RIGHT VENTRICULAR FUNCTION AND INTRAOPERATIVE DETERMINANTS OF INTENSIVE CARE UNIT STAY AFTER COMPLETE REPAIR OF TETRALOGY OF FALLOT IN CHILDREN

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Abstract. *This study investigated clinical, echocardiographic, and intraoperative factors associated with intensive care unit stay after complete repair of Tetralogy of Fallot in children. Analysis of 101 patients showed that younger age, longer cardiopulmonary bypass and operative times, and greater postoperative pulmonary regurgitation were associated with prolonged ICU stay. Valve-sparing repair was associated with a shorter ICU stay.*

Keywords: *Tetralogy of Fallot, pediatric cardiac surgery, right ventricular function, TAPSE, intensive care unit, cardiopulmonary bypass, pulmonary regurgitation, valve-sparing repair.*

Background. Tetralogy of Fallot remains the most common cyanotic congenital heart defect requiring surgical correction in early childhood. Although hospital mortality after complete repair is now low, the length of postoperative stay in the intensive care unit (ICU) varies considerably and largely determines the burden on the reanimation service and the incidence of early complications. Data on the relative contribution of preoperative right ventricular function, intraoperative technique, and residual haemodynamic lesions to ICU stay duration in a real-world clinical setting in Uzbekistan remain limited.

Aim. To identify clinical, echocardiographic and intraoperative parameters associated with the duration of ICU stay after complete surgical repair of tetralogy of Fallot.

Materials and methods. A retrospective single-centre study was performed at the National Children's Medical Centre (Tashkent), including 101 patients (61 boys, 40 girls) who underwent complete repair of tetralogy of Fallot between September 2023

and April 2026. Median age at surgery was 11.9 months (range 3.0–147.7 months). The following parameters were analysed: age, preoperative transcutaneous oxygen saturation, preoperative left ventricular end-diastolic volume index (LVEDVI, calculated from echocardiographic LV end-diastolic volume indexed to body surface area by the Haycock formula), preoperative tricuspid annular plane systolic excursion (TAPSE) in absolute value and as an age-adjusted z-score, cardiopulmonary bypass (CPB) time, aortic cross-clamp time, total operative time, and type of surgical correction (I - valve-sparing repair, II - transannular patch, IIIA - transannular patch with monocusp reconstruction, IIIB - transannular patch with autologous right-atrial-appendage valve). Early postoperative (day 1) echocardiographic findings included residual ventricular septal defect (VSD) size, residual right ventricular outflow tract (RVOT)–pulmonary artery pressure gradient, and the degree of pulmonary regurgitation (PR). The primary endpoint was duration of ICU stay, expressed in hours. Associations between continuous variables and ICU stay were assessed with Spearman's rank correlation; between-group comparisons by type of repair used the Kruskal–Wallis and Mann–Whitney U tests. A p-value <0.05 was considered statistically significant.

Results: Mean ICU stay was 70.4±49.6 hours (median 65.0 hours). A significant inverse correlation with ICU stay was found for age (r=-0.389; p=0.0001) and for absolute preoperative TAPSE (mean 14.9±1.8 mm; r=-0.320; p=0.0012); however, the age-adjusted TAPSE z-score (mean -0.25±0.74) showed no independent association (r=0.046; p=0.645), indicating that the raw-TAPSE effect largely reflected patient size rather than intrinsic right ventricular dysfunction. Significant positive correlations were observed for CPB time (mean 135.5±43.8 min; r=0.370; p=0.0002), aortic cross-clamp time (mean 98.5±30.5 min; r=0.314; p=0.0016), total operative time (mean 247.8±56.6 min; r=0.272; p=0.0064), and the degree of early postoperative pulmonary regurgitation (r=0.280; p=0.0046). Type of repair significantly influenced ICU stay (Kruskal–Wallis, H=7.82; p=0.050): patients undergoing valve-sparing repair had a shorter ICU stay (62.6±50.1 h) than those undergoing transannular patch techniques, combined (85.0±47.0 h; Mann–Whitney U, p=0.0072). Preoperative saturation (r=-0.169; p=0.108), LVEDVI (r=-0.181; p=0.070), residual RVOT–PA gradient (r=0.161; p=0.107) and residual VSD size (r=0.106; p=0.294) showed only non-significant trends.

Conclusions: prolonged ICU stay after tetralogy of Fallot repair is significantly associated with younger age, longer CPB and cross-clamp times, longer total operative time, and more pronounced early postoperative pulmonary regurgitation, whereas right

ventricular function assessed by age-normalised TAPSE was not an independent predictor. Valve-sparing repair, when technically feasible, is associated with a significantly shorter ICU stay than transannular patch techniques, supporting a valve-preserving surgical strategy whenever anatomically appropriate.

References

1. Apitz C., Webb G. D., Redington A. N. Tetralogy of Fallot // The Lancet. — 2009. — Vol. 374, No. 9699. — P. 1462–1471.
2. Martins R. S., Fatimi A. S., et al. Comparing clinical and echocardiographic outcomes following valve-sparing versus transannular patch repair of tetralogy of Fallot: a systematic review and meta-analysis // Interdisciplinary CardioVascular and Thoracic Surgery. — 2024. — Vol. 39, No. 1.
3. Anderson B. R., Celermajer D. S., Phelps C. M., et al. Early right ventricular function following trans-right atrial versus trans-right atrial, trans-right ventricular repair of Tetralogy of Fallot // Journal of Cardiothoracic Surgery. — 2019.