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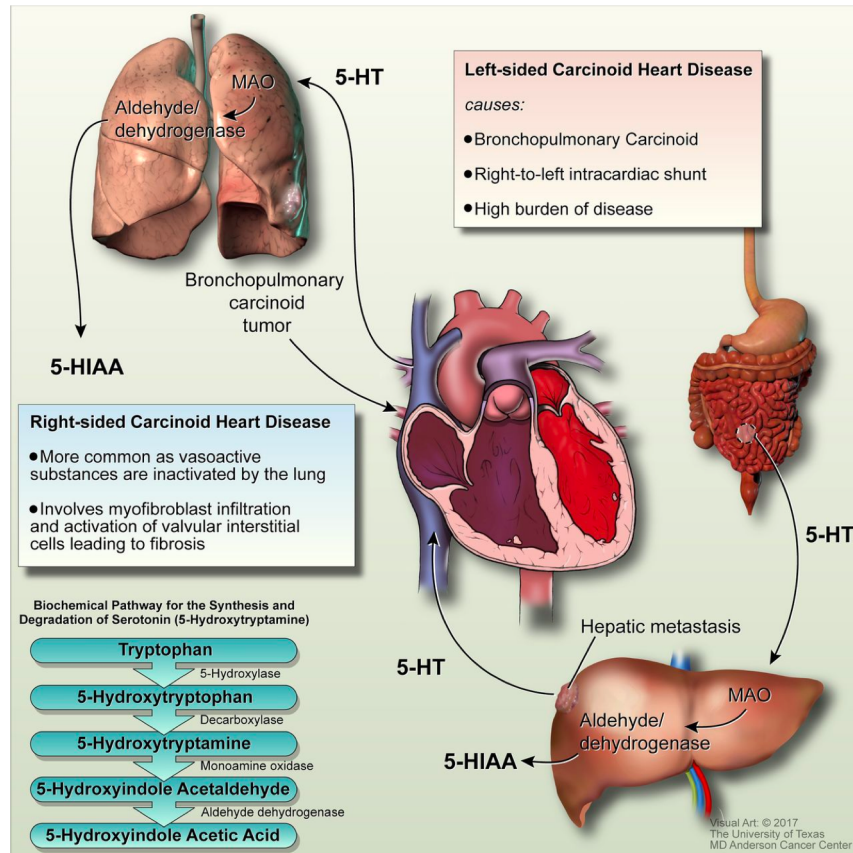
Outcomes of Surgical Treatment for Carcinoid Heart Disease: A Systematic Review and Meta-Analysis

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Introduction and Objective

Carcinoid Heart Disease (CaHD) develops from vasoactive substances released by neuroendocrine tumors which can cause significant patient morbidity and mortality without surgical intervention. There are currently very few studies on the condition as the rarity of the condition has not allowed for any high-quality trials.



Introduction and Objective

We performed a systematic review and meta-analysis to elucidate granular perioperative details and long-term outcomes in these patients. This will allow for better understanding of the condition and provide guidance to clinicians when managing this rare disease.

Research Question & Hypothesis

Purpose: To investigate the safety and efficacy of valve replacement in patients with carcinoid heart disease

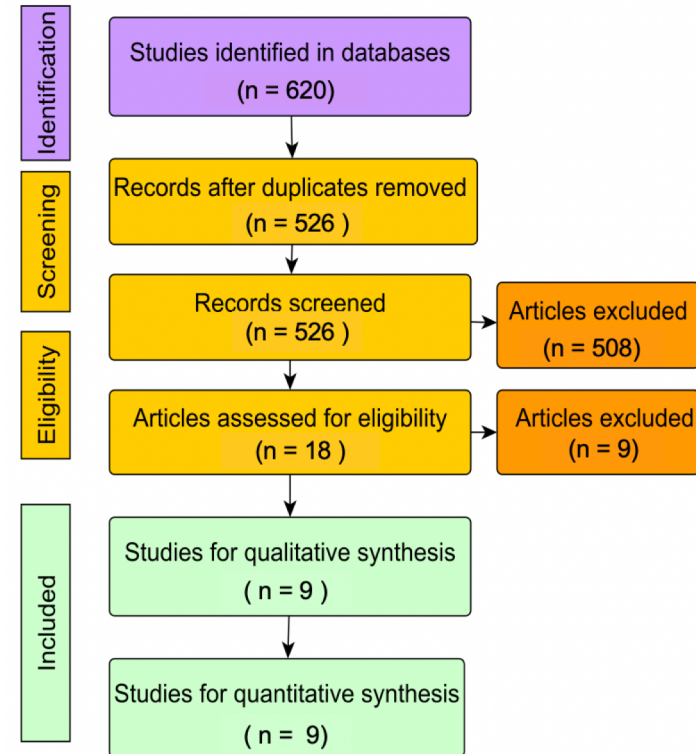
Question: Can valve replacement in patients with a neuroendocrine tumor (NE) and carcinoid heart disease (CaHD) be done safely and with acceptable long term outcomes? What are the peri-operative characteristics?

Hypothesis: Valve replacement in patients with an NE and CaHD can be done safely with acceptable outcomes. Valve replacement will mostly involve the tricuspid valve.

