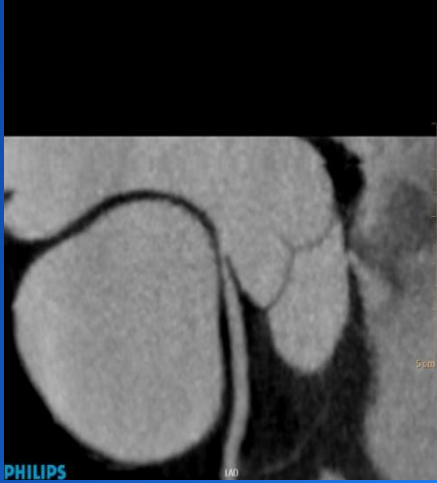




Pulmoner Hipertansiyonda Gözardı edilen Bir Komplikasyon : LMCA Basısı

Dr. Özgür Yaşar Akbal

SBÜ Kartal Koşuyolu Yüksek İhtisas Eğitim Araştırma
Hastanesi



- PAA nadir, postmortem çalışmalarda 8/109571 (Deterling et al. Am Heart J 1947)
- AA' ya daha genç grupda sık
- %89 ana pulmoner arter
- 29 mm>, 17 mm>
- Çoğunlukla KKH (PDA, VSD, ASD, Hipoplastik aort kapak, biküspit aort, pulmoner stenoz vb.)



Kreibich et al Circulation 2015

Ana koroner basıları

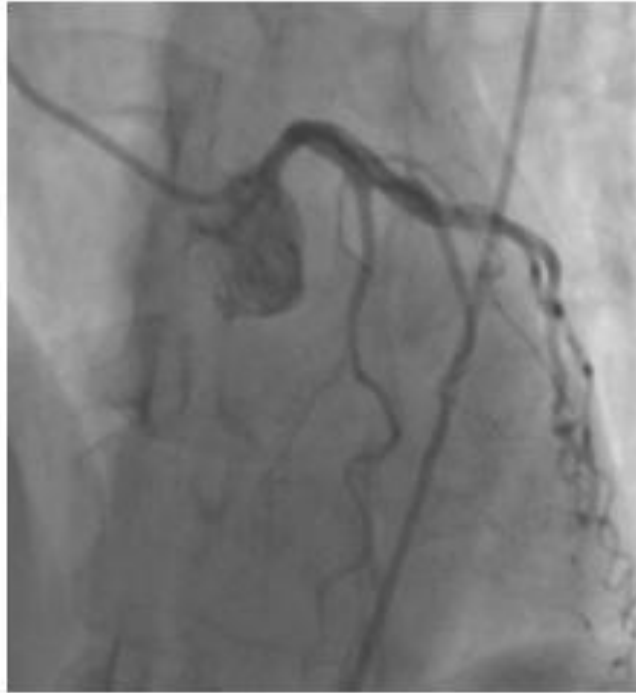
- Angina, dispne
- Kalp yetmezliđi
- Ölümcül aritmiler
- Ani ölüm

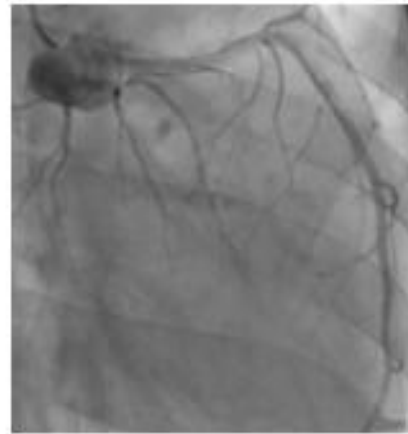
- 1192 PHT hastasının 153'ünde (13%) PAA (4,0 cm>)
- 32 (%2,6) hastada beklenmeyen ve ani kardiyak ölüm
- PA dilatasyonu ve prognoz arasında ilişki bulunmamış
- PA çapı >5,5 cm ile ani kardiyak ölüm, LMCA kompresyonu, PA trombozu, AC atelektazisi arasında anlamlı ilişki bulunmuş

- ASD olan 38 hasta (15-62 yaş)
- Pulmoner HT olan 16 (%42) hastanın 7 sinde LMCA kompresyonu (tüm hastaların 18%, PHT olanların 44%)
- LMCA basısı olanlarda mPAB: 43,6 mmHg ($\pm 17,3$)
- LMCA basısı olmayanlarda mPAB: 27,1 mmHg ($\pm 5,5$)
- LMCA stenozu en iyi LAO 20°

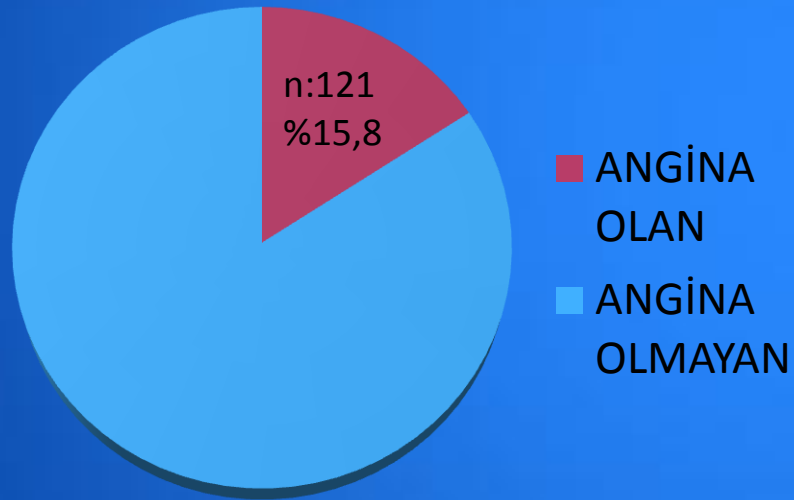
- LMCA stenozu olan 12 hasta (11 KKH, 1 IPAH)
- Tüm hastalarda ortalama PA/Ao >2,0
- Ortalama PAB: 30 mmhg
- LMCA stenozu en iyi LAO 45°, LAO-Cr 30°
- LMCA inferiora itilmiş ve sol aortik sinüse yakınlaşmış
- Ortalama açı 23° (±13°)

- IPAH/C-APAH olan 36 hasta (15-86 yaş)
- Anginası olan 26 hastanın 7' inde LMCA kompresyonu (> 50%)
- PA çapı < 40 mm olanlarda LMCA kompresyonu yok
- PA çapı \geq 40 olan 19 hastanın 37 % de LMCA kompresyonu saptanmış
- PA/Ao < 1,21 olanlarda LMCA kompresyonu yok
- PA/Ao \geq 1,21 olan 27 hastanın 26% da LMCA kompresyonu saptanmış.

