Acute angle-closure glaucoma after total knee replacement surgery: case report and literature review

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Abstract

An early and correct diagnosis improves the prognosis of post-operative Acute angle closure glaucoma (AAGC). A 65 years-old monophtalmus man was operated for a total knee replacement surgery, under general anaesthesia without any adverse events. The day after, the patient described recurrent periorbital pain in his eye, with ocular hyperaemia, and reduced visual acuity. A diagnosis of AAGC was made and conservative treatment was started to reduce the intraocular pressure. In the post-operative AAGC, several predisposing local factors including genetic predisposition, female gender, hypermetropia, increased lens thickness...
and small corneal diameter, can be added to a pupillary block induced by adrenergic and anticholinergic drugs used in anaesthetic procedures as risk factors. An acute and intensive periorbital or ocular pain, with or without visual disturbance, must aware the physician.

**Introduction**

Acute angle closure glaucoma (AACG) after non ocular surgery is a rare complication of general anesthesia. However, in case of delayed diagnosis, it may lead to blindness. Immediate diagnosis and appropriate treatment should be done to prevent visual loss [1]. We present a case of acute angle closure glaucoma after total knee replacement surgery under general anesthesia in a monophtalmus patient. In this case, the most likely trigger was the use of atropine and nefopam.

**Patient and observation**

**Patient information:** a 65-year-old monophtalmus man (ASA physical status I, BMI = 28.36 kg cm⁻²) with knee arthrosis was scheduled for a total knee replacement surgery under general anesthesia. The preoperative assessment was unremarkable. General anesthesia was induced with IV propofol (3 mg kg⁻¹), Fentanyl (3µg kg⁻¹), and cisatracurium (0.15 mg kg⁻¹) to facilitate tracheal intubation (size 7.5 oral cuffed tracheal tube). Mechanical ventilation was used. Anesthesia was maintained with a mixture of air and oxygen (50%: 50%) supplemented with isoflurane 1 to 1.5 minimum alveolar concentration, Fentanyl and cisatracrium reinjections as needed. Anesthesia lasted almost 3 hours. The patient received 8 mL kg⁻¹h⁻¹ crystalloid infusion during the surgery. The act has occurred with hemodynamic stability. IV paracetamol (1g) and IV nefopam (20 mg) were administered 30 minutes before the end of the surgery and every 6 hours for postoperative pain relief. Neostigmine and atropine were injected at the end of surgery for decurarization. No additional drugs were administered.

**Clinical findings:** on the first postoperative day, the patient complained of a reduced visual acuity associated with periorbital pain and nausea.

**Diagnostic assessment:** slit lamp examination revealed lid edema and conjunctival hyperemia. The iris showed fixed and mid-dilated pupil. Gonioscopic examination showed a narrow angle. Intraocular pressure was 30 mm Hg (normal intraocular pressure is 12-20 mm Hg).

**Diagnosis:** the diagnosis of acute angle closure glaucoma was made and in case of delayed diagnosis or absence of treatment, it may lead to blindness.

**Therapeutic interventions:** medical treatment included IV mannitol 20%, tontol and pilolol eye drops and acetazolamide pills was given to the patient.

**Follow-up:** the next day, the intraocular pressure was normalized, and visual acuity was completely recovered.

**Patient perspective:** the patient did not claim any adverse reaction to the treatment and was satisfied with the result.

**Informed consent:** the patient did finally give his consent.

**Discussion**

This case illustrates unilateral AACG most likely related to general anesthesia. The development of AACG requires the coexistence of both a predisposed eye (eye with a narrow anterior chamber angle) and a pupillary block. A pupillary block may appear in different circumstances such as the use of mydriatic agents or a mydriatic situation. Usual risk factors for postoperative AACG are a genetic predisposition, female gender, shallow anterior chamber depth or hypermetropia, increased lens thickness, small corneal diameter, and increased age [2]. Additionally, precipitating factors have been described. There are
pharmacologic manipulations of the pupil (Table 1), producing a partially or fully dilated pupil, and emotional factors. These 2 conditions are frequent in the context of general anesthesia [3]. Thirty-six cases of AAGC related to anesthesia have been published. The gender distribution is 1 male for 3 females, with a mean age of 63 years (58-64 interquartile range). There were 27 unilateral and 9 bilateral cases. The main identified precipitating factors for the development of AAGC were the stress and the use of atropine (80%) or scopolamine. Nine cases (25%) were related to ephedrine use.

