

## **Selective ophthalmic artery chemotherapy as primary treatment in advanced stages of retinoblastoma : a prospective study**

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## Aims and objectives

Retinoblastoma is the most common primary malignant intraocular tumor in children.

Unlike the West with excellent survival rates, mortality in developing nations as India is as high as 40%-70%, mainly due to delay in presentation.

India still accounts for nearly one-third of retinoblastoma cases in the Asia- Pacific region.

We aim to report our experience using selective ophthalmic intra arterial chemotherapy(SOAC) as primary treatment in advanced stages intraocular retinoblastoma from a tertiary care center.

## Methods and materials

study: Prospective design approved by Institutional Review board

Patients:

27 patients (20 male and 7 female) with age between 6 to 83 months(mean21) with newly diagnosed intraocular retinoblastoma of stage D and stage E underwent selective ophthalmic artery chemotherapy with triple drug regimen(Topotecan + Melphalan + Carboplatin with doses as shown in table 1) in three sessions with a time interval gap of 3 to 4 weeks(79 sessions).

We only included the cases of naive eyes(no prior treatment) treated with IAC in the present study.

All the procedures were done under general anesthesia using trans femoral access.

We used direct cannulation technique of ophthalmic artery(figure2) in 52 session, balloon occlusion technique(figure1) in 15 sessions, Middle meningeal artery in 12 sessions(figure3) for chemo infusion.

Each chemotherapy dose is diluted in 30 ml of saline and administered in a pulsatile fashion in a non-laminar manner without any reflux over 30 minutes to prevent lamination of medication and loss of dose to peripheral tributaries. The intracranial perfusion was checked with an angiogram at the end of each procedure to ensure uninterrupted blood flow.

### **Primary outcomes:**

Patient survival, globe salvage ,systemic toxicity and secondary cancers were assessed.

### **Measures:**

B mode USG(figure5), ophthalmic examination, Retinal photography(figure6)

Images for this section:

Sr no	Drug	Age	Dose
1	Topotecan	0-2 years	0.5 mg
		≥2 years	1 mg
2	Melphalan	0-2 years	3mg
		2-5 years	5mg
		≥5 years	7.5mg
3	Carboplatin	All ages	30mg

**Table 1:** Triple drug regimen with Melphalan (3mg/ 5mg/ 7.5mg), Topotecan (0.5mg/ 1 mg) and Carboplatin (30mg) using age adjusted doses were administered.

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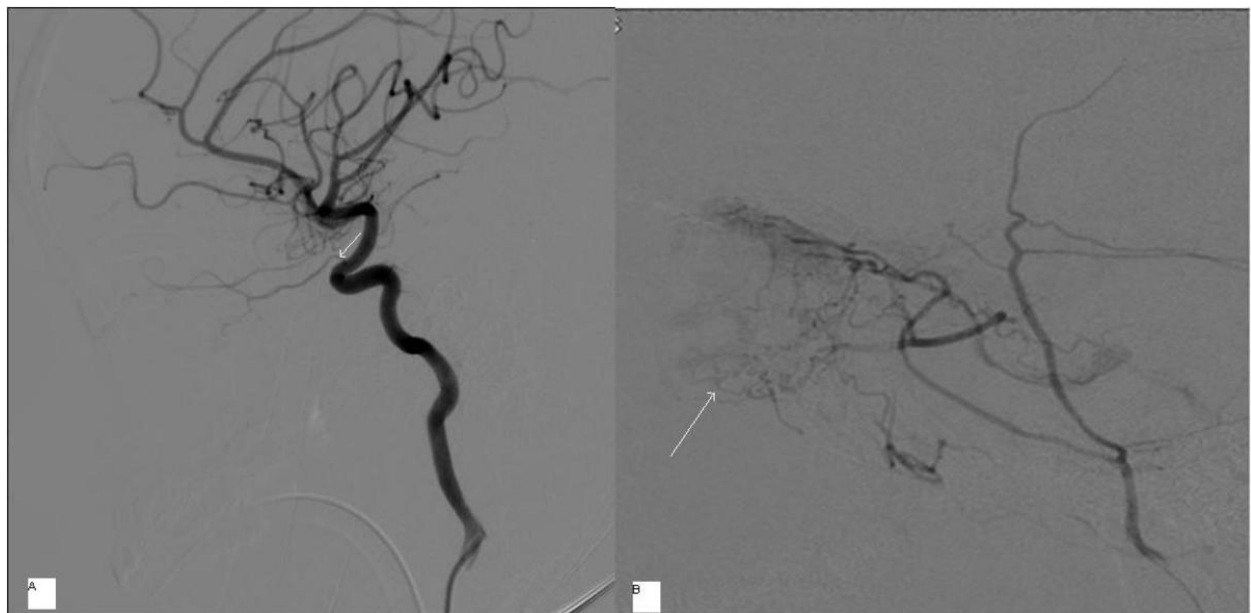
**Fig. 1:** Balloon inflated(hyperglide) in Internal carotid artery to cause temporary occlusion, facilitating the rapid drug delivery into ophthalmic artery

