

## Iris varix: 10-year experience with 28 eyes

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**Purpose:** The purpose of this study is to describe the clinical characteristics, multimodality imaging findings, and clinical course of iris varices. **Methods:** Retrospective, noncomparative, observational case series of 28 eyes of 26 patients with iris varices, diagnosed between 2007 and 2017, has been used. **Results:** The mean ( $\pm$ SD) age was  $58.3 \pm 12.5$  years (median 57.5, range 37–81). Patients were 57.7% male and 27% hypertensive. Varices were bilateral in two patients. The mean and median visual acuities were both 20/20 (range 20/16–20/40). Intraocular pressures were 16 mmHg (10–23 mmHg). Secondary glaucoma did not occur. The inferotemporal iris quadrant was affected in 75%. A single varix was seen in 64% and 36% appeared multiple. Varix orientation was radial in 57% and circumferential in 21%. Combined radial and circumferential varix orientation was noted in 18%. One had independent radial and circumferential varices in separate quadrants. A single episcleral sentinel blood vessel directed to the varix was present in 36%. Ultrasound biomicroscopy (UBM) showed a slightly increased mean iris thickness of 0.8 mm and multiple echolucent iris stromal vascular channels. Iris angiography showed no leakage of dye. Managed by observation over a mean follow-up of 37.7 months (range, 3–129), 96.4% eyes were stable and one (3.6%) regressed. No corectopia, ectropion uveae, hyphema, or metachronous anterior segment benign or malignant tumors occurred. **Conclusion:** Iris varix is primarily located in the inferotemporal quadrant and not associated with dysmorphic pupillary findings, progression, secondary glaucoma, or malignancy. Iris varices were benign vasculopathies with no associated ocular or vision-related morbidity.

**Key words:** Imaging, iris, tumor, varix, vasculopathy

Varix is defined as an elongated, dilated, typically tortuous vein reported in the eyelid, conjunctiva, iris, optic disk, and orbit.<sup>[1–8]</sup> In review of the literature, iris varices have only been described in nine case reports misdiagnosed as capillary hemangiomas, cavernous hemangiomas, and arteriovenous malformations.<sup>[9–17]</sup> Consequently, these cases were treated by observation, excision, and laser photocoagulation.<sup>[9–17]</sup> In general, iris varices have been thought to be unilateral, solitary, and without systemic associations.<sup>[9–18]</sup> This study provides the literature with a clinical profile, multimodality imaging findings, disease course, and long-term outcomes of iris varices in 28 eyes.

## Methods

A retrospective, noncomparative, observational case series was conducted. It adhered to the tenets of the Declaration of Helsinki and the Health Insurance Portability and Accountability Act of 1996. Approval was obtained from the Internal Review Board to perform a retrospective chart review. No informed patient consent was required in view of retrospective noninterventional nature of the study. This study was limited to patients with iris varix diagnosed between 2007 and 2017. Thus, 28 eyes of 26 patients were initially diagnosed with iris varix by clinical examination and followed for change. No patients with iris hemangioma or clinically indeterminate vascular iris lesions were included.

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## Data parameters

The demographic data included age, gender, and associated ocular and systemic diseases. Ophthalmologic examinations were inclusive of, but not limited to, visual acuity with the Early Treatment Diabetic Retinopathy Study charts in Collaborative Ocular Melanoma Study certified rooms, slit-lamp biomicroscopy with photography, tonometry, gonioscopy with photography, dilated indirect ophthalmoscopy, high-frequency ultrasonography (20–50 MHz), and iris fluorescein angiography.

Focused anterior segment examination included noting laterality of the varix, pupil shape, pupillary ruff, quadrant of the iris varix, number of varices, varix orientation (radial, circumferential, combined), associated iris nevus, hyphema, corneal endothelial pigment dusting, and dilated episcleral sentinel blood vessel in the quadrant of the iris varix.

