Cell squeezing of cancer cells and its application

Jhe-Wei Jhang[1, 2] , Peng-Yuan Wang[1, 2, *]

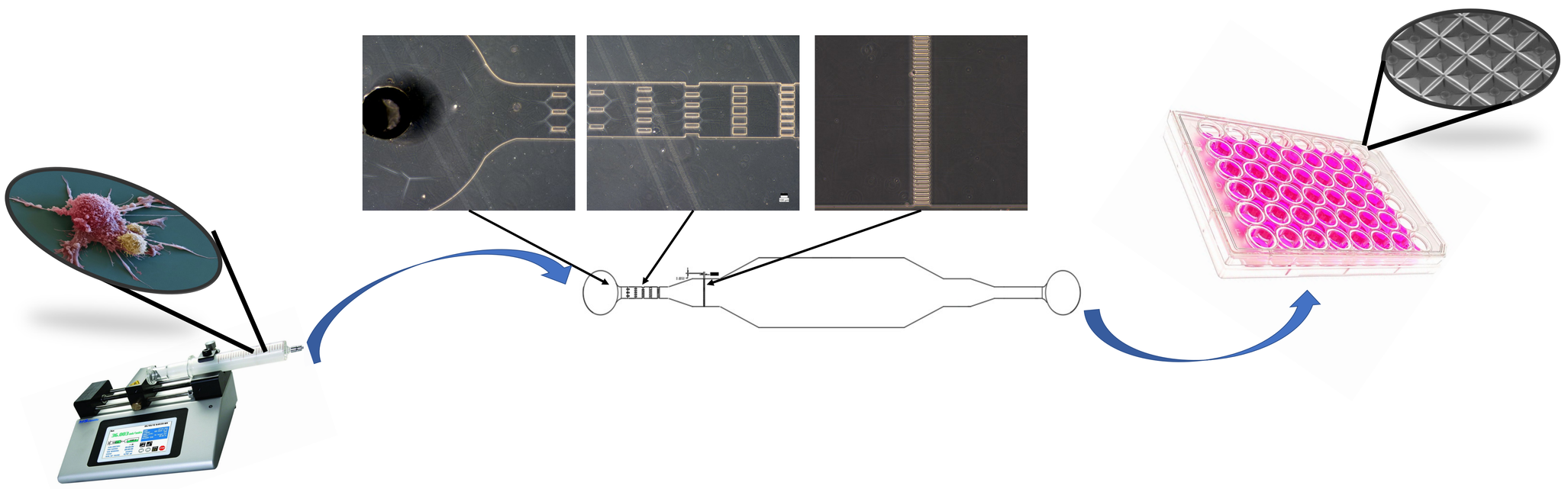
Shenzhen Key Laboratory of Biomimetic Materials and Cellular Immunomodulation, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences1068 Xueyuan Avenue, Shenzhen University Town, Shenzhen, China

Abstract

Biomechanical squeezing forces has been discovered during capillaries constriction. In order to simulate blood passing through narrow capillaries, we used microfluidic platform providing mechanical force on cancer cell lines (Huh-7). This mechanical forces might change cell behavior, such as cell growth, cell metastasis and cell drug resistance.

Material and Method

We designed 3 different size channels in microfluidic device for injected cancer cell pass through. In order to aggregate cell as tumor spheres easily, we put cell in the Aggrewell™ cell culture plates after squeezed.



Result

Squeezed cancer cells on Aggrewell™.

