



Eye Emergency: A Case Report on Acute Primary Angle Closure

Risnanda Putri Rasyda¹, Nurwasis², Dewi Rosarina³

^{1,2}Universitas Airlangga, Surabaya, East Java, Indonesia

³Undaan Eye Hospital, Surabaya, East Java, Indonesia

Email: risnandaptr@gmail.com¹, nurwasis@fk.unair.ac.id², rosarinadewi@yahoo.com³

KEYWORDS

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ABSTRACT

Acute Primary Angle Closure (APAC) or Acute Glaucoma is a condition where intraocular pressure rapidly increases due to the occlusion of the trabecular meshwork by the iris. This case report aims to present the clinical manifestations of APAC and evaluate the initial treatment strategies to immediately reduce intraocular pressure (IOP) and prevent visual loss. A 63-year-old woman presented with a sudden onset of pain in her left eye, accompanied by redness, headache, blurred vision, and nausea. Her visual acuity in the left eye was 1/300, with an IOP of 69.3 mmHg. Slit-lamp examination revealed hyperemic conjunctiva, mixed conjunctival and pericorneal injection, corneal edema, a shallow anterior chamber with Van Herick grade I, radially dilated iris, a mid-dilated pupil (4 mm in diameter), and a cloudy lens. Gonioscopy confirmed a closed angle and peripheral anterior synechiae (PAS). The right eye had a shallow anterior chamber with normal IOP. Initial treatment included oral glycerin, intravenous analgesic, oral acetazolamide 250 mg, potassium chloride 600 mg, and topical beta-blocker 0.5%, but showed no improvement. Subsequently, a trabeculectomy was performed. The patient also underwent Laser Peripheral Iridotomy (LPI) on the right eye. This case underscores that acute primary angle closure is an ophthalmic emergency, and timely management is crucial to prevent further complications and visual loss. Postoperative follow-up indicated a significant reduction in IOP and stabilization of visual acuity, highlighting the importance of rapid intervention in APAC cases.

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Corresponding Author: Risnanda Putri Rasyda*

Email: risnandaptr@gmail.com

INTRODUCTION

Acute Primary Angle Closure (APAC) or Acute Glaucoma is a condition in which intraocular pressure rapidly increases due to the occlusion of the trabecular meshwork by the iris (Sun et al., 2017). The term "angle closure" refers to the obstruction of the trabecular meshwork by the peripheral iris, known as ITC (iridotrabecular contact), which hinders the flow of aqueous humor. Angle-closure can be divided into two categories: primary and secondary. In primary angle closure, there is an anatomical predisposition, while in secondary angle closure, other ocular or systemic diseases are involved (American Academy of Ophthalmology, 2023; Salmon, 2019).

A gonioscopy examination is the definitive test to determine the angle of the anterior chamber of the eye (angle closure). This examination helps clinicians determine whether the occlusion between the iris and trabecular meshwork is reversible or irreversible. In fellow eyes, gonioscopy examination often reveals narrow and closed angles as well (American Academy of Ophthalmology, 2023).

The current prevalence of primary angle closure glaucoma is estimated to be 17.14 million in patients over 40 years old, with 12.3 million of them from Asia (Zhang, Wang, Chen, Li, & Jiang, 2021). Meta-analysis studies also show that in the adult population in Asia, approximately 0.75% are

estimated to suffer from PACG. The prevalence rate increases with age about twice per decade, and women exhibit a prevalence rate that is 1.5 times greater than that observed in men (Cheng, Zong, Zeng, & Wei, 2014).

Acute or subacute occurrences of elevated intraocular pressure (IOP) may result in symptomatic angle closure (Nesher, Mimouni, Khoury, Nesher, & Segal, 2014). Pupillary block, a mechanism where the iris obstructs the trabecular meshwork, leads to an elevation in intraocular pressure (IOP). The majority of mechanisms underlying primary angle closure involve pupillary block. Pupillary block is a condition where there is an obstruction in the flow of aqueous humor from the posterior chamber to the anterior chamber through the pupil. As a result of this obstruction, a pressure differential arises between the posterior and anterior chambers, leading to the displacement of the peripheral iris against the trabecular meshwork (American Academy of Ophthalmology, 2023).

