Supplementary Materials: Association between Uremic Toxin Concentrations and Bone Mineral Density after Kidney Transplantation

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Table S1. Statistical significance (p value) of Spearman's correlation coefficients for UT concentrations upon transplantation.

UT Concentrations	pCS	CMPF	IxS	pCG	HA	TMAO	IAA
pCS		0.0530	0.0330	<0.0001	0.0005	0.0133	<0.0001
CMPF	0.0530		0.0017	0.0433	0.0009	0.0016	0.0102
IxS	0.0330	0.0017		<0.0001	<0.0001	<0.0001	0.0338
pCG	<0.0001	0.0433	<0.0001			<0.0001	<0.0001
HA	0.0005	0.0009	<0.0001	<0.0001		<0.0001	<0.0001
TMAO	0.0133	0.0016	<0.0001	<0.0001	<0.0001		<0.0001
IAA	<0.0001	0.0102	0.0338	<0.0001	<0.0001	<0.0001	

CMPF, 3-carboxy-4-methyl-5-propyl-furanpropionic acid; HA, hippuric acid; IAA, indole-3-acetic acid; IxS, indoxylsulfate; pCG, p-cresylglucuronide; pCS, p-cresylsulfate; TMAO, trimethylamine-N-oxide; UT, uremic toxin.

Table S2. Changes in BMD at M12 and M24, by subgroup.

Time after Transplantation	Lumbar Spine			Femoral Neck			Total Hip		
	BMD Change (g/cm²), *m ± SD*	**BMD Change (%), *m ± SD***	***p* value**	**BMD Change (g/cm²), *m ± SD***	**BMD Change (%), *m ± SD***	***p* value**	**BMD Change (g/cm²), *m ± SD***	**BMD Change (%), *m ± SD***	***P* value**
12 months after transplantation									
All, *n = 310*	−0.001 ± 0.063	−0.2 ± 6.3	0.793	−0.008 ± 0.054	−0.9 ± 7.3	0.034	−0.025 ± 0.051	−2.7 ± 5.8	< 0.001
Female, n = 116	+0.000 ± 0.055	+0.4 ± 5.8	0.996	−0.016 ± 0.058	−2.3 ± 8.2	0.068	−0.015 ± 0.051	−1.7 ± 6.4	0.005
< 50, *n = 59*	+0.006 ± 0.049	+1.0 ± 5.1	0.360	+0.007 ± 0.056	+0.9 ± 4.6	0.551	−0.002 ± 0.039	−0.2 ± 4.6	0.728
> 50, *n* = 57	−0.006 ± 0.061	−0.3 ± 6.5	0.450	−0.038 ± 0.051	−5.4 ± 7.6	0.001	−0.027 ± 0.059	−3.2 ± 7.5	0.002
Male, n = 194	−0.002 ± 0.068	−0.2 ± 6.5	0.754	−0.005 ± 0.052	−0.2 ± 6.7	0.359	−0.031 ± 0.050	−3.2 ± 5.4	< 0.001
< 50, *n = 79*	+0.005 ± 0.066	+1.0 ± 6.7	0.544	−0.006 ± 0.054	−0.3 ± 7.0	0.512	−0.030 ± 0.056	−3.0 ± 6.0	< 0.001
> 50, *n = 115*	−0.006 ± 0.068	−0.4 ± 6.3	0.377	−0.004 ± 0.052	−0.2 ± 6.6	0.525	−0.031 ± 0.045	−3.3 ± 5.0	< 0.001
ABD, n = 39	−0.014 ± 0.062	−0.9 ± 5.9	0.283	−0.025 ± 0.044	−3.3 ± 5.5	0.027	−0.048 ± 0.053	−4.9 ± 5.5	< 0.001
No ABD, n = 271	+0.000 ± 0.063	+0.4 ± 6.3	0.905	−0.006 ± 0.55	−0.6 ± 7.4	0.224	−0.022 ± 0.050	−2.4 ± 5.8	< 0.001
ESW, n = 41	+0.031 ± 0.066	+3.6 ± 6.6	0.006	+0.001 ± 0.056	+0.6 ± 8.1	0.909	−0.021 ± 0.061	−2.0 ± 6.7	0.047

OSR, n = 269	-0.006 ± 0.061	-0.2 ± 6.1	0.142	-0.011 ± 0.054	-1.2 ± 7.1	0.035	-0.026 ± 0.049	-2.8 ± 5.6	< 0.001
24 months after transplantation									
All, *n = 222*	−0.020 ± 0.066	−1.6 ± 6.4	< 0.001	−0.009 ± 0.059	−0.9 ± 7.7	0.045	−0.011 ± 0.062	−1.0 ± 6.9	0.017
Female, n = 86	−0.022 ± 0.061	−1.9 ± 6.2	0.001	−0.009 ± 0.064	−0.8 ± 8.9	0.407	−0.002 ± 0.057	−0.0 ± 7.0	0.756
< 50, *n = 46*	−0.018 ± 0.057	−1.6 ± 5.7	0.036	−0.013 ± 0.056	−1.7 ± 7.0	0.276	+0.006 ± 0.057	+0.9 ± 6.5	0.498
> 50, *n* = 40	−0.026 ± 0.066	−2.2 ± 6.7	0.015	−0.002 ± 0.075	+0.5 ± 11.1	0.896	−0.011 ± 0.056	−1.0 ± 7.5	0.249
Male, n = 136	−0.018 ± 0.069	−1.4 ± 6.5	0.003	−0.009 ± 0.056	−1.0 ± 7.1	0.196	−0.016 ± 0.065	−1.5 ± 6.9	0.008
< 50, *n = 60*	−0.011 ± 0.074	−0.4 ± 6.5	0.273	−0.004 ± 0.060	−0.1 ± 7.2	0.689	−0.007 ± 0.064	−0.3 ± 6.3	0.410
> 50, *n = 76*	−0.024 ± 0.065	−2.2 ± 6.5	0.002	−0.012 ± 0.054	−1.8 ± 7.0	0.167	−0.022 ± 0.065	−2.5 ± 7.2	0.005
ABD, n = 26	−0.039 ± 0.093	−3.0 ± 7.5	0.044	−0.012 ± 0.059	−2.1 ± 6.2	0.411	−0.034 ± 0.078	−3.2 ± 7.1	0.057
No ABD, n = 196	−0.017 ± 0.062	−1.5 ± 6.2	< 0.001	−0.008 ± 0.059	−0.7 ± 8.0	0.192	−0.008 ± 0.060	−0.7 ± 6.9	0.080
ESW, n = 16	+0.036 ± 0.059	+3.9 ± 5.8	0.028	+0.007 ± 0.064	+1.1 ± 9.5	0.702	+0.015 ± 0.056	+2.1 ± 7.0	0.275
OSR, n = 206	−0.024 ± 0.065	−2.0 ± 6.2	< 0.001	−0.010 ± 0.058	−1.2 ± 7.5	0.075	−0.013 ± 0.062	−1.2 ± 6.9	0.005

ABD, adynamic bone disease; BMD, bone mineral.

Table S3. Correlations between BMD at M1 and quantitative variables.

Quantitative Variables	Lumbar Spine BMD		Femoral Neck BMD		Total Hip BMD	
	ρ	*p* value	ρ	*p* value	ρ	*p* value
Recipient's age	+0.11	0.050	−0.12	0.078	−0.03	0.564
BMI	+0.31	<0.001	+0.27	<0.001	+0.42	<0.001
Laboratory data (M0)						
Serum calcium	−0.12	0.036	−0.06	0.403	−0.06	0.314
Serum phosphate	−0.04	0.451	−0.05	0.462	+0.02	0.679
Serum 25 (OH) vitamin D3	−0.04	0.463	−0.02	0.754	−0.04	0.485
Serum PTH	−0.17	0.003	−0.09	0.178	−0.13	0.040
Serum bone alkaline phosphatases	−0.05	0.453	−0.01	0.846	−0.04	0.557
Serum osteocalcin	−0.09	0.240	+0.06	0.456	−0.00	0.999

BMI, body mass index; ρ, Spearman's correlation coefficient; PTH, parathyroid hormone.

Table S4. Correlations between BMD at M1 and binary variables.

