Original article

Production of knowledge on myocardial, exercise and menopause. Analysis of methodological approaches

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Abstract

Considering the importance of histological studies for the analysis of myocardial cell morphology and the effects produced by this muscle exercise in postmenopausal women, a literature review was carried out to analyze selected articles in PubMed, Medline, SciELO and Science Direct. 2001-2011 databases and to identify the study design relating to morphological infarction, exercise and menopause published over the last 10 years. **Materials and Methods:** After the selection according to the proposed inclusion criteria, the journals and articles were analyzed regarding the title, year of publication, country of origin, type of methodology, type of authorship and research subjects. **Results:** We found thirty-four articles related to myocardium, menopause and exercise from 2001-2011. In two of them the myocardium morphologically was evaluated, and in one of them there was a morphological and stereological cardiac muscle analysis. **Conclusion**: The main characteristics of the publications are: multiple authorship, publications in journals from different areas, literature review and experimental study as methodology, and all studies showed quantitative data analysis.

Keywords: myocardial, exercise, menopause cell morphology.

1 Introduction

The Brazilian Institute of Geography and Statistics 2010 census (INSTITUTO..., 2010), showed that 7.4% of the general population of the country, i.e., more than 14 million individuals, were 65 years of age or older. This number is expected to double by the year 2025, and the country will be ranked in 6th place among the world's elderly population (ORGANIZACIÓN..., 2000). The World Health Organization data of 2010 (WORLD..., 2010) reinforce this, indicating a significant increase of the population classified as elderly as a result of increased life expectancy. This new scenario is a major concern for the longevity and health of this group. Consequently, scientific studies should contribute to healthy aging and an improved quality of life.

This phase of life has become increasingly investigated by researchers and professionals working with the promotion of quality of life. The reason is that aging is crucial to a number of morphological, metabolic and psychic changes which may lead to a decline of the organism' activities and consequently to the loss of autonomy and efficiency. Physiological decline in aging can be measured by functional and structural imbalances of organs and tissues. Such imbalances cause multiple and chronic diseases, progressively affecting all organs (LIMA-COSTA and VERAS, 2003).

Besides the changes caused by aging, female individuals have endocrine-functional modifications determined by menopause, displaying different clinical conditions after this phase. Postmenopausal women , with the loss of ovarian function and lower level of estrogen production, have an elevation of blood lipids (AL-NUAIM, MIRDAD, AL-RUBEAAN et al., 2005; FERNANDES, LEME, YAMADA et al., 2005), elevated total or fractions cholesterol (AKAHOSHI, SODA, NAKASHINA et al., 2001; GRAFF-IVERSEN, THELLE and HAMMAR, 2008). Changes in lipid profile, weight gain, associated with physical inactivity and estrogen deficiency may be determining factors in this profile change before and after menopause.

Numerous studies indicate that physically active individuals enjoy a better quality of life and lower mortality rates, resulting in a higher longevity (MATSUDO and MATSUDO, 1992; ANTUNES, SANTOS, CASSILHAS et al., 2006). Therefore, regular exercise can contribute to non-pharmacological intervention in the prevention of several aging-associated diseases such as osteoporosis, dyslipidemia, type 2 diabetes mellitus and cardiovascular disease.

Aging leads to physical and endocrine modifications which can alter the metabolic balance of individuals, favoring the onset of disease. The incidence of heart disease in this phase has been often observed, especially in postmenopausal women, the investigation of heart changes becomes relevant in understanding this clinical condition.

Cardiovascular diseases are increased risk factors associated with this phase in women and therefore knowing the mechanisms which promote changes in the heart muscle is essential for determining interventions to lower these modifications

During exercise training, the heart is adjusted and results in an increase of metabolic and mechanical activities. Physical training causes biochemical, electrical, mechanical and morphological adaptations in the cardiac muscle providing an improvement in cardiac function (PATE, PRATT, BLAIR et al., 1995). These adjustments occur basically to reduce stress on the ventricular walls (GRAVES and FRANKLIN, 2001) and also to meet the increased demand for blood supply of muscles during training.

