Scanning Outside the Box: Utilizing Peripheral OCT to Differentiate Subclinical Retinal Detachment, Retinoschisis, and White Without Pressure

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Abstract
Introduction: No physician wants to misdiagnose a patient with retinal detachment, creating a low threshold for referral of suspicious peripheral retinal lesions. Conditions such as peripheral retinoschisis and white without pressure (WWOP) can raise alarm in the clinical examination for possible subclinical retinal detachment (SCRD). Utilization of optical coherence tomography (OCT) may be used to obtain images of the peripheral retina, and can aid in the differentiation of SCRD from the less ominous presentations of peripheral retinoschisis and WWOP. Case Series: This case series will explore peripheral OCT findings in each of these conditions and help the practitioner to use this valuable tool to improve patient care. Discussion: Peripheral OCT imaging can be used to help differentiate the findings of SCRD, retinoschisis, and white without pressure. This is important as SCRD typically requires treatment, while retinoschisis and white without pressure can be monitored.

Introduction
Subclinical retinal detachment (SCRD) is a term used to describe an often-shallow retinal detachment in an asymptomatic patient. Typically originating from small retinal holes or breaks and progressing slowly, SCRD is commonly found on routine examination. Conditions such as white without pressure and peripheral retinoschisis may be mistaken as SCRD. While SCRD will likely require intervention, peripheral retinoschisis and white without pressure typically do not. Even more convoluted, peripheral retinoschisis can progress to retinal detachment, resulting in a lesion that has components of each. A misdiagnosis of SCRD can result in an unnecessary urgent referral, creating undue alarm for a patient. While there are several fundus evaluation strategies that are beneficial in differentiating these conditions, optical coherence tomography (OCT) of the lesion in question can aid in the diagnosis.

Figure 1. (A) Superior region of lattice degeneration with atrophic retinal holes (red arrow) surrounded by possible subretinal fluid seen on fundus examination. (B) OCT image of the region shown by the blue line confirms the presence of SCRD as the neurosensory retina (green arrow) is separated from the RPE (yellow arrow) (C) Same patient post laser retinopexy to wall off SCRD.
Lattice degeneration is present in approximately 6 to 8% of the population. While only about 1% of patients with lattice degeneration will develop retinal detachment, lattice degeneration accounts for about 30% of phakic rhegmatogenous retinal detachments. Lattice degeneration represents thin areas of retina with firm regions of vitreous adhesions. Making these areas susceptible to retinal tears, particularly in older patients as they develop posterior vitreous detachments (PVD). In addition, lattice degeneration is prone to the development of atrophic retinal holes that can lead to more insidious retinal detachment, even in young patients without (PVD). These patients will often be completely asymptomatic. As such, it is important to monitor patients with lattice degeneration carefully for the development of atrophic retinal holes or slowly advancing SCRD. Prophylactic laser treatment of atrophic retinal holes remains controversial, but referral to a retina specialist for consultation and consideration of treatment may be discussed with patients.

**Case 2**

A 67-year-old African American female was referred for retinal detachment OS with acute onset vision loss OS. She had no visual symptoms OD. Examination revealed a temporal rhegmatogenous retinal detachment OS, which required surgical intervention. In addition to these findings, the OD had an infratemporal region of subclinical retinal detachment versus retinoschisis (Fig. 2). OCT imaging confirmed the region to be SCRD (Fig. 2). The OD had laser retinopexy to wall off the region of SCRD.

SCRD often originate from small holes or breaks in the retina. These breaks allow for slow advancement of fluid from the vitreous cavity into the potential space between the neurosensory retina and the retinal pigment epithelium (RPE), creating a slowly progressive, chronic retinal detachment. Pigmentary alterations and retinal atrophy from the chronicity of subretinal fluid make detection of small holes and breaks even more difficult. In this case, the lack of a detectable hole or break along with the typical infratemporal location of retinoschisis could mislead the physician to a diagnosis of peripheral retinoschisis. However, OCT findings confirm that there is separation of the neurosensory retina from the RPE, confirming the diagnosis as SCRD.

