Anisocoria after Posterior Spine Surgery: A Rare but Disastrous Complication – A Case Report and Literature Review

Ioannis Papaioannou[1], Konstantinos Xristopoulos[2], Andreas Baikousis[1], Panagiotis Korovessis[1], Kyriakos Kokkinis[3]

Learning Point of the Article:

Prolonged prone position spine surgeries can potentially cause permanent or transient anisocoria, although continuous monitoring of patient's position accompanied with extensive vigilance of surgery's duration can prevent most of the ocular complications.

Abstract

Introduction: Ocular complications after spine surgery in prone position are very rare and are described centrally in elective surgeries with long duration. The most well-known ocular complications are vision loss and acute angle-closure glaucoma. To the best of our knowledge, anisocoria after prone spinal surgery has never been reported previously in literature.

Case Report: We present a very rare case of a transient harmless anisocoria in a 23-year-old otherwise healthy female patient, who underwent in the traditionally prone position lumbosacral spinal fractures stabilization and calcaneal fracture reduction and external fixation. We describe step by step the diagnosis algorithm and we discuss detaily the differential diagnosis of the unilaterally fixed and dilated pupil. Careful stepwise medical history and examination are mandatory to establish correct diagnosis and avoid unnecessary, expensive, and potentially hazardous or invasive diagnostic testing.

Conclusion: The wrong position during prone spine surgery can cause iris sphincter muscle tears and transient or permanent dilation of the affected pupil. Fixed dilated pupil is a permanent abnormality of the iris, causing irregular cosmetic appearance, especially in young females, and requires further conservative or surgical intervention. Positioning of the patient and duration of surgery should be taken into consideration both by spine surgeons and anesthesiologists.

Keywords: Anisocoria, prone position, pupil dilation, spinal surgery, transient.

Introduction

Ocular complications after spine surgery in prone position are very rare and are described centrally in elective surgeries (deformity, tumors) with long duration. Post-operative vision loss is the most well-known but devastating complication, with the prevalence of 0.028%–0.2% [1]. Another, even rarer post-operative ocular complication with only four published cases is acute angle-closure glaucoma [2]. With this case report, we present a rare case of a transient harmless anisocoria in a 23-year-old otherwise healthy female patient, who underwent lumbosacral spinal fracture stabilization and calcaneal fracture reduction and external fixation in the traditionally prone position. To the best of our knowledge, this ocular complication has never been reported in literature. We also present the diagnosis algorithm of the isolated dilated pupil. Differential diagnosis is quite useful to avoid unnecessary imaging and costs. Spine surgeons and anesthesiologists involved in major spine surgeries should be aware of these potential ocular complications. Especially in cases of anisocoria, careful stepwise medical history and examination are mandatory to establish correct diagnosis and avoid unnecessary, expensive, and potentially hazardous or invasive diagnostic testing.

Access this article online

Website: www.jocr.co.in

DOI: 10.13107/jocr.2019.v09.i04.1496

Author's Photo Gallery


Dr. Ioannis Papaioannou


Dr. Konstantinos Xristopoulos


Dr. Andreas Baikousis


Dr. Panagiotis Korovessis


Dr. Kyriakos Kokkinis

[1]Department of Orthopedic, General Hospital of Patras Spine and Trauma Unit, Patras, Greece,
[2]Department of Ophthalmology, General Hospital of Patras, Patras, Greece,
[3]Department of Anesthesiology, General Hospital of Patras, Patras, Greece.

Address of Correspondence:
Dr. Ioannis Papaioannou,
Department of Orthopedic, General Hospital of Patras Spine and Trauma Unit, Pavlou Pavlopoulou 15, Aroi, Patras 26331, Greece.
E-mail: john-pane1984@hotmail.com

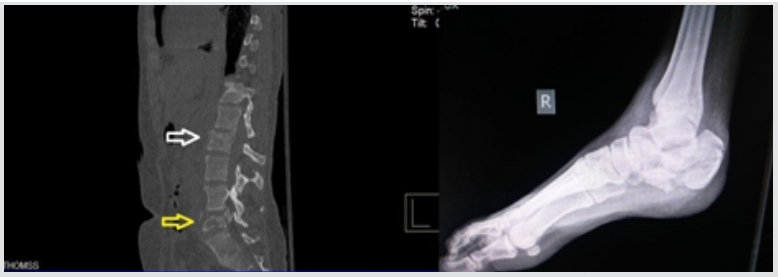

Figure 1: The first image demonstrates the sagital view of both vertebral fractures (white arrow for the L2 and yellow arrow for the L5) and the second image demonstrates the lateral view of the left foot showing a comminuted intra-articular calcaneal fracture.