Knowing that menopause lowers the protective action of estrogen on the female circulatory system, and that

physical training has been considered an important non-pharmacological intervention minimizing the risk of cardiovascular disease, it is important to assess the impact of exercise training on the myocardial morphology in this population.

Therefore, studies analyzing cellular morphology become relevant as we can observe effects of exercise training in the cardiac muscle of menopausal women.

It is of paramount importance the initial literature review to assess how this issue was developed, the trends in theoretical and methodological approaches, the types of study design and also which questions have been unanswered.

Scientific production is the essence of scientific research transforming the advancement of knowledge in accessible information to researchers (WITTER, 1997). Thus, research and analysis of national and international scientific publications is an indispensable tool to evaluate scientific advancement and experimental approaches in the field.

Our analysis of the articles aimed to identify and categorize authorship characteristics, methodological approaches and the study designs linking the role of exercise in cardiac muscle morphology of menopausal women, published from 2001 to 2011 and, also to describe the distribution of each approach and research design.

2 Methods

National and international publications on the role of exercise in morphological aspects of myocardial infarction in individuals in their menopause were obtained from literature research published from 2001 to 2011. It was performed in October 2011 in the following databases: PubMed, Medline, SciELO, and Science Direct.

The databases were selected according to the criteria including scientific publications indexed in the Health and Medicine field worldwide and in several languages. After choosing the databases, the search for articles was conducted with these keywords: myocardial, exercise and menopause, in languages such as Spanish, Portuguese and English with option of retrieving the words from the title of the article, from the abstract and subject descriptors.

The selection of papers was done according to inclusion and exclusion criteria, from the total number of publications obtained through the searches in the databases.

Articles published in indexed journals from 2001 to 2001 were selected according to these inclusion criteria: the chosen languages, with some myocardial morphological analysis, using human as well as (or) animal models and which associated the cardiac muscle to exercise.

The exclusion items or criteria were: publications such as theses, monographs, books, book chapters, conference papers and conference proceedings, reports, governmental publications and from regional and international organizations, as well as studies which did not associate the heart muscle to exercise.

The title of the journal, the title of the article, year of publication, country of origin of the director of the research institution, the type of methodology used (descriptive field, descriptive literature, action research, exploratory, experimental, theoretical reflection and experience reports), the type of authorship (single author, dual or multiple authorship) and research subjects (human or animal) were items of analysis.

3 Results

There was a great number of publications with the word myocardial, and then other search was done, including the word exercise and the word menopause. A more specific result was retrieved (Table 1).

The exclusion criteria were used in the abstracts retrieved through the search, as previously described, obtaining the data in Table 2.

A preliminary analysis of the abstracts of papers revealed that the databases Pub Med and MEDLINE have greater significance in our study. For this reason, thirty-four articles — not repeated in both databases — were selected for further analyses in this study.

Chart 1 shows the selected articles, with the country of publication, type of authorship, type of approach, the journal where it was published and the year of publication.

Table 1. Papers found in the databases researched.

Databases	Keywords	Keywords	Keywords
		Myocardial + Exercise	Myocardial + Exercise + Menopause
PUBMED	413.503	22.872	67
SCIENCE DIRECT	341.403	77.458	2.423
SCIELO	1.810	86	1
MEDLINE	392.289	26.597	56

Table 2. Number of papers found by keyword (according to exclusion criteria).

Databases	Keywords	Keywords	Keywords
		Myocardial + Exercise	Myocardial + Exercise + Menopause
PUBMED	114.020	5.561	34
SCIENCE DIRECT	164.964	33.120	1.186
SCIELO	1.474	79	1
MEDLINE	392.289	26.597	38

Chart 1. General index of selected articles.

