Heart Lesion After the First Attack of the Rheumatic Fever 22 Years Experience in Single Centre

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ABSTRACT

Background Acute rheumatic fever and its sequels, rheumatic heart diseases, remain major unsolved preventable health problems in Kosovo population, particularly among the disadvantages indigenous Albanian and Egyptians people. In Kosovo, despite of performing secondary prophylaxis with benzathine penicillin, acute rheumatic fever hospitalization rates have remained essentially unchanged for the last 20 years. The role of echocardiography in the diagnosis of acute rheumatic carditis was established over the last 20 years. Aims In this study we aimed to determine the prevalence of rheumatic heart disease in children from Kosovo population with first attack of acute rheumatic fever. Also, we presented that echocardiography examination detects a greater prevalence of rheumatic heart disease than other diagnostic procedures. We aimed to compare the sensitivity and specificity of cardiac auscultation, ECG record, lab analysis to echocardiography and to determine the feasibility of specific age in this setting. Methods To optimize accurate diagnosis of rheumatic fever and rheumatic heart disease, we utilized two group models. In the first group of 388 children, hospitalized and treated before 1999, diagnosis of rheumatic fever was decided basing on the clinical and laboratory findings whereas in second group (221 children treated from 1999 to 2010) clinical and lab diagnosis were amplified also on the detection by echocardiography. Conclusion In second group, using echocardiography as a method of diagnosis and assessment children with rheumatic fever, we found high rates of undetected rheumatic heart disease in this high-risk group population. Echocardiographic examination of children with rheumatic fever for rheumatic heart disease may over diagnose rheumatic heart disease unless congenital mitral valve anomalies and physiological regurgitation are excluded.

Key words rheumatic fever, rheumatic heart disease, chorea minor, echocardiography.

1. INTRODUCTION

Acute migratory polyarthritis, then known as “acute articular rheumatism” was the first manifestation described simultaneously in 1605, in France from Guilleaume de Baillou and in England by Thomas Sydenham. The following year he described the disorder of movement (St Vitus dance) that is now called Sydenham’s chorea. The clinical manifestations of rheumatic fever were described in the latter half of 17th century. The full clinical syndrome was appreciated only near the end of the 19th century. In 1944 Thomas Duckett Jones proposed a set of guidelines for the diagnosis of rheumatic fever, now known as the Jones’ criterions.(1, 2, 3, 4). Rheumatic fever is now considered an acute non-suppurative inflammatory disease that follows group A Streptococcal infection of the throat (5, 6).

At the beginning of the 21st century, and 400 years after the first description, it has remained the most common cause of acquired heart disease in underdeveloped countries, in children and young adults. It has continued to be a major public health problem worldwide, but particularly in developing countries. In 1990, the World Health Organization estimated that 12 million people are affected, with more than 400 000 deaths occurring annually and with hundreds of thousands more, mainly children, left disabled. Although the incidence has declined significantly in developed countries, rheumatic fever is relatively uncommon in North America and in the most European Countries but is still often in some Balkans countries, including Kosovo too. The consequences of acute rheumatic fever remain significant: approximately 80 % of patients have cardiac involvement with clinical and subclinical cardiitis during their acute episode and 35 % go on to develop moderate or severe rheumatic heart disease. Rheumatic heart disease result in considerable expensates to the health system and personal cost to patients whose career choices, quality of life; medical and surgical treatment and fertility are adversely affected. Rheumatic mitral stenosis is common in such children and adults, many times without a history of rheumatic fever in previous period (6, 7, 8).

