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Management and outcomes of acute primary angle closure with phacoemulsification: a clinical audit at hospital Tengku Ampuan Rahimah

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Abstract

Purpose: To evaluate the demographic characteristics, treatment effects, and timing of cataract extraction of patients with acute primary angle closure (APAC) in Hospital Tengku Ampuan Rahimah (HTAR), Klang, Malaysia.
Study design: Retrospective descriptive analysis.
Methods: This study included 17 patients with APAC in HTAR from 2021 to 2024. Data on demographics, visual acuity (VA), intraocular pressure (IOP), and antiglaucoma medications (including oral acetazolamide) were collected at presentation, preoperatively, and 3 months postoperatively following phacoemulsification with posterior chamber intraocular lens implantation (PCIOL).
Results: There were 10 females (58.8%) and 7 males (41.2%), with age ranging from 42 to 84 years. Seven patients (41.2%) were Malay, 7 (41.2%) were Chinese, and 3 patients (17.6%) were Indian. A total of 14 patients (82.4%) underwent phacoemulsification within 6 weeks of presentation. Mean IOP was 50.44 mmHg upon attack, 18.24 mmHg during abortion of attack, and 13.06 mmHg after surgery ($p < 0.001$). Mean logMAR VA improved from 1.00 to 0.62 ($p < 0.001$). Oral acetazolamide use declined significantly from 8 patients upon attack to 2 postoperatively ($p = 0.002$).

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However, 13 out of 17 patients (76.5%) of patients still required 2 or more topical IOP-lowering medications at final follow-up. No significant relationship was found between preoperative medication burden and early surgical timing.
Conclusion: Cataract surgery effectively improves VA and IOP and reduces dependency on systemic acetazolamide. Nevertheless, a high proportion of patients progress to require long-term topical therapy for chronic glaucoma, underscoring the need for ongoing monitoring. Further studies are required to determine the optimal timing for cataract surgery in APAC.

Keywords: acute primary angle closure, clinical audit, intraocular pressure, phacoemulsification

Pengurusan dan hasil rawatan penutupan sudut primer akut menggunakan fakoemulsifikasi: Audit Klinikal di Hospital Tengku Ampuan Rahimah

Abstrak

Tujuan: Untuk menilai ciri-ciri demografi, kesan rawatan, dan masa pembedahan ekstraksi katarak terhadap tekanan intraokular (IOP) pesakit dengan glaukoma sudut tertutup akut (APAC) di Hospital Tengku Ampuan Rahimah, Klang, Malaysia. Reka bentuk kajian: Analisis deskriptif retrospektif.
Kaedah: Kajian ini melibatkan 17 pesakit APAC yang menerima rawatan di HTAR dari tahun 2021 hingga 2024. Data demografi, akuiti penglihatan (VA), IOP dan penggunaan ubat antiglaukoma (termasuk acetazolamide oral) dikumpulkan semasa pesakit mula hadir ke hospital, sebelum pembedahan dan tiga bulan selepas pembedahan fakoemulsifikasi dengan implantasi kanta intraokular (PCIOL).
Keputusan: Terdapat 10 pesakit wanita (58.8%) dan 7 pesakit lelaki (41.2%), dengan umur antara 42 hingga 84 tahun. Pesakit Melayu 7 (41.2%), pesakit Cina 7 (41.2%) dan pesakit India 3 (17.64%). Seramai 14 (82.4%) pesakit menjalani pembedahan fakoemulsifikasi dalam tempoh enam minggu dari masa mula hadir ke hospital. Purata IOP adalah 50.44 mmHg semasa serangan akut, 18.24 mmHg selepas rawatan dan 13.06 mmHg selepas pembedahan ($p < 0.001$). Purata akuiti penglihatan logMAR bertambah baik daripada 1.00 kepada 0.62 ($p < 0.001$). Penggunaan ubat asetazolamide oral menurun secara signifikan dari lapan pesakit kepada dua selepas pembedahan ($p = 0.002$). Walaubagaimanapun, 13 daripada 17 pesakit (76.5%) masih memerlukan dua atau lebih ubat titis untuk menurunkan IOP pada rawatan