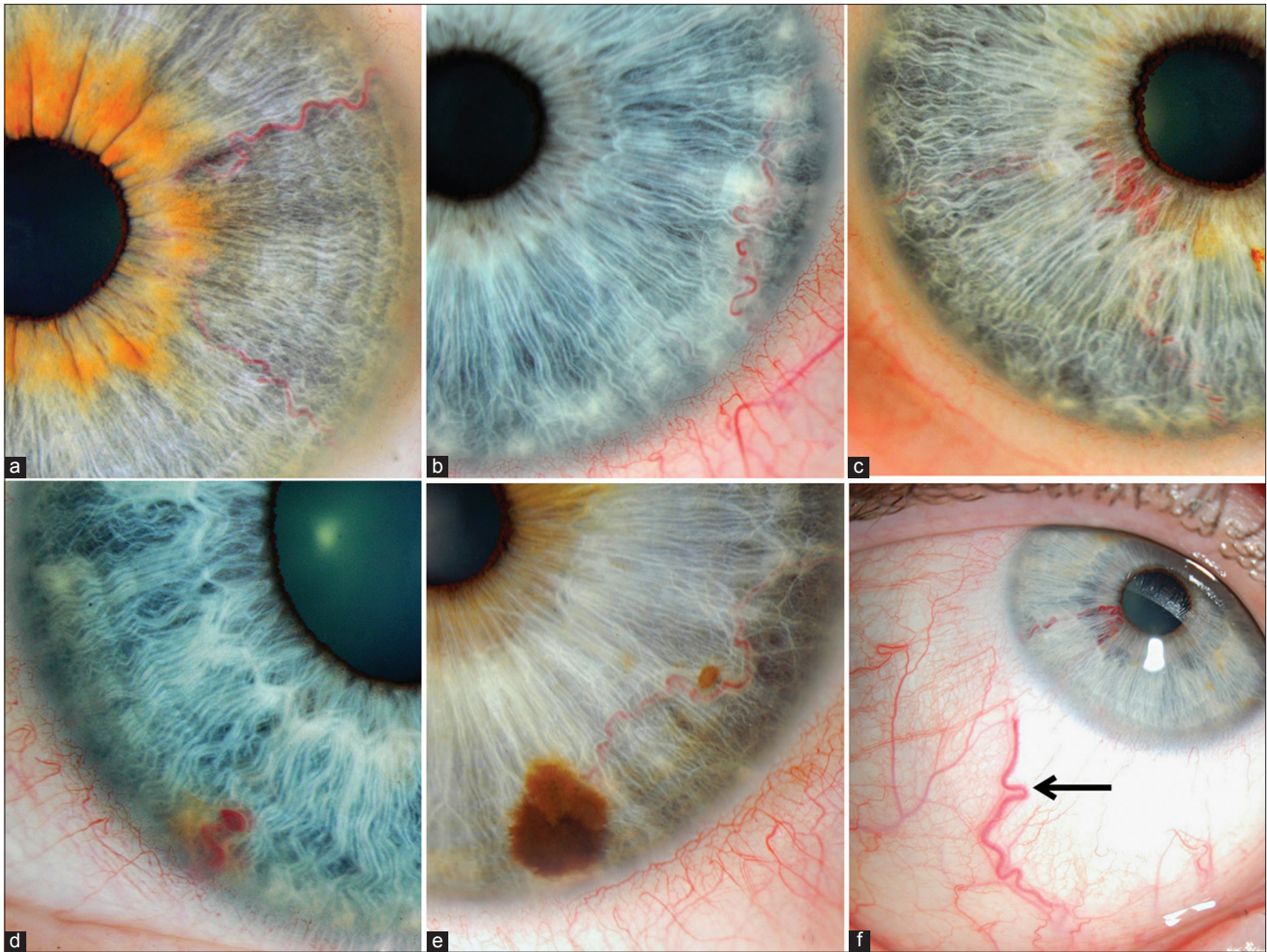
## Definitions of orientation

- **Radial iris varix** defined by a clinically visible portion of the varix was seen traversing from the root of the iris to the pupillary margin in one or more meridians [Fig. 1a].
- **Circumferential iris varix** was defined by a clinically visible portion, running parallel to the pupillary margin [Fig. 1b].

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**Figure 1:** Photography reveals the visible portions of iris varices: (a) radial varix, (b) circumferential varix, (c) combined varix (radial and circumferential components), (d) nevus in the same meridian as the varix, (e) nevus in same quadrant as the varix, and (f) varices with an episcleral sentinel blood vessel (black arrow)

- **Combined iris varix** contained both radial and circumferential components [Fig. 1c].

