



Relief of symptomatic pseudo-polycoria due to iris biopsy using a daily contact lens

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ABSTRACT

Purpose: To report a case of pseudo-polycoria from iris biopsy managed by a daily disposable prosthetic colored hydrogel lens.

Observations: A 55-year-old Caucasian female presented with complaints of photophobia in her right eye, that was exacerbated when going from a dark to light environment. Her past ocular history included a diagnosis by another outside physician of presumed multifocal iris melanoma in the right eye, followed by an iris biopsy performed one month later. Upon presentation to our clinic two months later, best corrected visual acuity was 20/20- in the right eye and 20/25 in the left eye. Slit lamp exam of the right eye revealed iris abnormalities, full-thickness biopsy defects at 2, 3 and 6 o'clock and a 0.8 × 0.7mm area of iris hyperpigmentation at 8 o'clock (Fig A,B,C, and D). The patient was provided with three non-surgical options to manage her symptoms: a commercially available soft daily replacement printed prosthetic hydrogel lens, a commercially available soft monthly replacement silicone printed prosthetic hydrogel lens, or a custom soft yearly replacement prosthetic hydrogel lens with dark inlay. The soft daily printed prosthetic hydrogel lens was chosen because of its ease in hygiene regimen and did not limit peripheral vision as the yearly dark inlay lens would.

Results: The patient now wears Alcon Dailies® Color, Base curvature 8.6, Diameter 13.8, color mystic green in the right eye and her symptoms of photophobia have been resolved (Figure F).

Conclusion: There are limited options to manage photophobia in patients with polycoria or pseudo-polycoria. Surgical intervention is dictated by how many quadrants of iris are involved and therefore how symptomatic a patient may be. A less invasive alternative to surgical intervention is the use of a contact lens. In this case, traditional hand painted or printed yearly or monthly replacement hydrogel contact lenses were not used. Instead, a daily disposable hydrogel was successfully fit, highlighting that there is often a simple solution to a seemingly complicated issue.

1. Introduction

Polycoria can be described as more than one pupillary opening in the iris. True polycoria is extremely rare and is defined by an additional pupil surrounded by an intact sphincter muscle. Contrastly, pseudo-polycoria is characterized by a full thickness iris defect that lacks a surrounding sphincter muscle. Because these pupillary defects lack a sphincter, when the primary pupil dilates, the accessory defects undergo reflexive constriction.¹

The bulk of iris tumors can be diagnosed with clinical or historical criteria without the need for cytologic or pathologic verification. In the

case that observation may be dangerous or a diagnosis cannot be solidified based on clinical information and historical signs, other methods of verification can be used. Biopsy technique is selected based on the tumor location, size, friability, feeder or intrinsic vessels, and the risk of potential scattering of tumor onto the iris surface or anterior chamber angle.² Biopsy techniques include fine-needle aspiration biopsy, surgical iridectomy through a corneal or limbal incision, iridocyclectomy, and transcorneal tumor biopsy.

We will discuss pseudo-polycoria, as a complication of iris biopsy, its greatest visual consequence; photophobia, and a non-surgical alternative for management.

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1.1. Case report

A 55-year-old-Caucasian female presented with the chief complaint of photophobia in her right eye, that was exacerbated when going from a dark to light environment. Her past ocular history included a diagnosis of presumed diffuse multifocal iris/ciliary body melanoma in the right eye, followed by an inconclusive diagnostic iris biopsy performed one month later by another outside physician. Upon presentation to our clinic two months later, best corrected visual acuity was 20/20- in the right eye and 20/25 in the left eye. Intraocular pressure was 13 mmHg/15 mmHg.

Slit lamp exam of the right eye revealed iris abnormalities, full-thickness biopsy defects at 2, 3:30 and 6:30 o'clock and a 0.7×0.8 mm area of iris hyperpigmentation at 8 o'clock (Fig. 1 & 2). Ultrasound biomicroscopy revealed an iris lesion at 7 o'clock measuring $0.7 \times 0.8 \times 1.3$ mm, negative for extraocular extension or spontaneous vascular pulsations and intraocular extension (Figs. 3 and 4). At this point, there were no overt signs of definitive malignancy. Since the previous pathology results from the iris biopsy were deemed to be inconclusive for melanoma, the assumption of an atypical iris nevus prevailed as the working diagnosis.

