

Prevalence of Symptoms and Osteoarticular Lesions in Brazilian Echocardiographers

Viviane Tiemi Hotta, Edgar Bezerra Lira Filho, Valdir Ambrosio Moises

Departamento de Imagem Cardiovascular, São Paulo, SP – Brazil

Summary

Introduction: Joint and neuromuscular injuries and symptoms (JNIS) may occur due to repetitive strain, with high prevalence in echocardiography technicians. The prevalence of diagnosed JNIS remains unknown in Brazilian echocardiographers.

Objective: Evaluate the prevalence of JNIS in Brazilian cardiologists related to their work as echocardiographers.

Methods: Physicians from the Department of Cardiovascular Imaging were asked to answer a questionnaire about their anthropometric profile, their work as echocardiographers, and JNIS. Participants with JNIS (group 1) and without JNIS (group 2) were analyzed as follows: a comparison of continuous variables was made by the unpaired t-test, and a comparison of categorical variables was made by a chi-square test. P values were considered significant if < 0.05 .

Results: From June 2014 to June 2015, 474 answered the questionnaire; of these, 311 were valid; 248 (80%) were in group 1 (45 ± 9.2 years; 48% women) and 63 (20%) in group 2 (43 ± 9.8 years; 29% women). In group 1, the mean time to the onset of JNIS was 6.8 ± 5.3 years as from the start of echocardiography training; 144 (58%) sought care; 126 (88%) required treatment; 51 (35%) required temporary leave; and 5 (4%) underwent surgery. JNIS were more common on shoulders and in professionals with more than 10 years working as echocardiographers (65%); group 2 had fewer women ($p = 0.009$). There was no difference between groups in relation to anthropometric measurements; test criteria: upper limb used for the exam ($p = 0.25$), number of exams per week ($p = 0.49$), or physical activity ($p = 0.91$).

Conclusion: The prevalence of JNIS in Brazilian echocardiographers seems to be high. Women and professionals with over 10-years' experience in echocardiography seem more susceptible. (Arq Bras Cardiol: Imagem cardiovasc. 2015;28(4):203-207)

Keywords: Cumulative trauma disorders; Prevalence; Arthralgia; Echocardiography; Brazil.

Introduction

The occurrence of arthralgia, myofascial pain and injuries in workers whose occupation requires the repetition of isometric maneuvers, poor posture or constant stress pressure on specific muscle groups while performing repetitive work is a fact widely known^{1,2}. Joint and neuromuscular injuries and symptoms (JNIS) may occur with high prevalence in ultrasound and echocardiography technicians³⁻⁵. The occurrence of these injuries has a high socioeconomic impact, resulting in disability and impaired quality of life of the affected patients. The literature related to this topic is scarce and generally evaluates the injuries in ultrasound and echocardiography technicians³⁻⁵.

Some studies have shown occurrence of pain symptoms in up to 90% of participants in questionnaires applied to diagnostic and vascular ultrasound technicians. In a study from 2009, the authors showed an increase of 9% of the symptoms

of pain in relation to a questionnaire applied to a large scale, back in 1997, to the same population⁶, giving evidence of the increasing occurrence of this problem.

To date, the prevalence of these symptoms and diagnosed injuries remains unknown in Brazilian echocardiographers. The purpose of this study was to evaluate the prevalence of JNIS in Brazilian echocardiographer-cardiologists.

Methodology

Physicians from the Department of Cardiovascular Imaging (DIC) of the Brazilian Society of Cardiology (SBC) were asked to answer an online questionnaire about their anthropometric profile, their work as echocardiographers, and JNIS. Chart 1 shows the questionnaire content. The study was conducted upon the consent and support of DIC. By accepting to participate in the study, participants had the confidentiality of their answers guaranteed, and agreed to the publication of research data.

Statistical Analysis

Data were organized in an Excel spreadsheet. The statistical analysis was performed using Excel and SPSS Statistics 20. Quantitative variables were presented as mean and standard deviations, while qualitative variables were expressed in absolute and relative terms (%). Participants

Mailing Address: Viviane Tiemi Hotta •

Avenida Dr. Enéas Carvalho de Aguiar, 44, Postal Code 05403-000,

São Paulo, SP - Brazil

E-mail: viviane.hotta@gmail.com

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with JNIS (group 1) and without JNIS (group 2) were analyzed as follows: a comparison of continuous variables was made by the unpaired t-test, and a comparison of categorical variables was made by a chi-square test. Differences were considered significant if $p < 0.05$.

Results

During the study period, the DIC had 1,923 registered members in good standing, who received the email with the proposal to participate in the study. From June 2014 to June 2015, 474 members (24.6% of total membership) answered the questionnaire; of these, 311 were valid; of these 248 (80%) were classified in group 1 (45 ± 9.2 years; 119 (48%) women; body surface area of 1.83 ± 0.23 m²), and 63 (20%) in group 2 (43 ± 9.8 years; 18 (29%) women; body surface area of 1.85 ± 0.32 m²) (Table 1).

