

Selective Killing of Cancer-Associated Fibroblasts by Ultrasound-Mediated Mechanical Forces

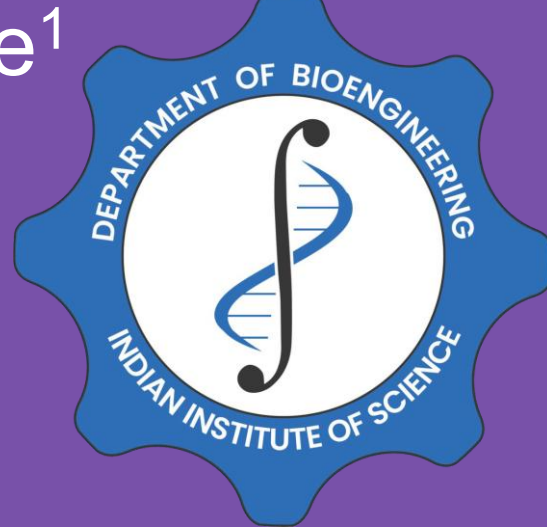
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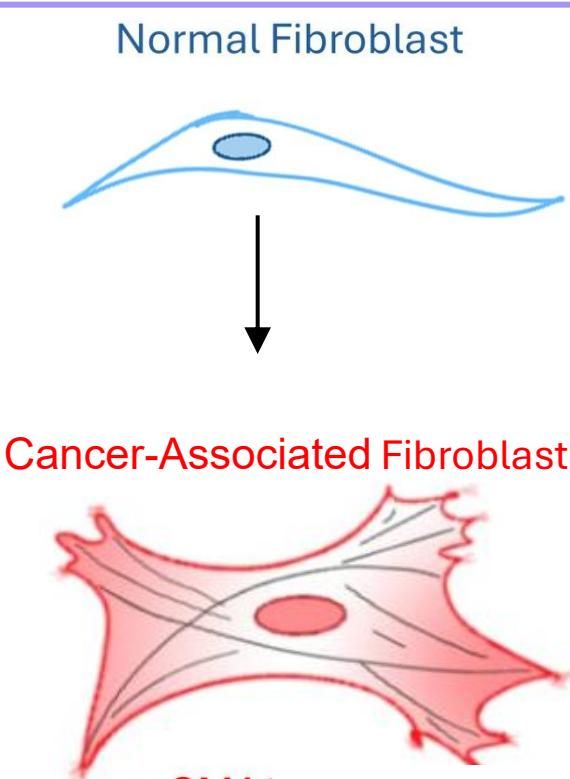
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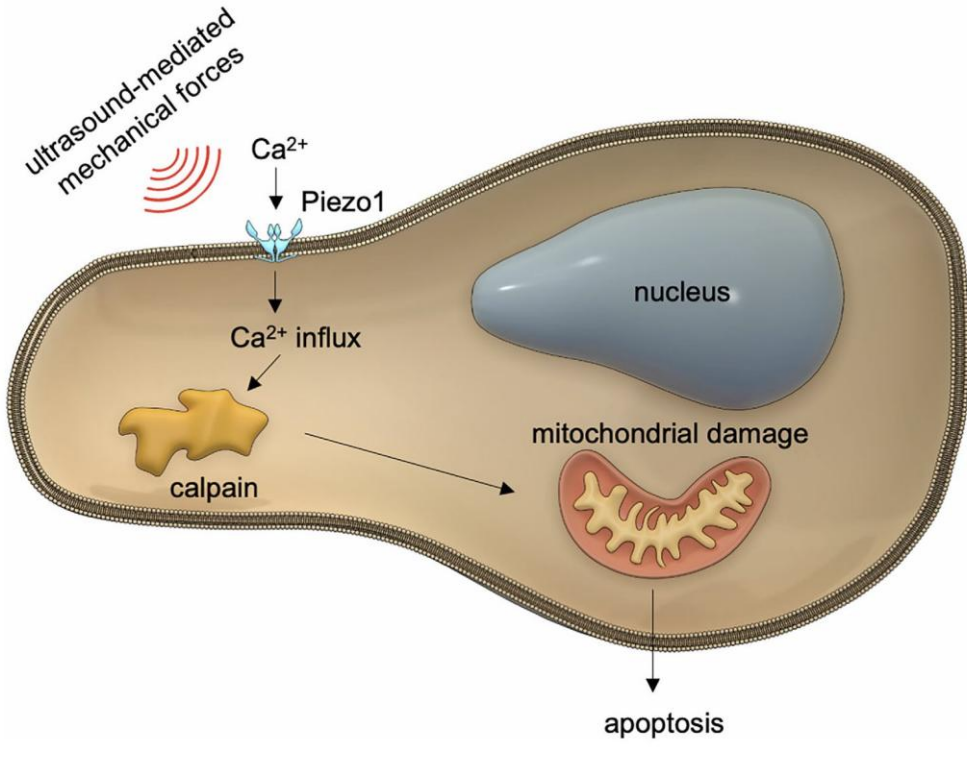
Background