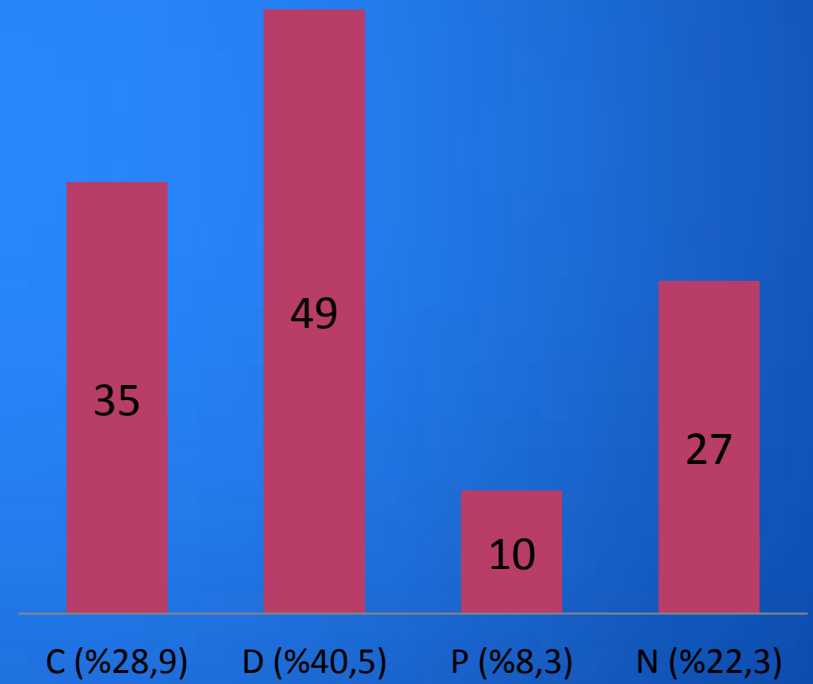




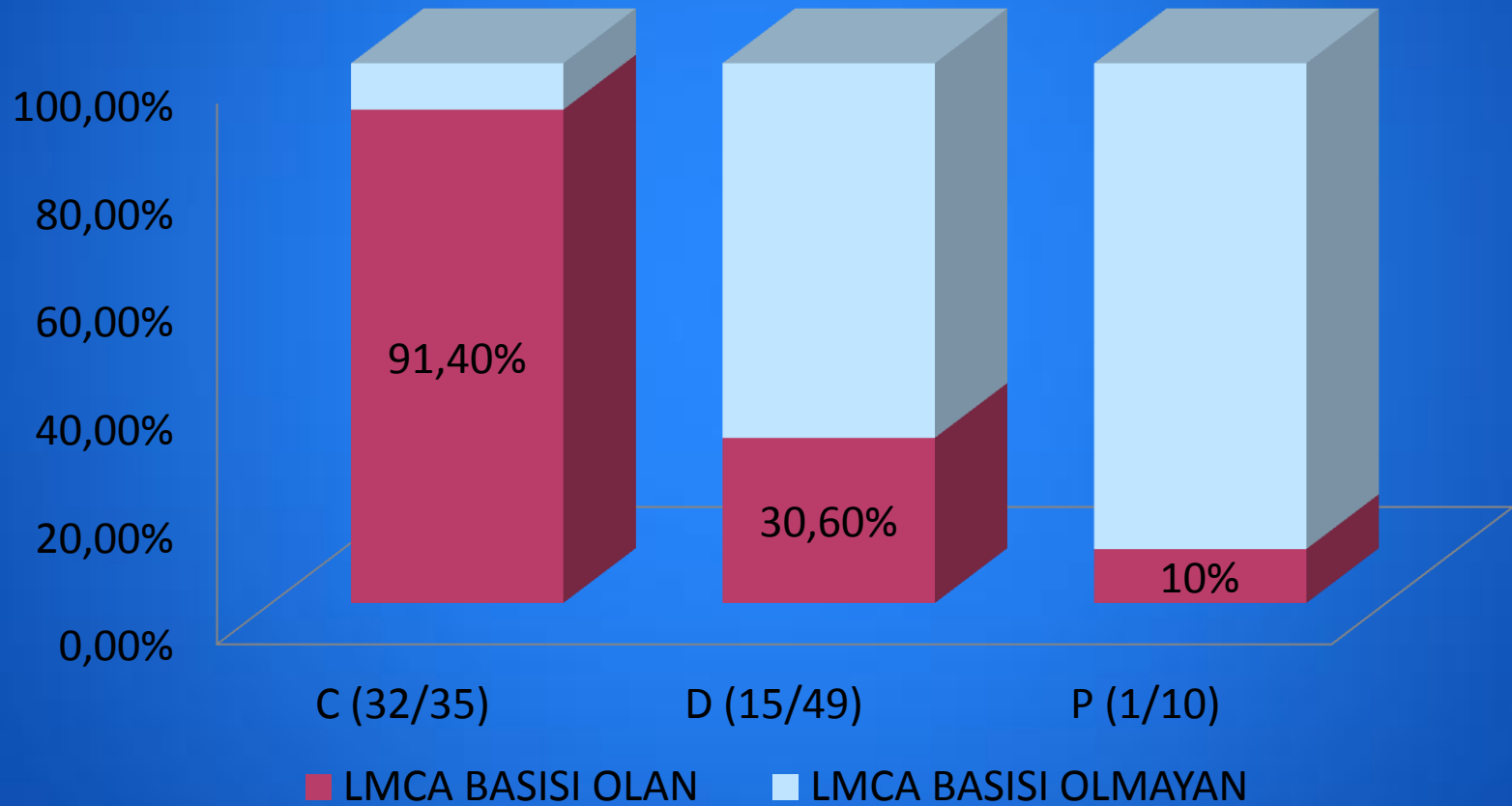
TOPLAM: 765 HASTA



TOPLAM: 121 HASTA

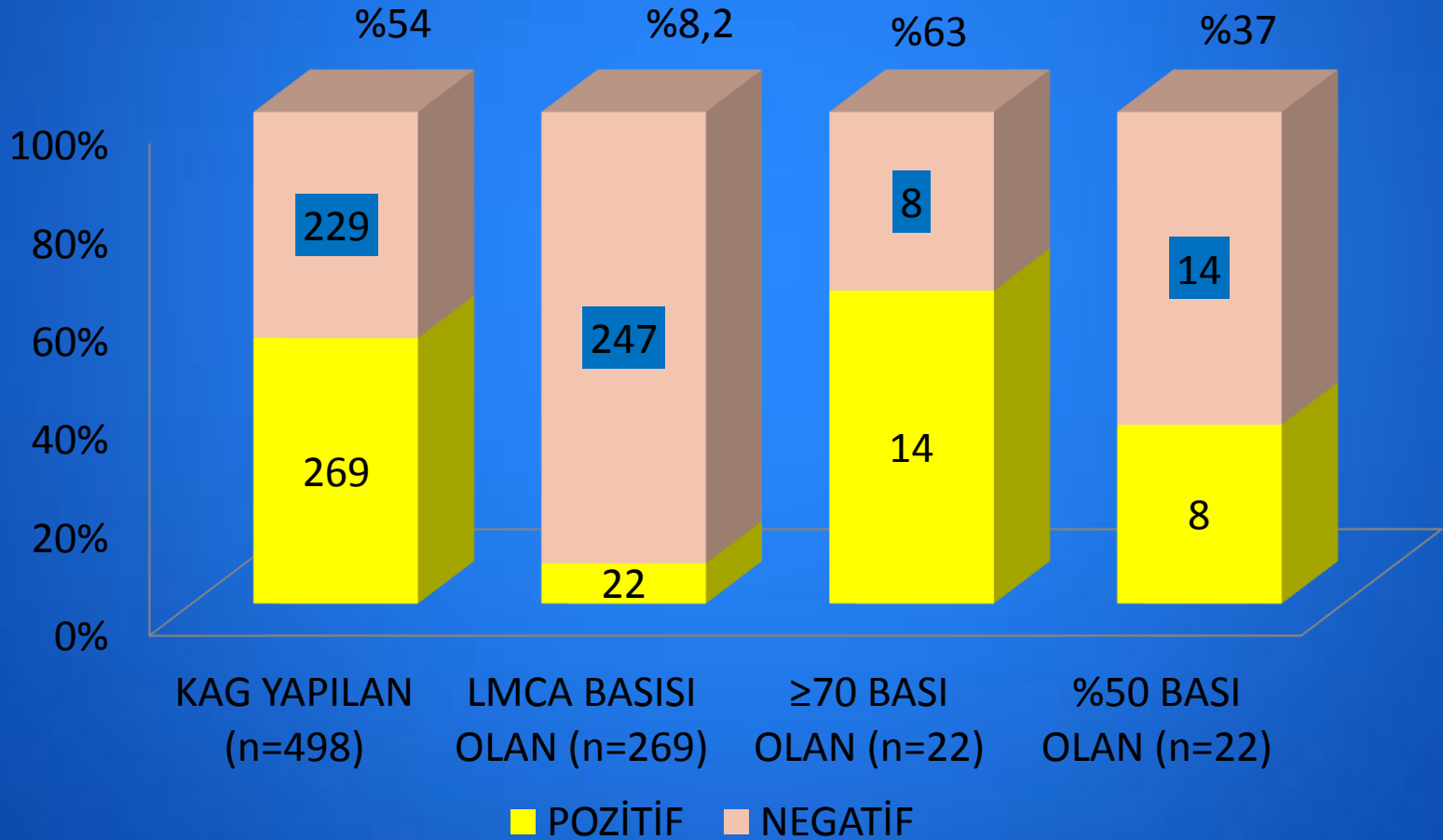


KAG' da LMCA basisi

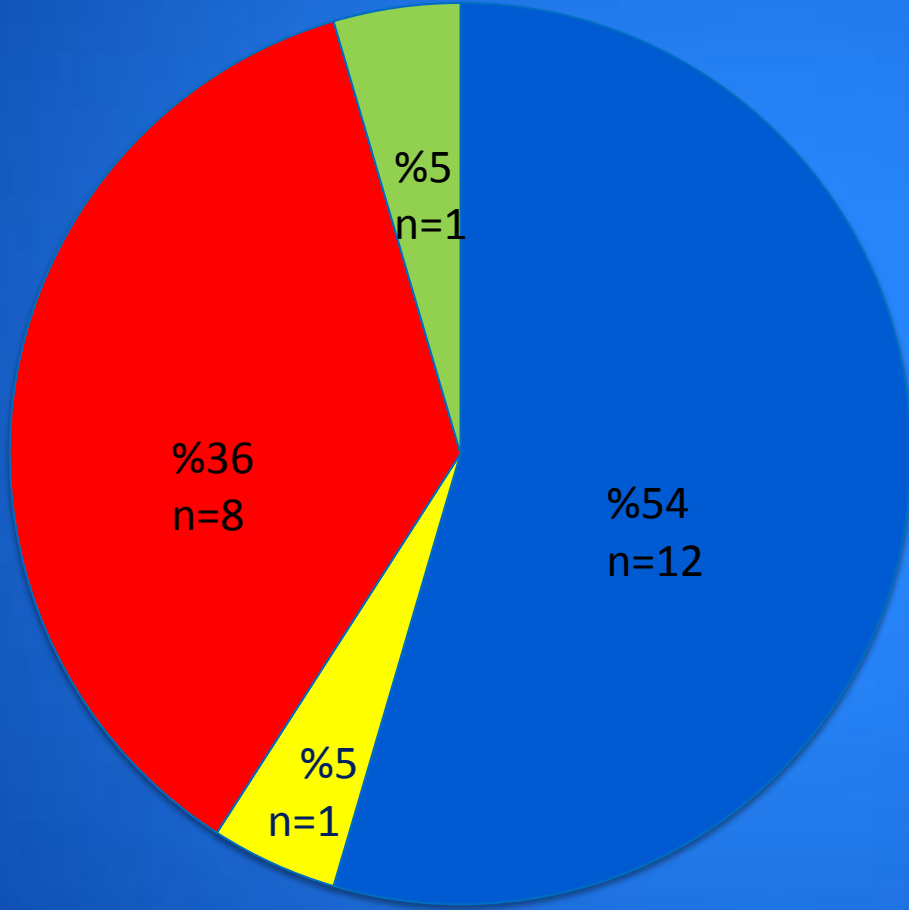


- Toplam hastaların % 6
- Anginası olan hastaların % 40
- LMCA basısı olan 48 hastanın 45' ne STENT
- Ortalama 23 ay takip , mortalite yok
- ROC analizinde BT'de mPA çapı > 40 mm LMCA kompresyonu içi prediktif
- STENT efektif ve güvenli

Koşuyolu hasta serimiz



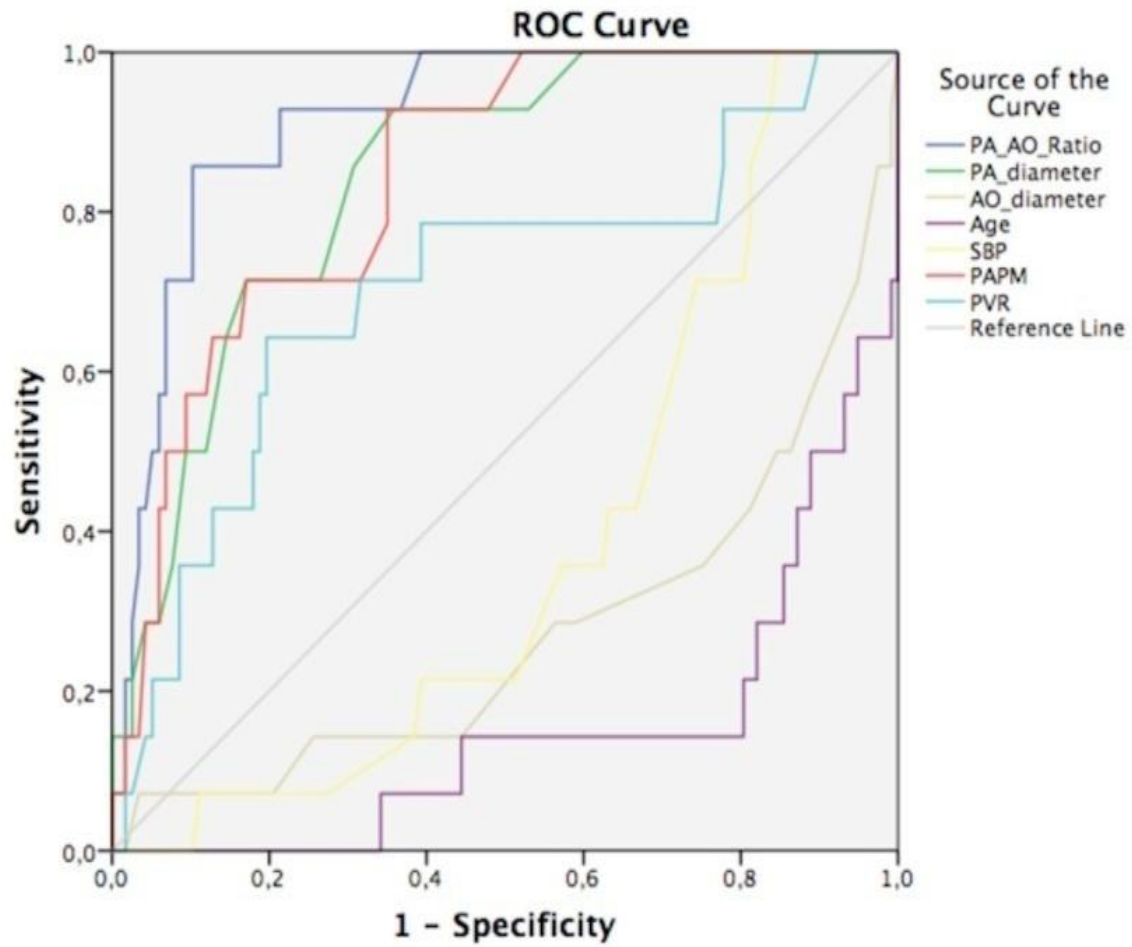
Tedavi



- STENT İMPLANTE EDİLEN
N=12
- CERRAHİ DÜZELTME
YAPILAN N=1
- MEDİKAL TAKİP N=8
- ANİ KARDİYAK ÖLÜM N=1

Variables	LM Compression	No LM Compression	P Value
Age, years	34.6 ± 13.6	54.5 ± 16.7	<0.001
Sex (Female %)	54.5	62.3	0.175
WHO-FC (median)	3	3	0.765
6 MWD, meter	286 (190-363)	268 (160-340)	0.311
Group, %			
