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Case Report

A Nine-Year-Old Child with Nasopharyngeal Cancer Treated with Concomitant Chemoradiotherapy with Cisplatin – A Case Report

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Abstract

In recent years, the role of radiation oncology in treating various pediatric cancers has been extensively researched and developed. The dosage of radiotherapy, when combined with chemotherapy, was either reduced in some oncological diseases or modified in other cancers. Despite these changes, due to swift advancements in radiation oncology technology, this combination therapy continues to enhance both overall and progression-free survival rates, maintaining its vital status as a therapeutic approach in precision medicine.

We report here a nine-year-old patient with nasopharyngeal carcinoma treated according to SIOPE guidelines, which included induction neoadjuvant chemotherapy followed by concurrent chemoradiotherapy with cisplatin. Post-therapy imaging assessments revealed a persistent tumor mass with reduced dimensions on MRI one month after treatment, characterized by absence of contrast enhancement, water diffusion restriction, or lymphadenopathy. Subsequent CT imaging at three months post-radiotherapy showed no signs of disease progression. Repeat MRI scans at four and six months post-treatment demonstrated stable disease without evidence of water diffusion restriction, indicating a positive response to therapy. These results underscore the effectiveness of the multimodal approach in achieving favorable tumor control and therapeutic efficacy in pediatric nasopharyngeal carcinoma.

Keywords

chemoradiotherapy, cisplatin, epipharynx cancer, pediatric cancer

INTRODUCTION

Nasopharyngeal cancer (NPC) is an extremely rare malignancy in children, constituting only 1%–5% of all childhood cancers and accounting for 20%–50% of all primary malignant nasopharyngeal tumors in this age group, according to various worldwide statistics.[1-3] Despite its rarity, NPC poses significant challenges in diagnosis and management due to its association with a multitude of etiological factors. These factors include infectious mononucleosis, Epstein-Barr virus infection, consumption of foods rich in nitrosamines, and various genetic and epigenetic influences that remain poorly understood.[1,4,5] Notably, NPC is particularly uncommon in children under the age of ten, further complicating a timely diagnosis. Consequently, many patients experience delayed diagnosis, leading to

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local-regional spread of the disease.[6] Complications may arise as the cancer progresses, such as infiltration into the base of the skull potentially resulting in cranial nerve palsy.

Additionally, facial muscle paralysis or difficulty in jaw movement may manifest, underscoring the severity of NPC in pediatric patients. Understanding the unique characteristics and challenges associated with pediatric NPC is crucial for early detection and effective management strategies. The use of optimal modern radiotherapy techniques helps to achieve a much higher dose of rain tumors and preserve the function and structure of normal organs and tissues adjacent to the tumor. This is of utmost importance to achieve long-term local tumor control, especially in children, where the surrounding healthy tissue must be maximally protected to avoid long-term radiation side effects.

CASE REPORT

A nine-year-old patient started treatment based on SIOPE nasopharyngeal carcinoma in children and adolescents (final version V.9) with induction neoadjuvant chemotherapy regimens in the pediatric oncology department. The regimens included 5-fluoracil at a dose of 1000 mg/5 days, and on the first day of this regimen 100 mg of cisplatin IV. After this induction therapy, we started radiotherapy with a concomitant weekly infusion of 34.5 mg of cisplatin. Volume-modulated arc therapy (VMAT) technique was used on Elekta Infinity LINAC. The plan included one whole arc, which started from 180 to 360 degrees of turning ***(Fig. 1)****. The daily fraction was 1.8 Gy per day, or 725.2 monitor units (MU), and a total dose of 48.6 Gy to the nasopharynx plus bilateral cervical lymph nodes, plus an integrated simultaneous boost of 2.2 Gy to a total of 59.4 Gy in a nasopharyngeal tumor. The dose in critical organs is within tolerance and meets international protocols* ***(Fig. 2)****. No early or late radiation side effects were observed. Every day, the position of the patient was checked with a cone beam computer tomograph. When radiotherapy was complete, the patient continued treatment with interferon beta-1a.*

RESULTS

Following the completion of therapy, comprehensive imaging assessments were conducted to evaluate the treat-