Kosovo is the youngest country in the world, with youngest population in the Europe, where 50 % of citizens are younger than 25 years. In the same time Kosovo was the most underdevelopment when it was a part of Yugoslavia.
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slavia, with a very low level of social and health care services. All of these issues have led to an increase in the incidence of rheumatic fever in that period in Kosovo. (3, 8, 9)

The role of echocardiography in the diagnosis of acute rheumatic carditis was established over the last 20 years. The World Health Organization recommends screening for rheumatic fever and rheumatic carditis in all affected children and in high risk population. The recent availability of compact portable echocardiography has led to the growing use of technology for rheumatic heart disease screening in a number of low-income countries where it is shown to detect significantly more rheumatic heart disease than laboratory analysis and cardiac auscultation. Recent data showed that in those low-income countries the prevalence of rheumatic heart disease varying from 75 per 100,000 children in urban population in South Auckland, 21.5 per 1000 in Cambodia and 42.6 per 1000 in Tonga (8, 9, 10). Echocardiography detects clinically inaudible yet hemodynamically significant valve lesions, and can exclude pathology in those with an innocent cardiac murmur. After the war in Kosovo we established guidelines for echocardiography screening for all children with or suspected for/or with rheumatic fever in order to confirm or exclude the presence of carditis and heart lesions.

2. OBJECTIVE

Based on the high incidence of rheumatic fever in Kosovo and the high number of patients with rheumatic heart disease, despite the improvement in prevention and treatment, our objective was to present all children admitted and treated from rheumatic fever in the Pediatric Clinic in Pristhina, during the period 1998 – 2010 and to describe the clinical manifestations and heart lesions, as diagnosed by echocardiography.

3. PATIENTS AND METHODS

Between January 1988 and December 2010, at Division of Cardiology and Rheumatology 609 patients were admitted with diagnosis of acute rheumatic fever. Diagnosis was based on using the modified Jones’ criterion. Patients were divided in two groups: Group I include patients admitted from January 1988 to December1998 and, Group II, included patients admitted from January 1999 to December 2010. Criteria for separation were war during the 1999 and, input of the echocardiography as a method for diagnosis and assessment heart lesions. Our study was based on the examination of medical records of 388 patients treated from Group I, and on the medical records and echocardiograms of 221 patients from Group II.

A single pediatric cardiologist executed echocardiograms and every patient underwent three or more examinations, with a mean interval of 15 days. Most of the patients have been under and streptococcical prevention, 364 children (93.8%) from first group and 211 (95%) from second group. None of the patients was receiving cardiovascular medications at the time of the echocardiographic examinations.

Before the examination, weight and stature were recorded and the body surface area was calculated by the Dubois and Dubois formula. Also, blood pressure was measured and 12-lead electrocardiogram record was obtained.

All the echocardiograms were performed at rest, without sedation, and included the M- and two-dimension modes, besides Doppler examination with color-flow mapping. The ultrasound systems used were: Acuson Aspen Advanced, Acuson Sequoia 256 and Hewlett Packard 2000 Sonos.

The diastolic and systolic diameters were measured using M-mode in the parasternal short axis view. Systolic function and dimensions of the left ventricle were obtained and the ejection fraction was obtained by the Teichholz method, and values equal to or above 55% were considered normal.

The morphological aspect of the valves was evaluated by the two-dimensional echocardiography. The severity of mitral and aortic regurgitation, and mitral and aortic stenosis were determined by color-flow Doppler evaluation and reported according to the recommendations of the American Society of Echocardiography. Gain settings were optimized by the sonographers as the large variation in body habitus precluded the use of standardized settings. Valve leaflet morphology was assessed in parasternal long and short-axis views. When indicated, echo-