At follow-up with ocular oncology three months later, the results of the genetic testing did not produce further information. Slit lamp exam was essentially stable with findings largely unchanged (Fig. 5). Given her stable clinical picture and absence of growth of the residual lesions, the decision was made to continue to monitor over time. At this point, the possibility of a nonsurgical prosthetic contact lens for photophobia was discussed to attempt to alleviate her symptoms.

Following the decision by ocular oncology to monitor the patient, she was then seen by the contact lens service. The decision to forgo a hand painted lens or custom hydrogel printed lens was made by the practitioner for three reasons: 1) The patient was very apprehensive about putting anything in her eye and these lenses tend to be thicker and larger. 2) Cost reduction was important to the patient. 3) The patient was unwilling to wait 3–5 weeks to receive a custom-made lens and was looking for a more immediate solution.

Given that the iris defects were peripheral in location and the patient had an average horizontal visible diameter (11mm), we had the flexibility to explore other options. The patient was provided with three options to manage her symptoms: a commercially available soft daily printed prosthetic hydrogel lens, a commercially available soft monthly silicone printed prosthetic hydrogel lens, or a custom soft yearly prosthetic hydrogel lens with dark inlay. The soft daily printed prosthetic hydrogel lens was chosen because of its ease in hygiene regimen and did



Fig. 1. Slit lamp photo of biopsy defects at 2, 3:30, and 6:30 o'clock and a 0.7×0.8 mm area of iris hyperpigmentation at 8 o'clock.

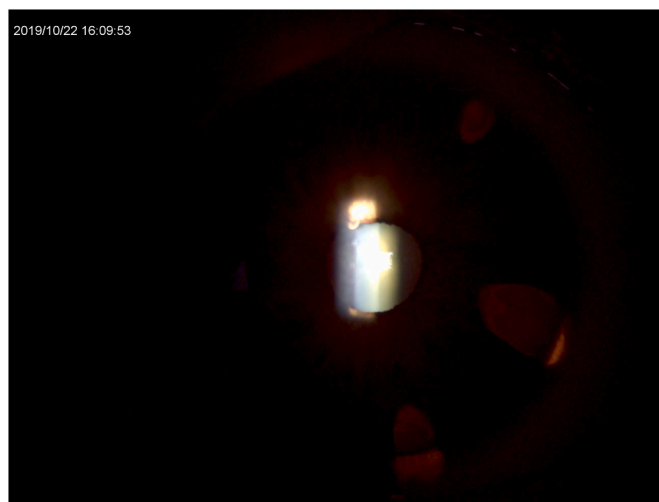


Fig. 2. Retro illumination slit lamp photo of biopsy defects at 2, 3:30, and 6:30 o'clock and a 0.7×0.8 mm area of iris hyperpigmentation at 8 o'clock.

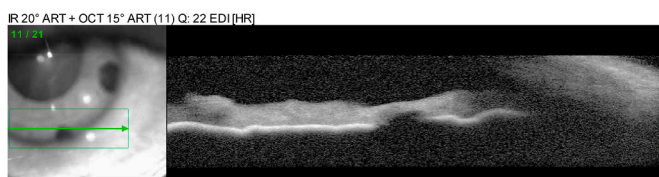


Fig. 3. Ultrasound biomicroscopy revealed an iris lesion at 7 o'clock measuring $0.7 \times 0.8 \times 1.3$ mm, negative for extraocular extension or spontaneous vascular pulsations and intraocular extension.

