A NOVEL DEVICE FOR MEASURING ARTERIAL STIFFNESS USING THE FINGER-TOE PULSE WAVE VELOCITY: VALIDATION STUDY OF THE POPMÈTRE®

Introduction

Arterial stiffness is an independent predictor of cardiovascular (CV) events in a large number of populations. The Gold standard to assess arterial stiffness is carotid-femoral pulse wave velocity (cf-PWV). However, the access to the femoral artery site is sometimes not possible for cultural or clinical reasons. Moreover, the examination requires a high technical level and trained technicians. Thus finger-toe pathway could represent a good alternative. The aim of the present study is to evaluate a novel non-invasive simple device pOpmètre which measures finger-toe pulse wave velocity (ft-PWV).

Materials and Methods

- **The pOpmètre® has 2 photodiodes sensors, positioned on the finger and on the toe, next to the pulp artery, and a cardiac activity electrode. Pulse waves were recorded continuously for 20 sec, and the difference (Dtf) between the toe pulse wave transit times (PWtt) and the finger PWtt was calculated. The travel distance was based on subject’s height.**

86 subjects mean aged 53(20) have been included in this study: 17 healthy subjects and 69 subjects with hypertension and/or with others CV risk factors. Each subject underwent applanation tonometry to calculate cf-PWV and pOpmètre to calculate ft-PWV. The measurements of carotid-radial (upper limb) and femoral-tibial (lower limb) PWV were obtained in 30 subjects.

1. **Comparison of ft-PWV to SphygmoCor cf-PWV.**
2. **Analyse of the discrepancies between transit times from SphygmoCor and pOpmètre.**
3. **Evaluation of the changes in ft-PWV and the simultaneously Complior cf-PWV in 10 healthy subjects by cold pressor test.**

Results

1. **Comparison of ft-PWV and cf-PWV**

2. **Analyse of the discrepancies**

3. **Changes from cold pressor test**

Discussion and Conclusion

The ft-PWV is well correlated to the cf-PWV. The pOpmètre seems to measure a central stiffness more so than a peripheral stiffness. Nevertheless, ft-PWV may contain elements that are influenced by lower limb arterial stiffness. Indeed in younger subjects, the Dtf is much greater than the TT-cf, but in the older subjects in whom transit time at lower limb arteries is smaller, the difference between Dtf and TT-cf decreases. The discrepancy between ft-PWV and cf-PWV decreases with age. During dynamic changes induced by cold pressor test, both cf-PWV and ft-PWV gave similar patterns, with increase following by a decrease PWV during recovery, however, the correlation between the change of cf-PWV and ft-PWV was weak.

In conclusion, the results of the present study indicate that ft-PWV may be a promising device to assess arterial stiffness. Probably, the greatest advantages of pOpmètre are: a low price, an easy and fast way to measure. Further studies are needed to adjust the bias concerning peripheral stiffness and to validate the pOpmètre in larger population.