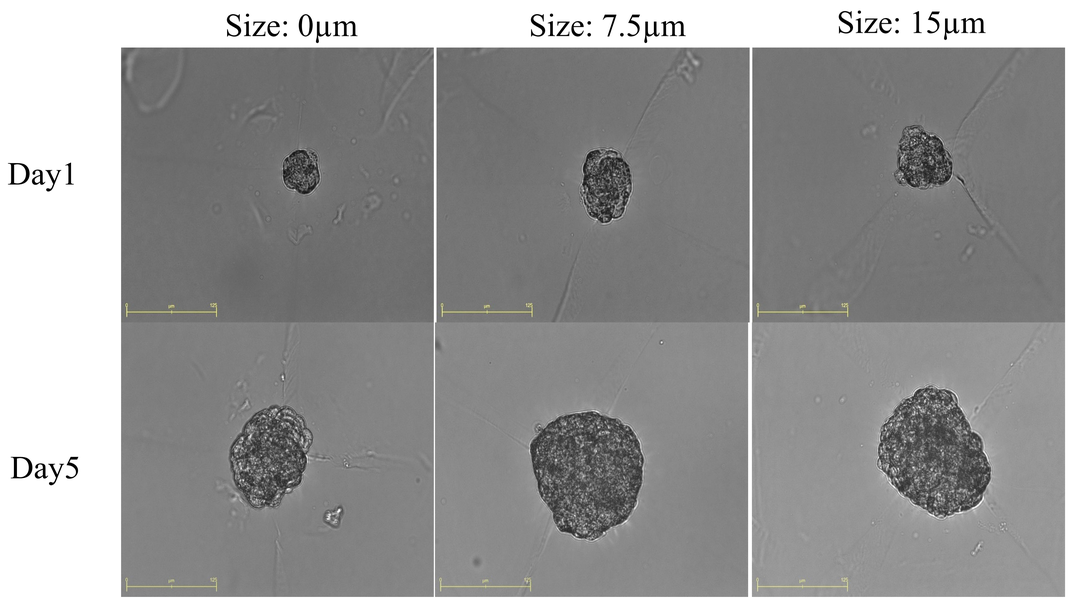


Figure1. Cancer cells aggregated as solid tumor spheres in Aggrewell plate after squeezing.

qPCR analysis of drug resistance.

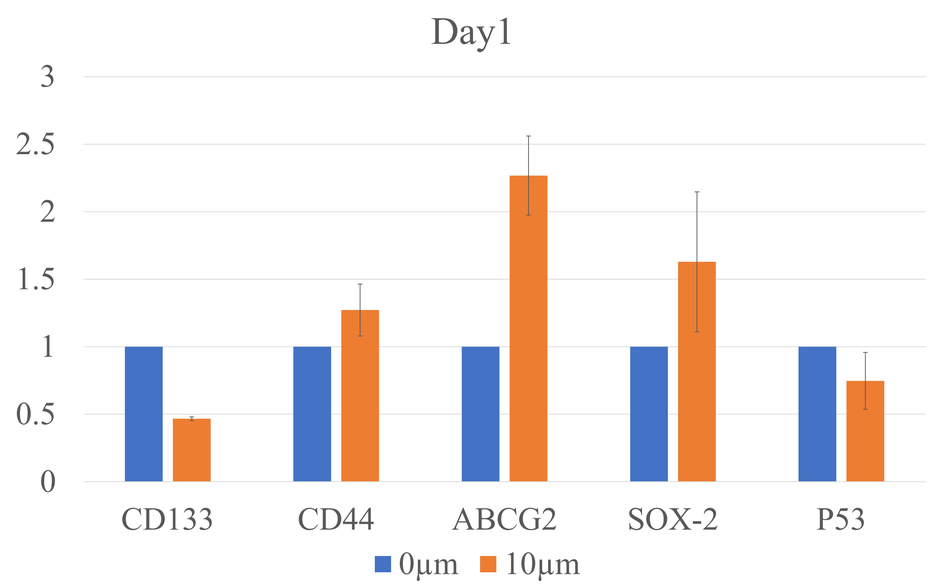


Figure2. Drug resistance gene (ABCG2) has significant increase after squeezing .

Conclusion

We found that some of cell membrane damaged when passing through the different size of microfluidics (0,7.5,15 μm). Squeezed cancer cells are aggregated easily and growth up quickly on flat surface. Therefore, we put squeezed cancer cell on 3D culture surface, showed that squeezed cancer cell lines (Huh-7) are tightly assembled as tumorspheres on aggrewell structure surface. Gene expression analyses were undertaken to observe after cells squeezing. The result of drug resistance genes expression showed that ABCG2 protein levels were higher in squeezed cancer cells.