

Postoperative Bacterial Endophthalmitis: Tap/Inject versus Sutureless Vitrectomy

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Keywords: Endophthalmitis,
vitrectomy (VIT), tap and inject (TAP)

Abstract

Purpose: To compare sutureless vitrectomy (VIT) versus vitreous tap/injection (TAP) in eyes with postoperative bacterial endophthalmitis.

Methods: Retrospective study of 126 consecutive eyes that underwent VIT (82) or TAP (44) between 2005 and 2015. All eyes were stratified into a group according to their pre and postoperative visual acuity. Group 1 included patients with visual acuity of 20/40 or better, group 2 had a visual acuity ranging from 20/50 to 20/100, group 3 had a visual acuity <20/100-20/400, group 4 had a visual acuity of <20/400-CF, and group 5 had a visual acuity of HM-LP. Outcome measures were post intervention visual acuity (VA) and complications.

Results: Mean preop VA was 20/2000 in VIT and 20/1800 in TAP ($p=0.30$), while postop VA was 20/160 in VIT and 20/125 in TAP ($p=0.18$). Preoperative vision was HM or LP in 87/126 eyes. Among those with poor preoperative vision of <20/400, postoperative vision was significantly better in the VIT group when compared to the TAP group ($p=0.05$). In eyes with good preoperative vision (20/400 or better), the mean postoperative vision was not significantly different between the VIT or TAP group ($p=0.94$). Final vision in all eyes was 20/40 or better in 25%, 20/100 or better in 56%, and only 11% had vision of HM or worse. Twelve eyes (9.5%) developed retinal detachment (RD), all in the VIT group, with 11/12 presenting with poor preoperative vision.

Conclusion: VIT or TAP has a similar visual outcome in patients with postoperative bacterial endophthalmitis that present with 20/400 or better vision. Sutureless vitrectomy (VIT) was found to be more beneficial than TAP in patients with worse than 20/400 initial vision. RD is more likely in the VIT group primarily due to poor presenting visual acuity

1. Introduction/Background

Endophthalmitis is one of the most feared complications resulting from cataract surgery. The reported rate of post-operative endophthalmitis varies between a range of 0.04%-0.2% (Hashemian et al. 2016), and can result in a sudden decrease in visual acuity. Two treatment options for postoperative bacterial endophthalmitis have been widely accepted and include sutureless pars plana vitrectomy (VIT) and in office tap and inject (TAP) of intravitreal antibiotics. The Endophthalmitis Vitrectomy Study (E.V.S.), the standard of care for treatment of postoperative endophthalmitis, showed a significant benefit of standard 20-gauge vitrectomy over tap and inject only for patients with presenting visual acuity of light perception (LP) or worse (Endophthalmitis 1995). In more recent literature, according to their 2015 literature review, Hashemian et al reports that “immediate pars plana vitrectomy is the gold standard of care for acute post cataract surgery endophthalmitis” (Hashemian et al. 2016). Similar studies, including Gower et al, Wykoff et al, and Ng et al, report high rates of vitrectomy

usage in the United States for the treatment of endophthalmitis and “recommend vitrectomy as the standard of care” (Gower et al. 2015, Wykoff et al. 2010, Ng et al. 2005).

The purpose of the current study was to compare two widely accepted treatment regimens for postoperative bacterial endophthalmitis to determine the best course of treatment compared to the standard of care that is shown in the E.V.S.

2. Methods

Institutional Review Board (IRB) approval and informed consent was obtained prior to collection of patient data from the University of Alabama-Birmingham IRB. The study conducted is HIPAA compliant and adhered to the tenets of the Declaration of Helsinki.

2.1 Overview

In this retrospective cohort study, 126 consecutive eyes were analyzed with postoperative bacterial endophthalmitis that underwent initial sutureless pars plana vitrectomy (VIT) (n=82) or tap and inject (TAP) (n=44) at University of Alabama at

Birmingham, Retina Consultants of Alabama between 2005 and 2015. All eyes were stratified into a group according to their pre and postoperative visual acuity. Group 1 included patients with visual acuity of 20/40 or better, group 2 included patients with a visual acuity ranging from 20/50 to 20/100, group 3 included patients with visual acuity <20/100-20/400, group 4 included patients with a visual acuity of <20/400-CF, and group 5 included patients with a visual acuity of HM-LP. Groups were used for statistical analysis of the data. Main outcome measures included post-intervention visual acuity and complications.