This case report aims to demonstrate the clinical manifestations of acute angle-closure glaucoma and the administered interventions for lowering intraocular pressure (Wetarini, Dewi, & Mahayani, 2020). A 62-year-old woman was referred from Mojokerto to the Emergency Department at Undaan Eye Hospital, presenting with a sudden onset of pain in her left eye that began three days prior to admission to the hospital. She reported experiencing redness, headache, blurred vision, and nausea in the left eye, while no complaints were noted for the right eye. Earlier in the day, the patient sought consultation with an ophthalmologist in Mojokerto, who had the same complaint of pain in the left eye. She was prescribed pilocarpine 2% eye drops and tobramycin eye drops.

The patient has a history of diabetes mellitus for the past 8 years and regularly takes oral antidiabetic drugs glimepiride and insulin. She also has a history of hypertension for the past 8 years and takes bisoprolol fumarate regularly (Kobayashi et al., 2024).

In the left eye, the visual acuity registered as 1/300, and the intraocular pressure measured 69.3 mmHg. Examination with a slit lamp unveiled hyperemic conjunctiva and a combination of conjunctival and peri corneal injection, corneal edema, a shallow anterior chamber with a Van Herrick grade I, radially dilated iris, a mid-dilated pupil with 4mm diameter, and a cloudy lens. A gonioscopy examination showed a closed angle and PAS. Funduscopy examination was challenging due to corneal edema. The right eye exhibited a visual acuity of 1/10, and the intraocular pressure measured 17.3 mmHg. Examination with a slit lamp disclosed a transparent cornea and a shallow anterior chamber graded as Van Herrick I-II, a radially dilated iris, a round pupil with 3mm diameter, and minimal lens opacity. Funduscopy examination was within normal limits.

Based on the patient's history and initial ophthalmological examination, a diagnosis of Acute Angle Closure in the left eye and Type 2 diabetes was established (Wetarini et al., 2020). Initial treatment provided in the Emergency Department included oral Glycerin 60 grams, Acetazolamide 250mg tablet every 6 hours, Potassium Chloride 600mg tablet every 24 hours, and topical beta-blocker 0.5% eye drops twice daily. Subsequently, the patient was admitted for further care and monitored for eye symptoms, visual acuity, and intraocular pressure (IOP).

The day after, the patient's left eye presented a visual acuity of 1/300 and an elevated intraocular pressure (IOP) of 59.1 mmHg, determined by a Schiotz tonometer. The treatment regimen included intravenous Dexamethasone, Acetazolamide, Potassium Chloride, Tobramycin and Dexamethasone eye drops, and Timolol 0.5% eye drops. Despite ongoing treatment on the third day of hospitalization, the left eye's visual acuity remained at 1/300, and the elevated IOP persisted at 59.1 mmHg. The therapeutic approach included intravenous Dexamethasone, oral Glycerin, continued Acetazolamide, and Potassium Chloride, and the same eye drop regimen. Subsequently, the patient was scheduled for a trabeculectomy the next day, which was successfully performed on the left eye. Post-operative tobramycin and Dexamethasone eye drops were administered every 4 hours, and anti-glaucoma medications were discontinued. This comprehensive management strategy addresses the challenging scenario of elevated intraocular pressure and provides insights into the successful implementation of Trabeculectomy as a therapeutic intervention (Garg & Gazzard, 2020).

After surgery, the patient presented with pain and discomfort in the left eye one-day post-operation (Li et al., 2021). Examination revealed an intraocular pressure of 17 mmHg, visual acuity of 1/300, conjunctival injection, a bleb in the upper nasal area, and corneal edema. The patient was discharged with Tobramycin and Dexamethasone eye drops, and a follow-up was scheduled for 7 days later. & days after surgery, the patient reported reduced pain, and the intraocular pressure in the left eye