In group 1, the mean time to the onset of symptoms was 6.8 ± 5.3 years as from the start of echocardiography training; 144 (58%) sought care (orthopedic care in 83% of cases); of these, 126 (88%) required treatment, of which 5 (4%) underwent surgery (Table 1); while 51 (35%) reported the need for temporary leave from professional activities. JNIS were more common on shoulders (left: 51%, and right: 32%), but there were reports on other body parts (Table 2).

There was no significant difference between groups in relation to anthropometric measurements; test criteria: exam using the left or right hand ($p = 0.25$), number of exams per week (group 1: 85 ± 54 ; group 2: 80 ± 51 ; $p = 0.49$), or

physical activity (group 1, 165; 67%; group 2, 43; 68%; $p = 0.91$); but the proportion of women in group 2 was lower than in group 1 ($p = 0.009$) (Table 1).

Discussion

This study indicates relatively high prevalence of JNIS in Brazilian echocardiographer physicians, and that women may be more susceptible. In the United States and Europe, echocardiography technicians perform the transthoracic echocardiographies (TTE), but the images are analyzed and interpreted by cardiologists trained in echocardiography, who also prepare the final report. In these countries, the prevalence of JNIS among ultrasound and echocardiography technicians who report some kind of symptom during work is high¹⁻⁶. According to the American literature, the socio-economic impact of occupational injuries is expressive^{5,6}.

In Brazil, the TTEs are performed by cardiologists trained in echocardiography who acquire and interpret the images. Thus, the study was conducted with cardiologists experts in echocardiography. During the study period there were 1,923 cardiologists affiliated with DIC. Surely, there are more cardiologists working with echocardiography who are not DIC members. In total, 474 answers were received, representing only 24.6% of active participation of affiliates.

Considering the highest number of injured participants (80%) compared to those without injury, it is acceptable to assume that a substantial part of those who answered the questionnaire did so because they already have

Chart 1 - Questionnaire sent to participants

Date of birth Sex: M () F () Weight: kg Height: m

- How long (in years) have you been working as echocardiographer?
- How many working hours per week do you work as echocardiographer?
- Number of exams per week:
- What arm do you rather use to hold the transducer?
Right () Left () Both ()
- Do you type your reports? Yes () No ()
- How do you position yourself to carry out the exam? Standing () Sitting ()
- In most times, does the stretcher have height adjustment? Yes () No ()
- Have you been instructed on the issues that may arise during or after training? Yes () No ()
- Have you ever had any neuromuscular or osteoarticular pain related to work as an echocardiographer?
Yes () No ()
- If you answered YES:
 - How long (in years) have you been feeling the symptoms since their onset, as from the beginning of your career as an echocardiographer (including residency in echocardiography):
 - Where did you feel the symptoms?
R Wrist () L Wrist () R Elbow () L Elbow () R Shoulder () L Shoulder ()
Cervical spine () Thoracic spine () Lumbar spine () Myofascial pain ()
 - Did you seek specialized medical care? Sim () No ()
 - What specialty? Orthopedist () Neurologist () Psychiatrist () Acupuncturist () Rheumatologist ()
 - Any injury diagnosed? Yes () No ()
 - If you answered YES, where?
R Wrist () L Wrist () R Elbow () L Elbow () R Shoulder () L Shoulder ()
Cervical spine () Thoracic spine () Lumbar spine () Myofascial pain ()
 - Treatment required: No () Medication () Physiotherapy () Surgery ()
Acupuncture () GPR () Pilates () Other ()
 - Leave of absence: Yes () No ()
 - Type of leave: A) Temporary () B) Definite
- Do you exercise regularly? No () Yes ()

Aerobic activity () Work out/Gym () 1 to 3 times/week () 3 to 5 times/week () > 5 times/week ()

presented JNIS. Excluding losses and assuming that the other physicians among the 1,923 DIC members do not suffer from JNIS, beyond the 248 physicians who positively answered having JNIS condition, the minimum prevalence of the problem can be estimated at approximately 13%. Such

percentage is not negligible, especially considering the impact on the loss of working hours due to the symptoms and the treatment required. To date, this seems to be the only study published that shows the prevalence of JNIS in Brazilian cardiologists in their activities as echocardiographers.