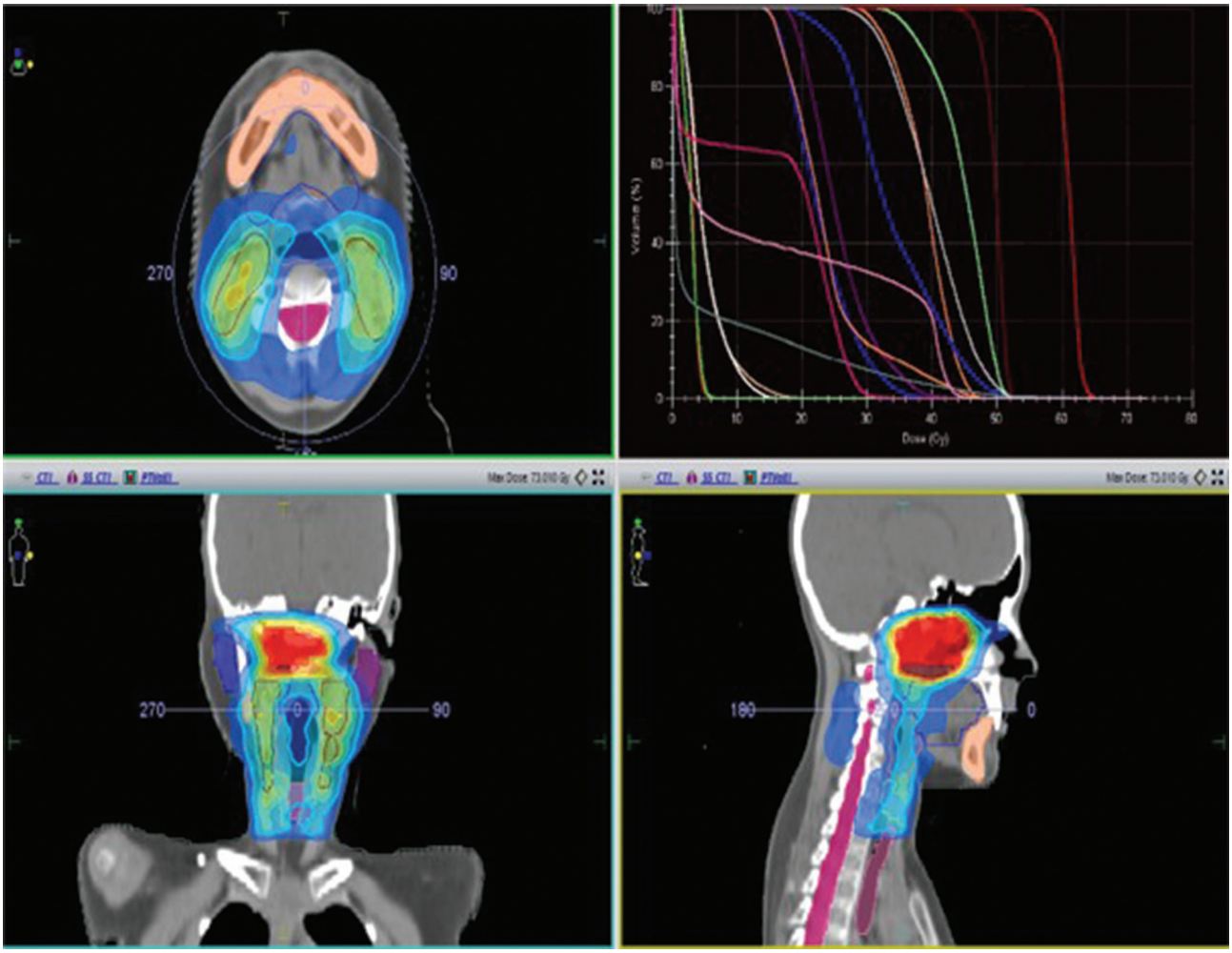
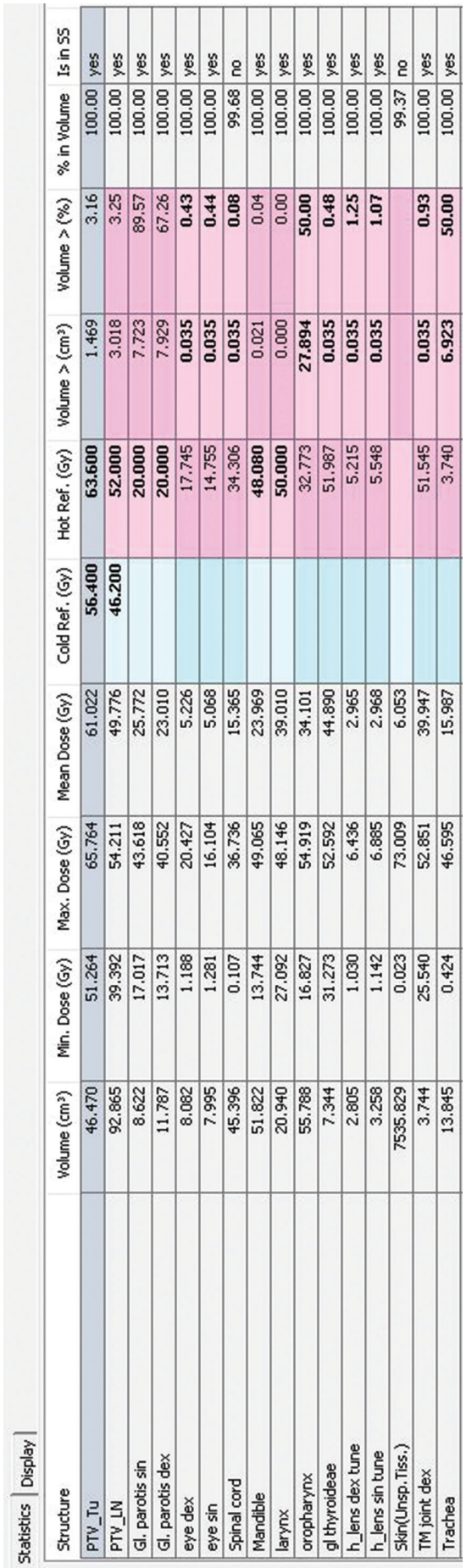