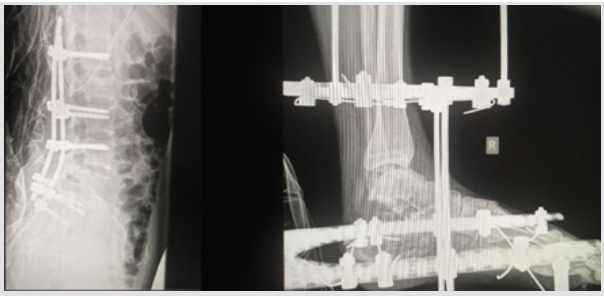

Figure 2: Profile view of the spinal instrumentation and profile radiogram of the right foot with the Ilizarov device application for the comminuted calcaneal fracture.

Case Report

A 23-year-old female patient was admitted to the authors' emergency department after falling from a height of 5 m. She complained of severe pain in her lumbar spine and right foot. She had no head trauma and the Glasgow coma score (GCS) was 15/15. Based on these findings, no brain computed tomography (CT) scan was performed at the emergency department after neurosurgeon's consultation. Physical examination revealed paresis of L5 left root with significant weakness (1/5) of the left long toe extensor muscle and impaired light touch and pinprick sensation (both 1/2). Urinary retention was diagnosed by means of urinary bladder ultrasound and the anal sphincter was spoiled with associated perianal hypoesthesia. Radiograms and CT revealed an A3/AO type fracture of the second lumbar vertebra, a B1/AO-type fracture of the fifth lumbar vertebra, and a comminuted (sanders type 4) right calcaneal fracture (Fig. 1). Thirty hours after the initial admission at the emergency department a posterior minimal stabilization from L1 to S2 vertebrae accompanied by L5 decompression was performed to address the spinal fractures, while an Ilizarov device was applied to reduce and temporarily stabilize the calcaneal fracture (Fig. 2). Both surgical interventions were performed in prone position under the same anesthesia in the same session. The total duration of both surgeries was 4.5 h. Immediately after surgery, the left pupil was found larger than the right associated with slower and incomplete reaction to light exposition (Fig. 3). The identification of the anisocoria was settled by the anesthesiologist in the recovery phase. With this clinical finding, the ophthalmologists did not recommend the pilocarpine administration test. By contrast, the right eye pupillary reactions were normal. Visual acuity was 20/20 in both eyes, while the Ishihara test was normal. The patient had no diplopia, the intraocular pressure was within normal limits (14 mmHg), and there was no history of pupillary abnormality in the past. Brain CT was normal, while our patient had no sign of brain herniation (GCS: 15/15). Furthermore, our patient was neurologically evaluated daily until the discharge on day 6 after surgery. Bedside fundus examination showed normal posterior vascularization and normal optic disk and macula (Fig. 4). It was impossible for the ophthalmologists to perform a slit-lamp examination in a non-ambulatory patient like ours to detect possible iris transillumination defects and sphincter tears at the pupillary margin, which could cause a dilated pupil. Six hours postoperatively, the anisocoria was gradually resolved and 24 h after surgery, it was completely absent (Fig. 5), while the pupillary reaction was also normal. At every follow-up, even at the last one at 18 months postoperatively, our patient had no complaints or pathology from the affected eye.

Discussion

A unilaterally fixed and dilated pupil poses a concern for a life- or globe-threatening injury, such as an intracranial bleeding or orbital injury when associated with trauma. Mydriasis is caused by either the injury to the sphincter muscle in the iris or the parasympathetic nerves innervating the iris. Three important causes of mydriasis are as follows: (1) An intracranial lesion

Figure 3: Clinical photo on the 1st post-operative hour demonstrates the dilated left pupil.