TITL[E]	JOURNAL	COUNTRY	AUTHORSHIP	METHODS	YEAR
1. Perimenopausal risk factors and future health	Hum Reprod Update	Italy	Multiple	Review- ---------	2011
2. Left ventricle relative wall thickness and plasma leptin levels: baseline relationships and effects of 4 months of walking training in healthy overweight postmenopausal women.	Menopause	Italy	Multiple	Human – Physio / ClinPar	2011
3. Effects of exercise training on autonomic dysfunction management in an experimental model of menopause and myocardial infarction.	Menopause	Brazil(USJT)	Multiple	Animal – Physio/ ClinPar	2011
4. A randomized controlled trial of low-dose hormone therapy on myocardial ischemia in postmenopausal women with no obstructive coronary artery disease: results from the National Institutes of Health/ National Heart, Lung, and Blood Institute-sponsored Women's Ischemia Syndrome Evaluation (WISE).	Am Heart J.	USA	Multiple	Animal – Physio/ ClinPar	2010
5. Coronary heart disease in women: a challenge for the 21st century.	Clinics	Brazill	Single	Review - ------	2010
6. The effects of hormone replacement therapy on myocardial performance in early postmenopausal women.	Climacteric	Turkey	Multiple	Human – Physio/Clin Par	2010
7. Left ventricular dysfunction secondary to ischemia in women with angina and normal coronary angiograms.	J Womens Health	Cuba	Multiple	Human – Physio/Clin Par	2009
8. How to improve noninvasive coronary artery disease diagnostics in premenopausal women? The influence of menstrual cycle on ST depression, left ventricle contractility, and chest pain observed during exercise echocardiography in women with angina and normal coronary angiogram.	Am Heart J.	Poland	Multiple	Human – Physio/Clin Par	2008
9. Autogenic training to manage symptomology in women with chest pain and normal coronary arteries.	Menopause	England	Multiple	Human – Physio/ClinPar	2009
10. Carotid intima-media thickness in pre- and postmenopausal women with suspected coronary artery disease.	Heart Vessels	Poland	Multiple	Human – Physio/Clin Par	2008
11. Cardiovascular effects of medroxyprogesterone acetate and progesterone: a case of mistaken identity?	Nat Clin Pract Cardiovasc Med	USA	Multiple	Review- --------	2008
12. Effect of exercise on rate pressure product in premenopausal and postmenopausal women with coronary artery disease.	Indian J Physiol Pharmacol.	India	Multiple	Human – Physio/Clin Par	2007
13. Effects of menopause on the myocardial velocities and myocardial performance index.	Circ J.	Turkey	Multiple	Human – Physio/Clin Par	2007
14. Combined effect of low-risk dietary and lifestyle behaviors in primary prevention of myocardial infarction in women	Arch Intern Med	Sweden	Multiple	Human – Physio/Clin Par	2007
15. Ischemia in women with angina and normal coronary angiograms.	Coron Artery Dis.	Cuba	Multiple	Human – Physio/Clin Par	2007
16. Value of electrocardiographically gated single-photon emission computed tomographic myocardial perfusion scintigraphy in a cohort of symptomatic postmenopausal women.	Am J Cardiol.	USA	Multiple	Human – Physio/Clin Par	2007

Chart 1. Continued...

