[0004] Handheld Doppler probes, which are typically permanently positioned on the distal tip of a pen-like device instead of being placed or left within the body, are helpful in blood flow monitoring, but they suffer from several drawbacks. One drawback with handheld probes is their inability to be reliably positioned about a vessel.

[0005] It is of great importance after microvascular surgery to monitor the region of the surgery in order to make sure that the blood flow is maintained at the desired level and that no problems, such as thromboses have occurred. Should thrombosis occur, the transferred tissue would die. Other indirect means of monitoring the functioning of blood flow through blood vessels, which have been subjected to microvascular surgery, are also often inadequate. For example, surface temperature measurements, transcutaneous PO_2 monitoring, photo plethysmography and laser Doppler flow meters have been employed. However, these approaches generally require an accessible exposed portion of the flap. Additionally, buried free tissue transfers and intraoral flaps cannot be monitored effectively by these methods.

SUMMARY

[0006] The present disclosure provides improved vascular monitoring systems, devices and methods to improve the accessibility, detection and/or reliability of detecting blood flow to confirm vessel patency at an anastomotic site.

[0006a] In an aspect, the present disclosure refers to a Doppler blood flow monitoring device comprising: a signal generation module configured to send a signal to a probe positioned in a probe receptacle on a vascular coupler positioned about a patient's vessel; a signal reception module configured to receive a return signal from the probe; a signal filtration module configured to filter the return signal; a signal conversion module configured to convert the filtered signal into an audible indication and a visual indication corresponding to a characteristic of blood flow in the patient's vessel; at least one speaker configured to emit the first audible indication; and a user interface configured to display the visual indication.

[0006b] In another aspect, the present disclosure refers to a Doppler blood flow

monitoring system comprising: a vascular coupler positioned about a patient's vessel; a transducer attached to the vascular coupler; and a monitor configured to: generate a signal to send to the transducer, wherein the transducer is configured to emit an ultrasonic signal based on the signal generated by the monitor, and wherein the ultrasonic signal is transmitted through the patient's vessel, receive a return signal from the transducer, and convert the return signal into a first indication and a second indication corresponding to a characteristic of blow flow in the patient's vessel.

[0006c] In another aspect, the present disclosure refers to a remote monitoring system comprising: a monitor configured to: generate a signal to send to a transducer positioned within a vascular coupler, wherein the vascular coupler is positioned about a patient's vessel, the transducer is configured to emit an ultrasonic signal based on the signal generated by the monitor, and the ultrasonic signal is transmitted through the patient's vessel, receive a return signal from the transducer, and convert the return signal into a first indication and a second indication corresponding to a characteristic of blow flow in the patient's vessel; and a remote database configured to: receive one or more files associated with the first indication, and store the one or more files associated with the first indication, wherein the one or more files are remotely accessible via a user device.

[0007] In one example, a Doppler blood flow monitoring device includes a signal generation module, a signal reception module, a signal filtration module, a signal conversion module, at least one speaker, and a user interface. The signal generation module is configured to send a signal to a probe positioned in a probe receptacle on a vascular coupler positioned about a patient's vessel. The signal reception module is configured to receive a return signal from the probe. The signal filtration module is configured to filter the return signal. The signal conversion module is configured to convert the filtered signal into an audible indication and a visual indication corresponding to a characteristic of blood flow in the patient's vessel. The at least one speaker is configured to emit the first audible indication. Additionally, the user interface is configured to display the visual indication.

[0008] In another example, a Doppler blood flow monitoring system includes a vascular coupler, a transducer, and a monitor. The vascular coupler is positioned about a patient's vessel. The transducer is attached to the vascular coupler. The monitor is configured to generate a signal to send to the transducer and the transducer is configured to emit an ultrasonic signal based on the signal generated by the monitor. Additionally, the ultrasonic signal is transmitted through the patient's vessel. The monitor is also configured to receive a return signal from the transducer and convert the return signal into a first indication and a second indication corresponding to a characteristic of blow flow in the patient's vessel.

[0009] In another example, a remote monitoring system includes a monitor and a remote database. The monitor is configured to generate a signal to send to a transducer positioned within a vascular coupler. The vascular coupler is positioned about a patient's vessel, the transducer is configured to emit an ultrasonic signal based on the signal generated by the monitor, and the ultrasonic signal is transmitted through the patient's vessel. The monitor is further configured to receive a return signal from the transducer and convert the return signal into a first indication and a second indication corresponding to a characteristic of blow flow in the patient's vessel. The remote database configured to receive one or more files associated with the first indication and store the one or more files associated with the first indication, wherein the one or more files are remotely accessible via a user device.

[0010] It is accordingly an advantage of the present disclosure to improve accessibility of blood flow data.

[0011] It is another advantage of the present disclosure to improve the detection of blood flow to confirm vessel patency.

[0012] It is another advantage of the present disclosure to provide remote monitoring of blood flow at an anastomotic site.

[0013] It is a further advantage of the present disclosure to reduce background noise from audio signals representing blood flow within a vessel.

[0014] It is yet a further advantage of the present disclosure to reduce the occurrence of free flap failure and serious adverse events due to insufficient blood flow in a free flap.