**Slit-lamp photography:** Digital imaging was performed in each case. We routinely use side-by-side comparisons over time as a method to screen for change in anterior segment anomalies.<sup>[19]</sup> Gonioscopy focused on angle (open, narrow or focal angle closure, pigment dispersion, and bridging blood vessels).

**High-frequency ultrasound imaging:** Longitudinal and transverse images in the central meridian of the varix were recorded. This was followed by a 360° screening of the entire anterior segment. Ultrasonography evaluated for iridociliary angle blunting, maximum iris thickness (meridian of the varix), adjacent ciliary body thickness (meridian of the varix), and iris pigment epithelium (IPE) characteristics (intact, erosion, posterior bowing, or anterior displacement). In addition, iris nodularity was measured and vascular channels were noted. Based on normative values, iris thickness of more than 0.7 mm was considered as increased.<sup>[20]</sup>

**Fluorescein angiography:** Intravenous anterior segment angiography was not typically performed. However, when obtained, we observed appearance of hyperfluorescence (early,

mid-phase, and late), duration of hyperfluorescence (transient, persistent), and dye leakage.

#### Follow-up

First follow-up examination was performed at 3 months. Subsequent examination included two 6-monthly visits and then at 12-month intervals thereafter. A detailed clinical evaluation, photographic documentation, and high-frequency ultrasound imaging were performed at each visit.

## Results

### Demographics

From 2007 to 2017, 26 patients with iris varix were referred for evaluation and treatment. Two were bilateral; therefore, 28 eyes of 26 patients were analyzed in this study. The mean ( $\pm$ SD) age at presentation was  $58.3 \pm 12.5$  years (median 57.5 and range 37–81). There were 57.7% ( $n = 15/26$ ) males and 42.3% ( $n = 11/26$ ) females. All patients in this series were Caucasian. Past medical histories at presentation revealed that 27% ( $n = 7/26$ ) had hypertension. Past ocular history revealed two cases with bilateral treated open angle glaucoma and two bilateral glaucoma suspects [Table 1].

**Table 1: Demographic and historical characteristics**

Case no.	Age (years)	Gender	Systemic history	Ocular history	Laterality
1	70	M	None	None	Unilateral
2	50	M	Hypertension	None	Unilateral
3	44	M	None	None	Bilateral
4	44	M	None	OU LASIK	Unilateral
5	65	M	Hypertension	None	Unilateral
6	47	F	Heart disease	None	Unilateral
7	51	M	Diabetes mellitus	None	Unilateral
8	67	M	None	OU POAG	Unilateral
9	72	M	Hypertension	None	Unilateral
10	47	M	None	None	Unilateral
11	81	M	Urinary bladder cancer, heart disease	None	Unilateral
12	70	M	None	None	Unilateral
13	73	F	None	Duane syndrome	Unilateral
14	44	F	Leukemia	None	Unilateral
15	77	F	Hypertension, uterine cancer, heart disease	None	Unilateral
16	44	F	None	None	Unilateral
17	43	F	None	None	Unilateral
18	66	F	None	OU POAG	Unilateral
19	60	M	Ulcerative colitis	None	Unilateral
20	55	F	Hypertension, breast cancer	None	Unilateral
21	37	M	None	None	Unilateral
22	71	F	Heart disease	OU cataract surgery	Bilateral
23	65	F	Hypothyroid	OU glaucoma suspect	Unilateral
24	53	M	None	Strabismus surgery	Unilateral
25	50	M	Hypertension	OU POAG	Unilateral
26	70	F	Hypertension	OU glaucoma suspect	Unilateral
	Mean age: 58.3 Median age: 57.5	Males: 57.7% (n=15/26) Females: 42.3% (n=11/26)	Most common systemic illness: Hypertension (n=7/26, 27%)	Most common ocular association: POAG (n=2/26, 7.7%)	Unilateral: 92.3% (n=24/26) Bilateral: 7.7% (n=2/26)

M: Male; F: Female; OU=Both eyes; LASIK: Laser-assisted in situ keratomileusis; POAG: Primary open angle glaucoma