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**Fig. 2:** Digital subtraction angiogram(DSA) of Internal carotid angiogram showing origin of ophthalmic artery as shown by arrow in A.selective ophthalmic artery angiogram showing choroidal blush (arrow in B)

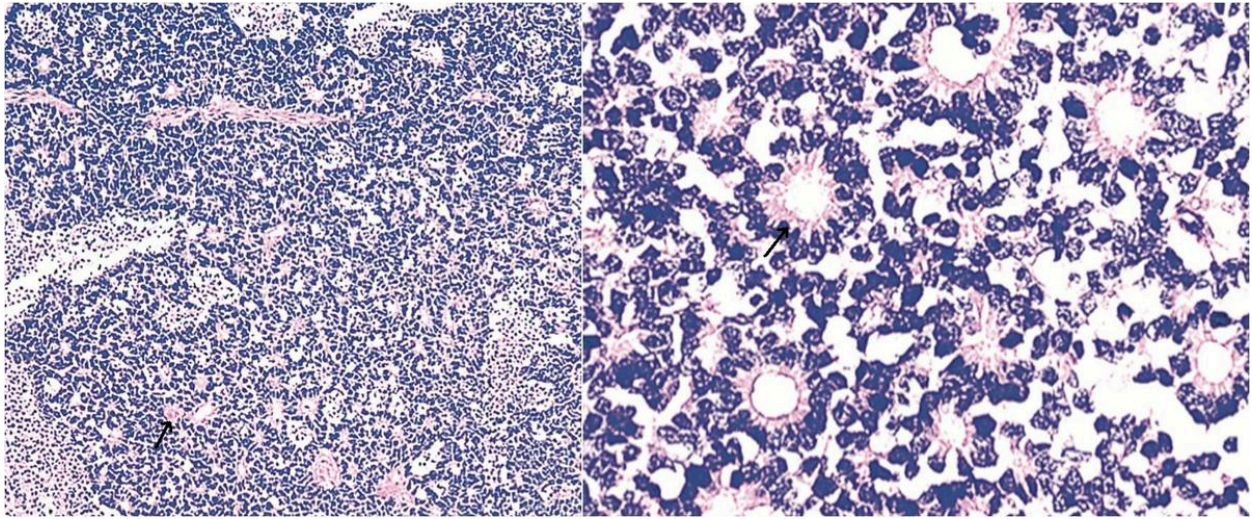
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**Fig. 3:** Selective ICA angiogram showing rudimentary ophthalmic artery (arrow in A). selective external carotid artery catheterisation showing choroidal blush (arrow in B)

