

Ophthalmic Artery Chemosurgery: A Nursing Perspective

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ABSTRACT

Retinoblastoma (RB) is the most common primary cancer to affect the eyes in children with approximately 350 cases/year in the United States and 8000 worldwide. Today, sadly, 50% of children with RB worldwide die from their disease. In our experience, utilization of ophthalmic artery chemosurgery (OAC) has transformed the treatment plan for patients; with over 1500 procedures performed, our survival rate exceeds 98%. It is now our standard first-line therapy for RB. OAC is a surgical outpatient procedure which delivers concentrated doses of chemotherapy directly to the tumor without the toxicities of systemic chemotherapy. Our team approach and nursing management of these patients are the focus of this article. Nursing navigation and collaboration after

OAC is vital and requires a combined effort by the nurses along with physicians, interventional radiologists, and the patient's families to ensure appropriate follow-up is established. Proper patient education throughout the process is crucial as is open and available communication for parents of patients with the nursing staff. The success in our treatment of this disease can be much accredited to the multidisciplinary team approach, with nursing playing an integral part in the support and management of these patients.

Key words: Coordination, nursing navigation, ophthalmic artery chemosurgery, retinoblastoma

Introduction

Retinoblastoma (RB) is the most common primary cancer to affect the eyes of children with approximately 350 cases/year in the United States (US)

and 8000 worldwide.^[1] RBs originate in the eye in the immature cones that arise from the layers of the retina in the back of the eye. Once developed, RBs can grow and fill the eye spreading outward along the optic nerve or into the

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vascular layer of the eye (uveal tract) and rarely through the wall of the eye (sclera) into the orbit.^[2] Figure 1 shows an enucleated eye with RB filling the globe.

In the US and developed countries, most patients present with intraocular disease with only 6%–7% presenting with disease outside the eye.^[3] In developing and low-income countries, factors such as a delay in diagnosis and initiating treatment are sadly a cause of advanced disease, greatly impacting survival rates. Survival for children with RB in the US and developed countries such as UK, Australia, and Canada exceeds 96%,^[4] for those in developing countries, mortality has been reported as high as 50%–90%.^[3] A lack of education of both parents and medical providers, as well as a lack in resources (financial, location, and expertise of medical staff), impacts the outcome of the patient.

Ophthalmic Artery Chemosurgery

Our treatment of RB has evolved dramatically over the past decade. Utilization of ophthalmic artery chemosurgery (OAC) also known as intra-arterial chemotherapy has transformed our treatment algorithm. It is now our standard first-line therapy for disease that cannot be controlled with local therapies such as cryotherapy and laser photocoagulation. We have eliminated the use of systemic chemotherapy removing the serious potential side effects such as febrile neutropenia, ototoxicity, neurotoxicity, and the risk of secondary leukemia, described by Youseff *et al.*, 2016.^[5] The exception is with children with metastatic disease and infants <7 kg or 3 months of age. Children who do not meet the age and weight parameters (thought necessary to adequately access the femoral artery and prevent occlusion) receive single-agent carboplatin (18.7 mg/kg/dose) as a “bridge” therapy while waiting to grow. OAC allows for concentrated doses of chemotherapy directly to the tumor and has been very

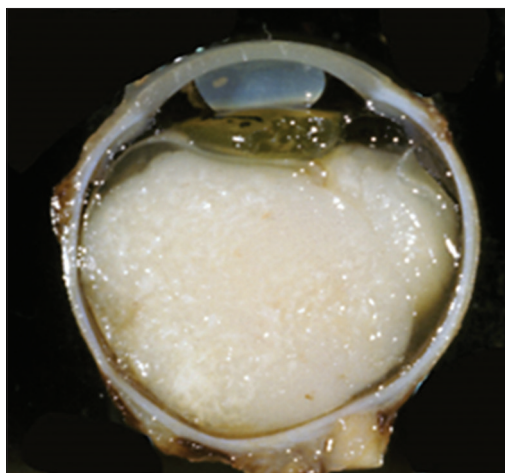


Figure 1: Retinoblastoma filling enucleated globe. Photograph used with permission from David H. Abramson, MD

successful even on advanced eyes.^[6] OAC has also eliminated 90% of enucleations performed just 5 years ago.^[7] To date, our team has performed over 1566 infusions during 1326 procedures in 465 eyes of 373 patients.

OAC is a surgical procedure performed in an interventional radiology suite under general anesthesia with endotracheal intubation. The procedure is performed with anticoagulation with heparin (80 IU/kg) to prevent thrombosis. The femoral artery is accessed with a microcatheter and threaded to the ostium of the ophthalmic artery with utilization of fluoroscopy. Occasionally, in young children, the ophthalmic artery is too small for catheterization, or anatomic variations exist; in this case, the middle meningeal artery is catheterized, or a “balloon technique” can be used.^[8] The placement of a temporary balloon allows occlusion of the internal carotid artery above the origin of the ophthalmic artery, and the chemotherapy is infused into the internal carotid below the balloon.^[6,9] Chemotherapy with melphalan, topotecan, and carboplatin is diluted and slowly injected in a pulsatile fashion. The need for single or multiple drugs is made by the treating ophthalmic oncologist; the drug doses are titrated by age [Table 1]^[10], using patient age as an approximation of eye size and arterial territory.^[6] We have found most children require an average of 3–4 monthly courses of OAC.