- Oral cancer is the second most prevalent cancer in India
- Tumor progression is influenced not only by cancer cells but also by the tumor microenvironment (TME) where cancer associated fibroblasts (CAFs) plays a key role.

Activation of fibroblasts



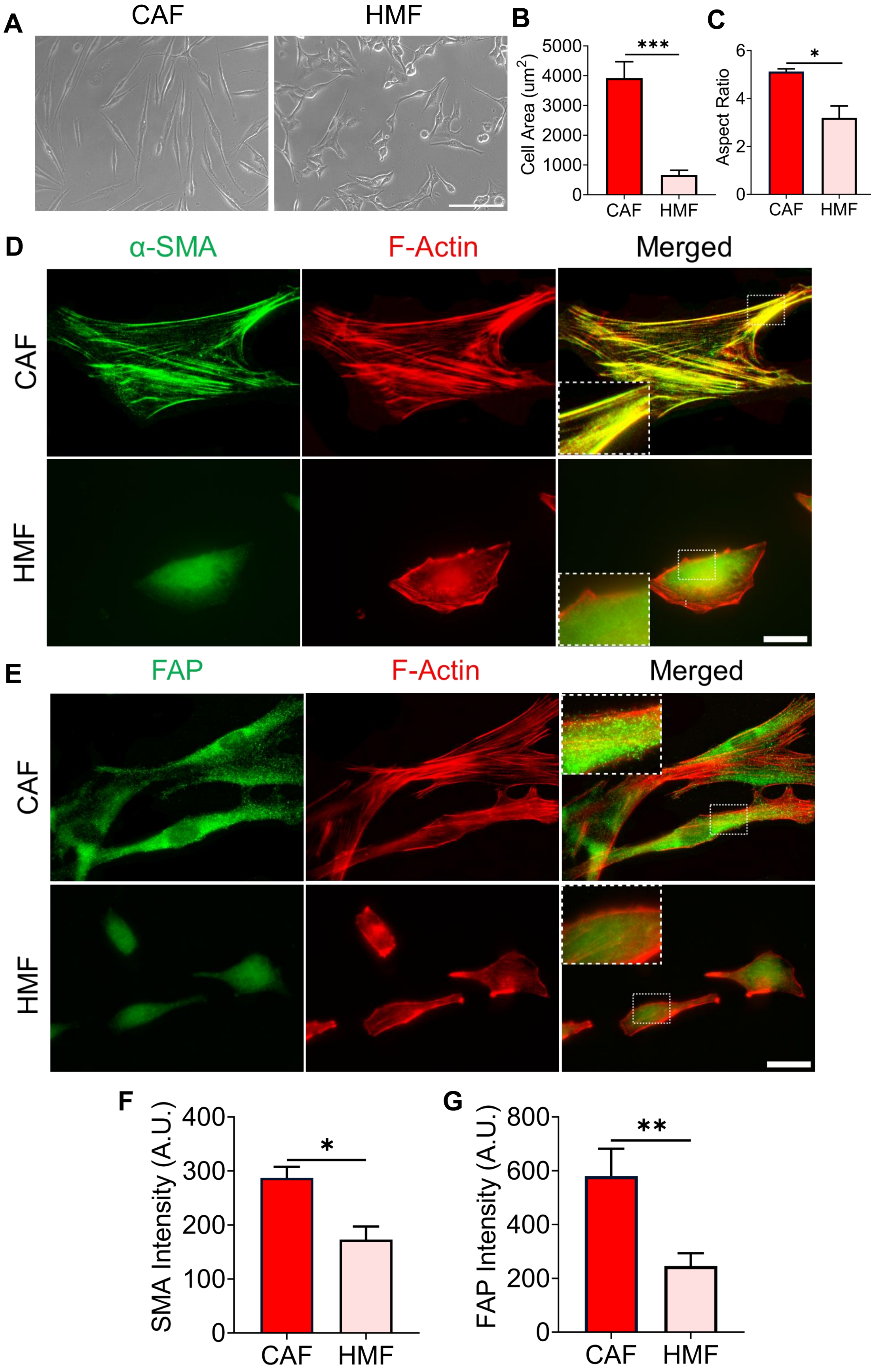
Cancer cell mechanoptosis



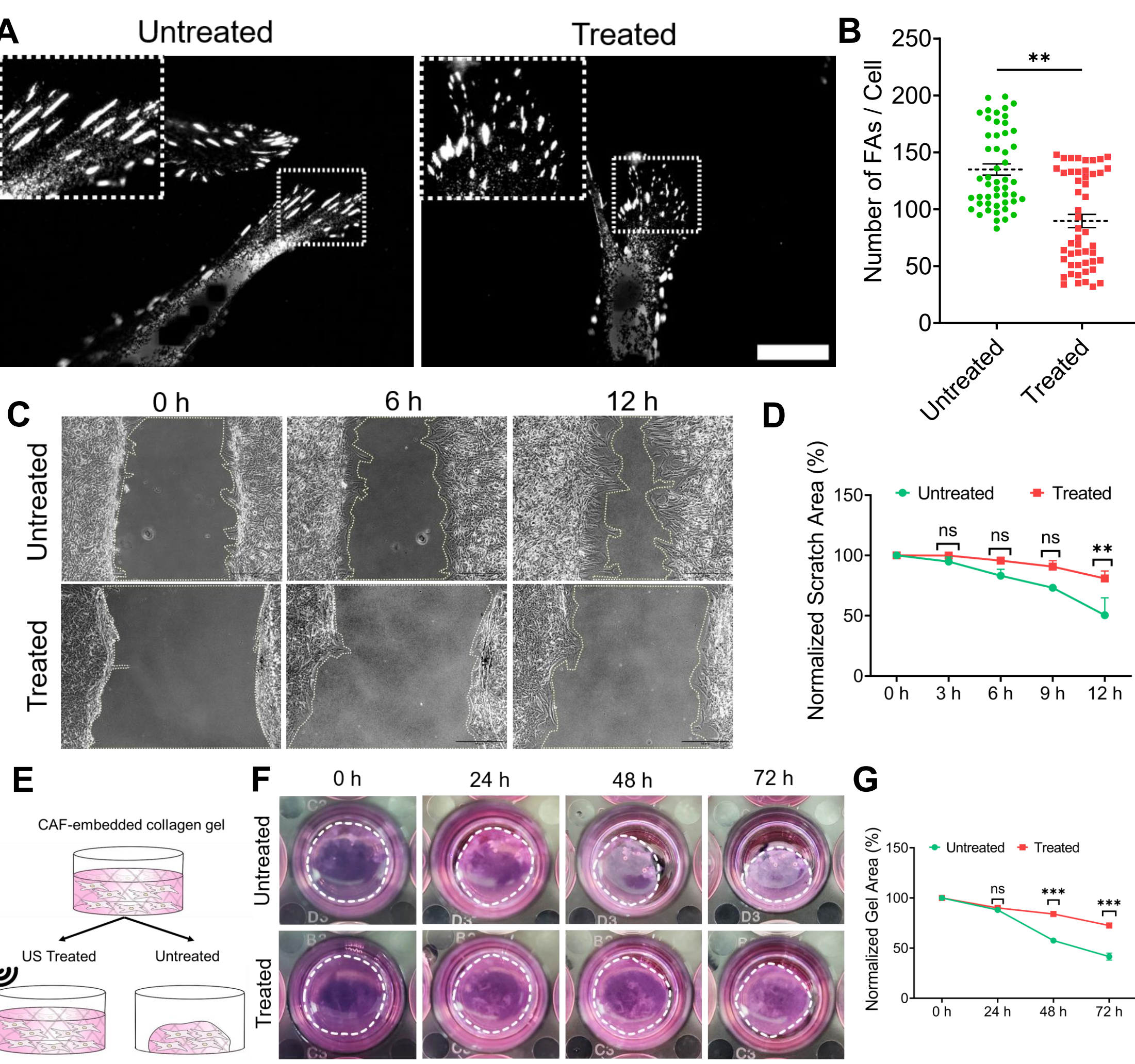
Can low-frequency ultrasound selectively induce apoptosis in cancer-associated fibroblasts while sparing normal fibroblasts in oral cancer?