Table 1 - Comparison of answers between groups 1 and 2

Questions	Group 1 (Injuries) N (%)	Group 2 (No injuries) N (%)	P
Participants	248 (80%)	63 (20%)	NA
Genre			
Men	129 (52%)	45 (71%)	0.009
Women	119 (48%)	18 (29%)	
Mean age (years) ± SD	44.6 ± 9.2	43.2 ± 9.7	0.30
Weight (kg)	73 ± 14.2	76.6 ± 15.7	0.10
Height (m)	1.69 ± 0.14	1.69 ± 2.31	0.84
BSA (m ²)	1.83 ± 0.23	1.85 ± 0.32	0.97
Years working as echocardiographer	14.5 ± 8.9	13 ± 9.5	0.26
Hours/week worked with eco.	28 ± 13.2	26.6 ± 12	0.44
Number of exams/week	84.7 ± 54.2	80 ± 50.6	0.49
Performs the exam			
Left arm	152 (61.3%)	45 (71.4%)	0.25
Right arm	68 (27.4%)	11 (17.5%)	
Both	28 (11.3%)	7 (11.1%)	
Types reports			
Yes	203 (82%)	54 (86%)	0.59
No	45 (18%)	9 (14%)	
Position in which performs the eco.			
Sitting	237 (96%)	59 (94%)	0.76
Standing	11 (4%)	4 (6%)	
Performs exams on a stretcher with height adjustment			
Yes	184 (74%)	47 (75%)	0.92
No	64 (26%)	16 (25%)	
Instructed on injury prevention			
Yes	64 (26%)	24 (38%)	0.08
No	184 (74%)	39 (62%)	
Exercises regularly			
Yes	165 (67%)	43 (68%)	0.91
No	83 (33%)	20 (32%)	
Mean time to onset of symptoms	6.8 ± 5.3	NA	NA
Years working as echocardiographer			
Up to 10 years	84 (35%)	31 (54%)	0.006
> 10 years	162 (65%)	29 (46%)	
Sought care			
Yes	144 (58%)	N/A	N/A
No	104 (42%)		
Treatment required			
Yes	126 (88%)	N/A	N/A
No	18 (12%)		
Injury diagnosed (among those who sought care)			
Yes	122 (85%)	N/A	N/A
No	26 (15%)		
Leave of absence required			
Yes	51 (21%)	N/A	N/A
No	197 (79%)		

N: number; %: percentage; SD: standard deviation; BSA: body surface area; N/A: not analyzable; Eco: echocardiography.

Table 2 - Diagnosed injuries

Injury location	N (%)	Injury location	N (%)
Left shoulder	126 (51%)	Cervical spine	86 (35%)
Right shoulder	80 (32%)	Thoracic spine	32 (13%)
Left elbow	33 (13%)	Lumbar spine	72 (29%)
Right elbow	24 (10%)	Myofascial pain	52 (21%)
Left wrist	50 (20%)		
Right wrist	46 (18,5%)		

N: number; %: percentage.

The shoulders are the most frequent location of JNIS in Brazilian echocardiographers; some participants reported symptoms or injuries in more than one location. Similarly, in the studies by McCulloch and contributors⁵ and Evans and contributors⁶, the shoulders were also the most frequent location of symptoms. The proportion of women was lower in the group without JNIS than in the group with injured participants. Excluding the selection bias, it is possible to consider that women are less protected from JNIS than men in the current study. In the study by Evans and contributors⁶, 88% of participants were female and the proportion of women was similar in both groups (injured and non-injured).

A noteworthy finding was the fact that 162 (65%) participants with JNIS had more than 10-years' experience working with echocardiography. Although 51 (21%) presented JNIS before 5 years of work, the number of years working as echocardiographer also seems to be associated with increased occurrence of JNIS. Other factors, such as age, body surface area, physical activity, upper limb used to hold and handle the transducer, position adopted to perform the exam, number of exams per week, and use of stretchers with height adjustment did not differ between groups with or without JNIS. In the study by McCulloch and contributors⁵, the authors showed that the prevalence of osteoarticular injuries increased proportionally with the number of exams performed per day and the length of time per exam⁵.

Although not significant, it is relevant that only 26% of participants in group 1 and 38% in group 2 were instructed on the potential risk of injury and on ergonomics in the workplace as echocardiographers. This highlights the lack of knowledge and information related to this issue for echocardiographers.

This study aimed, at first, to evaluate the extent of the problem at a national population level. Based on this result, further actions should be considered in order to raise awareness among Brazilian echocardiographers about this issue and, above all, prevent the occurrence of JNIS. In 2013, it was published recommendations for the prevention of musculoskeletal injuries in obstetric ultrasound technicians⁷. Similarly, guidelines and suggestions to improve ergonomics and prevent JNIS in Brazilian echocardiographers can also be an interesting issue to be covered.

Limitations

Echocardiographers physicians were invited to participate in the study voluntarily. It is possible that DIC affiliates with

symptoms and/or injuries show greater willingness and interest in participating in the research than participants without any symptoms or injuries. Unfortunately, there was a considerable number of losses due to incomplete or inadequate completion of the questionnaire, which reduced the final number of participants.

Conclusions

In this initial analysis, the prevalence of symptoms and/or neuromuscular injuries in Brazilian echocardiographers seems to be high and more common on shoulders. Women and professionals with over 10-years' experience in echocardiography seem more susceptible to JNIS. The data of this study highlight and warn about the occurrence and extent of this issue.

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Authors' contributions

Research creation and design: Hotta VT, Moises VA; data collection: Hotta VT, Lira Filho EB; data analysis and interpretation: Hotta VT, Lira Filho EB, Moises VA; statistical analysis: Hotta VT, Moises VA; manuscript drafting: Hotta VT; critical revision of the manuscript for important intellectual content: Hotta VT, Moises VA; preparation of the online questionnaire sent to members of DIC: Lira Filho EB.

Potential Conflicts of Interest

No relevant potential conflicts of interest.

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Academic Association

This study is not associated with any graduate program.

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