The procedure takes approximately 2 hours, and patients are recovered in a postanesthesia care unit on strict bed rest for 5 hours. During recovery, it is necessary for child to remain supine, with leg immobilized by a knee brace. The child’s blood pressure, pedal pulses, femoral puncture site, color, sensation, and skin temperature of the lower extremity are monitored every 15 minutes for the 1st hour and every 30 minutes for 2nd hour then hourly. Once bowel sounds are assessed and confirmed present, the child is allowed to resume fluids first then food as tolerated. The child is discharged to home if stable after 5 hours of monitoring.

Side effects managed by our team include erythema of the skin of the eyelid and brow area, periorbital edema, and madarosis (loss of eyelashes) of the affected eye(s) [Figures 2 and 3]. Neutropenia is the most common systemic toxicity, but most patients remain asymptomatic and do not develop fever. Rarely, thrombocytopenia and anemia develop in heavily pretreated children. Post procedure bruising, hematoma or bleeding at the

Table 1: Current ophthalmic artery chemosurgery drug doses age algorithm

Drug	Intra-arterial drug doses			
	3-6 months	6-12 months	1-3 years	>3 years
Melphalan (mg)	2.5	3	4	5
Carboplatin (mg)	30	40	50	50
Topotecan (mg)	0.5-2	0.5-2	0.5-2	0.5-2

femoral site is rare but may occur with any interventional femoral procedure. Systematic retrospective reviews on complications from OAC at multiple institutions revealed similar periorbital edema and inflammation and some ocular complications such as optic atrophy, eye dysmotility, ptosis, retinal detachment, and vitreous hemorrhage; systemic complications were rare.^[5]

Nursing Management

The nurse is an integral part of our multidisciplinary team and serves as the patient care coordinator to navigator the patient through the procedure and aftercare. Patients are seen for an examination under anesthesia (EUA) by the ophthalmic oncologist where the need for OAC is confirmed and orders faxed to the interventional radiology team. OAC is usually performed the following day at a devoted interventional suite that works as a part of our RB team. Education about OAC for parents and caregivers is vital as it is a same day outpatient procedure performed at a different institution.

Education includes preprocedure teaching to assure that parents and caregivers understand what is involved; this teaching is reinforced at the interventional radiology suite. Anticipated side effects include possible nausea and vomiting (from the anesthesia), redness, swelling and loss of eyelashes in the treated eye(s) that may last several days to a few weeks, and neutropenia.^[6] Education also includes explanation of fasting guidelines before anesthesia, the preanesthesia assessment of health status (done in the morning of the OAC to make sure the child is well enough to undergo anesthesia), blood counts, and need for follow-up of complete blood count 7–10 days postprocedure. Patients are told that they will meet the interventional radiologist before OAC to answer any additional procedure-related question and to obtain informed consent.

General chemotherapy-related instruction includes a verbal discussion as well as supplemental handouts given to the parent/caregiver as a resource. Topics discussed include facts about blood cells (function of white blood cells [WBC], red blood cells, and platelets) potential for fever and neutropenia, mild thrombocytopenia and anemia, and the importance of handwashing. In addition, parents/caregivers are instructed to avoid all vaccines, except annual influenza vaccine, until chemotherapy is completed. Post-OAC monitoring of blood counts is discussed and planned for 10 days postprocedure. Contact information for the pediatrician or pediatric oncologist is identified for all patients. Patients are prescribed specific medications to be administered post-OAC. Tobradex[®] ointment or drops, a combination of an antibiotic and steroid, are to be applied three times a day for 4 days to reduce inflammation and prevent infection. Oral steroids are prescribed to be tapered over 5 days to reduce eye swelling. Antiemetics are prescribed to be used as needed to prevent nausea and vomiting. Creative ways to enhance toleration of oral steroids include flavoring the medication, administering small doses in the side of the cheek, ensuring medication is given with food or milk (not on an empty stomach), and utilizing antiemetics 30 minutes before dosing. The importance of taking the medication exactly as prescribed is stressed, and contacting the physician offices is emphasized if the child is not tolerating medication. Family is given clinic contact information during clinic hours for nurse triage as well as emergency contact numbers and location for covering physician and emergent care.

In the 3–4 weeks post-OAC and before the next EUA, there is continued nursing coordination and follow-up. Blood counts are initially drawn 10 days post-OAC as some degree of neutropenia usually occurs and recommendations for timing of repeat blood work or use of Neupogen[®] (WBC growth factor) are given. Fever and neutropenia guidelines are reinforced as needed.



Figure 2: Redness post ophthalmic artery chemosurgery



Figure 3: Madarosis and swelling post ophthalmic artery chemosurgery

Patient triage is an integral part of our nursing practice and may include questions about medications, side effects, and follow-up care. Patients and families need to have an open means of communication with the nurses who serve as their liaison to the ophthalmic oncologist, interventional neuro-radiologist, and pediatrician or oncologist. Our patient population is from all over the US and from many countries all over the world. The nurse is a vital link, coordinating the care and smooth transition of patient and family between providers.

Access to OAC is limited worldwide but has become the standard of care at our institution. Our success rate with OAC has created heightened interest in this type of treatment and has increased awareness of this technique worldwide. Knowledge of the complex coordination of treatment and associated care can help nurses worldwide and reinforces the need for a dynamic team approach to safely and efficiently provide quality care for patients receiving OAC treatment.

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Conflicts of interest

There are no conflicts of interest.

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