susulan terakhir di klinik. Tiada hubungan yang ketara ditemui antara penggunaan ubat anti-glaukoma sebelum pembedahan dan jangkamasa pembedahan awal.
Kesimpulan: Pembedahan katarak berkesan meningkatkan VA dan mengurangkan IOP serta kebergantungan pada asetazolamide oral. Walaubagaimanapun, sebahagian besar pesakit masih memerlukan ubat titis glaukoma pada jangka panjang untuk glaukoma kronik, sekaligus menekankan keperluan untuk pemantauan berterusan. Kajian lanjut diperlukan untuk menentukan pengaturan masa yang paling optimum untuk pembedahan katarak dalam situasi APAC.

Kata kunci: audit klinikal, fakoemulsifikasi, glaukoma sudut tertutup akut, tekanan intraokular

Introduction

Primary angle closure glaucoma (PACG) contributes 50% of the cases of blindness due to glaucoma even though it only accounts for 26% of all glaucoma cases.[1] Laser peripheral iridotomy (LPI) is the recommended initial therapy of PACG with the aim of eliminating pupillary block and prevent progression to acute primary angle closure (APAC).[2] However, Asian individuals with PACG after LPI alone have a 58.2% risk of developing APAC in the first 6 months despite LPI.[3]

APAC is within the spectrum of PACG and is an ophthalmic emergency in which intraocular pressure (IOP) increases due to aqueous humour outflow obstruction. It usually presents as a sudden onset of unilateral severe eye pain or headache, associated with blurred vision, rainbow-colored halos around bright lights, nausea, and vomiting. This medical condition requires immediate IOP lowering and LPI is usually performed to relieve pupillary blockage.

Lens extraction is the recommended management for primary angle-closure disease (PACD) based on the Effectiveness in Angle-closure Glaucoma of Lens Extraction (EAGLE) study, a randomized control trial published in 2016. The study concluded that clear lens extraction was superior to LPI in terms of IOP control, medication burden, health economic benefits, and quality of life.[4] Although the ideal timing of phacoemulsification for patients with APAC in Asia still remains undefined, the Royal College of Ophthalmologist guidelines suggest that early phacoemulsification should be offered once IOP is controlled and the cornea is clear, approximately 1 to 4 weeks after presentation.[2] This audit aimed to evaluate the outcomes of phacoemulsification in patients with APAC in Hospital Tengku Ampuan Rahimah, Klang, Malaysia.

Methods

The retrospective data of 17 eyes of 17 patients with APAC collected in Hospital Tengku Ampuan Rahimah from 2021 to 2024 were included in this audit. The inclusion criterion was APAC, diagnosed at IOP > 21 mmHg with occludable angle based on anterior chamber angle in the presence of any 2 of these 3 symptoms: history of blurring of vision and halos, ocular and periocular pain, nausea and/or vomiting, and any 3 of these 4 signs: conjunctival injection, corneal epithelial oedema, mid-dilated unreactive pupil, or shallow anterior chamber. Secondary lens-induced glaucoma, such as phacomorphic glaucoma, phacolytic glaucoma and phacoanaphylactic glaucoma, were excluded from this audit.

All eyes had cataract and underwent phacoemulsification with implantation of a single-piece posterior chamber intraocular lens (IOL) in the bag. All patients were followed up for 3 months. Visual acuity based on Snellen chart, IOP, and number of antiglaucoma medications with or without the usage of acetazolamide were recorded upon presentation, preoperatively, and 3 months postoperatively.

Statistical analysis

Chi-square goodness-of-fit test was used to compare visual acuity and usage of oral acetazolamide pre- and postoperatively. ANOVA was used to assess the mean difference of IOP across 3 groups of upon attack, upon abortion of APAC, and post-operative. *P*-value < 0.05 was considered significant.

