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Laser ablation of necrotic tissue to promote healing in burn injury

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Each year approximately 40,000 people are hospitalized due to burn injuries. The majority of our population is familiar with the superficial burns that result from overexposure to the sun, commonly known as sunburn. These burns cause death to few cells and heal in several days. However, when skin tissue comes in contact with certain chemicals, hot water, flames, or concentrated amounts of electricity, the epidermal and dermal layers of skin cells can be destroyed, resulting in partial or full thickness burns. The dead, or necrotic, layers of tissue may need to be excised and grafted to allow for proper healing response. Unfortunately, partial and full thickness burns rarely occur with uniform depth and distribution, and this makes it difficult for a burn surgeon to determine what tissue is viable and what needs to be removed. In fact, current excision techniques rely primarily on the sight and experience of the surgeon conducting the procedure, and under or over-excision is common. This can eventually lead to poor grafting beds and slow healing. The technique of laser ablation involves removing a particular tissue using high energy, rapid laser pulses. Our research focuses on using this technique to precisely remove only the necrotic tissue of a burn injury. This would provide surgeons with a clean wound bed that could more readily accept a skin graft, reducing the time needed for the injury to heal. It can also allow more surgeons to accomplish excisions since they would not require years of firsthand experience to accurately assess a wound. Coupled with another of our systems that can determine the exact depth profile of a burn injury using laser induced acoustic waves, laser ablation can prove beneficial for both the patient and the burn surgeon, revolutionizing the relatively primitive techniques available today.