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Changes in cardiac output and development, progression of pulmonary hypertension in patients on hemodialysis with an existing arteriovenous fistula

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Background and Aims: Pulmonary hypertension (PH) is a common complication in hemodialysis patients, potentially linked to arteriovenous fistula (AVF) flow. Understanding the relationship between AVF characteristics, fistula flow, and cardiac function is vital for managing these patients effectively.

To examine the association of pulmonary hypertension (PH) with arteriovenous fistula (AVF) formation and to evaluate the relationship between AVF flow and fistula characteristics.

Method: At the Republican Scientific and Practical Center of Nephrology and Hemodialysis, 52 patients undergoing program hemodialysis were examined. Before AVF placement, patients underwent echocardiography to assess systolic pulmonary artery pressure (PAP), cardiac output (CO), and ejection fraction (EF). After 6 months of follow-up, a second echocardiographic evaluation and Doppler sonographic evaluation of the course of the fistula were performed. Complete data were available for 32 patients.

Results: Study data were collected from 32 patients, 26 males and 6 females with a mean age of 52 years ranging from 15–78 yrs. The data showed a statistically significant positive correlation between fistula flow and PAP2 and PAP changes ($P < 0.05$). Mean fistula flow was 1322 ml/min in patients without PH and 2750 ml/min in patients with PH. This difference (1428 ml/min) was statistically significant ($P = 0.03$). We found a significant negative correlation between PAP1 and EF1 and PAP2 and EF2 ($P < 0.05$). In addition, the mean EF2 in patients without PH was 57% in contrast to 46% in patients with PH. Mean fistula flow in radial fistulae (mean = 422 ml/min, range: 370–474 ml/min) was significantly less than brachial fistulae (mean = 1463 ml, range: 270–3300 ml/min) ($P = 0.03$). Mean systolic PAP2 of 14.8 mmHg in transplanted patients was 5.9 mmHg less than those who were not transplanted (20.7 mmHg). Diabetes was the most common cause of renal failure and diabetics had a significant reduction in their EF (15.5%) compared with non-diabetic patients (1% reduction) ($P = 0.016$).

Conclusion: Fistula flow, PAP and EF of all patients should be checked at least 6 months after fistula creation. Patients with higher fistula flow rates and patients with diabetes mellitus need to be more closely observed. In addition, elderly patients with significant cardiac and other comorbidities may be more prone to develop symptoms after AVF creation.