2.2. Procedures

Patients diagnosed with postoperative bacterial endophthalmitis underwent treatment by either sutureless vitrectomy (VIT) or in office vitreous tap and injection (TAP) of antibiotics. Aqueous and vitreous sampling was used to confirm infection by gram staining, as well as culture and sensitivity. 82/126 patients underwent immediate sutureless pars plana vitrectomy, performed in the operating room, to debride the infective

vitreous cavity and place intravitreal antibiotics. In contrast, 44/126 patients underwent tap and inject, performed in an office setting, for the treatment of endophthalmitis.

2.3. Analysis

Microsoft Excel was used for data analysis. Chi-square analysis was used to compare visual acuity in both treatment groups, VIT and TAP. A P value of less than 0.05 was considered statistically significant.

3. Results

A total of 126 consecutive eyes underwent treatment for postoperative bacterial endophthalmitis. Mean preoperative vision was 20/2000 in the VIT group and 20/1800 in the TAP group ($p=0.30$). Mean postoperative vision was 20/160 in the VIT group and 20/125 in TAP group ($p=0.18$) (Table 1). Cultures were positive in 75/126 (60%) eyes, and 8 organisms were identified. The most common organisms were coagulase-negative Staphylococcus 46/126 (37%), Streptococcus species in 12/126 (11%), and Enterococcus species in 6/126 (4.7%). Preoperative vision was HM or LP in

87/126 eyes. Among those with poor preoperative vision of <20/400, postoperative vision was significantly better in the VIT group when compared to the TAP group (p=0.05) (Table 2). In eyes with good preoperative vision (20/400 or better), the mean postoperative vision was not significantly different between the VIT or TAP groups (p=0.94) (Table 2). Final vision in all eyes was 20/40 or better in 25%. In 56%, vision was 20/100 or better; only 11% had vision of HM or worse. Risk factors for final poor visual

outcome (<20/400) included infection with Enterococcus (p=0.01). Poor preoperative vision and abnormal intraocular pressure (IOP) (<5 or >26 mmHg) was not statistically significant but showed a trend toward poor visual outcome (p=0.09 and 0.08 respectively). Twelve eyes (9.5%) developed retinal detachment (RD), all in the VIT group, with 11/12 presenting with poor preoperative vision of hand motion (HM) or light perception (LP).

Table 1: Visual Acuity Before and After Treatment

	VIT Group	TAP Group	P Value
Preop VA	20/2000	20/1800	0.30
Postop VA	20/160	20/125	0.18

VIT= Vitrectomy

TAP= Tap and inject

Table 2: Visual Acuity Determines Treatment Plan

Preop Vision <20/400	VIT group benefitted	P= 0.05
Preop Vision 20/400 or better	VIT or TAP groups equal	P= 0.94

VIT=Vitrectomy

TAP= Tap and inject

4. Discussion

The Endophthalmitis Vitrectomy Study (E.V.S.) set the standard for treatment and visual outcomes for patients with acute postoperative bacterial endophthalmitis. Overall, 69% had 20/100 or better visual acuity, while 15% had worse than 5/200 visual acuity. Furthermore, in patients presenting with hand motion or better vision, there was no difference in final visual outcome between an immediate standard vitrectomy or an in office tap and inject procedure. The E.V.S. found vitrectomy more beneficial than vitreous tap in patients with light perception or worse visual acuity (Endophthalmitis 1995). Due to recent improvements in surgical techniques and instrumentation (sutureless vitrectomy became available in 2005), a retrospective evaluation was conducted of all cases of endophthalmitis over a ten-year period that underwent sutureless vitrectomy or vitreous tap for postoperative bacterial endophthalmitis. The current study, the most recent large series, found similar results to the previous literature with final acuity of 20/200 in 56% of patients, and 11% hand motion or worse. Unlike the

E.V.S., which found that patients with light perception or worse initial vision benefitted with vitrectomy, this study showed that among those with preop vision of $<20/400$, postop vision was significantly better in the vitrectomy group than TAP group. This may be as a result of 25g sutureless techniques and improvement in instrumentation and technology.