**Case 3**

A 28-year-old African American male was referred for possible retinal detachment OD. He denied any symptoms of retinal detachment or visual problems in general. The examination revealed a region of retinal color alteration at 8:00 OD consistent with white without pressure (Fig. 3). OCT of the region confirmed these findings (Fig. 3). OCT through the lesion revealed the lesion to be flat without separation of the neurosensory retina from the RPE. Although it is subtle, within the lesion there is thickened and hyper-reflective ELM consistent with WWOP. The blue arrow demonstrates the demarcation between the lesion (left of the arrow) and normal tissue (right of the arrow).

WWOP is a common peripheral retina finding. It is a distinct, well-demarcated, region of retinal whitening present without scleral indentation. The exact cause of WWOP remains unknown, but there is no association of increased risk of retinal detachment in those with WWOP. Prominent areas of WWOP can be mistaken for regions of SCRD or retinoschisis.

**Case 4**

A 59-year-old African American female was referred for evaluation of a retinal hole OD. She was asymptomatic for signs or symptoms of retinal detachment. Examination findings revealed white without pressure located supratemporally. A region of peripheral retinoschisis from 6:00 to 7:00 with outer layer breaks. And a region of possible subretinal fluid or SCRD located at the temporal aspect of the lesion from 7:00 to 9:00 (Fig. 4). OCT findings confirmed the presence of both retinoschisis and SCRD. The patient had laser retinopexy to wall off the region of detachment (Fig. 4).
The patient’s presentation was slightly less typical due to the unilateral findings and supratemporal location. As mentioned prior, retinoschisis typically occur bilateral with the most common location being infratemporal. However, OCT imaging of the case shows no evidence of separation of the neurosensory retina from the RPE as would be seen in SCRD.

Limitations of Peripheral OCT
As with any testing strategy, limitations of peripheral OCT do exist. These include the inability to image the entirety of a lesion, reduced image quality, inversion artifacts, and image shadowing.

While it is ideal to have a scan that spans the entirety of a lesion, in the peripheral retina, this may be difficult or impossible. This must be taken into consideration as a limited scan area could lead to a misdiagnosis. As such OCT information must still be used in the context of the full clinical picture and fundus evaluation remains critical. Figure 6 shows a large region of SCRD with pigment demarcation lines. OCT B-scan captures small region of the lesion shown by red line on the fundus photograph. While the entire lesion is not imaged, this small region confirms the presence of subretinal fluid and the diagnosis of subclinical retinal detachment.

The management of schisis-related retinal detachment remains controversial as they may be slowly progressive or non-progressive. Treatment with prophylactic laser retinopexy can be considered to wall off areas of detachment that have not extended too far posteriorly.2,3

Case 5
A 53-year-old white male was referred for possible retinal detachment OS. He had no symptoms of retinal detachment. On examination, he had a supratemporal bullous lesion (Fig. 5). OCT confirmed that the lesion was a splitting of the retinal layers consistent with peripheral retinoschisis and not a separation of the neurosensory retina from the RPE (Fig. 5). The patient was diagnosed with acquired retinoschisis and will be monitored without treatment.
Due to the curvature of the eye and elevation of lesions being evaluated, inversion artifacts are commonly encountered when scanning the peripheral retina. This is also a limiting factor in the ability to scan the entirety of a lesion and can create confusion during interpretation. Figure 7 shows examples of inversion artifacts.

Elevation of lesions also leads to shadow artifacts making it difficult to view structures in the outer retina, and again making it difficult or impossible to clearly evaluate the full extent of a lesion. Figure 8 shows an example of image shadowing in an elevated retinoschisis.

Conclusions
While clinical examination techniques are adequate in many cases to differentiate subclinical retinal detachment, peripheral retinoschisis, and white without pressure, OCT imaging may aid in solidifying a diagnosis when examination findings are not clear. Peripheral retinal imaging with OCT can be useful in clinical practice to reduce unnecessary patient referrals, reduce patient anxiety, and improve patient outcomes. Careful examination remains crucial in identifying suspicious lesions and guiding OCT imaging to the correct location.