### Ophthalmic findings

Mean, median, and range of visual acuity at presentation were 20/20, 20/20, and 20/16–20/40. Visual acuities less than 20/20 ( $n = 2/28$ ) were unrelated to the varices (1 choroidal melanoma and 1 vitelliform macular degeneration). Varices involved the left eye in 68% ( $n = 19/28$ ) resulting in a Chi-square 7.1429 and a significant  $P$  value of 0.007526 ( $P < 0.05$ ). There were no relative afferent pupillary defects. No corectopia, ectropion uveae, or hyphema was noted in our series. One eye had bilateral corneal endothelial pigmentation in a case with open angle glaucoma. The mean ( $\pm$ SD), median, and range of initial intraocular pressures were 15.6 ( $\pm$  2.9), 16, and 10–23 mmHg. No early or late glaucoma could be attributed to a varix in this series. Dilated fundus examination findings are shown in Table 2.

### Varix characteristics

- **Laterality:** Unilateral varices ( $n = 24/26$ , 92.3%) and bilateral varix ( $n = 2/26$ , 7.7%)
- **Number of varices in each eye:** ( $n = 18/28$ , 64.3%) had a single varix, ( $n = 10/28$ , 35.7%) contained multiple varices. All circumferential varices and bilateral varices were single
- **Location (quadrant):** Varices involved one or more iris quadrants. They were most commonly observed in the inferotemporal ( $n = 21/28$ , 75%) followed by superotemporal ( $n = 11/28$ , 39.2%). Five eyes (17.9%) had more than 1 quadrant involvement (2 quadrants:  $n = 3/28$ , 10.7%; and 3 quadrants:  $n = 2/28$ , 7.1%). Circumferential varices occurred only in the inferotemporal quadrant. Radial and combined varix showed no quadrant predilection.
- **Orientation:** Most common varix orientation was radial ( $n = 16/28$ , 57.1%), followed by circumferential varices ( $n = 6/28$ ,



**Table 2: Clinical and varix characteristics**

Eye no.	Eye	BCVA	IOP (mmHg)	No. of varix	Location (quadrant)	Orientation of varix	Episcleral sentinel vessel	Iris nevus	Fundus
1	OS	20/16	16	2	STQ	Radial	No	No	Normal
2	OS	20/20	15	1	ITQ, STQ	Radial	Yes	No	Normal
3	OD	20/20	10	1	ITQ	Radial	No	No	Normal
4	OS	20/20	10	1	INQ	Radial	Yes	Yes	Normal
5	OS	20/16	16	1	ITQ	Circumferential	No	No	Normal
6	OS	20/40	17	4	STQ, ITQ, INQ	Radial	Yes	No	Vitelliform macular dystrophy
7	OS	20/20	18	1	ITQ	Radial	No	No	Normal
8	OD	20/25	12	1	ITQ	Combined	No	No	Normal
9	OD	20/20	23	1	ITQ	Radial	No	No	Normal
10	OS	20/16	17	3	STQ, ITQ	Radial and Circumferential	No	No	Normal
11	OD	20/16	16	1	ITQ	Circumferential	Yes	No	Normal
12	OS	20/25	15	1	STQ	Radial	No	No	RPE hypertrophy
13	OS	20/20	13	1	STQ	Combined	No	No	Normal
14	OS	20/20	12	2	STQ	Radial	Yes	No	Normal
15	OS	20/20	13	1	STQ	Combined	No	No	Normal
16	OS	20/40	18	1	ITQ	Combined	No	No	Choroidal melanoma
17	OS	20/20	17	1	ITQ	Radial	Yes	No	RPE hypertrophy
18	OS	20/16	16	1	ITQ	Circumferential	No	Yes	Normal
19	OS	20/20	19	4	STQ, ITQ, SNQ	Radial	No	No	Choroidal nevus
20	OS	20/16	16	1	ITQ	Circumferential	No	No	Normal
21	OD	20/16	14	1	ITQ	Radial	No	Yes	Normal
22	OD	20/20	12	2	ITQ	Radial and combined	Yes	No	Normal
23	OD	20/25	16	1	ITQ	Circumferential	Yes	No	Normal
24	OS	20/20	16	1	ITQ	Circumferential	Yes	No	Normal
25	OS	20/20	22	2	ITQ	Radial	No	No	Normal
26	OS	20/25	15	2	STQ, ITQ	Radial	No	No	Normal
27	OD	20/20	17	2	ITQ	Combined	No	No	Normal
28	OD	20/25	15	2	STQ	Radial and Combined	Yes	No	Normal
	OD: 32% (n=9/28) OS: 68% (n=19/28)	Mean BCVA: 20/20	Mean IOP: 15.6	Median number of varix: 1	Most common location: ITQ (n=21/28, 75%)	Most common orientation: radial (n=16/28, 57.1%)	Sentinel blood vessel: 35.7% (n=10/28)	Iris nevus: 10.7% (n=3/28)	Most common: RPE hypertrophy (n=2/28, 7%)