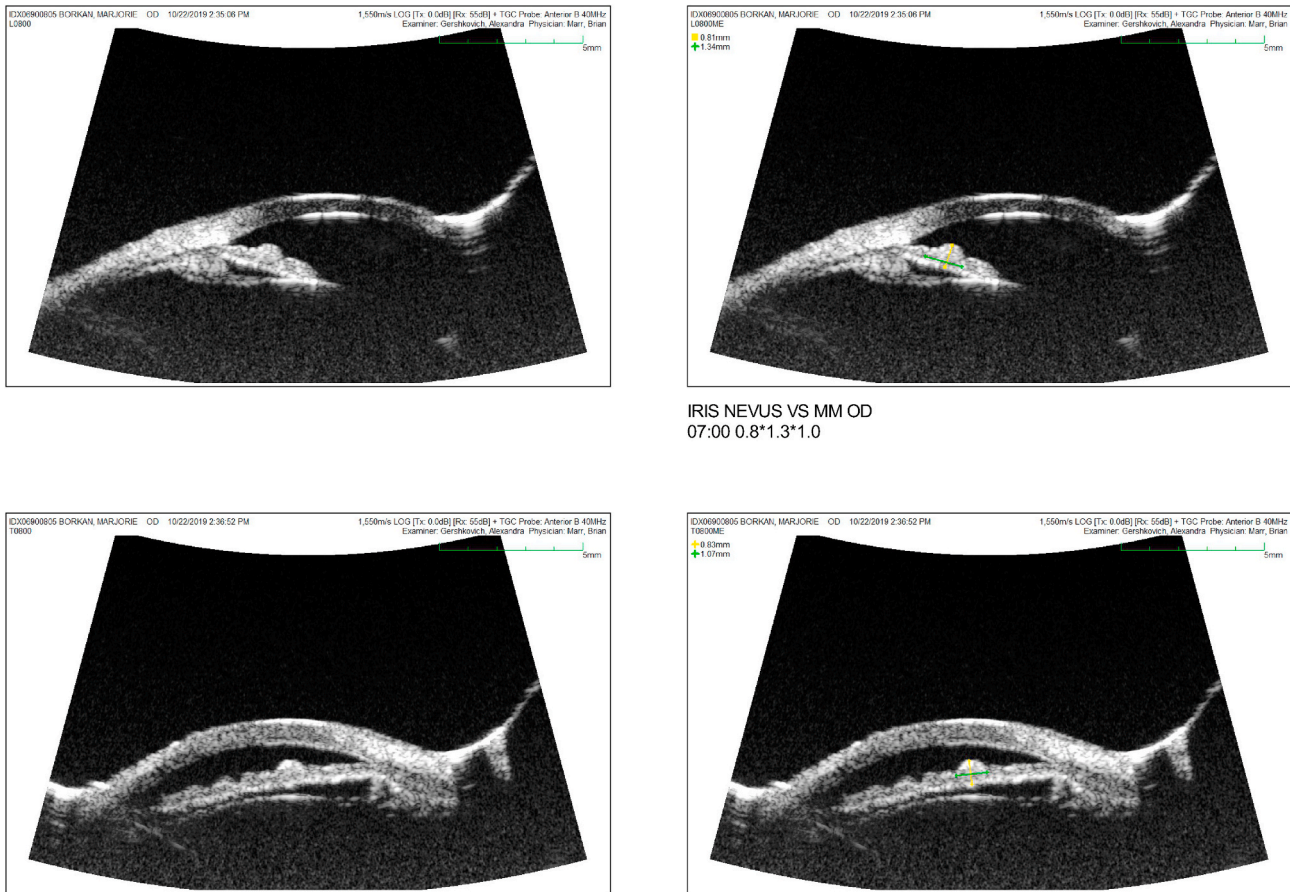
not limit peripheral vision as the yearly dark inlay lens would.

