Advanced Medical Journal, Vol.9, No.4, P.8-14,2024 https://doi.org/10.56056/amj.2024.292

Transthoracic Echocardiography findings in patients with Ankylosing Spondylitis in Kurdistan region

Elaf Kamal Abdulwahab* **Dashty Abbas Albustany****

Abstract

Background and objectives: Ankylosing spondylitis is a chronic inflammatory disorder that affecting axial and non-axial joints leads to a loss of mobility and function over time. The aim of this study is to evaluate the cardiac involvement using transthoracic echocardiography.

Methods: A case-control research study took place at Rizgary Teaching Hospital Rheumatology Department between January 2022 and March 2023. Inclusion criteria involved those patients diagnosed with ankylosing spondylitis based on the Assessment of Spondylarthritis International Society criteria for axial spondylarthritis. Transthoracic echocardiography (vivid machine) had been performed for all the participants and parameters such as right and left ventricle dimension, aortic root dimension, left atrium dimension, interventricular septum thickness in diastole and ejection fraction had been documented.

Results: This study revealed that transthoracic echocardiography findings of patients with ankylosing spondylitis with diastolic dysfunction in 12%, mitral regurgitation in 8%, mitral prolapse in 10% and 2% of each of anteroseptal hypokinesia, dilated aortic root and aortic regurgitation. The study demonstrated a significant increase in right ventricular, aortic, and left atrium dimensions in patients with ankylosing spondylitis with a p value of 0.0001, 0.001 and 0.001 respectively. In terms of ejection fraction; this study showed a significant decrease in ejection fraction in cases of ankylosing spondylitis with a mean of 64.3% with a p value of 0.004.

Conclusion: Tricuspid regurgitation and a drop in ejection fraction are the two significant findings among patients with ankylosing spondylitis.

Keywords: Ankylosing spondylitis, Aortic root, Echocardiography, Tricuspid regurgitation

* MBChB, Trainee of Kurdistan Higher Council of Medical Specialties, Department of Rheumatology, Rizgary Teaching Hospital, Erbil -Iraq.
**MBChB, Consultant Rheumatologist & Internist, Assistant professor in Medicine, Department of medicine, College of medicine, Hawler Medical University, MBCHB, DIM, FICMS (Medicine), FRCP (UK-London). Email: dr_albustany@yahoo.com
Corresponding author: Elaf Kamal Abdulwahab. Email address: elianaelamo@gmail.com

Introduction

Ankylosing spondylitis (AS) is an ongoing inflammatory condition that affects the spine as well as sacroiliac joints and causing discomfort and rigidity. Over time, this condition impairs movement and function.[1] Despite the fact that the precise cause of AS is unknown, it is believed to be an outcome of a combination of environmental as well as genetic factors.[2] Ankylosing spondylitis is considered a type of arthritis that falls under the category of spondyloarthropathies, which are inflammatory joint diseases that affect the axial skeleton.[3] Although AS primarily affects the spine and sacroiliac joints, it can also cause inflammation and pain in other joints, such as hips, shoulders, and knees. Other symptoms of AS may include fatigue, fever, and weight loss.[4] The disease typically begins in early adulthood and affects men more frequently than women.[5] If left untreated, AS can progress and cause significant disability and a reduced quality of life.[6] Early diagnosis and treatment are crucial for managing the symptoms and preventing long-term complications, such as spinal deformity and disability.[7] In the United States, between 0.5 and 1% of adults have AS8, according to the National Institute of Arthritis and Musculoskeletal and Skin Diseases.[8] Nonsteroidal anti-inflammatory drugs (NSAIDs) are typically the initial option for therapy for AS.[9] In more severe cases, disease-modifying antirheumatic drugs (DMARDs) and biologic agents may be used. [10] Physical therapy and exercise are also important components of AS management, as stretching and strengthening exercises can help maintain flexibility and range of motion, while low-impact aerobic workouts can raise cardiovascular fitness and general health.[11] A greater risk of developing cardiac problems exists in AS patients, nevertheless, which are recognized complications of the disease.[12] Or side effect of drugs. Cardiac involvement is common in AS, with an incidence of between 2% and 10%, and may include various abnormalities in the heart and blood vessels. [13] The most common cardiac abnormality in AS is aortic valve disease, which includes aortic valve regurgitation and aortic stenosis.[14] The reversal of blood flow from the aorta into the left ventricle (LV) during diastole is referred to as aortic regurgitation (AR), also called aortic insufficiency. Valve leaflets or basic aortic root dysfunction can both cause AR.[15] On the other hand, The most frequent heart valve disorder demanding surgical or percutaneous intervention is aortic stenosis.[14] Echocardiography is considered a mainstay tool in forms of diagnosing these two disorders.[16] Patients with AS may also develop inflammation and dilation of the aorta, known as aortitis, which can lead to aortic aneurysm or dissection, both of which can be life-threatening if not promptly diagnosed and managed.[17] The chance of developing coronary artery disease (CAD), a disorder that occurs when the vessels carrying circulation to the heart constrict or become clogged by accumulation of plaque, may also be higher in those with AS. [18] Early detection and management of cardiac abnormalities can help prevent long-term complications and improve outcomes for patients with AS.[19] Regular monitoring with imaging modalities, such as echocardiography, may be recommended for AS patients with suspected or confirmed cardiac involvement.[14] Echocardiography, an imaging technique that visualizes the heart using sound waves at high frequencies, can identify a number of cardiac involvement-related abnormalities in AS. [20] Transthoracic echocardiography was used in our study to determine the cardiac involvement in patients with ankylosing spondylitis.

