



Case Report

Hearing loss in a pediatric patient following cisplatin chemotherapy and subsequent exposure to excessive noise

Emilia Peleva^{a,1}, Emilie Aloy^{b,2}, Anne-Sophie Carret^{c,3}, Sam J. Daniel^{a,*}^a Department of Otolaryngology-Head and Neck Surgery, McGill University, Montreal, Quebec, Canada^b Faculté de Médecine de Montpellier, Université Montpellier 1, Montpellier, France^c Division of Hematology-Oncology, Department of Pediatrics, CHU Sainte-Justine/Université de Montréal, Montreal, Quebec, Canada

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ABSTRACT

Cisplatin is a commonly-used chemotherapeutic agent that is highly-effective against a variety of pediatric cancers. Unfortunately, it may lead to ototoxicity, with serious consequences on the quality of life of survivors. Patients remain at risk of progression of ototoxicity even after completion of treatment. We report the case of a medulloblastoma survivor with previously documented normal hearing, who developed significant hearing loss and tinnitus following exposure to excessive noise at a nightclub three years after completion of treatment. We highlight the importance of long-term audiological follow up and education about the increased risk of hearing loss in this population.

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1. Introduction

Cisplatin is a chemotherapeutic agent commonly-used and highly effective against a variety of pediatric cancers. It is also the single most ototoxic drug in clinical use today, leading to tinnitus and sensorineural hearing loss, which is often permanent, bilateral and progressive [1]. It is estimated that 50–60% of children will develop ototoxicity during platinum-based chemotherapy [1,2]. Some patients will have progression of hearing loss even after completion of chemotherapy [3,4]. The risk of progression is even greater in patients who have received radiotherapy to the head and neck [5]. We report the case of a child who, despite normal hearing following cisplatin chemotherapy and cranial radiotherapy,

developed a severe hearing loss over three years later, after exposure to excessive noise.

2. Case report

A 13.5 year-old boy underwent craniotomy and macroscopically complete resection of a left cerebellar medulloblastoma. Due to residual tumor on the post-surgical MRI, he underwent a second surgery with complete excision of the residual tumor. The patient then received cranio-spinal radiotherapy of 23.4 Gy in 13 sessions of 1.8 Gy each, followed by a boost to the posterior fossa of 30.6 Gy in 17 sessions of 1.8 Gy each in combination with weekly vincristine as radio-sensitizer. Four weeks after completion of radiotherapy, he began chemotherapy consisting in lomustine, cisplatin, vincristine, and cyclophosphamide. This patient received cisplatin at 75 mg/m² over 6 h, for a total of six cycles administered over nine months. Furosemide and mannitol were also administered as part of supportive care.

Audiological testing included conventional audiometry (0.25–8 kHz), impedance audiometry, Distortion Product Otoacoustic Emission (DPOAE) tests and Transiently-Evoked Otoacoustic

* Corresponding author at: The Montreal Children's Hospital, 2300 Rue Tupper, Rm. B-240, Montreal, QC, Canada, H3H 1P3. Tel.: +1 514 412 4304; fax: +1 514 412 4342.

E-mail address: sam.daniel@mcgill.ca (S.J. Daniel).

¹ Address: 103 Belgrave Road, Flat 8, London SW1V 2BH, UK.

² Address: 28 rue de la Cadoule, 34740 Vendargues, France.

³ Address: Pediatric Hematology-Oncology, CHU Sainte-Justine, 3175 Chemin Côte Sainte-Catherine, Local A.12.39, Montreal, QC, Canada, H3T 1C5.

Table 1
Audiological evaluations.

Freq	Pre-chemotherapy				During platinum-based chemotherapy										Post-chemotherapy				Freq											
	1		2		3		4		5		6		7		8		9			10		11		12						
	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE		RE	LE	RE	LE	RE	LE					
Conventional (C)	0.25	10	10	10	0	5	10	10	15	10	10	0	0	5	10	5	10	0	5	0	10	10	10	10	10	5	0.25			
	0.5	0	0	10	0	5	10	5	5	5	10	-5	0	5	5	5	5	0	0	0	5	5	5	0	5	0.5				
	1	10	0	5	10	0	10	0	0	5	5	-5	-5	0	5	5	5	0	0	5	25	0	0	0	0	1				
	2	5	10	5	10	0	10	0	5	0	5	-5	-5	-5	5	0	5	0	5	25	30	0	5	5	5	2				
	3	5	10	5	5	0	5	0	0	-	-	-	-	-5	0	-5	5	0	0	30	35	0	0	0	0	3				
	4	5	5	0	5	0	5	0	0	0	0	0	-5	-5	5	-5	0	0	0	25	30	0	0	0	0	4				
	6	0	10	0	0	0	5	0	0	-	-	-	-	0	0	0	20	0	0	10	15	0	10	0	5	6				
	8	0	5	0	5	0	5	0	0	0	0	5	5	10	0	15	30	5	5	5	-	5	15	5	15	8				
	HF	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	35	45	35	9			
		10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	40	45	45	10			
		11.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	40	-	-	-	45	35	45	40	11.2			
		12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	30	30	40	25	80	65	25	45	-	-	65	45	50	40	12.5
		14	-	-	-	-	-	-	-	-	-	-	-	-	-	35	30	45	35	65	45	35	50	-	-	60	45	55	45	14
		16	-	-	-	-	-	-	-	-	-	-	-	-	-	>40	25	>40	>40	40	45	30	45	-	-	45	55	40	35	16
	ASHA (C/HF)																													
	Chang																													
Tymp																														
DPOAE																														
TEOAE																														
Normal																														

Evaluations were performed: 1) prior to radiotherapy, 2–7) prior to each cisplatin dose, 8) three months after cisplatin chemotherapy, 9) 15 months after cisplatin chemotherapy, 10) 41 months after cisplatin chemotherapy (3 days post-noise exposure), 11) 42 months after cisplatin chemotherapy, 12) 52 months after cisplatin chemotherapy. Freq, frequency; RE, right ear; LE, left ear; Conventional, conventional audiometry; HF, high-frequency audiometry; ASHA, hearing loss based on the American Speech-Language-Hearing Association criteria; Chang, Chang grade assigned; Tymp, tympanogram; DPOAE, Distortion Product Otoacoustic Emission tests, with abnormal frequencies being listed (in kHz, defined as: signal/noise ratio below 6 dB); TEOAE, Transiently-Evoked Otoacoustic Emission test results, as determined by the audiologist. *Note 1:* The patient has normal hearing (thresholds ≤ 20 dB in evaluations #3 and 5 despite hearing loss according to the ASHA criteria). *Note 2:* Chang grades were assigned based on frequencies up to 12 kHz, whenever possible.

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