Group 1	90.5	48.1	0.003
Group 2	0	5.4	
Group 3	0	15.1	
Group 4	9.5	31.4	
Group 1, %			
IPAH	31.6	43.6	0.077
APAH-CTD	0	12.8	
APAH-CHD	68.4	43.6	
PDA, %	36.4	2.8	<0.001
ASD, %	23.8	9.8	0.047
VSD, %	23.8	9.8	0.047
Heart Rate (/min)	92.8 ± 16.8	87.8 ± 16.9	0.204
EF %	63.2 ± 3.7	61.8 ± 8.1	0.826
D-shaped septum, %	95	64.8	0.023
PA Diameter, mm	46 ± 8	32 ± 7.2	<0.001
Aortic Diameter, mm	29 ± 6.7	31.2 ± 7.5	0.009
PA/Aortic diameter ratio			
SBP, mmHg	108 ± 27	124 ± 27	0.017
DBP, mmHg	72 ± 11	72 ± 16	0.968
RA pressure, mmHg	7.2 ± 2.3	9.5 ± 5.3	0.068
PASP, mmHg	110 ± 24	79 ± 28	<0.001
PADP, mmHg	49.6 ± 16	28.6 ± 15.3	<0.001
PAMP, mmHg	72.5 ± 18.7	47.7 ± 19.3	<0.001
PVR, wood units	12.8 (5.9-19)	6 (4-10.8)	0.005
SVR, wood units	22.8 ± 7.6	22 ± 9	0.414
CO, L/min	4.7 ± 2.2	4.6 ± 1.3	0.421
PH targeted treatment,%			
No	15.8	29.6	0.287
Mono	73.7	65.7	
Dual	10.5	4.7	