Figure 1. Radiotherapy treatment plan with VMAT technique in axial, sagittal and coronal planes.



Statistics | Display

Structure	Volume (cm³)	Min. Dose (Gy)	Max. Dose (Gy)	Mean Dose (Gy)	Cold Ref. (Gy)	Hot Ref. (Gy)	Volume > (cm³)	Volume > (%)	% in Volume	Is in SS
PTV_Tu	46.470	51.264	65.764	61.022	**56.400**	**63.600**	1.469	3.16	100.00	yes
PTV_LN	92.865	39.392	54.211	49.776	**46.200**	**52.000**	3.018	3.25	100.00	yes
Gl. parotis sin	8.622	17.017	43.618	25.772		**20.000**	7.723	89.57	100.00	yes
Gl. parotis dex	11.787	13.713	40.552	23.010		**20.000**	7.929	67.26	100.00	yes
eye dex	8.082	1.188	20.427	5.226		17.745	**0.035**	**0.43**	100.00	yes
eye sin	7.995	1.281	16.104	5.068		14.755	**0.035**	**0.44**	100.00	yes
Spinal cord	45.396	0.107	36.736	15.365		34.306	**0.035**	**0.08**	99.68	no
Mandible	51.822	13.744	49.065	23.969		**48.080**	0.021	0.04	100.00	yes
larynx	20.940	27.092	48.146	39.010		**50.000**	0.000	0.00	100.00	yes
oropharynx	55.788	16.827	54.919	34.101		32.773	**27.894**	**50.00**	100.00	yes
gl thyroideae	7.344	31.273	52.592	44.890		51.987	**0.035**	**0.48**	100.00	yes
h_lens dex tune	2.805	1.030	6.436	2.965		5.215	**0.035**	**1.25**	100.00	yes
h_lens sin tune	3.258	1.142	6.885	2.968		5.548	**0.035**	**1.07**	100.00	yes
Skin(Unsp.Tiss.)	7535.829	0.023	73.009	6.053					99.37	no
TM joint dex	3.744	25.540	52.851	39.947		51.545	**0.035**	**0.93**	100.00	yes
Trachea	13.845	0.424	46.595	15.987		3.740	**6.923**	**50.00**	100.00	yes

Figure 2. Dose volume distribution in target volumes and critical organs.

ment response. One-month post-therapy MRI imaging revealed a persistent tumor mass with reduced dimensions (27/15 mm), notable for the absence of contrast enhancement, water diffusion restriction, or lymphadenopathy. Subsequent imaging with CT of the head, neck, and thorax performed three months post-radiotherapy did not indicate any signs of disease progression. Notably, at the fourth and sixth months following concomitant chemoradiotherapy, repeat MRI scans demonstrated stable disease without evidence of water diffusion restriction, indicating a positive response to treatment **(Fig. 3)**. These results suggest favorable tumor control and therapeutic efficacy, highlighting the effectiveness of the multimodal approach in managing pediatric NPC. Continued surveillance and monitoring are essential to assess long-term treatment outcomes and ensure disease stability in this challenging patient population.