measured 10 mmHg, accompanied by a visual acuity of 1/300. Treatment was adjusted to Tobramycin and Dexamethasone eye drops every 6 hours and Lyteers eye drops every 6 hours for both eyes. Post-operative day 21, the patient was asymptomatic. The left eye maintained an intraocular pressure of 9 mmHg, coupled with a visual acuity of 1/300, whereas the right eye displayed an intraocular pressure of 20 mmHg and a visual acuity of 1/10. The treatment plan encompassed the administration of Tobramycin and Dexamethasone eye drops for the left eye and Sodium Diclofenac eye drops for the right eye. Additionally, a Laser Peripheral Iridotomy was scheduled for the right eye. On the 27th day post-operation, an ophthalmological assessment of the right eye indicated a visual acuity of 2/10 and an intraocular pressure of 19 mmHg measured with non-contact tonometry (NCT). In the left eye, the ophthalmological examination indicated a visual acuity of 1/300 and an intraocular pressure of 12 mmHg with NCT and OS 1/300. Subsequently, the patient underwent LPI (Laser Peripheral Iridotomy) on the right eye.

This study aims to evaluate the effectiveness and safety of using a combination of Tobramycin and Dexamethasone eye drops in alleviating pain and discomfort post-eye surgery, as well as its impact on intraocular pressure and visual acuity. Additionally, it seeks to compare treatment outcomes between the left and right eyes post-surgery, including the response to Laser Peripheral Iridotomy (LPI) intervention, and to monitor clinical changes over a 27-day post-operative period, such as intraocular pressure, visual acuity, and other clinical symptoms. Analysis will be conducted on the influence of the eye drop combination, identification of risk factors affecting prognosis, and effectiveness of LPI intervention on the patient's right eye. The study aims to provide a deeper understanding of post-eye surgery management and generate valuable insights to enhance patient care in the future (Jones, Lee, Castle, Heinze, & Gomes, 2022).

METHODS

This case report research method aims to depict the clinical manifestations of Acute Primary Angle Closure (APAC) or Acute Glaucoma and evaluate initial treatment strategies for promptly reducing intraocular pressure (IOP) and preventing visual loss. A 63-year-old woman presented with sudden-onset pain in her left eye, accompanied by redness, headache, blurred vision, and nausea. Further examination revealed various clinical findings, including high intraocular pressure and closed angle in the left eye, as well as normal intraocular pressure and open angle in the right eye. Initial treatment provided did not yield improvement, leading to trabeculectomy on the left eye. The patient also underwent Laser Peripheral Iridotomy on the right eye (He et al., 2019). This study aims to evaluate the effectiveness and safety of using a combination of Tobramycin and Dexamethasone eye drops in alleviating pain and discomfort post-eye surgery, as well as its impact on intraocular pressure and visual acuity. Additionally, it seeks to compare treatment outcomes between the left and right eyes post-surgery, including the response to Laser Peripheral Iridotomy (LPI) intervention, and to monitor clinical changes over a 27-day post-operative period, such as intraocular pressure, visual acuity, and other clinical symptoms. Analysis will be conducted on the influence of the eye drop combination, identification of risk factors affecting prognosis, and effectiveness of LPI intervention on the patient's right eye. This study aims to provide a deeper understanding of post-eye surgery management and generate valuable insights to enhance patient care in the future.

RESULTS

In an ophthalmic emergency, Acute Primary Angle Closure is characterized by a swift elevation in intraocular pressure (Mohan, Chitra, & Jayalatha, 2023). This surge is attributed to the obstruction of the trabecular meshwork by the iris, leading to a disturbance in the flow of aqueous humor. The rapid increase in intraocular pressure is characterized by clinical manifestations such as sudden eye pain, headache, blurred vision, seeing halos around lights, nausea, and vomiting. Known risk factors for this condition include age above 40 years old, female, race, and family history (American Academy of Ophthalmology, 2023; Budiono, 2013). In this instance, a 62-year-old woman exhibited symptoms aligning with various clinical manifestations of acute angle closure, including sudden eye pain, blurred vision, eye redness, headache, and nausea.

Examination with a slit lamp revealed congested episcleral and conjunctival blood vessels, corneal edema, a shallow anterior chamber, the presence of flare and cells, irregular and mid-dilated pupils, and enlarged and anteriorly displaced lens, which can be found in acute conditions (American Academy of Ophthalmology, 2023; Budiono, 2013). Ophthalmological examination of the patient showed corresponding findings, including hyperemic conjunctiva, mixed conjunctival and pericorneal injection, corneal edema, a shallow anterior chamber with a Van Herrick grade I, radially dilated iris, mid-dilated pupil with 4 mm diameter, and a cloudy lens.