Results

Patient-derived oral CAFs represent the myo-fibroblastic CAF subtype

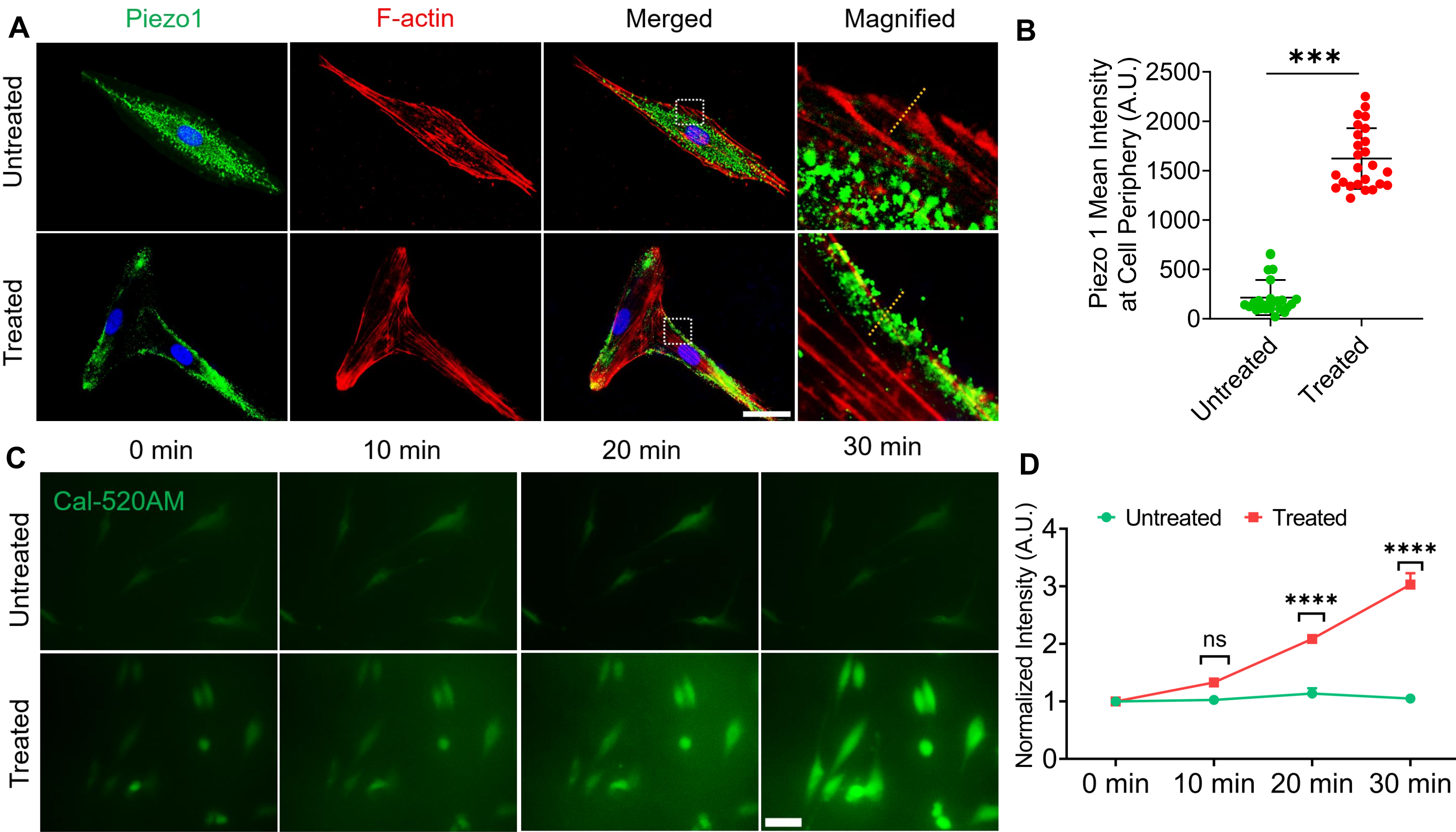


