

Skin Perfusion Pressure (SPP) Assessments with the moorVMS-PRES and moorVMS-LDF

Application note #105

Application

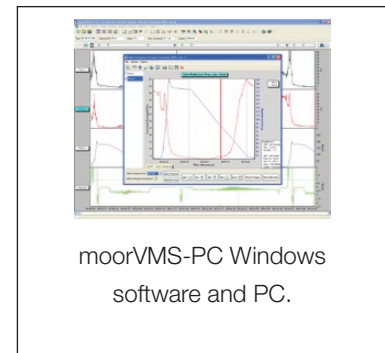
Skin Perfusion Pressure (SPP) is the pressure required for restoring microcirculatory blood flow following release of carefully controlled occlusion. The measurement of SPP with laser Doppler is a non-invasive test. It has proved useful in the assessment of peripheral arterial disease (PAD) for both critical ischemia (Castronuovo, 1997, Castronuovo et al, 1997), and also for the determination of optimal levels for amputation (Tsuji et al, 2008). There are also indications in the literature that SPP measurements are useful indicators for wound healing potential (Yamada et al, 2008).

SPP provides a good indication of the status of the proximal arterial system whilst remaining unaffected by conditions such as arterial wall calcification (commonly seen in diabetic patients with PAD for example). Foot SPP has also been shown to correlate well to toe pressure and would be useful in situations where toe pressure measurements are not possible, due to toe amputation, ulceration or gangrene (Tsai et al, 2000).

The combined moorVMS-PRES and moorVMS-LDF systems enable simple, rapid and reproducible measurement of SPP. The user friendly PC software enables protocols to be written which exactly match user requirements for individual experimental conditions – the user is in no way limited to pre-defined protocols.

Equipment Required

The following equipment is required for this assessment: -



*The moorVMS-LDF2 is a new model and replaces previous monitors including the MBF3D, moorLAB server, moorLAB satellite and DRT4. Not necessary if you have another laser Doppler monitor, imager or other flow detection method. The moorVMS-PRES provides you with 2 analogue outputs (pressure and pulse volume) at the rear of the monitor, for use with data acquisition units and chart plotters.

** The cuff used will depend upon patient and limb size e.g. arm, thigh, lower leg etc.

Method

- Refer to the Practical Suggestions section of this Application Note for environmental and patient recommendations.
- Ensure the skin probe is calibrated (See moorVMS-LDF User Guide).
- Measurements should be made with the patient in the supine position with the limb to be measured at heart level.



- Place the skin probe on the measurement site under the pressure cuff.
- Set the moorVMS-PC software using the settings shown in Figure 1 (adjust for preferred protocol, see moorVMS-PRES user guide, section 2 or moorVMS-PC user guide section 2 for details or ask your Moor Instruments representative for further information).

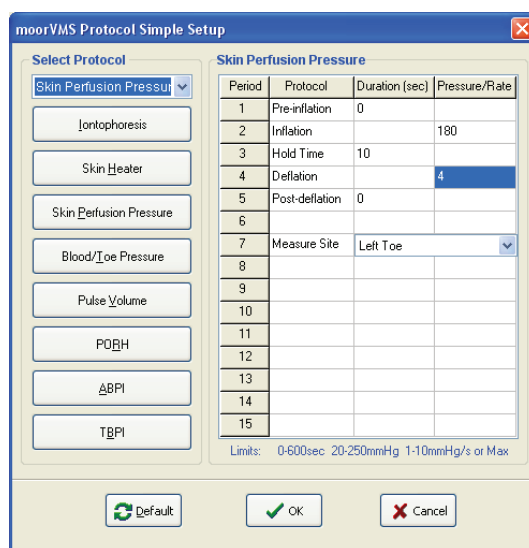


Figure 1 - moorVMS-PC Simple protocol Set-up Skin Perfusion Pressure.

Analysis

The SPP report contains the SPP charts in addition to the following statistical information:

- Site
- SPP (mmHg)
- Flux (PU)
- Flux/BZ
- Time (hh:mm:ss)
- Deflation (mmHg/s)
- Flux ch
- Pressure ch
- Average
- Press calc
- Mean SPP (mmHg)