Patients and methods

This is a case control study is performed at Rheumatology department of Rizgary teaching hospital. This study has been

https://doi.org/10.56056/amj.2024.292

conducted between January 2022 and March 2023 and participants had been selected from the outpatient clinic. This study was submitted to the Ethics and Scientific committees of the Kurdistan Higher Council of Medical Specialties for scientific and ethical approval (Number 9). Inclusion criteria involved those patients diagnosed with ankylosing spondylitis based on the Assessment of Spondylarthritis International Society (ASAS) criteria for axial spondylarthritis. Those with cardiac disease, malignancy, diabetes, hypertension, first degree family with cardiac disease, renal or hepatic disease, other autoimmune diseases, or on long term steroid has been excluded from the study. Basic demographic data such as age, weight, height and gender plus medical history including visual analogue scale for pain, number of tender tendons and swollen joints has been obtained from participants. Transthoracic echocardiography had been performed for all the participants and parameters such as right and left ventricle dimension, aortic root dimension, left atrium dimension, interventricular septum thickness in diastole and ejection fraction had been documented. Other pathologies such as impaired left ventricular relaxation, left ventricular hypertrophy, diastolic dysfunction, mitral regurgitation and prolapse, and others had been documented as well. Data analysis was performed through the Statistical Package for the Social Sciences (SPSS) version 26. Quantitative continuous variables were presented as mean, median and standard deviation. Categorical nominal and ordinal variables were introduced in the form of frequencies and percentages. Statistical significance was determined by a p-value of ≤ 0.05. According to the Declaration of Helsinki, the study methodology was authorized by the Kurdistan Higher Council of Medical Specialties, and patient agreement was sought before we reviewed their medical records.

Results

One hundred participants have been included in this case control study; 50 of them had ankylosing spondylitis while the other fifty were the control group. The mean age of AS group was 37.74 ± 9.7 while the control group was 37.48 ± 9.9 with no statistical difference between the two groups as the p value was 0.895. In terms of gender; 41 males and 39 females within the case group had participated in this study with no statistical significance among the two groups as illustrated in Table (1). In terms of body mass index (BMI), it was higher in the case group but with no statistical significance. The duration of AS was 10.04 ± 6.6 years.

Table (1): Demographic variables.

		Case (n=50)	Control (n=50)	p value*
Age (years)		37.74 ± 9.7	37.48 ± 9.9	0.895
Gender, n (%)	Male	41	39	0.803
	Female	9	11	
BMI		26.16 ± 4.1	25.37 ± 3.4	0.308
Duration of AS (years)		10.04 ± 6.6		

*T-test had been conducted

Table (2) reveals the transthoracic echocardiography finding in both study groups. The case group had echo findings of diastolic dysfunction, mitral regurgitation, mitral prolapse, anteroseptal hypokinesia, dilated aortic root and aortic regurgitation more than the control group, but this difference had no statistical significance as the p value was more than 0.05. The case group had seven participants with tricuspid regurgitation with no such finding within the control group, the p value of 0.012 indicated that this difference was statistically significant.

https://doi.org/10.56056/amj.2024.292

Table (2): Transthoracic echography findings.

	Case (n, %)	Control (n, %)	p value*
Left ventricular hypertrophy (LVH)	1, 2%	1, 2%	1.0
Diastolic dysfunction (DD)	6, 12%	4, 8%	0.669
Mitral regurgitation (MR)	4, 8%	2, 4%	0.678
Mitral prolapse (MP)	5, 10%	1, 2%	0.204
Tricuspid regurgitation (TR)	7, 14%	0	0.012
Anteroseptal hypokinesia	1, 2%	0	1.0
Dilated aortic root	1, 2%	0	1.0
Aortic Regurgitation	1, 2%	0	1.0

*Fisher's Exact Test had been conducted

The dimension of the right ventricle was higher in AS group than health group with a mean of 23.03 and 21.16 for both groups respectively. Given a p value of 0.05, this difference was statistically significant. The aortic root and left atrium dimensions are different across the two distinct groups, with a p value of 0.001 for every factor. In terms of left ventricular dimension and interventricular septum thickness in diastole; although they have a relatively larger mean within the case group more than the control group but as seen in Table (3), this difference has a p value greater than 0.05, indicating that it is not statistically significant. The ejection fraction was higher in Healthy group than the AS groups group with a mean of 66.94 and 64.3 for both groups respectively. This difference has a statistical significance with a p value of 0.004.