Binary Variables	Lumbar Spine			Femoral Neck			Total Hip		
	BMD		*p* value	BMD		*p* value	BMD		*p* value
	No	Yes		No	Yes		No	Yes	
Female	1.034 ± 0.16	0.970 ± 0.16	<0.001	0.788 ± 0.16	0.693 ± 0.12	<0.001	0.929 ± 0.15	0.822 ± 0.13	<0.001
Ethnic group (Caucasian)	1.035 ± 0.16	1.008 ± 0.16	0.492	0.831 ± 0.22	0.751 ± 0.15	0.138	0.914 ± 0.13	0.890 ± 0.15	0.555
Thyroid disorders	1.009 ± 0.16	1.022 ± 0.17	0.750	0.758 ± 0.15	0.691 ± 0.10	0.122	0.893 ± 0.15	0.863 ± 0.15	0.454
Prior osteoporotic fractures	1.016 ± 0.16	1.004 ± 0.17	0.826	0.759 ± 0.15	0.705 ± 0.16	0.111	0.894 ± 0.15	0.860 ± 0.16	0.274
Diabetes mellitus	0.999 ± 0.16	1.065 ± 0.16	0.008	0.752 ± 0.15	0.766 ± 0.15	0.614	0.892 ± 0.15	0.885 ± 0.14	0.764
Chronic inflammatory rheumatism	1.011 ± 0.16	0.943 ± 0.16	0.402	0.755 ± 0.15	0.635 ± 0.09	0.262	0.893 ± 0.15	0.759 ± 0.09	0.079
Autoimmune diseases	1.014 ± 0.16	0.956 ± 0.16	0.121	0.756 ± 0.15	0.725 ± 0.17	0.482	0.894 ± 0.15	0.850 ± 0.17	0.247
Primary HPT	1.007 ± 0.16	1.130 ± 0.15	0.033	0.752 ± 0.15	0.815 ± 0.13	0.314	0.890 ± 0.15	0.932 ± 0.11	0.434
Secondary HPT	1.037 ± 0.16	1.005 ± 0.16	0.227	0.755 ± 0.14	0.754 ± 0.15	0.976	0.909 ± 0.15	0.888 ± 0.15	0.423
Smoking	1.003 ± 0.15	1.017 ± 0.17	0.461	0.745 ± 0.15	0.763 ± 0.15	0.382	0.882 ± 0.16	0.901 ± 0.15	0.284
Alcohol consumption	1.010 ± 0.16	1.015 ± 0.18	0.877	0.755 ± 0.15	0.732 ± 0.14	0.560	0.892 ± 0.15	0.877 ± 0.14	0.678
Prior steroid intake	1.024 ± 0.16	0.944 ± 0.15	<0.001	0.758 ± 0.14	0.732 ± 0.18	0.320	0.899 ± 0.14	0.852 ± 0.18	0.048
Prior calcium intake	0.999 ± 0.16	1.039 ± 0.17	0.052	0.746 ± 0.15	0.780 ± 0.16	0.155	0.885 ± 0.14	0.909 ± 0.7	0.234
Prior vitamin D intake	1.013 ± 0.15	1.007 ± 0.17	0.744	0.750 ± 0.13	0.758 ± 0.17	0.684	0.891 ± 0.14	0.891 ± 0.17	0.982
Prior BP intake	1.011 ± 0.16	0.864 ± 0.04	0.199	0.754 ± 0.15	0.750 ± 0.10	0.980	0.892 ± 0.15	0.810 ± 0.00	0.447

BP, bisphosphonate; HPT, hyperparathyroidism; MMF, mycophenolate mofetil;.

Table S5. Correlations between changes in BMD at M12 and quantitative variables.

Quantitative Variables	Lumbar Spine BMD		Femoral Neck BMD		Total Hip BMD	
	ρ	*p* value	ρ	*p* value	ρ	*p* value
Recipient age	−0.11	0.057	−0.10	0.225	−0.16	0.006
BMI	−0.11	0.064	+0.20	0.015	−0.02	0.706
Laboratory data						
Serum calcium	−0.01	0.892	+0.01	0.952	−0.11	0.074
Serum phosphate	+0.07	0.233	−0.03	0.703	−0.09	0.142
Serum 25 (OH) vitamin D3	−0.10	0.079	+0.03	0.759	−0.01	0.823
Serum PTH	+0.06	0.263	+0.20	0.019	+0.19	0.002
Serum bone alkaline phosphatases	+0.01	0.849	+0.19	0.038	+0.26	<0.001
Serum osteocalcin	+0.07	0.331	+0.14	0.175	+0.20	0.009
Serum creatinine at M12	−0.06	0.263	−0.09	0.258	+0.04	0.482

BMI, body mass index; ρ, Spearman's correlation coefficient; PTH, parathyroid hormone.

Table S6. Correlations between changes in BMD at M12 and binary variables.

Binary Variables	Lumbar Spine			Femoral Neck			Total Hip		
	BMD Variations		*p* value	BMD Variations		*p* value	BMD Variations		*p* value
	No	Yes		No	Yes		No	Yes	
Female	−0.002 ± 0.06	+0.000 ± 0.07	0.834	−0.005 ± 0.06	−0.016 ± 0.016	0.262	−0.015 ± 0.05	−0.031 ± 0.05	0.012
Race (Caucasian)	−0.002 ± 0.04	−0.001 ± 0.06	0.966	−0.002 ± 0.07	−0.009 ± 0.05	0.752	−0.001 ± 0.03	−0.026 ± 0.05	0.060
Thyroid disorders	−0.000 ± 0.06	+0.003 ± 0.04	0.327	−0.007 ± 0.05	−0.027 ± 0.06	0.309	−0.024 ± 0.05	−0.048 ± 0.04	0.086
Prior osteoporotic fractures	−0.00 ± 0.06	−0.009 ± 0.07	0.453	−0.009 ± 0.05	−0.005 ± 0.05	0.819	−0.025 ± 0.05	−0.023 ± 0.07	0.805
Diabetes mellitus	+0.001 ± 0.06	−0.008 ± 0.06	0.363	−0.010 ± 0.05	−0.005 ± 0.06	0.739	−0.025 ± 0.05	−0.026 ± 0.06	0.924
Chronic inflammatory rheumatism	−0.001 ± 0.06	+0.024 ± 0.06	0.431	−0.008 ± 0.05	−0.014 ± 0.01	0.893	−0.025 ± 0.05	−0.010 ± 0.03	0.552
Autoimmune diseases	−0.003 ± 0.06	+0.025 ± 0.06	0.054	−0.007 ± 0.05	−0.028 ± 0.08	0.229	−0.026 ± 0.05	−0.015 ± 0.04	0.383
Primary HPT	+0.001 ± 0.06	−0.077 ± 0.10	0.001	−0.006 ± 0.05	−0.117 ± 0.06	<0.001	−0.024 ± 0.05	−0.052 ± 0.06	0.155
Secondary HPT	−0.015 ± 0.07	+0.001 ± 0.06	0.105	−0.041 ± 0.06	−0.004 ± 0.05	0.005	−0.035 ± 0.05	−0.023 ± 0.05	0.182
Smoking	+0.000 ± 0.06	−0.002 ± 0.06	0.716	−0.002 ± 0.05	−0.015 ± 0.06	0.172	−0.024 ± 0.05	−0.026 ± 0.05	0.721
Alcohol consumption	−0.001 ± 0.06	−0.007 ± 0.06	0.649	−0.011 ± 0.06	−0.012 ± 0.04	0.852	−0.024 ± 0.05	−0.040 ± 0.05	0.175
Calcium intake during the study period	+0.005 ± 0.06	−0.012 ± 0.07	0.024	−0.010 ± 0.05	−0.005 ± 0.05	0.657	−0.026 ± 0.05	−0.024 ± 0.05	0.737
Vitamin D intake during the study period	−0.001 ± 0.07	−0.001 ± 0.06	0.966	+0.011 ± 0.06	−0.012 ± 0.05	0.074	−0.009 ± 0.06	−0.025 ± 0.05	0.113
BP intake during the study period	−0.003 ± 0.06	+0.054 ± 0.05	0.003	−0.008 ± 0.05	−0.036 ± 0.01	0.470	−0.025 ± 0.05	−0.028 ± 0.05	0.852
Induction therapy									
Basiliximab	−0.007 ± 0.07	+0.005 ± 0.06	0.107	−0.009 ± 0.05	−0.008 ± 0.06	0.961	−0.033 ± 0.05	−0.018 ± 0.05	0.014
Thymoglobulin	+0.004 ± 0.06	−0.007 ± 0.07	0.134	−0.008 ± 0.06	−0.009 ± 0.05	0.961	−0.019 ± 0.05	−0.032 ± 0.05	0.040
Intravenous immunoglobulins	−0.002 ± 0.06	+0.019 ± 0.08	0.241	−0.008 ± 0.05	−0.011 ± 0.04	0.879	−0.026 ± 0.05	−0.009 0.05	0.291
Maintenance therapy									

MMF + tacrolimus	−0.013 ± 0.06	+0.003 ± 0.06	0.064	+0.003 ± 0.06	−0.012 ± 0.05	0.178	−0.035 ± 0.05	−0.022 ± 0.05	0.062
MMF + cyclosporine	+0.006 ± 0.06	−0.014 ± 0.06	0.010	−0.012 ± 0.05	+0.001 ± 0.05	0.222	−0.022 ± 0.05	−0.031 ± 0.05	0.182
Tacrolimus + everolimus	+0.000 ± 0.06	−0.011 ± 0.07	0.377	−0.008 ± 0.05	−0.015 ± 0.05	0.704	−0.025 ± 0.05	−0.025 ± 0.05	0.994
MMF + everolimus	−0.001 ± 0.06	−0.003 ± 0.06	0.836	−0.006 ± 0.06	−0.022 ± 0.04	0.246	−0.023 ± 0.05	−0.037 ± 0.05	0.095
Tacrolimus + azathioprine	−0.001 ± 0.06	+0.004 ± 0.770	0.770	−0.008 ± 0.05	−0.028 ± 0.01	0.476	−0.026 ± 0.05	−0.008 ± 0.04	0.206
Early steroid withdrawal	−0.006 ± 0.06	+0.031 ± 0.07	<0.001	−0.010 ± 0.05	+0.001 ± 0.06	0.318	−0.026 ± 0.05	−0.021 ± 0.06	0.583

BP, bisphosphonate; HPT, hyperparathyroidism; MMF, mycophenolate mofetil.

