Investigating potential circulating tumor cell release following breast cancer biopsy

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Background & objectives

Breast cancer diagnosis involves needle biopsies to allow histological assessment of the tumor tissue and primary surgery is required to remove the malignant lesion. The release of tumor cells as a result of tumor tissue injury during these invasive procedures is still an area of investigation. In the ongoing INJURMET project, we employ liquid biopsy assays to investigate the potential impact of tissue injury on tumor cell dissemination and cancer metastasis.

Methods

We analyzed peripheral blood from women who underwent biopsy following abnormal finding in their diagnostic mammograms or a newly detected palpable finding. Circulating tumor cell (CTC) enumeration was performed using EpCAM-based CellSearch® System from 7.5 mL of blood. Additionally, size and deformability-based enrichment of CTCs was performed using Parsortix® system, where keratin-positive, DAPI-positive and CD45-negative cells (standard definition of epithelial CTCs) were picked after immunofluorescent staining. For further characterization, picked presumable CTCs from 5 different patients were validated as tumor cells by whole-genome next generation sequencing and subsequent analysis for genomic copy number aberrations.

Results

We recruited 114 biopsied women in our study thus far; 68% (77/114) were diagnosed with breast cancer. From CellSearch analysis, CTCs were detected in 13% (10/77) and 19% (15/77) of cases before and after biopsy respectively, while 17% (13/77) had a CTC increase following biopsy. From Parsortix analysis, the corresponding amounts were 27% (21/77) and 21% (16/77) respectively, whereas 14% (11/77) had an increase. The CTC enumeration analysis revealed low agreement between the two enrichment methods (κ=0.24), therefore the overall CTC counts were pooled from both analyses. Altogether, CTCs were detected in 42% (32/77)

of breast cancer patients with an average of 2.8 CTCs (std. dev. 2.3) pre- and 3.4 CTCs (std. dev. 2.9) post-biopsy. However, no significant increase of CTCs (P=0.0658) was observed due to biopsy in this pooled analysis.

Conclusion

Although a slight increase of CTCs was detected in peripheral blood post biopsy, this difference was not statistically significant, suggesting no influence of tissue biopsy on potential tumor cell release. A comparatively higher number of CTCs detected from Parsortix indicates higher sensitivity of size-based enrichment.