Introduction

Tetralogy of Fallot is the most common cyanogenic congenital heart disease with an incidence of approximately 0.5/1000 live births [1-10]. It statistically accounts for 5-8% of congenital heart disease [4, 10]. BARAKAT found in one of his hospitals studies an incidence of 4.9/1000 live births. Management of this curable heart disease requires a specialized environment, in particular an operating room adapted for pediatric cardiac surgery as well as a pediatric and neonatal intensive care unit [1]. Currently, Fallot tetralogy screening is performed at a young age and even antenatally in developed countries. In sub-Saharan Africa, particularly in Senegal, despite many advances in the management of Fallot tetralogy, predilections in its management still prevail.

This delay in management leads to long-term complications of “aged Fallot”. The new medical-surgical cardio pediatric center CUOMO inaugurated in Dakar in early 2017, raises hope for surgical management of children with heart disease in the country.

Methodology

This is a retrospective study of 125 cases of tetralogy of Fallot collected in the cardiology department of CHNEAR. We included all children with a tetralogy of Fallot confirmed by cardiac ultrasound followed in the cardiology department of the Albert Royer Children’s Hospital in Dakar from January first, 2010, to December thirty-one, 2015.
Results
During the study period, 672 children with congenital heart disease were included in CHNEAR’s cardiology department. Tetralogy of Fallot accounted for 18.6% of congenital heart disease. The sex ratio is 1.6. Inbreeding was noted in 38.9% of patients. Symptoms began on average at 8.6 months [range 0-36 months]. Age at diagnosis ranged from birth to 120 months with a mean of 20.19 months. The time from symptom onset to age at diagnosis averaged 11.5 months. Cyanosis was the main sign of disease onset (33.2%) followed by dyspnea (31.1%), anoxic discomfort (12.8%), and squatting (10.1%). (Table 1) illustrates the circumstances of the discovery of Fallot’s tetralogy and (Figure 1) the main physical signs.

Table 1: Circumstances of Discovery of the Tetralogy of Fallot

| Circumstances of Discovery | Case | Percentage (%) |
|---------------------------|------|----------------|
| Dyspnea + fatigability    | 30   | 24             |
| Cyanosis                  | 36   | 28.8           |
| Squatting + walking fatigue | 17   | 13.6           |
| Delayed psychomotor development | 1 | 0.8 |
| Anoxic discomfort         | 29   | 23.2           |
| Malnutrition/Staturo-ponderal Retardation | 1 | 0.8 |
| Malformative assessment   | 2    | 1.6            |
| Heart murmur + cyanosis   | 2    | 1.6            |
| Preoperative assessment   | 2    | 1.6            |
| Sepsis                    | 2    | 1.6            |
| Repeated lung infections  | 3    | 2.4            |

Complications were detected in 20 patients (16%). Infectious complications occurred in 14 patients (11.2%), with mainly cerebral abscesses (4.8%) followed by recurrent pneumonia (3.2%). Vascular complications were found in 6 patients (4.8%) with mainly cerebral thrombosis (3.2%). 18 patients (14.4%) who did not receive surgical management, deceased.

The overall postoperative outcome following a complete surgical treatment was favorable/acceptable. However, some complications were noted with one case of conduction disorders (complete AVB); 4 cases of residual pulmonary stenosis, and mild pulmonary insufficiency in 3 patients. There were 2 postoperative deaths due to hemorrhagic syndrome increasing the number of deaths to 20 (16%).

Discussion
The prevalence of Fallot tetralogy in our series was 18.6%. Our results are consistent with several African studies. In fact, KAKOU found a prevalence of 15.5%, BARAKAT 16.6%, and DIOP 16.49% [2, 6]. The age at diagnosis is 20.19 months, in line with some African studies. (Table 2) compare the age at diagnosis of Fallot’s tetralogy in different studies and the (Table 3) compare the summary of clinical signs of Fallot’s tetralogy between different series. Results discrepancy with Western studies is justified by the early diagnosis of Fallot tetralogy, generally, in antenatal care. In comparison, DIOPs series completed from 1992 and 1995 in
Senegal revealed an earlier age at the time of diagnosis. This finding indicates an improvement in the means of diagnosing congenital heart disease in Senegal over time. In our study, 64.8% regular and 35.2% irregular shapes were identified. The ELYANDOUZI series also conceded the regular form to be the most frequent with 78.46% in the LAMLIKI study and 57.7% in the KAKOU study. A brain abscess was noted in 4.8% of our patients; whereas it was lower in the DIOP series (2.9%); and non-existent in the ELYANDOUZI and LAMLIKI series. In our palliative series, Blalock-modified surgery was performed in 12.8% of patients. Curative surgery was executed in 30.4% of patients. In the DIOP series undergone years ago (1992-1995), only 20.6% of patients were able to benefit from curative surgery. The mean age at the time of Blalock-modified surgery was 28.6 months in our series, which was greater than in the ELYANDOUZI series of 18 months; but lower than in the KAKOU series of 56 months and in the THIAM series of 57.6 months. The mean age at the time of curative surgery was 103 months; while in the ELYANDOUZI series, it was 58 months. The age was greater in the KAKOU series where it was 91 months. In the THIAM series, the average age at the complete cure was 83.35 months. Results found in the sub-Saharan African series, particularly in ours, testify to the adverse effects in the late treatment of Fallot tetralogy.