Table S7. Correlations between changes in BMD at M24 and quantitative variables.

Quantitative Variables	Lumbar spine		Femoral neck		Total hip	
	Correlation coefficient	*P* value	Correlation coefficient	*P* value	Correlation coefficient	*P* value
Recipient age	−0.07	0.311	−0.08	0.397	−0.19	0.006
BMI	+0.00	0.973	+0.09	0.326	−0.06	0.398
Laboratory data						
Serum calcium	+0.09	0.172	+0.06	0.551	−0.03	0.658
Serum phosphate	+0.14	0.033	+0.24	0.011	+0.01	0.856
Serum 25 (OH) vitamin D3	−0.08	0.246	+0.06	0.563	+0.00	0.987
Serum PTH	+0.07	0.302	+0.28	0.003	+0.19	0.006
Serum bone alkaline phosphatases	+0.01	0.866	+0.08	0.449	+0.22	0.005
Serum osteocalcin	+0.14	0.099	+0.28	0.017	+0.19	0.061
Serum creatinine at M12	−0.13	0.048	−0.28	0.003	−0.15	0.028

BMI, body mass index; ρ, Spearman's correlation coefficient; PTH, parathyroid hormone.

Table S8. Correlations between changes in BMD at M24 and binary variables.

Binary Variables	Lumbar Spine			Femoral Neck			Total Hip		
	BMD Variations		*p* value	BMD Variations		*p* value	BMD Variations		*p* value
	No	Yes		No	Yes		No	Yes	
Female	−0.018 ± 0.06	−0.022 ± 0.06	0.662	−0.009 ± 0.06	−0.009 ± 0.06	0.992	−0.002 ± 0.06	−0.016 ± 0.06	0.140
Race (Caucasian)	−0.024 ± 0.07	−0.019 ± 0.07	0.774	−0.017 ± 0.03	−0.008 ± 0.06	0.721	−0.001 ± 0.04	−0.011 ± 0.06	0.602
Thyroid disorders	−0.019 ± 0.07	−0.020 ± 0.04	0.977	−0.007 ± 0.06	−0.039 ± 0.05	0.236	−0.010 ± 0.06	−0.023 ± 0.03	0.483
Prior osteoporotic fractures	−0.021 ± 0.07	−0.003 ± 0.06	0.236	−0.009 ± 0.05	−0.009 ± 0.09	0.786	−0.012 ± 0.06	+0.001 ± 0.06	0.401
Diabetes mellitus	−0.018 ± 0.07	−0.027 ± 0.07	0.480	−0.005 ± 0.06	−0.041 ± 0.05	0.052	−0.009 ± 0.06	−0.019 ± 0.06	0.490
Chronic inflammatory rheumatism	−0.021 ± 0.07	+0.022 ± 0.06	0.203	−0.008 ± 0.06	−0.019 ± 0.03	0.802	−0.011 ± 0.06	−0.011 ± 0.02	0.984
Autoimmune diseases	−0.022 ± 0.07	+0.015 ± 0.06	0.031	−0.009 ± 0.06	−0.005 ± 0.09	0.869	−0.012 ± 0.06	+0.013 ± 0.06	0.134
Primary HPT	−0.017 ± 0.06	−0.098 ± 0.010	0.003	−0.008 ± 0.06	−0.021 ± 0.09	0.664	−0.010 ± 0.06	−0.032 ± 0.05	0.391
Secondary HPT	−0.029 ± 0.08	−0.018 ± 0.06	0.331	−0.029 ± 0.06	−0.005 ± 0.06	0.131	−0.016 ± 0.06	−0.010 ± 0.06	0.602
Smoking	−0.020 ± 0.07	−0.019 ± 0.06	0.894	−0.012 ± 0.05	−0.005 ± 0.07	0.562	−0.011 ± 0.07	−0.010 ± 0.05	0.859
Alcohol consumption	−0.019 ± 0.07	−0.020 ± 0.05	0.964	−0.009 ± 0.06	+0.008 ± 0.05	0.495	−0.010 ± 0.06	−0.020 ± 0.07	0.613
Prior steroid intake	−0.021 ± 0.06	−0.013 ± 0.08	0.523	−0.009 ± 0.06	−0.008 ± 0.05	0.950	−0.013 ± 0.016	+0.002 ± 0.07	0.173
Calcium intake during the study period	−0.015 ± 0.06	−0.027 ± 0.08	0.197	−0.005 ± 0.06	−0.015 ± 0.06	0.388	−0.010 ± 0.06	−0.012 ± 0.06	0.782

Vitamin D intake during the study period	−0.017 ± 0.06	−0.020 ± 0.07	0.854	−0.019 ± 0.06	−0.007 ± 0.06	0.442	+0.009 ± 0.05	−0.014 ± 0.06	0.089
BP intake during the study period	−0.023 ± 0.07	+0.053 ± 0.03	<0.001	−0.010 ± 0.06	+0.043 ± 0.10	0.076	−0.011 ± 0.06	−0.003 ± 0.05	0.715
Induction therapy									
Basiliximab	−0.024 ± 0.07	−0.015 ± 0.06	0.300	−0.002 ± 0.05	−0.013 ± 0.06	0.331	−0.010 ± 0.05	−0.011 ± 0.07	0.924
Thymoglobulin	−0.015 ± 0.06	−0.024 ± 0.07	0.289	−0.013 ± 0.06	−0.002 ± 0.05	0.331	−0.012 ± 0.07	−0.010 ± 0.06	0.795
Intravenous immunoglobulins	−0.020 ± 0.07	−0.012 ± 0.04	0.783	−0.008 ± 0.06	−0.049 ± 0.02	0.330	−0.010 ± 0.06	−0.021 ± 0.05	0.664
Maintenance therapy									
MMF + tacrolimus	−0.022 ± 0.05	−0.017 ± 0.07	0.748	−0.006 ± 0.05	−0.010 ± 0.06	0.742	−0.021 ± 0.06	−0.007 ± 0.06	0.148
MMF + cyclosporine	−0.015 ± 0.07	−0.027 ± 0.06	0.210	−0.009 ± 0.06	−0.008 ± 0.05	0.960	−0.006 ± 0.06	−0.018 ± 0.06	0.193
Tacrolimus + everolimus	−0.020 ± 0.07	−0.020 ± 0.05	1.000	−0.009 ± 0.06	−0.006 ± 0.05	0.871	−0.009 ± 0.06	−0.024 ± 0.07	0.315
MMF + everolimus	−0.020 ± 0.07	−0.020 ± 0.0	0.951	−0.012 ± 0.06	+0.008 ± 0.04	0.154	−0.010 ± 0.06	−0.014 ± 0.06	0.715
Tacrolimus + azathioprine	−0.021 ± 0.07	−0.002 ± 0.06	0.347	−0.009 ± 0.06	−0.008 ± 0.03	0.976	−0.012 ± 0.06	−0.007 ± 0.04	0.301
Early steroid withdrawal	−0.024 ± 0.06	+0.036 ± 0.06	**<0.001**	−0.010 ± 0.06	+0.007 ± 0.06	0.328	−0.013 ± 0.06	+0.016 ± 0.06	0.077

BP, bisphosphonate; HPT, hyperparathyroidism; MMF, mycophenolate mofetil;.

Table S9. Predictive factors for a BMD decrease at M1 (multiple linear regression model).