Utilizing the Van Herick technique, slit-lamp examination can assess the peripheral anterior chamber depth by comparing it to the adjacent corneal thickness (Sihota et al., 2019). A closed angle is identified when the peripheral anterior chamber depth measures less than one-quarter of the corneal thickness (Budiono, 2013). In the patient's left eye, the examination results showed Van Herrick grade I, signifying that the peripheral anterior chamber depth is less than one-quarter of the corneal, hence, a closed angle can be inferred. This examination is a diagnostic parameter with a sensitivity of 61.9% and specificity of 89.3% (Budiono, 2013).

A gonioscopy examination is the definitive test used to determine the depth of the anterior chamber of the eye. The grading system used for gonioscopy is the Shaffer system, which describes the angle between the trabecular meshwork and the iris (American Academy of Ophthalmology, 2023). Gonioscopy of the left eye showed results indicating a closed angle and iridocorneal contact (ICT).

In acute conditions, treatment aims to rapidly lower intraocular pressure, prevent further optic nerve damage, and prevent the formation of anterior and posterior synechiae. Currently, systemic therapy is the top priority (Budiono, 2013). The patient was given oral glycerin therapy at a dose of 1.0-1.5 g/kg/body weight, oral acetazolamide 250 mg every 8 hours, topical beta-blocker 0.5% every 12 hours, and oral potassium chloride 600 mg every 24 hours.

Prior, the patient was given a pilocarpine. Pilocarpine is the one of the strong parasympathomimetic agent, by contracting the pupillary sphincter, the medication causes the peripheral iris to separate from the trabecular meshwork (Salmon, 2019). In the condition where intraocular pressure high (>40 mmHg), ischemia of the iris occurs, resulting in paralysis of the pupillary sphincter muscle, therefore pilocarpine has no impact. Beside that, it was also mentioned that pilocarpine does not prove effective for attack episodes lasting longer than 1-2 hours (2,5). Therefore pilocarpine was discontinued.

Glycerin is one of the hyperosmotic agents used to control episodes of severely elevated intraocular pressure (Laxson, 2022). Other studies recommend the use of hyperosmotic agents when intraocular pressure exceeds 60 mmHg (Budiono, 2013). This medication can be mixed with lemon water to avoid nausea (Salmon, 2019). Hyperosmotic agents exert their mechanism of action by elevating blood osmolarity. This establishes an osmotic gradient between the blood and the vitreous fluid, leading to the extraction of water from the vitreous cavity and consequently lowering intraocular pressure (American Academy of Ophthalmology, 2023). The peak effect of this medication occurs within 1 hour. Glycerin is metabolized into glucose, so before administering this therapy, the patient's random blood sugar level was measured at 243 mg/dl to prevent the side effect of hyperglycemia, given the patient's history of diabetes mellitus. After administration, periodic blood sugar monitoring is also required (American Academy of Ophthalmology, 2023; Salmon, 2019).

Systemically administered drugs of the carbonic anhydrase inhibitor (CAI) class are typically used in cases of acute glaucoma (Salmon, 2019). In this patient's case, acetazolamide was chosen, with a dose of 250 mg every 8 hours. This medication lowers intraocular pressure by reducing aqueous humor production due to the resulting renal metabolic acidosis, which can lower the activity of Na^+ , K^+ -ATPase in the ciliary epithelium (American Academy of Ophthalmology, 2023). The most common side effects of this medication are paresthesia in the extremities, hypokalemia, gastrointestinal symptoms, malaise, and mood disturbances (American Academy of Ophthalmology, 2023; Salmon, 2019). To mitigate the risk of hypokalemia, an additional medication of potassium chloride 600 mg every 24 hours was administered to the patient.

The topical medication given to the patient belongs to the beta-blocker class, specifically timolol maleate (Kurian, Reghunadhan, Thilak, Soman, & Nair, 2020). The effectiveness of this medication lies in its inhibition of cyclic adenosine monophosphate (cAMP) production in the ciliary epithelium,

thus reducing intraocular pressure. It can reduce intraocular pressure by approximately 20%-30% (American Academy of Ophthalmology, 2023).

