Original Article

A Comparison between Prophylactic Vitrectomy and Laser Photocoagulation in Treatment of Acute Retinal Necrosis Syndrome

Seyed Ali Tabatabaei [1], MD; Aliasghar Ahmadraji [1], MD; Simindokht Hosseini [1], MD; Mohammad Soleimani *[1], MD; Mohammadreza Mansouri [1], MD; Alireza Lashay [1], MD; Mohammadbagher Rajabi [1], MD

1. Eye Research Center, Farabi Eye Hospital, Tehran University of Medical Sciences, Tehran, Iran.

***Corresponding Author:** Mohammad Soleimani

E-mail: Soleimani_md@yahoo.com

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Abstract

Purpose: To compare the results of prophylactic pars plana vitrectomy with barrier laser photocoagulation in treatment of acute retinal necrosis (ARN).

Patients and Methods: Fifteen ARN patients were retrospectively included in this study. At presentation, all patients had severe vitreous involvement without any detectable break or retinal detachment (RD), either in funduscopy or echography exams. All patients received intravenous acyclovir 2 g/daily for two weeks. Eight patients underwent prophylactic vitrectomy and seven patients underwent barrier laser photocoagulation after resolution of vitritis. Visual and structural outcomes were compared between the two groups.

Results: In eight vitrectomized patients, one patient (12.5 %) experienced RD. The mean best corrected visual acuity (BCVA) improved significantly in this group (P = 0.027). Among seven patients undergoing barrier laser photocoagulation, 3 patients (43 %) developed RD and BCVA improvement was not significant (P = 0.207). Comparison between the two groups did not show any statistically significant benefit when comparing post treatment BCVA (P = 0.59) or RD prevention (P = 0.282).

Conclusion: Early prophylactic vitrectomy, in the course of ARN has been suggested as a useful method in preventing RD and improving the visual outcome, but the results of the present study did not indicate any significant benefit for vitrectomy compared to barrier laser photocoagulation. Further studies with larger sample size are recommended to compare these two methods of treatment.

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Introduction

Acute retinal necrosis (ARN) is an uncommon disease that may affect one or both eyes and result in blindness. Varicella Zoster Virus (VZV), Epstein Bar Virus (EBV), Herpes Simplex Virus (HSV), and rarely Cytomegalovirus (CMV) are implicated in the pathogenesis of ARN [1-8]. The clinical features of ARN include peripheral patchy necrotizing retinitis that quickly becomes confluent, occlusive retinal vasculitis and inflammation in both anterior and posterior segments [9-15]. Secondary retinal atrophy may cause multiple retinal breaks leading to retinal detachment (RD) in up to 85 % of patients [16-19].

Prophylactic laser photocoagulation posterior to retinitis patches has been advocated to prevent RD, but it is limited by vitreous opacity caused by severe inflammation in these patients [16-23].There is no general consensus on indications and efficacy of pars plana vitrectomy in ARN patients.

The aim of the present study was to compare the outcomes between prophylactic vitrectomy and prophylactic laser photocoagulation in patients with acute retinal necrosis.

Patients and Methods

In this retrospective study the treatment results of fifteen immunocompetent patients with the diagnosis of ARN in one eye treated in the emergency ward of Farabi Eye Hospital, Tehran, Iran, between January 2015 and November 2018 were evaluated. All participants gave informed consent before their data was used in the present study and the study was approved by the ethics committee of Tehran University of Medical Sciences, Tehran, Iran. All patients had severe cloudy media due to severe vitreous inflammation, but neither funduscopy nor echography showed any sign of RD in any patient. ARN diagnosis was made clinically according to the American Uveitis Society diagnostic criteria [19]. All patients received antiviral therapy consisting of intravenous acyclovir 15 mg/kg, prescribed three times per day for seven days followed by oral acyclovir 800 mg five times a day for 3 months [20]. Oral prednisolone (1 mg/kg) was also administered in active phase. If surgery was considered, corticosteroid was stopped due to lack of severe inflammation in silicone filled operated eyes.

In the first group 8 patients underwent pars plana vitrectomy within 10 days of ARN diagnosis. In the second group 7 patients underwent three rows of barrier laser photocoagulation posterior to retinal necrosis area after partial resolution of vitritis and media opacity.