BMD at M1	Coefficient	T value	*P* value
Lumbar spine			
IxS	$+5.555 \times 10^{-4}$	+1.167	0.245
BMI	$+5.153 \times 10^{-3}$	+4.001	<0.001
Male (ref. = female)	+0.035	+3.174	0.002
Serum calcium	−0.075	−2.774	0.006
Serum phosphate	-2.248×10^{-4}	−0.019	0.985
Serum 25 (OH) vitamin D3	-3.740×10^{-5}	−0.121	0.904
Serum PTH	-3.815×10^{-5}	−2.494	0.014
Serum bone alkaline phosphatases	7.782×10^{-5}	+0.176	0.861
Serum osteocalcin	-8.958×10^{-6}	−0.446	0.656
Femoral neck			
IxS	+0.001	+2.063	0.042
BMI	+0.005	+3.280	0.001
Male (ref. = female)	+0.038	+2.964	0.004
Serum calcium	−0.049	−1.599	0.112
Serum phosphate	−0.011	−0.714	0.477
Serum 25 (OH) vitamin D3	-3.310×10^{-4}	−0.953	0.342
Serum PTH	-2.753×10^{-5}	−1.346	0.181
Serum bone alkaline phosphatases	$+1.221 \times 10^{-4}$	+0.234	0.815
Serum osteocalcin	$+1.942 \times 10^{-5}$	+0.849	0.397
Total hip			
IxS	$+6.276 \times 10^{-4}$	+1.396	0.164
BMI	$+6.001 \times 10^{-3}$	+4.998	<0.001
Male (ref. = female)	$+4.558 \times 10^{-2}$	+4.379	<0.001
Serum calcium	-7.103×10^{-2}	−2.880	0.005
Serum phosphate	$+1.731 \times 10^{-3}$	+0.155	0.878
Serum 25 (OH) vitamin D3	-2.474×10^{-4}	−0.811	0.418
Serum PTH	-3.054×10^{-5}	−1.935	0.054
Serum bone alkaline phosphatases	$+1.853 \times 10^{-4}$	+0.391	0.697
Serum osteocalcin	$+4.547 \times 10^{-6}$	+0.251	0.802

BMI, body mass index; IxS, indoxylsulfate;.

Table S10. Correlations between UT concentrations and BMD at M1, by subgroup.

	Uremic Toxins													
	pCS		CMPF		IxS		pCG		HA		TMAO		IAA	
Subgroups	**r**	***p* value**	**r**	***p* value**	**r**	***p* value**	**r**	***p* value**	**r**	***p* value**	**r**	***p* value**	**r**	***p* value**
Lumbar spine														
All, *n = 310*	+0.02	0.782	+0.01	0.805	+0.04	0.477	−0.01	0.876	−0.06	0.300	+0.01	0.797	+0.03	0.656
Female, n = 116	−0.07	0.485	−0.08	0.417	+0.10	0.271	−0.15	0.111	−0.19	0.038	−0.03	0.744	+0.04	0.689
< 50, *n = 59*	−0.01	0.939	−0.01	0.956	+0.19	0.144	+0.02	0.863	−0.10	0.494	−0.04	0.752	+0.06	0.636
> 50, *n = 57*	−0.08	0.542	−0.22	0.095	−0.04	0.796	−0.26	0.049	−0.30	0.022	−0.04	0.744	−0.01	0.959
Male, n = 194	+0.03	0.710	+0.06	0.408	−0.04	0.565	+0.07	0.364	−0.02	0.802	+0.03	0.700	−0.01	0.937
< 50, *n = 79*	−0.03	0.814	+0.04	0.698	−0.04	0.758	+0.02	0.873	−0.00	0.974	+0.08	0.493	−0.18	0.107
> 50, *n = 115*	+0.07	0.478	+0.03	0.752	−0.02	0.803	+0.10	0.311	−0.03	0.722	−0.00	0.989	+0.03	0.750
ABD, n = 39	+0.03	0.852	−0.33	0.038	+0.31	0.055	+0.16	0.341	+0.14	0.393	−0.07	0.666	+0.08	0.608
No ABD, n = 271	60.01	0.834	+0.05	0.369	+0.01	0.877	−0.04	0.551	−0.07	0.238	+0.03	0.634	+0.02	0.799
Femoral neck														
All, *n = 310*	+0.02	0.730	−0.05	0.448	+0.13	0.049	+0.03	0.701	−0.14	0.036	−0.00	0.975	−0.07	0.282
Female, n = 116	−0.12	0.275	+0.05	0.641	+0.12	0.282	−0.12	0.288	−0.15	0.180	−0.04	0.734	+0.07	0.540
< 50, *n = 59*	−0.03	0.838	+0.18	0.249	+0.10	0.538	−0.10	0.543	−0.17	0.268	+0.06	0.722	+0.09	0.584
> 50, *n = 57*	−0.23	0.165	−0.17	0.299	+0.14	0.398	−0.14	0.396	−0.13	0.442	−0.16	0.344	+0.05	0.776
Male, n = 194	+0.03	0.759	−0.12	0.155	+0.07	0.394	+0.03	0.691	−0.18	0.035	+0.02	0.811	−0.16	0.058
< 50, *n = 79*	−0.12	0.372	−0.18	0.177	+0.21	0.108	+0.01	0.942	−0.14	0.305	+0.10	0.463	−0.22	0.097
> 50, *n = 115*	+0.14	0.197	−0.06	0.585	−0.10	0.381	+0.05	0.641	−0.21	0.061	−0.04	0.719	−0.15	0.161
ABD, n = 39	+0.09	0.623	−0.32	0.075	+0.30	0.112	+0.06	0.772	+0.00	0.981	−0.27	0.146	−0.17	0.377

No ABD, n = 271	+0.01	0.893	−0.01	0.912	+0.10	0.174	+0.01	0.904	−0.16	0.026	+0.06	0.368	−0.05	0.455
Total hip BMD														
All, *n = 310*	−0.01	0.913	+0.03	0.592	+0.13	0.037	+0.01	0.901	−0.08	0.190	−0.00	0.942	−0.02	0.738
Female, n = 116	−0.23	0.024	+0.11	0.281	+0.18	0.068	−0.13	0.191	−0.13	0.190	−0.08	0.416	+0.09	0.388
< 50, *n = 59*	−0.11	0.441	+0.20	0.165	+0.16	0.261	+0.02	0.916	−0.08	0.568	−0.07	0.611	+0.13	0.369
> 50, *n* = 57	−0.30	0.034	−0.07	0.633	+0.15	0.298	−0.25	0.082	−0.22	0.119	−0.13	0.356	−0.04	0.797
Male, n = 194	+0.04	0.563	−0.04	0.555	+0.01	0.876	+0.07	0.355	−0.12	0.112	+0.01	0.931	−0.09	0.232
< 50, *n = 79*	+0.04	0.753	−0.02	0.853	+0.07	0.554	+0.03	0.776	−0.11	0.349	+0.02	0.892	−0.12	0.312
> 50, *n = 115*	+0.05	0.631	−0.05	0.620	−0.05	0.618	+0.10	0.319	−0.12	0.200	−0.01	0.892	−0.09	0.367
ABD, n = 39	+0.19	0.297	−0.19	0.291	+0.34	0.055	+0.25	0.165	+0.17	0.337	−0.20	0.267	−0.06	0.728
No ABD, n = 271	−0.05	0.490	+0.07	0.267	+0.09	0.162	−0.03	0.610	−0.10	0.106	+0.04	0.568	−0.01	0.830

ABD, adynamic bone disease; CMPF, 3-carboxy-4-methyl-5-propyl-furanpropionic acid; HA, hippuric acid; IAA, indole-3-acetic acid; IxS, indoxylsulfate; pCG, p-cresylglucuronide; pCS, p-cresylsulfate; r, correlation coefficient; TMAO, trimethylamine-N-oxide.

Table S11. Comparison of UT concentrations in patients with BMD loss vs. gain 12 months after kidney transplantation, by subgroup.

Subgroups	Lumbar Spine			Femoral Neck			Total Hip		
	BMD loss *n* = 154	**BMD gain *n* = 156**	***p***	**BMD loss *n* = 89**	**BMD gain *n* = 56**	***p***	**BMD loss *n* = 197**	**BMD gain *n* = 79**	***p***
pCS (µg/mL)									
All, *n = 310*	16.2 [0.02–65.7]	15.9 [0.3–68.1]	0.857	13.9 [0.1–52.5]	15.4 [0.5–65.7]	0.556	16.0 [0.1–68.1]	16.0 [0.6–57.3]	0.964
Female, n = 116	14.1 [0.5–57.3]	14.5 [1.8–46.8]	0.790	13.3 [0.6–42.8]	9.6 [0.5–30.6]	0.515	13.2 [0.6–48.47]	15.3 [1.9–57.3]	0.354
< 50, *n = 59*	11.5 [0.5–48.7]	12.2 [1.8–48.8]	0.727	8.4 [6.6–48.8]	9.6 [0.5–30.6]	0.487	11.2 [0.7–48.7]	14.6 [1.9–45.4]	0.240
> 50, *n* = 57	16.7 [0.6–57.3]	17.2 [3.4–46.8]	0.806	14.1 [0.6–33.5]	13.9 [3.4–23.8]	0.561	16.4 [0.6–43.8]	16.8 [6.9–57.3]	0.667

