Int J Cardiovasc Imaging (2011) 27:321–323
DOI 10.1007/s10554-010-9632-1

ORIGINAL PAPER

Echocardiography: a tool to foster research into neglected cardiovascular diseases in Africa

Ana Olga Mocumbi

Received: 14 March 2010 / Accepted: 8 April 2010 / Published online: 6 May 2010

Introduction

Research in wealthy countries has been co-funded by the government and the industry, allowing spectacular discoveries in molecular biology, chemistry and engineering, which are then taken to the pharmaceutical industry and applied to the development of drugs and devices for a wide range of diseases, leading to a decrease in mortality in developed countries. Unfortunately, most benefits of these gains for human kind are not available in most parts of Africa, a continent with low life expectancy associated with an extremely high burden of diseases that have been controlled in other parts of the world.

Cardiovascular diseases are the primary non-communicable health problem in Africa, and according to *The World health report 2001* they accounted for 9.2% of the total deaths in the African Region in 2000 [1]. If we consider that research efforts targeted at a disease should ideally be in proportion to its global health impact, several diseases affecting the heart in most parts of Africa are neglected. Indeed, several conditions that affect millions of people and cause high morbidity and mortality, are not the subject of comprehensive research programmes mainly because they are confined to areas that have suffered chronic lack of incentives for research and development. The lack of scientific interest in neglected tropical diseases is confirmed if we compare the low scientific output on these conditions in the PubMed or the Web of Science, with that of matched diseases with comparable DALYs [2]. This remains the case for rheumatic heart disease, cardiomyopathies that affect predominantly the African population (such as the case of endomyocardial fibrosis and peripartum cardiomyopathy), and infectious diseases with cardiovascular manifestations such as tuberculosis and schistosomiasis, which are highly prevalent in Africa [3, 4]. While complications of untreated congenital heart diseases are responsible for considerable morbidity and mortality in children and young adults who live for years without diagnosis and/or cannot be surgically treated due to lack of facilities and human expertise, new challenges are feared with the growing threat imposed by cardiac disease related to HIV infection and antiretroviral therapy. Finally, there is an increasing importance of ischemic heart disease, partially due to the increased prevalence of hypertension, smoking, obesity, hyperlipidemia and adoption of western life-style in some urban areas [1].

Little is known about the epidemiology of cardiovascular neglected diseases, which continue to be largely underdiagnosed. Although affecting large segments of the population and imposing a high burden to the African communities, these conditions are perceived to be less important than other health problems. Statistical information on these conditions

A. O. Mocumbi (✉)
Instituto do Coração, Maputo, Moçambique
e-mail: amocumbi@yahoo.com

has traditionally been estimated from results of research performed in developed world or at hospitals. Recent data from community-based research in Mozambique revealed higher prevalence of rheumatic heart disease [5] and endomyocardial fibrosis [6] than previously thought, presenting a compelling argument for the use of echocardiography in research in Africa. Regardless of opinions considering that its use may represent an inappropriate application of modern technology in such poor settings, we think that echocardiography can be used to find answers to relevant problems in Africa. In this viewpoint we discuss its potential to foster research into cardiovascular neglected diseases in Africa.

Potential role of echocardiography in Africa

Echocardiography is an accurate non-invasive technique for diagnosis of cardiovascular diseases, but its use in clinical practice is still limited to a small number of tertiary centres in most African countries, due to its costs and to the lack of expertise to perform the exams. It is far more sensitive than auscultation for detection of pathologic valve disease [7], and has been tested for screening of conditions that are highly prevalent in the African population, such as Rheumatic Heart Disease and Endomyocardial Fibrosis [5, 6]. Increase in its availability has been paralleled by improvement in cardiovascular research into neglected conditions in poor remote areas of Sub-Saharan Africa, including community-based research performed using hand-carried echocardiography battery-operated systems.

For Rheumatic Heart Disease, the most preventable of all cardiovascular diseases, echocardiography may become the mainstay of diagnosis for screening and research programs [8] provided that standardization of criteria for diagnosis is achieved. One relevant question is how to identify people with mild rheumatic heart disease who may benefit from secondary prophylaxis. The World Health Organization states that echocardiographically diagnosed, clinically silent rheumatic valve involvement should be managed as rheumatic heart disease until proven otherwise [9]. However, any decision for screening strategy should ideally entail the calculation of prior probability of rheumatic heart disease in a given area and evaluation of the diagnostic accuracy of the screening method [7].

Regarding Endomyocardial Fibrosis, a form of restrictive cardiomyopathy of unknown etiology and pathogenesis affecting predominantly the Sub-Saharan region of Africa, by allowing diagnosis in asymptomatic stages and subsequent imaging follow-up, echocardiography can help unveil the mechanisms involved in pathogenesis, determine better timing for surgery, assess therapeutic response [10, 11], explore new therapeutic targets and establish prognostic criteria [12]. Therefore for these highly prevalent conditions in the African population, echocardiography offers a unique opportunity for combined epidemiological and basic research aiming at defining the basic mechanisms involved, uncovering aspects related to natural history, testing differences in genetic and biological profile in affected individuals, and identifying predictors of outcome with different disease management strategies.

