Oxidative stress analysis in pregnant women with breast cancer during chemotherapy treatment

S. Martínez[1,2], O. Sánchez[3], J. Kuligowski[4], O. Córdoba[5], C. Archer[6], C. Tornador[1,2], E. Llurba[7,2];

[1]Teresa Moretó Foundation, Esplugues de Llobregat, Spain, [2]Autonomous university of Barcelona, Spain, [3]Vall d'Hebron Research Institute, Barcelona, Spain, [4]Neonatal Research Unit, Health Research Institute La Fe, Valencia, Spain, [5]Obstetrics and Gynecology Department, Hospital Universitari Son Espases, Palma de Mallorca, Spain, [6]University of Texas, Austin, USA, [7] Obstetrics and Gynaecology Department, University Hospital de la Santa Creu i Sant Pau, Barcelona, Spain.

Introduction

Pregnancy-associated breast cancer (PABC) is rare and is defined as breast cancer diagnosed during pregnancy or up to one year postpartum[1]. Incidence PABC is estimated to occur in 1 out of 3000 pregnant women, but since maternal age at conception continues to increase, the incidence of such cases is expected to rise[2-3].

Evidence in the literature indicates that, the administration of chemotherapy during the second and third trimester has acceptable low side effects for the foetus[1,4-5]. However, it is a widely known fact that also induces oxidative stress (OS) to promote the destruction of cancer cells but impact negatively in the patient prognosis[6]. OS is a result of imbalance between the generation of reactive oxygen species (ROS) and the antioxidant defence systems which lead to cause lipids, proteins and DNA damaged[7].

Our study expects to find alterations in OS biomarkers values, which would explain the obstetric complications associated to chemotherapy exposition[8-9].

Material & Methods

Blood samples were collected from PABC women before and after chemotherapy treatment (cases) and from healthy pregnant women as controls (n=16). Additionally, we collected blood and urine samples from neonates delivered by mothers with PABC under treatment and by healthy mothers The urines were gathered within their first 24h of life.

	Maternal Blood	Neonatal Blood	Neonatal Urine
Cases	10	13	5
Control	16	5	6

All of them were analysed by UPLC-MS/MS. MassLynx 4.1 and QuanLynx 4.1 software was used for data acquisition and processing, respectively and all statistical analyses were performed using RStudio software version 1.1.447. A two-tailed p value less than 0.05 was considered significant.

Conclusions

- We have shown lower levels of oxidative stress in PABC women before chemotherapy and also an increase once the treatment is finished.
- The analysis of both plasma and urine neonatal could demonstrate that no oxidative stress damage was caused to the neonates during the pregnancy.

In summary, our results provide support to other studies which claimed that administration of chemotherapy in women with PABC after the second trimester could not be the cause of obstetric complications[1,8-9].

Results

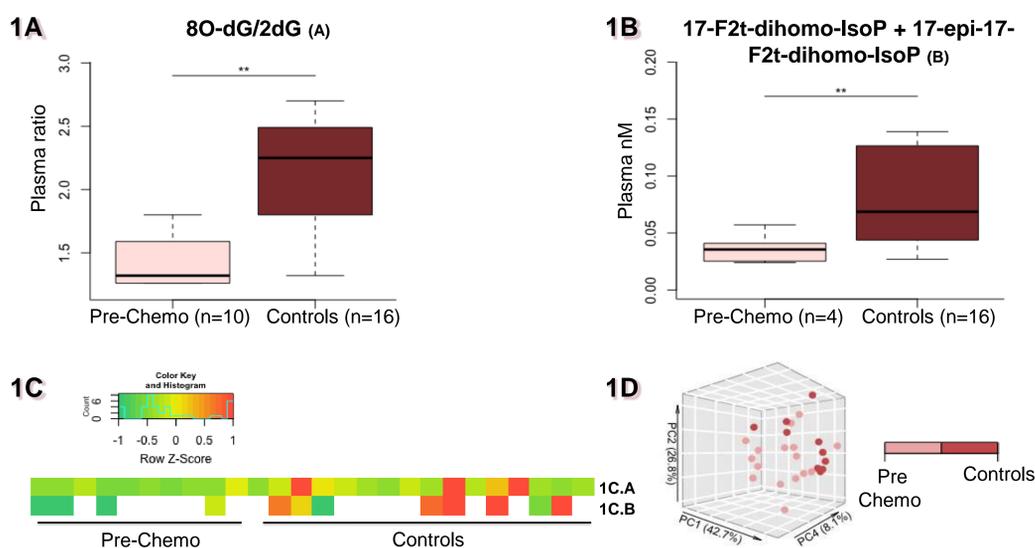### Maternal Blood: Pre-Chemotherapy – Controls