The daily printed colored lens chosen for our patient was created for the purpose of iris color enhancement and contains an outer ring aiming to amplify the size and brightness of the eye. The outer dot matrix imprint ring created a sufficient barrier to light without encroaching the central pupil, allowing our patient to experience improved photophobia while maintaining an adequate field of view. The daily wear lens eliminated the potential for solution related complications, including corneal staining, and lid irritation due to solution sensitivities, additionally removing the risk of lens case contamination.⁴ This lens provided limbal to limbal coverage with $\frac{1}{2}$ mm of movement upon blink in central and upgaze. The patient reported great comfort and limited lens awareness. The patient now wears a daily printed colored lens, Base curvature 8.6, Diameter 13.8, color mystic green in the right eye and her symptoms of photophobia have been resolved (Fig. 6).

2. Discussion

Iris nevi are typically asymptomatic and are commonly recognized on routine ophthalmic examinations. Iris nevi can present in two different forms (1) circumscribed and (2) diffuse. Circumscribed iris nevi are smooth to nodular, solitary or multiple, and involve an isolated portion of the iris. A diffuse iris nevus may involve the entire sector or rarely the entire iris. Evaluating iris nevi is best done by slit-lamp biomicroscopy and gonioscopic evaluation and are most often observed with serial slit-lamp photography, anterior segment optical coherence tomography and high-frequency ultrasound biomicroscopy. These techniques aide in differentiating iris nevi from iris or ciliary body melanomas. Iris nevi do not usually require invasive treatment.³

Iris melanocytomas are rare variants of iris nevi and can be difficult to distinguish from benign iris nevi clinically. Iris melanomas are rarer and account for 3–5% of all uveal melanomas which occurs in only 6/



IRIS NEVUS VS MM OD
07:00 0.8*1.3*1.0

Fig. 4. Ultrasound biomicroscopy revealed an iris lesion at 7 o'clock measuring $0.7 \times 0.8 \times 1.3$ mm, negative for extraocular extension or spontaneous vascular pulsations and intraocular extension.

1,000,000 Americans. Differential diagnoses for iris melanoma may include: iris freckle, iris nevi, iris melanocytomas, Lisch nodules, ocular melanocytosis, primary cysts, iridocorneal endothelial syndrome, iris foreign body, iris pigment epithelial proliferation, metastatic carcinoma to the iris, iris leiomyoma, and more.³ In the scenario where observation may be dangerous or a diagnosis cannot be solidified based on clinical information and historical signs, other methods of verification can be used. Biopsy technique is selected based on the tumor location, size, friability, feeder or intrinsic vessels, and the risk of potential scattering of tumor onto the iris surface or anterior chamber angle.² Biopsy techniques include fine-needle aspiration biopsy, surgical iridectomy through a corneal or limbal incision, iridocyclectomy, and transcorneal tumor biopsy.

Reported complications from different methods of iris biopsies include hyphema,² transient increased intraocular pressure, asymptomatic pupillary defects,⁵ postsurgical iris coloboma causing photophobia and unwanted cosmetic defects of the iris, and cataracts.⁶ The Iridectomy method was performed in this patient leaving three iris defects resulting in pseudo-polycoria causing photophobia. To our knowledge this is not a reported complication of this specific procedure.

True polycoria is extremely rare⁷ and can be described as more than one pupillary opening in the iris and is defined by an additional pupil surrounded by an intact sphincter muscle.¹ There are a few theories on why true polycoria manifests: abnormal segregation of a portion of the pupil margin, partial closure of a coloboma, differentiation of pluripotent neuroectoderm into muscle fiber or defective separation of the lens and cornea.¹

Pseudo-polycoria is defined by passive constriction of the accessory pupil when the actual pupil is expanded.^{1,8} The concept behind visual disturbance from pseudo-polycoria or polycoria is explained by

diffraction rings and interference fringes, which are provoked by the second pupil. Patients experiencing this may not convey glare or contrast-lowering effect of stray light accurately and that is why this complaint is often ignored.⁸

Photophobia can be a common complaint from a patient and can be robust enough that it hampers their normal visual functioning. It is most frequently found in patients with ocular conditions such as: aniridia, albinism, colobomas and iridectomies. Surgical intervention such as an artificial iris (AI) could be considered, however performing intraocular surgery on a biopsy proven malignancy may bring unwanted complications. Historically, these kinds of conditions are often corrected with the use of a prosthetic custom yearly replacement soft hydrogel contact lenses.

