

# The comparison of retinal blood flow after scleral buckling surgery with or without encircling procedure

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**Aim:** We aimed to compare peak systolic velocity of central retinal artery (PSV.CRA) and peak systolic velocity of ophthalmic artery (PSV.OA) between patients with retinal detachment who were treated with segmental scleral buckling and scleral buckling with encircling procedure. **Materials and Methods:** This study was a descriptive-analytic cross sectional study that was performed in Isfahan university referral centers since April 2010 to April 2011. Of the patients who have undergone scleral buckling surgery, 20 patients belonging to two groups were randomly selected to enroll in the study. Study groups were, patients who have undergone segmental scleral buckling and the other group were patients who have undergone scleral buckling with encircling procedure. Patients were invited to perform color Doppler imaging. PSV-RA and PSV-OA were measured and documented in both operated and unoperated eyes. All of the Doppler's performed at least three months after ophthalmic surgery. **Results:** We found significant decrease in PSV.CRA among patients in both groups. In patients who had undergone scleral buckling with encircling procedure PSV.CRA was  $11.03 \pm 3.04$  (cm/sec) and  $14.83 \pm 4.80$  in operated and unoperated eye respectively ( $P = 0.03$ ). In other hand, who treated with segmental scleral buckling these parameters were  $11.02 \pm 2.48$  and  $14.45 \pm 4.69$  ( $P = 0.03$ ). PSV.OA did not change significantly in each method. The difference between mean PSV.CRA and PSV.OA in operated eye between two study groups was not significant. **Conclusion:** PSV.CRA reduced significantly in both surgery methods and PSV.OA changes was not significant. However, the mean PSV.CRA and PSV.OA changes did not show statistically significant difference between surgery methods.

**Key words:** Central retinal artery, color doppler imaging, encircling procedure, ophthalmic artery, retinal blood flow, scleral buckling

## INTRODUCTION

Rhegmatogenous retinal detachment occurs most commonly between fifth and ninth decades of life. Previous studies showed the frequency of 9 to 24 per 100,000 populations per year.<sup>[1,2]</sup> If retinal detachments remain untreated, it results in different degrees of visual loss in all patients.<sup>[3]</sup> Nowadays, scleral buckling procedures are the treatment of choice for most uncomplicated rhegmatogenous retinal detachments. This method leads to successful retinal reattachment in approximately 85% of patients after first surgery. In cases of failure in the first surgery, most patients are treated with vitrectomy.<sup>[4]</sup>

Scleral buckling can perform as segmental scleral buckling and the other method is scleral buckling followed by encircling procedure with prophylactic band. There are some post surgery complications which are caused by changing in blood flow of retina that was reported frequently before.<sup>[5-9]</sup>

There are some studies which have been performed in

this field evaluating retina blood flow including peak systolic velocity of central retinal artery (PSV.CRA) and peak systolic velocity of ophthalmic artery (PSV.OA) after scleral buckling surgery, using Bidirectional laser Doppler technique,<sup>[10]</sup> laser speckle method<sup>[11]</sup> and color Doppler imaging.<sup>[9,12]</sup> However, several aspects still remain unknown.

Up to now, there is no study to compare ocular blood circulation alternation between these two methods of surgery.

In this study, we used color Doppler imaging and we aimed to determine PSV.CRA and PSV.OA changes among patients with retinal detachment who treated with segmental scleral buckling in comparison with those who have undergone scleral buckling with encircling procedure.

## MATERIALS AND METHODS

### Patients and settings

This study was a descriptive-analytic cross sectional

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study that performed in Feiz and Alzahra hospital, Isfahan, Iran, university referral centers. During the period of 12 months, since April 2010 to April 2011, 20 patients who belonged to two groups were randomly selected to enroll in the study. Study groups were, patients who have undergone segmental scleral buckling and the other group were patients who have undergone scleral buckling with encircling procedure. Patients were excluded if any of the following criteria were present: Patients who have undergone unsuccessful surgery and need to more surgical intervention, underlying ophthalmic disease and decline to participate in a research project.

### Intervention and assessment

Enrolled patients were interviewed by the project investigators and invited to Alzahra hospital to perform color Doppler imaging of ocular arteries including central retinal artery and ophthalmic artery. All of the color, Doppler imaging's have been performed by one of the research investigators (MK), PSV-RA and PSV-OA were measured and documented in both operated and unoperated eyes. All of the Doppler's performed at least three months after ophthalmic surgery.

In this study, sample size were calculated using statistical formula considering  $\alpha = 0.05$  and  $\beta = 0.1$  to be 10 in each study group.

Data analysis has been performed using SPSS 16 (SPSS Inc., Chicago, IL, USA) software and comparisons were made using student *t*-test as needed. Written Informed consents were obtained from all patients for authorize use of their medical records for research purposes with approval of the protocol by ethical committee of our university.

