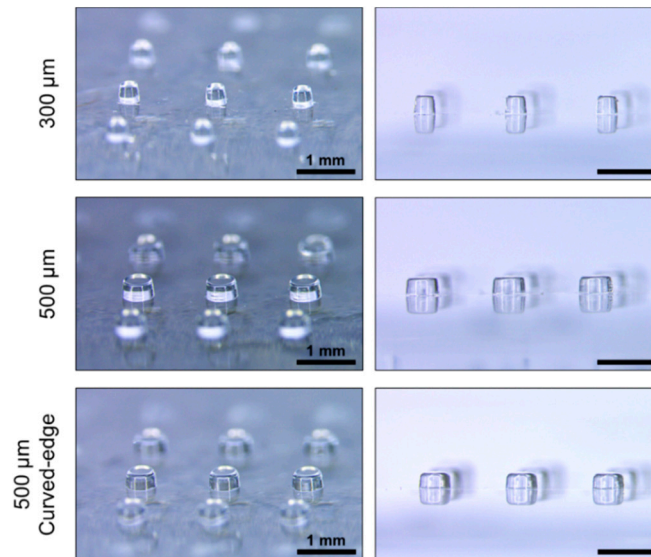
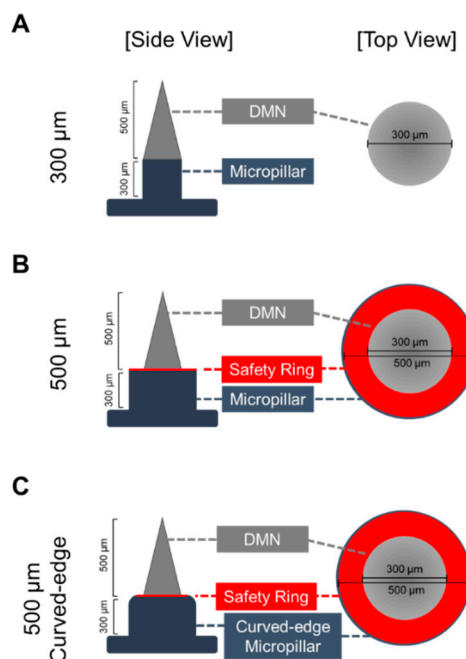


# Supplementary Materials: Rapidly separable micropillar integrated dissolving microneedles

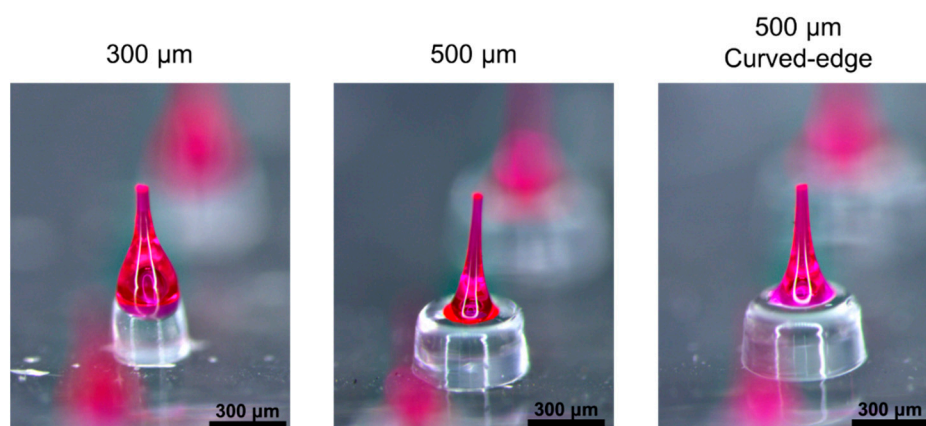
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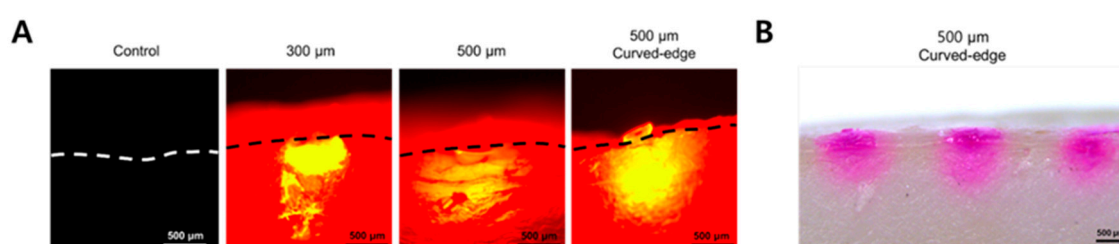
**Figure S1.** The micropillars were fabricated at a total height of 300  $\mu\text{m}$  with base diameters of 300  $\mu\text{m}$  (top panels) and 500  $\mu\text{m}$  (middle panels). In addition, a 500  $\mu\text{m}$  with a 45° curved edge was fabricated to evaluate the damage impact of micropillar edge on the skin (bottom panels). The 3  $\times$  3 array of micropillars were fabricated with a fixed pitch of 1.5 mm. The scale bars in all panels are 1 mm.



**Figure S2.** Specification of micropillars. The height of DMN and micropillars in all three types were fixed at  $500 \pm 63 \mu\text{m}$  and  $300 \mu\text{m}$ , respectively. (A) The base diameter of micropillar and DMN were at 300  $\mu\text{m}$ . (B) The base diameter of micropillar was 500  $\mu\text{m}$ , which is 200  $\mu\text{m}$  larger than the base diameter of DMNs. (C) A 45° curve was introduced to the edge of micropillars to minimize the friction force during SPDMN separation process.



**Figure S3.** Geometry of DMNs fabricated over the micropillars. The DMNs fabricated over 300  $\mu\text{m}$ -micropillars had a wider mid-portion compared with those fabricated over the 500  $\mu\text{m}$ -micropillars.



**Figure S4.** (A) Section analysis of pig cadaver skin at 10 min post application of single SPDMN for 300  $\mu\text{m}$ , 500  $\mu\text{m}$  and 500  $\mu\text{m}$  curved-edge, respectively. Yellow color (highest intensity) indicates the DMN application site and the red color shows permeation of rhodamine inside the skin. Dashed line indicates the skin surface. (B) Arrayed section analysis of pig cadaver skin at 10 min post application of 500  $\mu\text{m}$  curved-edge SPDMN.