OD: Right eye; OS: Left eye; BCVA: Best-corrected visual acuity; IOP: Intraocular pressure; STQ: Superotemporal quadrant; SNQ: Superonasal quadrant; ITQ: Inferotemporal quadrant; INQ: Inferonasal quadrant; RPE: Retinal pigment epithelium

21.4%). Radial and circumferential varices (same eye but different quadrants) were also seen (n = 1/28, 3.6%).

In consideration of the multiple varix characteristics, the most common presentation was unilateral, radial, and inferotemporal (n = 7/28, 25%). Second most common presentation was unilateral, circumferential, and inferotemporal (n = 4/28, 14.3%).

An iris nevus was seen in 10.7% (n = 3/28) eyes. Of these nevi, 3.6% (n = 1/28) were in the primary meridian of the varix [Fig. 1d] and 7.1% (n = 2/28) were in the quadrant of the varix [Fig. 1e]. A dilated episcleral sentinel blood vessel was present in 35.7% (n = 10/28) in the quadrant of the varix [Fig. 1f]. Gonioscopy revealed bridging vessels in 7.1% (n = 2/28), focal angle closure

in the primary meridian of the varix 3.6% (n = 1/28) eyes, and glaucoma-related pigment dispersion in 3.6% (n = 1/28).

**High-frequency ultrasound imaging**

The iris involved by varix was most commonly within than the normative range for thickness (n = 15/28, 53.6%). However, increased iris stromal thickness (n = 13/28, 46.4%) was seen and iris nodularity was noted (n = 12/28, 42.9%). Among all 28 iris varices, the mean (±SD) meridional iris thickness was 0.8 ± 0.1 mm (median 0.7, range 0.6–1.0 mm). Further, the ciliary body thickness in the meridian of the varix was a normative 1.3 ± 0.2 mm (median 1.3, range 1.1–1.7 mm). Additional ultrasonographic characteristics associated with the iris varices included presence of distinct, varix-related, echolucent, dot-

**Table 3: High-frequency ultrasound findings**

Eye no.	IPE	Maximum iris thickness (varix meridian; mm)	Iris module	Iris vascular channel	Maximum ciliary body thickness (varix meridian; mm)
1	Intact	0.8	+	None	1.1
2	Posterior bowing	0.8	+	None	1.2
3	Posterior bowing	0.7	+	None	1.2
4	Intact	0.9	+	None	1.5
5	Irregular	0.9	+	None	1.2
6	Intact	0.7	+	None	1.4
7	Intact	0.7	None	None	1.3
8	Intact	0.8	None	+	1.4
9	Intact	0.7	None	None	1.5
10	Irregular	0.8	None	+	1.3
11	Intact	0.7	None	+	1.6
12	Intact	0.8	+	None	1.7
13	Intact	0.7	None	None	1.3
14	Intact	0.6	None	None	1.2
15	Intact	0.7	None	None	1.5
16	Intact	0.7	None	None	1.2
17	Erosion	0.8	+	None	1.3
18	Posterior bowing	0.8	+	None	1.4
19	Intact	0.8	+	None	1.5
20	Intact	0.7	None	+	1.4
21	Intact	0.6	None	None	1.3
22	Intact	1.0	None	None	1.5
23	Intact	0.7	None	None	1.2
24	Anterior displacement	1.0	+	None	1.3
25	Intact	0.7	None	None	1.1
26	Intact	0.7	None	None	1.2
27	Intact	0.7	None	None	1.3
28	Intact	1.0	+	None	1.5
	IPE erosion: 3.6% ( <i>n</i> =1/28)	Mean: 0.8 Median: 0.7	Nodularity: 42.9% ( <i>n</i> =12/28)	Vascular channels: 14.3% ( <i>n</i> =4/28)	Mean: 1.3 Median: 1.3

IPE: Iris pigment epithelium

shaped vascular channels in 14.3% (*n*=4/28) eyes. The underlying IPE was eroded (*n* = 1/28, 3.6%), anteriorly displaced (*n* = 1/28, 3.6%), irregular and wavy (*n*=2/28, 7.1%), and showed posterior bowing (*n*=3/28, 10.7%) without discontinuity [Fig. 2]. No case in our series had iridociliary angle blunting or prominent vascular channels within the adjacent ciliary body [Table 3].