Results

There were 10 females (58.8%) and 7 males (41.2%), with age ranging from 42 to 84 years old. Ethnic distribution was equal between Malay and Chinese 7 (41.18%) for both races, while 3 (17.64%) were Indian (Table 1). Follow-up period was 3 months. All surgeries were completed with no major complications. A total of 4 (23.53%) patients had no known medical illness. The most prevalent comorbidity identified in this audit was hypertension, found in 13 out of 17 patients (76.46%). Within the hypertension group, 7 patients (41.18%) also had diabetes mellitus. The audit shows a statistically significant ($p < 0.002$) treatment distribution among the 17 patients, with LPI being the standard intervention for 13 patients (76.47%), whereas 2 (11.77%) had argon laser peripheral iridoplasty (ALPI) as primary procedure and 2 (11.77%) had no procedure done prior to cataract extraction. The patients who did not have LPI or ALPI were planned for early cataract surgery by 17 days.

Table 1. Demographic data, comorbidities, duration of APAC upon presentation, and timing of phacoemulsification of patients with APAC

Variable	***n* (%)** **Total *N* = 17**	***p*-value**
Gender		
Male	10 (58.8%)	0.467
Race		
Malay	7 (41.18%)	0.390
Chinese	7 (41.18%)	
Indian	3 (17.64%)	
Laterality		
Left eye	9 (52.94%)	0.808
Comorbidities		
No known medical illness	4 (23.53%)	0.662
Hypertension	6 (35.29%)	
Diabetes mellitus & hypertension	7 (41.18%)	
Procedure		
Laser peripheral iridotomy	13 (76.47%)	0.002*
Argon laser peripheral iridoplasty	2 (11.77%)	
No procedure	2 (11.77%)	
Duration of APAC at presentation		
Less than 1 week	9 (52.94%)	0.567
2 to 4 weeks	3 (17.65%)	
4 weeks to 3 months	3 (17.65%)	
Longer than 3 months	2 (11.76%)	
Timing of phacoemulsification from APAC		
Less than 2 weeks	2 (11.8%)	0.057
2 to 4 weeks	4 (23.5%)	
4 to 6 weeks	8 (47.1%)	
6 weeks to 3 months	2 (11.8%)	
Longer than 3 months	1 (5.9%)	

* Statistically significant

Table 2. Mean difference in IOP upon attack, preoperative, and postoperative

IOP (mmHg)	Upon attack	Preoperative	Postoperative	*P*-value
	50.44	18.24	13.06	< 0.001

Table 3. Comparison of visual acuity improvement in mean logMAR upon attack and postoperativel

Category	Level of impairment	Visual acuity (mean logMAR)	Upon attack, *n* (%) Total *N* = 17	*p*-value	Postoperative, *n* (%) Total *N* = 17	*p*-value
0	None to mild	< 6/18	7 (41.2%)	0.221	14 (82.5%)	< 0.001
1	Moderate	6/24–6/60	4 (29.4%)		1 (5.9%)	
2	Severe	5/60–3/60	1 (5.9%)		0	
3	Blindness	2/60–1/60	0		0	
4	Blindness	>1/60	3 (17.65%)		1 (5.9%)	
5	Blindness	No light perception	1 (5.9%)		1 (5.9%)	

Table 4. Mean number of topical medications and oral acetazolamide upon attack, preoperative, and postoperative

Mean numbers of medications	Upon attack	*P*-value	Preoperative	*P*-value	Postoperative	*P*-value
1 antiglaucoma	2	0.346	2	0.475	4	0.392
2 antiglaucoma	2		3		4	
3 antiglaucoma	6		6		2	
4 antiglaucoma	5		5		7	
4 antiglaucoma + pilocarpine	2		0		0	
Oral acetazolamide	8	0.808	5	0.134	2	0.002*

* Statistically significant

Table 2 presents the mean IOP upon attack, 50.44 mmHg; during abortion of attack, 18.24 mmHg; and at 3 months postoperative, 13.06 mmHg ($p < 0.001$). There was 1 patient whose IOP remained 30 mmHg at 5 weeks postoperative with antiglaucoma eye drops, oral acetazolamide, and glycerol with logMAR of 0.54. Trabeculectomy with subconjunctival mitomycin C was then performed, and IOP subsequently was reduced to 12 mmHg.