Prosthetic custom yearly replacement soft hydrogel contact lenses are designed and manufactured to order for each patient, utilizing a wide range of colors, designs, powers, and materials. Because of this, practitioners are able to make modifications to closely match the patient's natural eye color.⁹ Each manufacturer has their own way of making lenses varying on fabrication protocol or printing a colored matrix once or twice.

The most difficult aspect of fitting a soft prosthetic lens is managing patient expectations. Prosthetic contact lenses are frequently used for cosmetic purposes or in this case for a functional purpose. The prosthetic contact lens will fit similarly to a conventional contact lens. Some manufacturers give practitioners fitting sets with trial lenses, which enable in-office immediate feedback about potential obstacles. This also allows for in-office comparison of the iris color and pupil size with the non-affected eye. The pupil diameter in bright and normal light, horizontal visual iris diameter and best corrected vision should be considered when determining final pupil size. Unlike a natural pupil, the

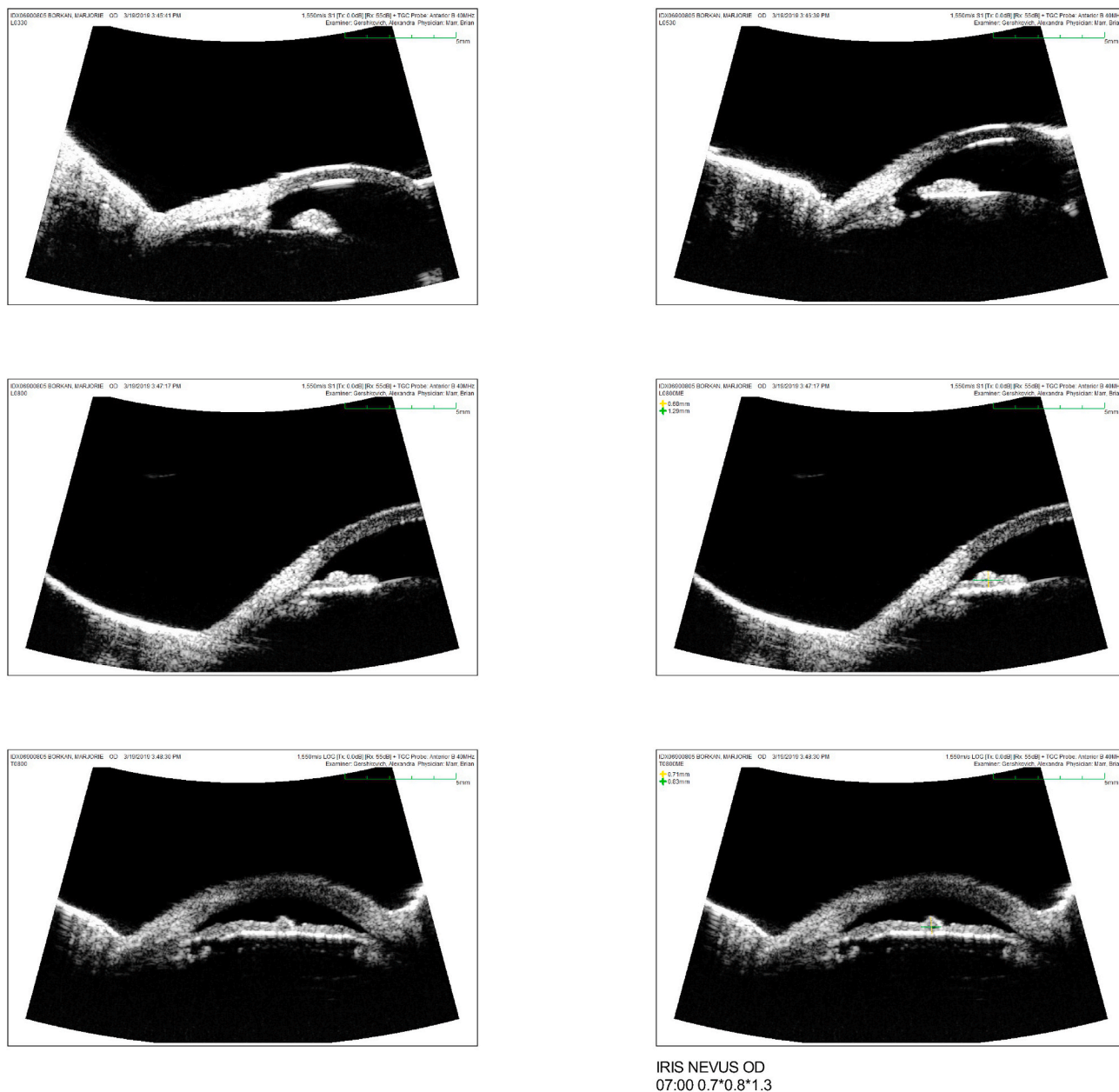


Fig. 5. Ultrasound biomicroscopy revealed a stable iris lesion at 7o'clock measuring $0.8 \times 0.8 \times 1.3$ mm negative for extraocular and intraocular extension, spontaneous vascular pulsations, and ciliary body involvement, (+) defect of the iris at 3:30 and 6:30.

prosthetic lens pupil will be fixed.⁹