#### Iris varix angiography

Fluorescein iris angiography was not routinely performed. In two cases, it showed early hyperfluorescence, which persisted up to 10 min [Video clip 1]. However, no leakage of the dye into the anterior chamber was noted [Fig. 3].

#### Follow-up and outcomes

All patients were managed by observation. At a mean ( $\pm$ SD), follow-up of 37.7  $\pm$  34.9 months (median 28, range 3–129 months),

27 eyes (96.4%) had stable varix, and 1 eye (3.6%) showed regression. No secondary iris or ciliary body melanomas evolved in this series.

## Discussion

This is the first long-term observational case series of eyes with iris varix. Multiple unique clinical and imaging findings were revealed. These included that varices were 92.3% unilateral and that bilateral cases occurred. Varices were most commonly located in the inferotemporal quadrant (*n* = 21/28, 75%) and radial (*n* = 16/28, 57%) in orientation. More than one variceal vein was noted in (*n* = 10/28, 36%) eyes. A single single synchronous iris nevus was seen in (*n* = 3/28, 11%). Though dilated episcleral sentinel blood vessels were seen (*n* = 10/28, 36%), high-frequency ultrasound imaging revealed no

**Table 4: Review of literature on iris varix**

Publication	No. of eyes	Year of study	Visual acuity	Location (iris quadrant)	Mode of diagnosis	Management
Varix of the Iris <sup>[10]</sup>	1	1975	–	Inferonasal	Pathology	Sector iridectomy
Varix node of the iris with spontaneous regression <sup>[11]</sup>	1	1992	–	Temporal	Clinical	Observation
Varicose vein of the iris <sup>[12]</sup>	1	1995	–	Superonasal	Pathology	Sector iridectomy
Iris varix <sup>[13]</sup>	1	1997	6/6	Inferotemporal	Pathology	Sector iridectomy
Iris varix simulating an iris melanoma <sup>[14]</sup>	1	2000	6/6	Inferonasal	Pathology	Sector iridectomy
Iris varix: report of a case and review of iris vascular anomalies <sup>[9]</sup>	1	2009	20/20	Superonasal	Pathology	Excision
Unilateral tumor of the iris <sup>[15]</sup>	1	2011	20/20	Temporal	Clinical	Observation
Iris varix as a cause of late-onset inflammation after implantation of a phakic iris claw lens <sup>[16]</sup>	1	2012	20/20	Superotemporal	Clinical	Observation
Successful argon and diode laser photocoagulation treatment of an iris varix with recurrent hemorrhage <sup>[17]</sup>	1	2013	20/20	Superotemporal	Clinical	Laser photocoagulation
Our study	28	2018	20/20 (mean)	Inferotemporal (most common)	Clinical	Observation

M: Male; F: Female

**Table 5: Comparison of common features in the differential diagnoses of iris varix**

Features	Iris varix	Iris hemangioma	Iris melanoma
Hyphema	Rare	Common	Rare
Corectopia	Rare	Rare	Common
Ectropion uveae	Rare	Rare	Common
Episcleral sentinel vessel	Rare	Rare	Common
Bridging vessels on gonioscopy	Rare	Rare	Common
Pigment dispersion on gonioscopy	Rare	Rare	Typical
IPE on high-frequency ultrasound imaging	Intact	Intact	Eroded
Iris FA	No dye leakage	Dye leakage present	Dye leakage with feeder vessels

IPE: Iris pigment epithelium; FA: Fluorescein angiography

evidence of ciliary body tumor. High-frequency ultrasound findings included slightly increased iris stromal thickness in 46%, nodularity in 43% eyes, cross-sectional dot-like vascular channels in 14% eyes, and one focally eroded IPE. This patient had no additional suspicious clinical or imaging findings and remained stable over a 37-month follow-up. In our series, all varices monitored with serial ultrasonographic imaging remained stable throughout follow-up.

