Journal of 21 September University for Medical and Applied Sciences
Volume (3), Issue (1):13 Aug 2024
P: 12-20
Journal homepage: http://21umas.edu.ye/masj

Original Research Article

Efficacy and Safety of Intravitreal Triamcinolone Injection in the Treatment of Cystoid Macular Edema

Nabil Taresh*[1], Talal Haider[2], Basma Al-Refai[1]

1Department of Ophthalmology, Faculty of Medicine, 21 September University for Medical and Applied Sciences, Sana'a, Yemen.
2Department of Eye Diseases and Surgery, Faculty of Medicine and Health Sciences, Sana'a University, Sana'a, Yemen.
*Corresponding Author: Nabil Taresh, 21 September University for Medical and Applied Sciences, Sana'a, Yemen. Tel: +967777068997

Article History| Received: 04.01.2024 | Accepted: 10.06.2024 | Published: 13.08.2024

Abstract

Cystoid Macular Edema (CME) is a major concern for global vision health, often resulting in distorted vision due to fluid accumulation in the macula. Intravitreal Triamcinolone (IVT) injections have emerged as a promising treatment, reducing macular thickening and improving visual acuity. This study aimed to assess the efficacy and safety of IVT injections in treating CME triggered by various diseases and improving visual acuity. The study included 20 eyes of 12 patients with CME associated with conditions such as diabetic mellitus type II, pseudophakia, central retinal vein occlusion (CRVO), Aphakia, retinitis pigmentosa, and panuveitis. A reduced dose of IVT was administered to mitigate corticosteroid-related complications. Each patient received a single IVT injection of triamcinolone acetate. The initial findings indicated the efficacy of IVT injections in managing CME, particularly in cases related to diabetic retinopathy, uveitis, and central retinal vein occlusion. The study provided valuable insights into the efficacy of IVT injections in managing CME across diverse disease conditions, with observed improvements in visual acuity and resolution of CME.

Keywords: Macular Edema, Steroids, Triamcinolone

Introduction

Cystoid Macular Edema (CME) is a significant cause of vision loss globally, characterized by fluid accumulation in the macula, leading to swelling and distorted vision [1]. Various conditions, including diabetic retinopathy, retinal vein occlusion, and post-cataract surgery inflammation can result in CME [2]. The treatment of CME is a complex and challenging task, requiring effective interventions to manage the underlying disease while reducing macular edema. In recent years, Intravitreal Triamcinolone (IVT) injections present a promising treatment, but their efficacy across disease conditions necessitates further exploration [3]. Triamcinolone is a corticosteroid that has been shown to have potent anti-inflammatory and anti-permeability effects, thereby reducing macular thickening and improving visual acuity [4]. However, while the efficacy of IVT injections in managing CME associated with certain conditions like diabetic retinopathy has been well-documented, its efficacy across different disease conditions is a topic that warrants further exploration [5]. IVT injections have been a promising solution, but further research is needed to see whether they are effective for a variety of medical disorders. As of right now, several studies have indicated that IVT injections hold promise for treating CME, which can result from several disorders. Further research should concentrate on maximizing the frequency and dosage of IVT injections for various disease states as well as investigating the possibility of combination therapies to improve treatment outcomes [6-8]. Thus, a less dose of IVTA (2mg/0.05 ml) was used in this study instead of (4mg/0.1 ml) to decrease complications of corticosteroid such as increasing Intraocular Pressure (IOP).

Accordingly, this study aims to explore the efficacy and safety of IVT injections in the treatment of CME and improving visual acuity across various disease conditions.

Materials and Methods

This study was a prospective, non-randomized, interventional clinical study conducted between December 2020 and October 2022 to assess the efficacy and safety of IVT injections in treating CME triggered by various diseases and improving visual acuity and IOP. Less dose of IVTA (2mg/0.05 ml) was used instead of (4mg/0.1 ml). TA is a synthetic steroid of the glucocorticoid family that has molecular weight of 434.50 and its empirical formula is $C_{24}H_{31}FO_6$. It is commercially available as an ester, a white powder only minimally soluble in water but soluble in alcohol and chloroform, Kenacort-A (Bristol-Myers Squibb, New York, USA) [9].