In the present case, 3 possible triggering factors which are the stress, the use of atropine for decurarization and nefopam for postoperative analgesia could be incriminated. Nefopam, which is a non-opioid analgesic that inhibits reuptake of serotonin, norepinephrine and dopamine [4], is contraindicated in patients with known angle closure glaucoma because of its parasympatholytic effects. Atropine, which is used to relax the ciliary muscle and dilate the pupil, has long-acting anticholinergic action, and can induce AAGC [5]. Moreover, the perioperative period carries the risk of psychological stress. However, general anesthesia and postoperative events often mask the first symptoms. The presence of hypotension or anemia, may enhance ischemic optic neuropathy, which is a much more frequent cause of postoperative vision loss than AAGC, but in contrast with AAGC, its prognosis is often poor [6,7]. The published cases of AAGC are summarized in Table 2 [8-24]. The purpose of this observation is to insist on good preoperative patients’ evaluation. The search for preexisting eye damage would be necessary in a programmed functional surgery. In our case, in front of the existence of monophtalmia, a specialized ophthalmological examination should have been required. In fact, the preoperative diagnosis of glaucoma could change the choice of anesthetic technique and used drugs.

Conclusion

Acute angle closure glaucoma is a rare cause of postoperative visual impairment. The use of mydriatic drugs such as atropine on predisposed individuals may precipitate this acute event, therefore physicians’ awareness is required in order to quickly initiate the treatment.

Competing interests

The authors declare no competing interests.

Authors' contributions

Patient management: Salma Ketata, Rahma Derbel, Imen Zouche, Omar Ketata; data collection: Salma Ketata, Rahma Derbel, Hichem Kolsi, Ahlem Bousabbeh; manuscript drafting: Salma Ketata, Omar Ketata; manuscript revision: Salma Ketata, Imen Zouche, Rania Dammak, Hichem Kolsi, Ahlem Bousabbeh. All authors read and approved the final version of the manuscript.

Tables

Table 1: classification of drugs inducing acute angle closure glaucoma by administration route

Table 2: previously published cases of perioperative acute angle closure glaucoma