| N of patients | Male N % | Female N % | Arthritis N % | Carditis N % | Ch.minor N % | N. subcut. N % | E. margi. N % |
|---------------|----------|------------|-------------|-------------|-------------|---------------|---------------|
| 1988          | 38       | 20 (52.6)  | 18 (47.4)   | 32 (84.2)   | 31 (81.5)   | 4 (10.5)      | 12 (31.5)     | 13 (34.2)     |
| 1989          | 19       | 10 (52.6)  | 9 (47.4)    | 17 (89.4)   | 16 (84.2)   | 2 (10.6)      | 4 (21.0)      | 4 (21.0)      |
| 1990          | 25       | 14 (56.0)  | 11 (44.0)   | 22 (88.0)   | 23 (92.0)   | 3 (12.0)      | 8 (32.0)      | 6 (24.0)      |
| 1991          | 30       | 13 (43.3)  | 17 (56.6)   | 28 (93.3)   | 26 (86.6)   | 2 (6.6)       | 13 (43.3)     | 7 (23.3)      |
| 1992          | 53       | 23 (43.3)  | 30 (56.7)   | 47 (88.6)   | 47 (88.6)   | 6 (11.4)      | 18 (33.9)     | 23 (43.3)     |
| 1993          | 58       | 32 (55.1)  | 26 (44.9)   | 54 (93.1)   | 54 (94.8)   | 4 (6.9)       | 23 (39.6)     | 19 (32.7)     |
| 1994          | 41       | 18 (43.9)  | 23 (56.1)   | 38 (92.6)   | 39 (95.1)   | 3 (7.4)       | 28 (68.2)     | 23 (56.0)     |
| 1995          | 37       | 18 (48.6)  | 19 (51.3)   | 36 (97.2)   | 32 (86.4)   | 1 (2.8)       | 14 (37.8)     | 16 (43.2)     |
| 1996          | 21       | 12 (57.1)  | 9 (42.8)    | 21 (100)    | 19 (90.4)   | 0             | 12 (57.1)     | 12 (57.1)     |
| 1997          | 43       | 24 (55.8)  | 19 (44.1)   | 42 (97.6)   | 39 (90.6)   | 1 (2.4)       | 23 (53.4)     | 36 (83.7)     |
| 1998          | 23       | 12 (52.6)  | 11 (47.2)   | 20 (86.9)   | 22 (95.6)   | 3 (13.1)      | 12 (52.1)     | 18 (78.2)     |

Table 1. Data of patients from Group I, based on the Jones’ criterions Ch.minor – chorea minor, N.subcut. – nodules subcutaneous, E.margi. – erythema marginatum
cardiophic measurements were interpreted according to the body surface area.

4. RESULTS AND COMMENTS

**Global evaluation**

From total number of 609 children included in our study, 388 (63.7%) belong to the Group I, with nearly equal frequency in males and females (311 male or 51% and 298 female or 49%), aged 5 to 17 years, with a median 11 years. All patients were white, 238 (61.3%) were from rural environments and 150 (38.7%) from urban communities. All children underwent careful clinical examination specifically evaluating for manifestations of rheumatic fever e.g. migratory polyarthritis, chorea minor, carditis, rash, cardiomegaly on a chest radiograph and AV-block on the electrocardiogram.

Data from Table 1 shows decreasing number of patients in the end of 80’s and, increasing of the number in the beginning of last decade, with peak of incidence in 1993. In both groups incidence of the carditis and other Jones’ criterions are equal and, basing on the clinical findings towards recovery. (11, 12) In our study in acute stadium of rheumatic fever, 75% of children with carditis and, 1% with chorea minor manifested systolic murmur. Three months later this number decreased in 62%.

5. DISCUSSION

The advent of echocardiography has paved the way for a clearer understanding of the pathophysiological findings observed in the hearts of patients with rheumatic fever. Results from this diagnostic modality have shown that as many as three-fifths of patients without clinical evidence of carditis had significant findings of mitral valvar prolapse, annular dilation, chamber enlargement and multiple valvar regurgitation (13, 14).

Echocardiography as a method for evaluation of cardiac problems (congenital anomalies and lesion of rheumatic fever) in our Division started improving from September 1999. In our study, we noted that from 221 patients with acute rheumatic fever, 198 or 89.59 % manifested echocardiographic parameters of carditis. Diagnosis was based in the value of dimensions of the left ventricle and value of fractional shortening or the ejection fraction using Teichholz method of calculation. All children with carditis manifested FS fewer than 0.28. In 28 patients, with signs of heart failure we measured FS from 0.16 to 0.21, where 7 of them died, in acute period.

