

Case series: Zonulectomy in the treatment of aqueous misdirection

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Abstract

Purpose: The management for aqueous misdirection remains a challenge and numerous strategies have been described. Unfortunately the failure rate for medical and laser therapy is high. Previous reports describe a technique of combined vitrectomy with hyaloido-zonulectomy for the treatment of aqueous misdirection. We report our case series of patients managed with a modified version of this technique.

Methods: Seven consecutive cases of aqueous misdirection diagnosed between January 2006 and September 2010 (7 eyes of 5 patients) were included in the study. Five eyes underwent pars plana vitrectomy combined with peripheral zonulectomy, two patients underwent a peripheral zonulectomy from an anterior approach. Outcome measures included BCVA, IOP, medications and slit lamp findings.

Results: All patients responded to surgery with reduction in IOP and deepening of the AC. One patient needed an additional procedure after 4 months and one patient suffered from post operative endophthalmitis. Mean follow up 27 months (range 14-42 months).

Conclusions: A reason for the high recurrence rate in patients who have had vitrectomy alone is due to difficulty in establishing unobstructed flow from the vitreous cavity to the anterior chamber. Our case series highlights the importance of the zonulectomy which we feel to be a crucial step as it establishes the unobstructed communication.

Three port pars plana vitrectomy combined with hyaloido-zonulectomy is an effective treatment for the management of aqueous misdirection; experienced anterior segment surgeons may consider performing a peripheral iridectomy and zonulectomy from an anterior approach.

Introduction

Aqueous misdirection is a rare condition thought to be caused by aqueous being diverted posteriorly into the vitreous cavity [1]. It most commonly occurs after glaucoma filtration surgery but can occur after cataract extraction, laser iridotomy, capsulotomy, miotic therapy and cyclophotocoagulation [2-6]. It is more common in patients who have a history of treatment for angle closure glaucoma [7].

It is characterised by central and peripheral shallowing of the anterior chamber (AC) with a patent iridotomy and no evidence of suprachoroidal haemorrhage or effusion [8,9]. The management for aqueous misdirection remains a challenge and numerous strategies have been described. Medical therapies with cycloplegics and aqueous suppressants, laser therapies with peripheral iridotomy and anterior hyaloidotomy and surgical therapy with pars plana vitrectomy have all been described [2,10-12]. Unfortunately the failure rate for medical and laser therapy is high. Previous reports describe a technique of combined vitrectomy with hyaloido-zonulectomy for the treatment of aqueous misdirection [13]. We report our case series of patients managed with a modified version of this technique, and in some cases performed some time after diagnosis of aqueous misdirection.

Methods

7 consecutive cases of aqueous misdirection diagnosed between January 2006 and September 2010 (7 eyes of 5 patients) were included in the study. 5 eyes underwent pars plana vitrectomy combined with peripheral hyaloido-zonulectomy, two patients underwent a peripheral zonulectomy from an anterior approach.

Surgical technique: patients underwent 3 port pars plana core vitrectomy (3PPV). Following this, the vitrector was then angled upwards to perform a hyaloido-zonulectomy and a peripheral iridectomy from a posterior approach.

Two patients underwent a zonulectomy and peripheral iridectomy from an anterior approach. Here the AC was deepened with viscoelastic and an AC maintainer was used. From a limbal incision the vitrector was angled backwards through the previous peripheral iridectomy to initially enlarge it and then maneuvered further posteriorly to perform a zonulectomy as well.

Results

See summary table 1.

Case 1

71 year old female diagnosed with chronic angle closure glaucoma (CACG) underwent uncomplicated trabeculectomy surgery. Her low pre-op intra ocular pressure (IOP) was only maintained with oral acetazolamide medication. 2 weeks post op she was noted to have

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Table 1. Summary.