Vitrectomy was performed using 23 gauge standard three-port system and moderate to

Table1: Demographic findings and visual outcome of patients entering the study

Variable	Vitrectomized	Non-vitrectomized	P value
Mean age	44.6 years	39 years	0.49
Sex (Female/Male)	3/5	2/6	0.59
Mean best pretreatment corrected visual acuity (LogMAR)	- 2.43	- 2.47	0.92
Mean best post treatment corrected visual acuity (LogMAR)	- 1.5	- 2.26	0.59
Retinal detachment	12.5 % (One patient)	50 % (Four patients)	0.282

Table 2: Characteristics of vitrectomized patients entering the study

Case	Gender	Age	Duration: days from symptom onset to surgery	Initial visual acuity	Final visual acuity
1	Male	32	5	LP	LP
2	Male	35	9	LP	HM
3	Male	30	2	FC 3 meter	20/200
4	Male	50	4	HM	HM
5	Female	30	5	FC 1 meter	FC 2 meter
6	Male	70	6	FC 2 meter	FC 4 meter
7	Female	65	7	LP	LP
8	Female	45	4	FC 2 meter	20/200

LP: Light perception; HM: Hand motion; FC: Finger counting

severe cataracts were extracted. Posterior vitreous detachment (PVD) was induced and peripheral shaving was performed after core vitrectomy. In four patients retinal breaks were seen intraoperatively at the border of necrosis (patients 1, 2, 4 and 7 in table 2). In these patients laser photocoagulation was performed around the breaks. Also three rows of laser barrier spots posterior to retinal necrotic area (even if no break was found) were implemented. Tamponade with silicone oil (viscosity 5700 cs) was performed after air-fluid exchange.

Statistical Analysis

Statistical analysis was performed using SPSS software version 20 (Armonk, NY: IBM Corp.). Data normality was assessed using Shapiro-Wilk test. Mann-Whitney and Chi square tests were used to assess age, gender and retinal detachment distributions. Signed ranks test was applied to compare visual improvement before and after treatment in both vitrectomized and non-vitrectomized groups. The repeated measure test was used to compare the trend of visual acuity changes between groups. P values less than 0.05 were considered statistically significant.

Results

In the present retrospective study fifteen medical records were reviewed. Patients' demographic data are summarized in table 1. Follow-up time of the patients ranged from 3 to 17 months with a mean follow-up of 8.5 months. All vitrectomized eyes except one had attached retina until last follow-up. One patient showed tractional membrane causing progressive RD developed in nasal retina 3 months after surgery. This patient was scheduled for a second surgery (Patient 4, table 2). The mean corrected visual acuity of patients improved significantly in vitrectomized group (P = 0.027), but this improvement was not statistically significant in non-vitrectomized patients undergoing barrier laser photocoagulation (P = 0.207). Comparison of post treatment visual acuity between the two groups was insignificant (P = 0.59). In non-vitrectomized group, three patients (43 %) developed RD and underwent vitrectomy (Table 3). The difference between the number of patients developing post treatment RD in two groups of patients was not statistically significant (P = 0.282).

Discussion

Complicated RD develops in 50-85% of cases

Table 3: Characteristics of non-vitrectomized patients entering the study

Case	Gender	Age	Initial VA	Final VA	Retinal examination
1	Male	22	No light perception	No light perception	RD after 2 weeks
2	Male	32	FC 2 meter	FC 3 meter	Retina remained attached
3	Female	50	LP	HM	RD after 1 month
4	Male	45	FC 1 meter	FC 2 meter	Retina remained attached
5	Male	33	HM	FC 1 meter	RD after 2 months
6	Male	45	1/10	2/10	Retina remained attached
7	Male	32	2/10	2/10	Retina remained attached

LP: Light perception; HM: Hand motion; FC: Finger counting

with ARN syndrome [1,2,13,16,18,21] and a low reattachment rate is present even with early surgery [13,21,22]. Retinal laser photocoagulation and vitrectomy are the strategies suggested to reduce the rate of RD [10-18].

Lau et al., [14] have reported a decrease in the rate of RD by more than half using prophylactic laser photocoagulation in patients with ARN [14]. If media opacity allows, confluent rows of laser photocoagulation posterior to necrotic retina might decrease the incidence of RD [12,15,22-26].

Vitreous opacity may prevent careful examination of fundus and detection of breaks for photocoagulation. It is also difficult to obtain good laser effect in areas of exudation. The use of laser photocoagulation in management of ARN remains controversial. Laser photocoagulation has been found to be unhelpful in controlling the progression of retinitis in some trials [27]. Also some studies have reported that prophylactic laser photocoagulation does not contribute to a lower detachment rate [28]. In a study by Luo et al.,[27] laser photocoagulation was performed in 13 patients but necrosis did not improve and RD developed in all patients. In our study RD occurred in 3 patients (43 %) out of 7 patients undergoing laser photocoagulation.

