Resident complications of intravitreal injections at a large county hospital

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Parkland

Introduction

Intravitreal injections (IVIs) are a rapidly growing method of intraocular drug administration, used to deliver medication into the vitreous cavity of the eye. IVIs have now surpassed cataract surgery as the most frequently performed procedure in ophthalmology. According to the Centers for Medicare and Medicaid Services, their incidence has increased from less than 3,000 in 1999 to more than 2.3 million in 2012.

The most common pharmacologic agents administered intravitreally inhibit angiogenesis by blocking vascular endothelial growth factor (VEGF); for example, bevacizumab, ranibizumab, and aflibercept. Other intravitreally administered medications, such as steroids and antimicrobials, are less commonly utilized. The most common indications for injections are diabetic macular edema, exudative age-related macular degeneration, and venous occlusion associated macular edema.

IVIs are becoming the standard of care for an increasing number of ophthalmic conditions. As such, IVI usage will only increase as the population ages, new medications become available, and indications broaden. With IVIs being performed at increasing rates at the Parkland county hospital's resident ophthalmology clinic, identification of an accurate risk profile must be delineated, including possible associated complications during cataract surgery, mainly posterior capsular rupture (PCR).

PCR is an intraoperative complication that can occur during cataract surgery whereby the main support for placement of the intraocular lens into the capsular bag is compromised. Further, PCR is a known risk factor for other post-operative complications, including retinal detachment, glaucoma, and cystoid macular edema. Current literature remains divided with regards to whether prior administration of intravitreal injection(s) increases the risk of PCR during cataract surgery.

Methods

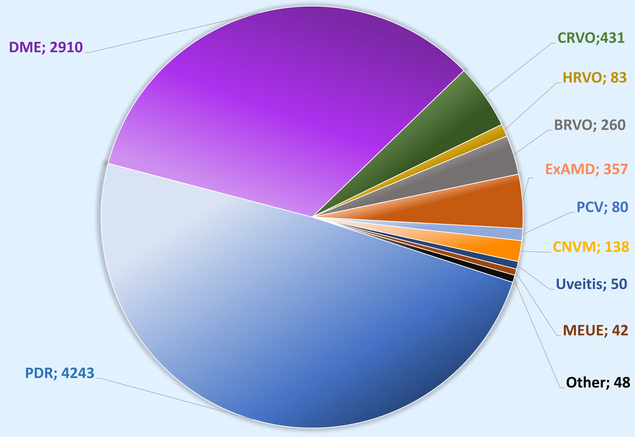
A retrospective chart review of patients who received one or more IVIs by an ophthalmology resident at Parkland between 1/2010 and 7/2016 was conducted. Charts were reviewed for a variety of IVI-related complications as well as the incidence of PCR during subsequent cataract surgery. Patients receiving injections of antibiotic or antiviral agents were excluded due to presumptive other fundus findings such as retinal atrophy or vitritis that could skew data. Patients with a diagnosis of pseudoexfoliation or phacodonesis, independent risk factors for PCR, or those with records insufficient for meaningful analysis were also excluded. All patient information was deindentified to protect patient privacy.

Results

Indications of intravitreal injections

The study included 1893 eyes, from 1300 subjects, which received a total of 8642 injections. Of the 8642 injections, 98.52% were of an anti-VEGF agent with the remaining 1.48% being steroids. Proliferative diabetic retinopathy (PDR) and diabetic macular edema were the most common indications, with more than half of the eyes studied receiving injections for PDR. This is consistent with the finding that 91.81% of the study subjects had a known diagnosis of diabetes. Infrequent diagnoses that occurred in less than 5 eyes each were combined into an "other" category; these include but are not limited to central retinal artery occlusion, macular telangiectasia, and retinal arterial macroanureysm.

