

The changing rates and indications of optical coherence tomography and fundus fluorescein angiography over 5 years

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Abstract

Purpose. To evaluate the relative frequency of use of fundus fluorescein angiography (FFA) following the introduction of optical coherence tomography (OCT) at a tertiary university ophthalmology practice.

Methods. We retrospectively analyzed the demand for and indications of all requests for FFA or OCT during the five years from 2007 to 2011, inclusively, at our tertiary care university hospital department of ophthalmology.

Results. In January 2007, out of 194 total imaging studies requested and performed, there were 85 OCTs (43.8% of total imaging studies) and 109 FFAs (56.2%). By January 2011, out of 172 total imaging studies requested and performed, there were 127 OCT cases (73.8%) and 45 FFA cases (26.2%). FFAs for macular degeneration and diabetic maculopathy accounted for 54.3% of all imaging in 2007, but five years later had fallen to just 22%.

Conclusions. A decrease in the number of FFAs requested and performed was associated an increase in number of OCTs, over the five year period. While this pattern was observed in a single relatively small tertiary care setting, this study may be the first report in the peer-reviewed medical literature of this trend. The relative safety profile and convenience of OCT as compared to FFA may be a primary factor in this shift.

Introduction

Fundus fluorescein angiography (FFA) is an over-hundred years-old technique that has remained largely unchanged during that period, though the associated technology for capturing the FFA images has dramatically improved. However, as a diagnostic testing modality, it is relatively time-consuming, invasive and carries a small but significant morbidity and mortality. Severe adverse reactions, including anaphylactic-type shock, hypotension, cardiovascular collapse, seizure, respiratory arrest, or acute pulmonary edema, have been reported to occur in approximately 1 in 1,900 to 1 in 18,000 patients. Death has been reported to occur in approximately 1 in 50,000 to 1 in 220,000 patients undergoing FFA.¹ The advantage of FFA is that it allows real-time physiological assessment of the choroidal and retinal vasculature that are impossible with any other current imaging modality.

Over a decade ago optical coherence tomography (OCT) was introduced into the clinical setting and rapidly gained widespread acceptance as a macular imaging modality. The concurrent rise of the anti-vascular endothelial growth factor (VEGF) treatment has had a near synergistical effect upon the dissemination and use of this technology. Performing an OCT is substantially faster than performing an FFA, and unlike the FFA, OCT has no morbidity or mortality; it has been reported that OCT is useful for

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Conflict of Interest: The authors report no conflicts of interest.

Contributions: All authors contributed equally.

Accepted for Publication: April 1, 2014

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the diagnosis and monitoring of disease.^{2,3} With current resolution capabilities of approximately 5 microns in cross-sectional imaging of the retina, there is evidence – and some controversy – that OCT is as effective as FFA for detecting cystoid macular edema.^{4,5}

Thus, we aimed to evaluate if the frequency of utilization of FFA has changed following the introduction of OCT in a busy ophthalmology photographic department in a tertiary care university hospital department of ophthalmology. We hypothesized that the frequency of OCT utilization has increased and FFA utilization has decreased particularly in diabetic maculopathy and age-related macular degeneration (AMD).

Methods

We retrospectively analyzed all requests for FFA or OCT during the same time period (the month of January) each year of the five years from 2007 to 2011, inclusively. We compared the indications for each investigation. The unit has an on-demand policy for both imaging modalities, with no waiting list, so the level of requests reflects the level of demand for each given timeframe.

Results

In January 2007, there were 85 OCTs (43.8% of total imaging studies) and 109 FFA performed (56.2%). In January 2009, this had increased to 129 OCT cases (66.5%), while FFA dropped to 65 FFA cases (33.5%). By January 2011, this trend continued: 127 OCT cases (73.8%) and 45 FFA cases (26.2%) (Figure 1). There was also a trend towards less imaging overall, from 194 total requests in 2007 to 172 in 2011.

Looking specifically at macular imaging, among which AMD and diabetic maculopathy are the at the most common indications for both FFA and OCT, we observed that FFA requests accounted for 54.3% of all imaging in 2007, but 5 years later had fallen to just 22% (Figure 2).