Male, n = 194	17.4 [0.02–65.7]	16.9 [0.3–68.1]	0.912	13.9 [0.1–52.5]	13.4 [0.6–65.7]	0.740	17.0 [0.1–68.1]	16.9 [0.6–55.6]	0.732
< 50, *n = 79*	16.7 [0.02–46.2]	18.5 [0.3–68.1]	0.432	17.4 [0.3–48.8]	15.5 [0.6–49.5]	0.967	16.4 [0.3–68.1]	19.5 [0.6–49.5]	0.489
> 50, *n = 115*	17.7 [0.07–65.7]	16.5 [0.3–55.6]	0.700	13.9 [0.1–52.5]	13.3 [3.2–65.7]	0.701	17.1 [0.1–54.0]	13.2 [3.2–55.6]	0.262
ABD, n = 39	16.7 [0.1–34.7]	17.6 [3.4–52.5]	0.254	14.6 [7.6–52.5]	13.3 [3.4–23.7]	0.336	14.3 [0.8–52.2]	21.5 [13.3–42.8]	0.281
No ABD, n = 271	16.0 [0.02–65.7]	15.9 [0.3–68.1]	0.901	13.0 [0.1–48.8]	13.4 [0.5–65.7]	0.838	16.4 [0.1–68.1]	15.7 [0.6–57.3]	0.848
GFR > 60 mL/min, n = 102	18.1 [0.02–50.6]	14.8 [1.01–50.8]	0.528	16.7 [1.1–46.2]	11.9 [0.5–32.7]	0.552	17.0 [1.1–50.8]	15.1 [1.9–42.8]	0.935
GFR < 60 mL/min, n = 208	18.6 [0.1–65.7]	16.1 [0.3–68.1]	0.504	13.5 [0.1–52.5]	13.4 [0.6–65.7]	0.763	15.5 [0.1–68.1]	16.1 [0.6–57.3]	0.935
CMPF (μg/mL)									
All, *n = 310*	3.0 [0.0–32.3]	2.0 [0.0–18.0]	0.005	2.9 [0.0–22.0]	2.2 [0.0–32.3]	0.070	2.5 [0.0–28.3]	2.4 [0.0–18.0]	0.921
Female, n = 116	2.4 [0.0–32.3]	1.9 [0.0–12.2]	0.437	2.2 [0.1–22.0]	1.5 [0.0–32.3]	0.098	1.6 [0.0–22.0]	2.4 [0.1–14.0]	0.266
< 50, *n = 59*	2.9 [0.0–5.2]	3.3 [0.0–12.2]	0.767	5.0 [0.8–22.0]	2.4 [0.0–32.3]	0.051	3.1 [0.0–22.0]	3.6 [0.1–14.0]	0.330
> 50, *n = 57*	1.9 [0.1–12.2]	1.2 [0.2–12.2]	0.154	2.9 [0.1–12.2]	1.1 [0.3–1.5]	0.152	1.3 [0.1–12.2]	1.0 [0.2–8.4]	1.000
Male, n = 194	3.1 [0.0–23.8]	2.1 [0.0–18.0]	0.004	3.3 [0.0–14.1]	2.4 [0.0–18.0]	0.254	2.7 [0.0–28.3]	2.4 [0.0–18.0]	0.603
< 50, *n = 79*	2.6 [0.0–19.0]	1.8 [0.0–8.6]	0.364	2.0 [0.0–9.7]	2.4 [0.0–7.3]	0.814	2.1 [0.0–19.0]	2.5 [0.0–7.3]	0.722
> 50, *n = 115*	4.5 [0.1–28.3]	2.6 [0.0–18.0]	0.004	4.4 [0.3–14.1]	2.4 [0.0–18.0]	0.212	3.3 [0.0–28.3]	2.4 [0.1–18.0]	0.462
ABD, n = 39	1.9 [0.0–12.2]	1.3 [0.0–7.4]	0.602	2.8 [0.0–12.2]	1.0 [0.0–2.7]	0.104	1.5 [0.0–7.4]	1.1 [0.4–5.9]	1.000
No ABD, n = 271	3.2 [0.0–32.3]	2.1 [0.0–18.0]	0.003	3.0 [0.0–22.0]	2.4 [0.0–32.3]	0.154	2.6 [0.0–28.3]	2.4 [0.0–18.0]	0.739

GFR > 60 mL/min, n = 102	2.6 [0.0–32.3]	2.8 [0.0–12.2]	0.560	2.9 [0.1–22.0]	1.4 [0.0–32.3]	0.079	2.6 [0.0–22.0]	2.5 [0.1–14.0]	0.872
GFR < 60 mL/min, n = 208	3.4 [0.0–28.3]	1.8 [0.0–18.0]	0.003	3.3 [0.0–14.1]	2.4 [0.0–18.0]	0.345	2.4 [0.0–28.3]	2.3 [0.0–18.0]	0.997
IxS (μg/mL)									
All, *n = 310*	20.4 [1.2–101.0]	19.6 [1.8–67.2]	0.401	19.3 [1.8–68.6]	19.9 [1.3–54.5]	0.861	19.8 [1.2–67.2]	20.7 [3.7–101.0]	0.476
Female, n = 116	16.4 [1.2–101.0]	16.1 [3.7–34.8]	0.816	15.0 [2.2–34.8]	18.1 [6.8–40.8]	0.392	14.6 [1.2–57.7]	18.6 [3.7–101.0]	0.027
< 50, *n = 59*	19.4 [3.4–101.0]	17.5 [6.8–27.8]	0.499	16.7 [9.3–34.8]	18.1 [6.8–40.8]	0.928	16.8 [3.4–57.7]	18.2 [8.1–101.0]	0.252
> 50, *n = 57*	14.2 [1.2–49.5]	15.0 [3.7–31.1]	0.749	13.4 [2.2–33.3]	17.3 [9.6–30.7]	0.682	12.6 [1.2–33.3]	19.9 [3.7–31.1]	0.164
Male, n = 194	21.3 [1.3–68.6]	20.7 [1.8–67.2]	0.530	23.7 [1.8–68.6]	20.0 [1.3–54.5]	0.619	21.2 [1.3–67.2]	22.1 [3.8–54.5]	0.982
< 50, *n = 79*	22.4 [2.8–68.6]	25.89 [4.2–67.2]	0.702	21.4 [3.2–68.6]	25.9 [7.6–40.1]	0.783	23.1 [3.2–67.2]	27.4 [6.2–40.1]	0.752
> 50, *n = 115*	20.6 [1.3–55.1]	19.8 [1.8–65.4]	0.269	19.8 [1.8–54.6]	17.5 [1.3–54.5]	0.414	20.6 [1.3–65.4]	18.4 [3.8–54.5]	0.697
ABD, n = 39	16.0 [3.4–65.3]	16.2 [3.7–54.6]	0.724	17.7 [6.6–54.6]	17.0 [8.5–38.2]	0.775	16.2 [3.4–56.3]	17.0 [3.7–34.8]	0.514
No ABD, n = 271	20.6 [1.2–101.0]	19.9 [1.8–67.2]	0.398	19.6 [1.8–68.6]	20.0 [1.3–54.5]	0.798	20.0 [1.2–67.2]	21.2 [4.8–101.0]	0.439
GFR > 60 mL/min, n = 102	22.6 [2.8–101.0]	17.5 [3.7–66.7]	0.018	15.5 [3.2–68.6]	18.4 [7.5–38.7]	0.630	20.2 [3.2–66.7]	17.8 [3.7–101.0]	0.553
GFR < 60 mL/min, n = 208	19.3 [1.2–62.0]	20.7 [1.8–67.2]	0.532	19.8 [1.8–62.0]	20.0 [1.3–54.5]	0.988	19.3 [1.2–67.2]	21.4 [3.8–54.5]	0.221
pCG (μg/mL)									
All, *n = 310*	0.89 [0.00–9.10]	0.71 [0.00–6.80]	0.368	0.72 [0.00–7.04]	0.66 [0.00–5.75]	0.488	0.80 [0.00–9.10]	0.69 [0.00–5.17]	0.786
Female, n = 116	0.84 [0.00–6.89]	0.60 [0.00–4.19]	0.431	0.56 [0.00–3.05]	0.60 [0.00–2.75]	0.991	0.79 [0.00–6.89]	0.62 [0.00–5.17]	0.833
< 50, *n = 59*	0.77 [0.00–1.46]	0.55 [0.00–1.48]	0.611	0.52 [0.00–2.88]	0.98 [0.00–2.75]	0.517	0.53 [0.00–6.89]	0.67 [0.00–2.88]	0.992