Some trials have reported the efficacy of prophylactic vitrectomy in prevention of RD in ARN patients, but controversy still exists about the usefulness of vitrectomy in helping these patients and there is no general consensus on surgical indications [18,29]. Ishida et al.,[29] in their study concluded that prophylactic vitrectomy is effective in preventing the development of RD when necrotic lesions do not extend beyond the midperiphery. They indicated that the extent of necrotizing retinitis at the initial presentation following prophylactic vitrectomy can be used as a parameter to predict the development of RD. Lou et al., [27] in their study emphasized that prophylactic vitrectomy can prevent RD and improve the prognosis of ARN, making it an option for cases with rapidly progressing necrosis despite antiviral treatment as well as cases with moderate to extensive necrosis and severe vitreous opacity. In some other reports vitrectomy has been found to be useless in improving ARN patient' vision [28].

In the present study, prophylactic vitrectomy did not show a statistically significant difference with laser photocoagulation in improving visual outcomes. Besides the low sample size, other reasons which may cause low vision improvement including optic atrophy, macular ischemia and epiretinal

proliferation [30], might have caused the lack of significant difference in our outcomes. One of the operated patients in the present study developed progressive tractional RD and a second surgery was necessary for retinal attachment. Also four patients with no significant vision improvement developed optic atrophy at their last follow-up visit. Similar to these findings, Iwahashi-Shima et al., [30] reported that prophylactic vitrectomy was not correlated with the visual prognosis. They suggested that irreversible damage to the retina and optic nerve before antiviral treatment strongly affects the visual prognosis. In the present study, prophylactic vitrectomy reduced the incidence of RD (12.5 % in operated eyes versus 43 % in the photocoagulation group), but the difference was not statistically significant (P = 0.282), possibly due to the low sample size. Other studies have reported that prophylactic vitrectomy might prevent retinal detachment, but could not improve the mean final visual acuity [13].

Limitations of the present study were the small number of patients in groups, retrospective design of the study and the fact that vision in eyes with retained silicone oil may improve after silicone removal, which was not followed in this study.

Conclusion

Early prophylactic vitrectomy, in the course of ARN has been suggested as a useful method in preventing RD and improving the visual outcome, but the results of the present study did not indicate a significant benefit for vitrectomy compared to barrier laser photocoagulation. Further studies with larger sample sizes are recommended to compare these two methods of treatment.

Authors ORCIDs

Seyed Ali Tabatabaei:
https://orcid.org/0000-0001-8069-779X
Mohammad Soleimani:
https://orcid.org/0000-0002-6546-3546

References

1. Schoenberger SD, Kim SJ, Thorne JE, Mruthyunjaya P, Yeh S, Bakri SJ, et al. Diagnosis and Treatment of Acute Retinal Necrosis: A Report by the American Academy of Ophthalmology. Ophthalmology. 2017;124(3):382-92.

2. Muthiah MN, Michaelides M, Child CS, Mitchell SM. Acute retinal necrosis: a national population-based study to assess the incidence, methods of diagnosis, treatment strategies and outcomes in the UK. Br J Ophthalmol. 2007;91(11):1452-5.

3. Wensing B, de Groot-Mijnes JD, Rothova A. Necrotizing and nonnecrotizing variants of herpetic uveitis with posterior segment involvement. Arch Ophthalmol. 2011;129(4):403-8.

4. Margolis R, Brasil OF, Lowder CY, Smith SD, Moshfeghi DM, Sears JE, et al. Multifocal posterior necrotizing retinitis. Am J Ophthalmol. 2007;143(6):1003-8.

5. Culbertson WW, Blumenkranz MS, Pepose JS, Stewart JA, Curtin VT. Varicella zoster virus is a cause of the acute retinal necrosis syndrome. Ophthalmology. 1986;93(5):559-69.

6. Lewis ML, Culbertson WW, Post JD, Miller D, Kokame GT, Dix RD. Herpes simplex virus type 1. A cause of the acute retinal necrosis syndrome. Ophthalmology. 1989 ;96(6):875-8.

7. Nishi M, Hanashiro R, Mori S, Masuda K, Mochizuki M, Hondo R. Polymerase chain reaction for the detection of the varicella-zoster genome

in ocular samples from patients with acute retinal necrosis. Am J Ophthalmol. 1992;114(5):603-9.

8. de Boer JH, Luyendijk L, Rothova A, Baarsma GS, de Jong PT, Bollemeijer JG, et al. Detection of intraocular antibody production to herpesviruses in acute retinal necrosis syndrome. Am J Ophthalmol. 1994;117(2):201-10.

9. Wong RW, Jumper JM, McDonald HR, Johnson RN, Fu A, Lujan BJ, et al. Emerging concepts in the management of acute retinal necrosis. Br J Ophthalmol. 2013;97(5):545-52.

10. Duker JS, Blumenkranz MS. Diagnosis and management of the acute retinal necrosis (ARN) syndrome. Surv Ophthalmol. 1991;35(5):327-43.