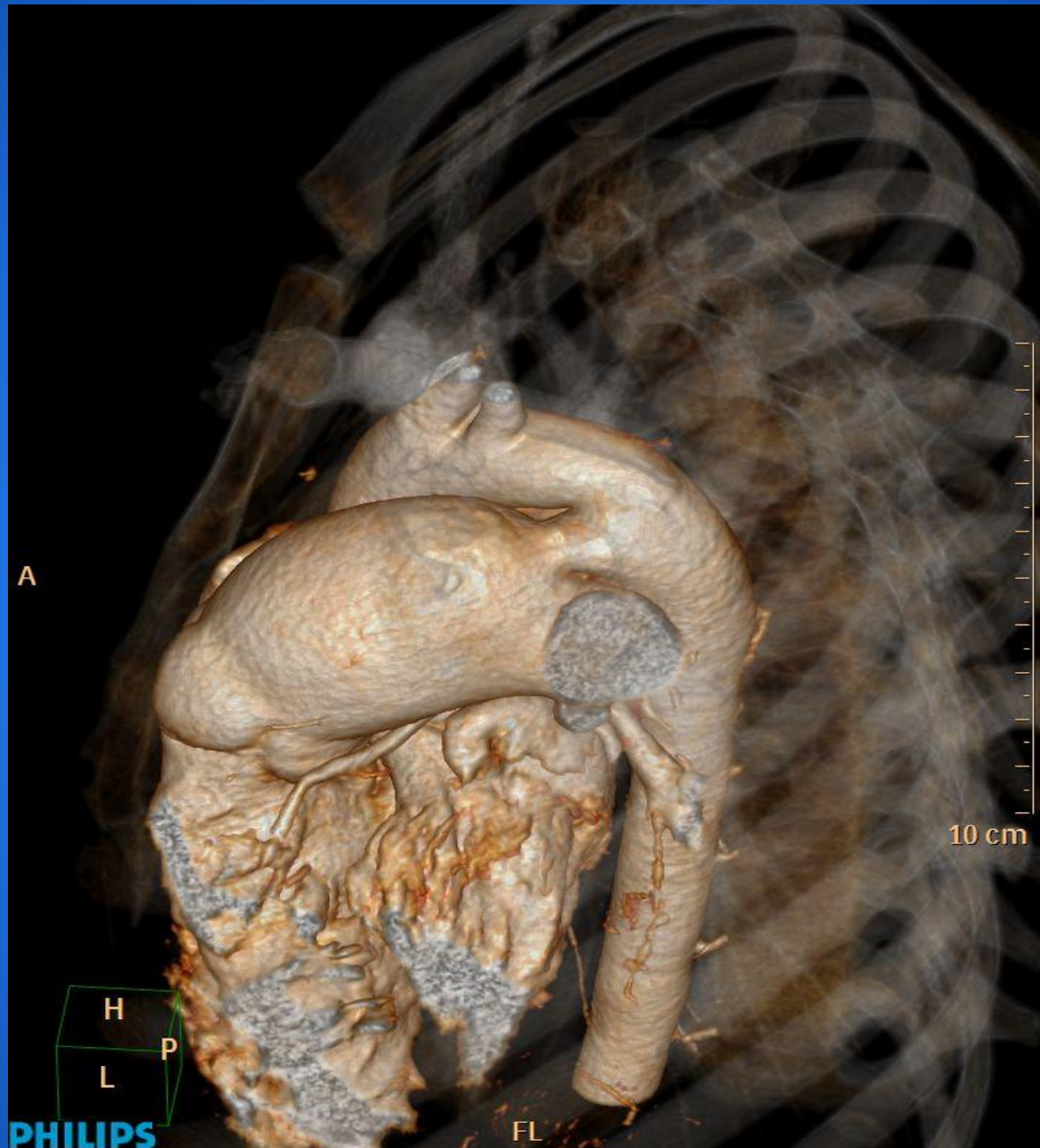
Variables	AUC	95% CI	P value
PA diameter	0.842	0.751-0.934	<0.001
Aortic diameter	0.275	0.116-0.435	0.006
PA/Ao diameter ratio	0.916	0.854-0.978	<0.001
PVR	0.704	0.544-0.864	0.013
PASP	0.820	0.710-0.929	<0.001
PAMP	0.841	0.744-0.942	<0.001
PADP	0.843	0.750-0.933	<0.001
Age	0.151	0.041-0.262	<0.001
SBP	0.385	0.257-0.512	0.160



Diagonal segments are produced by ties.

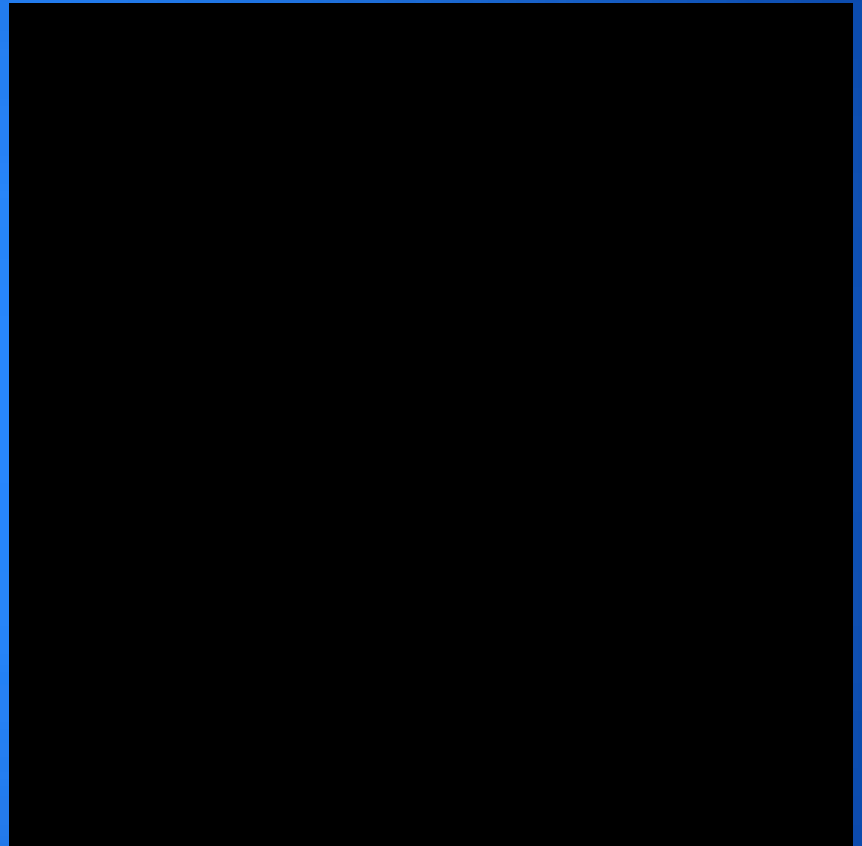
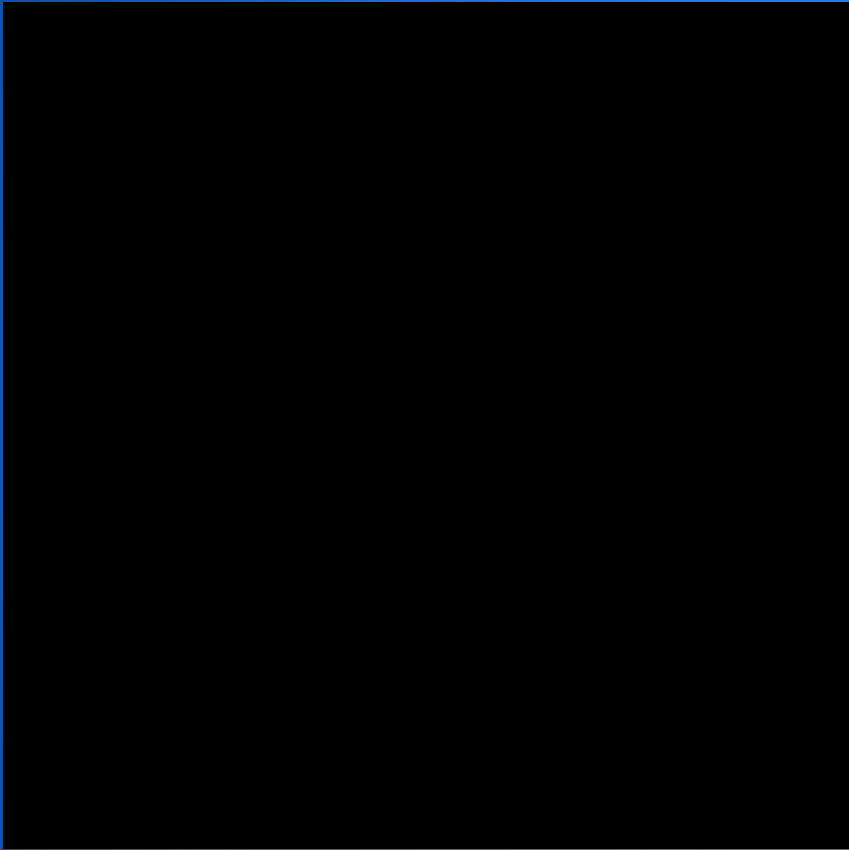
APAH-PDA
Genç yaş
Yüksek mPAB
Artmış PA çapı
Artmış PVR

