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Pain control post IMRT for malignant pleural mesothelioma

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Abstract---Purpose: This is retrospective study-reviewing patients with unresectable pleural mesothelioma who received IMRT as part of their treatment course. This work aimed to study pain control and improvement among this group of patients. Methods and Materials: Between 2016 and 2020, 50 patients with unresectable malignant pleural mesothelioma following chemotherapy, of both sex and different age groups, were treated with pleural IMRT to the hemithorax (median dose, 46.8 Gy) at The National Cancer Institute, Cairo University. Results: Of the 30 patients, 38% had stage II, 62 % had stage III, and all received induction chemotherapy (mostly cisplatin and pemetrexed) before IMRT. Patients were evaluable at week 5 post radiotherapy, 17 patients (56.7%) had an improvement of $\geq 30\%$ while 6 patients (20 %) had $< 30\%$ pain improvement and 7 patients (23.3%) reported no pain improvement, with overall response rate was

77 %. Conclusion: Treating malignant pleural mesothelioma patients with IMRT is a feasible treatment option with an acceptable rate of pneumonitis.

Keywords---malignant pleural mesothelioma, radiotherapy, pneumonitis, chemotherapy.

Introduction

Malignant mesothelioma is a rare neoplasm, which arises most commonly from the mesothelial surfaces of the pleural cavity; with asbestos inhalation the main risk factor for 80 % of cases. [1] MPM often associated with several clinical symptoms, most commonly severe chest pain. Strong opioids, nonsteroidal anti-inflammatory & anticonvulsants usually given with suboptimal pain control. [2] Chest pain occurs secondary to chest wall invasion by the malignant mesothelioma. The pain might radiate to the upper abdomen, shoulder, or arm because of entrapment of intercostal thoracic, autonomic, or brachial plexus nerves. [3] Although radiotherapy widely accepted as a key analgesic modality in MPM. There is limited evidence to support the role of radiotherapy in pain management in MPM. [4] Consequently, the ASCO guidelines published in 2018 supports radiation therapy as an effective treatment modality for symptomatic disease. [5] To date, studies have used a wide range of dosages and fractionation schemes, with no clear consensus on the appropriate radiation treatment. We present a retrospective analysis of pain control among malignant pleural mesothelioma patients who received conventionally fractionated intensity-modulated radiotherapy.

Materials and Methods

This is a retrospective study included 30 patients with biopsy-proven MPM received IMRT to the hemithorax at Cairo National cancer institute between 2018 and 2020. Eligible patients fulfilled the following criteria: histologically proven diagnosis of MPM, Age; 75 years old or less, Karnofsky index; 70–100, had pain ≥ 4 of 10 on a 0–10 visual analogue scale. Patients with Karnofsky index less than 70, prior thoracic radiotherapy; active pneumonia were excluded

The specific patient and Treatment characteristics are listed in Table 1

Table 1: Patient and Tumor Characteristics

Characteristic	Value
Age	
Median	54
Range	35-70
Smoking	
Yes	21(70%)
No	9(30%)

Sex	
Male	
Female	22 (73.4%)
	8 (26.6%)
Histology	
Epithelioid	27 (90%)
Biphasic	2 (6%)
Sarcomatoid	1 (2%)
Stage	
II	9 (30%)
III	21 (70%)

Radiotherapy

Hemithoracic pleural IMRT was prescribed to patients who met the specified criteria. The dose prescribed for radiotherapy was between 50 Gy over 25 fractions, wire markings were placed on the skin to mark the scar sites of previous interventions. The gross target volume (GTV) included the primary tumor the entire pleural surface was designated as the clinical target volume (CTV), The planning target volume (PTV) was generated using a uniform 1 cm margin around the CTV.

Follow-up

Every patient in this study had Pre & Post radiotherapy pain assessment using the Numerical Scale; patients were evaluated 4 weeks after the end of radiotherapy. A 30 % reduction in pain intensity from baseline was considered an improvement as 30% reduction was generally accepted in many analgesic studies. [6]

Statistical Considerations

All statistical analyses were performed using SPSS, means and standard deviations (SD) are used.

Results

From June 2018 to December 2020, 30 patients with MPM completed IMRT to hemithorax. Patient demographics are shown in Table 1. Twenty-two patients were male, and the median age was 54 years. The most common histological type was epithelioid in 26 patients (86.6%), and the majority of patients were performance status 1 or 2. The entire patient cohort received systemic chemotherapy according to the treating medical oncologist discretion; the median radiation dose was 48.6 Gy (range, 7.2–54 Gy). Thirty-nine patients completed the radiation protocol. Thirty patients were evaluable at week 5 post radiotherapy, 17 patients (56.7%) had an improvement of ≥ 30 % while 6 patients (20 %) had < 30 % pain improvement and 7 patients (23.3%) reported no pain improvement, with overall response rate was 77 %.

