Impact of Intravenous Vitamin C and Endolaser Therapies on a Pediatric Brainstem Glioma Case

Ivette M Solís-Nolasco, BSc¹, Gilberto Caraballo, MD², Michael J González, DSc, NMD, PhD³, José Olalde, MEE², and Raul H Morales-Borges, MD⁴

Abstract
Pediatric cases of a brainstem glioma are one of the most difficult tumors to treat. In children, this type of cancer is perhaps the most dreaded of cancers due to its poor prognosis, yet it remains an area of intense research. In the case presented herein, conventional chemotherapy and radiotherapy treatments were not showing any improvement. The patient was then treated with high-dose intravenous vitamin C (IVC) and endolaser therapy. A significant reduction in glioma’s size was achieved in 2 months with this adjunct therapy. These results present a possibility of decreasing brainstem glioma progression with adjuvant IVC and endolaser therapy.

Keywords
brainstem glioma, pediatric cancer, intravenous vitamin C, intravenous laser therapy

Received September 22, 2019. Accepted for publication December 30, 2019

Case Background
In the case presented herein, we discuss the effect of intravenous vitamin C (IVC) and endolaser therapy in a 6-year-old female child with a brainstem glioma. From 15% to 20% of all central nervous system, tumors in children are brainstem gliomas.¹ The statistics of survival for this condition have not improved over the years. The symptoms of brainstem glioma are headache, vomiting, motor weakness, and hearing impairment.² In most cases, it is a tumor difficult to resect; for that reason, the evaluation of other clinical approaches is necessary.³ Intravenous (IV) administration of ascorbate can act as a prodrug to deliver a significant influx of H₂O₂ to tumors.⁴ H₂O₂ is the principal mediating factor in cytotoxicity to cancer cells via IVC.⁵ Vitamin C promotes an intracellular oxidation state and energy generation that improves overall therapeutic potential including stimulation of processes such as apoptosis and necrosis.⁶

In combination with IV laser therapy, it is possible to activate mitochondrial metabolic pathways and increase production of ATP.⁷ Each laser color applied therapeutically provides wavelengths capable of influencing different cellular and physiological aspects, among them, energy, oxygenation, circulation, and reduction in blood pressure among others.⁸

Case Presentation
A 5-year-old child, with a weight of 59 pounds and height of 3’10”, presented in a computer tomography (CT) scan with contrast a neurohypophysis bright spot and a heterogeneous mass at the brain stem, classified as

¹Department of Interdisciplinary Studies, College of Natural Sciences, University of Puerto Rico, Rio Piedras Campus, Rio Piedras, Puerto Rico
²Centro Medico Regenerativo, Bayamon, Puerto Rico
³Department of Human Development, School of Public Health, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico
⁴Integrative Optimal Health of Puerto Rico, San Juan, Puerto Rico

Corresponding Author:
Michael J González, Department of Human Development, School of Public Health, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico.
Email: michael.gonzalez5@upr.edu
brain stem glioma. In January 2018, the measurements of the mass were $4.6 \times 2.9 \times 2.7\ cm^3$ (36.018 cm$^3$). The patient received chemotherapy (carboplatin and vincristine). Carboplatin was administered by a 1-hour infusion at a dose of 175 mg/m$^2$ for 4 consecutive weeks, followed by a 2-week rest period, and then reinstituted for 4 more weeks. Vincristine at a dose of 1.5 mg/m$^2$ (maximum dose 2 mg) was administered by IV bolus weekly for 10 weeks, concurrent with the carboplatin and 30 radiotherapy treatments (60 Gy given locally to the primary tumor site in single daily fractions). In April 2018, a CT scan showed a 55% reduction in size with measurements were $2.9 \times 2.7 \times 2.6\ cm$ (20.358 cm$^3$). Nevertheless, the patient started to lose control of foot movement. At this point, the patient was restarted on chemotherapy-only treatment.