Practitioners must educate their patients on proper care regimen for the lens they have selected. Patients may develop an ocular hypersensitivity¹⁰ if the wrong cleaning solutions are used and sometimes these harsh solutions can cause the paint on the lens to fade. Frequent follow-up is critical in order to ensure the lens has not caused mechanical stress on an unhealthy eye. The disadvantages of traditional hydrogel prosthetic contact lenses include non-disposability, high cost, and a low oxygen permeability due to the lack of silicone material.¹¹

Commercially available hydrogel colored contact lenses became accessible in the 1980s. Silicone hydrogel colored contact lenses were introduced much later, in 2014 and became commercially available only as a daily wear, monthly replacement.¹² More recently, other companies have created daily disposable hydrogel colored contact lenses that are commercially available.

3. Conclusion

In our patient, a commercially available daily disposable hydrogel colored contact lens improved symptoms of unilateral photophobia due to pseudo-polycoria acquired from multiple iris biopsies. Rather than fitting the traditional custom prosthetic hydrogel monthly replacement contact lens, a quicker and more convenient solution was provided for the patient, ultimately leading to a higher patient satisfaction.

Patient consent

The patient consented to publication of the case orally. This case report does not contain any personal information that could lead to the identification of the patient.

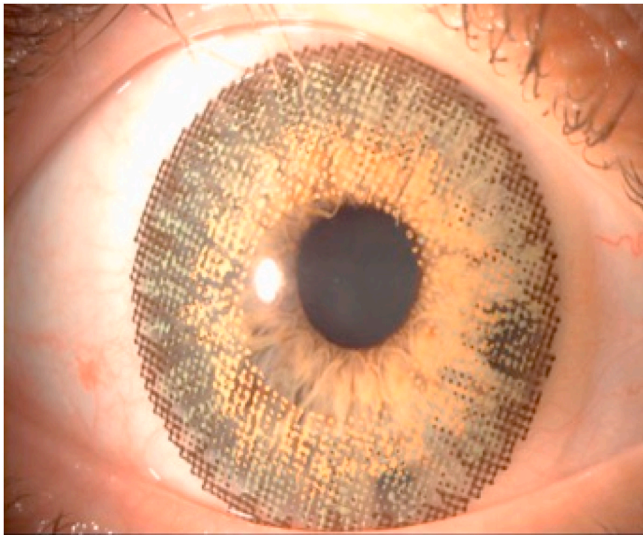


Fig. 6. The patient now wears a daily soft prosthetic, Base curvature 8.6, Diameter 13.8, color mystic green in the right eye and her symptoms of photophobia have been resolved. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

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Declaration of competing interest

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BM.

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