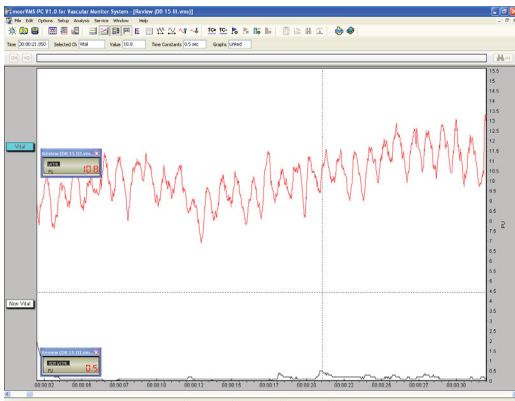


Tooth vitality testing using moorVMS-LDF

Application note #100

Application

Laser Doppler (LD) is considered more reliable than sensory testing for vitality assessment (1). This is because there can be adequate vascularisation to support tooth pulp vitality even when sensation is lost due to nerve damage. Blood flow is assessed by placing laser Doppler probes in contact with the teeth, typically using a dental putty splint to support the probe. The graph below illustrates a simultaneous comparison of blood flow in Vital and Non Vital teeth. Further confirmation can be obtained by using FFT analysis of the blood flow recording to investigate the presence or absence of the cardiac pulse.



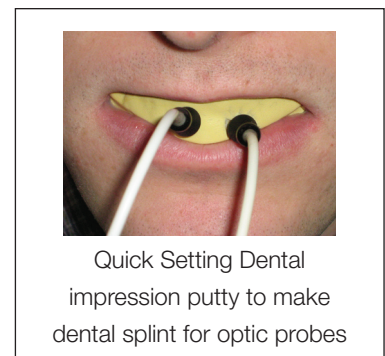
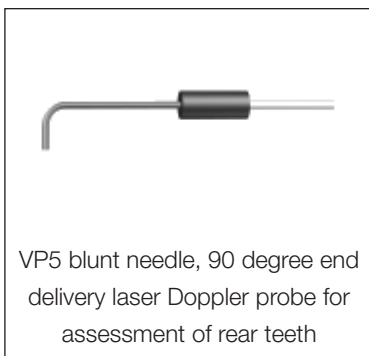
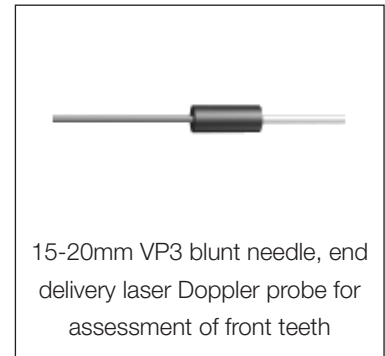
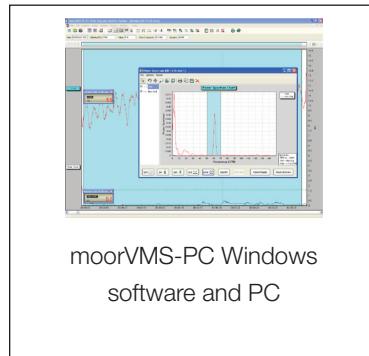
Trace Characteristics:

← **Vital:** Relatively high blood flow usually with a pulsatile (cardiac frequency) component.

← **Non Vital:** Relatively low blood flow with no clear pulsatility.

Equipment Required

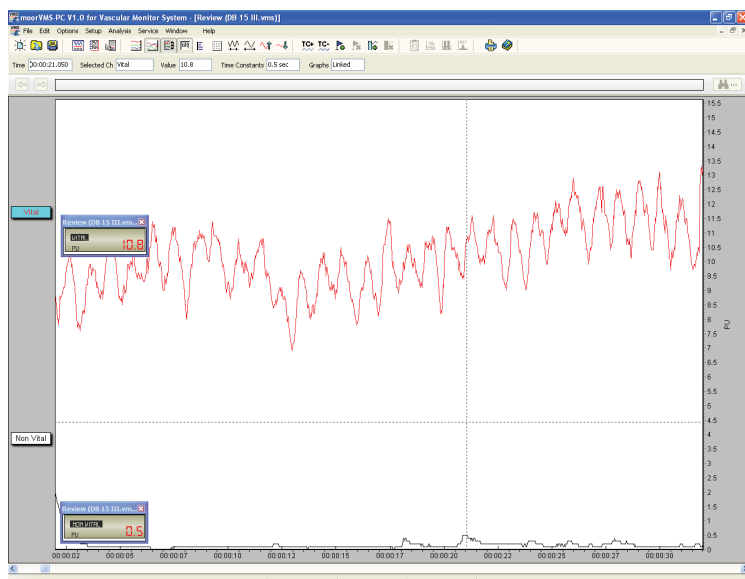
The following equipment is required for tooth Pulp Vitality testing: -



Method

- Ensure your MoorVMS-LDF module is calibrated and with an in-date service record.
- Ensure your probes are clean; disinfect with Cidex OPA where facilities and local regulations allow. If sterilisation is required use the Sterrad low temperature technique (see Q36 Cleaning and handling of optic probes, supplied with all optic probes).
- Set the LD time constant of the system to 0.1 seconds (to view pulsatility).
- Consider using warm mouth wash to enhance local flow, then insert the dental splint into the patients mouth.
- Ensure the probe tip is in contact with the tooth is held firmly in the dental splint (see practical suggestions).
- Ensure optic fibres are supported and not swinging free (possibly tape the probe leads to fixed surfaces).
- Sample continuously for at least a minute to obtain a trace free of movement artefact signals.
- Vitality is assessed by the magnitude of the LD signal, presence of cardiac pulsatility and other, natural, spontaneous variations in blood flow.
- Please refer to publications for further hints / tips.

