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Full Text

Postoperative visual loss is one of the most devastating complications that has been reported to occur after cardiopulmonary bypass, neck dissection, general surgical abdominal procedures, hip arthroplasty, craniotomies, thyroidectomy and prone spine cases. The incidence of symptomatic postoperative visual loss varies depending upon the population studied and has been reported as low as one in 60,965 for all nonocular operations and as high as 3.6 percent in cardiopulmonary bypass cases.^{1,2} Atheromatous, or air emboli, prolonged hypotension and anemia, inadequate venous drainage of the globe and direct pressure to the eye have all been implicated as causative factors.

Ischemic optic neuropathy is the most common diagnosis in postoperative visual loss. Ischemic optic neuropathy is divided into anterior and posterior, depending upon the location of the lesion on the optic nerve. The majority of anterior ischemic optic neuropathy cases occur during cardiopulmonary bypass procedures (53 percent), followed by prone spine cases (12 percent). Most posterior ischemic optic neuropathy cases have occurred during neck, nose or sinus operations (48 percent) followed by prone spine cases (16 percent) and cardiopulmonary bypass procedures (11 percent).²

Case reports and retrospective reviews have suggested that although direct compression of the globe can cause postoperative blindness, it seldom occurs intraoperatively. Postoperative ischemic optic neuropathy has occurred in patients in the prone position whose eyes are free from compression with the head in Mayfield pins and during cardiopulmonary bypass cases in the supine position.³ Procedure-dependent factors that have been suggested to be associated with the development of postoperative ischemic optic neuropathy are: large estimated blood loss, systemic hypotension, long duration of procedure and anemia.^{2,4,5} Patient-dependent factors include hypertension, tobacco use, atherosclerosis, diabetes and morbid obesity.^{2,4,5} Outside the hospital setting, anterior ischemic optic neuropathy is one of the most common causes of sudden visual loss in middle-aged and elderly people. In these nonoperative cases, risk factors include atherosclerosis, hypertension, diabetes mellitus and nocturnal hypotension, among others.⁶

The etiology of postoperative ischemic optic neuropathy is unclear but may be associated with decreased oxygen delivery to the optic nerve.⁴ Severe and/or prolonged hypotension has frequently been associated with postoperative ischemic optic neuropathy, particularly when it is combined with anemia. However, it is important to emphasize that cases of postoperative ischemic optic neuropathy have occurred in the absence of these factors. Many cases of postoperative ischemic optic neuropathy are reported from head and neck dissections and prone spine procedures where there is significant facial swelling and where venous hemodynamics may be altered.

Due to a perceived increase in the incidence of postoperative visual loss over the last decade, the ASA Committee on Professional Liability established the Postoperative Visual Loss Database on July 1, 1999, in order to better identify associated risk factors so that this tragic complication might be prevented in the future. Patients who develop visual deficits within seven days after nonophthalmologic surgery are eligible for inclusion in the registry, and data are collected on standardized forms from the registry Web site . Information is collected anonymously, and reporting is voluntary.

Thus far, we have received and analyzed data on 23 patients. The most common operations associated with postoperative visual loss were spine surgery in the prone position (57 percent) followed by procedures using cardiopulmonary bypass (22 percent) [Table 1]. Ischemic optic neuropathy was diagnosed or strongly suspected in 20 out of the 23 cases. The other three cases were diagnosed as either central retinal artery obstruction, retinal ischemia or a questionable transient ischemic attack. All 23 cases involved an anesthetic time of more than 5.5 hours and a median estimated blood loss of 2.2 liters (range 100ml to >12 liters). Significant hypotension (defined as systolic blood pressure or mean arterial pressure \bar{Z} 40 percent below baseline) was present in 52 percent of cases. Controlled hypotension was utilized in 42 percent of these cases. The lowest hematocrit during the operation averaged 25 percent (range 13 to 40

percent). Bilateral lesions were present in 56 percent of the 23 patients. There was partial recovery of vision in 39 percent of patients in the database overall, consistent with a reported partial recovery rate of 30 percent to 43 percent.^{5,7}

Table 1: Procedure-Dependent Associated Factors

Variable	All Cases (n=23)
Procedure	CPB* 5 (22 percent) Prone 13 (56 percent) Other 5 (22 percent)
OR* Time (median)	9.9 hrs (range 5.75 to 18 hrs)
EBL* (median)	2.2 liters (range 100 ml to > 12,000 ml)
Hypotension	12 (52 percent)
Lowest Hct*(median)	24.5 percent (range 13-40 percent)
Percent Bilateral Lesions	13 (56 percent)
Partial Recovery of Vision	9 (39 percent)
AION*	8 (35 percent)
PION*	11 (48 percent)
*OR = operating room, EBL = estimated blood loss, Hct = hematocrit, AION = anterior ischemic optic neuropathy, PION = posterior ischemic neuropathy, CPB = cardiopulmonary bypass.	

Data on preoperative or patient-dependent factors cited in other series were collected (Table 2). Median patient age was 58 years. Obesity was present in 57 percent, hypertension in 48 percent, diabetes mellitus in 22 percent, atherosclerotic disease in 48 percent, a smoking history in 52 percent and superior vena cava syndrome in one patient. Only two of the 23 patients had no known preoperative patient-related factors. Of these two patients, one patient had a prolonged back operation (10.3 hours) with significant hypotension for brief periods of time, and the other patient received an anesthetic with controlled hypotension and dropped his hematocrit to 24 percent.

Table 2: Patient-Dependent Associated Factors

Variable	All Cases (n=23)
Median Age (range)	58 (24-73) years
Obesity (percent cases)	13 (56 percent)
Hypertension	11 (48 percent)
Diabetes Mellitus	5 (22 percent)
Smoking History	12 (52 percent)
Atherosclerosis	12 (52 percent)

There has been speculation that postoperative visual loss in supine operations that do not involve head and neck surgery are due primarily to hypotension and/or anemia in patients with occlusive vascular disease.⁶ In contrast, venous congestion may be more important in head and neck procedures and in prone spine operations, perhaps in association with hypotension and/or anemia.⁸ This concept is supported by previously published case series in which anterior ischemic optic neuropathy is most commonly diagnosed in supine cases (mostly cardiopulmonary bypass cases) in patients with atherosclerotic disease, while posterior ischemic optic neuropathy is most commonly diagnosed in prone operations or in cases in which the venous pressure of the head and neck is elevated.² The fact that the different types of operations are not equally distributed between anterior and posterior ischemic optic neuropathy suggests that the etiology of visual loss differs between the two.

Although our data support this hypothesis, the number of cases reported thus far is too small to draw any conclusions, and any data published at this time must be considered preliminary. We need additional cases of postoperative visual loss in order for the database to provide meaningful data. This project is expanding to be prospective in scope, accepting reports of cases occurring after 1999 (pending institutional review board approval), which will make more cases available and make it easier to reach the goal of 100 cases for analysis.

For more information, please visit our [Web site](#) and see our poster presentation at the ASA 2000 Annual Meeting in San Francisco on October 16, 2000, in the Moscone Center, Exhibit Hall A-C. Information on postoperative visual loss and the database will also be available at the Anesthesia Patient Safety Foundation exhibit area at the ASA Annual Meeting.

References

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