Table (3): Echocardiographic parameters

	Case	Control	p value*
Right ventricular dimension (mm)	23.03 ± 2.33	21.16 ± 1.97	0.0001
Aortic root dimension (mm)	26.28 ± 3.68	24.02 ± 2.65	0.001
Left atrium dimension (mm)	32.68 ± 2.17	29.7 ± 5.08	0.001
Left ventricular dimension (mm)	44.32 ± 4.09	42.96 ± 3.6	0.81
Interventricular septum thickness in diastole (mm)	9.58 ± 0.78	9.28 ± 0.78	0.059
Ejection fraction % (EF)	64.30 ± 4.86	66.94 ± 4.01	0.004

Table (4) shows the correlation between age and duration of disease with the transthoracic echography findings within patients with ankylosing spondylitis.

Table (4): Echocardiographic variables link to age and disease duration.

	Age	Disease duration	p value*
Right ventricular dimension (RVD)	0.145	-0.102	p1: 0.31 p2: 0.48
Aortic root dimension	0.165	0.339	p1: 0.25 p2: 0.33
Left atrium dimension (DD)	-0.011	0.076	p1: 0.94 p2: 0.59
Left ventricular dimension (LVD)	0.219	0.209	p1: 0.14 p2: 0.12
Interventricular septum thickness in diastole (IVSd)	0.196	0.155	p1: 0.17 p2: 0.28
Ejection fraction % (EF)	0.15	0.131	p1: 0.29 p2: 0.36

*Bivariate with person correlation had been conducted, p1: Age vs Variable, p2: Disease duration vs Variable

All the variables had a week positive correlation with age except for the left atrial dimension which had a week negative correlation with a value 0f -0.011, those parameters are all of no statistical significance with a p value of more than 0.05. Regarding ankylosing spondylitis duration and echography findings; all the variables had a positive but not significant correlation except for right ventricular dimension which had a weak and non-significant correlation with a value of -0.102.

https://doi.org/10.56056/amj.2024.292

Discussion

This study is a case control study that included healthy participants compared to a group of patients with ankylosing spondylitis. With regard to age, gender, and body mass index, the two groups were exceptionally well matched. This study came up with the results that transthoracic echocardiography findings of patients with ankylosing spondylitis with diastolic dysfunction in 12%, mitral regurgitation in 8%, mitral prolapse in 10% and 2% of each of antero-septal hypokinesia, dilated aortic root and aortic regurgitation. The prevalence of those findings was higher than the healthy group but of no significant value. This finding disagrees with Klingberg et al. [21] ,Bengtsson et al. [22] ,Pallazi et al. [23] ,and Biesbroek et al. [24]; those studies has found that aortic valve abnormalities represent the highest cardiac anomaly that is associated with ankylosing spondylitis, since our patients not hypertensive, rate of aortic involvement decrease, other reason trivial aortic regurgitation excluded because it is not significant. On the other hand, according to this research, tricuspid valve regurgitation was more common in individuals with ankylosing spondylitis. (14%) than the healthy control group; this difference was statistically significant with a p value of 0. 012.Ankylosing spondylitis is a rheumatological condition marked by a form of inflammation that causes platelet aggregation within the intima of the valves; this will lead eventually to a dramatic increase in the activity of fibroblasts[17] .This process will result in an increase in the thickness within the vascular area which will lead eventually to regurgitation.[17] On the other hand, this study has shown a significant increase in right ventricular, aortic, and left atrium dimensions in patients with ankylosing spondylitis. This result agrees with Moyssakis et al.[25] as it showed a significant increase in aortic dimensions. According to this study, ankylosing spondylitis patients have a much lower ejection fraction than those without the condition. This agrees with Almasi et al.[27] but several studies had shown that there was no significant difference between healthy and patients with ankylosing spondylitis.[27,28] Improving diagnostic and imaging technique has helped to detect cardiopulmonary manifestations of ankylosing spondylitis. There are still no definitive rules for evaluating some of the life-threatening cardiac associations. Therefore, in those patients, early diagnosis of cardiac abnormalities linked to ankylosing spondylitis is crucial. There are several limitations of this study, that the patients have been recruited from the outpatient clinic was of small size. The second issue was using echocardiography as the sole method of detecting cardiac anomaly and not using other new modalities to help in this matter.

Conclusion:

Tricuspid regurgitation, a lower ejection fraction, and increased right ventricular, aortic root, and left atrial dimensions are the main cardiac anomalies in patients with ankylosing spondylitis. In order to assess the cardiac connection with ankylosing spondylitis, additional research with a bigger sample size and employing more diagnostic techniques is needed.

Conflicts of interest:

There were no conflicts of interest.

Acknowledgment

I would to show my sincere appreciation for the patients who approved to participate in our study. My sincere Gratitude to my supervisor Dr. Dashthy Albustany for his continuous guidance and support through this study. Special Thanks to Dr. Omar Saleem for helping me out to complete the statistical analysis and the result of my research.

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https://doi.org/10.56056/amj.2024.292