Case	Details	Eye	Diagnosis	Surgery	IOP		BCVA		Treatment		Follow up (months)
					Pre	Post	Pre	Post	Pre	Post	
1	71 F	Right	CACG	Trab	12	11	6/6	6/9	Latanoprost, timolol & Acetazolamide SR 250mg BD	duotrav	28
2	30 M	Right	plateau iris syndrome	Trab	24	20	6/9	6/5	cosopt, latanoprost, brimonidine and acetazolamide 250mg BD	timolol	42
3	77 F	Right	CACG	Trab	33	18	6/12	6/12	cosopt	duotrav	33
		Left	OHT and shallow AC	Phaco	23	15	6/12	6/9	timolol	duotrav	36
4	44 F	Right	plateau iris syndrome	Trab	17	14	6/5	6/5	Acetazolamide SR 250 OD	0	14
		Left	plateau iris syndrome	Phaco-Trab	14	12	6/6	6/18	Acetazolamide SR 250 OD	0	14
5	79 F	Left	CACG	Trab	32	10	6/12	6/24	Acetazolamide SR 250 BD	timolol	22

F= female, M= male, CACG= chronic angle closure glaucoma, OHT= ocular hypertension, AC= anterior chamber, Trab= Trabeculectomy, Phaco= Phacoemulsification of lens

a raised IOP of 34 for which she underwent laser suture lysis and bleb needling with 5 fluoro-uracil. She was intolerant to atropine and underwent YAG capsulotomy and to the anterior hyaloid face 6 months post op. Her IOP remained high (28 mmHg) and she underwent a 3PPV combined with hyaloido-zonulectomy. She has since been maintained on two topical agents and her latest IOP was 11, two and a half years after the vitrectomy.

Case 2

A 31 year old male with plateau iris syndrome underwent difficult trabeculectomy surgery. During the surgery it was noted that the globe was tense for which he required intravenous mannitol. The iris protruded through the sclerostomy and miocinol was used. At one week his IOP was 26 mmHg with a very shallow AC and he was diagnosed with aqueous misdirection. He underwent 3PPV with subsequent deepening of the AC. Following this he was controlled with atropine but developed an intolerance. After 18 months on stopping atropine his AC was very shallow and his IOP was 52 mmHg. He underwent a further vitrectomy combined with phacoemulsification of the lens but his pressure remained high at 30. His AC progressively shallowed and his pressure increased to 44. He underwent an iridectomy, zonulectomy and anterior vitrectomy from an anterior approach with immediate deepening of the anterior chamber. His post op IOP was 18 and despite maintaining a deep AC his IOP increased to 40 mmHg after four months and he underwent revision of his peripheral iridectomy and anterior hyloidectomy from a posterior approach. His IOP post op was 20 mmHg and has been maintained for four years on just one topical agent.

Case 3

A 77 year old female with CACG in the right eye and ocular hypertension with a shallow AC in the left, underwent trabeculectomy surgery to the right eye which had previously undergone cataract surgery. Aqueous misdirection was diagnosed two months post op. She developed an intolerance to atropine and her IOP steadily rose over three years when she underwent 3PPV combined with hyaloido-zonulectomy. Her IOP has been controlled at 18 on two topical drops for three years. Over the same time period she underwent uncomplicated cataract extraction (phacoemulsification) in her left eye. Two years following this she was noted to have a shallow AC and raised IOP at 32 mmHg. She underwent 3PPV and hyaloido-zonulectomy four months later. Her IOP has been controlled for the last four years at 15 on two topical drops.

Case 4

A 44 year old female with plateau iris syndrome and previous bilateral laser peripheral iridotomies underwent a right trabeculectomy.

