Perfluorochemicals in women with uterine leiomyoma, endometriosis and adenomyosis

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Abstract

To determine the association between Perfluorochemicals exposure and risk of uterine leiomyoma. We assessed the serum concentration of 13 Perfluorochemical compounds in women with endometriosis with (n=12) and without uterine leiomyoma (n=26). The diagnoses of uterine leiomyoma and endometriosis were confirmed by direct visualization during operation and then pathological analysis. Perfluorochemicals compound included PFHxS, perfluoroheptane sulfonic acid (PFHpS), peruorooctane sulfonate (PFOS), perfluorodecane sulfonic acid (PFDS), PFOA, perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUnDA), perfluorododecanoic acid PFDoDA), perfluorotridecanoic acid (PFTrDA), perfluorotetradecanoic acid (PFTeDA). A comparison of serum peruorooctane sulfonate (PFOS) (1.94 ± 0.76 μg/g creatinine showed a significant increase in the leiomyoma group (<0.05) compared to the controls. Serum PFOS (OR = 2.44 [95% CI = 1.03–5.78]) was associated with uterine leiomyoma.

Our findings suggest an association between perfluorochemical compounds exposure and uterine leiomyoma. However, larger studies are needed to investigate potential interactions between perfluorochemical compounds exposure and uterine leiomyoma.

Key words: Perfluorochemicals, uterine leiomyoma, Endometriosis, uterine adenomyosis

Introduction

Perfluorinated compounds (PFCs) are synthetic compounds produced for several decades during industrial and commercial manufacturing of non-stick cookwave, waxes, carpets, foodstuff packaging, cosmetics and water-oil repellents. PFCs degrade slowly in the environment, and have entered the food chain. They exist widely and are ubiquitous in nature. The half-lives of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are 3.8 and 5.4 years, respectively.

Methods

We conducted a case-control study to determine whether estrogen dependent diseases are associated with Perfluorochemicals exposure. We recruited subjects who underwent laparotomy and had pathologic confirmation of endometriosis (n=25), adenomyosis (n=9) and leiomyoma (n=35). Controls (n=29) were patients without any of the three aforementioned gynecologic conditions.

The serum samples were collected before surgery and analyzed for 14 Perfluorochemical compounds using a high-performance liquid chromatography (HPLC) system (Series 1100, Agilent Technologies, Palo Alto, CA).

Perfluorochemicals compound included PFHxS, perfluoroheptane sulfonic acid (PFHpS), peruorooctane sulfonate (PFOS), perfluorodecane sulfonic acid (PFDS), PFOA, perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUnDA), perfluorododecanoic acid PFDoDA), perfluorotridecanoic acid (PFTrDA), perfluorotetradecanoic acid (PFTeDA)

Results

The distribution of 14 Perfluorochemical compounds among the disease and control groups is shown in Table 1. Patients with adenomyosis had significantly higher levels of PFDA, PFUnDA and PFOS than endometriosis group (Table 2).

PFCs(ng/mL)(n=97)	GM ± GSD	N >LOQ (percent)
PFOA	1.88 ± 1.09	97 (100)
PFNA	0.32 ± 0.37	67(69.1)
PFDA	0.32 ± 0.19	96(99.0)
PFUnDA	0.34 ± 0.32	80(82.5)
PFDoDA	0.04 ± 0.06	49(50.5)
PFHxS	0.60 ± 0.38	97(100)
PFOS	2.67 ± 1.56	97(100)
PFDS		0
PFPeA		1 (1.1)
PFHxA	0.02 ± 0.19	4 (4.1)
PFHpA	0.01 ± 0.04	17 (17.5)
PFTrDA	0.23 ± 0.19	79 (81.4)
PFTeDA	0.004 ± 0.02	5 (5.2)
PFBS	0.001 ± 0.01	2 (2.1)

Table 1. Distrubution of PFCs

PFCs (ng/mL) GM ± GSD	Control (n=29)	Endometriosis (n=25)	Adenomyosis (n=9)	Leiomyoma (n=35)
PFOA	2.07 ± 1.09	1.88 ± 1.28	1.88 ± 0.67	1.73 ± 1.04
PFNA	0.34 ± 0.38	0.19 ± 0.23	0.48 ± 0.41	0.35 ± 0.41
PFDA*	0.33 ± 0.17	0.25 ± 0.11	0.45 ± 0.35	0.34 ± 0.20
PFUnDA*	0.32 ± 0.21	0.22 ± 0.21	0.59 ± 0.57	0.39 ± 0.34
PFDoDA	0.04 ± 0.05	0.03 ± 0.04	0.07 ± 0.10	0.05 ± 0.06
PFTrDA	0.22 ± 0.14	0.19 ± 0.17	0.24 ± 0.19	0.26 ± 0.24
PFHxS	0.69 ± 0.41	0.51 ± 0.28	0.77 ±0.58	0.55 ± 0.33
PFOS*	2.71 ± 1.41	1.94 ± 0.78	3.82 ±3.02	2.87 ± 1.38

Table 2. Distribution of PFCs in controls and patients of endometriosis, adenomyosis and leiomyoma.(*p<0.05)

GM: geometric mean, GSD: geometric standard deviation:
LOQ: limit of quantification

Conclusions

Endometriosis and uterine adenomyosis were thought to be similar in pathogenesis, but showed opposite results for PFC exposure. However, larger studies are needed to investigate potential interactions between perfluorochemical compounds exposure and estrogen dependent diseases.

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