Figure 1. Maternal blood analysis using UPLC-MS/MS method show no sign of oxidative stress in PABC women before chemotherapy. Low levels of (A) and (B) in PABC women before chemotherapy treatment as to healthy pregnant women. A heat map (C) of both metabolites was made. (D) PC1, PC2 and PC4 account for 77.6% of the data's variance.

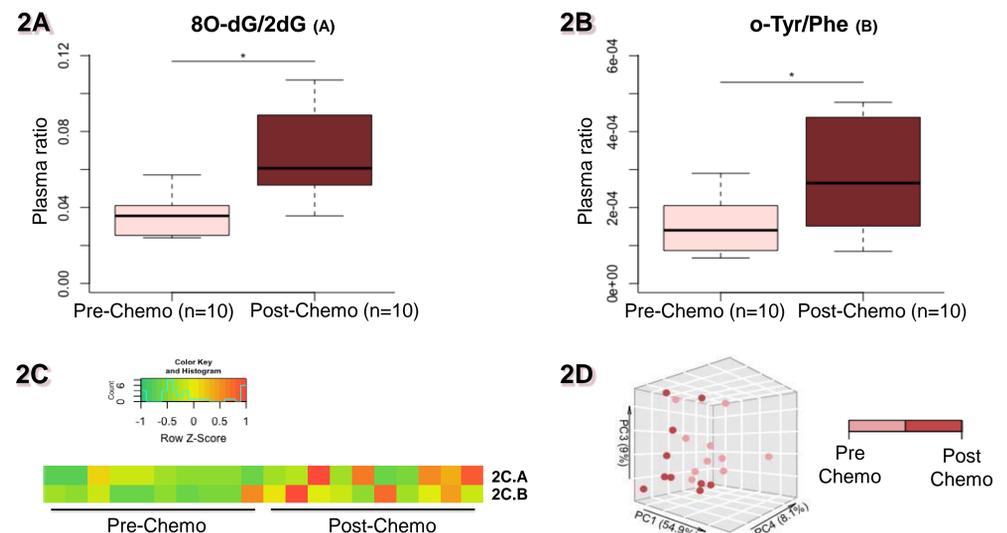### Maternal Blood: Pre-Chemotherapy – Post-Chemotherapy

