**RETROSPECTIVE ANALYSIS OF PERCUTANEOUS PATENT FORAMEN OVALE CLOSURE FOLLOWING CARDIAC SURGERY**

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Background:

Prior cardiac surgery increases the risk of complications in subsequent surgeries.1 However, there have not been any studies to evaluate how prior cardiac surgery affects percutaneous closure of interatrial shunts.2-3 This study’s aim is to assess if prior cardiac surgery has any association with residual shunt following percutaneous patent foramen ovale (PFO) closure.

Methods:

Single-center retrospective analysis of 137 patients who underwent percutaneous PFO closures evaluating patients who underwent a percutaneous PFO closure within the dates of January 1, 2009, to December 31, 2020. PFO closure failure was defined as one or more bubble(s) seen in the left heart within 3 beats of the cardiac cycle as per the current guidelines which identify the presence of PFO. Demographic information was collected on all patients. Survival analysis using a Cox regression model was performed to assess for associations between demographic information along with prior medical history and risk of PFO closure failure.

Results:

Percutaneous PFO closure failure was found in 33 patients (24%). Of the total population studied, 13 (9.5%) patients underwent prior cardiac surgery. Prior cardiac surgery (Relative Risk, RR 3.94, 95% CI 1.06-14.57) and the presence of hypoxia (RR 3.41, 95%CI 1.18-9.81) was identified as independent (statistically significant, P < 0.05) predictors of PFO closure failure. End-stage renal disease (ESRD) was found to be marginally significant (RR 6.02, 95%CI 0.80-16.75) (Table 1).

Conclusions:

Prior cardiac surgery and hypoxia are each individually associated with an increased risk of PFO closure failure. ESRD may be associated with PFO closure failure as it was marginally significant. A larger study would be beneficial to sort out if marginally significant variables are truly statistically significant predictors.

**Table 1:** Univariates Survival Analyses: Cox regression model

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor Variable | Relative Risk | RR 95% Confidence Interval | P-value |
| Age | 1.01 |  | 0.6400 |
| Age range (31-49yo) | 0.43 |  | 0.4499 |
| Age range (50-64yo) | 0.93 |  | 0.9481 |
| Age range (>64) | 0.73 |  | 0.7958 |
| Male Gender | 1.14 |  | 0.7842 |
| Prior Cardiac Surgery | **3.94** | **1.06-14-57** | **0.0406** |
| Post-LVAD Closure | 3.09 |  | 0.1466 |
| Prior Stroke or TIA | 1301940 |  | 0.9924 |
| Hypoxia on presentation | **3.41** | **1.18-9.81** | **0.0234** |
| Hypertension | 0.69 |  | 0.4421 |
| Hyperlipidemia | 1.72 |  | 0.2756 |
| Diabetes Mellitus | 0.73 |  | 0.7700 |
| Atrial Fibrillation | **6.02** | **1.93-18.54** | **0.0019** |
| ESRD | **3.68** | **0.80-16.75** | **0.0925** |
| Rheumatic Disease | 0.80 |  | 0.8314 |
| Migraines | 0.76 |  | 0.6416 |
| Congenital Disease | 0.54 |  | 0.4078 |

*Statistically significant P values (P < 0.05) are highlighted in red with the associated relative risk (RR). Marginally significant P values (0.05 ≤ P < 0.10) are highlighted in blue with the associated relative risk (RR).* 95% CI is for RR are shown only for the statistically significant predictor variables.

References:

1. Bianco V, Kilic A, Gleason TG, Aranda-Michel E, Habertheuer A, Wang Y, Navid F, Kacin A, Sultan I. Reoperative Cardiac Surgery Is a Risk Factor for Long-Term Mortality. Ann Thorac Surg. 2020 Oct;110(4):1235-1242.
2. Bernhard Meier. Closure of patent foramen ovale: technique, pitfalls, complications, and follow up. Heart. 2005 Apr; 91(4):444-448.
3. Achille Gaspardone et al. Predictors of residual right to left shunt after percutaneous suture-mediated patent foramen ovalis closure. JACC Vol 13. No 18. 2020.