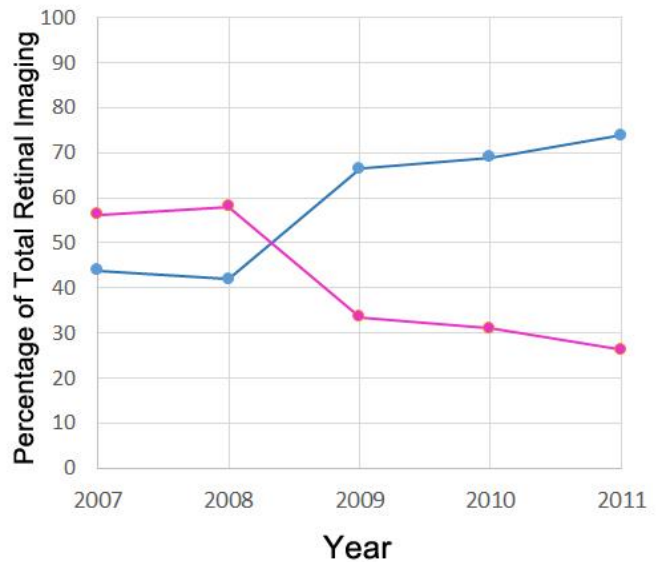


Figure 1

The percentage of total retinal imaging attributable to FFA or OCT (percentage of requests) for each year from 2007 and 2011 (OCT in blue and FFA in pink).

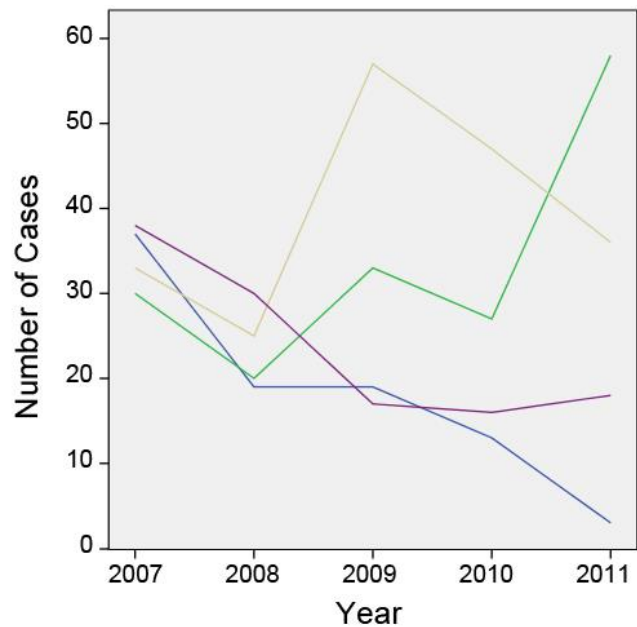


Figure 2

The numbers of requests for FFA and OCT, for the two most common indications, diabetic maculopathy and AMD, each year from 2007 and 2011 (FFA for AMD in blue; FFA for diabetic maculopathy in purple; OCT for AMD in yellow; OCT for diabetic maculopathy in green).

Discussion

This study demonstrates that in this tertiary care university hospital department of ophthalmology, there has been a reduction in the request rate for FFA with a corresponding increase in the OCT request rate. This change may reflect the practice that OCT, because of its ease, speed, and no-risk profile, has taken on a role of monitoring disease progression in addition to its diagnostic capability, while the FFA is used predominantly diagnostically.² When we consider that patients receiving intravitreal anti-VEGF regimes for conditions such as diabetic macular edema and neovascular AMD may have clinic visits as frequent as every month, this explains why the ratio of OCT-to-FFA has increased.

It should be noted that certain indications for FFA are not necessarily indications for OCT. These include, among many conditions, proliferative diabetic retinopathy and retinal vascular occlusions, which suggests that perhaps FFA rates are unlikely to decline further due to the role being assumed by OCT.

While the safety and convenience of OCT compared to FFA make it more attractive to clinicians and patients, there is still very much a definite role for FFA in clinical ophthalmology. In a search of the peer-reviewed medical literature (using MEDLINE and cross-referenced literature), this study may be the first to quantify the changing relationship of retinal image and may help plan future service delivery.

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