CHIRURGIE CARDIAQUE / CARDIAC SURGERY

NEGLECTED TRICUSPID REGURGITATION DURING MITRAL VALVE OR MITRAL-AORTIC VALVE SURGERY

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Abstract

Neglected Tricuspid Regurgitation or Neglected Tricuspid Insufficiency (TI) during mitral valve and mitral-aortic valve surgery. **Objective:** This study reported on clinical outcomes of neglected TI during mitral valve and/or mitral-aortic valve surgery. **Material and methods:** we realized a retrospective study between 1985 and 2002 including 30 patients who presented a small or moderate TI neglected during surgery for mitral and/or mitral-aortic valves diseases. **Results:** Twenty-four patients were female and six males. Median age was 18 years (ranged: 8 to 56 years). We noted rheumatic etiology in 81.5% of cardiac valves diseases. Patients 'mean episodes of global heart failure was1.67±1.5. Median duration of disease was 5 years (2 months - 12years). 60% of patients were at NYHA functional class III. Left cardiac valve diseases associated with neglected TI were mitral valve insufficiency (n=4), mitral valve stenosis(n=4), mitral valve disease (n=16), mitral-aortic valve insufficiency (n=3) and mitral-aortic valve disease (n=3). Mean cardio-thoracic index was 0.68±0.16. On Electrocardiogram, 53.3% of patients had a sinus rhythm. Diagnosis has been confirmed by Echocardiography-Doppler and cardiac catheterization-angiocardiography. Surgical procedures were isolated mitral valve replacement(n=24), aortic valve replacement with mitral valve annuloplasty (n=3) and double mitral-aortic valve replacement (n=3). Hospital mortality was 3.3% (n=1) due to cardiac failure. 22 and 12 patients were completely followed-up at 2 and 5years. At 2years, we noted premature bioprosthesis deterioration (n=1), mitral para-prosthetic leak (n=2) and increasing of neglected TI (n=1). At 5 years follow-up, 9 patients presented worsening of their neglected TI. Significant risks factors statistically associated with worsening neglected TI were: episodes of preoperative heart failure (p = 0.0227), mitral valve surgery associated with (p = 0.0048) and moderate TI (p = 0.046)).

Keywords: neglected tricuspid regurgitation/insufficiency, outcomes, cardiac valve surgery.

Introduction

Tricuspid insufficiency (TI) is the result of a lack of coaptation of the tricuspid valve leaflets, associate with a blood regurgitation the right ventricle to the right atrium during ventricular systole[1,2]. Two types of anatomo-pathological patterns can be identified: functional TI and organic TI characterized by valvular and/or sub valvular tricuspid apparatus lesions. For a long time, functional TI (FTI) has been a neglected and underestimated entity[3]. It is often due to idiopathic annular dilatation, dilated cardiomyopathy, pulmonary arterial hypertension, atrial fibrillation, right ventricular dysplasia and sometimes to congenital heart septal defects. FTIs can be small or minimal, moderate and large or major. In sub-Saharan Africa1, FTIs are frequently associated with mitral or mitral-aortic insufficiency. Surgical options regarding FTI remain controversial[4,5]. Those would be either a tricuspid annuloplasty with or without a prosthetic ring[5,6] or a tricuspid valve replacement, or a surgical abstention. The aim of this study is to contribute to a better codification of surgical indications for neglected FTIs during mitral-aortic or mitral valve surgery in Sub-Saharan Africa.

Material and Methods

We carried out a retrospective study including 30 patients with minimal or moderate TI coexisting with surgical mitral and mitral-aortic valvopathies between 1985 and 2002.Clinical data collection concerned:

- Demographic parameters, etiology, associated lesions and severity; -
Functional status according to NYHA classification;
- Radiological cardio-thoracic index (CTI);
- electrocardiographic parameters;
-Doppler echocardiography measurements: systolic and diastolic diameters of the right ventricle (RV), RV ejection fraction and the degree of TI;
- Cardiac catheterization coupled with angiography outcomes: RV end-diastolic pressure, cardiac index, RV ejection fraction and grade of TI;
- Surgical informations: all the patients underwent open heart surgery through a vertical median sternotomy, cardio-pulmonary bypass, aortic cross clamping, myocardial protection by a cold hyperkalemic, a sanguineous, antegrade cardioplegic solution. Types of surgery performed on the left cardiac valve(s), hospital morbidity and mortality, and post-operative evolution in the medium term (1- 2 years) and long-term (> 2 years) were studied.