Diagnoses for 8642 Intravitreal Injections



DME = diabetic macular edema without PDR, PDR = proliferative diabetic retinopathy, CRVO = central retinal vein occlusion, HRVO = hemispheric retinal vein occlusion, BRVO = branch retinal vein occlusion, ExAMD = exudative age-related macular degeneration, PCV = polypoidal choroidal vasculopathy, CNVM = choroidal neovascular membrane, MEUE = macular edema of unknown etiology

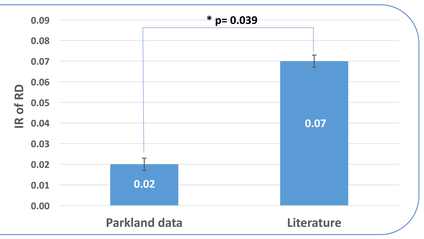
Results

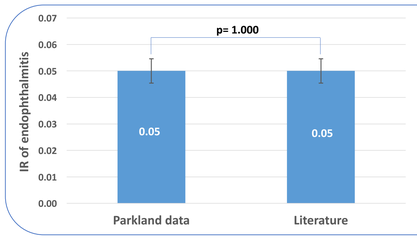
Complications associated with intravitreal injections

Of a total of 8642 IVIs that were reviewed, 76 complications (0.89%) were noted. Their nature ranged from relatively non-vision threatening (corneal abrasion, ptosis, posterior vitreous detachment) to severely vision threatening (endophthalmitis, intraocular pressure (IOP) elevation, retinal detachment, other mechanical complications).

Retinal Detachment

2 new diagnoses (IR=0.02%) of retinal detachment (RD) were noted within 1 month post IVI. One subject presented with a macula-on tractional RD 3 days post IVI. Another subject presented with a large combined rhegmatogenous/tractional RD 1 month post IVI. The overall incidence of RDs reported post IVI at Parkland hospital (0.02%) was significantly lower than the rate reported in the literature (0.07%) (p=0.039).



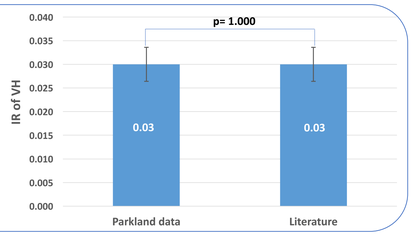


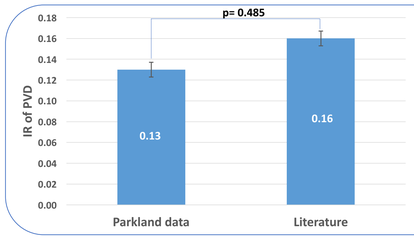
Endophthalmitis

4 diagnoses (IR=0.05%) of endophthalmitis were reported within 1 week post IVI. 2 subjects lost all light perception in the affected eye and the remaining 2 subjects had best corrected visual acuities of 20/150 and 20/400 upon follow up 6 months later. The rate of endophthalmitis at Parkland (0.05%) was not significantly different from the rate reported in the literature (0.05%) (p=1.000).

Vitreous Hemorrhage

3 new onset vitreous hemorrhages (VH) (IR=0.03%) were diagnosed within 1 week post IVI. OF note, all 3 eyes also carried a preexisting diagnosis of proliferative diabetic retinopathy. This rate (0.03%) is not significantly different from that reported in literature (0.03%) (p=1.000).



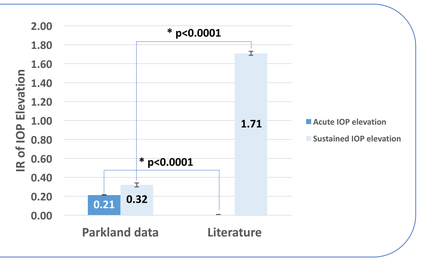


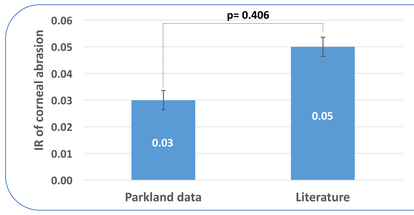
Posterior Vitreous Detachment

11 cases (IR=0.13%) of acute posterior vitreous detachment (PVD) were diagnosed within 2 months post IVI. PVD was noted after a median of 4 IVIs (range 1-13). In 2 eyes, PVD occurred after only 1 IVI. No significant difference was observed between the rate at Parkland hospital (0.13%) and the rate reported in literature (0.16%) (p=0.485).

IOP Elevation

18 cases (IR=0.21%) of acute IOP elevation requiring anterior chamber paracentesis for transient vision loss were observed post IVI. All affected eyes regained at least hand motion vision after paracentesis. The rate of acute elevation at Parkland is significantly higher than the rate in literature (0.00%) (p<0.0001). 6 eyes (IR= 0.32%) were diagnosed with sustained IOP elevation after 1 or more injections. This rate is significantly lower than than the rate reported in the literature (1.71%) in a study of patients receiving IVIs for DME (p<0.0001).





