Mosquito inspired medical needles

The stinging proboscis in mosquitos have diameters of only 40-100 μm which is much less than the thinnest medical needles and the mechanics of these natural stinging mechanisms have therefore attracted attention amongst developers of injection devices. The mosquito use a range of different strategies to lower the required penetration force hence allowing a thinner and less stiff proboscis structure. Earlier studies of the mosquito proboscis insertion strategies have shown how each of the single strategies reduces the required penetration force. The present paper gives an overview of the advanced set of mechanisms that allow the mosquito to penetrate human skin and also presents other biological mechanisms that facilitate skin penetration. Results from experiments in a skin mimic using biomimetic equivalents to the natural mechanisms are presented. This includes skin stretching, insertion speed and vibration. Combining slow insertion speed with skin tension and slow vibration reduces the penetration force with 40%