11. Blumenkranz MS, Culbertson WW, Clarkson JG, Dix R. Treatment of the acute retinal necrosis syndrome with intravenous acyclovir. Ophthalmology. 1986;93(3):296-300.

12. Sternberg P Jr, Han DP, Yeo JH, Barr CC, Lewis H, Williams GA, et al. Photocoagulation to prevent retinal detachment in acute retinal necrosis. Ophthalmology. 1988;95(10):1389-93.

13. Clarkson JG, Blumenkranz MS, Culbertson WW, Flynn HW Jr, Lewis ML. Retinal detachment following the acute retinal necrosis syndrome. Ophthalmology. 1984;91(12):1665-8.

14. Lau CH, Missotten T, Salzmann J, Lightman SL. Acute retinal necrosis features, management, and outcomes. Ophthalmology. 2007;114(4):756-62.

15. Han DP, Lewis H, Williams GA, Mieler WF, Abrams GW, Aaberg TM. Laser photocoagulation in the acute retinal necrosis syndrome. Arch Ophthalmol. 1987;105(8):1051-4.

16. Peyman GA, Goldberg MF, Uninsky E, Tessler H, Pulido J, Hendricks R. Vitrectomy and intravitreal antiviral drug therapy in acute retinal necrosis syndrome. Report of two cases. Arch Ophthalmol. 1984;102(11):1618-21.

17. Min WK, Kang JH. Early surgical management in bilateral acute retinal necrosis. Korean J Ophthalmol. 1990;4(1):46-9.

18. Hillenkamp J, Nölle B, Bruns C, Rautenberg P, Fickenscher H, Roider J. Acute retinal necrosis: clinical features, early vitrectomy, and outcomes. Ophthalmology. 2009;116(10):1971-5.e2.

19. Holland GN. Standard diagnostic criteria for the acute retinal necrosis syndrome. Executive Committee of the American Uveitis Society. Am J Ophthalmol. 1994 15;117(5):663-7.

20. Wong RW, Jumper JM, McDonald HR, Johnson RN, Fu A, Lujan BJ, et al. Emerging concepts in the management of acute retinal necrosis. Br J Ophthalmol. 2013;97(5):545-52.

21. Blumenkranz M, Clarkson J, Culbertson WW, Flynn HW, Lewis ML, Young GA. Vitrectomy for retinal detachment associated with acute retinal necrosis. Am J Ophthalmol. 1988;106(4):426-9.

22. Blumenkranz M, Clarkson J, Culbertson WW, Flynn HW, Lewis ML, Young GM. Visual results and complications after retinal reattachment in the acute retinal necrosis syndrome. The influence of operative technique. Retina. 1989;9(3):170-4.

23. Sternberg P Jr, Han DP, Yeo JH, Barr CC, Lewis H, Williams GA, Photocoagulation to prevent retinal detachment in acute retinal necrosis. Ophthalmology. 1988;95(10):1389-93.

24. Crapotta JA, Freeman WR, Feldman RM, Lowder CY, Ambler JS, Parker CE, et al. Visual outcome in acute retinal necrosis. Retina. 1993;13(3):208-13.

25. Hudde T, Althaus C, Sundmacher R. Acute retinal necrosis syndrome. Argon laser coagulation for prevention of rhegmatogenic retinal detachment. Ophthalmologe. 1998;95(7):473-7. (Article in German)

26. Nakanishi F, Takahashi H, Ibaraki N, Ohara K. Acute retinal necrosis with varicella zoster dermatitis in the fellow eyelid. Nippon Ganka Gakkai Zasshi. 1999;103(6):477-81. (Article in Japanese)

27. Luo YH, Duan XC, Chen BH, Tang LS, Guo XJ. Efficacy and necessity of prophylactic vitrectomy for acute retinal necrosis syndrome. Int J Ophthalmol. 2012;5(4):482-7.

28. Sims JL, Yeoh J, Stawell RJ. Acute retinal necrosis: a case series with clinical features and treatment outcomes. Clin Exp Ophthalmol. 2009;37(5):473-7.

29. Ishida T, Sugamoto Y, Sugita S, Mochizuki M. Prophylactic vitrectomy for acute retinal necrosis. Jpn J Ophthalmol. 2009;53(5):486-9.

30. Iwahashi-Shima C, Azumi A, Ohguro N, Okada AA, Kaburaki T, Goto H, et al. Acute retinal necrosis: factors associated with anatomic and visual outcomes. Jpn J Ophthalmol. 2013;57(1):98-103.

Footnotes and Financial Disclosures

Conflict of interest:

The authors have no conflict of interest with the subject matter of the present study.