CONCLUSION

In the pediatric age group, NPC is an exceedingly rare clinical entity, often presenting with advanced loco-regional disease if diagnosed at a late stage.[7] Multimodal treatment approaches are typically employed, with radiotherapy combined with weekly platinum-based chemotherapy serving as a cornerstone.[8-11] Concomitant chemoradiotherapy has shown promise in managing NPC, particularly when employing advanced techniques such as VMAT to precisely target tumor sites while sparing healthy tissues and organs at risk. However, the administration of high doses of radiation poses a significant risk of toxicity, especially in pediatric patients, necessitating careful dose modulation. Strategies such as reducing radiation doses to the nasopharynx through neo-adjuvant or concomitant chemotherapy have been explored to mitigate late toxicity while maintaining effective local tumor control. This comprehensive approach underscores the importance of tailored treatment regimens in pediatric NPC to optimize outcomes while minimizing treatment-related morbidity. Continued research and clinical advancements are imperative to further refine therapeutic strategies and improve the long-term prognosis for children with NPC.

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Competing Interests

The authors have declared that no competing interests exist.

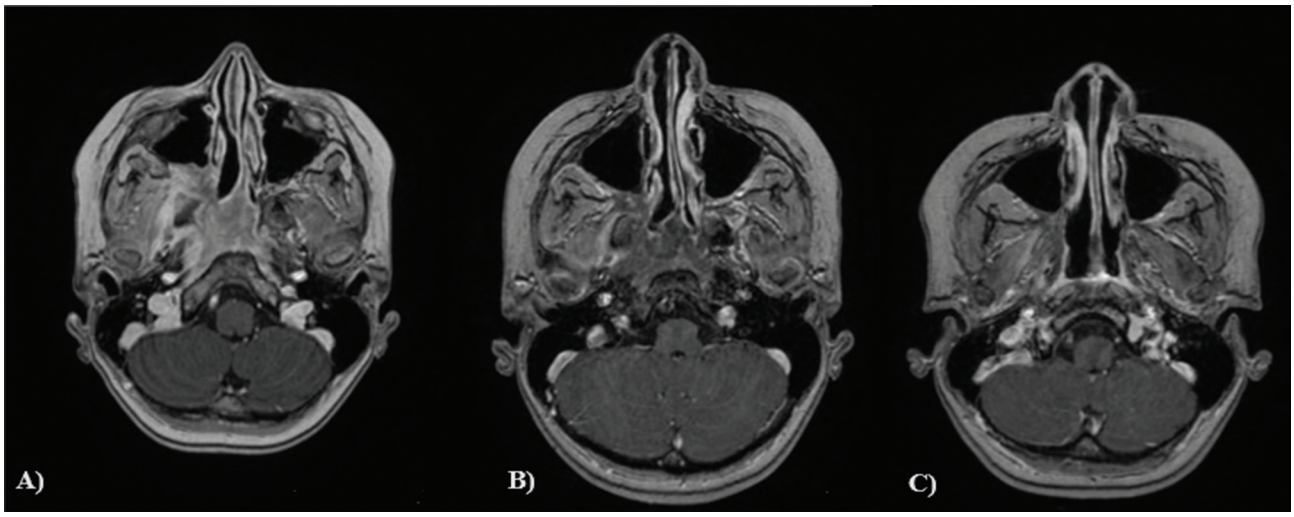

Figure 3. MRI results at 1 (**A**), 4 (**B**), and 6 (**C**) months after treatment.

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Девятилетний ребёнок с раком носоглотки, прошедший сопутствующую химиолучевую терапию с цисплатином – отчёт о клиническом случае

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Резюме

В последние годы роль лучевой терапии в лечении различных видов детского рака была тщательно исследована и разработана. Дозировка лучевой терапии в сочетании с химиотерапией была либо снижена при некоторых онкологических заболеваниях, либо изменена при других видах рака. Несмотря на эти изменения, благодаря быстрому прогрессу в технологии лучевой терапии эта комбинированная терапия продолжает повышать как общую, так и безрецидивную выживаемость, сохраняя свой жизненно важный статус терапевтического подхода в прецизионной медицине.

Мы сообщаем здесь о девятилетнем пациенте с носоглоточной карциномой, прошедшем лечение в соответствии с рекомендациями SIOPE, которые включали индукционную неоадъювантную химиотерапию с последующей одновременной химиорадиотерапией с цисплатином. Оценка визуализации после терапии выявила постоянную опухолевую массу с уменьшёнными размерами на МРТ через месяц после лечения, характеризующуюся отсутствием контрастного усиления, ограничения диффузии воды или лимфаденопатии. Последующая КТ-визуализация через три месяца после лучевой терапии не выявила признаков прогрессирования заболевания. Повторные МРТ-сканы через четыре и шесть месяцев после лечения продемонстрировали стабильное заболевание без признаков ограничения диффузии воды, что указывает на положительный ответ на терапию. Эти результаты подчёркивают эффективность мультимодального подхода в достижении благоприятного контроля опухоли и терапевтической эффективности при детской носоглоточной карциноме.

Ключевые слова

химиолучевая терапия, цисплатин, рак носоглотки, детский рак