• Letter to the Editor •

Acute postoperatory visual loss following bilateral lung transplantation surgery: a case series

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Dear Editor,

I am Rosa Gutiérrez Bonet, former ophthalmology resident at Puerta de Hierro University Hospital, Madrid, Spain. I write to present four cases of cortical blindness (CB) after bilateral lung transplant (LT).

LT is considered as a first-choice treatment for patients with some advanced pulmonary entities, such as chronic obstructive pulmonary disease, idiopathic pulmonary fibrosis, cystic fibrosis (CF), alpha-1-antitrypsin deficiency and pulmonary arterial hypertension. This operation can improve survival rates and provide a better quality of life[1].

CB after LT is a rare and devastating complication for which there is no effective treatment[2]. It is probably caused after hypoperfusion or embolic phenomenon affecting the posterior cerebral artery and damaging the occipital cortex[3]. Patients typically show initial improvement, but visual acuity (VA) and visual fields do not complete their recovery[4].

Perioperative visual loss (POVL) after non-ocular surgery has been reported during spine, cardiac, and head-neck surgeries. Other causes of POVL more prevalent than CB have been described, such as ischemic optic neuropathy (ION), central or branch retinal vein occlusion (CRVO, BRVO), or less frequently, external ocular injuries and posterior reversible encephalopathy. The Nationwide Inpatient Sample estimated a prevalence of POVL in cardiac surgery of 8.64/10 000 and 3.09/10 000 in spinal fusion[5]. There are no records about lung interventions.

The underlying specific pathogenesis of these neuro-ophthalmic complications remains unknown, so physicians should be aware of the potential visual loss in the postoperative period. Efforts must be focused in the prevention of this complication, given it is irreversible.

We present a case series of four patients with bilateral LT that presented POVL, with a slight improvement during the follow up in all cases.

CASE 1

A 63-year-old male patient diagnosed with chronic respiratory insufficiency due to chronic obstructive pulmonary disease requiring bilateral LT. The patient suffered a penetrant traumatism during childhood to his left eye (LE) so it was amaurotic.

During the procedure, ischemia lasted 360min for the right lung and 435min for the left one. The pulmonary artery was accidentally dissected and vasopressive drugs were required. The patient also suffered from ST segment elevation in the electrocardiogram when bronchial and vascular sutures were being practised, however it quickly reversed when these were loosened. No blood transfusions were needed.

Two days later, the patient referred a complete visual loss, so an ophthalmological examination was carried out. VA was counting fingers in the right eye (RE), and no light perception in the LE. No other abnormalities were noticed. The results from the magnetic resonance imaging (MRI) showed a subacute suboccipital ischemic stroke and a left anterior frontal hypodense focus of hemodynamic etiology.

A few weeks later, a visual field (VF) test was performed on the RE showing left hemianopia. The patient showed progressive improvements and current VA is 0.4 in the RE and the campimetric damage has diminished. His pulmonary evolution has shown a positive progression since the beginning.

CASE 2

Bilateral LT was performed in a 28-year-old male, who suffered from chronic respiratory insufficiency due to CF.

The procedure started at 2:30 a.m., finishing at 11:30 a.m. The second lung transplantation was complicated by progressive desaturation and hypotension, with subsequent important reperfusion edema. At that point, extracorporeal circulation was necessary to continue the surgery.

During the immediate post-operatory period, the patient received multiple blood transfusions and suffered renal insufficiency. Nineteen days after the surgery, ophthalmic examination was required due to bilateral VA loss. VA was reduced to hand motion in both eyes, and no other alterations were found. MRI showed a left occipital cortical-subcortical hypodense area suggesting ischemic etiology. No further examinations could be carried out because the patient did not survive the postoperative complications.

CASE 3

A 38-year-old male patient with CF history underwent LT due to chronic respiratory insufficiency. Surgery took 8h and was complicated by a disproportion in size between the donor's lung and the recipient's, so it was necessary to remove the left lung lingula. After unclamping the first lung, a macroscopic reperfusion edema became evident, together with poor unipulmonar ventilation and maintained hypotension that required high doses of vasopressive drugs. Cardiac tamponade occurred during the second transplantation because of the same disproportion in size, so a resection was also carried out to solve this event, extending the surgery.

During the first days after the surgery, the patient suffered primary graft dysfunction, pulmonary hypertension, so extubation was not possible. On the fifth post-operatory day, the patient referred bilateral VA loss. An ophthalmic examination was carried out at the intensive care unit (ICU). VA was 0.1 in the RE, and 0.2 in the LE. No alterations were found during funduscopic examination, therefore a VF test was carried out, which showed an absolute homonymous right hemianopia and relative left defects. A MRI scan was scheduled after these findings. Results showed evidence of several hypodense areas with an effacement of the fissures at bilateral occipitoparietal level. The location of these injuries suggested sub-acute chronology as well as ischemic etiology (Figure 1).