APAC is usually successfully managed with medications and laser peripheral iridotomy. In certain cases, the IOP may be uncontrollable and required additional medical intervention. Historically, in cases when conventional therapy proves ineffective, surgical iridectomy and/or trabeculectomy have been seen as the subsequent suitable measures.

In this case, the patient had been given oral and topical anti-glaucoma medications for 3 days, but the intraocular pressure remained high. Consequently, the patient underwent a trabeculectomy. Although it has the potential for success, trabeculectomy may be more challenging in certain cases because to aqueous misdirection (Sousa & Pinto, 2018). A significant inflammatory response followed by bleb failure (7). Trabeculectomy is a surgical intervention designed to diminish intraocular pressure by establishing a fistula. This facilitates the drainage of aqueous humor from the anterior chamber through a subtenon's space (Salmon, 2019).

In this particular case, the patient underwent a Laser Peripheral Iridotomy (LPI) procedure as a preventive measure. In the majority of instances of acute primary angle closure, the fellow eye often exhibits anatomical predispositions to pupillary block, posing a heightened risk of encountering a similar acute attack (Olson et al., 2017). LPI is the definitive procedure for cases of acute angle closure with pupillary block. The purpose of this procedure is to relieve pupillary block, allowing the iris to move away from the trabecular meshwork, resulting in a shallow anterior chamber and an open angle. Peripheral iridotomy using laser significantly reduces intraocular pressure, increases the peripheral anterior chamber depth, and improves gonioscopic angle appearance (American Academy of Ophthalmology, 2023; Shetty et al., 2020).

CONCLUSION

Acute Primary Angle Closure (APAC) is a critical ophthalmic emergency characterized by a rapid increase in intraocular pressure due to the obstruction of the trabecular meshwork by the iris. This condition presents with severe symptoms such as sudden eye pain, blurred vision, eye redness, headache, nausea, and vomiting, and requires immediate medical intervention to prevent permanent visual loss. The case of the 63-year-old woman discussed in this report exemplifies the typical clinical manifestations and the importance of prompt treatment to manage intraocular pressure. Initial treatment with systemic and topical medications, including oral glycerin, acetazolamide, potassium chloride, and topical beta-blockers, aimed to reduce intraocular pressure. Despite these measures, the patient's condition did not improve, necessitating surgical intervention with trabeculectomy and Laser Peripheral Iridotomy (LPI). The LPI procedure on the contralateral eye served as a preventive measure, given the anatomical predispositions that increase the risk of a similar acute attack. This case underscores the significance of early detection and comprehensive management of APAC to prevent severe complications and preserve vision. The findings highlight the need for continued research and clinical awareness to optimize treatment strategies and outcomes for patients with this condition.

REFERENCES

- American Academy of Ophthalmology. (2023). 2022-2023 Basic and Clinical Science Course.pdf. In M. Tanna, Angelo P., M. V. M. Boland, M. Giaconi, JoAnn A., M. Lin, Shan C, P. Medeiros, Felipe A., MD, P. Moroi, Sayoko E. MD, & M. Sit, Artrhur J. (Eds.), *2022-2023 Basic and Clinical Science Course* (2022nd–2023rd ed.). San Fransisco: American Academy of Ophthalmology (AAO).
- Budiono, S. (2013). *Buku Ajar Ilmu Kesehatan Mata* (1st ed.). Surabaya: Airlangga University Press.
- Cheng, J.-W., Zong, Y., Zeng, Y.-Y., & Wei, R.-L. (2014). The Prevalence of Primary Angle Closure Glaucoma in Adult Asians: A Systematic Review and Meta-Analysis. *PLoS ONE*, 9(7), e103222. <http://doi.org/10.1371/journal.pone.0103222>
- Garg, A., & Gazzard, G. (2020). Treatment choices for newly diagnosed primary open angle and ocular hypertension patients. *Eye*, 34(1), 60–71.
- He, M., Jiang, Y., Huang, S., Chang, D. S., Munoz, B., Aung, T., ... Friedman, D. S. (2019). Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled

