

Quantitative evaluation of Spectralis OCT image quality with systematic variation of B-scan averaging before and after cataract surgery



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Background

Spectralis spectral-domain optical coherence tomography (OCT) with B-scan averaging is widely used in research and practice for retinal imaging. However, there are no recommendations for optimal frame averaging settings, combining adequate image quality and minimal scanning time. The aim of this study was to determine such optimized settings in eyes with and without media opacities using quantitative analysis of image quality.

Methods

In this prospective study, patients with senile cataract were imaged one week before and one week after uncomplicated cataract surgery. At each visit eyes were imaged 7 times with Spectralis OCT using active eye tracking, employing a logarithmically escalating scale of B-scan averaging. Image quality was quantitatively evaluated in MatLab after manual annotation using four different measures as follows:

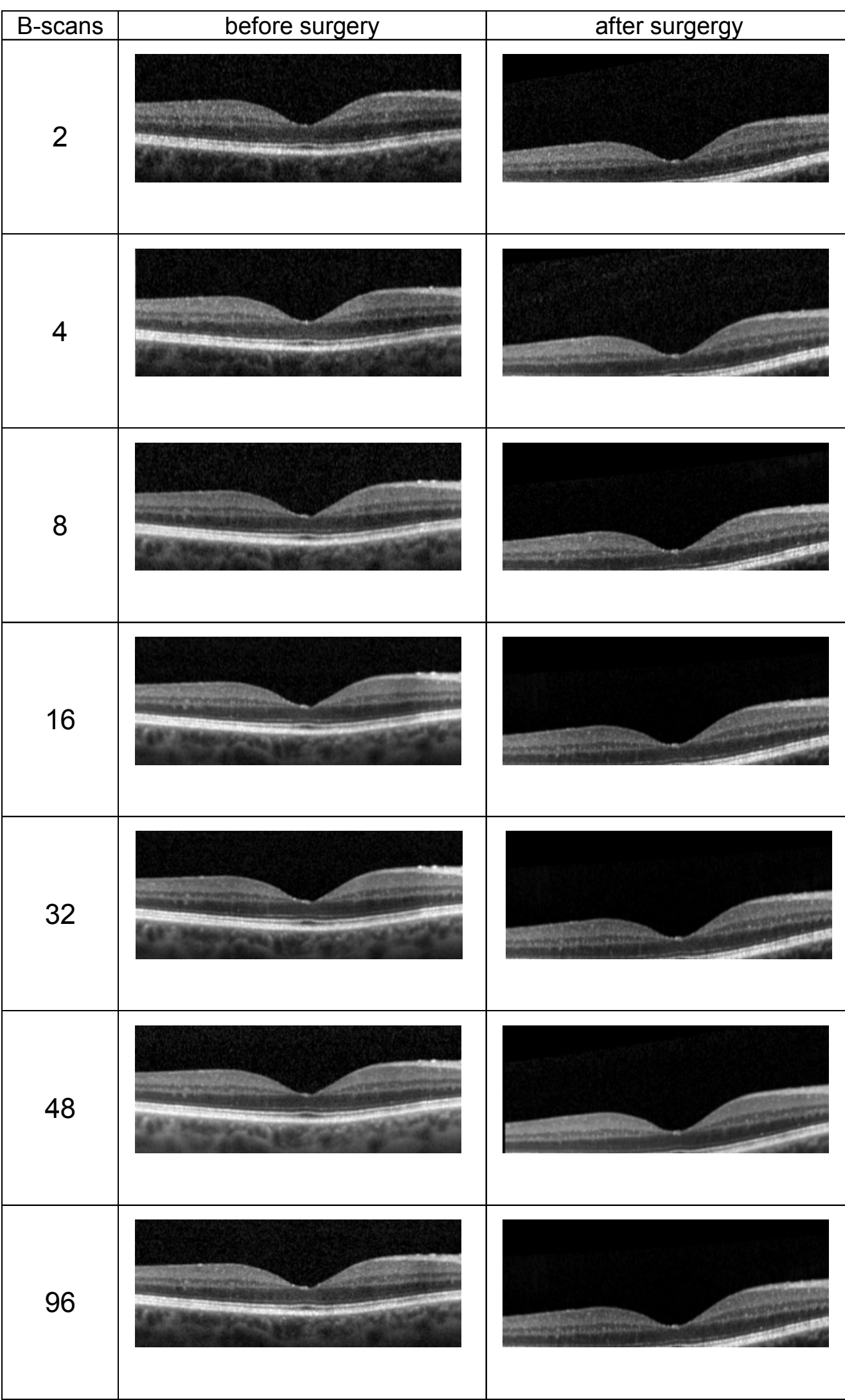
1) Signal-to-noise ratio

2) Image smoothness to evaluate potential blurring effects of B-scan averaging

3) Distinction of individual retinal layers using histogram overlap

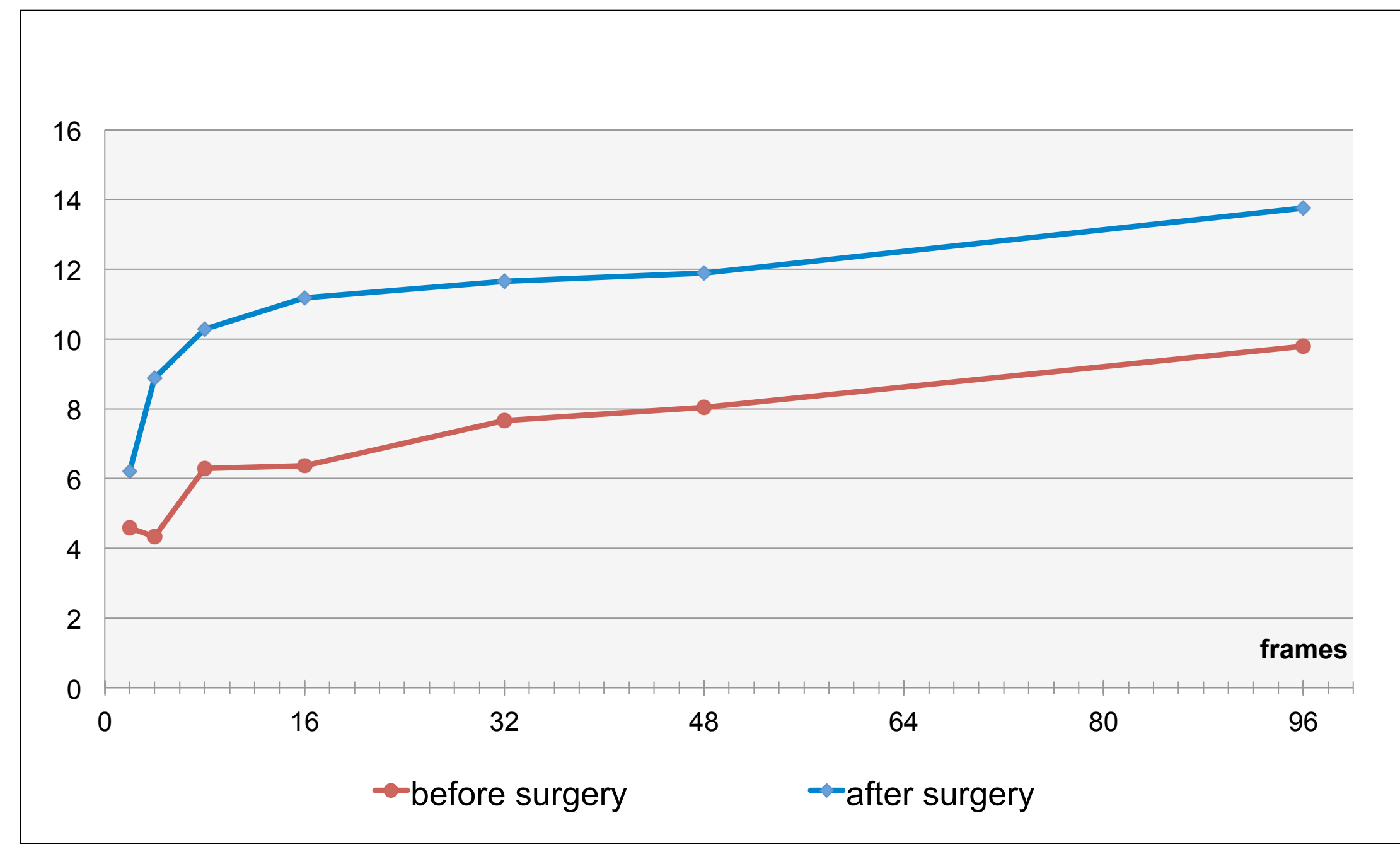
4) Distinction of individual retinal layers using classification

The four quantitative measures were compared among different degrees of B-scan averaging, and before versus after surgery.