Mean logMAR visual acuity was 1.00 during APAC attack and 0.62 at final follow-up ($p < 0.001$) (Table 3). The audit revealed a high pharmacological burden upon attack and in the preoperative phase, with all APAC patients in HTAR requiring multiple IOP-lowering medications. Phacoemulsification was highly effective in eliminating the need for systemic acetazolamide, from 8 patients upon attack to only 2 postoperatively ($p = 0.002$). The audit showed 13 patients still needing 2 or more topical IOP-lowering medications, indicating progression to chronic glaucoma (Table 4). Of the 17 patients with APAC managed in HTAR, 14 patients (82.4%) underwent phacoemulsification surgery by 6 weeks. However, three patients (17.6%) proceeded later than 6 weeks as 1 required 5 months to stabilize glucose control preoperatively, another refused early surgery after regaining good visual acuity following an attack, and 1 had a planned operation scheduled 8 weeks later.

Discussion

The mainstay treatment of APAC is LPI, as it relieves the pupillary block. However, LPI alone might not be sufficient, especially for Asian eyes, as shown by multiple studies in Asia— particularly Hong Kong, Singapore, Iran, and China—where higher percentages have persistently high IOP, suggesting that anatomical differences of eyes might play a role in this.[3] Asian eyes have heavily pigmented irises, which means that the laser needs more power to be able to penetrate effectively. This can cause more inflammation and pigment release, which could damage the trabecular meshwork and make it harder to control IOP.[5]

Phacoemulsification has been shown to be superior than LPI alone and can be a definitive treatment in APAC patients.[6] It significantly reduces peripheral anterior synechiae (PAS), effectively opens the drainage angle, deepens the anterior chamber, lowers IOP postoperatively, and requires fewer medications at the final visit.[3,5,6,7] All APAC patients in HTAR underwent uncomplicated phacoemulsification with IOL implantation. Topical dexamethasone 0.1% and a topical broad-spectrum antibiotic of the fluoroquinolone group (ciprofloxacine) were administered to all patients to reduce the intraocular inflammation, which prevents further formation of PAS that could lead to suboptimal IOP control. The visual acuity of the 2 patients who had neither LPI nor ALPI prior to phacoemulsification improved and the number of antiglaucoma medications decreased to a maximum of 2.

The optimal time frame of phacoemulsification for APAC remains uncertain. Lam *et al.* suggested the ideal timing for phacoemulsification is 1 month post-abortion of APAC, when the eye is quiescent, or before the formation of significant PAS.[6] On the contrary, some studies found no significant difference in outcomes for patients who underwent phacoemulsification a few weeks compared to a few days after an acute angle closure crisis.[7,8] HTAR implemented a mean time for phacoemulsification within 4 to 6 weeks, allowing more time for better corneal clarity and better control of inflammation, thereby reducing the formation of PAS. A well-planned cataract surgery anticipates zonulolysis with retropupillary IOL standby to overcome the risk of secondary angle closure. Biometry readings also achieve greater accuracy to prevent postoperative refractive surprises.

In this audit, there were no intraoperative complications, such as posterior capsule rupture or suprachoroidal haemorrhage, nor postoperative complications, the most common of which is pseudophakic cystoid macular oedema. Furthermore, patients have a risk of defaulting on appointments; arranging an early surgery is a way to curb further glaucomatous damage that could develop over time by 50%.[3] However more studies are required to establish the optimal timing for phacoemulsification in APAC patients. In our study, phacoemulsification showed significant reduction of IOP, improvement of visual acuity postoperatively, and reduced dependency on oral acetazolamide to control IOP ($p < 0.002$). This audit revealed only a small number of APAC patients treated in HTAR, which may be attributed to the manual system employed for card maintenance; this may have led to underreporting of cases.

Conclusion

Patients in HTAR underwent phacoemulsification when the eye was in the quiescent phase within 6 weeks of APAC. Cataract surgery can significantly improve VA, lower IOP, and reduce dependency on oral acetazolamide usage postoperatively in patients with APAC. However, further study is necessary to establish the optimal timing for cataract surgery in patients with APAC. A sustained commitment to professionalism and diligence is advocated in order to mitigate the prevalence of blindness among patients in Klang, Malaysia.

Declarations

Ethics approval and consent to participate

None to declare, as this was a retrospective descriptive analysis.

Competing interests
None to declare.

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