Another CT performed 4 months later in August 2018 showed that the measurements of the brainstem glioma were $4.9 \times 3.1 \times 3.8\ cm$ (57.722 cm$^3$). The 285% increment in size showed that after the 30 chemotherapies and 30 radiotherapies plus chemotherapy-only treatments resulted only in a transitory response. Given the poor improvement, the patient started IVC and endolaser therapy. For vitamin C, the dose was 25g in 250mL ringers lactated ringer’s solution, and for endolaser therapy, the colors given were green, blue, red, and yellow with a 20 Hz frequency/wavelength 10 minutes each. The patient received the treatment twice a week for a total of 18 treatments.

After starting with IVC and laser therapy for a period of 2 months, in October 2018, a CT showed a 79% decrease in the size of the brainstem glioma. The measurements were $2.9 \times 2.2 \times 1.9\ cm$ (12.122 cm$^3$). The brainstem glioma was causing less extrinsic impression upon the fourth ventricle anterior aspect. This result revealed that the brainstem glioma that was previously diagnosed with a fatal prognosis was significantly reduced after IVC and endolaser therapy.

**Conclusion**

Application of IV AA in cancer patients might provide them with better quality of life and increases the possibility of therapeutic improvement. Cancer patients have depressed circulatory, cellular, and tissue ascorbate levels and reserves. The high-dose IVC therapy will correct those identified deficiencies. IV laser therapy improves cell energy, blood, and cell properties that enhance therapeutic outcomes. Combining IVC with endolaser as adjuvant therapies, we have a better chance to reduce the progression of the glioma.

**Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.
Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD
Raul H Morales-Borges https://orcid.org/0000-0002-3469-3074

References
1. Hargrave D, Bartels U, Bouffet E. Diffuse brainstem glioma in children: critical review of clinical trials. *Lancet Oncol*. 2006;7(3):241–248.
2. Deshpande RP, Chandrasekhar YB, Babu D, Rao IS, Panigrahi M, Babu PP. Brainstem glioma: clinical significance and prognostic evaluation. *Interdiscip Neurosurg*. 2019;16:64–66.
3. González MJ, Rosario-Pérez G, Guzmán AM, et al. Mitochondria, energy and cancer: the relationship with ascorbic acid. *J Orthomol Med*. 2010;25(1):29.
4. Du J, Cullen JJ, Buettner GR. Ascorbic acid: chemistry, biology and the treatment of cancer. *Biochim Biophys Acta*. 2012;1826:443–457.
5. Doskey CM, Buranasudja V, Wagner BA, et al. Tumor cells have decreased ability to metabolize H₂O₂: implications for pharmacological ascorbate in cancer therapy. *Redox Biol*. 2016;10:274–284.
6. Park S. The effects of high concentrations of vitamin C on cancer cells. *Nutrients*. 2013;5(9):3496–3505.
7. Momenzadeh S, Abbasi M, Ebadifar A, Aryani M, Bayrami J, Nematollahi F. The intravenous laser blood irradiation in chronic pain and fibromyalgia. *J Lasers Med Sci*. 2015;6(1):6–9.
8. Alesskaya GA, Sambor EG, Kuchinskii AV. Effect of intravenous laser irradiation on the molecular structure of blood and blood components. *J Appl Spectrosc*. 2006;73:115.
9. Shilpi S, Shivvedi R, Singh A, Saraogi G, Jain V, Khatri K. Vitamin C: properties, function and application in cancer therapy. *Adv Pharm J*. 2018;3:130–135.
10. Gasparyan LV, Brill G, Makela AM. Activation of angiogenesis under influence of red low-level laser radiation. In: *Laser Florence 2004: A Window on the Laser Medicine World* (Vol. 5968). International Society for Optics and Photonics, 2005.
11. Avci P, Gupta A, Sadasivam M, et al. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. *Semin Cutan Med Surg* 2013; 32(1): 41–52.
12. Wei Y, Song J, Chen Q, Xing D. Enhancement of photodynamic antitumor effect with pro-oxidant ascorbate. *Lasers Surg Med*. 2012;44(1):69–75.
13. Li C, Chen Y, Wang Q. [Whole bladder wall laser irradiation to prevent bladder cancer recurrence with intravesical HpD and ascorbic acid]. *Zhonghua Zhong Liu Za Zhi*. 1997;19(6):463–465.
14. Riordan HD, Hunninghake RB, Riordan NH, et al. Intravenous ascorbic acid: protocol for its application and use. *P R Health Sci J*. 2003;22:287–290.