Carditis is the most common serious manifestation of the acute rheumatic process, since it is the only one that causes death during the acute attack or produces residual

| Table 2. Children who had developed systolic and diastolic murmur in comparison with children with a three dominate Jones’ criterions. Ch. Minor – chorea minor, S. murm – systolic murmur, D. murm. – diastolic murmur, Card/Ch.m – carditis/choria minor |
|---|---|---|---|---|
| N. of patients | Male N (%) | Female N (%) | Arthritis N (%) | Carditis N (%) | Ch. Minor N (%) | Ery marg N (%) |
| 1999 | 14 | 8 (64.2) | 6 (42.8) | 14 (100) | 12 (85.7) | 0 (0) | 4 (28.7) |
| 2000 | 30 | 16 (53.3) | 14 (46.7) | 28 (93.3) | 24 (72.0) | 2 (6.6) | 6 (6.6) |
| 2001 | 43 | 20 (46.5) | 23 (53.5) | 42 (97.6) | 40 (93.0) | 1 (2.3) | 7 (16.2) |
| 2002 | 33 | 17 (51.5) | 16 (45.5) | 33 (100) | 30 (90.9) | 0 (0) | 6 (18.1) |
| 2003 | 18 | 10 (55.5) | 8 (44.5) | 16 (88.8) | 16 (88.8) | 2 (11.1) | 6 (33.3) |
| 2004 | 11 | 5 (45.4) | 6 (54.6) | 10 (90.9) | 11 (100) | 1 (9.0) | 4 (36.3) |
| 2005 | 9 | 4 (44.5) | 5 (55.5) | 9 (100) | 9 (100) | 0 (0) | 2 (22.2) |
| 2006 | 11 | 4 (36.4) | 7 (63.6) | 9 (81.8) | 9 (81.8) | 2 (18.1) | 2 (18.1) |
| 2007 | 14 | 6 (42.8) | 8 (57.2) | 13 (92.8) | 13 (92.8) | 1 (7.14) | 2 (14.2) |
| 2008 | 16 | 7 (43.7) | 9 (56.3) | 14 (87.5) | 15 (93.3) | 2 (12.5) | 3 (18.7) |
| 2009 | 8 | 4 (50.0) | 4 (50.0) | 7 (87.5) | 7 (87.5) | 1 (12.5) | 2 (25) |
| 2010 | 14 | 6 (42.8) | 8 (57.2) | 12 (85.7) | 12 (85.7) | 2 (14.2) | 2 (14.2) |
| Total | 221 | 107 | 114 | 207 | 198 | 14 | 46 |
| 100 % | 48.4 % | 51.6 % | 93.6 % | 89.5 % | 6.3 % | 20.8 % |
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In our study 136 children (61.5%) from 221 manifested MR. For complete hemodynamic evaluation of MR we used the full range of echocardiographic techniques, especially color Doppler imaging which was the primary echocardiographic tool for detection and quantification of MR. In the determination of the severity of MR we used continual wave and color Doppler imaging. We used the average value of three measurements, indexing the regurgitation jet area to left trial size. From 132 of our patients with MR, 28 had trivial, 62 had medium and 42 had severe MR.

In future, fewer individuals with borderline regurgitation would need cardiology referral. The absence of universally accepted diagnostic criteria for rheumatic heart disease, in particular the morphological features, presents challenges for clinicians involved with rheumatic heart disease screening and diagnosis. There is some agreement that both morphological features and pathological grade regurgitation need to be present for echocardiographic diagnosis of rheumatic heart disease, but our analysis supports the use of more stringent Doppler criteria than were used in earlier studies. Ref) Further studies to achieve international standardization are required (9, 25, 26).

The most common cause of acquired aortic valve disease in children and adults in underdeveloped countries is rheumatic fever. The cusps are thickened and exhibits restricted mobility (27). In our study 31 patients manifested aortic insufficiency, and 24 of them manifested hemodynamic importance. Only 3 patients were presented with trivial aortic stenosis.

The tricuspid valve is rarely included in rheumatic fever and can be manifested as stenosis or regurgitation. We noted trivial tricuspid regurgitation in 12 patients and none of them with stenosis.