Corneal Abrasion

3 corneal abrasions (IR=0.03%) occurred after receiving an intravitreal injection. There was no significant difference in the rate of corneal abrasion noted in this study (0.03%) and that reported in the literature (0.05%)(p=0.406).

Results

Mechanical Complications

18 instances (IR= 0.21%) of mechanical complications were noted, 16 of which were due to the patient moving mid-procedure. The remaining two events were due to equipment malfunction and provider error. The majority of these eyes suffered only from minor subconjunctival hemorrhages. One eye suffered from a Seidel positive corneal wound which was treated with a bandage contact lens.

Ptosis

11 eyes (IR= 0.58%) were diagnosed with new onset ptosis or progression of preexisting ptosis after 1 or more IVIs. One eye with preexisting ptosis had documented worsening after receiving 12 IVIs. Of the remaining 10 eyes, 4 eyes did not have any prior history of ophthalmic surgeries or procedures that would have necessitated the use of a rigid eyelid speculum.

Posterior Capsular Rupture

Out of the 1893 eyes that were studied, 354 eyes underwent subsequent cataract surgery after receiving at least 1 IVI. 12 of these eyes had surgeries complicated by PCR (3.39%). 7 of these 12 eyes were excluded for a prior history of pars plana vitrectomy (PPV), a known independent risk factor for PCR. This yields a PCR rate of 1.41% at Parkland compared to 1.9-2.1% in literature (p=0.428).

Intraoperatively, 1 eye[A] was found to have a linear defect from 9 to 5 o'clock and another eye[B] was found to have a linear defect from 10 to 4 o'clock defect. Interestingly, these would correlate with the inferotemporal path of IVIs performed according to the Parkland protocol.

5 cases of PCR in non-vitrectomized eyes out of 354 eyes undergoing cataract surgery after IVI(s)

	PCR #1[A]	PCR #2[B]	PCR #3	PCR #4	PCR #5
Axial length (mm)	24.20	21.70	23.80	24.30	21.20
Age of subject	48	59	54	76	71
Number of IVIs pre-op	9	1	1	1	1
Grade of cataract	Tr NSC, 2+ PSC	1+ NSC, 1+ PSC	2+ NSC, 3+ PSC	3+ NSC, 2+ PSC	2+ NSC, 3+ CC, 2+ PSC

Discussion

Resident administered IVIs at Parkland pose an overall low risk of complication, minimally different from IVIs administered at other institutions.

The rates of endophthalmitis, PVD, VH, and corneal abrasion were not significantly different than that reported in literature; while the rate of retinal detachment and sustained IOP elevations was in fact lower than that reported in literature. The rate of acute IOP elevation was significantly higher than the rate reported in literature.

This significantly higher rate could be explained by the fact that a large percentage of our subjects suffer from comorbidities of diabetes, hypertension, and severe cardiovascular disease. Consequently, ocular perfusion is likely limited at baseline and smaller increases in pressure are sufficient to prevent adequate perfusion of the central retinal artery. Our study also utilized a stricter threshold in order to define sustained ocular hypertension (>10mmHg from baseline or elevation requiring medical treatment) than a majority of reports in the literature. This presumably underestimates our true incidence of sustained ocular hypertension. However, our focus on eyes requiring medical treatment is likely a more clinically relevant manner of defining sustained ocular hypertension.

Of 76 complications reviewed, the most (18 complications) were noted to be mechanical in nature and despite the possibility of significant ocular injury, none had suffered severe permanent visual consequences. Furthermore, of the 76 complications, only 9 had lasting negative visual effects.

Interestingly, ptosis was noted to be diagnosed in many patients undergoing IVIs. It is likely that repeated trauma to the levator palpabrae induced by lid specula usage during IVIs may contribute to this in part.

Finally, upon exclusion of previously vitrectomized eyes, the PCR rate in eyes undergoing cataract surgery with prior history of IVIs was not significantly different from standard PCR rates in literature. This contradicts findings reported by Lee et al. which show that prior intravitreal therapy is associated with higher likelihood of PCR during cataract surgery and that this risk increases with an increasing number of injections. In fact, of the 5 cases of PCR studied (excluding eyes with prior vitrectomy), 4 had only 1 intravitreal injection. Barring the 2 cases of direct lens trauma during intravitreal injection, this study has no evidence to show that increased number of injections increases the risk of PCR.

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