Applications of lasers in medical procedures offer minimally-invasive alternatives to traditional surgical procedures. However, modern methods typically use an open air point-and-shoot method to irradiate the clinical target with the laser light, which can present significant hazards to the patient and practitioner alike. These techniques are also limited in that they need a clear line-of-sight between the laser source and the target, which precludes the use of any additional technology that might otherwise reduce side effects or provide additional diagnostic information at the same time as laser irradiation. This research developed an alternative laser irradiation method and demonstrated three distinct applications, one of which improved the therapeutic potential of the laser device while another provided diagnostic information about the depth of a blood vessel analogue in skin samples. This work focused on laser dermatology applications and demonstrated that the laser light could be transmitted into skin by placing an optical selective release waveguide in contact with the tissue, which makes clinical laser procedures safer to perform. It also saw the incorporation of an ultrasonic pulser during the procedure, which increased transmission of light through the skin by 174.3% through a phenomenon referred to as sonoillumination. Finally, the research also laid the foundation for a backward-mode photoacoustic tomography device, which represents a new medical imaging technology that fills in the gaps left by traditional ultrasound and may provide clinicians with better diagnoses of skin-related problems such as severe burns and pressure ulcers.