Figure 2. Maternal blood analysed by UPLC-MS/MS method presents an increment of oxidative damage after chemotherapy treatment. Higher levels of (A) and (B) in PABC women after being treated with anthracyclines and taxanes than before. These were included in a heat map (C). PC1, PC3 and PC4 account for 72% of the data's variance (D).
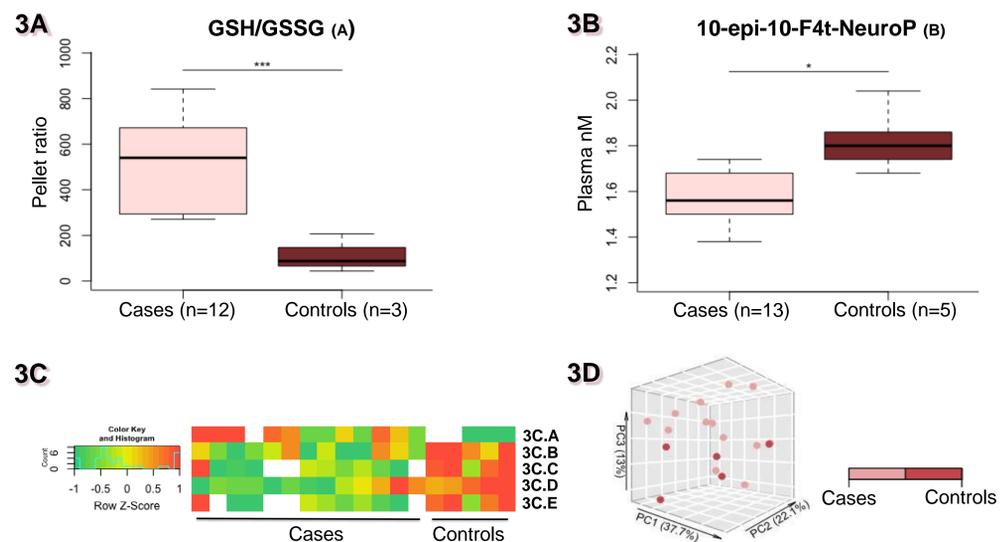
Neonatal Blood: Cases – Controls

Figure 3. No evidence of oxidative stress was found in neonates' blood from mothers with PABC under treatment through UPLC-MS/MS method. Antioxidant levels in blood (A) were higher in case group than in control group. In metabolite (B) was the opposite. All together with 15-E2t-IsoP (3C.C), PGF2α (3C.D) and PGE2 (3C.E) were shown in a heat map (C). PC1, PC2 and PC3 account for 72.8% of the data's variance (D).
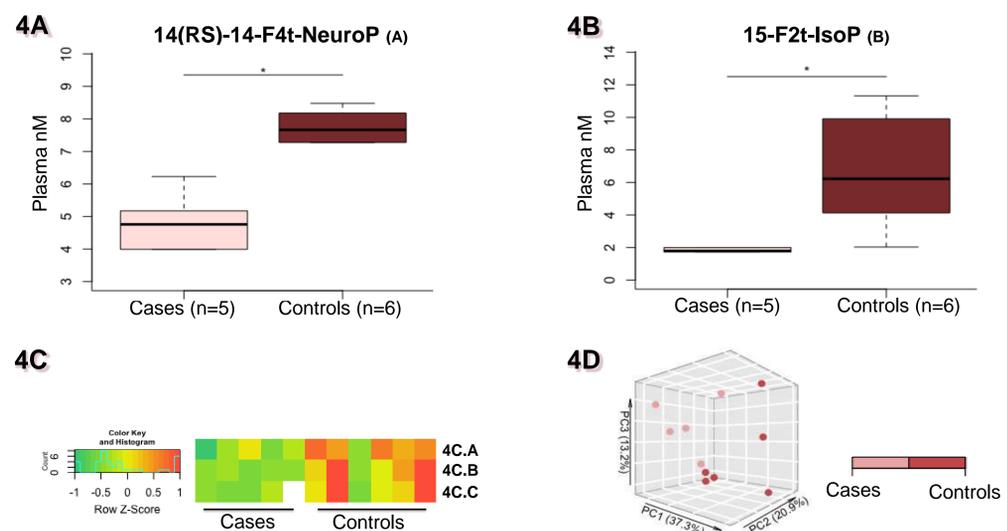
Neonatal Urine: Cases – Controls

Figure 4. Analysis made by UPLC-MS/MS method in urine, could demonstrate that neonates delivered by mothers with PABC under treatment did not suffer from oxidative stress harm. Representation of two significant metabolites (A) and (B). All of them had lower levels in cases than in controls. 11β -PGF2a (4C.C) was incorporated in the heat map (C). PC1, PC2 and PC3 account for 71.4% of the data's variance (D).

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