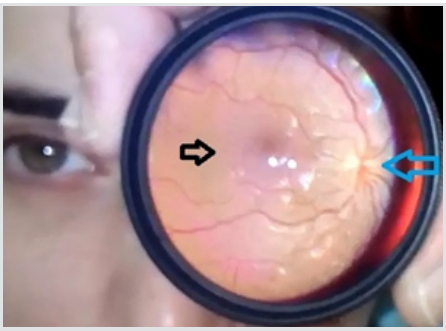

Figure 4: Bedside fundus clinical image shows normal posterior vascularization, normal optic disk (blue arrow), and macula (black arrow).

Figure 5: Clinical photo 24 h postoperatively shows equal size of both pupils and no sign of anisocoria or iris transillumination defect.

compressing the third cranial nerve by tumor, trauma, or aneurysm; (2) pharmacologic mydriasis; and (3) traumatic mydriasis. Other less common causes of anisocoria are as follows: (1) The physiologic anisocoria, (2) the Adie pupil (means the disruption of parasympathetic innervations of the pupil), and (3) the contralateral Horner syndrome [3].

When physicians face new-onset anisocoria, third-nerve palsy should be excluded; first, because the main causes for this entity are ipsilateral brain herniation (Hutchinson pupil) and posterior communicating artery aneurysm, although, in alert patients with an isolated dilated pupil and without associated eyelid ptosis, either exotropia (outward deviation of the eye) or extraocular motility deficit is unlikely to have a third-nerve palsy [3].

Exposure to pharmaceutical agents (lidocaine hydrochloride, tetracaine hydrochloride, epinephrine, and ipratropium bromide aerosol), which can cause mydriasis, should always be taken into consideration by physicians [4, 5]. Lack of constriction of the dilated pupil in the presence of light or convergence after administration of pilocarpine is diagnostic of a toxic pharmacological pupil or an iris abnormality. Thus, the accurate diagnosis of a pharmacologically dilated pupil depends on lack of ptosis and extraocular mobility abnormalities that may suggest the third-nerve palsy, a normally appearing iris without a concern for an iris sphincter tear, and lack of constriction of the pupil following topical pilocarpine 1% [3].

Blunt trauma can cause iris sphincter muscle tears and dysfunction of the muscle, by means of paresis or paralysis. This dysfunction causes iris transillumination defects at the pupillary margin, which may cause a dilated pupil. Slit-lamp examination is mandatory to evaluate such defects, especially if these lesions are very small. "Iridoplegia" (which means the traumatic mydriasis) is often associated with iris sphincter tears that can permanently alter the shape of the pupil. In these cases, special eye contacts application or iridoplasty is essential to address this permanent dilated pupil. Acute angle-closure glaucoma can also cause acute sphincter paresis and a unilateral dilation, although these patients often have ocular pain, conjunctival hyperemia, or corneal edema. Finally, iris ischemia, such as carotid occlusion, may also result in a dilated pupil [3].

Tonic pupil includes an absent pupillary reaction to light stimulus, palsy of the iris sphincter, and cholinergic supersensitivity to topical pilocarpine of the denervated sphincter. The pathophysiological feature of the Adie tonic pupil is most likely damage to the ciliary ganglion or postganglionic efferent nerves [3]. Pilocarpine constricts Adie pupil and the dilated pupil from parasympathetic denervation (Hutchinson pupil or intracranial aneurysm), but not the dilated pupil from pharmacologic blockade or from iris sphincter muscle abnormalities.

Physiologic anisocoria affects 38% of healthy persons and is a constant finding in 3%, although the difference in pupil size rarely exceeds 1 mm and this difference remains the same in both bright and dim ambient light [6].

Even rarer causes of anisocoria are migraine headaches or Horner syndrome of the contralateral eye. Thus, transient dilation of the pupil has been described in patients with migraine headaches, even in children [7]. Horner syndrome is related to sympathetic paresis of the eye. It produces miosis, ptosis, and anhidrosis.