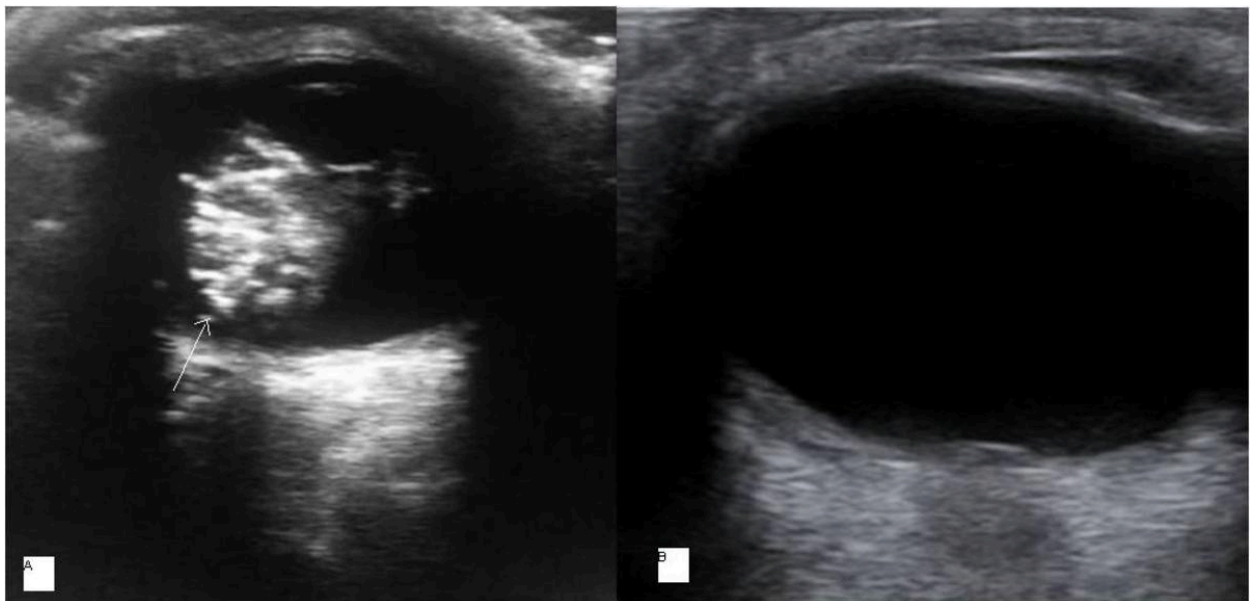
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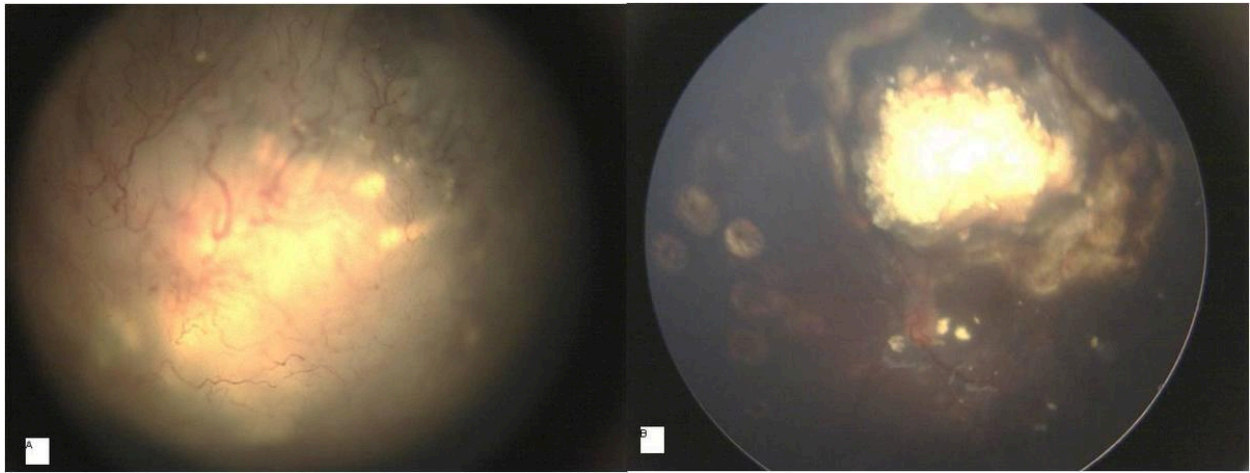
**Fig. 4:** Tumor persisted after IAC. Histopathology of tumor (enucleated eye) showing Flexner-Wintersteiner rosettes, tumor cells forming a round structure with a clear center rimmed by a membrane (arrows) - suggestive of well differentiated retinoblastoma

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**Fig. 5:** B mode ultra sonogram image showing tumor (arrow in A) in stage D retinoblastoma of 11 months old baby. Total resolution of the tumor is seen after 3 sessions of intraarterial chemotherapy as seen in B.

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**Fig. 6:** Retinal camera images of group D tumor(A)in 14 month old baby which regressed after 3 sessions of IAC as seen in B.

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## Results

12 patients of group D and 15 patients of group E (International classification of retinoblastoma classification) underwent IAC in 79 sessions.

The technique of ophthalmic artery catheterisation is performed by our trained intervention radiologist team safely in all the sessions.

The response of the tumor is graded as complete regression, partial regression and no response.

In a follow up period of 2 years enucleation was done in 5 patients.

Histopathology of the tumour in enucleated eyes were analysed (figure 4)

No procedural related complications such as strokes or femoral artery puncture site hematomas occurred in any patients.

Adverse effects in the form of lid edema, hyperemia occurred in 3 patients.

One patient developed fever and neutropenia who improved subsequently.

Thus globe salvage of 81.5% is seen in our patients even in advanced stages of retinoblastoma with SOAC.

## Conclusion

Selective ophthalmic artery IAC is safe and can be done repeatedly in children and we achieved >80 % globe salvage even in advanced stages of retinoblastoma (Majority of such patients underwent enucleation in the past).

In view of its safety and high efficacy IAC should be considered as first line treatment in children with intraocular retinoblastoma with acceptable risks.

A multidisciplinary departmental team approach is necessary for the selection of the patients and our institution being the highest referral centre, required expertise for safely providing this technically sophisticated procedure multiple times was possible with our dedicated team effort.

## Personal information

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