Changes in catecholamine and metanephrine levels and 24-hour ambulatory blood pressure parameters before and after catecholamine-secreting neuroendocrine tumor resection

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Background

- Catecholamine and metanephrine levels typically normalize after complete surgical removal of pheochromocytomas and paragangliomas
- Minimal data exist regarding the relationship between the degree of decline in catecholamine and metanephrine levels and changes in systolic blood pressure (SBP) and SBP variability following tumor resection

Methods

- Prospective observational study
  - Patients evaluated at the Penn Neuroendocrine Program for suspected pheochromocytoma or paraganglioma
  - Recruitment period: January 2014 - December 2016
  - Data collection:
    - Plasma and urine catecholamines
    - Plasma and urine metanephrines
    - 24-hour ambulatory blood pressure monitoring 1-3 weeks prior to tumor resection
    - 24-hour ambulatory blood pressure monitoring 6-8 weeks post-operatively
- Descriptive statistics (mean, median, proportion)
  - Continuous: Student's t-test or ranksum
  - Categorical: Chi-square
- Correlations between changes in blood pressure parameters and laboratory results
  - Spearman's rho for non-parametric measurement of rank correlation

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Results

Table 1. Baseline Patient Characteristics (N=32)

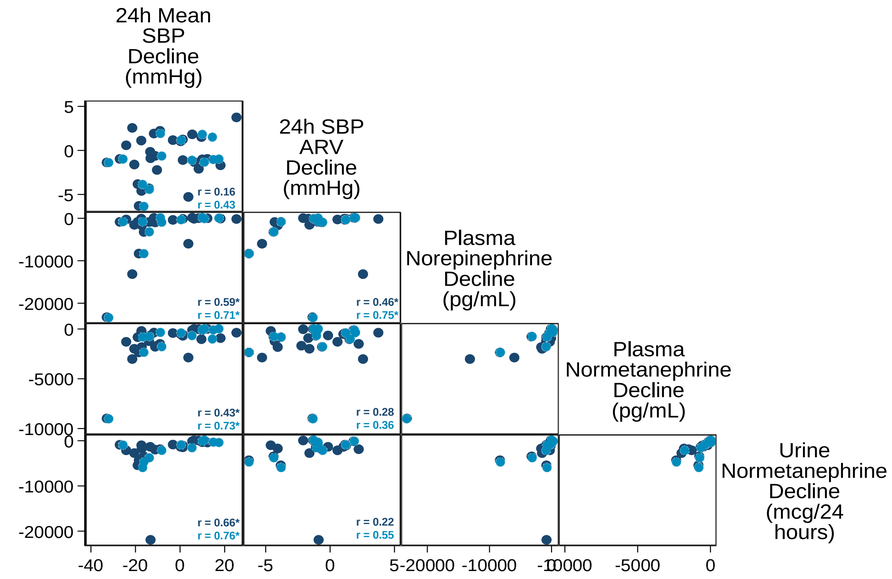
Median age, years (IQR)	56 (49-68)
Male gender, n (%)	14 (44%)
Race, n (%)	
White	25 (78%)
Black	6 (19%)
Asian	1 (3%)
Median duration of hypertension, years (IQR)	3 (1-13)
Alpha-blockade pre-operatively, n (%)	18 (56%)
Number of antihypertensive medications pre-operatively, n (%)	
0	5 (16%)
1	10 (31%)
2	12 (38%)
≥ 3	5 (15%)
Number of antihypertensive medications post-operatively, n (%)	
0	16 (50%)
1	10 (31%)
2	6 (19%)
Genetic study positive, n (%)	7 (22%)
SDHB	2 (6%)
RET/MEN2	3 (9%)
SDHD	1 (3%)
NF1	1 (3%)

Table 2. Changes in in-office and 24-hour ambulatory blood pressure parameters pre-operatively and post-operatively

Measurement	Mean Pre-operative	Mean Post-operative	Mean Decline	P-value
Clinic SBP, mmHg	134.6	122.5	12.1	<0.001
Clinic DBP, mmHg	78.5	71.8	6.7	<0.001
Clinic MAP, mmHg	97.0	88.7	8.3	<0.001
Clinic PP, mmHg	56.0	50.7	5.4	0.037
Clinic HR, bpm	80.8	75.5	5.2	0.029
24h mean SBP, mmHg	133.1	127.4	5.7	0.036
24h SBP ARV, mmHg	10.0	9.0	1.0	0.031
24h mean DBP, mmHg	78.5	75.8	2.7	0.121
24h mean MAP, mmHg	97.5	93.6	3.9	0.049
24h mean PP, mmHg	54.5	51.6	2.9	0.012
24h mean HR, bpm	78.5	74.0	4.5	0.023
Night mean SBP, mmHg	125.2	116.3	8.9	0.007
Day mean SBP, mmHg	135.2	128.4	6.8	0.035

SBP: systolic blood pressure; DBP: diastolic blood pressure; MAP: mean arterial pressure; PP: pulse pressure; HR: heart rate; bpm: beats per minute; ARV: average real variability

Figure 1. Scatterplot matrix comparing decline in 24-hour mean SBP and 24-hour SBP average real variability with decline in plasma catecholamines and plasma and urine metanephrine levels



Overall cohort; r = Spearman's rho
Patients not on alpha-blockade at baseline; r = Spearman's rho
* p < 0.05

Conclusions

- Patients had a significant decline in 24-hour mean SBP and SBP variability, and had resolution of white coat, masked, and sustained hypertension following pheochromocytoma and paraganglioma resection
- Decline in 24-hour mean SBP was directly associated with degree of improvement in catecholamine and metanephrine levels
- Decline in 24-hour SBP average real variability was directly associated with degree of improvement in plasma catecholamines