This study included 20 eyes of 12 patients (10 men, 2 women) ranging in age from 28 to 54 years with cystoid macular edema (six patients have diabetic mellites type II, two have pseudophakic, one has central retinal vein occlusion (CRVO), one has Aphakia, one has retinitis pigmentosa, and one has panuveitis). All treated eyes received an intravitreal injection dose of IVTA (2mg/0.05 ml) instead of (4mg/0.1 ml) of triamcinolone acetonide Kenacort-A (40 mg/mL) (Bristol-Myers Squibb, New York, USA). Following the tenets of the

Declaration of Helsinki, the study received approval from the Magrabi Eye Hospital, Yemen. All potential risks and possible benefits of either treatment were clearly explained to patients and written informed consent was obtained from all patients.

Inclusion Criteria

Inclusion criteria included patients with CMO of diabetes mellitus (any subtype) with diabetic retinopathy, pseudophakic, CRVO, Aphakia, retinitis pigmentosa, and panuveitis.

Exclusion Criteria

Exclusion criteria were as follows: 1) systemic used steroids within 90 days; 2) intraocular hypertension (intraocular pressure [IOP] >21 mmHg); 3) history periocular/intraocular inflammation; 4) Intravitreal ante-vascular endothelial growth factor and corticosteroid injection; 5) history of vitrectomy.

Procedure

Baseline clinical examination was performed, including best corrected Snellen visual acuity (VA), IOP examination slit lamb examination, standard fundus fluorescein angiography, and ocular coherent tomography. Each patient received a single intravitreal injection of triamcinolone acetate of 2 mg/0.05 mL (Kenacort-A (Bristol-Myers Squibb, New York, USA) after topical lidocaine 1%, topical povidone iodine 5%. Injections were given via 30-gauge needles through the inferotemporal pars plana, 4 mm from the Limbus. Intraocular pressure was checked following the injection.

Baseline Evaluation

On initial examination, best corrected visual acuity (BCVA), central macular thickness (CMT), IOP examination, and slit lamp were performed. Detailed clinical history was likewise recorded. Trained optometrists masked to both groups measured the BCVA using the E-ETDRS method as reported by Beck et al. [10, 11]. IOP was recorded using Goldmann applanation tonometry. IOP >21 mmHg was defined as intraocular hypertension. Spectral domain optical coherence tomography (SD-OCT;3D OCT-2000, Topcon Corporation, Japan) was used to detect the CMT [11].

Examination and Follow-up Evaluation

The efficacy of intravitreal injections in managing CME across different disease conditions was evaluated through a series of assessments. These assessments were performed at specific time points, including 1st day preoperatively, 1st week, and 1st, 2nd, 3rd, and 6th months after surgery. The assessments included Best Corrected Visual Acuity (BCVA), slit lamp examination, measurement of IOP, fundus photographs, and optical coherence tomography. Postoperative adverse events, such as intraocular hyper-tension, secondary ocular infections, endophthalmitis, non-infectious inflammation, retinal detachments, and conjunctival hemorrhage were also assessed.

Results

Demographics of Patients

A total of 20 eyes of 12 patients with CME were included in this study. The patients consisted of 10 male and 2 women, with ages ranging from 28 to 54 years (Figure 1-a). The patients had different underlying conditions, including diabetic mellitus type II, pseudophakic, central retinal vein occlusion (CRVO), Aphakia, retinitis pigmentosa, and panuveitis (Figure 1-b).

The initial findings suggested that intravitreal (IVT) injections have been effective in managing CME, particularly in cases related to diabetic retinopathy, uveitis, and CRVO. The treatment resulted in reducing macular thickening and improving visual acuity. In some cases, the treatment led to temporary improvement, but the recurrence rate was low.

