Efficacy Evaluation of Vacuous Pulse and Replete Pulse by using Clip-type Pulsimeter Equipped with a Magnetic Sensing Hall Device

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1. Introduction

The clinical data of 120 subjects were compared by a normal statistical method. The ratio of systolic peak amplitude to time in the pulse waveform is determined as a major efficacy parameter to discern the vacuous pulse and replete pulse with an estimation equation. This is deducted by a statistical logistic regression method.

2. Equipment

Permanent magnet, Hall sensor, measurement part, LED, display, USB port and switch part of pulsimeter was as shown in Fig. 1(a). Magnetic material of the contact on the clip-type pulsimeter can be modified easily through vibration of the pulse and small cylindrical permanent magnet. There is s flexible silicon housing, which is suitable for skin contact. The flexibility of the housing was needed so as not to press the skin typically.

A actual figure of measuring the pulse wave signal through a clip-type pulsimeter worn on a human wrist, and a real feature of clinical trial for the acquisition of pulse signals by using one clip-type are shown in Fig. 1(b) and (c), respectively.

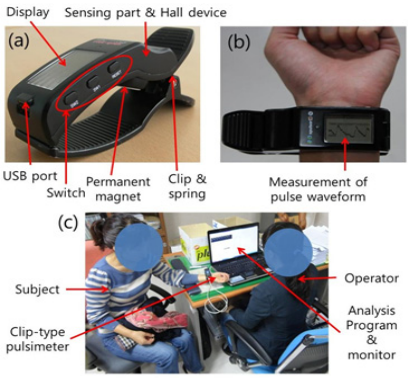

Fig. 1

3. Method

The overall flow of the final selection processing for the screening subject with one informed consent form and for the selection criteria with five doctor's diagnosis by using syndrome questionnaire in order to measure three pulse waves such as deficiency syndrome group, excess syndrome group and non-classified syndrome group is shown in Fig. 2(a).

After giving a 5 minute break to the selected subjects for deficiency syndrome group, excess syndrome group and non-classified syndrome group as Fig. 2(b), the subjects were measured by the pulsimeter simultaneously during 3 minutes after a minute of rest.

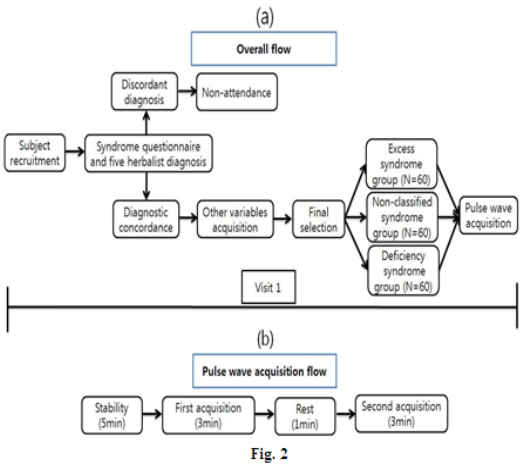

Fig. 2

4. Parameters of pulse wave

Definition of each of nine parameters of pulse wave shown in the Fig. 3, is as Table 1.

In addition, the 1st and the 2nd measurements are distinguished waveforms measured before and after the one minute break. This is the method to obtain the waveform of the subject in Fig.3.

On the other hand, We have selected sex, age, body mass index (BMI [kg/m^2]), diastolic blood pressure (DBP) and systolic blood pressure (SBP), body temperature, etc as a secondary variable.

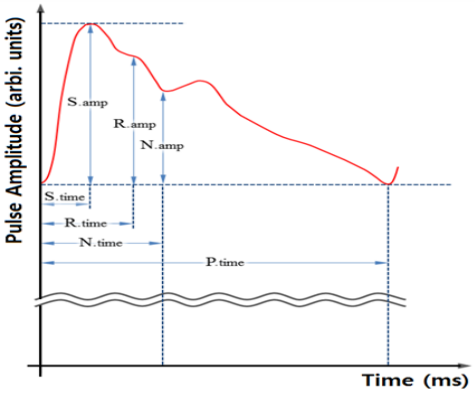

Fig. 3

Table 1

Parameters of pulse wave (1*,2*)	Definitions
S.amp	Systolic peak amplitude
R.amp	Reflective peak amplitude
N.amp	Notch peak amplitude
S.time	Systolic peak time
S.amp/S.time	Systolic peak amplitude/ Systolic peak time
R.time	Reflective peak time
N.time	Notch amplitude time
P.time	Period time
b/a rate	Maximum peak/minimum peak in the 2nd order derivative

5. Result

$$\log\left(\frac{p}{1-p}\right) = -9.662 + 0.014 * Sex - 0.001 * Age + 0.127 * BMI + 0.038 * SBP - 0.000 * DBP + 0.120 * S.amp/S.time$$

In general regression equation, a regression coefficient B_0 is elicited constant term value at logistic regression analysis and the regression coefficient value; B_1, B_2, B_3, B_4, B_5 has the slope of 5 correction variables(X_1 = sex, X_2 = age, X_3 = BMI, X_4 = SBP, X_5 = DBP). B_6 has the slope of pulse wave variable (S.amp/S.time).

Through implementing logistic regression analysis the binary clinical data from the deficiency syndrome group and excess syndrome group. The distinct regression equation of vacuous pulse and replete pulse is used for assessing the pulse wave variable of sex, age, BMI, SBP, DBP, and S.amp/S.time offered.

6. Conclusion

Based on the results of statistical analysis for the clinical pulse data ; the pulse wave parameters of age, sex, BMI. SBP, DBP, and the S.amp/S.time are presented in the logistic regression equation of this study. It could be determine the vacuous pulse and the replete pulse.

Keywords : magnetic sensing Hall device, clip-type pulsimeter, vacuous pulse, replete pulse, clinical trial, efficacy evaluation, logistic regression analysis

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