

Measurement of arterial stiffness and central aortic pressure in sub-Saharan Africa

Jan Kips

Supervisor(s): Sebastian Vermeersch, Luc Van Bortel, Patrick Segers

I. INTRODUCTION

Hypertension is one of the most important risk factors for the development of cardiovascular disease (CVD), the burden of which increases rapidly in Africa. In recent years, arterial stiffness and central pressure have emerged as important determinants of increasing blood pressure [1]. Arterial stiffness can be quantified by pulse wave velocity (PWV), measuring the speed of the aortic blood flow. Central aortic pressure differs from conventional cuff blood pressure, and is considered to be more predictive of CVD. Although people of African descent are more prone to develop hypertension as compared to Caucasians [2], little is known on arterial stiffness and central pressure in Africans. Commercially available devices such as SphygmoCor are too expensive for application in Africa. In addition, their measurements are not necessarily precise in these populations and require a trained operator.

The aim of this study is to acquire baseline data on arterial stiffness and central pressure in sub-Saharan Africa. For this purpose, a relatively low-cost device was built. In addition, we tested and validated existing technology in sub-Saharan populations.

II. METHODS AND RESULTS

A. Validation of a new tonometry device

A recently introduced device, the Omron HEM-9000AI, makes use of a self-positioning tonometer which eliminates operator

dependence. We compared the central pressure estimate from Omron with that of SphygmoCor on 143 South African subjects

(aged 39-91 years) and found a substantial difference of 18.8 (4.3) mmHg. Following our data, neither of these devices provides an accurate estimate of central pressure.

B. Development of a custom-made device

A custom-made device was built to measure PWV and central pressure. Using a tonometer (Millar Instruments) and Doppler probes (Huntleigh Healthcare), flow and pressure signals were acquired and displayed in realtime. Total device cost was below 4000€ (in contrast to >20000€ for commercial devices). PWV was measured in 184 Nigerian mothers (aged 19-45 years) and 264 Nigerian children (0-1 years). The mean values did not differ significantly from corresponding values measured in Caucasians.

III. CONCLUSIONS

Given the high and rising prevalence rates, research into the development of hypertension in sub-Saharan Africa is crucial. Practical obstacles such as the high device cost currently hamper large scale research. The developed low-cost device proved adequate and may provide a solution for this problem.

REFERENCES

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