TITL[E]	JOURNAL	COUNTRY	AUTHORSHIP	METHODS	YEAR
17. Changes with age in left ventricular function and volumes at rest and postexercise in postmenopausal women.	Ann Nucl Med.	Japan	Multiple	Human – Physio/Clin Par	2006
18. Nutritional risk and the metabolic syndrome in women: opportunities for preventive intervention from the Framingham Nutrition Study.	Am J Clin Nutr.	USA	Multiple	Human – Physio/Clin Par	2006
19. Exercise training attenuates cardiovascular adverse remodeling in adult ovariectomized spontaneously hypertensive rats.	Menopause.	Brazil	Multiple	Animal- Morphol/Stereol	2006
20. Tibolone improves myocardial perfusion in postmenopausal women with ischemic heart disease: an open-label exploratory pilot study.	J Am Coll Cardiol.	Argentina	Multiple	Human – Physio/Clin Par	2006
21. Assessment of estrogen status as a marker of prognosis in women with symptoms of suspected coronary artery disease presenting for stress testing.	Am J Cardiol.	USA	Single	Human – Physio/Clin Par	2006
22. Self-reported physical activity and myocardial flow reserve in postmenopausal women at risk for cardiovascular disease.	J Womens Health	USA	Multiple	Human – Physio/Clin Par	2006
23. Peripheral vascular endothelial function correlates with exercise capacity in women.	Clin Cardiol	USA	Multiple	Human – Physio/Clin Par	2005
24. Exercise training improves baroreflex sensitivity associated with oxidative stress reduction in ovariectomized rats.	Hypertension.	Brazil	Multiple	Animal-Physio/ClinPar/Morphol	2005
25. Overweight, hypertension and ECG changes in menopausal women in West Bengal.	J Indian Med Assoc	India	Multiple	Human – Physio/Clin Par	2004
26. Psychosocial factors associated with noncardiac chest pain and cardiac syndrome X.	Herz.	England	Dual	Review - --------	2005
27. Association between hormonal changes at menopause and the risk of a coronary event: a longitudinal study.	Menopause	Australia	Multiple	Human – Physio/Clin Par	2004
28. Effect of diet and exercise intervention on inflammatory and adhesion molecules in postmenopausal women on hormone replacement therapy and at risk for coronary artery disease.	Metabolism.	USA	Multiple	Human – Physio/Clin Par	2004
29. Effect of postmenopausal hormone replacement therapy on cardiovascular performance.	Maturitas	Turkey	Multiple	Human – Physio/Clin Par	2004
30. Knowledge and attitude towards personal health care and menopause among women with ischemic heart disease undergoing coronary angiography.	Gynecol Endocrinol.	Israel	Multiple	Human – Physio/Clin Par	2003
31. Influence of angiotensin converting enzyme inhibitors on stable myocardial ischemia in menopausal cardiac patients.	Clin Exp Obstet Gynecol	Lebanon	Multiple	Human – Physio/Clin Par	2003
32. Impaired cardiac response to exercise in post-menopausal women: relationship with peripheral vascular function.	Nucl Med Commun.	Japan	Multiple	Human – Physio/Clin Par	2003
33. Risk factors and secondary prevention in women with heart disease: the Heart and Estrogen/progestin Replacement Study.	Ann Intern Med	USA	Multiple	Human – Physio/Clin Par	2003
34. Effect of hormone replacement therapy on the electrocardiographic response to exercise.	J Nucl Cardiol.	USA	Multiple	Human – Physio/Clin Par	2002

In relation to authorship, it is noticed that only one of the thirty-four articles analyzed has dual authorship and two with single authorship. This demonstrates a preference for multiple authorship and reinforces the trend of inter-and multidisciplinary teamwork and research groups in modern sciences. These groups have a higher possibility of carrying out comprehensive and in-depth studies, which may meet the criteria of the indexed journals. (Table 1)

It was noticed that the journals where the articles were published belong to several different fields of study — Medicine, Cardiology, Physiology, Endocrinology, Gynecology, Obstetrics, and Women's Health and Nutrition. This confirms the strong inter-and multidisciplinary trend early mentioned (Table 1).

Regarding the country of origin of the institution, which conducted the research, it was found that the United States leads with ten publications, followed by Brazil with four, Turkey with three articles, Cuba, India, England, Poland and Japan with two and Argentina, Australia, Israel, Lebanon and Sweden have only one publication (Figure 1).

It is observed in Chart 1 that the heart disease studies and their relations have recently been conducted worldwide as it is a health issue of the population in developed and developing countries (WONG, SMITH and STUFF, 1998).