Her preop IOP was 17 mmHg controlled on acetazolamide tablets. On day one post op she was noted to have a pressure of 24 mmHg and was diagnosed with aqueous misdirection. She was controlled on acetazolamide 250 mg QDS and underwent a 3PPV and hyaloido-zonulectomy the following week. Her IOP following this was controlled at 12 mmHg on no topical treatment, She remained on acetazolamide to control the left IOP. Later the same month, the patient underwent a left phaco-trabeculectomy. Aqueous misdirection was diagnosed on day one post op again, with an IOP of 12 mmHg. She underwent a vitrectomy and hyaloido-zonulectomy later the same day. Unfortunately her post op recovery was complicated by endophthalmitis where her vision reduced to hand movements in the affected eye. She underwent a further vitrectomy with intra-vitreous antibiotics with slow resolution of the endophthalmitis. Her latest IOP is 14 mmHg in her right eye and 12 mmHg in her left after one year and she is on no treatment. The vision in the left eye has reduced from 6/6 preop to 6/18.

Case 5

A 79 year old female with narrow angle glaucoma underwent an uncomplicated trabeculectomy to her left eye. One year later she underwent a trabeculectomy to her right eye complicated by aqueous misdirection diagnosed one week post op. She underwent a 3PPV and subsequent bleb needling two weeks later. Six months later she underwent an uncomplicated phacoemulsification to her left cataract and was followed up six monthly for five years. At this point she had an elevated IOP at 22 mmHg with a slightly shallow AC. She was treated initially with atropine drops which deepened her AC but she continued to have a raised IOP at 30 mmHg. The pressure was controlled with oral acetazolamide SR 250 mg twice daily and two topical agents. Given the deep AC her signs were not typical of aqueous misdirection and she underwent a redo trabeculectomy. One week post op the AC was very shallow and she was diagnosed with aqueous misdirection. After no resolution after one week she underwent a left peripheral iridectomy, anterior vitrectomy and zonulectomy from an anterior approach. Her AC deepened dramatically on the table and remained deep throughout her post operative recovery. For the last two years her she has not had any recurrence. Her latest IOP was 12 mmHg in the right and 10 mmHg in the left.

Discussion

Aqueous misdirection results from posterior flow of aqueous into the vitreous cavity. Although the mechanism is not fully understood, a number of possibilities have been suggested such as anterior rotation of the ciliary body causing ciliolenticular touch and ciliary block, as well as abnormalities in the choroid, lens, zonules and vitreous [8,13].

By creating a communication between the anterior chamber and

vitreous cavity, aqueous flow can be re-established to the anterior chamber. Medical management in aqueous misdirection consists of cycloplegia and topical and/or oral IOP lowering agents. In some pseudophakic patients, YAG laser capsulotomy with hyaloidotomy is an option as this creates a channel for fluid to flow to the anterior chamber once the anterior hyaloid face has been disrupted. Unfortunately, a number of patients do not respond to the treatment and in those that do, there is a high relapse rate [10,13].

Other options include trans-scleral cyclodiode and argon laser iridoplasty which attempts to shrink the processes and thus break the ciliary block [14,15]. A total pars plana vitrectomy can facilitate the flow of aqueous into the anterior chamber by disrupting the anterior hyaloid face however this may not be enough to break the cycle. One of the reasons for a high recurrence rate in patients who have had vitrectomy alone is due to the difficulty in establishing unobstructed flow from the vitreous cavity to the anterior chamber by removing the anterior hyaloid face [1,3]. In our case series most patients underwent a standard three port pars plana vitrectomy combined with hyaloido-zonulectomy through the pre existing peripheral iridotomy. This we feel to be the most important step in the procedure as it establishes the unobstructed communication. Two patients underwent a zonulectomy from an anterior approach, with immediate visible deepening of the AC, further suggesting that this step is the crucial in allowing the aqueous to flow into the AC and breaking the cycle. Unfortunately one of these patients required an extra surgery, suggesting an adequate sized peripheral iridectomy and zonulectomy is required to achieve a satisfactory outcome.

Three port pars plana vitrectomy combined with hyaloido-zonulectomy is an effective treatment for the management of aqueous misdirection; experienced anterior segment surgeons may consider performing a peripheral iridectomy and zonulectomy from an anterior approach as a possible management option.

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