Though limited to two cases, iris fluorescein angiography revealed no dye leakage. At a mean follow-up of 38 months, 96% of varices were stable and one showed regression. No secondary iris or ciliary body melanomas occurred.

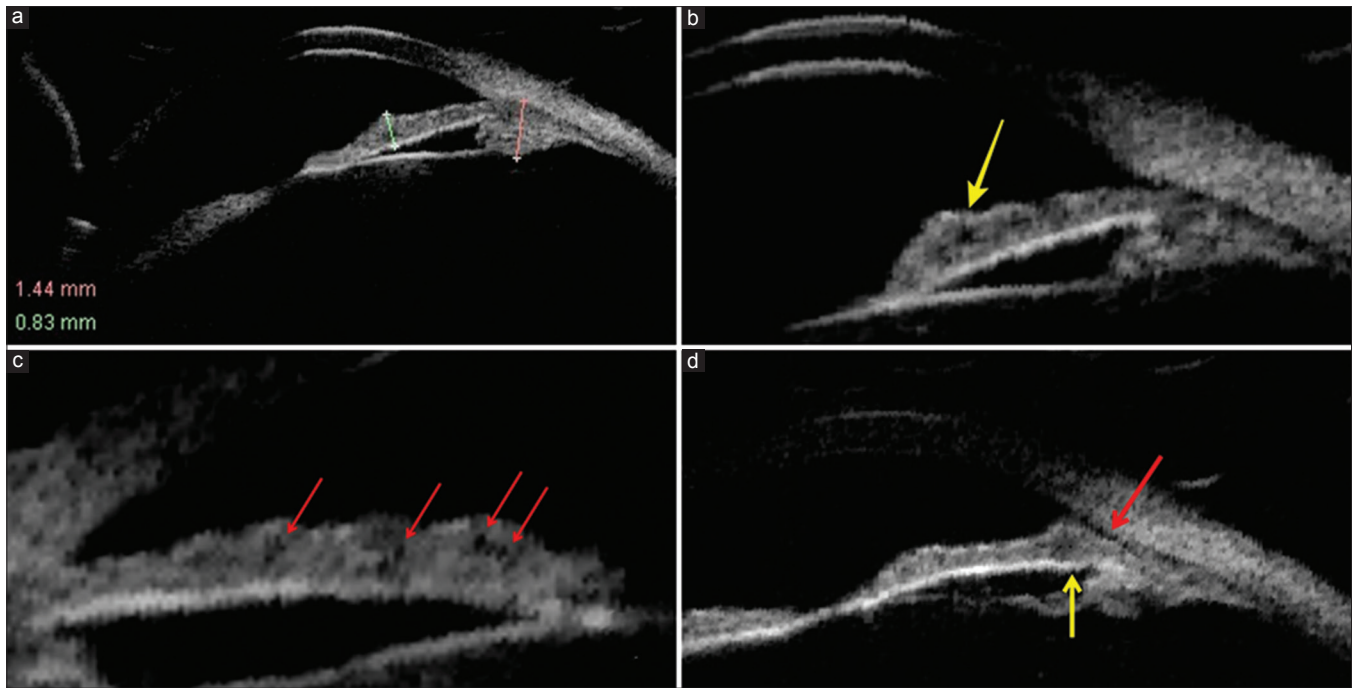
Previously, only isolated, unilateral cases of iris varix have been published with no associated ocular or systemic medical problems. Like our study, prior iris varices have not been associated with permanent loss of vision. Unlike our study, descriptions have not highlighted quadrantic predilection, sentinel blood vessels, or ultrasonographic characteristics [Table 4].