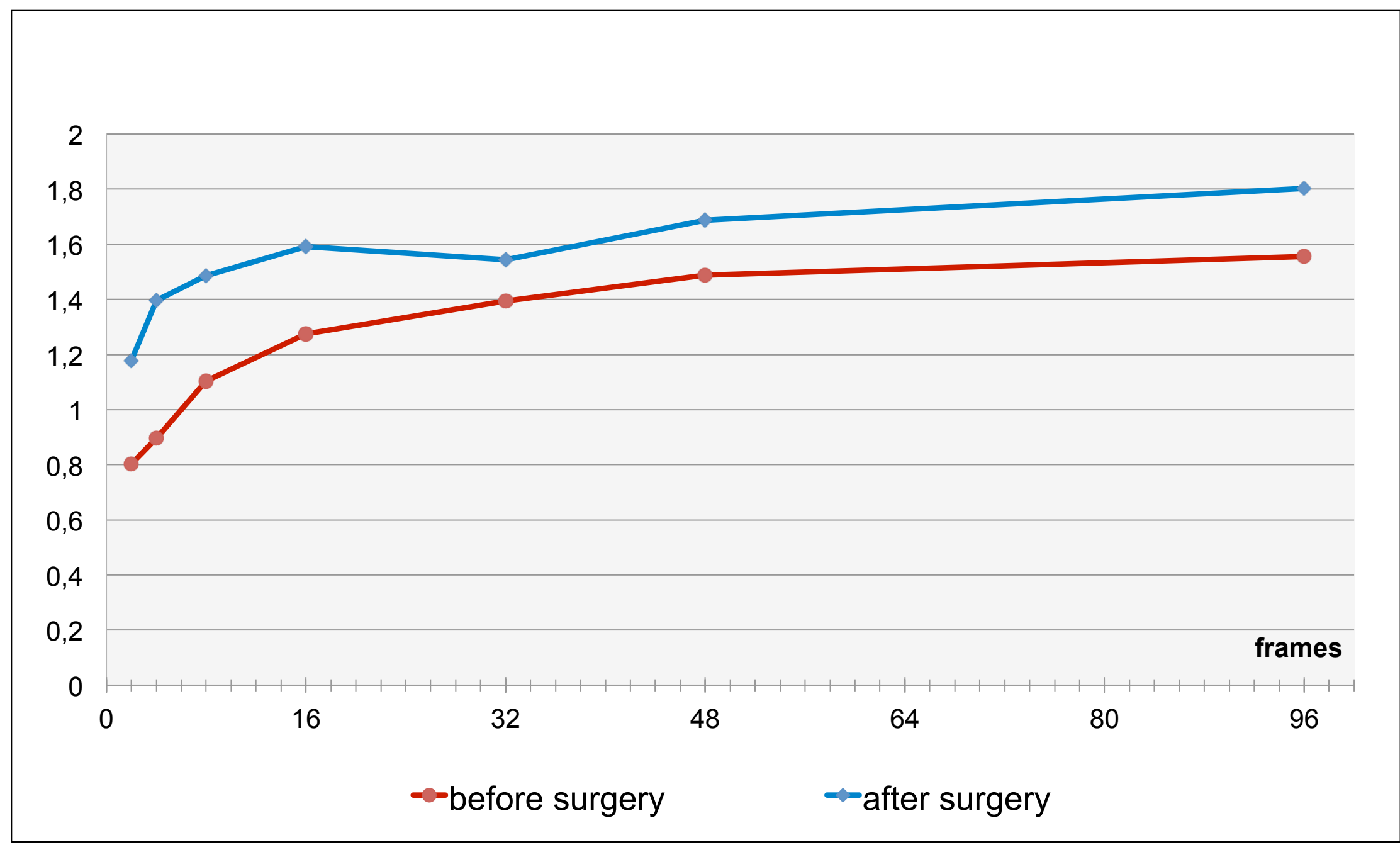


Results