- trial. *The Lancet*, 393(10181), 1609–1618.
- Jones, L., Lee, M., Castle, C. L., Heinze, N., & Gomes, R. S. M. (2022). Scoping review of remote rehabilitation (telerehabilitation) services to support people with vision impairment. *BMJ Open*, 12(8).
- Kobayashi, T., Bando, H., Okada, M., Iwatsuki, N., Ogawa, T., & Sakamoto, K. (2024). Effective Imeglimin (Twymeeeg) Treatment for Diabetic Patient with Various Medical Problems. *SunText Rev Endocrine Care*, 3(1), 116.
- Kurian, A., Reghunadhan, I., Thilak, P., Soman, I., & Nair, U. (2020). Short-term efficacy and safety of topical β -blockers (timolol maleate ophthalmic solution, 0.5%) in acute migraine: a randomized crossover trial. *JAMA Ophthalmology*, 138(11), 1160–1166.
- Laxson, L. C. (2022). 13 Chapter Osmotic Agents. *Havener's Ocular Pharmacology*, 139.
- Li, Y.-T., Cui, X.-X., Yang, X.-T., Li, B., Ren, X.-J., Li, X.-R., & Zhang, X.-M. (2021). Utilizing dexamethasone intravitreal implant to control postoperative inflammation in refractory uveitis undergoing cataract surgery. *International Journal of Ophthalmology*, 14(2), 317.
- Mohan, K., Chitra, M. R., & Jayalatha, J. (2023). A Prospective Study Of The Incidence Of Acute Attack Of Angle Closure Glaucoma In Patients Attending Glaucoma Clinic In A Tertiary Eye Care Hospital. *Journal of Population Therapeutics and Clinical Pharmacology*, 30(1), 7836–7844.
- Nesher, R., Mimouni, M. D., Khoury, S., Nesher, G., & Segal, O. (2014). Delayed diagnosis of subacute angle closure glaucoma in patients presenting with headaches. *Acta Neurologica Belgica*, 114, 269–272.
- Olson, R. J., Braga-Mele, R., Chen, S. H., Miller, K. M., Pineda, R., Tweeten, J. P., & Musch, D. C. (2017). Cataract in the adult eye preferred practice pattern®. *Ophthalmology*, 124(2), P1–P119.
- Salmon, J. F. (2019). *Kanski's Clinical Ophthalmology, 9th Edition: A Systematic Approach.pdf* (9th ed.). Oxford, UK: Elsevier.
- Shetty, M., P. S. B., K. T., CV, S. P., . N., & Reddy, A. R. (2020). Laser Iridotomy In Pupillary Block Angle Closure Glaucoma. *MedPulse International Journal of Ophthalmology*, 13(2), 38–41. <http://doi.org/10.26611/10091325>
- Sihota, R., Kamble, N., Sharma, A. K., Bhari, A., Gupta, A., Midha, N., ... Pandey, R. M. (2019). 'Van Herick Plus': a modified grading scheme for the assessment of peripheral anterior chamber depth and angle. *British Journal of Ophthalmology*, 103(7), 960–965.
- Sousa, D. C., & Pinto, L. A. (2018). Trabeculectomy–Prevention and Management of Complications. *Journal-Trabeculectomy–Prevention and Management of Complications*.
- Sun, X., Dai, Y., Chen, Y., Yu, D.-Y., Cringle, S. J., Chen, J., ... Jiang, C. (2017). Primary angle closure glaucoma: what we know and what we don't know. *Progress in Retinal and Eye Research*, 57, 26–45.
- Wetarini, K., Dewi, N. M. R. P., & Mahayani, N. M. W. (2020). Acute angle closure glaucoma: management in acute attack setting. *Bali Medical Journal*, 9(1), 386–389.
- Zhang, N., Wang, J., Chen, B., Li, Y., & Jiang, B. (2021). Prevalence of Primary Angle Closure Glaucoma in the Last 20 Years: A Meta-Analysis and Systematic Review. *Frontiers in Medicine*, 7(January), 1–10. <http://doi.org/10.3389/fmed.2020.624179>



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