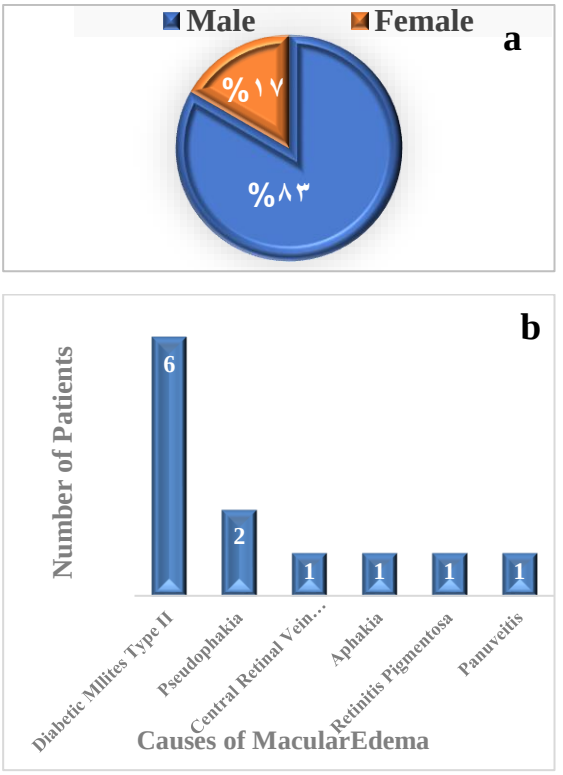

Figure 1: (a) Distribution of patients according to gender; (b) Distribution of patients according to causes of Macular Edema

Floaters in the Vitreous

Figure 2 shows that, during the first day of follow-up, all patients in the study reported seeing floaters (pieces of TA) in the vitreous. It was also observed that some patients continued to see floaters for a few days after the initial day of follow-up.

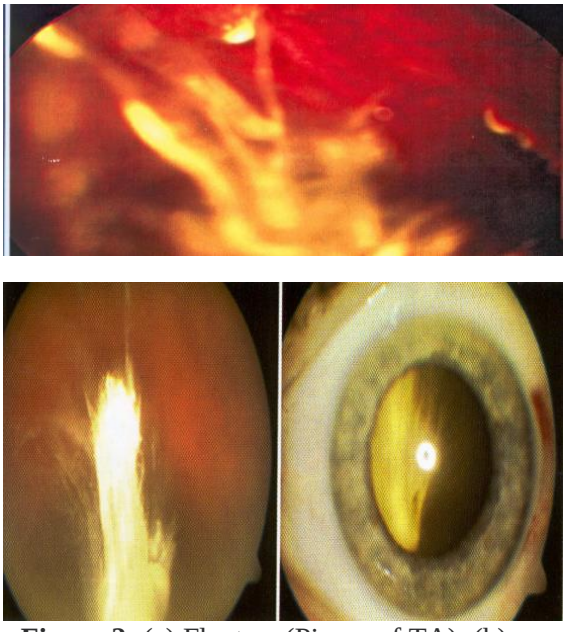

Figure 2: (a) Floaters (Pieces of TA); (b) fundus photography; (c) Slit lamp photography

Best Corrected Visual Acuity (BCVA) Improvement

Table 1 shows improvements in the best corrected visual acuity (BCVA) after the IVTA injection. The median corrected VA prior to the injection was 6/24, while the post-injection median BCVA was 6/12 at month 1 and 6/9 at month 3 for uveitis patients. The maximum improvement in BCVA was observed at month 3 in 9 cases, including uveitis, pseudophakia, diabetic mellitus type II (DM-II), and central retinal vein occlusion (CRVO). However, there was no change in BCVA in 3 cases

Table 1: Best Corrected Visual Acuity before and after the IVTA injection

Patient Number	Causes	Eye	BCVA Before IVTA	1st Week	Month 1	Month 3	Month 6
1.	**DM-II**	OD OS	6/CF2m 6/60	6/CF4m 6/24	6/CF4m 6/18	6/CF4m 6/18	6/CF2m 6/24
2.	**DM-II-**	OD OS	6/60 6/CF3m	6/36 6/CF4m	6/24 6/60	6/24 6/60	6/36 6/60
3.	**DM-II**	OD OS	6/36 6/60	6/18 6/36	6/12 6/36	6/12 6/24	
4.	**DM-II**	OD OS	6/CF2m 6/60	6/CF2m 6/36	6/CF2m 6/24	6/CF2m 6/24	6/CF2m 6/24
5.	**DM-II**	OD OS	6/CF4m 6/36	6/CF4m 6/24	6/CF4m 6/18	6/CF4m 6/24	6/CF4m 6/36
6.	**DM-II**	OD OS	6/CF2m 6/CF4m	6/CF2m 6/60	6/CF4m 6/36	6/CF4m 6/24	6/CF4m 6/24
7.	**CRVO**	OD	6/60	6/24	6/18	6/12	6/18
8.	**Pseudophakia**	OD OS	6/60 6/36	6/24 6/12	6/18 6/12	6/18 6/12	6/18 6/12
9.	**Pseudophakia**	OS	6/60	6/24	6/18	6/18	
10.	**Aphakia**	OD	6/CF3m	6/CF3m	6/CF3m	6/CF3m	6/CF3m
11.	**Retinitis Pigmentosa**	OD OS	6/CF3m 6/60	6/CF3m 6/36	6/CF3m 6/36	6/CF3m 6/60	6/CF3m 6/60
12.	**Uveitis**	OD	6/60	6/24	6/12	6/9	

(patients No. 4 and 5 with DM-II OD, retinitis pigmentosa OD, and Aphakia).