Low-frequency ultrasound suppresses CAF migration and gel contraction

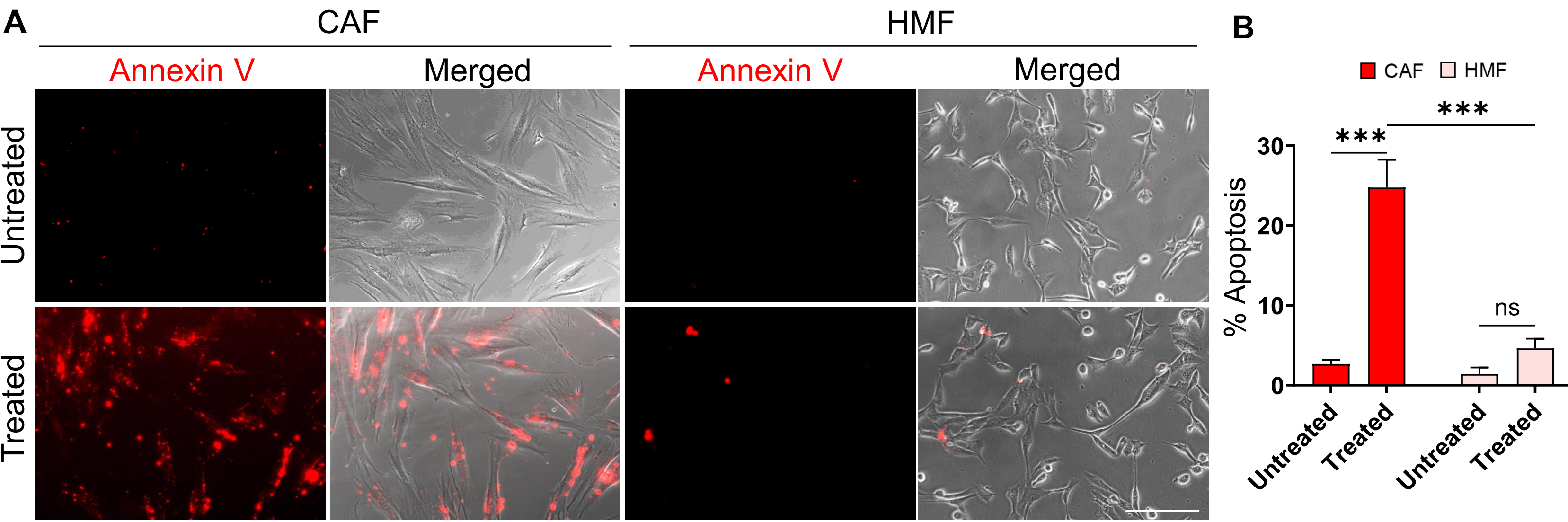


Results

