Beach, CA, USA) containing a radiographically dense simulated thoracic spine was used to simulate the patient, with an externally applied paperclip designating the vertebral level with MESCC [Figure 1]. The trainees then worked

with the radiation therapists to use on-board imaging to visualize the spine, design appropriate radiation fields, and determine the optimal beam energy. They then used calipers to measure treatment depth and a spreadsheet with machine field and energy data to calculate the number of monitor units required to deliver the desired dose.

Following the exercise, resident participants completed surveys with Likert-type scales describing whether the simulated consult and use of the linear accelerator to treat a phantom improved their ability to handle MESCC consultation and treatment correctly and confidently [Figure 2]. Radiation therapists were surveyed about resident communication and collegiality as well as the educational value they received from the exercise [Figure 3]. Institutional review board approval was granted to analyze data from this educational intervention for the purposes of publication.

Results

Over the course of three academic years (2014–2016), eight residents and six radiation therapists participated in this training exercise during new resident orientation in July. All eight residents (100%) agreed or strongly agreed that the activity improved their ability to handle MESCC consultation and treatment correctly and confidently. All of the residents felt that the exercise had educational value and should be maintained in the curriculum. Qualitative comments from residents suggested that this exercise was most valuable in allowing hands-on experience with treatment procedures and technology in a low-pressure environment. Radiation therapists also reported that the chance to practice this procedure was valuable for their training.

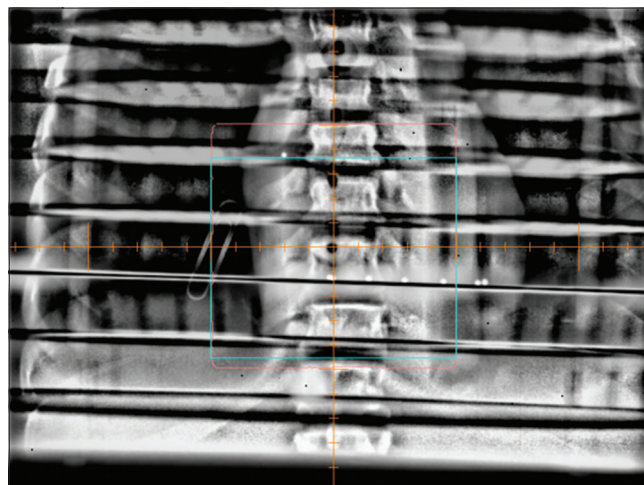


Figure 1: MV port film ordered by trainees to design treatment fields for simulated urgent treatment of malignant epidural spinal cord compression. Paperclip designates the site of simulated multilevel malignant epidural spinal cord compression

1. The simulated consult in lecture improved my ability to handle a spinal cord compression consult confidently and correctly.

Strongly Disagree	Disagree	Agree	Strongly Agree

2. Using a linac to treat a phantom improved my confidence and ability to treat spinal cord compression correctly in an emergent situation.

Strongly Disagree	Disagree	Agree	Strongly Agree

3. Overall, the spinal cord compression simulation exercises are a valuable addition to the curriculum and should be offered to future resident classes.

Strongly Disagree	Disagree	Agree	Strongly Agree

4. This exercise could be improved by:

5. Strengths of this exercise:

6. Other comments:

Figure 2: Survey administered to residents following didactic/simulation exercise

Discussion

The inclusion of didactics and hands-on simulation activities in orientation for new residents helped to provide valuable experiential learning prior to the first resident call experience. After we initiated our orientation as described above, Brown *et al.* published their experience with a similar approach incorporating both didactic and simulation components into a single half-day workshop.^[8] Their study similarly found universally positive feedback, underscoring that these types of simulation activities may have broad educational appeal and utility in radiation oncology. There is likely no meaningful difference between this approach and the approach we utilized, which scheduled the experiential/simulation component and didactic sessions on different days.

The use of structured educational interventions in radiation oncology was previously studied by Barker *et al.*, who examined whether resident knowledge regarding contrast administration could be improved and whether the improvement was sustained one year later.^[10] While their intervention improved knowledge among those residents who attended, improvement was not sustained at the one-year mark. While this highlights the limitations of a single-session educational intervention, this is less of a concern for educational interventions pertaining to introductory topics repeated annually during new resident orientation. Thus, the novelty of this study lies in its ability to capture longitudinal data over multi-year interventions. In addition, the knowledge and skills imparted during

1. The resident communicated effectively with the treatment team.

	Strongly Disagree	Disagree	Agree	Strongly Agree
<resident 1>				
<resident 2>				
<resident 3>				

2. The resident treated the therapists and other members of the treatment team collegially and professionally.

	Strongly Disagree	Disagree	Agree	Strongly Agree
<resident 1>				
<resident 2>				
<resident 3>				

3. This simulation was a good educational experience for the radiation therapist.

Strongly Disagree	Disagree	Agree	Strongly Agree

4. This exercise could be improved by:

5. Strengths of this exercise:

6. Other comments:

Figure 3: Survey administered to radiation therapists following didactic/simulation exercise

resident orientation provide a foundation that new residents will build upon throughout residency. An important limitation of this study is that residents were not surveyed after initiation of their real-world on-call experiences handling MESCC to determine if their increased ability and comfort with handling MESCC at the conclusion of the exercise translated into improved patient care in real time and improved patient outcomes in the long term.

Conclusions

Overall, our experience indicates that a combined didactic and simulation educational module can be a useful component of radiation oncology residency orientation. Particularly, when focused on an emergency situation relevant to a common on-call scenario such as MESCC, these sessions can be helpful both as preparation for new residents and as a refresher for more senior residents. This type of educational intervention can be implemented with minimal resources, and we recommend that programs that have not instituted this type of session should consider doing so.

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Conflicts of interest

There are no conflicts of interest.

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