We suspect that in our case, during this demanding surgical intervention, patient's head slipped out of its position in the silicone base, resulting in accidental increased pressure to the left globe, resulting in iris sphincter muscle tears, causing iris transillumination defect, and presenting with the dilated pupil. Fortunately, in our case, the muscle dysfunction was transient and the anisocoria disappeared after 24 h without any intervention. The clinical image in Fig. 2 is not indicative of trauma to the iris because iris transillumination defects are usually obvious and the iris margins are not so smooth. Furthermore, the inability to perform a slit-lamp examination to detect any mild defects made the diagnosis even more challenging.

The recommendations according to the American Society of Anesthesiologists to avoid ocular complications in prone position spinal surgeries are the following: Avoid direct pressure on the globes; avoid perioperative hypotension; avoid perioperative anemia; consider 10° of reverse Trendelenburg during prone surgery [8]; lower transfusion threshold to keep hemoglobin above 10 g/dL in high-risk patients; avoid infusions of large amounts of crystalloid; consider staging long spinal surgeries (above 8 h); maintain mean arterial pressure at patient's baseline; avoid changes in any perfusion-related medication; and perform a post-operative visual examination as early as possible in high-risk patients [9, 10].

Conclusion

The presence of anisocoria may be a worrisome neurological sign, especially after trauma. Comprehensive medical history, careful neurological examination, as well as ophthalmologic consultation are mandatory to diagnosis. The learning point here is that the wrong position during prone spinal surgery can cause iris sphincter muscle tears and transient or permanent dilation of the affected pupil. Incidence of ocular complications after prone position surgery is closely related to the surgery duration, while 10° of reverse Trendelenburg is the most

appropriate position. Positioning of the patient and duration of surgery should be taken into consideration both by spine surgeons and anesthesiologists.

Clinical Message

Among ocular complications after long-lasting (more than 4 h) prone position spine surgeries, transient or permanent pupil dilation should be included to the pre-operative counseling. Pre- and post-operative ophthalmologic examination is advised in all these spine surgeries, while positioning and duration of the surgery are paramount of importance to avoid ocular complications.

References

1. Newman NJ. Perioperative visual loss after nonocular surgeries. Am J Ophthalmol 2008;145:604-10.e1.
2. 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 (Phila Pa 1976) 2016;41:E297-9.
3. Lee AG, Taber KH, Hayman LA, Tang RA. A guide to the isolated dilated pupil. Arch Fam Med 1997;6:385-8.
4. Gala PK, Henretig FM, Alpern ER, Sampayo EM. An interesting case of a unilaterally dilated pupil. PediatrEmerg Care 2013;29:648-9.
5. Pejic R, Klaric B. Transient anisocoria in a patient treated with nebulized ipratropium bromide. Am J Ophthalmol Case Rep 2017;7:11-3.
6. Steck RP, Kong M, McCray KL, Quan V, Davey PG. Physiologic anisocoria under various lighting conditions. ClinOphthalmol 2018;12:85-9.
7. Patel R, Davis C, Sivaswamy L. Anisocoria – Not always cause for alarm. J Pediatr 2014;164:1497.
8. Carey TW, Shaw KA, Weber ML, DeVine JG. Effect of the degree of reverse trendelenburg position on intraocular pressure during prone spine surgery: A randomized controlled trial. Spine J 2014;14:2118-26.
9. American Society of Anesthesiologists Task Force on Perioperative Blindness. Practice advisory for perioperative visual loss associated with spine surgery: A report by the American Society of Anesthesiologists task force on perioperative blindness. Anesthesiology 2006;104:1319-28.
10. Zimmerer S, Koehler M, Turtschi S, Palmowski-Wolfe A, Girard T. Amaurosis after spine surgery: Survey of the literature and discussion of one case. Eur Spine J 2011;20:171-6.

Conflict of Interest: Nil
Source of Support: Nil

Consent: The authors confirm that Informed consent of the patient is taken for publication of this case report

How to Cite this Article

Papaioannou I, Xristopoulos K, Baikousis A, Korovessis P, Kokkinis K. Anisocoria after Posterior Spine Surgery: A Rare but Disastrous Complication – A Case Report and Literature Review. Journal of Orthopaedic Case Reports 2019 Jul-Aug; 9(4): 92-95.