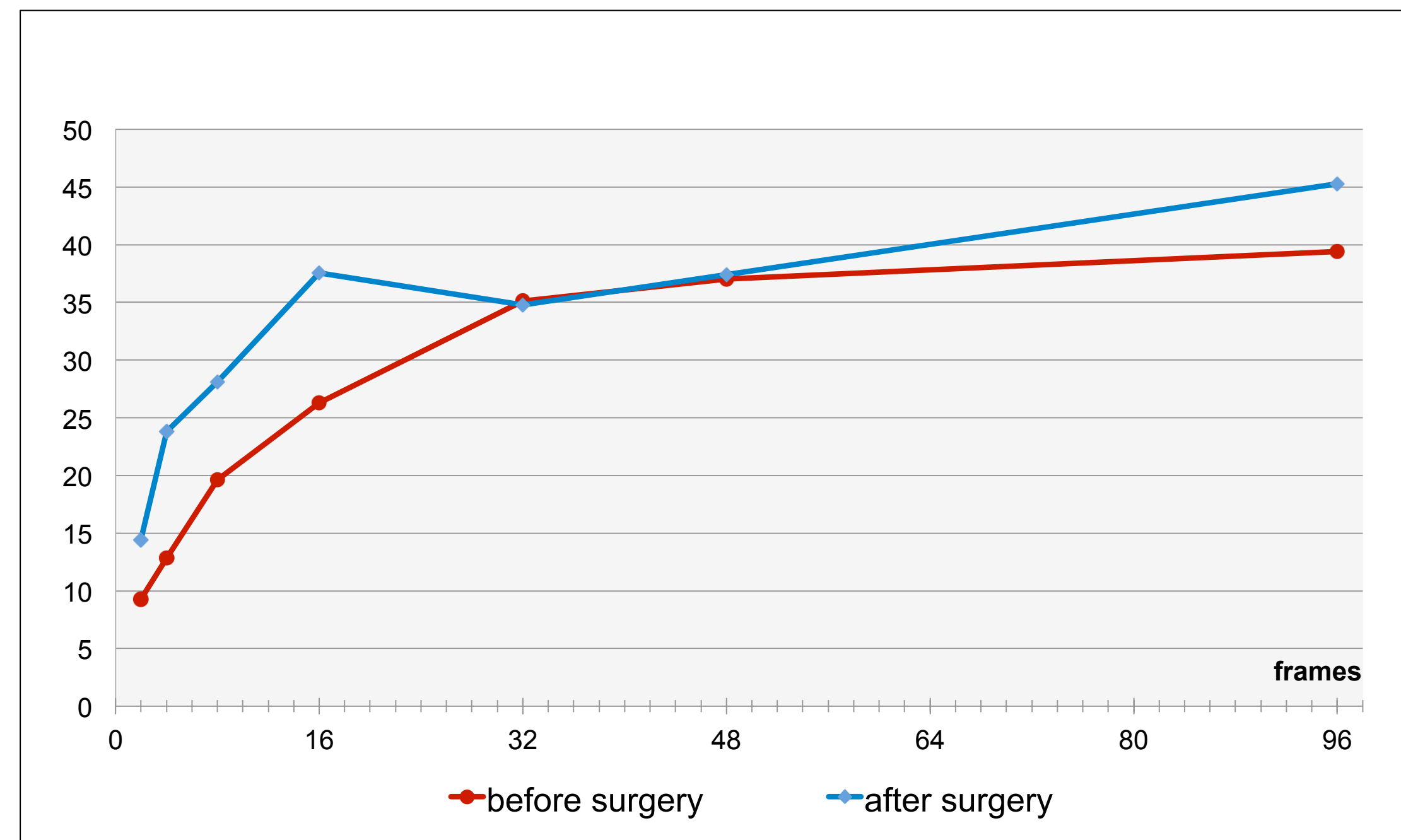
1) Signal to noise ratio (SNR)