Risk factors for FTI aggravation were assessed. All incomplete files were excluded from the study. Continuous variables were expressed as mean ± standard error (MSE) or percentage (%) depending on considered factors. Comparisons were made using the Mantel-Haenszel test, Yates test and Fisher test for values below 5. For all values, the significance threshold is set to 0.05.

Results

There were 25 women and 5 men (a sex ratio equal to 0.2) . Median age was 18 years (extremes: 8 -56 years). Acute rheumatic fever was valve diseases' dominant etiology (n = 25; 81.5%). In history, there were 1.67 ± 1.5 episodes of right heart failure (n = 12). Tricuspid insufficiency was associated with a mitral insufficiency (n = 4), mitral stenosis (n=4), a mitral valve disease (n = 16), and mitro-aortic insufficiency (n= 6). Mean time between symptoms onset and presentation to hospital was 5 years (extremes: 2 months - 12 years). 60% and 40% of patients were at NYHA class III (n = 18) and class II (n = 12) respectively. On auscultation, stenosis (n = 3), or mitral disease (n = 10) or

mitral insufficiency (n = 10) or mitral-aortic insufficiency (n = 3). Echocardiography, hemodynamic and angiocardiography results are shown on tables I and II.

Right aterial enlargement	24;80%
Right ventricular enlargement	21;70 %
Mean pulmonary arterial pressure (mmHg)	51.16±13.3
Ejection Fraction	50.15±13.12
TR grade I	14;46.7%
TR grade II	16,53.3%

Table I: Echocardiography Results

TR : Tricuspid Regurgitation

Mean right arterial pressure(mmHg)	5.75±4.2
Right ventricular end-diastolic pressure(mmHg)	35.14±16.8
Mean pulmonary arterial pressure (mmHg)	37.15±14.5
Pulmonary artery wedge pressure (mmHg)	19.75±10.12
Cardiac Index (l/min/m²)	2±0.52
TR grade I	n=18
TR grade IIa	n=8
TR grade IIb	n=4

Table II: Hemodynamic and Angiocardiography Results

During cardiac valvular surgery, TI was neglected in a double mitral- aortic valve replacement (n =3), isolated mitral valve replacement (n = 24), and a combined aortic valve replacement and mitral valve pasty (n = 3). Types of prosthetic valves used are listed in Table III.

Prosthesis		Number (n)	Percentage (%)
Bioprosthesis (n = 16; 53.3%)	Carpentier-Edwards	16	53.3
	Duromedics	2	6.7
Mechanical Prosthesis (n = 14;46.7 %)	Starr 3M	8	26.6
	St Jude	4	13.4
TOTAL		30	100

Table III: Types of Prosthesis

Surgical follow-up was uneventful in 29 patients. Hospital mortality was 3.3% (n = 1) related to a low cardiac output. Mean follow-up was10.93 ± 3.9 years (extremes: 0-13 years) with a total follow-up of 152 patients per year. Morbidity included lung infection (n = 3), right heart failure (n = 2), hepatocellular insufficiency (n = 1) and atrial fibrillation (n = 1). All alive patients were in NYHA I / II functional class. At short term, disappearance of the TI murmur was noted in all survivors. At midterm, improvement rate of functional status was 56.4 % (Figure1).

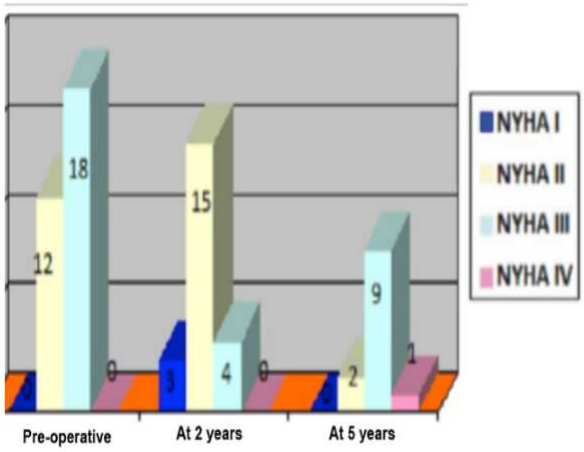

Figure 1: Clinical evolution at mid and long term

Risk factors	Neglected FTI aggravation (n=15)	Relative Risk (RR)	CI 95% [-]	P
Age (< 25ans)	10	0.8333	0.3233-2.14	00335
Sex (Female)	12	0.750	0.2815-1.9983	0.255
Preoperative heart failure Phase (> 1)	11	0.9167	0.2995 – 2.8057	0.0227
Moderate FTI	12	1.143	0.444 – 2.938	0.046
Mitral surgery	12	2.051	0.9561-6.62	0.0048