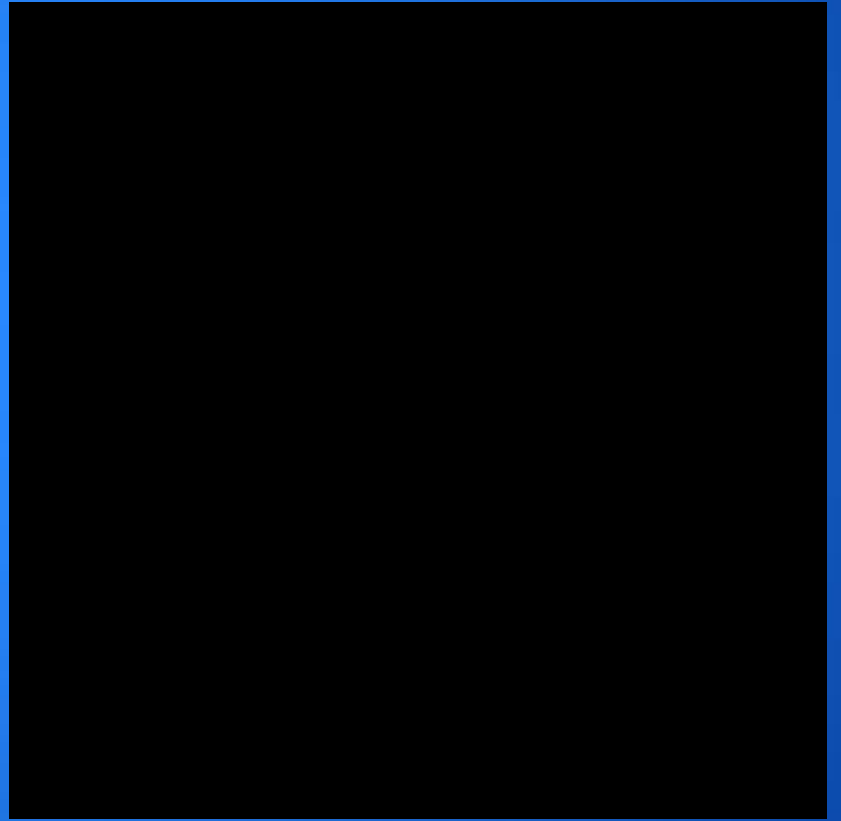
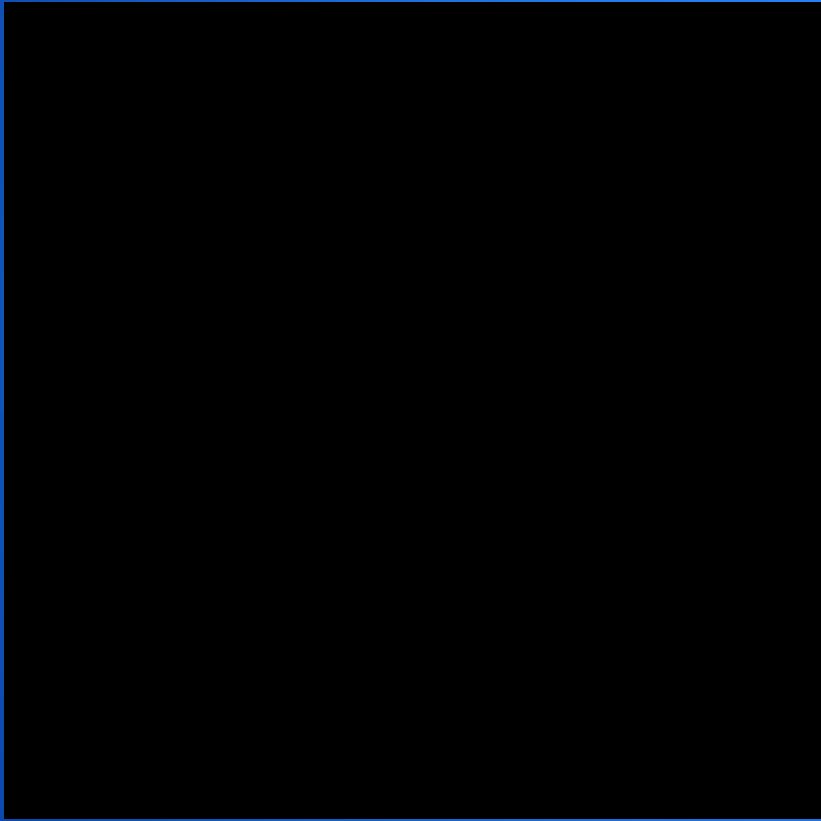
- PDA , sensitivite 36 %, spesifite 97%
- PA > 4,0 cm, sensitivite 82%, spesifite 82 %
- PA / Ao : 1,24 , sensitivite 91%, spesifite 74%

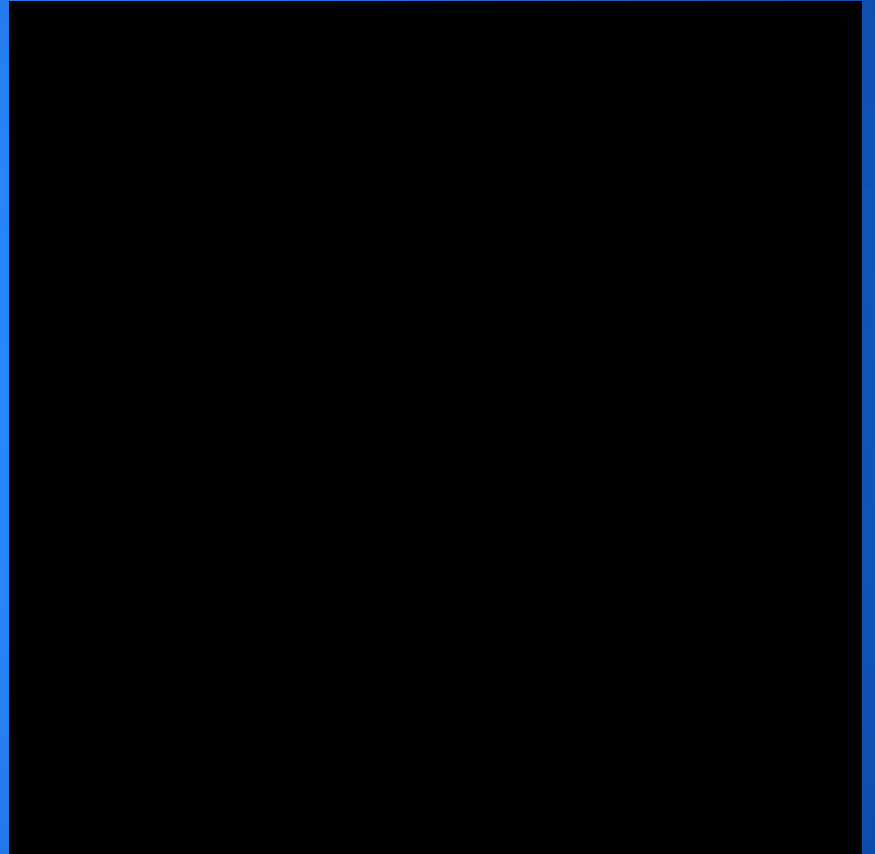
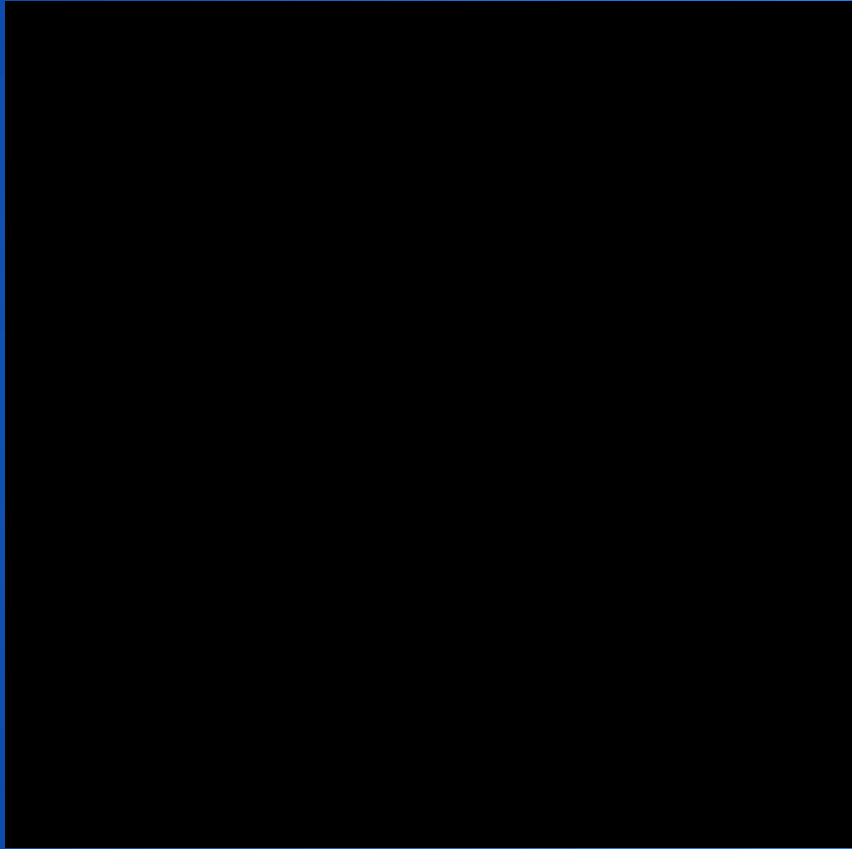


