Early Postoperative Intraocular Pressure Elevation after Vitreoretinal Surgery

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Abstract

Objective: The evaluation of intraocular pressure (IOP) after vitreoretinal surgery is critical to ensure the normal function of the eye. The purpose of this study was to determine the incidences and risk factors of early postoperative IOP elevation after vitreoretinal surgery.

Method: Data were collected and retrospectively analyzed from 150 patients (150 eyes) who received vitreoretinal surgery from March 2012 to December 2012 in Tongji Hospital. IOP was measured before surgery and on day 1, 2, 3, 4-7 after surgery by Goldmann applanation tonometer. Ocular hypertension was defined as IOP ≥ 24 mmHg. The incidences and risk factors were analyzed.

Results: 87 of the 150 patients were male and 63 were female. The IOP was elevated significantly in 54 eyes (36.00%) within 1 week after vitreoretinal surgery. Among them, 31 eyes (57.40%) occurred on day 1; 14 eyes (25.93%) occurred on day 2. The incidences of elevated IOP between different primary diseases had no statistical difference (p>0.05). However, patients with proliferative diabetic retinopathy (PDR), and rhegmatogenous retinal detachment (RRD) with proliferative vitreoretinopathy (PVR) grade ≥ C2, had higher rates of IOP elevation. Vitrectomy combined with cataract surgery or scleral buckling had no significant difference in IOP elevation compared with vitrectomy only (p>0.05). The rate of IOP elevation between 20G pars-plana vitrectomy (41.76%) and 23G pars-plana vitrectomy (27.40%) had statistical difference (p=0.033). The incidence of IOP elevation with intraocular tamponade of C3F8 was significantly higher than simple vitrectomy (chi²=7.723, p=0.005), while with silicone oil, the difference was not significant (chi²=3.627, p>0.05).

Conclusion: IOP measurement after vitreoretinal surgery is important to monitor and prevent unintentional high IOP as it is a common complication after vitreoretinal surgery. The risk factors of early IOP elevation include the 20G pars-plana vitrectomy and C3F8 injection. Early treatment of IOP may prevent IOP spike to protect the vision.

Keywords: Intraocular pressure; Vitreoretinal surgery; 20G pars-plana vitrectomy; 23G pars-plana vitrectomy; Postoperative complication; C3F8; Silicone oil

Introduction

With the development of novel instruments and techniques, vitreoretinal surgery has been more and more widely used in the recent 50 years to treat a large variety of retinal pathology, such as retinal detachment, macular holes, epiretinal membranes, and proliferative vitreoretinopathy. Despite the accumulation of surgical experience, complications are still not rare in clinical practice, and some of which may have severe consequences. IOP elevation is one of the most common postoperative complications in vitreoretinal surgery. High IOP causes pain and discomfort in patients, more severely, the functionality of the eye may be permanently damaged. Therefore, a close monitor of IOP after vitreoretinal surgery is an important and routine examination in clinic. The incidence of postoperative IOP elevation has been reported as 3.6% to 22.2%; within 48 h, up to 40% of patients experienced an increased IOP [1-3]. Several risk factors have been related with high IOP after vitreoretinal surgery, such as the procedure of the surgery, the application of tamponade and the primary diseases of the patients [1,4,5]. However, these observations were conducted in different clinical studies separately; the data were collected from few hours to 1 day, or 1 month in the postoperative period [1,4-6]. The purpose of this study was to determine the incidence and risk factors of elevated IOP in the early stage (day 1, 2, 3, 4-7) after vitreoretinal surgery.

Methods

Patient cohort

Medical histories obtained from 150 patients (87 males and 63 females) undergoing vitreoretinal surgery between March, 2012 and December 2012 in Tongji Hospital were retrospectively reviewed. The average age was 50.1 ± 6.5 years (age range 3 to 79 years). As to the primary diseases, 14 eyes were ocular injuries, 36 eyes were PDR, 25 eyes were vitreous hemorrhage caused by retinal vascular diseases, 18 eyes were RRD with PVR grade ≥ C2, 88 eyes were RRD with PVR...
Results

The incidences of early IOP elevation after vitreoretinal surgery

IOP elevation occurred within one week after vitreoretinal surgery (54 of 150 eyes, 36.00%). As shown in Figure 1, most patients experienced high IOP at day 1 (31 eyes, 57.40%) and day 2 (14 eyes, 25.93%) postoperatively. These data were in accordance with Han's study [10].

Early IOP elevation after vitreoretinal surgery in patients with different primary diseases

In 36 eyes with PDR, high IOP occurred in 15 eyes (41.76%). In 18 RRD eyes with PVR grade ≤ C2, high IOP occurred in 10 eyes (55.56%). In 38 RRD eyes with PVR grade > C2, high IOP occurred in 13 eyes (34.21%). In 25 eyes with vitreous hemorrhage caused by retinal vascular diseases, high IOP occurred in 7 eyes (28.00%). In 14 eyes with traumatic vitreoretinopathy, high IOP occurred in 4 eyes (28.57%). Among the rest of 19 eyes, 5 experienced high IOP (26.31%). Chi-square tests were used to analyze whether different primary diseases affected the incidences of early elevated IOP after vitreoretinal surgery. The Chi-square value was 5.345 (p=0.375), which indicated the incidences of early IOP elevation in eyes with different primary diseases had no statistical difference.