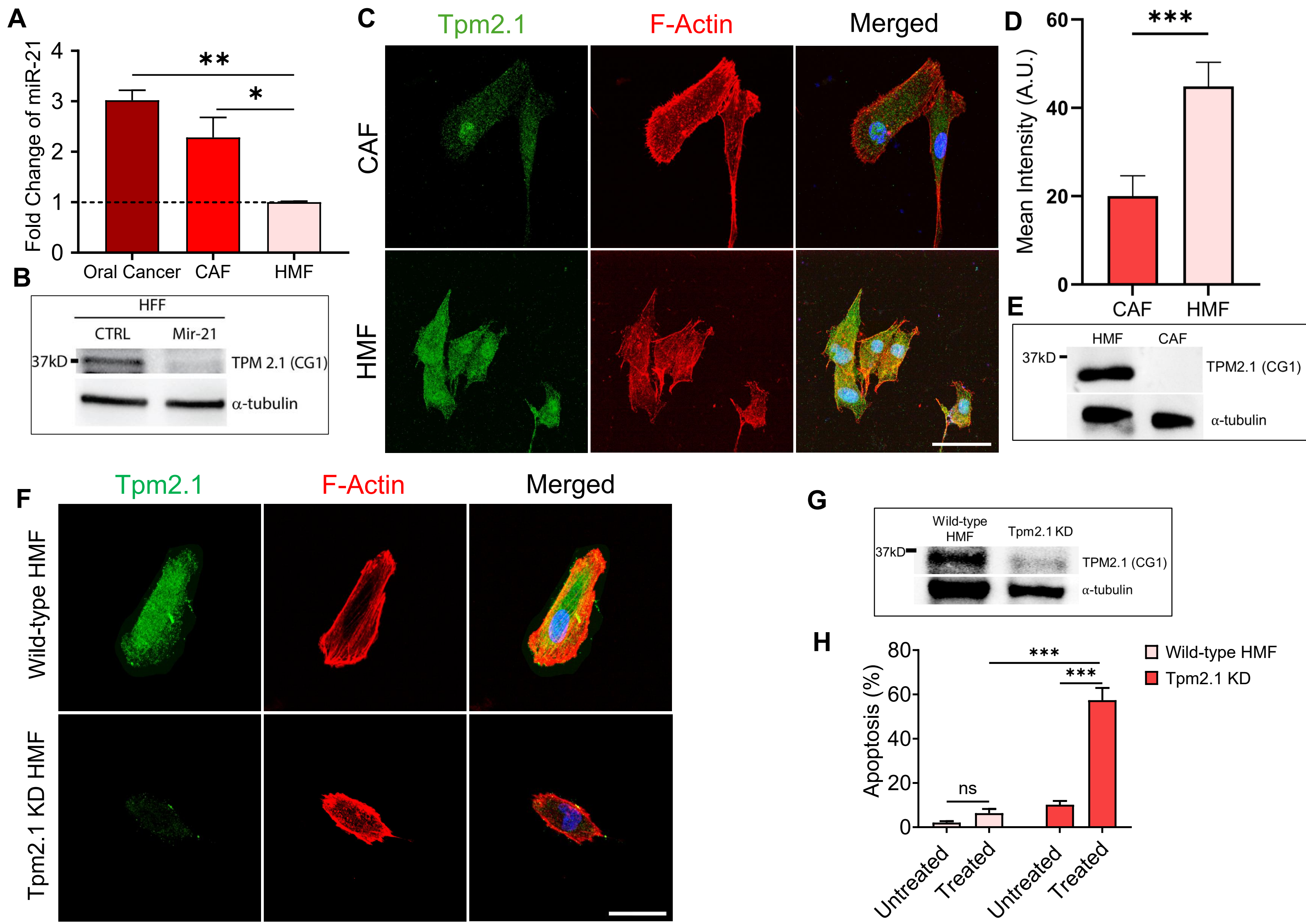
Low-frequency ultrasound activates Piezo1-mediated calcium influx to induce CAF mechanoptosis