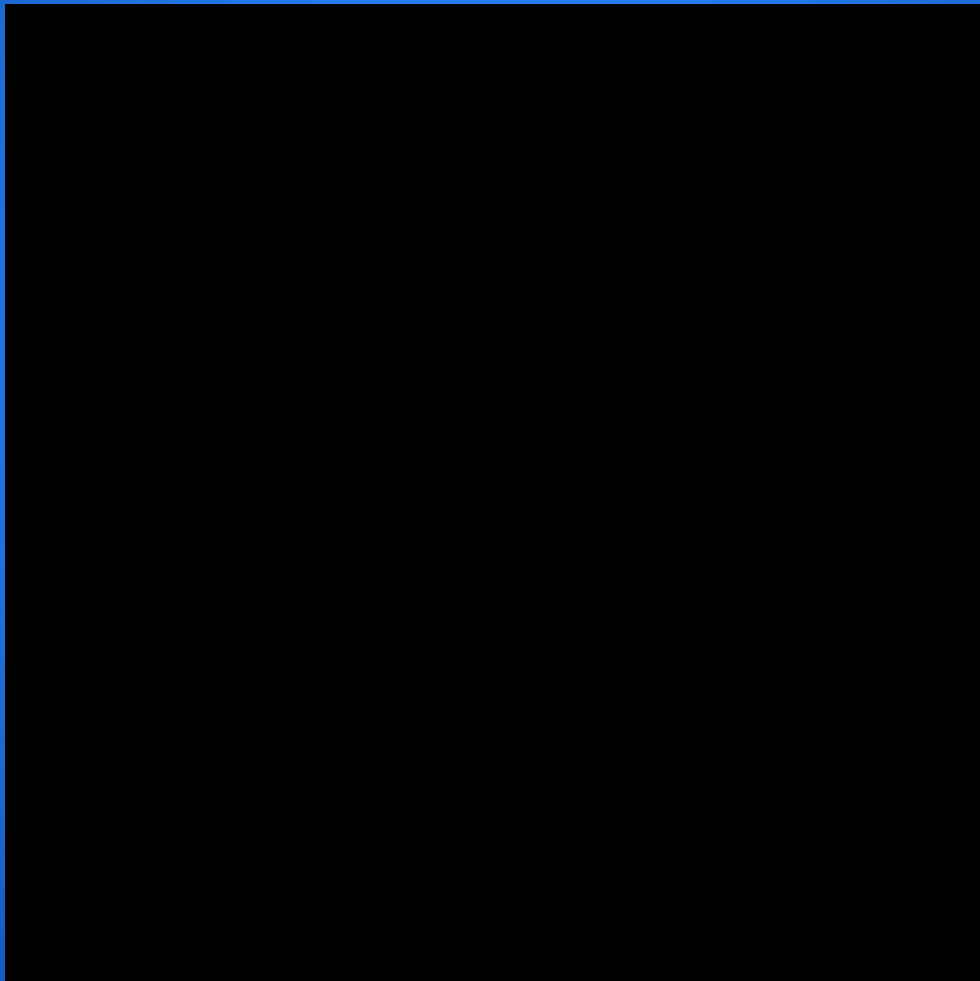












DOB: 14 Mar, 1981
Study: 17339
28 Aug, 2014 13:14:02.00
10-0 iDOSE, 45.0%

A

3 cm



FL

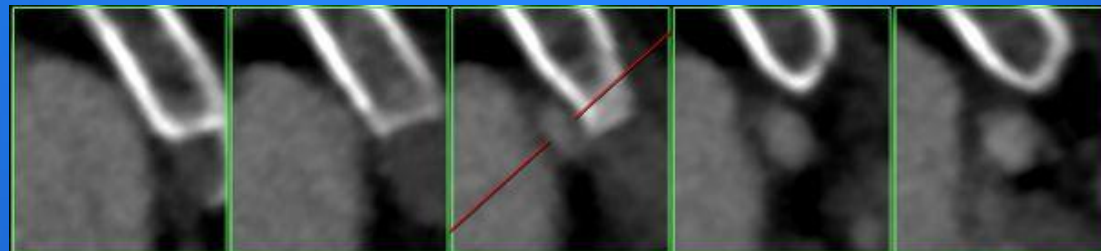
OLGU 2

SAIME ERDOGAN
DOB: 14 Mar, 1981
Study: 17339
28 Aug, 2014 13:26:30.36
10-0 iDOSE, 45.0%