Early IOP elevation after vitreoretinal surgery in patients with different endotamponades

Endotamponades included BSS, gas (C3F8) and silicone oil. 5 of 30 eyes with BSS experienced high IOP (16.67%); 25 of 53 eyes with C3F8 experienced high IOP (47.17%); 24 of 67 eyes with silicone oil experienced high IOP (35.82%). Chi-square tests were used to analyze whether different endotamponades affected the incidences of early elevated IOP after vitreoretinal surgery. The Chi-square value was 7.738 (p=0.021), which suggested the incidences of early IOP elevation in eyes with different endotamponades had significant difference. Then, we tested the differences between C3F8 and silicone oil group (χ²=1.578, p=0.209), silicone oil and BSS group (χ²=3.627, p=0.057), as well as C3F8 and BSS group (χ²=7.723, p=0.005). The results implicated intraocular tamponade of C3F8 increased the rate of early IOP elevation after vitreoretinal surgery significantly (Tables 1 and 2).

<table>
<thead>
<tr>
<th>Primary Diseases</th>
<th>Total Eye Number</th>
<th>High IOP eye number</th>
<th>Incidences of IPO (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDR</td>
<td>36</td>
<td>15</td>
<td>41.65</td>
</tr>
<tr>
<td>RRD</td>
<td>38</td>
<td>10</td>
<td>26.31</td>
</tr>
</tbody>
</table>
RRD with PVR grade ≥ C2  & 18 & 10 & 55.56  
RRD with PVR grade <C2  & 38 & 13 & 34.21  
Vitreous hemorrhage caused by retinal vascular diseases  & 25 & 7 & 28  
Traumatic Vitreoretinopathy  & 14 & 4 & 28.57  
Others  & 19 & 5 & 26.31  

Table 1: The incidences of early IOP elevation in eyes with different primary diseases.

<table>
<thead>
<tr>
<th>Endotamponades</th>
<th>Total eye number</th>
<th>High IOP eye number</th>
<th>Incidences of IOP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS</td>
<td>30</td>
<td>5</td>
<td>16.67</td>
</tr>
<tr>
<td>C3F8</td>
<td>53</td>
<td>25</td>
<td>47.17</td>
</tr>
<tr>
<td>Silicone Oil</td>
<td>67</td>
<td>24</td>
<td>35.82</td>
</tr>
</tbody>
</table>

Table 2. The incidences of early IOP elevation in eyes with different endotamponades.

Early IOP elevation after vitrectomy combined with cataract surgery
In 37 eyes performed vitrectomy combined with cataract surgery, high IOP occurred in 18 eyes (48.65%). In 113 eyes underwent only vitreoretinal surgery, high IOP occurred in 36 eyes (31.86%). The Chi-square value was 3.411 (p=0.065), which indicated combined cataract surgery in vitrectomy did not affect the incidence of early postoperative IOP elevation.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total eye number</th>
<th>High IOP eye number</th>
<th>Incidences of IOP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV</td>
<td>113</td>
<td>36</td>
<td>31.86</td>
</tr>
<tr>
<td>PPV combined with cataract surgery</td>
<td>37</td>
<td>18</td>
<td>48.56</td>
</tr>
</tbody>
</table>

Table 3: The incidences of early IOP elevation in eyes performed vitrectomy combined with or without cataract surgery.

Early IOP elevation after vitrectomy combined with scleral buckling
In 19 eyes performed vitreoretinal surgery combined with scleral buckling, high IOP occurred in 9 eyes (47.37%). In 131 eyes underwent only vitreoretinal surgery, high IOP occurred in 45 eyes (34.35%). The Chi-square value was 1.220 (p=0.269), which suggested combined scleral buckling in vitrectomy did not affect the incidence of early postoperative IOP elevation.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total eye number</th>
<th>High IOP eye number</th>
<th>Incidences of IOP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV</td>
<td>131</td>
<td>45</td>
<td>34.35</td>
</tr>
<tr>
<td>PPV combined with cataract surgery</td>
<td>19</td>
<td>9</td>
<td>47.37</td>
</tr>
</tbody>
</table>

Table 4. The incidences of early IOP elevation in eyes performed vitrectomy combined with or without scleral buckling.

Early IOP elevation after 20G or 23G PPV
77 eyes received 20G PPV, 34 of them experienced early postoperative IOP elevation (41.76%). 73 eyes underwent 20G PPV, 20 of them experienced early postoperative IOP elevation (27.40%). The Chi-square value was 4.568 (p=0.033), which implicated 20G PPV increased the rate of early postoperative IOP elevation.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total eye number</th>
<th>High IOP eye number</th>
<th>Incidences of IOP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20G PPV</td>
<td>77</td>
<td>34</td>
<td>41.76</td>
</tr>
<tr>
<td>23G PPV</td>
<td>73</td>
<td>20</td>
<td>27.4</td>
</tr>
</tbody>
</table>

Table 5: The incidences of early IOP elevation after 20G or 23G PPV.
In Zhang's study, IOP was statistically significantly lower in the early stages after 23G PPV because of choroidal detachment [15]. However, we did not detect this complication in the follow-up of our patients. Again, the inconsistence of the results implicated the complex impact factors in early postoperative IOP elevation of vitreoretinal surgery.

In conclusion, early IOP elevation is a common complication after vitreoretinal surgery. IOP measurement after vitreoretinal surgery is important to monitor and prevent unintentional high IOP. The risk factors of early IOP elevation include the 20G pars-plana vitrectomy and C3F8 injection. Early treatment of IOP may prevent IOP spike to protect the vision.

**References**