The patient has shown constant improvement during a 2-year follow-up period with a decrease of visual field defects and VA of 0.5 in the RE and 0.6 in the LE (Figure 2).

CASE 4

Bilateral LT was practiced to a 21-year-old male patient suffering from advanced pulmonary CF. The procedure time was 6h 15min for the right lung and 8h 15min for the left one. During the act the Swan-Ganz catheter was misplaced and vasopressive drugs were required as well as two erythrocyte concentrate bags.

The patient showed hemodynamic stability during the postoperative period, which led to an early extubation. One day after the procedure the patient referred bilateral VA loss so an ophthalmic examination was performed. VA was counting fingers in both eyes and no other abnormality was noticed except VF defects, which again, showed right homonymous hemianopia and left inferior quadrantanopia. MRI demonstrated ischemic injuries of subacute chronology of hypotensive origin pattern. There was also remarkable bioccipital, biparietal and frontal necrosis (Figure 3).

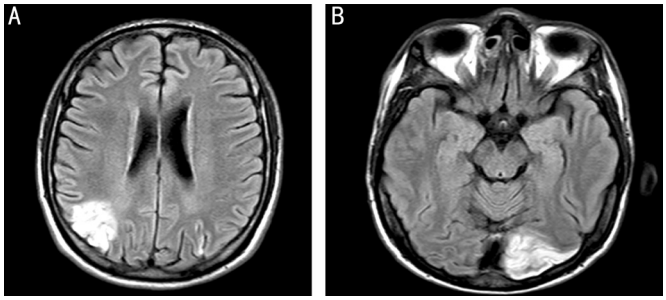

Figure 1 MRI scan of a 38-year-old male patient who underwent bilateral LT Images show evidence of several hypodense areas with an effacement of the fissures at bilateral occipitoparietal level.

Six months after the surgery he started to improve with a final VA of 0.3 in the RE and 0.4 in the LE, and a reduction of the VF defect, as in the former cases. The patient passed 18mo after the procedure.

DISCUSSION

POVL accompanying non-ocular surgery has been described after different kinds of surgeries, mainly spinal fusion and cardiac procedures[6-7], as well as head and neck interventions[8]; however, to the best of our knowledge this is the first report that establishes a relationship between cortical blindness and bilateral LT. Several specific neurologic complications have been described in association with LT; the most common symptoms being seizures, encephalopathy, headache and depression[9-10].

The etiology of POVL remains unknown, but multiple factors have been associated to it, and they are common for ION, retinal vein occlusion and CB. The most important include age, gender and the presence of comorbidities. Some studies confirm that the bigger the Charlson comorbidity index, the greater the probability of suffering from CB, however in our sample this figure was very low: the first case presented chronic pulmonary disease, which together with age added up to an index of 3.3; the second suffered from chronic pulmonary disease and due to his age the index was of -0.3; the third case showed three conditions that raised the index up to 3.4 (chronic pulmonary disease, diabetes without end-organ damage and tumor without metastases); our last patient had chronic pulmonary disease and diabetes without end-organ damage with an index of 0.1.

It is remarkable that those aged 50 and older suffer more often from ION and retinal vein occlusions, whilst those under 18, will endure CB, possibly because this age group shows less vascular-related diseases[5,11-12], with only a few pediatric cases of POVL in literature[13-14].

