

## Smokestack leak on indocyanine green angiography in acute central serous chorioretinopathy

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**Key words:** Central serous chorioretinopathy, fundus fluorescein angiography, indocyanine green angiography, smokestack leak

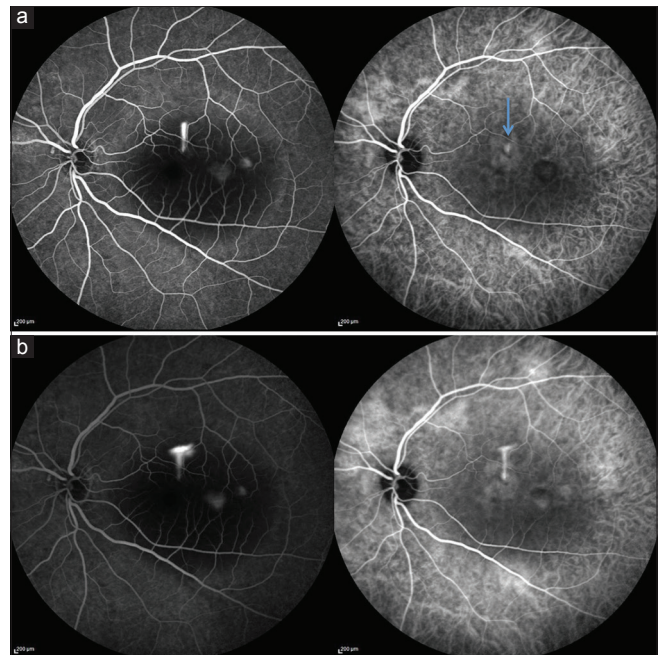
Smokestack leak (SSL) is pathognomonic feature of central serous chorioretinopathy (CSC) seen on fundus fluorescein angiography (FFA). The fluorescein dye leaks through choriocapillaris and is then restricted by outer blood-retina barrier (retinal pigment epithelium [RPE]). In the setting of CSC, the leaked fluorescein dye from hyperpermeable choriocapillaris reaches the subretinal space through a breach in outer blood-retina barrier. Since indocyanine green (ICG) dye is almost completely protein bound (98%), the dye does not leak across the choriocapillaris; and therefore, the characteristic patterns of leak seen on FFA are not seen on ICG angiography (ICGA). We report SSL on ICGA in two eyes of two patients with acute CSC.

### Case Report

Two patients of acute CSC underwent simultaneous FFA and ICGA (Heidelberg Spectralis, Heidelberg, Germany) using 25 mg ICG dye and 3 ml of 20% fluorescein sodium. A typical SSL on FFA was seen in both the cases. Interestingly, the ICGA also showed an SSL. The SSL seen on ICGA, however, appeared later than that of FFA [Figs. 1 and 2]. Areas of choroidal hyperpermeability were seen in addition, in the late phases of ICGA in both the cases. Spectral domain optical coherence tomography (OCT) showed a large neurosensory detachment (NSD) in both the cases. Irregular, flat pigment epithelial detachments (PEDs) and a dip in the neurosensory retina were also seen on OCT through the area of the leak in both eyes [Figs. 3 and 4].

### Discussion

SSL is due to differential osmotic pressures of fluorescein dye and subretinal fluid in CSC causing a rise of leaked fluorescein dye inside the NSD.<sup>[1]</sup> The reported ICGA findings in CSC include arterial filling delay, venous dilatation, dilated choroidal vessels



**Figure 1:** (a) Simultaneous fundus fluorescein angiography and indocyanine green angiography of the left eye of patient 1 showing the smokestack configuration on the fundus fluorescein angiography. The smokestack leak on indocyanine green angiography first appeared at 1 min 2 s (blue arrow). (b) Smokestack leak seen on fundus fluorescein angiography as well as indocyanine green angiography. The leak on indocyanine green angiography is smaller in size as compared to fundus fluorescein angiography. Areas of choroidal hyperpermeability are seen on indocyanine green angiography along the vascular arcades