Approach and Results

- **Study design:** Meta-Analysis
- **Population:** CaHD patients that receive Valvular surgery
- **Intervention/Comparator:** Not applicable
- **Outcome:** Survival, Relief of CaHD Symptoms
- **Data source and collection:** Systematic Search
- **Rationale:** Meta-analysis was performed in order to aggregate the small number of studies in the literature to evaluate a rare condition with a large sample size

Electronic search of Ovid, Scopus, Cumulative Index of Nursing and Allied Health Literature, and Cochrane Controlled Trials Register was performed to examine studies discussing surgical treatment of carcinoid disease. Nine articles comprising 416 patients were selected. Study-level data were extracted and pooled for meta-analysis.



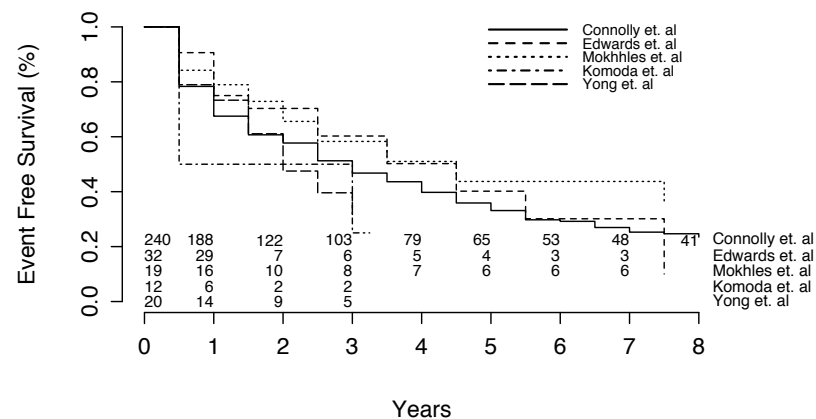
Approach and Results

Analysis was performed using R software and included KM curve analysis along with other standard statistical analysis

Findings:

Table 1: Baseline, Pre-operative, Peri-operative Characteristics and Outcomes of Patients Undergoing Valvular Surgery for Carcinoid Heart Disease

Variables	Pooled Value [95% CI]	No. of Studies	No. of patients (N or n/N)	I ² (%)
Baseline Demographics				
Age (years)	63 [57; 70]	8	377	0
Male (%)	53 [46; 61]	9	214/416	39
BMI	24.0 [20; 28]	3	291	0
Right Heart Failure Symptoms/Signs (%)	48 [14; 81]	4	36/88	92*
Pre-Operative NYHA Class				
NYHA Class I (%)	2 [0; 4]	7	10/364	0
NYHA Class II (%)	33 [23; 43]	6	97/345	53
NYHA Class III (%)	56 [40; 72]	6	183/347	87*
NYHA Class IV (%)	48 [10; 18]	5	43/328	0
Pre-operative Valve Dysfunction Characteristics				
92*				
Tricuspid Regurgitation, moderate or severe (%)	97 [95; 99]	7	367/377	1
Pulmonary Regurgitation, moderate or severe (%)	72 [58; 83]	8	209/309	75*
Pulmonary Stenosis, any, with or without regurgitation (%)	33 [6; 60]	5	33/113	93*
Mitral Regurgitation, any (%)	24 [0; 51]	3	36/292	94*
Aortic Regurgitation, any (%)	18 [1; 35]	3	32/292	86*
Peri-operative Characteristics				
<i>Valve Replacement with or without Additional Procedures</i>				
Tricuspid Valve (%)	99 [98; 100]	9	407/416	0
Bioprosthetic (%)	80 [68; 93]	9	344/416	95*
Pulmonary Valve (%)	59 [38; 79]	9	244/416	96*
Bioprosthetic (%)	59 [23; 95]	6	79/125	98*
Mitral Valve (%)	8 [5; 11]	6	29/346	0
Aortic Valve (%)	8 [5; 11]	7	30/360	0
Outcomes				
Hospital Stay, days	25 [11; 39]	5	103	0
30 Day Mortality (%)	9 [6; 12]	9	43/416	0
Cause of Death				
Tumor Progression (%)	20 [11; 28]	4	20/95	0
Sepsis/Pneumonia	18 [5; 30]	4	15/88	57
Cardiac Dysfunction (%)	10 [5; 14]	6	16/144	0



Conclusions

- Right heart failure was present preoperatively in 48% of patients
- Moderate to severe regurgitation was present in 97% of tricuspid and 72% of pulmonary valves
- Thirty-day mortality was 9% and median survival was 3 years
- Valve replacement in patients with a NET and CaHD be done safely with acceptable outcomes. Valve replacement mostly involved Pulmonary Valve Replacement in addition to Tricuspid Valve Replacement
- Mortality remains high, particularly at 5 and 10 years, primarily from progression of the primary disease
- Surgery was often delayed until NYHA III or IV Heart Failure and there is no consensus on how to monitor these patients, we suggest early referral to cardiology for close monitoring and early intervention

Future Directions

- **Future studies should investigate cardiac monitoring protocols for patients with Carcinoid Syndrome and the effects of operative timing on survival**

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