Discussion

In MPM, pain is a major issue, and patients scored well on all pain questionnaires. Pain had a considerable influence on day-to-day function and was associated with high levels of anxiety. MPM related pain usually have a strong neuropathic component due to its effect on neurovascular bundle [7]. There are lack of data regarding the role of radiotherapy in pain control in MPM with which to compare our findings. A study of 22 patients received hemithoracic irradiation using Cobalt-60 machines at a dose of 30 Gy over 10 fractions, reported pain scores improvement in 13 patients 1 month after radiotherapy with no increase in analgesic requirements [8].

The findings of this study support the rationale of radiotherapy as an effective treatment modality in managing of malignant pleural mesothelioma related pain as more than half of the patients experienced clinical meaningful pain improvement. Therefore, radiotherapy should be strongly considered for pain control in MPM patients. Future work should examine dose escalation, both in terms of total dose and dose per fraction, because the likelihood of improving outcomes by increasing dose per fraction varies between tumor types and is determined by the α/β ratio of the tumor.

MPM has relatively low proliferation index mesenchymal origin, and apparent radioresistance, which all are consistent with a low α/β value. Therefore, hypofractionated approach would also have the advantage of reducing hospital visits and delivering palliative treatment in a timely fashion, which are clearly important in patients with limited survival, as is the limited toxicity seen here. Therefore, dose escalation studies, ideally delivered using advanced radiotherapy techniques, such as intensity-modulated radiotherapy, to help provide adequate coverage of bulky areas of disease, while sparing critical normal tissues including lung and would seem the obvious next step.

Abbreviations

MPM: Malignant Pleural Mesothelioma; IMRT: Intensity-modulated radiation therapy, CT: computed tomography, IASLC: International Association for the Study of Lung Cancer, CTV: Clinical target volume, PTV: planning target volume, FEV1: Forced expiratory volume in 1 second, DCLO: Diffusing capacity of the lung for carbon monoxide, FVC: forced vital capacity, PD: Progressive Disease, PR: partial response, SD: stable disease, IMIG: International Mesothelioma Interest Group

Ethics approval and consent to participate

This study was approved by the institutional review Board-National Cancer Institute-Cairo University (MD2010014014.3)

Competing interests

The authors report no conflicts of interest.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

Data collection and radiotherapy delineation and Follow up: MA, Conception and design: ML, , Provision of study materials or patients: RMG, AMA, Medical physics data analysis: MHM, Data analysis and interpretation::SMA. All authors read and approved the final manuscript.

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References

1. Kanarek MS. (2011). Mesothelioma from chrysotile asbestos: an update. *Ann Epidemiol* 2011; 21:688.
2. Price A. What is the role of radiotherapy in malignant pleural mesothelioma? *Oncologist* 2011; 16:359–365.
3. Ismail-Khan R., Robinson L.A., Williams C.C. Jr, et al. (2006). Malignant pleural mesothelioma: a comprehensive review. *Cancer Control*, 13:255–263.
4. Macleod N, Price A, O'Rourke N, Fallon M, Laird B. Radiotherapy for the treatment of pain in malignant pleural mesothelioma: a systematic review. *Lung Cancer* 2014; 83:133–138.
5. Kindler HL, Ismaila N, Armato SG, et al. Treatment of malignant pleural mesothelioma: American Society of Clinical Oncology clinical practice guideline. *J Clin Oncol*. 2018; 36(13):1343–1373.
6. Farrar JT, Portenoy RK, Berlin JA, Kinman JL, Strom BL. Defining the clinically important difference in pain outcome measures. *Pain* 2000; 88:287–294.
7. Robinson BW, Lake RA. Advances in malignant mesothelioma. *N Engl J Med* 2005; 353(15): 1591–603.
8. Bissett D, Macbeth FR, Cram I. The role of palliative radiotherapy in malignant mesothelioma. *Clin Oncol (R Coll Radiol)* 1991; 3:315–317
9. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. *International Journal of Health Sciences*, 5(3), x-xv. <https://doi.org/10.53730/ijhs.v5n3.2938>
10. Herman, H., Ardani, I. G. A. I., Aryani, L. N. A., Windiani, I. G. A. T., Adnyana, I. G. N. S., & Setiawati, Y. (2022). Signs and symptoms of depression in children and adolescents with type 1 diabetes mellitus: A case report. *International Journal of Health & Medical Sciences*, 5(1), 150–153. <https://doi.org/10.21744/ijhms.v5n1.1861>