References

1. Mapstone R. The syndrome of closed-angle glaucoma. Br J Ophthalmol. Feb 1976;60(2): 120-3. PubMed | Google Scholar
2. Lowe RF. Aetiology of the anatomical basis for primary angle-closure glaucoma: biometrical comparisons between normal eyes and eyes with primary angle-closure glaucoma. Br J Ophthalmol. March 1970;54(3): 161-9. PubMed | Google Scholar
3. Murphy DF. Anesthesia and intraocular pressure. Anesth Analg. May 1985;64(5): 520?30. PubMed | Google Scholar
4. Evans MS, Lysakowski C, Tramèr MR. Nefopam for the prevention of postoperative pain: quantitative systematic review. Br J Anaesth. Nov 2008;101(5): 610-7. PubMed | Google Scholar
5. Lachkar Y, Bouassida W. Drug-induced acute angle closure glaucoma. Curr Opin Ophthalmol. March 2007;18(2): 129-33. PubMed | Google Scholar
6. Remigio D, Wertenbaker C. Post-operative bilateral vision loss. Surv Ophthalmol. apr 2000;44(5): 426-32. PubMed | Google Scholar
7. Williams EL, Hart WM, Tempelhoff R. Postoperative ischemic optic neuropathy. Anesth Analg. May 1995;80(5): 1018-29. PubMed | Google Scholar
8. Cordier J, Vitte G. Acute glaucoma after intervention for general surgery. Bull Soc Ophtalmol Fr. Feb 1957;(2): 143-5. PubMed | Google Scholar
9. Gartner S, Billet E. Acute glaucoma: a complication of general surgery. Am J Ophthalmol. May 1958;45(5): 668-71. PubMed | Google Scholar
10. Wang BC, Tannenbaum CS, Robertazzi RW. Acute glaucoma after general surgery. JAMA. 15 Jul 1961;177: 108-10. PubMed | Google Scholar
11. Fazio DT, Bateman JB, Christensen RE. Acute angle-closure glaucoma associated with surgical anesthesia. Arch Ophthalmol Chic Ill. March 1985;103(3): 360-2. PubMed | Google Scholar
12. Eldor J, Admoni M. Acute glaucoma following nonophthalmic surgery. Isr J Med Sci. Nov 1989;25(11): 652-4. PubMed | Google Scholar
13. Lotery AJ, Frazer DG. Iatrogenic acute angle closure glaucoma masked by general anaesthesia and intensive care. Ulster Med J. Oct 1995;64(2): 178-80. PubMed | Google Scholar
14. Ujino H, Morimoto O, Yukioka H, Fujimori M. Acute angle-closure glaucoma after total hip replacement surgery. Masui. June 1997;46(6): 823-6. PubMed | Google Scholar
15. Horimoto S, Katada Y, Omura S, Fujita K, Fujimoto J, Okazaki K. Acute angle-closure glaucoma following surgery for oral cancer. Masui. May 1998;47(5): 618-21. PubMed | Google Scholar
16. Ates H, Kayıkçioğlu O, Andaç K. Bilateral angle closure glaucoma following general anesthesia. Int Ophthalmol. 1999;23(3): 129-30. PubMed | Google Scholar
17. Lentschener C, Ghimouz A, Bonnichon P, Parc C, Ozier Y. Acute postoperative glaucoma after nonocular surgery remains a diagnostic challenge. Anesth Analg. Apr 2002;94(4): 1034-5. PubMed | Google Scholar
18. Ooi KG-J, Nabilí S, Thompson KJ, Gavin MP. Bilateral subacute angle-closure glaucoma in association with tonic pupils post-coronary artery bypass graft. Clin Experiment Ophthalmol. Oct 2004;32(5): 538-9. PubMed | Google Scholar
19. Ceruti P, Morbio R, Marraffa M, Marchini G. Simultaneous bilateral acute angle-closure glaucoma in a patient with subarachnoid hemorrhage. J Glaucoma. Feb 2008;17(1): 62-6. PubMed | Google Scholar
20. Singer MS, Salim S. Bilateral acute angle-closure glaucoma as a complication of facedown spine surgery. Spine J Off J North Am Spine Soc. Sept 2010;10(9): e7-9. PubMed | Google Scholar
21. Gayat E, Gabison E, Devys J-M. Case report: bilateral angle closure glaucoma after general anesthesia. Anesth Analg. Jan 2011;112(1): 126-8. PubMed | Google Scholar
22. Hidalgo Grau LA, Opisso Juliá LL, Roqué Meseguer A, Yuste Graupera M, Suñol Sala X. Postoperative unilateral acute glaucoma after abdominal surgery. Rev Esp Anestesiol Reanim. Nov 2012;59(9): 507-10. PubMed | Google Scholar
23. Jain D, Dhua A, Ravisankar V, Chellam L, Joshi M. Acute angle closure glaucoma after hypospadias surgery: a vision-threatening complication of oxybutynin. J Indian Assoc Pediatr Surg. Sept 2015;20(3): 161-2. PubMed | Google Scholar
24. Stewart RJ, Landy DC, Lee MJ. Unilateral acute angle-closure glaucoma after lumbar spine surgery: a case report and systematic review of the literature. Spine. March 2016;41(5): E297-299. PubMed | Google Scholar