The challenges faced by the African research community

Several challenges are faced when attempting to establish echocardiographic facilities in Africa. Research and implementation of cost-effective approaches to reduce mortality and disability by cardiovascular diseases in Africa are hampered by the scarcity of reliable data and concern that investment in this area will deviate governments from efforts to control communicable diseases, improve maternal and perinatal survival, and prevent nutritional disorders. Funding for research in this continent is scarce related to the small number of industries and trusts, as well as to the lack of expertise to administer research projects. Despite this difficulties, local cardiologists have understood the importance of local research as an essential element for changing the actual health picture, and have been involved in regional and international taskforces to define standardized criteria for screening of neglected cardiovascular diseases, as well as to assess the role of echocardiography as a tool for their diagnosis and management in the context of Africa [13].

Echocardiography can generate specific answers to local cardiovascular problems in Africa. However, considering the lack of specialized human resources in these settings relying solely on cardiologists to

perform screening is not realistic. Therefore, innovative strategies to increase the access are needed, one of which might be the use of non-medical staff for screening. This would be a two-step diagnosis strategy in which trained nurses or technicians would perform initial screening using simple standardized criteria including colour doppler criteria; at a second stage, patients with well-defined lesions would be seen by cardiologists for further evaluation, complete diagnosis and decision on management. Another possible strategy could be the use of general-purpose machines with larger abdominal probes, currently available in a larger number of tertiary centres, for screening by trained non-medical personal. Although not ideal for pediatric chest and providing incomplete hemodynamic information these machines are still useful to confirm several structural abnormalities, severe valve disease and pericardial effusions. Finally, battery-powered ultrasound machines with wider potential for dissemination in poor remote rural areas without electrical network, are a new tool that must be explored for community-based research and screening.

The impact of erroneous diagnosis should not be underestimated in such settings with limited resources, hence the need for research into the applicability of such strategies in Africa. Research on the feasibility of such strategies is mandatory because the prospect of spreading the use of echocardiographic machines in such large population as the one in Sub-Saharan Africa might incite manufacturers to reduce the prices or stimulate subsidized schemes similar to those used for promotion of drugs for neglected diseases. Knowledge about the real epidemiology will also allow advocacy at the level of policy-makers towards the acquisition of echocardiographic machines, ultimately increasing the availability of this technique in poor areas of Africa.

References

1. World Health Organization (2005) Report of the Regional Committee of Africa (2005)
2. Vanderelst D, Speybroeck N (2010) Quantifying the lack of scientific interest in neglected tropical diseases. PloS Negl Trop Dis 4(1):e576. doi:10.1371/journal.pntd.00005762010
3. Dye C, Scheele S, Dolin P, Pathania V, Raviglione MC (1999) Consensus statement. Global burden of tuberculosis: estimated incidence, prevalence, and mortality by country. WHO global surveillance and monitoring project. JAMA 282(7):677–686
4. Doumenge JP, Mott KE, Cheung C et al (1987) Atlas de la Répartition Mondiale des Schistosomiases. Talence, CEGET-CNRS. WHO, Geneve, p 400
5. Marijon E, Ou P, Celermajer DS, Ferreira B, Mocumbi AO, Jani D, Paquet C, Jacob S, Sidi D, Jouven X (2007) Prevalence of rheumatic heart disease detected by echocardiographic screening. N Eng J Med 357(5):470–476
6. Mocumbi AO, Ferreira MB, Sidi D, Yacoub MH (2008) A population study of Endomyocardial Fibrosis in a rural area of Mozambique. N Eng J Med 359:43–49
7. Pandve HP, Bhawalkar JS, Banerjee A, Bhuyar P (2009) Can echocardiography be used for screening of rheumatic heart disease? Indian J Community Med 34(1):79
8. Carapetis JR (2008) Pediatric rheumatic heart disease in the developing world: echocardiographic versus clinical screening. Nat Clin Pract Cardiovasc Med 5(2):74–75
9. Rheumatic fever and rheumatic heart disease. Report of a WHO Expert Consultation. Geneva, 29 Oct–1 Nov 2001. (2004) Geneva World Heart Organization
10. Hassan W, Fawzy ME, Helaly SA, Hegazy H, Malik S (2005) Pitfalls in diagnosis and clinical, echocardiographic, and hemodynamic findings in endomyocardial fibrosis: a 25-year experience. Chest 128:3985–3992
11. Berensztein CS, Pinero G, Marcotegui M et al (2000) Usefulness of echocardiography and Doppler echocardiographiy in endomyocardial fibrosis. J Am Soc Echocardiogr 13(3):226–230
12. Mady C, Salemi VMC, Ianni BM, Fernandes F, Arteaga E (2005) Relation between left atrial dimension and exercise capacity in Endomyocardial Fibrosis. Arq Bras Cardiol 84(3):222–224
13. Mayosi B, Robertson K, Volmink J et al (2006) The Drakensberg declaration on the control of rheumatic fever and rheumatic heart disease in Africa. S Afr Med J 96:246