Philips, iCT 256
PROTOKOL17
SW 1.00 mm



PHILIPS

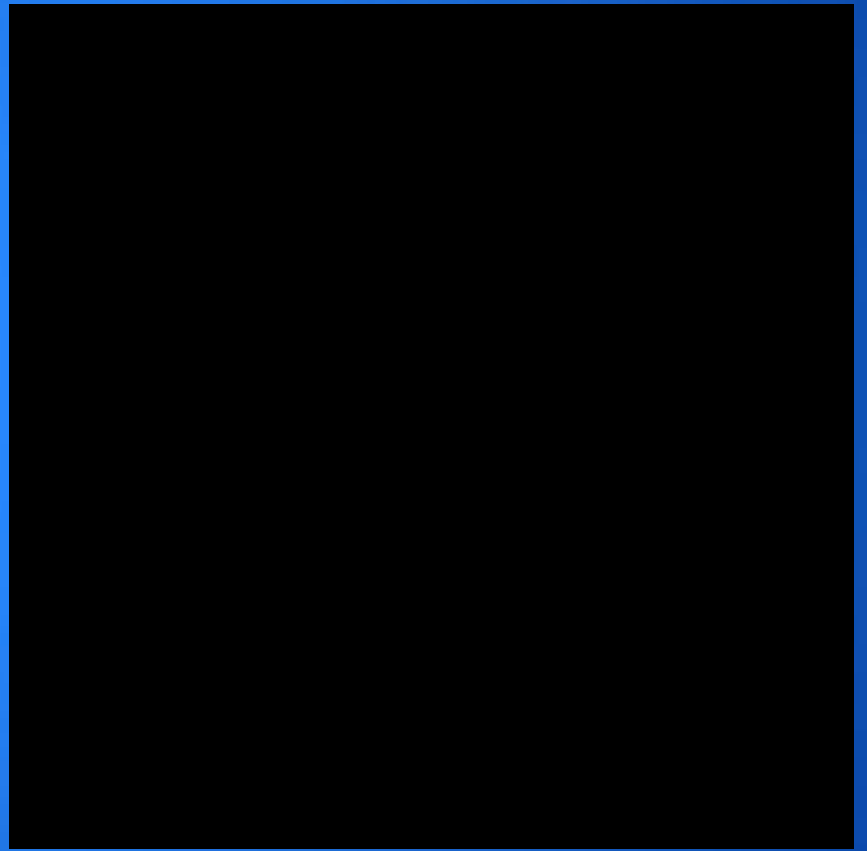


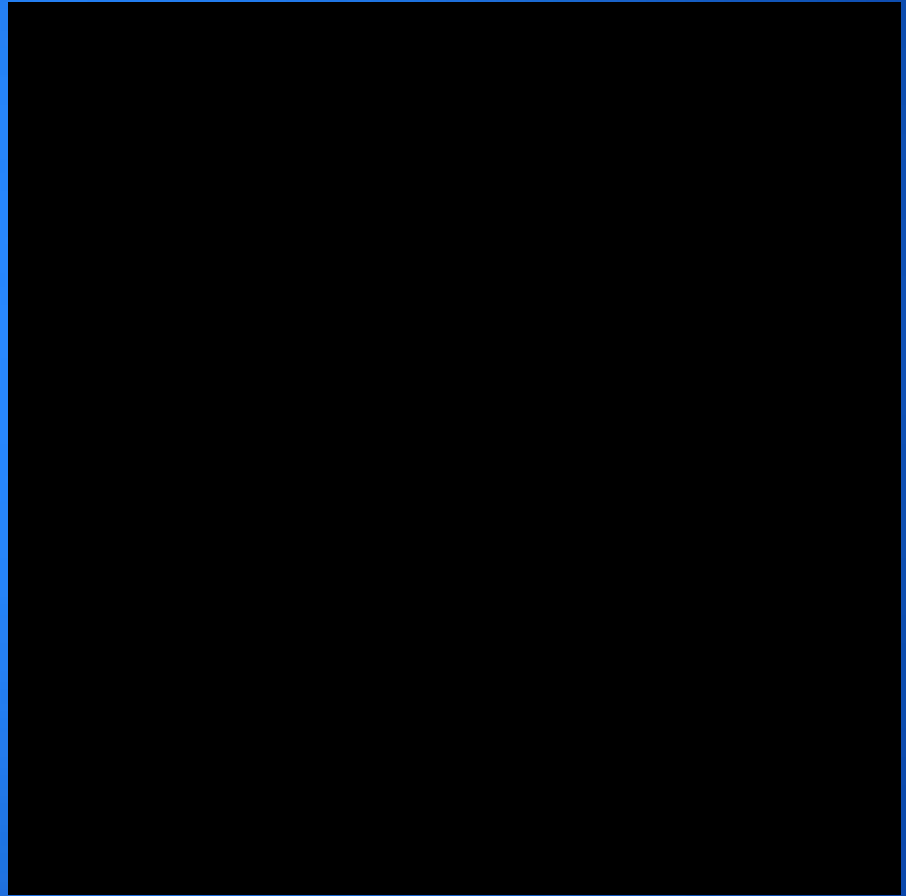
SW 0.55 mm

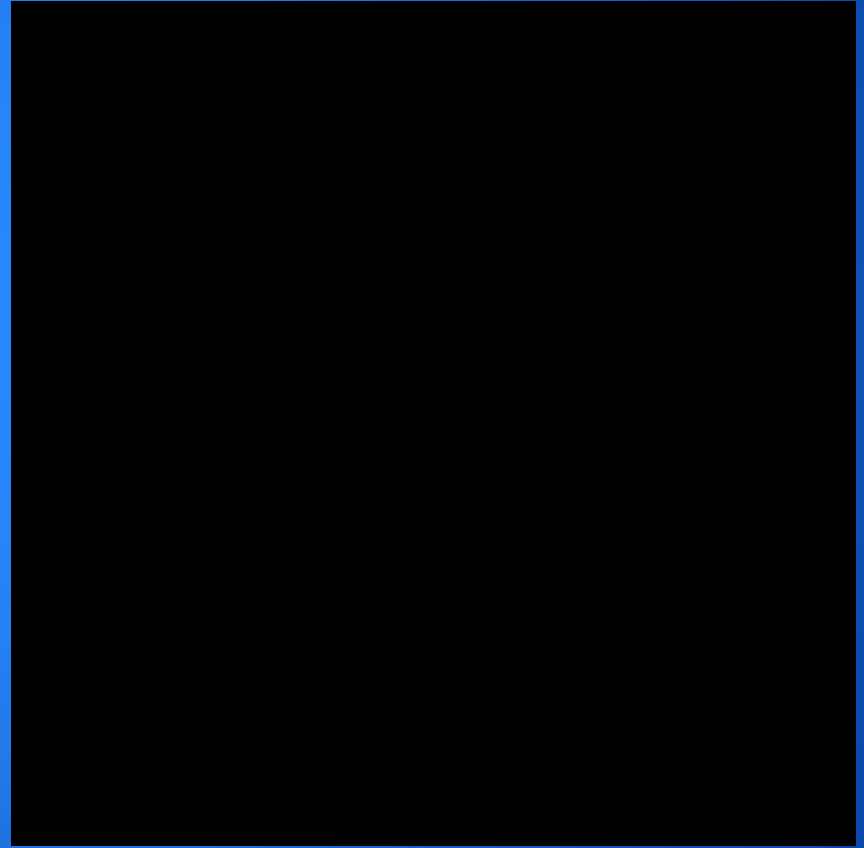


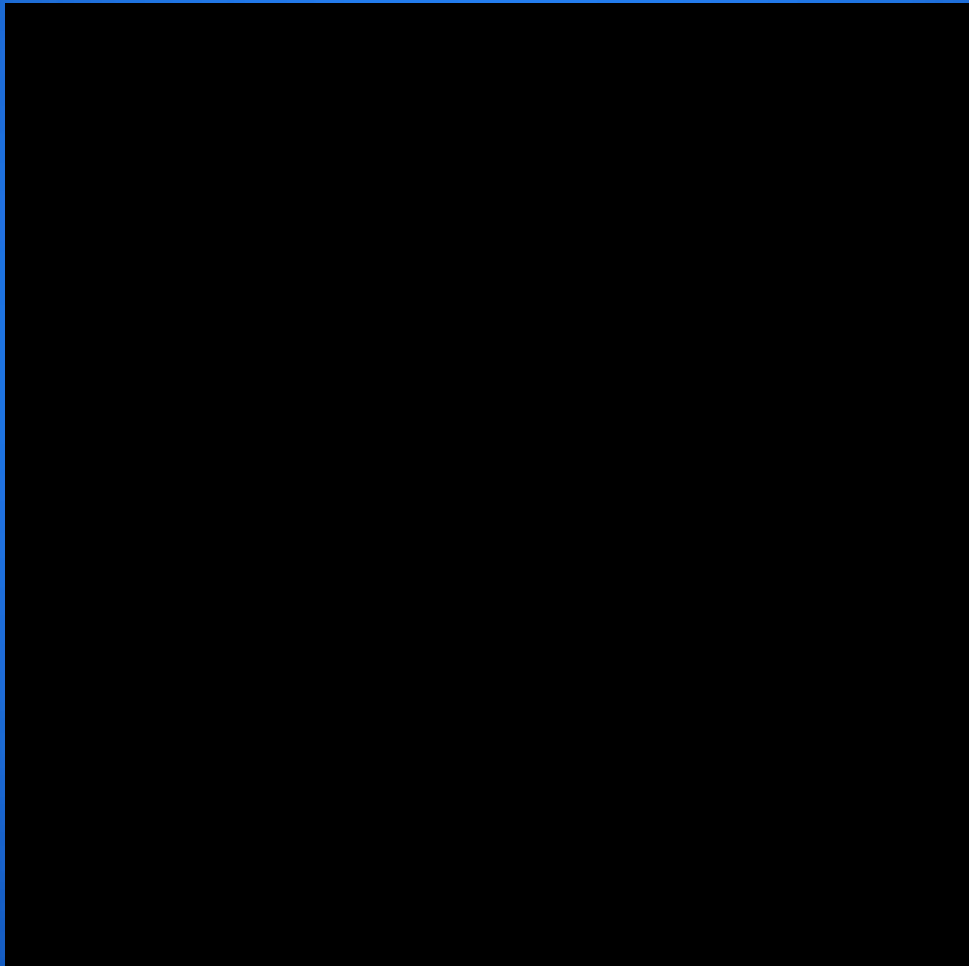