## RESULTS

A total number of 20 patients were enrolled in the study. Of this 20, 10 patients had undergone segmental scleral buckling and the other 10, scleral buckling with encircling procedure. Thirteen were men and 7 were women.

PSV.CRA and PSV.OA were evaluated in both eyes of the patients. We found significant decrease in PSV.CRA among patients who undergone segmental surgery ( $P = 0.03$ ). Detailed data are shown in Table 1.

We also evaluated PSV.CRA and PSV.OA among the patients who undergone scleral buckling surgery with encircling procedure. The results show significant decrease in PSV.CRA in operated eye in comparison with Unoperated contra lateral eye ( $P = 0.03$ ).

Moreover, we observed an increase in mean PSV.OA in

operated eye which was not statistically significant ( $P = 0.67$ ). Detailed data are shown in Table 1.

At last we analyzed the mean PSV.CRA and PSV.OA in operated eye between two study groups that did not show any significant changes among these parameters. Further data are shown in Table 2.

## DISCUSSION

The aim of the present study was to compare the PSV.CRA and PSV.OA changes in patients who have undergone segmental scleral buckling in comparison with those who have undergone scleral buckling with encircling procedure. Our data shows that there is no statistically significant difference between PSV, CRA and PSV.OA changes after retinal detachments surgery in patients treated with scleral buckling with or without use of encircling procedure. Previous study on humans did not mention this point clearly. One animal study which performed by Diddie *et al.*, on rabbits<sup>[13]</sup> showed that scleral buckling with encircling procedure decrease retinal blood flow significantly in comparison with segmental scleral buckling which is in contrast with our results.

We also compared PSV.CRA change among patients with each surgery methods. We found statistically significant decrease in PSV.CRA among the patients in both methods.

**Table 1: Comparison of peak systolic velocity of central retinal artery and peak systolic velocity of ophthalmic artery of operated and unoperated eye among patients in each surgery method**

Parameters	Operated eye	Unoperated contra lateral eye	P value
Segmental scleral buckling			
PSV.CRA (cm/sec)	11.02±2.48	14.45±4.69	0.03*
PSV.OA (cm/sec)	36.45±10.17	35.30±10.01	0.64
Scleral buckling with encircling procedure			
PSV.CRA (cm/sec)	11.03±3.04	14.83±4.80	0.03*
PSV.OA (cm/sec)	36.54±8.34	34.97±8.09	0.67

Data are presented as mean±standard deviation. PSV.CRA=peak systolic velocity of central retinal artery; PSV.OA=peak systolic velocity of ophthalmic artery. \*statistically significant change

**Table 2: Comparison of peak systolic velocity of central retinal artery and peak systolic velocity of ophthalmic artery of operated eye between study groups**

Parameters	Scleral buckling with encircling procedure	Segmental scleral buckling	P value
PSV.CRA (cm/sec)	11.31±3.04	11.02±2.48	0.82
PSV.OA (cm/sec)	36.54±8.34	37.45±10.17	0.83

Data are presented as mean±standard deviation. PSV.CRA=peak systolic velocity of central retinal artery; PSV.OA=peak systolic velocity of ophthalmic artery

Almost all the previous studies in this field mentioned that CRA blood flow reduced after scleral buckling surgery but they did not follow their patients more than one week.<sup>[9,12]</sup> In a recent study, which was performed by Ito *et al.*, 65 consecutive patients who have undergone segmental scleral buckling evaluated for central retinal artery and ophthalmic artery blood flow velocity.<sup>[7]</sup> They followed up their patients up to 24 weeks after surgery. They revealed that CRA blood flow decreased after 2 weeks and after 12 weeks returned to pre surgery level. In our study, color Doppler imaging's performed 12 weeks after surgery; however, in contrast with this study we found significant decrease in PSV.CRA.

We also evaluated PSV.OA in patients with both surgery methods. Previous studies in this field were controversial.<sup>[9,12,14]</sup> In a study by Santos *et al.*, which was performed on 12 patients with rhegmatogenous retinal detachment, they noted that buckling surgery significantly decreased the OA blood flow.<sup>[15]</sup> On the other hand, more recent study by Jukić *et al.*, revealed that OA blood flow does not change after sclera buckling surgery.<sup>[14]</sup> However, our data showed that PSV.OA did not change significantly after sclera buckling in each surgery method.

Our study also had a limitation about the patient's follow-up. We suggest furthermore studies with larger sample size and long term follow-up to determine the changes after scleral buckling surgery.

## CONCLUSION

We deduce that PCV.CRA reduces significantly in both segmental scleral buckling and scleral buckling with encircling procedure; however, there was no statistically significant difference between these two methods. PSV.OA did not changed significantly in either of each method and the comparison between these two methods did not showed significant difference.

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