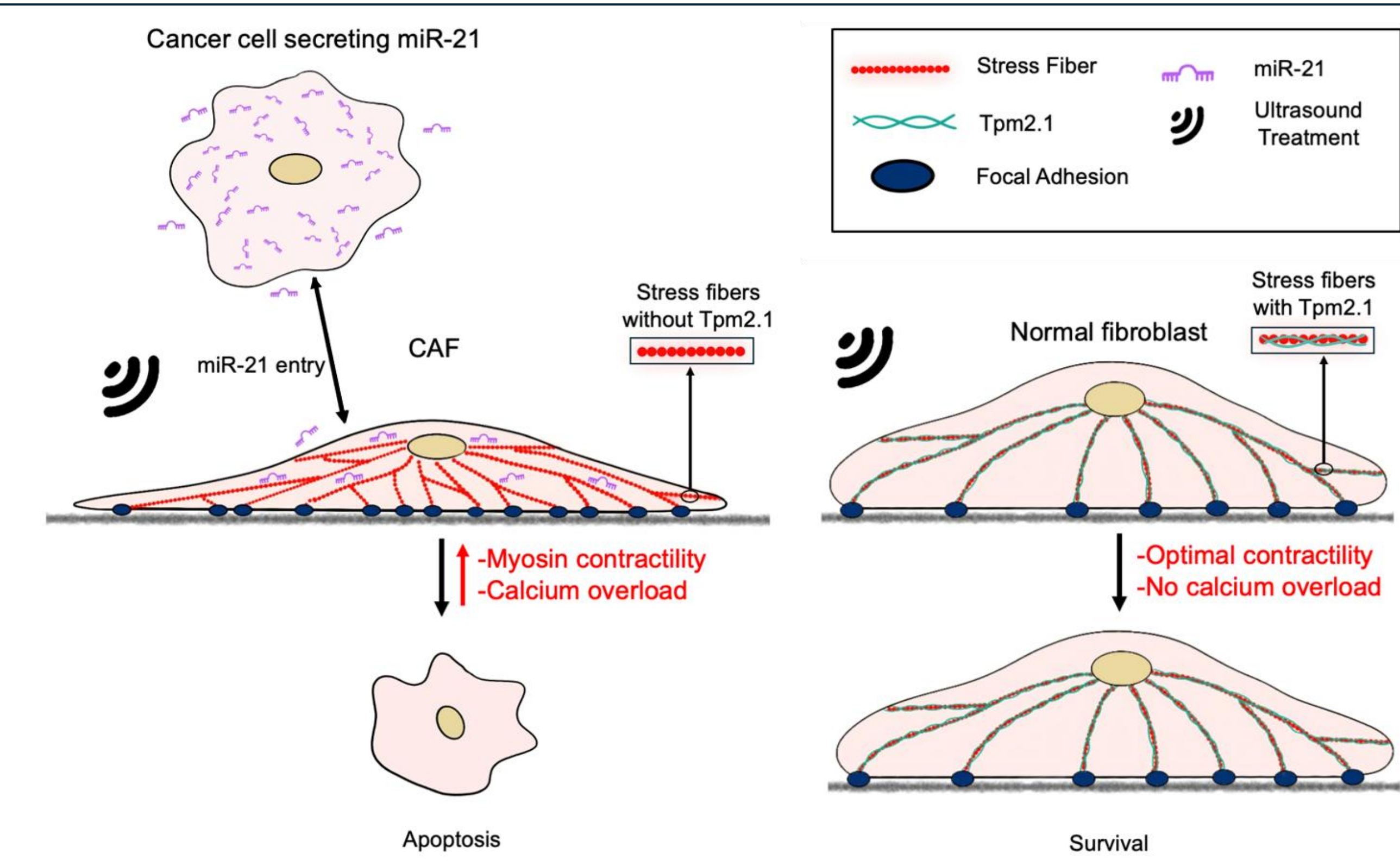
Low-frequency ultrasound causes selective killing of primary CAFs



miR-21 secreted by oral cancer cells downregulates Tpm2.1 in oral CAFs and causes CAFs mechanoptosis



Proposed model for CAF mechanoptosis



Publication



G. Sankar, A. Roy Choudhury, R. Luha, A. Kumar, K. Kulkarni, M. Yao, R. Pratap, A. Kapali, A. Tijore, Selective killing of cancer-associated fibroblasts by ultrasound-mediated mechanical forces, Biomaterials 328 (2026) 123844.



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