Analysis

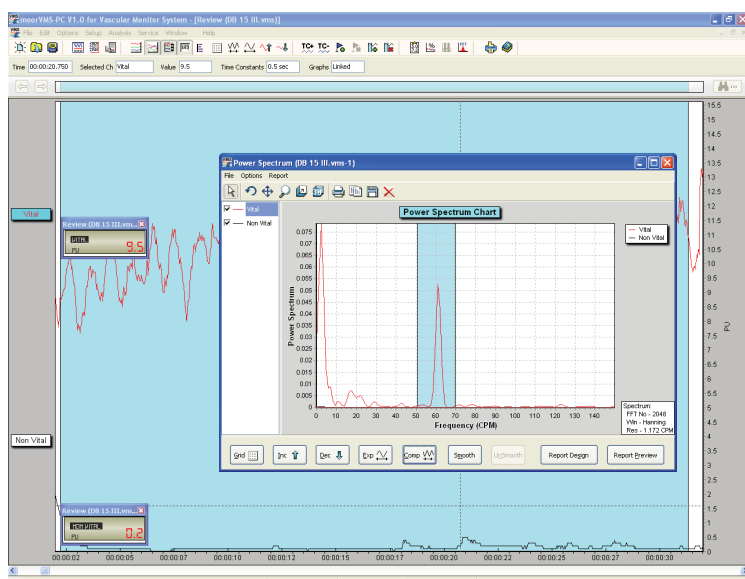


Tooth Vitality is confirmed by examining both the pulsatility and magnitude of the traces.

Trace Characteristics:

← **Vital:** Relatively high blood flow usually with a pulsatile (cardiac frequency) component.

← **Non Vital:** Relatively low blood flow with no clear pulsatility.



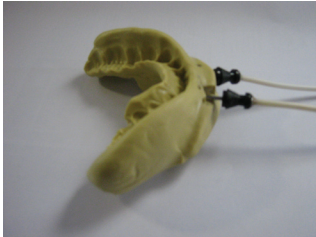
As a further aid to vitality assessment, it is possible to quantify and assess cardiac pulsatility of the tooth blood flow: the flux traces can be transformed with Fourier analysis (FFT using MoorVMS-PC software). FFT examples are shown left; note the prominence of the peak at cardiac frequency (here about 60 cycles per minute) indicating pulp vitality.

Practical Suggestions

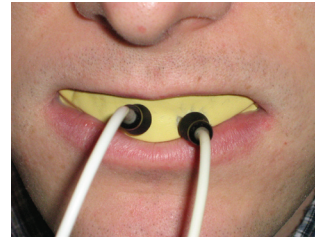
Supporting the probe: Dental Putty Splint.

Measurements free of movement artefact signals can be obtained when the laser Doppler optic fibre probe is supported in a dental putty splint (although successful hand held measurements have been reported). The splint also ensures reproducible positioning at follow-up to assess progress.

Dental splints are made for the individual patient using dental impression putty (e.g. President Putty). Mould the putty to the patients' teeth, then drill a small hole (size 2) at 2 to 3mm from the gingival margin (first test positions using a needle).



Dental putty probe holder for chronic blood flow measures.



Dental putty probe holder in position with 2 laser Doppler probes.

Publications

1. Laser Doppler Flowmetry in Assessing Vitality in Luxated Permanent Teeth. Olgart L, Gazelius B and Lindh-Stromberg U. Int. Endodont. J. 21, 300-306, 1988.
2. Reliability of Pulpal Blood Flow Measurements Utilising Laser Doppler Flowmetry. Ramsay DS, Artun J and Martinen SS. J. Dent. Res. 70, 1427-1430, 1991.
3. Effects of Inferior Alveolar Nerve Block Anaesthesia on the Lower Teeth. Odor TM, Pitt-Ford TR and McDonald F. Endod. Dent. Traumatol. 10, 144-148, 1994.
4. A two-probe laser Doppler flowmetry assessment as an exclusive diagnostic device in a long-term follow-up of traumatised teeth: a case report. Roeykens H, Van Maele G, Martens L, De Moor R. Dent Traumatol. 2002 Apr;18(2):86-91.
5. Some aspects of the use of laser Doppler flow meters for recording tissue blood flow. Vongsavan N, Matthews B. Exp Physiol. 1993 Jan;78(1):1-14.

Further Reading

moorVMS-LDF User Manual.

Q36 cleaning and handling of optic probes.

www.moor.co.uk - information about laser Doppler monitors and probes.

Clinical advice courtesy of Heather Pitt-Ford, St Thomas' & Guys Hospital, London.

www.primadentalgroup.com - bur drill supplies.

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

