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Incidence of Cardiovascular Abnormality in Hypertensive Patients Undergoing Neurosurgical Procedures: A Prospective, Observational Study

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Abstract : Hypertension is a critical global health issue and a significant contributor to cardiovascular and cerebrovascular complications, particularly in patients undergoing neurosurgical procedures. Hypertensive patients are at heightened risk of structural and functional cardiac abnormalities, which may adversely affect perioperative outcomes. This prospective observational study aimed to assess the incidence, patterns, and reversibility of cardiovascular abnormalities in hypertensive patients undergoing intracranial neurosurgical interventions. Seventy-five hypertensive patients, aged 18–65 years, were enrolled after meeting strict inclusion criteria. Comprehensive preoperative evaluations were performed, including electrocardiograms (ECG), transthoracic echocardiography (TTE), and serum B-type natriuretic peptide (pro-BNP) measurements. Preoperative ECG findings showed abnormalities in 60% of patients, with left ventricular hypertrophy (LVH) being the most prevalent (24%), followed by ST-segment changes (14.7%). Echocardiographic assessment revealed systolic dysfunction in 30% of patients, with a mean left ventricular ejection fraction (LVEF) of 50.4 ± 5.6%. Diastolic dysfunction, observed in 62% of patients, was graded as mild to moderate in most cases. Elevated pro-BNP levels (mean: 354.7 ± 235.2 pg/mL) reflected significant cardiac stress in the study cohort. Postoperative evaluations on day 7 or at discharge demonstrated substantial improvements in cardiac function. LVEF increased significantly to a mean of 52.4 ± 4.3% ($p < 0.0001$), and pro-BNP levels reduced significantly (mean: 351.9 ± 232.8 pg/mL, $p < 0.0001$). However, diastolic dysfunction showed limited reversibility, with most patients continuing to exhibit mild to moderate dysfunction postoperatively. Subgroup analysis indicated that patients undergoing aneurysm clipping had a higher prevalence of systolic dysfunction, while tumor resection patients were more likely to exhibit diastolic abnormalities. A significant negative correlation was noted between the duration of hypertension and postoperative recovery, particularly with LVEF and pro-BNP levels, underscoring the progressive impact of chronic hypertension on cardiac function. This study highlights the importance of early detection and perioperative management of cardiovascular abnormalities in hypertensive neurosurgical patients. Preoperative TTE and biomarkers such as pro-BNP provide valuable insights into cardiac function and can guide personalized interventions to optimize patient outcomes. While systolic dysfunction showed notable reversibility with appropriate care, persistent diastolic dysfunction warrants further investigation to improve management strategies. In conclusion, hypertensive neurosurgical patients frequently present with significant cardiovascular abnormalities, many of which are reversible with timely intervention. The findings underscore the need for comprehensive cardiovascular assessment and tailored care to improve perioperative outcomes and long-term prognosis.

Keywords : hypertension, cardiac abnormalities, echocardiography, neurosurgical procedures
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