The number of Brazilian publications in the field places the country in a privileged position, far ahead from countries with more tradition in scientific research. Brazil is now in the 13th place of countries with the largest production in the world (www.brasil.gov.br), demonstrating an improvement over previous years and revealing the possibility and the need for growth.

The methodological approaches used in the thirty-four articles were quantitative. The study design in four of them was descriptive literature review studies and thirty were classified as experimental studies. Other methodological approaches and study designs proposed in this study methodology were not included in the analyses.

As the macro and microscopic structures of organs and tissues have been widely studied through descriptive research, there has currently been a trend to experimental studies, where the possibility of controlling certain variables may interfere in the results, often leading to changes in function. Thus, the increase of scientific advancement in this field is determined by experimental research, although the latter is supported by previous descriptive studies.

Twenty-seven out of the thirty experimental studies publications used human experimental model and investigated clinical parameters. Three of them used animals as experimental models, particularly Wistar rats (Figure 2). One of the articles evaluated clinical parameters; other related morphological changes of the myocardium to clinical parameters and the last one analyzed morphological and stereological aspects of the myocardium.

Studies related to the myocardium, menopause and exercise are highlighted. There is a prevalence of studies with clinical parameter approaches with a physiological focus. Conversely, morphological changes resulting from exercise and menopause in cardiac muscle need to be further investigated since the morphology is directly related to its function.

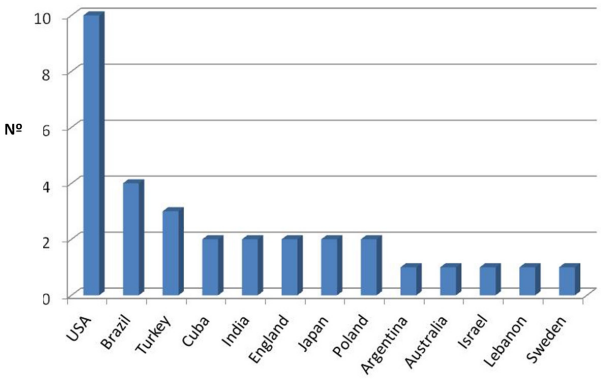

Figure 1. Numerical distribution of articles by country of origin of the institution's research director.

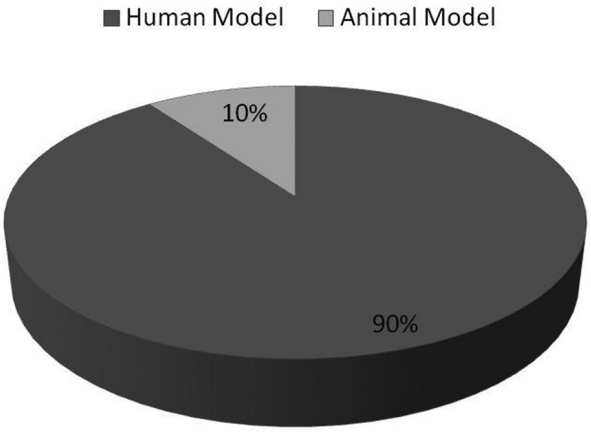

Figure 2. Percentage of experimental animal and human models.

4 Conclusion

The results support the conclusion that from 2001 to 2011 thirty-four articles were found indexed in relevant databases in the health field addressing myocardial, menopause and exercise. Only two articles evaluated the morphological aspect of myocardium and only one of them performed a morphological and stereological analysis of cardiac muscle.

The methodological approaches used were literature review and experimental study, and all studies presented quantitative data analysis.

The articles were published in journals of multiple subject fields as Medicine, Cardiology, Physiology, Endocrinology, Gynecology, Obstetrics, Women's Health, and Nutrition and are characterized by multiple authorship.

However, with these findings we cannot claim that there are few studies on this topic because the selected databases have strict criteria for the publication of studies, excluding the ones which do not meet that level and do not contribute to scientific advancement in the field.

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