Monitoring the release of tumor cells before, during and after prostatectomy

Gresa Emurlai[1]
Randi Marisa Pose[2], Nikhil Kalra[1], Maria Medina-Mesa[1], Cornelia Coith[1], Sandra Lenz[1], Pierre Tennstedt[2], Sabine Riethdorf[1], Derya Tilki[3], Simon Joosse[4] and Klaus Pantel[1]
[1] University Medical Center Hamburg-Eppendorf | Department of Tumor Biology
[2] University Medical Center Hamburg-Eppendorf | Martini-Klinik Prostate Cancer Centre
[3] University Medical Center Hamburg-Eppendorf | Martini-Klinik Prostate Cancer Centre, Department of Urology
[4] University Medical Center Hamburg-Eppendorf | Department of Tumor Biology, Mildred Scheel Cancer Career Center HaTriCS4

Background & objectives

Prostate cancer is one of the most frequent tumor types occurring with an incidence rate of 110 cases per 100,000 men in the European Union. One of the available treatment options is the radical prostatectomy. Within our ongoing ERC project INJURMET we investigate whether tumor tissue trauma can cause the release of tumor cells into the circulation.

We will evaluate whether tissue injury through radical prostatectomy contributes to a significant blood-borne dissemination of viable tumor cells, which is one of the most under-investigated areas in cancer research.

Methods

For patients that underwent prostatectomy, the blood from 103 patients was obtained 24 hours before surgery, during surgery, 2 hours after surgery, and 24 hours after surgery. Circulating tumor cells (CTCs) where quantified using CellSearch from 7.5 mL blood, whereas isolation of single cells was performed by Parsortix enrichment. After enrichment, keratin-positive, DAPI-positive and CD45-negative cells (standard definition of CTCs) were picked and analyzed by whole-genome next generation sequencing (NGS). In addition, we received blood drained at the site of operation from 88 patients.

Results

CTCs in peripheral blood were detected in patients before (15/88, 17.0%), during (10/90, 11.1%), 2 hours after (10/92, 10.9%) and 24 hours after (8/81, 9.9%) surgery; these differences were not statistically significant yet. In the peripheral blood samples that were taken during surgery, 17.8% of patients were positive for CTCs (range: 0-10). Interestingly, higher numbers of CTCs (range: 0-6085) were found in a substantial larger amount of patients in blood drained

at the site of operation (78/88, 88.6%, p=0.0004). The malignant origin of some of the selected CTCs was shown by the presence of CNAs.

Conclusion

A substantial amount of tumor cells can be found in the blood drained during surgery at the site of operation on prostate cancer, while the detection rate of CTCs in the peripheral venous blood of these patients is rather low. The moderate decrease in the incidence of CTCs during and after surgery might be explained by the removal of the primary tumor as prime source of CTCs. Future follow up studies have been initiated to assess whether the measured release of CTCs could eventually contribute to relapse or not.