Table 2: Age at diagnosis of Fallot’s tetralogy in different studies

| Author          | Location of the study | The average age of diagnosis (months) |
|-----------------|-----------------------|--------------------------------------|
| GUIRGIS [5]     | France                | 3.7                                  |
| NEED [8]        | UNITED STATES         | 4.9                                  |
| ELYANDOUZI [3]  | Fez (Morocco)         | 30                                   |
| LAMLIKI [7]     | Rabat (Morocco)       | 48                                   |
| BARAKAT         | Lagos (Nigeria)       | 51.6                                 |
| KAKOU           | Abidjan (Ivory Coast) | 136.8                                |
| DIOP            | Dakar (Senegal)       | 100.3                                |
| Our series      | Dakar (Senegal)       | 20.19                                |

Table 3: Summary of clinical signs of Fallot’s tetralogy between different series

| Clinical events               | Our study (%) | ELYANDOUZI (%) | LAMLIKI (%) | DIOP (%) | BARAKAT (%) | THIAM [9] (%) |
|-------------------------------|---------------|----------------|-------------|----------|-------------|---------------|
| Cyanosis                      | 81.6          | 95             | 98.46       | 79.41    | 72.1        | -             |
| Dyspnea                       | 81.6          | 85             | 40          | 94       | 4.2         | 79.4          |
| Anoxic discomfort             | 32            | 43             | 36.9        | 17.6     | -           | 44.1          |
| Squatting                     | 32            | 31             | 21.5        | 76.47    | 2.4         | 55.9          |
| SaO2                          | 70            | 74             | -           | 91       | -           | -             |
| Digital Hippocratism          | 60.8          | 38             | 30.8        | 70.58    | -           | -             |
| Delayed psychomotor development | 4.6           | -              | 3.02        | -        | -           | -             |
| Staturo-ponderal delay        | 20.5          | 5              | 26.15       | -        | 0.6         | 5.9           |
| Breath of pulmonary stenosis | 84            | 99             | -           | -        | -           | 23.5          |

Limitations of our study
The limitations of our study are mainly related to its retrospective nature. We had difficulties in exploring our files, while occasionally missing complementary examinations.

Conclusion
Even though the results of our series indicate an improvement in the management of Fallot tetralogy in Senegal, this is still insufficient. These results are encouraging, given that patients with Fallot tetralogy did not previously receive adequate care. A great deal of effort must be made in the early detection of this cardiopathy. The new medical-surgical cardiopediatric center CUOMO inaugurated in Dakar in early 2017 raises hopes for the surgical management of children with heart disease in Senegal.
References

1. Barakat AA, Akpoembe DMW, Samuel O, Olisamedua FN (2015) Children with Tetralogy of Fallot in an Urban Centre in Africa. J Cardiovasc Thorac Res 7: 168-171.

2. Diop IB, Ba SA, Sarr M, Kane A, Hane L, et al. (1997) Tetralogy of Fallot. Anatomy-clinical, prognostic and therapeutic features Dakar Med 42: 118-122.

3. Elyandouzi A (2012) Tetralogy of Fallot (about 55 cases) Thesis. Med Fez 2013: 43.

4. Friedli B (2010) Tetralogy of Fallot EMC SAS, Paris, Cardiol.

5. Guirgis H, Losay J, Serraf (1991) Complete cure of the tetralogy of Fallot in the infant of less than 6 months. Arch Mal Coeur Vaiss 84: 679-683.

6. Kakou-Guikahue M (2008) Therapeutic approach to Fallot tetralogy in sub-Saharan Africa: to About 130 cases hospitalized at the Abidjan Heart Institute (ICA) Cote d’Ivoire Afr. Ann Thorac Cardiovasc Surg 3: 39-44.

7. Lamliki O (2015) Surgical results of Fallot tetralogy surgery (About 65 cases) Thesis. Med Rabat 35.

8. Need LR, Powell AJ, Del Nido P (2000) Coronary echocardiography in tetralogy of Fallot: diagnostic accuracy, Resource utilization and surgical implications over 13 years. J Am Coll card 36: 1371-1377.

9. Thiam M (2009) Fallot Tetralogy Surgery: Indications and Results (About 34 cases operated on Dakar) Thesis. Med Dakar 146.

10. Vaujois L, Gorincour G, Alison M, Dery J, Poirier N, et al. (2016) Postoperative imaging after complete repair of a Fallot tetralogy. J Radiol Diag Interv 97: 182-194.