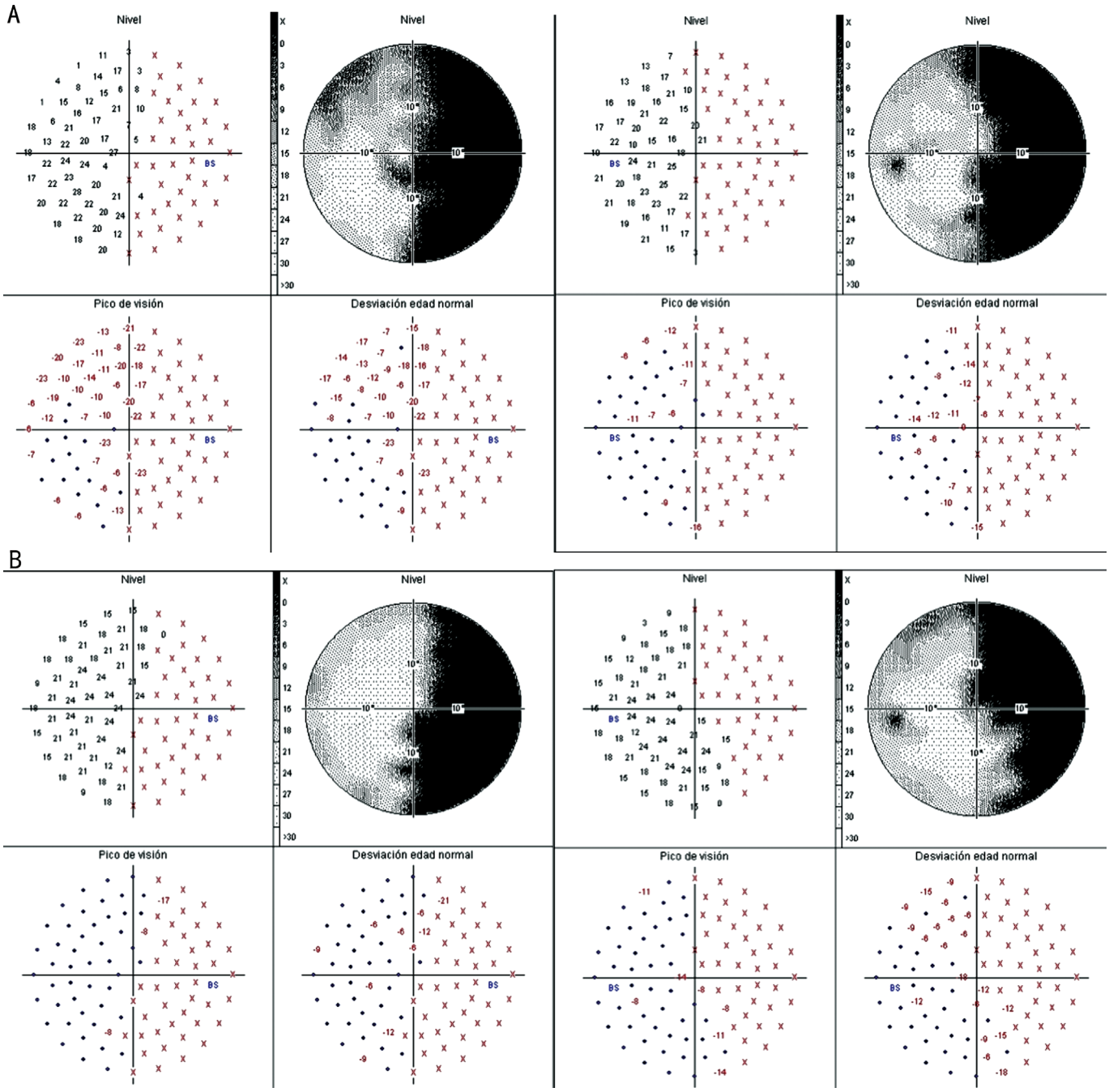

Figure 2 Visual field tests showing an absolute homonymous right hemianopia and relative left defects that improve with time

A: Visual field tests showing an absolute homonymous right hemianopia and relative left defects; B: The patient has shown constant improvement during a 2-year follow-up period with a decrease of visual field defects.

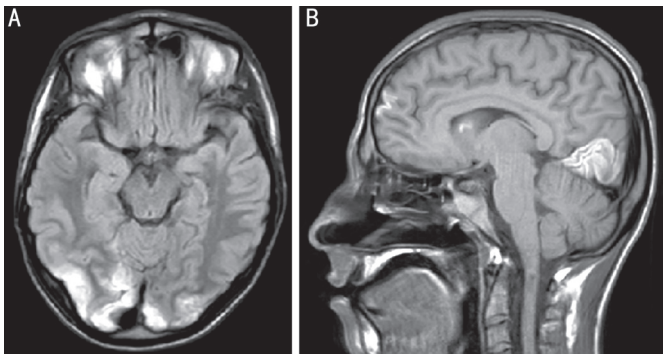

Figure 3 MRI scan of a 21-year-old male patient suffering from advanced pulmonary CF showing ischemic injuries of subacute chronology with hypotensive origin pattern.

Gender is another important risk factor for POVL, as it has been proven that males present a 1.3 odds ratio for POVL in the multivariable analysis. Experimental animal studies demonstrate that higher estrogen levels protect from cerebral ischemia, so this may explain the lower proportion of POVL among women[7,15-18]. All of our patients were males, and only one was over 50 years old. All of them endured a low Charlson comorbidity index.

Some retrospective studies establish an increased risk of POVL for cases that suffer a blood loss of approximately 1000 mL or more during the procedure, or when the duration of an aesthesia is longer than 6h[16,19].

CB is generally associated with stroke or embolia, with predilection for the occipital lobes. There are theories that associate vasospasm and secondary ischemia to direct toxic injury or used drugs. Probably, a combination of long surgery, blood loss, anemia/hemodilution and infusion of large amounts of intravenous fluids are some of the potential factors involved in the etiology of postoperative CB.

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