> 50, *n* = 57	0.87 [0.00–5.17]	0.87 [0.00–4.19]	0.60 5	0.61 [0.00–3.10]	0.37 [0.13–0.84]	0.29 5	0.84 [0.00–6.22]	0.56 [0.00–5.17]	0.894
Male, n = 194	0.90 [0.00–9.10]	0.75 [0.00–6.80]	0.57 6	0.79 [0.00–7.04]	0.69 [0.00–5.75]	0.31 2	0.80 [0.00–9.10]	0.78 [0.00–5.14]	0.772
< 50, *n* = 79	0.72 [0.00–4.51]	0.76 [0.00–6.80]	0.67 2	0.12 [0.00–6.80]	0.85 [0.00–4.38]	0.75 1	0.79 [0.00–6.80]	0.64 [0.00–4.38]	0.930
> 50, *n* = 115	0.97 [0.00–9.10]	0.69 [0.00–4.27]	0.29 3	0.94 [0.00–7.04]	0.69 [0.00–5.75]	0.27 5	0.80 [0.00–9.10]	0.90 [0.00–5.14]	0.651
ABD, n = 39	0.81 [0.00–7.04]	1.03 [0.00–3.99]	0.78 2	0.90 [0.00–7.04]	0.93 [0.00–1.58]	0.48 9	0.79 [0.00–7.04]	0.93 [0.06–2.88]	0.403
No ABD, n = 271	0.90 [0.00–9.10]	0.70 [0.00–6.80]	0.33 6	0.67 [0.00–6.80]	0.63 [0.00–5.75]	0.70 1	0.80 [0.00–9.10]	0.67 [0.00–5.17]	0.606
GFR > 60 mL/min, n = 102	0.70 [0.00–6.89]	0.72 [0.00–4.65]	0.49 2	0.61 [0.00–3.53]	0.98 [0.00–5.75]	0.89 4	0.76 [0.00–6.89]	0.60 [0.00–3.84]	0.239
GFR < 60 mL/min, n = 208	0.92 [0.00–9.10]	0.71 [0.00–6.80]	0.54 3	0.82 [0.00–7.04]	0.58 [0.00–5.14]	0.37 5	1.31 [0.00–9.1]	1.29 [0.00–5.17]	0.744
HA (μg/mL)									
All, *n* = 310	25.6 [0.4–195.0]	25.7 [1.0–139.0]	0.84 2	28.0 [1.8–139.0]	25.7 [0.4–100.0]	0.93 2	24.0 [0.4–195.0]	30.7 [1.1–100.0]	0.471
Female, n = 116	20.5 [1.8–100.0]	22.4 [1.1–139.0]	0.68 7	22.2 [1.8–139.0]	34.4 [4.1–80.8]	0.45 1	19.1 [1.8–139.0]	30.7 [1.1–98.7]	0.184
< 50, *n* = 59	17.1 [2.0–100.0]	24.0 [1.1–139.0]	0.68 2	22.2 [2.0–139.0]	50.8 [4.04–80.8]	0.32 5	19.7 [2.0–139.0]	24.9 [1.1–98.7]	0.574
> 50, *n* = 57	23.3 [1.8–83.2]	20.8 [1.1–100.0]	0.81 2	25.0 [1.8–100.0]	17.5 [5.9–34.4]	0.47 7	18.5 [1.8–117.0]	34.0 [1.1–90.1]	0.199
Male, n = 194	28.1 [0.4–195.0]	29.1 [1.0–100.0]	0.86 9	29.1 [1.8–124.0]	25.6 [0.4–100.0]	0.49 4	28.4 [0.4–195.0]	30.6 [2.9–100.0]	0.821
< 50, *n* = 79	22.0 [0.5–195.0]	25.7 [1.0–100.0]	0.54 1	22.4 [1.8–124.0]	25.7 [2.9–78.6]	0.94 6	22.8 [0.5–195.0]	25.7 [2.9–100.0]	0.697
> 50, *n* = 115	38.4 [0.4–126.0]	36.1 [2.4–100.0]	0.48 6	37.0 [2.4–63.4]	19.1 [7.0–36.9]	0.24 6	38.4 [0.4–126.0]	37.3 [3.4–76.7]	0.954
ABD, n = 39	25.8 [3.2–82.2]	20.6 [1.1–63.4]	0.32 3	24.7 [1.8–139.0]	25.7 [0.4–100.0]	0.87 1	24.5 [3.2–82.2]	19.1 [1.1–24.0]	0.129

No ABD, n = 271	25.3 [0.4–195.0]	27.3 [1.0–139.0]	0.66 1	24.6 [1.8–139.0]	21.1 [3.36–98.4]	0.76 6	24.0 [0.4–195.0]	32.8 [1.1–100.0]	0.315
GFR > 60 mL/min, n = 102	23.1 [1.8–100.0]	21.3 [1.0–139.0]	0.76 9	30.0 [1.8–124.0]	33.6 [0.4–100.0]	0.86 3	21.4 [1.0–139.0]	21.1 [1.1–100.0]	0.872
GFR < 60 mL/min, n = 208	28.2 [0.4–195.0]	29.9 [2.4–100.0]	0.62 2	28.2 [0.4–195.0]	29.9 [2.4–100.0]	0.62 2	25.0 [0.4–195.0]	33.9 [2.9–94.3]	0.274
TMAO (μg/mL)									
All, *n = 310*	4.4 [0.0–32.5]	4.2 [0.0–54.0]	0.57 7	4.2 [0.0–22.7]	4.1 [0.0–32.5]	0.53 4	4.3 [0.0–54.0]	4.5 [0.0–32.4]	0.433
Female, n = 116	3.3 [0.0–31.6]	4.2 [0.0–34.1]	0.52 5	3.3 [0.0–15.2]	3.8 [0.0–14.7]	0.51 5	3.5 [0.0–31.6]	5.1 [0.0–32.4]	0.110
< 50, *n = 59*	3.2 [0.0–29.0]	4.8 [0.1–34.1]	0.10 3	3.7 [0.1–15.2]	3.8 [0.0–14.7]	0.78 6	3.5 [0.1–15.2]	7.6 [0.5–32.4]	0.006
> 50, *n = 57*	3.5 [0.0–31.6]	3.3 [0.0–15.4]	0.38 5	3.2 [0.0–12.7]	3.7 [0.4–9.7]	0.96 9	4.2 [0.0–31.6]	3.4 [0.0–7.7]	0.519
Male, n = 194	5.1 [0.0–32.5]	4.3 [0.0–54.0]	0.22 1	4.4 [0.0–22.7]	4.3 [0.0–32.5]	0.96 3	4.7 [0.0–54.0]	4.4 [0.0–20.5]	0.954
< 50, *n = 79*	4.3 [0.0–29.1]	4.5 [0.8–54.0]	0.85 0	3.8 [0.8–22.7]	3.7 [1.6–14.9]	0.82 5	4.4 [0.0–54.0]	3.7 [1.6–16.1]	0.778
> 50, *n = 115*	5.9 [0.0–32.5]	4.2 [0.0–24.0]	0.05 8	5.0 [0.0–18.1]	4.6 [0.0–32.5]	0.76 6	4.7 [0.0–32.5]	4.5 [0.0–20.5]	0.979
ABD, n = 39	4.2 [0.0–31.6]	4.1 [0.4–12.3]	0.86 6	5.4 [0.0–12.3]	3.3 [0.4–4.6]	0.05 9	4.2 [0.0–31.6]	4.5 [0.4–12.3]	0.610
No ABD, n = 271	4.5 [0.0–32.5]	4.3 [0.0–54.0]	0.60 9	4.0 [0.0–22.7]	4.3 [0.0–32.5]	0.19 0	4.5 [0.0–54.0]	4.4 [0.0–32.4]	0.495
GFR > 60 mL/min, n = 102	4.0 [0.0–29.2]	4.8 [0.1–22.7]	0.91 8	4.1 [0.1–22.7]	4.3 [0.0–14.9]	0.83 1	4.0 [0.0–22.7]	5.8 [0.4–29.2]	0.090
GFR < 60 mL/min, n = 208	4.9 [0.0–32.5]	4.1 [0.0–54.0]	0.39 8	4.2 [0.0–17.1]	3.9 [0.0–32.5]	0.55 2	4.5 [0.0–54.0]	3.8 [0.0–32.4]	0.807
IAA (μg/mL)									
All, *n = 310*	0.75 [0.08–7.61]	0.75 [0.10–5.28]	0.30 2	0.74 [0.14–7.61]	0.75 [0.24–5.89]	0.94 0	0.74 [0.19–7.61]	0.78 [0.08–5.89]	0.808
Female, n = 116	0.69 [0.19–5.22]	0.77 [0.10–2.83]	0.87 6	0.67 [0.14–2.52]	0.71 [0.35–1.80]	0.62 7	0.71 [0.19–5.22]	0.78 [0.14–2.52]	0.365