Intraocular Pressure (IOP) Variation

Table 2 displays the variation in IOP before and after the IVTA injection. The mean IOP before the injection and at month 3 was 15.50 mmHg and 17.80 mmHg, respectively. On the first day after treatment, there was a temporary increase in IOP in some cases, with the maximum increase observed in patients No. 6 and 7 (30, 28, and 28 mmHg). However, the IOP decreased without treatment to 18, 17 mmHg and 16 mmHg, respectively.

Table 2: Intraocular Pressure before and after the IVTA injection

Patient Number	Causes	Eye	Before Surgery	1st day	Week 1	Month 1	Month 3	Month 6
1.	**DM-II**	OD OS	14 12	16 14	16 14	16 14	14 12	15 17
2.	**DM-II**	OD OS	15 17	20 19	17 17	17 17	15 17	17 19
3.	**DM-II**	OD OS	11 13	14 13	14 15	14 15	11 13	
4.	**DM-II**	OD OS	15 18	17 18	17 18	17 18	15 18	17 20
5.	**DM-II**	OD OS	15 16	15 16	15 18	15 18	15 16	18 19
6.	**DM-II**	OD OS	19 20	30 28	18 17	18 17	19 20	19 20
7.	**CRVO**	OD	15	28	16	16	15	17
8.	**Pseudophakia**	OD OS	13 14	15 17	15 16	15 16	13 14	14 16
9.	**Pseudophakia**	OS	17	17	19	19	17	
10.	**Aphakcia**	OD	16	16	16	16	16	18
11.	**Retinitis Pigmentosa**	OD OS	14 12	14 12	15 14	15 14	14 12	15 13
12.	**Uveitis**	OD	15	17	15	15	15	
Mean			15.05	17.8	16.1	16.1	15.05	17.13

Discussion

The findings of the study provide valuable insights into the efficacy of the low dose of IVT injections in managing CME across different disease conditions. The results revealed that IVTA effectively improved BCVA and decreased CME across different disease during 6 months of follow-up. Comparably, Dang et al. found that 44% of patients had improved their BCVA by ten letters or more by the end of the first month following intravitreal injection, and that this benefit continued for six months without the need for further injections [11]. In addition, a relatively low percentage of patients with intraocular hypertension was reported.

According to preliminary research, IVT injections are quite successful in controlling CME, especially in situations with postoperative inflammation and diabetic retinopathy [4].

To the best of the researchers' knowledge, this is the first study conducted in Yemen on the safety and efficacy of IVTA, which may enable making wise decisions in clinical practice and properly comprehending the therapeutic effect of corticosteroids. The varying efficacy of IVT across diseases could be attributed to the unique pathophysiology of each condition. In diabetic retinopathy, inflammation drives CME, making IVT's anti-inflammatory action effective [3]. Positive results have been obtained in this study in cases including uveitis, pseudophakia, diabetic mellitus type II (DM-II), and central retinal vein occlusion (CRVO). In contrast, retinal vein occlusion involved both inflammation and ischemia, complicating the treatment outcomes, compeered to Scott et al. [12].

These results indicate that the most important feature of this study is that the use of less does of IVTA is relatively low incidence of intraocular hypertension, compeered to Dang et al. [11] who reported that elevated IOP is a common steroid-related complication, but it seems more frequent and serious after IVTA.

Intravitreal triamcinolone (4 mg/0.1 mL) was an effective treatment for inflammatory macular edema with clinical and angiographic resolution evident in all patients by 6 weeks (range 2–6 weeks), but induced ocular hypertension increases [13].

More recent steroid formulas, such as injection of the DEX implant might be more suited for slow-release device insertion or repeated injections since they have less of an impact on the IOP while still eliminating CMO [11, 13].