Table IV: Risk factors for aggravation of neglected functional tricuspid insufficiency

At long term, aggravation of neglected FTI (n=9; 75%) was the dominant post-operative complication. Average time for worsening FTI was 3.1 ± 2 years. Risk factors for aggravation of neglected FTI (n = 15) shown in Table IV were as follows: episodes of preoperative cardiac failure (p =0.0227), mitral valve surgery (p = 0.0048) and moderate TI (p = 0.046).

Discussion

Such as in our tropical context[1], combined minimal or moderate functional TI and left valvular heart diseases is frequent, in the range of 74-86%7; in post-operative period, it has been noted that FTIN at mitral valve surgery may have variable evolution; therefore, evaluating late postoperatively FTIN during mitral or mitral-aortic surgery becomes relevant. Worsening FTIN after mitral or mitral-aortic surgery occurs in 7.7 to 67% of cases[7,8,9] independently of valvular heart diseases etiology[1,9,10]. For Kwak et al[9], aggravation of FTI could be moderate (7.5%) or severe (19.5%) several years after mitral and / or mitral-aortic surgery. According to Dreyfus and al[11], based on perioperative measurement of tricuspid ring diameter, aggravation rates of FTI from minimal to moderate or to severe were 41% and 34% respectively after mitral surgery. Causes of worsening FTIN were residual mitral insufficiency and persistent pulmonary arterial hypertension[11]. From Dreyfus et al[11] viewpoint FTI can be neglected per-operatively when tricuspid ring diameter is less than 70 mm as recommended by Bonow RO et al[12]. On this basis, right ventricular failure preoperative symptoms have regressed in our NYHA class III patients similarly to Dreyfus GD and al[13] experience. He mentioned that clinical improvement was related to left cardiac valvular dysfunction correction by either mitral and / or aortic replacement or mitral plasty[13]. Clinical improvement often contrasted with echocardiographic and Doppler results of FTIN after mitral valve surgery[2,5,14]. In our study, in[15] patients, as expressed by some authors[11,14,15], onset of right ventricular failure symptoms, persistent preoperative pulmonary arterial hypertension post-operatively generated worsening neglected FTI at middle and long term and subsequently right ventricular dysfunction[16,17]. Izumi et al[18] reported between 4 and 24 years of post-operative period, 14% of severe aggravation of neglected FTI during rheumatic valve mitral surgery. Conversely, at seven years, Kirali K et al.[5] observed a significant regression of tricuspid regurgitation, of systolic pulmonary arterial pressure, and of left atrium diameter when comparing moderate FTIN and organic TI after rheumatic mitral valve surgery without pulmonary arterial hypertension. At 10 years of age, Kim H et al[19] showed 10% of minimal neglected TIs after mitral

valve replacement shifted faster after mitral-aortic valve surgery than after isolated mitral or aortic surgery. Majority of authors[4,16,20,21] assert that, in the long term, FTI continues to worsen after mitral and/or mitral-aortic valve surgery. From those authors predictive factors for late aggravation of FTI were: moderate FTI, TI grade II at echocardiography[22], atrial fibrillation[9,22], mitral surgery[9], left atrium dilatation22 and right ventricle failure [8,16,22,23]. According to Kim JB et al.[22], advanced age and neglected moderate FTI were predictive independent factors for moderate FTI aggravation after rheumatic mitral valve replacement. In our study, besides moderate FTI and mitral valve surgery, age less than 25 years, pre-operative cardiac failure episodes before surgery were in the long term, risk factors for worsening FTIN. For Kirali et al[5], predictive factors for late mortality were: age, severe post-operative TI (> grade 3) and
pulmonary arterial hypertension. Mortality proportionally goes up with preoperative tricuspid regurgitation degree in patients with aortic valve surgery due to a severe aortic valve regurgitation[24]. For several authors[19,24,25,26,27]pulmonary arterial hypertension higher than 50 mmHg combined with moderate FTI would be the only condition for performing tricuspid annuloplasty which could improve neglected moderate FTI survival rates.

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