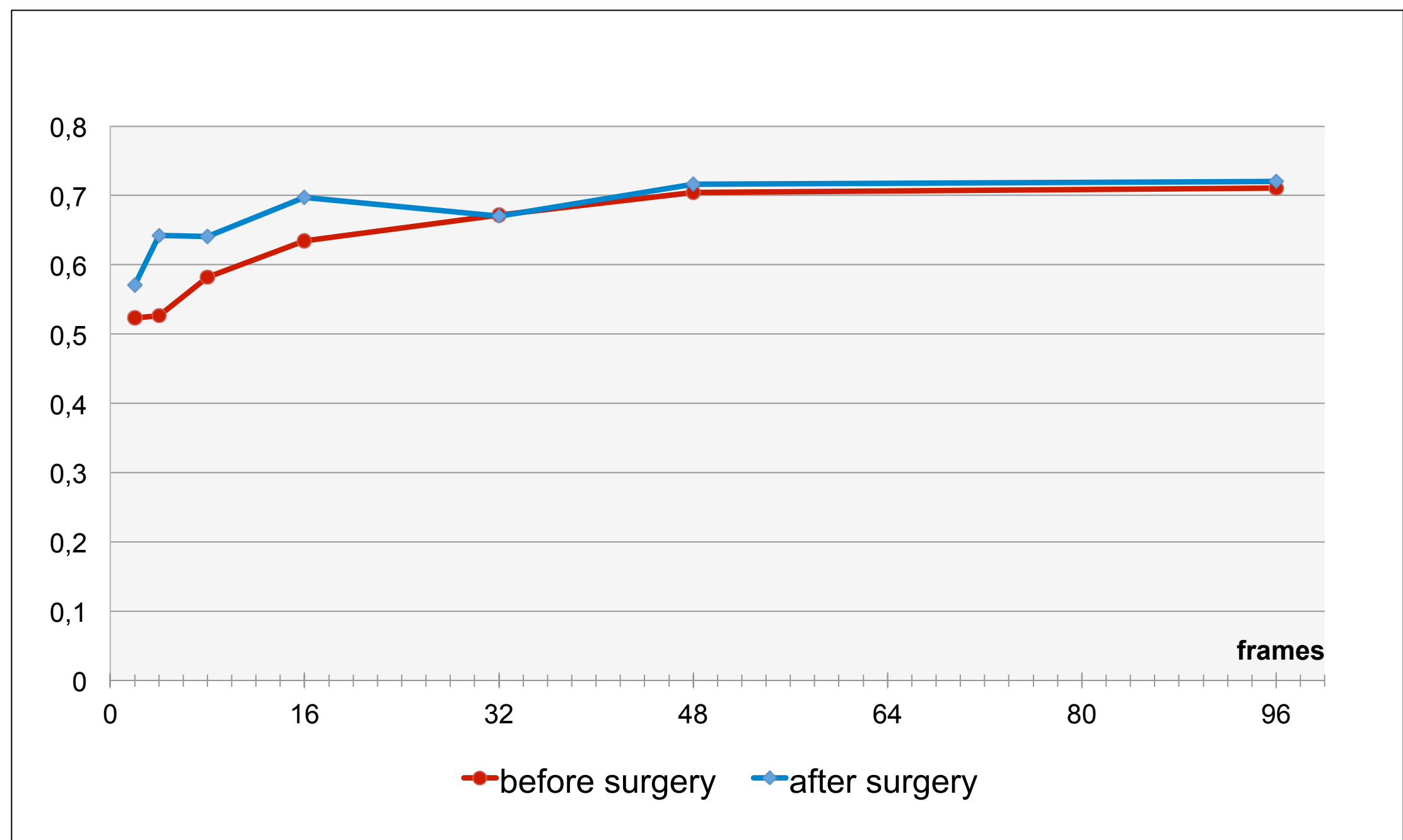
3) Histogram overlap



2) Smoothness



4) True positive rate



Conclusion

- In patients with **clear optical media**, OCT scan acquisition using **averaging of 16 B-scans** delivered **excellent signal quality** and contrast between retinal layers.
- Further increase in the averaging degree did not deliver corresponding image quality benefits.
- In patients **with media opacities**, **maximum B-scan averaging** resulted in **further increases** in image quality.