| Table 1: classification of drugs inducing acute angle closure glaucoma by administration route |
|---------------------------------------------------------------|
| **Route of administration** | **Type of drug** | **examples** |
| Eye drops | Mydriatics | Phenylephrine, tropicamide, atropine, homatropine, cyclopentolate |
| Local drugs | In the anterior chamber | Acetylcholine, carbachol |
| | Intranasal | Ephedrine, naphazoline, cocaine |
| | Periocular | Botulinum toxin |
| | Aerosolized drugs | Salbutamol, albuterol, terbutaline, ipratropium bromide, atropine |
| Systemic Drugs | Vegetative nerve system drugs | Ephedrine, epinephrine adrenaline |
| | Anticoagulants | Heparin, warfarin, enoxaparin |
| | Central nerve system drugs | Topiramate, amphetamines, some antidepressant agents |
| | Diuretics | Acetazolamide, hydrochlorothiazide |
| | Other drugs | Cotrimoxazol, histamine H1 and H2 receptor antagonists |
| Authors (year of publication) | Number of cases (bilateral) | Age, gender, and surgical indication | Identified precipitating factors |
|-------------------------------|-----------------------------|--------------------------------------|---------------------------------|
| Cordier and Vitte (1957) [8]  | 3 (0)                       | 52-year-old man, inguinal hernia 65-year-old woman, uterine prolapse 54-year-old man, inguinal hernia | “Emotive” patients Atropine sulfate premedication |
| Gartner and Billet (1958) [9] | 4 (1)                       | 54-year-old man, rectal polyp resection 59-year-old woman, cholecystectomy 63-year-old woman, abdominoperineal Resection 60-year-old woman, cholecystectomy | Atropine/scopolamine premedication Pupillary dilatation related to deep anesthesia Anxiety Darkness in the recovery room Succinylcholine |
| Wang et al. (1961) [10]      | 5 (0)                       | 60-year-old man, nephrectomy 52-year-old woman, cholecystectomy 72-year-old woman, cholecystectomy 65-year-old man, cystoscopy 69-year-old man, intestinal resection for obstruction | Stress Atropine/scopolamine premedication Succinylcholine |
| Fazio et al. (1985) [11]     | 9 (2)                       | 7 women and 2 men, mean age 63 year, urologic and gynecologic surgery | 7 received atropine or scopolamine, 4 received ephedrine, 6 received succinylcholine |
| Eldor and Admoni (1989) [12] | 2                           | 47-year-old man, closure of ileostomy 64-year-old woman, mastectomy | Atropine premedication, difficult tracheal intubation Reversed with atropine/neostigmine |
| Lottery and Frazer (1995) [13]| 1 (0)                       | 66-year-old woman, abdominal surgery | Atropine premedication Antimuscarinic agents (IV cyclizine and nebulized ipratropium bromide) and nebulized salbutamol |
| Ujino et al. (1997) [14]     | 1 (0)                       | 49-year-old woman, hip replacement | Atropine premedication High dose of ephedrine |
| Horimoto et al. (1998) [15]  | 1 (0)                       | 60-year-old woman, surgery for oral Cancer | Atropine premedication Atropine given during general anesthesia |
| Ates et al. (1999) [16]      | 2 (2)                       | 57-year-old woman, cerebral frontal lobe cystic mass resection 54-year-old woman, cholecystectomy | Atropine during induction of anesthesia |
| Lentschener et al. (2002) [17]| 1 (0)                       | 66-year-old woman, thyroidectomy | Hypermetropia High dose of ephedrine |
| Ooi et al. (2004) [18]       | 1 (1)                       | 69-year-old man, coronary artery bypass graft | Use of ephedrine Succinylcholine Reversed with atropine/neostigmine |
| Ceruti et al. (2008) [19]    | 1 (1)                       | 60-year-old woman, brain surgery | Use of ephedrine Associated with subarachnoid hemorrhage |
| Singer and Salim (2010) [20] | 1 (1)                       | 68-year- old woman supine surgery | Prone position |
| Gayat et al. (2011) [21]     | 1 (1)                       | 72-year-old woman, cervical spine surgery | Hypermetropia High dose of ephedrine Prone position |
| LHidalgo Grau et al. (2012) [22]| 1 (0)                   | 90-year-old woman, right hemicolecotomy | Stress |
| Jain et al. (2015) [23]      | 1 (0)                       | 9-year-old boy hypospadias surgery | Oxybutynin |
| Stewart et al. (2016) [24]   | 1 (0)                       | 65-year-old man lumber supine surgery | Mydriatics agents Prone postioning |