Limitations

The current study had the following limitations. The small sample size of 12 patients and the relatively short follow-up period of 6 months for most patients limit the generalizability of the findings. Additionally, the study did not provide information on the long-term outcomes and recurrence rates beyond the 6-month follow-up period. Further research with larger sample sizes and longer follow-up periods would provide more comprehensive insights into the efficacy and long-term outcomes of IVT injections in managing CME.

Conclusion

This study highlights the efficacy and safety of the low dose of IVT injections in managing CME, particularly in cases related to diabetic retinopathy, uveitis, and central retinal vein occlusion. The findings shed light on the occurrence of floaters, BCVA improvement, CMO relapse, and IOP variation in CME patients undergoing IVTA injections. Further research is warranted to address the limitations of the present study and explore additional factors influencing treatment outcomes in CME patients.

Conflict of Interest

The authors declare no conflict of interest.

References:

1. Yanyali A, Nohutcu AF, Horozoglu F, Celik E. Modified grid laser photocoagulation versus pars plana vitrectomy with internal limiting membrane removal in diabetic macular edema. American journal

of ophthalmology. 2005;139(5):795-801.
2. Holló G, Aung T, Cantor LB, Aihara M. Cystoid macular edema related to cataract surgery and topical prostaglandin analogs: Mechanism, diagnosis, and management. Survey of Ophthalmology. 2020;65(5):496-512.
3. Antonetti DA, Klein R, Gardner TW. Diabetic retinopathy. The New England journal of medicine. 2012;366(13):1227-39.
4. Jonas JB, Kreissig I, Degenring R. Intravitreal triamcinolone acetonide for treatment of intraocular proliferative, exudative, and neovascular diseases. Progress in Retinal and Eye Research. 2005;24(5):587-611.
5. Munk MR, Somfai GM, de Smet MD, Donati G, Menke MN, Garweg JG, et al. The Role of Intravitreal Corticosteroids in the Treatment of DME: Predictive OCT Biomarkers. International journal of molecular sciences. 2022;23(14).
6. Tariq F, Wang Y, Ma B, He Y, Zhang S, Bai L. Efficacy of Intravitreal Injection of Filtered Modified Low-Dose Triamcinolone Acetonide and Ranibizumab on Pseudophakic Cystoid Macular Edema. 2022;9.
7. Becerra EM, Morescalchi F, Gandolfo F, Danzi P, Nascimbeni G, Arcidiacono B, et al. Clinical evidence of intravitreal triamcinolone acetonide in the management of age-related macular degeneration. Current drug targets. 2011;12(2):149-72.
8. Moon J, Kim M, Sagong M. Combination therapy of intravitreal bevacizumab with single simultaneous posterior subtenon triamcinolone acetonide for macular edema due to branch retinal vein occlusion. Eye. 2016;30(8):1084-90.
9. Tao Y, Jonas JB. Intravitreal triamcinolone. Ophthalmologica Journal international d'ophtalmologie International journal of ophthalmology Zeitschrift fur Augenheilkunde. 2011;225(1):1-20.
10. Beck RW, Moke PS, Turpin AH, Ferris FL, 3rd, SanGiovanni JP, Johnson CA, et al. A computerized method of visual acuity testing: adaptation of the early treatment of diabetic retinopathy study testing protocol. American journal of ophthalmology. 2003;135(2):194-205.
11. Dang Y, Mu Y, Li L, Mu Y, Liu S, Zhang C, et al. Comparison of dexamethasone intravitreal implant and intravitreal triamcinolone acetonide for the treatment of pseudophakic cystoid macular edema in diabetic patients. Drug design, development and therapy. 2014;8:1441-9.
12. Scott IU, Ip MS, VanVeldhuisen PC, Oden NL, Blodi BA, Fisher M, et al. A randomized trial comparing the efficacy and safety of intravitreal triamcinolone with standard care to treat vision loss

associated with macular Edema secondary to branch retinal vein occlusion: the Standard Care vs Corticosteroid for Retinal Vein Occlusion (SCORE) study report 6. 2009;127(9):1115.

13. Young S, Larkin G, Branley M, Lightman S. Safety and efficacy of intravitreal triamcinolone for cystoid macular oedema in uveitis. Clinical & experimental ophthalmology. 2001;29(1):2-6.