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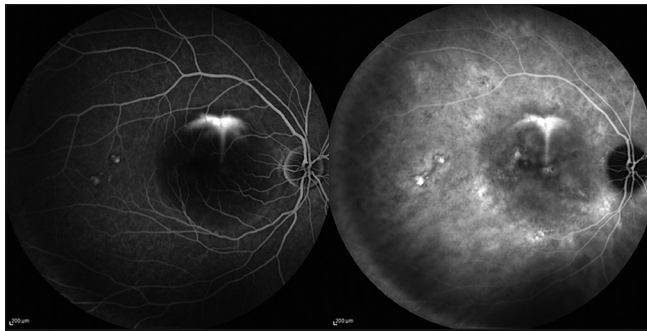
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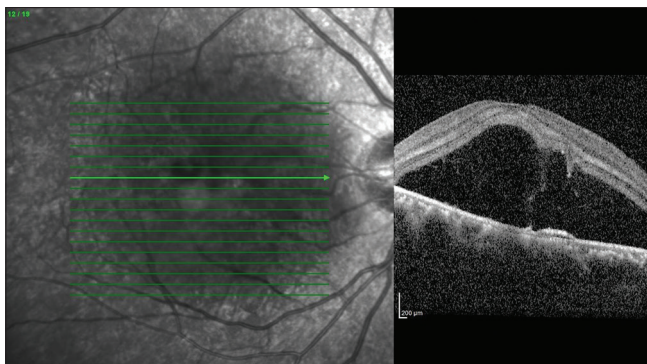
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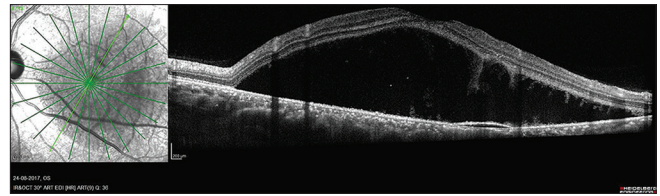


**Figure 2:** Smokestack seen on both fundus fluorescein angiography and indocyanine green angiography of the second patient. There are pigment epithelial detachments temporal to the macula showing pooling. Areas of choroidal hyper permeability are seen, especially along the inferior arcade



**Figure 4:** Spectral domain optical coherence tomography of second patient through point of leakage showing a large neurosensory detachment, subretinal hyperreflective vertical dipoles, and a flat irregular pigment epithelial detachment

and hyperpermeability, and choroidal lobular ischemia.<sup>[2]</sup> SSLs on ICGA have not been described in CSC and indicate leakage of ICG dye across the choriocapillaris as well as RPE into the subretinal space. PEDs are known to show late pooling on ICGA suggesting that some amount of ICG dye leaks through the choriocapillaris.



**Figure 3:** Spectral domain optical coherence tomography of patient 1 through the point of leakage showing a large neurosensory detachment, subretinal hyperreflective vertical dipoles, and a flat irregular pigment epithelial detachment

A vigorous leak of ICG dye across choriocapillaris in certain patients may explain leak of dye across choriocapillaris. An RPE micro-rip may explain the entry of leaked ICG dye (in the PED) into subretinal space.<sup>[3]</sup> Although we could not identify the RPE micro-rip in either of our cases, its presence is supported by the presence of large NSDs in both the cases.

## Conclusion

SSLs may be seen on ICGA in patients with acute CSC with large neurosensory detachments and may result from a combination of vigorous leak from choriocapillaris and RPE micro-rip.

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## Conflicts of interest

There are no conflicts of interest.

## References

1. Bujarborua D, Nagpal PN, Deka M. Smokestack leak in central serous chorioretinopathy. *Graefes Arch Clin Exp Ophthalmol* 2010;248:339-51.
2. Kitaya N, Nagaoka T, Hikichi T, Sugawara R, Fukui K, Ishiko S, *et al*. Features of abnormal choroidal circulation in central serous chorioretinopathy. *Br J Ophthalmol* 2003;87:709-12.
3. Pryds A, Sander B, Larsen M. Characterization of subretinal fluid leakage in central serous chorioretinopathy. *Invest Ophthalmol Vis Sci* 2010;51:5853-7.