Several more recent reports have found similar results regarding visual acuity outcomes for the treatment of endophthalmitis using both treatment techniques. One study on endophthalmitis at a University teaching hospital found final acuity to be $\geq 20/200$ in 64% of eyes with 14% having no light perception (Wykoff et al. 2010). A series of 213 episodes of endophthalmitis from Australia reported similar visual outcomes to the E.V.S. regarding visual acuities. Ng et al stated that visual outcomes remain poor and have not improved since the E.V.S. (Ng et al. 2005). In a more recent study, Hashemian et al conducted a literature review of post-cataract surgery endophthalmitis focusing on articles published between January 2015 and

February 2016. This study found that visual outcome mainly depends on the bacteriology and timing of treatment with the appropriate approach. 84% of patients with gram positive, coagulase-negative micrococci endophthalmitis achieve a visual acuity of 20/100 or better. However, a positive gram stain infection, as opposed to *Staphylococcus epidermidis* or gram negative cultures, were associated with much poorer visual outcomes. Presenting visual acuity is also one of the most important predictors of final visual outcome after treatment (Hashemian et al. 2016, Gower et al. 2015). Kessel et al's literature review on antibiotic prevention of post-cataract endophthalmitis reported 17% of patients in the European Society of Cataract and Refractive Surgeons study had a final visual acuity $\leq 20/200$ and 48.3% had a final visual acuity $\leq 20/40$ (Kessel et al. 2015).

4.1. Risk Factors

The risk factors that might be associated with poor visual outcome were assessed. Previous literature has shown that a positive culture, a more virulent organism, treatment delay, presence of related ocular disease, including retinal

detachment, and poor initial visual acuity are all risk factors for poor visual outcomes (Endophthalmitis 1995, Driebe et al. 1986, Bohigan et al. 1986, Puliafito et al. 1982). Lundstrom et al concluded that due to cataract severity being an important risk factor for endophthalmitis, intervening earlier in the course of cataract development may help reduce the risk of vision loss and overall endophthalmitis rate in patients. This study also found that administering a prophylactic intracameral antibiotic to every patient may also further reduce the risk of endophthalmitis (Lundstrom et al. 2015). Gower et al concluded in their study that worse visual acuity at presentation was associated with poorer final acuity. They also found that vitrectomy was not predictive of final visual acuity (Gower et al. 2015). The study described in this manuscript showed similar results for decreased final visual acuity. The data confirmed that the most important risk factor for poor visual acuity (VA) was an initial poor VA.

The data showed twelve eyes (9.5%) developed retinal detachment (RD). All twelve occurred in the VIT

group, with 11/12 presenting with poor preoperative vision of hand motion (HM) or light perception (LP). RD is more likely in the VIT group primarily due to poor presenting visual acuity, as 92% (11/12) of patients with a RD had HM or LP vision. The study indicates that this is not due to surgery, but the severity of the endophthalmitis upon presentation.

4.2. Limitations

Several limitations can be recognized in this study with regards to its retrospective nature, and that the follow-up period varied between the 126 patients. Nevertheless, this is the second largest study in the field of ophthalmology comparing two treatment options for postoperative bacterial endophthalmitis. This study proposes the need for further research of this kind in the field of postoperative bacterial endophthalmitis to determine the optimal preoperative vision that would necessitate a sutureless vitrectomy rather than tap and inject.

5. Conclusion

In conclusion, the findings of this study show that sutureless vitrectomy or in office tap and inject appear to have similar visual outcome in patients with postoperative bacterial endophthalmitis that present with 20/400 or better vision. The majority of patients have final vision of 20/100 or better, as the median final visual acuity for patients post treatment was 20/160 in the VIT group and 20/125 in the TAP group. Sutureless vitrectomy was found to be more beneficial than in office tap and inject in patients with worse than 20/400 initial vision. This finding is significant because it differs from the landmark Endophthalmitis Vitrectomy Study (E.V.S.). This study is the largest series to date since the E.V.S. comparing vitrectomy to in office tap and inject, and should be used in conjunction with the E.V.S. as the standard of care in the treatment of patients with postoperative bacterial endophthalmitis.

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