< 50, *n* = 59	0.70 [0.21–5.22]	0.74 [0.10–2.83]	0.52 2	0.71 [0.21–2.52]	0.81 [0.35–1.80]	0.60 8	0.71 [0.21–5.22]	0.88 [0.34–2.52]	0.190
> 50, *n* = 57	0.68 [0.19–2.18]	0.77 [0.14–1.69]	0.69 4	0.65 [0.14–2.18]	0.64 [0.40–0.88]	0.85 2	0.78 [0.19–2.11]	0.68 [0.14–2.18]	0.894
***Male, n* = 194**	0.80 [0.08–7.61]	0.73 [0.22–5.28]	0.14 4	0.76 [0.33–7.61]	0.78 [0.24–5.89]	0.65 3	0.75 [0.21–7.61]	0.78 [0.08–5.89]	0.798
< 50, *n* = 79	0.75 [0.22–2.63]	0.84 [0.36–3.20]	0.68 3	0.74 [0.40–1.69]	0.86 [0.36–3.20]	0.49 9	0.74 [0.22–2.63]	0.89 [0.36–3.20]	0.537
> 50, *n* = 115	0.83 [0.08–7.61]	0.68 [0.22–5.28]	0.02 6	0.78 [0.24–5.89]	0.71 [0.24–5.89]	0.30 7	0.76 [0.21–7.61]	0.74 [0.08–5.89]	0.296
***ABD, n* = 39**	0.68 [0.21–2.12]	0.89 [0.33–5.28]	0.70 2	0.95 [0.33–5.28]	0.88 [0.53–2.12]	1.00 0	0.94 [0.33–5.28]	0.64 [0.21–1.33]	0.405
***No ABD, n* = 271**	0.76 [0.08–7.61]	0.74 [0.10–5.26]	0.21 6	0.74 [0.14–7.61]	0.73 [0.24–5.89]	0.93 9	0.73 [0.19–7.61]	0.78 [0.08–5.89]	0.530
***GFR > 60 mL/min, n* = 102**	0.74 [0.21–2.63]	0.70 [0.33–4.75]	0.69 7	0.75 [0.21–4.75]	0.63 [0.35–2.12]	0.10 3	0.72 [0.21–4.75]	0.78 [0.42–1.69]	0.447
***GFR < 60 mL/min, n* = 208**	0.82 [0.08–7.6]	0.77 [0.10–5.28]	0.30 6	0.69 [0.14–7.61]	0.82 [0.24–5.89]	0.34 5	0.77 [0.19–7.61]	0.78 [0.08–5.89]	0.795

ABD, adynamic bone disease; CMPF, 3−carboxy−4−methyl−5−propyl−furanpropionic acid; GFR, glomerular filtration rate; HA, hippuric acid; IAA, indole−3−acetic acid; IxS, indoxylsulfate; pCG, p−cresylglucuronide; pCS, p−cresylsulfate; r, correlation coefficient; TMAO, trimethylamine−N−oxide.

Table S12. Correlations between UT concentrations and BMD changes 12 and 24 months after transplantation, by subgroup.

	Uremic Toxins													
	pCS		**CMPF**		**IxS**		**pCG**		**HA**		**TMAO**		**IAA**	
Subgroups	**rho**	***p***	**rho**	***p***	**rho**	***p***	**rho**	***p***	**rho**	***p***	**rho**	***p***	**rho**	***p***
Changes in the lumbar spine BMD (%) 12 months after transplantation														
All, *n* = 310	−0.02	0.747	−0.09	0.116	+0.02	0.736	−0.03	0.624	+0.02	0.666	−0.01	0.901	−0.03	0.569
***Female, n* = 116**	−0.12	0.215	−0.05	0.595	−0.09	0.337	−0.12	0.200	+0.03	0.781	−0.01	0.891	−0.04	0.660
< 50, *n* = 59	−0.12	0.371	−0.01	0.943	−0.17	0.200	−0.20	.0135	−0.01	0.914	+0.11	0.399	−0.04	0.742
> 50, *n* = 57	−0.09	0.527	−0.18	0.197	−0.06	0.662	−0.04	0.747	+0.06	0.663	−0.20	0.149	−0.07	0.612
***Male, n* = 194**	+0.02	0.770	−0.11	0.125	+0.07	0.329	+0.01	0.870	−0.05	0.533	−0.00	0.962	−0.03	0.694
< 50, *n* = 79	+0.08	0.486	−0.04	0.708	+0.11	0.327	+0.11	0.337	+0.01	0.920	+0.02	0.837	+0.13	0.254
> 50, *n* = 115	−0.02	0.816	−0.12	0.186	+0.03	0.775	−0.05	0.613	−0.09	0.340	−0.04	0.667	−0.07	0.467
***ABD, n* = 39**	+0.27	0.104	−0.12	0.487	+0.10	0.571	+0.01	0.975	−0.16	0.354	−0.12	0.488	+0.10	0.557

No ABD, n = 271	−0.05	0.400	−0.10	0.118	+0.00	0.943	−0.03	0.602	−0.02	0.761	+0.01	0.927	−0.05	0.419
ESW, n = 41	−0.08	0.634	+0.09	0.591	+0.09	0.590	−0.01	0.947	+0.01	0.930	+0.18	0.272	+0.10	0.539
OSR, n = 269	−0.01	0.868	−0.08	0.166	+0.04	0.486	−0.02	0.787	−0.02	0.730	−0.01	0.874	−0.08	0.195
GFR > 60 mL/min, n = 102	−0.15	0.127	+0.01	0.908	−0.10	0.344	−0.02	0.831	+0.06	0.533	+0.08	0.436	−0.01	0.958
GFR < 60 mL/min, n = 208	+0.04	0.584	−0.15	0.033	+0.07	0.285	−0.02	0.744	−0.06	0.390	−0.03	0.625	−0.03	0.645
Changes in the lumbar spine BMD (%) 24 months after transplantation														
All, *n = 222*	−0.00	0.967	−0.10	0.135	−0.03	0.662	+0.03	0.621	−0.03	0.614	+0.07	0.320	−0.06	0.368
Female, n = 86	+0.02	0.857	−0.06	0.553	−0.11	0.298	+0.05	0.657	−0.02	0.869	+0.04	0.704	−0.17	0.116
< 50, *n = 46*	+0.00	0.980	−0.05	0.759	−0.17	0.272	+0.01	0.953	−0.14	0.371	+0.04	0.783	−0.20	0.195
> 50, *n = 40*	+0.06	0.715	−0.12	0.462	−0.09	0.566	+0.10	0.558	+0.10	0.526	+0.03	0.876	−0.17	0.291
Male, n = 136	−0.02	0.826	−0.12	0.148	+0.01	0.937	+0.02	0.779	−0.05	0.582	+0.08	0.361	−0.01	0.932
< 50, *n = 60*	+0.11	0.417	+0.00	0.997	+0.06	0.623	+0.11	0.416	+0.01	0.967	+0.12	0.354	−0.9	0.517
> 50, *n = 76*	−0.14	0.214	−0.17	0.135	−0.08	0.487	−0.03	0.810	−0.12	0.309	−0.01	0.964	−0.05	0.675
ABD, n = 26	+0.00	0.983	+0.30	0.134	−0.25	0.219	+0.00	0.991	−0.18	0.387	+0.00	0.997	−0.10	0.628
No ABD, n = 196	−0.00	0.960	−0.16	0.023	−0.00	0.991	+0.04	0.544	−0.03	0.724	+0.08	0.276	−0.06	0.436
ESW, n = 16	−0.19	0.475	+0.68	0.003	+0.23	0.376	+0.32	0.232	+0.36	0.171	+0.18	0.515	+0.01	0.969
OSR, n = 206	+0.02	0.798	−0.10	0.139	−0.01	0.856	+0.05	0.440	−0.03	0.697	+0.08	0.259	−0.05	0.494
GFR > 60 mL/min, n = 76	+0.04	0.751	+0.04	0.761	−0.17	0.144	+0.02	0.869	+0.01	0.925	+0.17	0.141	+0.08	0.493
GFR < 60 mL/min, n = 146	−0.02	0.797	−0.18	0.028	+0.05	0.578	+0.05	0.544	−0.06	0.501	+0.03	0.733	−0.12	0.134
Changes in the femoral neck BMD (%) 12 months after transplantation														
All, *n = 310*	−0.10	0.229	+0.10	0.218	+0.04	0.654	−0.01	0.908	−0.03	0.760	+0.07	0.397	+0.01	0.869
Female, n = 116	−0.14	0.347	+0.22	0.131	+0.23	0.124	+0.00	0.984	+0.12	0.437	+0.02	0.906	−0.10	0.485
< 50, *n = 59*	+0.04	0.853	+0.22	0.309	+0.18	0.417	+0.15	0.498	−0.01	0.976	+0.14	0.514	−0.11	0.599
> 50, *n = 57*	−0.21	0.320	−0.03	0.901	+0.13	0.560	−0.18	0.389	+0.13	0.530	−0.29	0.177	−0.21	0.330
Male, n = 194	−0.11	0.297	+0.00	0.950	+0.05	0.614	−0.03	0.766	−0.03	0.775	+0.08	0.455	+0.02	0.808
< 50, *n = 79*	−0.06	0.716	+0.22	0.176	−0.08	0.634	+0.00	0.994	−0.01	0.967	+0.16	0.334	+0.25	0.123
> 50, *n = 115*	−0.14	0.294	−0.10	0.433	−0.03	0.832	−0.05	0.701	−0.05	0.724	+0.02	0.870	−0.03	0.820
ABD, n = 39	+0.01	0.972	+0.00	0.973	−0.03	0.920	+0.06	0.806	−0.13	0.617	−0.10	0.688	−0.13	0.596
No ABD, n = 271	−0.10	0.246	+0.10	0.256	+0.05	0.569	−0.01	0.915	+0.02	0.787	+0.08	0.376	+0.04	0.686
ESW, n = 41	+0.04	0.848	+0.38	0.052	+0.31	0.136	+0.10	0.642	+0.13	0.536	+0.33	0.104	−0.07	0.730

