A fiber optic sensor is a sensor that uses optical fiber either as the sensing element (“intrinsic sensors”), or as a means of relaying signals from a remote sensor to the electronics that process the signals (“extrinsic sensors”). Fibers have many uses in remote sensing. Depending on the application, fiber may be used because of its small size, or because no electrical power is needed at the remote location, or because many sensors can be multiplexed along the length of a fiber by using light wavelength shift for each sensor, or by sensing the time delay as light passes along the fiber through each sensor. Time delay can be determined using a device such as an optical time-domain reflectometer and wavelength shift can be calculated using an instrument implementing optical frequency domain reflectometry.

Fiber optic sensors are also immune to electromagnetic interference, and do not conduct electricity so they can be used in places where there is high voltage electricity or flammable material such as jet fuel. Fiber optic sensors can be designed to withstand high temperatures as well.

A new technology involving a 330 µm fiber optic sensor embedded in the wall of a sheath structure was tested against both Radial Artery Catheterization and sphygmomanometer readings obtained simultaneous with readings recorded from the pressure sensing system (PSS). Correlations and Bland-Altman analysis were used to determine whether use of the PSS could substitute for these standard techniques.

The results indicated highly significant correlations in systolic, diastolic, and mean arterial pressures (MAP) when compared against radial artery catheterization ($p<0.0001$), and MAP means differed by <4%. Bland-Altman analysis of the data suggested that the sheath measurements can replace a separate radial artery catheter. While less striking, significant correlations were seen when PSS readings were compared against BP cuff readings.

The PSS has competitive functionality to that seen with a dedicated radial artery catheter for BP monitoring and is available immediately on sheath insertion without the added risk of radial catheterization. The sensor is structurally separated from the primary sheath lumen and readings are unaffected by device introduction through the primary lumen. Time delays and potential complications from radial artery catheterization are avoided [1)].

1)
Purdy PD, South C, Klucznik RP, Liu KC, Novakovic RL, Puri AS, Pride GL, Aagaard-Kienitz B, Ray A, Elliott AC. Use of a pressure sensing sheath: comparison with standard means of blood pressure monitoring in catheterization procedures. J Neurointerv Surg. 2016 Jul 15. pii: neurintsurg-2016-012536. doi: 10.1136/neurintsurg-2016-012536. [Epub ahead of print] PubMed PMID: 27422970.

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