All the aforementioned cases suggest that iris varix is an acquired condition. The youngest reported case was of a 31-year-old male by Ang *et al.*<sup>[13]</sup> In our series, the median patient age was 57.5, range 37–81 years. Six of the nine varix-reported cases were male and we also found a slight male preponderance (male-to-female of 1:1.36).<sup>[9-17]</sup>

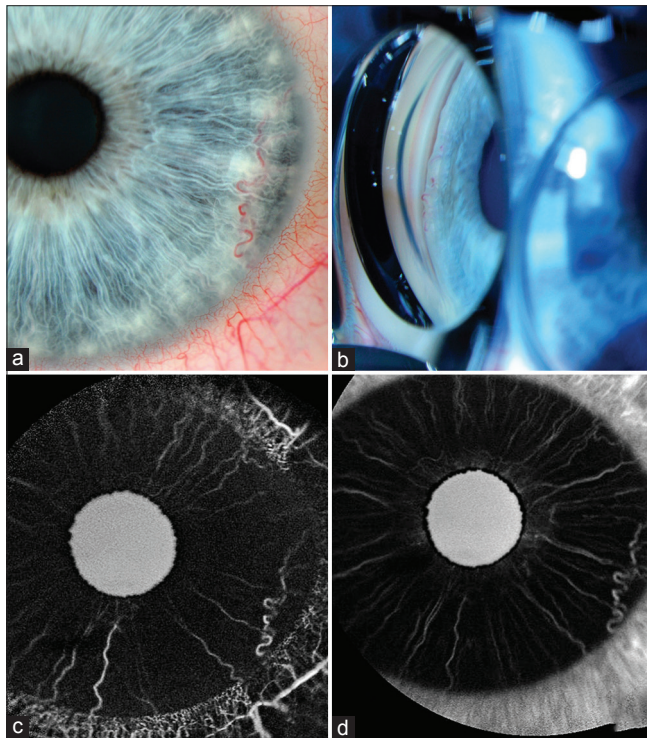
In contrast to prior studies where ultrasonographic findings have included irregular, echo-dense mass in the iris stroma, in our study, iris varices have been shown to be moderately reflective mass, dotted with echolucent varix-related ultrasonographic cross-sections.<sup>[9,14]</sup> Though the involved iris stroma was marginally thickened, benign findings included a general respect for tissue planes (IPE and ciliary body).

Fluorescein iris angiography has been reported. Broaddus *et al.* described a varix to be a hypo-fluorescent mass, whereas Kuchle *et al.* found a well-circumscribed hyperfluorescence with surrounding hypofluorescence.<sup>[9,11]</sup> However, in our series, we noted early hyperfluorescence without any leakage of the dye indicating that the anomalous varix contains an intact vascular endothelium and thus blood–aqueous barrier.

Iris varix is most often confused with iris hemangioma. More than half of the iris varix cases till date have been histopathologically diagnosed [Table 4].<sup>[9,10,12-14]</sup> Iris hemangiomas tend to be lobulated, bleed recurrently into the anterior chamber, and leak dye on fluorescein iris angiography.<sup>[9]</sup> In addition, iris varix has been presumed as a clinical pointer to a forme-fruste iris melanoma or irido-ciliary



**Figure 2:** High-frequency ultrasound images (longitudinal sections): (a) varix with increased iris thickness (0.8 mm), (b) prominent hypoechoic spot signifies a vascular channel (yellow-arrow), (c) zoomed-in view: nodular iris stroma with multiple dot-like and linear hypo-echoic vascular channels (red arrows), and (d) focal angle narrowing (red arrow) with posterior bowing of iris pigment epithelium (yellow arrow)



**Figure 3:** (a) Photograph of a circumferential iris varix. (b) Gonioscopic photography revealed no extension to the ciliary body. Note no bridging vessels or pigment dispersion. (c) Iris fluorescein angiography (40 s) showed a dilated hyperfluorescent vessel with no leakage. (d) Iris fluorescein angiography (5 min) showed persistent hyperfluorescence without leakage

melanoma.<sup>[14]</sup> The presence of pupillary dysmorphism, episcleral sentinel blood vessel, erosion of IPE, and dye leakage can be used to clinically distinguish between iris melanoma and varix [Table 5]. The main limitation of our study was the retrospective nature and lack of pathological confirmation.

## Conclusion

This long-term observational study of iris varix reveals it to be a benign vasculopathy without associated morbidity or risk of secondary malignant transformation.

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The study was financially supported by Eye Cancer Foundation, New York, USA (<http://eyecancerfoundation.net>). Dr. Puneet Jain received a fellowship grant from the foundation.

## Conflicts of interest

There are no conflicts of interest.

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