OSR, n = 269	−0.12	0.198	+0.09	0.350	+0.01	0.907	−0.03	0.780	+0.00	0.967	+0.04	0.646	+0.03	0.747
GFR > 60 mL/min, n = 102	−0.25	0.083	+0.18	0.224	−0.05	0.711	−0.05	0.732	−0.13	0.386	+0.06	0.664	−0.04	0.779
GFR < 60 mL/min, n = 208	−0.04	0.719	+0.04	0.673	+0.10	0.357	+0.01	0.926	−0.11	0.265	+0.07	0.470	+0.05	0.658
Changes in the femoral neck BMD (%) 24 months after transplantation														
All, *n = 222*	+0.03	0.747	−0.03	0.733	+0.11	0.244	+0.06	0.533	+0.13	0.173	+0.07	0.443	+0.05	0.576
Female, n = 86	+0.03	0.859	−0.10	0.553	+0.18	0.277	+0.13	0.410	+0.33	0.038	+0.15	0.341	+0.25	0.119
< 50, *n = 46*	−0.12	0.594	−0.19	0.382	+0.29	0.185	−0.07	0.766	+0.26	0.238	+0.22	0.314	+0.38	0.075
> 50, *n* = 40	+0.22	0.399	+0.06	0.805	+0.09	0.737	+0.33	0.195	+0.37	0.145	+0.09	0.722	+0.08	0.755
Male, n = 136	+0.03	0.783	+0.02	0.893	+0.08	0.484	+0.03	0.813	+0.02	0.861	−0.01	0.946	−0.03	0.808
< 50, *n = 60*	+0.22	0.231	+0.37	0.041	+0.18	0.322	+0.13	0.480	+0.12	0.530	−0.01	0.975	+0.25	0.168
> 50, *n = 76*	−0.11	0.496	−0.05	0.772	−0.03	0.852	−0.03	0.852	−0.11	0.496	−0.03	0.856	−0.13	0.423
ABD, n = 26	+0.08	0.771	+0.02	0.942	−0.27	0.297	−0.16	0.533	−0.31	0.223	−0.00	0.998	−0.29	0.257
No ABD, n = 196	+0.03	0.798	+0.04	0.704	+0.18	0.077	+0.14	0.174	+0.19	0.069	+0.09	0.381	+0.08	0.416
ESW, n = 16	−0.24	0.458	+0.45	0.135	+0.41	0.187	+0.25	0.435	+0.39	0.209	+0.79	0.002	+0.33	0.288
OSR, n = 206	+0.06	0.531	+0.05	0.630	+0.09	0.356	+0.06	0.580	+0.11	0.267	+0.03	0.759	+0.04	0.669
GFR > 60 mL/min, n = 76	+0.21	0.182	+0.09	0.552	+0.14	0.372	−0.07	0.642	+0.02	0.897	+0.00	0.989	+0.07	0.650
GFR < 60 mL/min, n = 146	−0.05	0.662	−0.13	0.280	+0.11	0.383	+0.15	0.218	+0.21	0.090	+0.11	0.375	+0.04	0.727
Changes in the total hip BMD (%) 12 months after transplantation														
All, *n = 310*	−0.05	0.389	−0.02	0.770	−0.02	0.763	−0.04	0.545	−0.07	0.257	−0.00	0.976	+0.07	0.238
Female, n = 116	+0.04	0.686	+0.06	0.547	−0.17	0.094	−0.05	0.641	+0.04	0.712	−0.02	0.834	+0.11	0.295
< 50, *n = 59*	+0.07	0.618	−0.03	0.833	+0.00	0.986	−0.22	0.123	−0.05	0.731	+0.28	0.052	+0.09	0.540
> 50, *n = 57*	+0.09	0.538	+0.05	0.727	+0.28	0.048	+0.09	0.557	+0.08	0.594	−0.31	0.025	+0.08	0.575
Male, n = 194	−0.08	0.286	−0.03	0.653	−0.07	0.333	−0.03	0.702	−0.10	0.176	+0.02	0.792	+0.08	0.311
< 50, *n = 79*	−0.14	0.260	−0.09	0.479	−0.14	0.235	−0.13	0.275	−0.21	0.078	+0.00	0.968	−0.03	0.778
> 50, *n = 115*	−0.03	0.764	−0.01	0.956	−0.02	0.869	+0.05	0.587	+0.01	0.915	+0.04	0.706	+0.13	0.182
ABD, n = 39	−0.01	0.951	+0.04	0.832	−0.34	0.064	+0.01	0.953	−0.35	0.051	−0.11	0.552	−0.12	0.531
No ABD, n = 271	−0.05	0.396	−0.04	0.506	+0.02	0.792	−0.05	0.452	−0.06	0.321	+0.01	0.893	+0.10	0.112
ESW, n = 41	+0.13	0.426	+0.41	0.012	+0.27	0.109	+0.09	0.613	+0.17	0.323	−0.06	0.716	+0.19	0.250
OSR, n = 269	−0.09	0.186	−0.06	0.362	−0.05	0.436	−0.05	0.432	−0.11	0.098	+0.01	0.930	+0.04	0.572

GFR > 60 mL/min, n = 102	−0.17	0.117	+0.03	0.802	−0.17	0.105	−0.19	0.078	−0.07	0.500	+0.20	0.058	−0.09	0.398
GFR < 60 mL/min, n = 208	+0.01	0.935	−0.04	0.570	+0.08	0.302	+0.03	0.673	−0.07	0.367	−0.09	0.210	+0.13	0.076
Changes in the total hip BMD (%) 24 months after transplantation														
All, *n = 222*	−0.05	0.509	−0.02	0.730	+0.04	0.570	+0.01	0.868	+0.02	0.743	+0.03	0.671	−0.01	0.944
Female, n = 86	−0.02	0.886	−0.06	0.610	+0.06	0.598	−0.07	0.561	+0.12	0.303	+0.05	0.690	+0.09	0.437
< 50, *n = 46*	+0.06	0.736	+0.08	0.618	−0.07	0.687	−0.25	0.132	+0.13	0.403	+0.23	0.174	+0.08	0.639
> 50, *n = 40*	−0.04	0.834	−0.24	0.167	+0.22	0.206	+0.14	0.435	+0.10	0.562	−0.21	0.225	+0.08	0.628
Male, n = 136	−0.05	0.596	+0.01	0.938	+0.06	0.519	+0.05	0.551	+0.02	0.984	+0.03	0.733	−0.05	0.592
< 50, *n = 60*	−0.05	0.704	−0.12	0.376	+0.04	0.755	−0.03	0.802	−0.06	0.652	−0.05	0.704	−0.17	0.203
> 50, *n = 76*	−0.05	0.699	+0.11	0.362	+0.04	0.735	+0.11	0.348	+0.06	0.637	+0.11	0.380	−0.00	0.996
ABD, n = 26	+0.11	0.633	+0.25	0.276	−0.26	0.245	+0.06	0.794	−0.17	0.460	+0.02	0.926	−0.17	0.474
No ABD, n = 196	−0.07	0.378	−0.06	0.435	+0.08	0.299	+0.00	0.975	+0.03	0.679	+0.03	0.692	+0.01	0.857
ESW, n = 16	−0.13	0.625	+0.48	0.058	+0.47	0.069	+0.32	0.221	+0.40	0.124	+0.30	0.260	+0.34	0.196
OSR, n = 206	−0.04	0.613	−0.03	0.688	+0.04	0.612	+0.02	0.839	+0.02	0.787	+0.03	0.718	−0.01	0.919
GFR > 60 mL/min, n = 76	−0.02	0.871	−0.04	0.739	−0.01	0.942	−0.00	0.995	+0.06	0.635	+0.12	0.332	−0.12	0.364
GFR < 60 mL/min, n = 146	−0.06	0.485	−0.05	0.575	+0.06	0.479	+0.03	0.694	−0.00	0.994	−0.01	0.888	+0.05	0.530

ABD, adynamic bone disease; CMPF, 3-carboxy-4-methyl-5-propyl-furanpropionic acid; ESW, early steroids withdrawal; GFR, glomerular filtration rate; HA, hippuric acid; IAA, indole-3-acetic acid; IxS, indoxylsulfate; OSR, other steroid regimens; pCG, p-cresylglucuronide; pCS, p-cresylsulfate; r, correlation coefficient; TMAO, trimethylamine-N-oxide.