FREQUENCY OF CORONARY ANOMALIES AMONG PATIENTS WITH TETRALOGY OF FALLOT

Zia-Ullah[1], Imran Khan Khalil[2], Zia Ul-Haq[3]

ABSTRACT

Objective: We report the results of our retrospective cross sectional study from January 2015 through June 2017, with regards to frequency of coronary anomalies among patients with tetralogy of Fallot at a tertiary care hospital.

Methodology: Computed tomography angiography (CTA) results of tetralogy of Fallot were extracted from pediatric cardiology clinic of Hayatabad Medical Complex, Peshawar from January 2015 to June 2017. All the CTAs were taken with the help of Toshiba 64 aquiloin machine and reviewed by pediatric cardiologist. Overall, data was summarized using tables and graphs. Statistical analyses were performed using SPSS version 22. Statistical significance was defined as $p<0.05$.

Results: Total of 105 patients was included in the study. Age range was from 2 and half months (0.21 years) to 30 years with mean age of 7.5 years (Standard Deviation 6.5 years). Males were 64 (61%) while females were 41 (39%). Coronary anomalies were present in 4 patients i.e. 3.8%. The most common anomaly was that of the single coronary artery i.e. 1.9%. In one patient left anterior descending artery originated from right coronary artery and one patient had large conal branch of right coronary artery in front of infundibulum.

Conclusions: Coronary anomalies were present in 3.8% of patients with tetralogy of Fallot. The most common anomaly was the single coronary artery followed by left anterior descending (LAD) from right coronary artery and large conal branch of right coronary artery (RCA) in front of right ventricular outflow tract (RVOT)

Key words: Tetralogy of Fallot, Computed tomographic angiography, Coronary anomalies

INTRODUCTION

Tetralogy of Fallot (TOF) is the most common cyanotic congenital heat disease[1]. It occurs in 3 of every 10,000 live births and comprises almost 10% of all congenital heart disease[2]. This anomaly consists of an inter-ventricular communication, also known as a ventricular septal defect, obstruction of the right ventricular outflow tract, overriding of the ventricular septum by the aortic root, and right ventricular hypertrophy[2,3]. Diagnosis is usually established with transthoracic echocardiography[4,5]. Computed tomographic angiography (CTA) is also complementary to echocardiography in diagnosing tetralogy of Fallot[5]. Coronary artery abnormalities are associated with TOF in 5% to 8% of cases[6,7]. The most common pattern is the left anterior descending (LAD) artery arising from right coronary artery which follows an anterior path to the right ventricular infundibulum[2]. A prominent conal branch of the right coronary artery may also run in front of the infundibulum[8], a potential site of surgical incision. These findings change the surgical approach, involving the introduction of a conduit between the right ventricle and the pulmonary arteries (RV–PA conduit) rather than right ventricular infundibulotomy because of the possible associated myocardial ischemic damage[6]. Another anomaly is that of a single coronary artery and some studies have reported this to be the most common pattern[9,10]. One study has reported the origin of circumflex coronary artery from right coronary artery[11]. Though the diagnosis of coronary artery anomalies in Tetralogy of Fallot can be made with echocardiography, various studies have shown low sensitivity for this modality[12,13]. Though invasive angiography is gold standard for the diagnosis of coronary anomalies in TOF, it is not without risks. Cardiac CT angiography is an attractive alternative not only because the risks of an invasive examination are avoided, but also because sedation risks also are eliminated in most cases[7,14]. As depicted earlier, coronary distribution impacts upon the decision making for surgery and subsequent management so it is necessary to find the origin and course of coronaries in TOF patients before proceeding to surgery[15]. This study aimed to determine the frequency of coronary anomalies among patients with tetralogy of Fallot from January 2015 through June 2017 in pediatric cardiology unit of a teaching hospital.

