





Prospective Comparative Study Of Normotensive And Hypertensive Pheochromocytoma & Paraganglioma

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Introduction

- Hypertension due to catecholamine excess is the hallmark of Pheochromocytoma and Paraganglioma (PPGL) ¹
- Around 5-15% of PPGL patients are normotensive²
- The characteristics and surgical outcomes of normotensive PPGL are poorly known

<u>Aim</u>

To compare the demographic, clinical, hormonal, histopathological features, and surgical outcomes between normotensive (NP) and hypertensive (HP) PPGL patients.

Patients & Methods

A prospective cohort of 101 functional PPGL patients

Part of **Pheocard** study³

✓ Imaging characteristics on CECT (Fig. 1 & 2)

✓ Syndromic associations

✓ Cardiac dysfunction

✓ Pre-, intra- and post-

✓ Sex

√ Symptoms

√ Family history

Jan 2019 to Jun 2024 (Males = 50, Females = 51) Patients were alpha blocked, underwent conventional or minimally invasive surgery.

Data assessed and compared:

- ✓ Histology with PASS score ✓ Age
 - ✓ Surgical approach
 - √ Hormonal profile- 24 hr fractionated urinary metanephrines (UMN) and normetanephrines (UNMN) at
 - time of diagnosis
 - 1 week after surgery

ND

operative blood pressure ✓ Postoperative events

	ПР	NP	-	Characterist
Demographic Data	n (%) or	n (%) or	p value	(Internal Ne
	Mean ± SD	Mean ± SD	Tuide	Cardiac eval
Blood Pressure	71 (70.3)	30 (29.7)		Normal
Pheochromocytoma n=82	56 (68.3)	26 (31.7)	0.22	Mild dysfund
Paraganglioma n=17	14 (82.35)	3 (17.64)	0.32	Moderate dysfunction
Both n=2	1 (50)	1 (50)		Severe dysf
Male n=50	37 (74)	13 (26)	0.10	•
Female n=51	34 (66.7)	17 (33.3)	0.12	Hormonal Pi
Mean age at Dx years ± SD	33.5 ± 12.9	33.7±14.6	0.92	fractionated hour UMN
Family History present	14 (21.5)	3 (10.3)	0.23	fractionated hour UNMN
Genetic Mutations				UMN-Urin
VHL	8 (11.3)	3 (10)		· Similar
MEN2A	5 (7)	1 (3.3)	_	• Cardiac d
MEN2B	0 (0)	1 (3.3)	_	 Mean tur
NF-1	1 (1.4)	0 (0)		groups (¡
SDHD	1 (1.4)	0 (0)		
	Intraonera			

VHL – Von Hippel Lindau Syndrome, MEN 2A and 2B – Multiple Endocrine Neoplasia, NF 1- Neurofibromatosis Type 1, SDH D- Succinate dehydrogenase D

Hypertensive **Normotensive** ■ Both UNMN Both UMNM &UMN and UMN 34% elevated elevated 37% Only UNMN Only UNMN 63% 66% elevated elevated

Majority of patients in both groups i.e., 66% of HP and 63% of NP had isolated elevation of UNMN with UMN levels in physiological range

References

- 1. Agarwal G et al. Cardiovascular ... reversal following surgical cure:... Surgery. 2011;150(6):1202-11.
- 2. Zuber SM, Kantorovich V, Pacak K. Hypertension in pheo...
- Endocrinol Metab Clin North Am. 2011;40(2):295-vii 3. Vishvak Chanthar KM et al. Cardiac changes ... Pheocard prospective cohort study. World Journal of Surgery. 2022

Conclusions / Key Findings

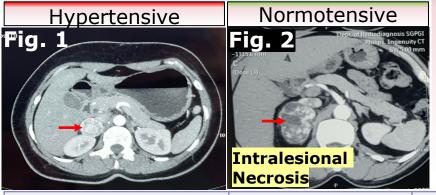
In the prospective cohort of PPGL patients included in PHEOCARD study,

Hypertensive and Normotensive groups were similar in

Demography **Clinical manifestations Intraoperative** hemodynamic behavior **Pathology Biochemistry Outcomes**

Normotensive PPGL need to be managed in a manner similar to Hypertensive PPGL

Results



60.6% of HP presented with the classical triad vs less than one third of NP (p=0.002)

63.3% NP had intralesional necrosis on imaging (p=0.007)

0.006

2425.4

NP

	Necrosis					
Preoperative Data	Hypertensive N (%)or Mean ± SD	Normotensive N (%) or Mean ± SD	p value			
Median blood pressu	ledian blood pressure in mm Hg at presentation					
Systolic	167 ± 32.6	123 ± 15	<0.001			
Diastolic	99.9 ± 17	80.6 ± 10	<0.001			
Presentation (Classical Triad)	43 (60.6)	9 (30)	0.005			
Imaging Characteristics (Internal Necrosis)	30 (42.3)	19 (63.3)	0.05			
Cardiac evaluation						
Normal	29 (40.8)	20 (66.7)	0.02			
Mild dysfunction	38 (53.6)	7 (23.4)				
Moderate dysfunction	0 (0)	1 (3.3)				
Severe dysfunction	4(5.6)	2(6.6)				
Hormonal Profile in r	microgram/24h					
fractionated 24- hour UMN	1051.1 ± 1912.9	797.5 ± 1121.6	0.5			
fractionated 24-	5322.7 ±	3661.8 ±	0 006			

UMN-Urinary metanephrines, UNMN- Urinary normetanephrines

Similar intraoperative hemodynamic behaviour (p=0.9)

3264.8

- Cardiac dysfunction more in HP (p=0.02)
- Mean tumour size & weight was comparable in the two groups (p=0.5)

HP

	Intraoperative Data	n (%) or Median (IQR)	n (%) or Median (IQR)	p value	
	Surgical Approach				
	Open n=56	40(56.3)	16(53.3)		
	Minimally Invasive n=45	31(43.6)	14(46.6)	0.79	
	Median blood pressure in mm Hg				
	Highest Systolic	193.9 ± 42	192.2 ± 35.3	0.84	
-	Highest Diastolic	110.8 ± 23.5	110.7 ± 22.4	0.98	
	Lowest Systolic	87.1 ± 22.1	79 ± 15.1	0.07	
	Lowest Diastolic	53 ± 15.3	45.6 ± 11	0.02	
1	Tumor characteristics				
	Size in centimeters	6.7 ± 2.9	7.1 ± 3.5	0.50	
	Weight in grams	115.8 ± 164.8	136.4 ± 207	0.59	

- All NP had benign HPE (p=0.05)
- 15.5% HP were malignant
- PASS score, post op hormone biochemical profile, recurrence rates were comparable between the two groups