6. LIMITATIONS

We presented only data of patients which have been treated in our Institution, but real number could be much higher, basing in the fact that Albanian community boycotted new health institutions organized by Serbians. After next four years (1992-1994) thousands Albanians migrated in the West Europe and started supporting their families in Kosova. Despite of decreasing incidence in the next four years, presented statistical data showed that rheumatic fever remains still the highest in Europe. In this period we still didn't have echo machine to perform echocardiography and, this was the reason why we didn't have evaluation of heart lesion and, exact data of type and level of disability of the valves.

The tendency of increasing the incidence is present in period 1999-2001, despite of them that we don't have real data during the 1999, where war was in Kosova. This can

| N. of patients | Carditis N | Mitr. st. N % | Mitr ins N % | Ao. ins N % | Ao. st. N % | Tr. ins. N % |
|---------------|------------|--------------|--------------|------------|-----------|-----------|
| 1999          | 14         | 12           | 2.14         | 8.57       | 14.2      | 2.14      |
| 2000          | 30         | 24           | 13.3         | 16.63      | 10.0      | 2.66      |
| 2001          | 43         | 40           | 6.19         | 28.65      | 16.2      | 1.23      |
| 2002          | 33         | 30           | 2.0          | 22.66      | 12.2      | 2.0       |
| 2003          | 18         | 16           | 11.1         | 12.66      | 16.6      | 1.5       |
| 2004          | 11         | 11           | 3.72         | 8.72       | 3.63      | 0.0       |
| 2005          | 9          | 9            | 2.22         | 6.66       | 2.22      | 2.22      |
| 2006          | 11         | 9            | 1.81         | 6.54       | 3.72      | 0.0       |
| 2007          | 14         | 13           | 3.14         | 8.57       | 14.2      | 0.0       |
| 2008          | 16         | 15           | 1.25         | 8.50       | 0.0       | 0.0       |
| 2009          | 8          | 7            | 0.0          | 6.75       | 0.0       | 0.0       |
| 2010          | 14         | 12           | 2.14         | 8.57       | 1.71      | 0.1       |
| Total         | 221        | 198          | 89.59        | 13.12      | 61.53     | 14.0%     |

Table 4. Group II – patients with carditis and lesion of the heart valves; Mitr.st. – mitral stenosis, Mitr. ins. – mitral insufficiency, Ao. ins. – aortic insufficiency, Ao. st. – aortic stenosis, Tr. ins. – tricuspid insufficiency
be disserted as a consequence of the war, migration of the population from and to the Kosovo, destroyed of the infrastructure and poor health care service.

There are several technical factors that must be accounted for determining anatomic orifice size from this approach. We used two-dimensional echocardiography to visualize the actual restrictive orifice of the stenotic mitral valve and its limiting orifice. We also used Doppler echocardiography to determine the transvalvular gradient from left atrium to the left ventricle, using the continuous wave Doppler and color Doppler. In our study it was one of the most important factors in determining severity of mitral stenosis and relationship to the patient’s functional status.

7. CONCLUSION

Despite results of economic development and increasing level of social and health services Kosovo still remains one of the most underdevelopment countries in Europe, where Chronic diseases e.g., cystic fibrosis, seasonal enterocolitis, tuberculosis and rheumatic heart disease overload the public health system and contribute to the high morbidity and mortality in these disease states. The number of the affected children with rheumatic fever remains still high, especially during the last war, while, more of them as a consequence left disable of heart lesion. In last decade we started applied echocardiography as a diagnostic method in evaluation and assessment of the carditis and heart lesion. In 1995 Veasy, proposed that Doppler evidences for mitral and aortic regurgitations be included as one of the minor manifestations in the revised Jones’ criterions provided that rigid echocardiographic rules are employed (6, 8, 10). Analysis of current data on the use of echocardiography has made Narulla and colleagues move one step further and in 1999 they concluded that the echocardiography and Doppler imaging may have a place as a major criterion in the Jones’s criterions. Implementation of this modification to the Jones’ criterions may not be practicable at this point in developing countries unless prospective well-controlled studies are done that demonstrate distinctly superior treatment and prognostic value of detecting carditis in this manner (25, 26). In developing countries exit opportunity for this proposes but, basing on the recent published data and on our experience and results we support this propose.

CONFLICT OF INTEREST: NONE DECLARED.

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