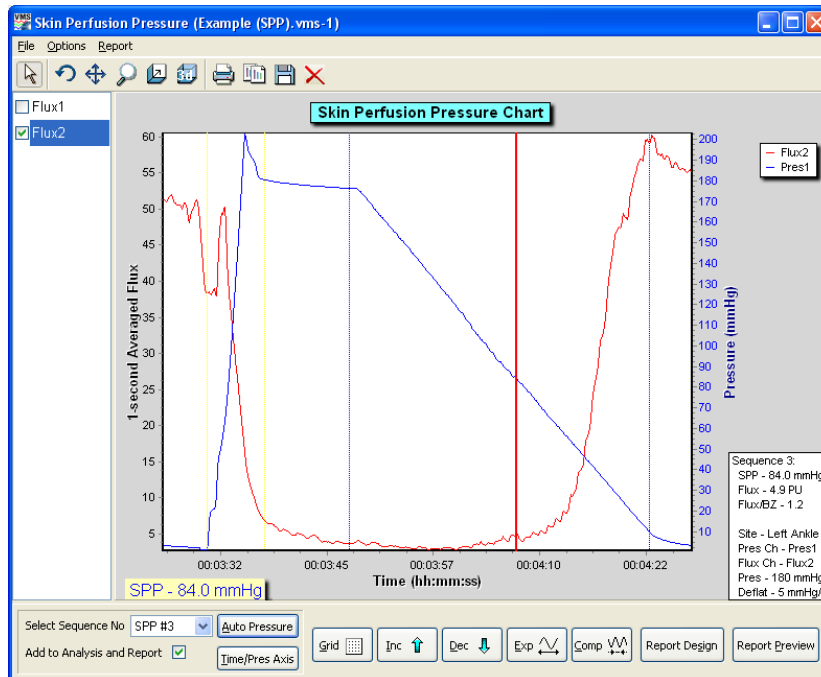


Figure 2 - example of Skin Perfusion Pressure chart.

In the example shown above the following protocol was used: Inflate pressure automatically to 180 mmHg and hold for 19 seconds, controlled deflation at rate of 5 mmHg/s, Flux was constantly monitored and is also shown on the chart. Yellow and blue lines indicate inflation, holding, deflation and abort markers. The site, target pressure and deflation rate are displayed in the bottom right info box. SPP is calculated when the Flux returns to 1.5 x biological zero which is shown by the SPP marker in the above figure (indicated by the vertical red line). A different SPP detection point can be selected from the Report Design. You can also measure SPP manually by moving the red line.

Practical Suggestions

Microvascular blood flow can be affected by various external factors. The following practical suggestions are provided as a guide and are not exhaustive:

- Perform measurements in a quiet room whilst maintaining a comfortable temperature (typically 22°C). Ensure the patient is acclimatised to the room temperature for 30 minutes prior to measurements.
- Patients should avoid caffeine, high salt food, alcohol, vigorous exercise, and smoking for 24 hours prior to the study.
- During measurements ask the patient to breathe normally. Coughing, talking and yawning can all affect microvascular blood flow readings.
- The patient should be in a comfortable, relaxed position and avoid movement during all measurements.

Publications

1. Castronuovo J. J. (1997) Diagnosis of critical limb ischemia with skin perfusion pressure measurements. *The Journal of Vascular Technology*, 21(3), pp 175-179.
2. Castronuovo J. J., Aclera, H. M., Smiell J. M., Price, R. (1997) Skin perfusion pressure measurement is valuable in the diagnosis of critical limb ischemia. *Journal of Vascular Surgery*, 26(4), pp 629-637.
3. Tsai F. W., Tulsyan N., Jones D. N., Abdel-AI N., Castronuovo J. J., Carter S. A. (2000) Skin perfusion pressure of the foot is a good substitute for toe pressure in the assessment of limb ischemia. *Journal of Vascular Surgery*, 32(1), pp 32-36.
4. Tsuji, Y., Hiroto, T., Kitano, I., Tahara, S., Sugiyama, D. (2008) Importance of skin perfusion pressure in treatment of critical limb ischemia. *Wound Research*, Apr 2008 Issue 4.
5. Yamada, T., Ohta, T., Ishibashi, H., Sugimoto, I., Iwata, H., Takahashi, M., Kawanishs, J. (2008) Clinical reliability and utility of skin perfusion pressure measurement in ischemic limbs – Comparison with other non-invasive diagnostic methods. *Journal of Vascular Surgery*, 47(2), pp 318-323.

Further Reading

moorVMS-LDF, moorVMS-PRES and moorVMS-PC user manuals for instrument operation and cleaning and handling of optic probes.

www.moor.co.uk - information about moorVMS-LDF, moorVMS-PRES, optic probes and pressure cuffs.

Please feel free to consult sales@moor.co.uk for further advice or support with issues not covered in this application note and details of other application notes using the moorVMS-PRES.

Important Disclaimer: This information is provided to further clinical research into diagnostic capabilities of laser Doppler. The moorVMS-LDF and moorVMS-PRES are CE marked for human use but not specifically for clinical diagnosis of SPP assessments. Calibrated equipment with a current service record should only be used.

Notes



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