[1] Paediatric Cardiology Department, MTI, Hayatabad Medical Complex, Peshawar
[2] Cardiovascular Surgery Department, MTI, Lady Ready Hospital, Peshawar
[3] Institute of Public Health & Social Sciences, Khyber Medical University, Peshawar

Address for correspondence:
Dr. Ziaullah
Associate Professor Paediatric Cardiology
Hayatabad Medical Complex, Peshawar.
Contact: 0302-4611082
Email: drziau@yahoo.com

METHODOLOGY

Computed tomography angiography (CTA) results of patients with tetralogy of fallot (TOF) were extracted from pediatric cardiology clinic of Hayatabad Medical Complex, Peshawar from January 2015 to June 2017. All the CT angiograms were taken with the help of Toshiba 64 aquiloin machine and reviewed by pediatric cardiologist and all patients with above diagnosis were included in the study. Overall, data was summarized using tables and graphs. All statistical analyses were performed using SPSS version 22. Statistical significance was defined as $p<0.05$.

RESULTS

Total of 105 patients was included in the study. Age range was from 2 and half months (0.21 years) to 30 years with a mean age of 7.5 years. Males were 64 (61%) while females were 41 (39%). Coronary anomalies were present in 4 patients (3.8%). The most common anomaly was that of the single coronary artery 2 (1.9%). In one patient (1%) left anterior descending (LAD) artery originated from right coronary artery (RCA) and one patient (1%) had large conal branch of right coronary artery (RCA) in front of infundibulum. All these coronary anomalies were only noted in male patients. (P value 0.44)

Table1: General Characteristics

Variable	Value
Total no. of patients	105
Males	64(61%)
Females	41(39%)
Mean age	7.5 years
Minimum	2.5 months
Maximum	30 years

Table2: Coronary anomalies

Coronary anomalies	No (%)
No coronary anomaly	101 (96.20)
Single coronary artery	2 (1.9)
LAD from RCA	1 (1)
Conal branch in front of RVOT	1 (1)

Table3: Distribution of coronary anomalies among gender

	No coronary anomaly	Single coronary artery	LAD from RCA	Conal branch in front of RVOT
Male	61	02	01	01
Female	41	00	00	00

DISCUSSION

The surgical management of tetralogy of Fallot (TOF) may be complicated by anomalies in the course and distribution of coronary arteries[16]. Injury to the anomalous coronary artery during repair of TOF may cause myocardial infarction and may lead to death[17], so accurate preoperative assessment of coronary anatomy is essential to avoid postoperative complications. Although transthoracic echocardiographic analysis remains the first-line imaging modality for the preoperative evaluation of patients with TOF, computed tomographic angiographic analysis had 100% sensitivity and 100% specificity for detecting coronary artery abnormalities[18]. In this study computed tomographic angiographic results of 105 patients were reviewed and coronary anomalies were noted in 4 patients (3.8%). The incidence of coronary anomalies in TOF patients is lower in our study in comparison to most other studies by Hussain[10], Kervancioglu[19], fellows[8], Gumbiene[20]. The most common anomaly in our study was that of the single coronary artery i.e. in 2 patients (1.9%). This finding is consistent with some other studies by Hussain[10], farsani[9] and Hekmat[21]. Studies by Kervancioglu[19], Eugene, bailiard[2] have shown LAD from RCA as the most common coronary anomaly in TOF patients, while in our study one patient (1%) had left anterior descending (LAD) artery originated from right coronary artery (RCA) ranking second most common anomaly and one patient had large conal branch of RCA in front of infundibulum. An another finding that we noted in our study was that all the coronary anomalies were found to be in male patients with TOF and female patients were devoid of them but this finding was statistically non-significant.

Our study has some limitations. First, there is the matter of a selection bias, for which we selected only patients with a diagnosis of coronary anomaly in tetralogy of Fallot obtained from computed tomographic angiography, and from which we excluded patients whose CT angiographic scans were negative (either true or false negative). Second, the results of the study are those of a single center. Therefore, it might not be accurate to generalize these results beyond centers that have experience and equipment similar to ours. It is recommended to conduct a multicenter study to confirm our results

CONCLUSION

This study showed the incidence of coronary artery anomalies to be 3.8 % that is lower than most other studies in this regard. The most frequent coronary artery anomalies were the single coronary artery ostium, followed by the left anterior descending (LAD) artery arising from the right coronary artery (RCA) and large conal branch of the right coronary artery that crossed in front of right ventricular tract outflow tract (RVOT) making it surgically important.

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