PHILIPS

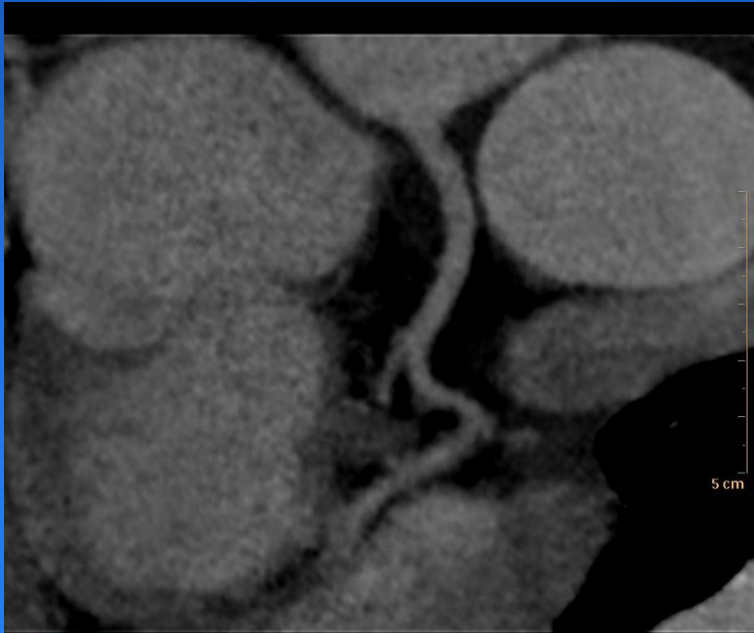
RCA





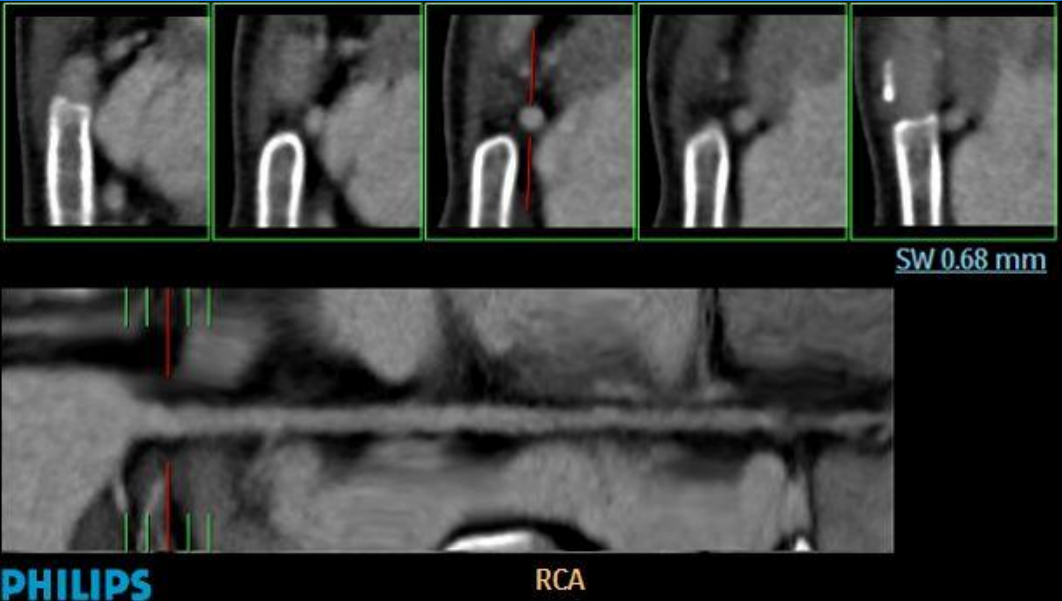






PHILIPS

LAD

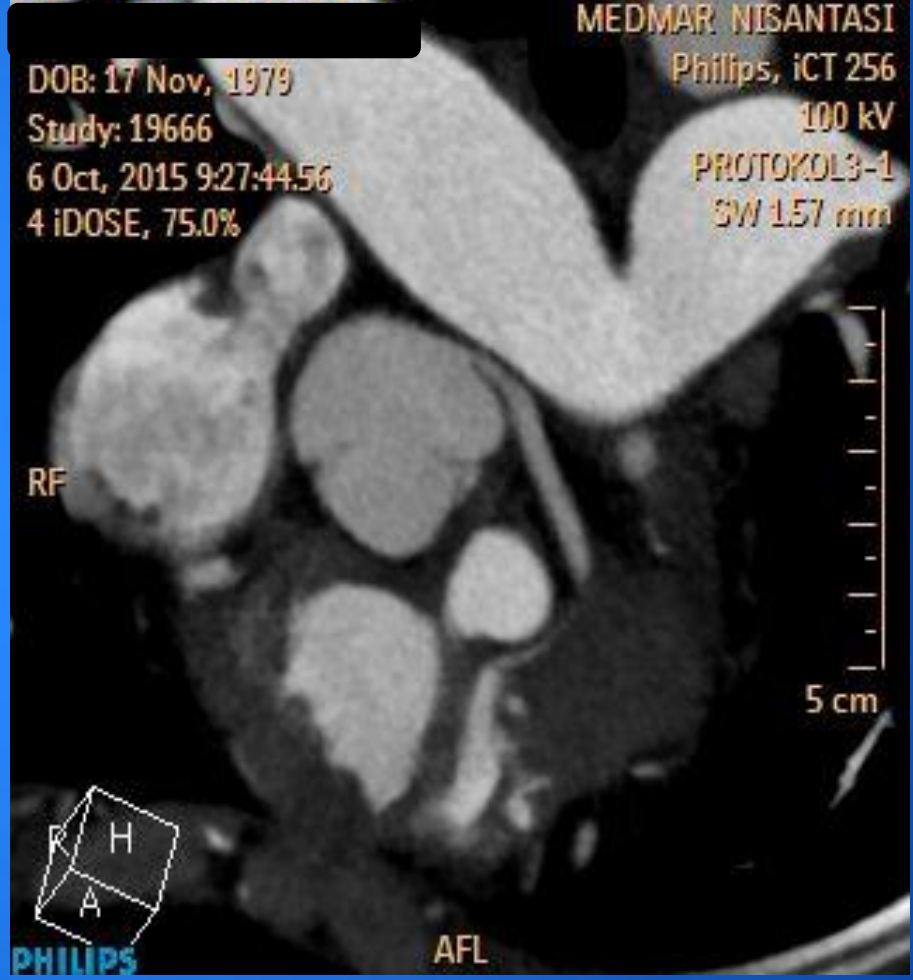
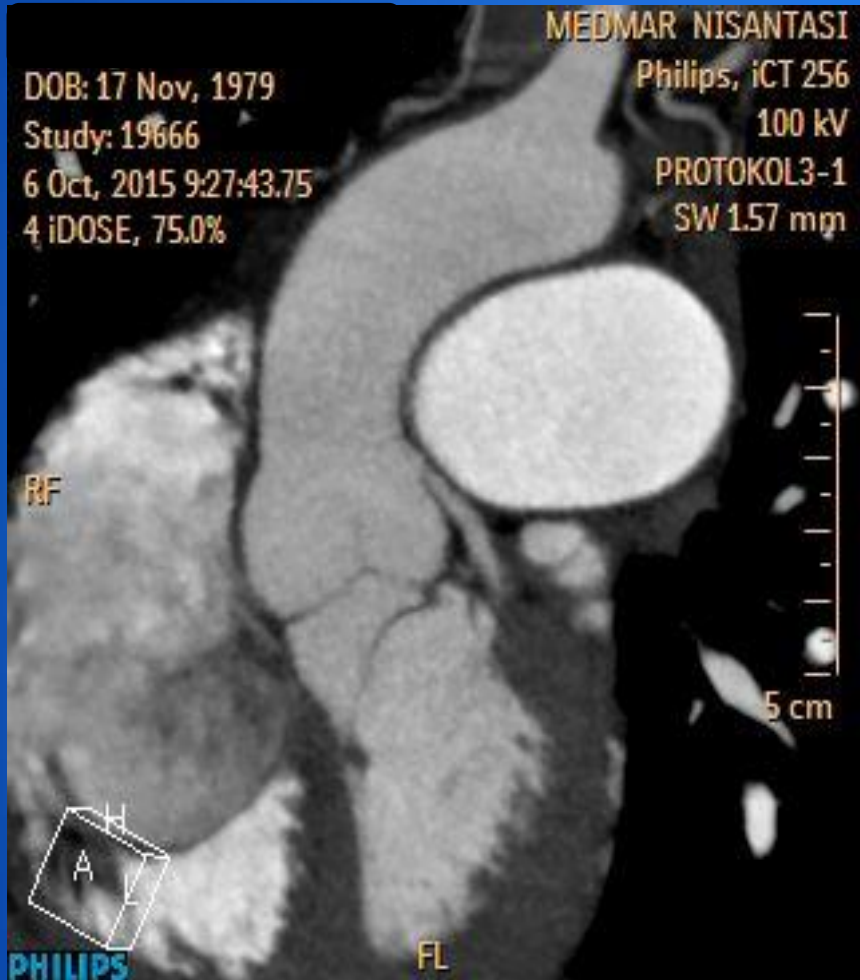


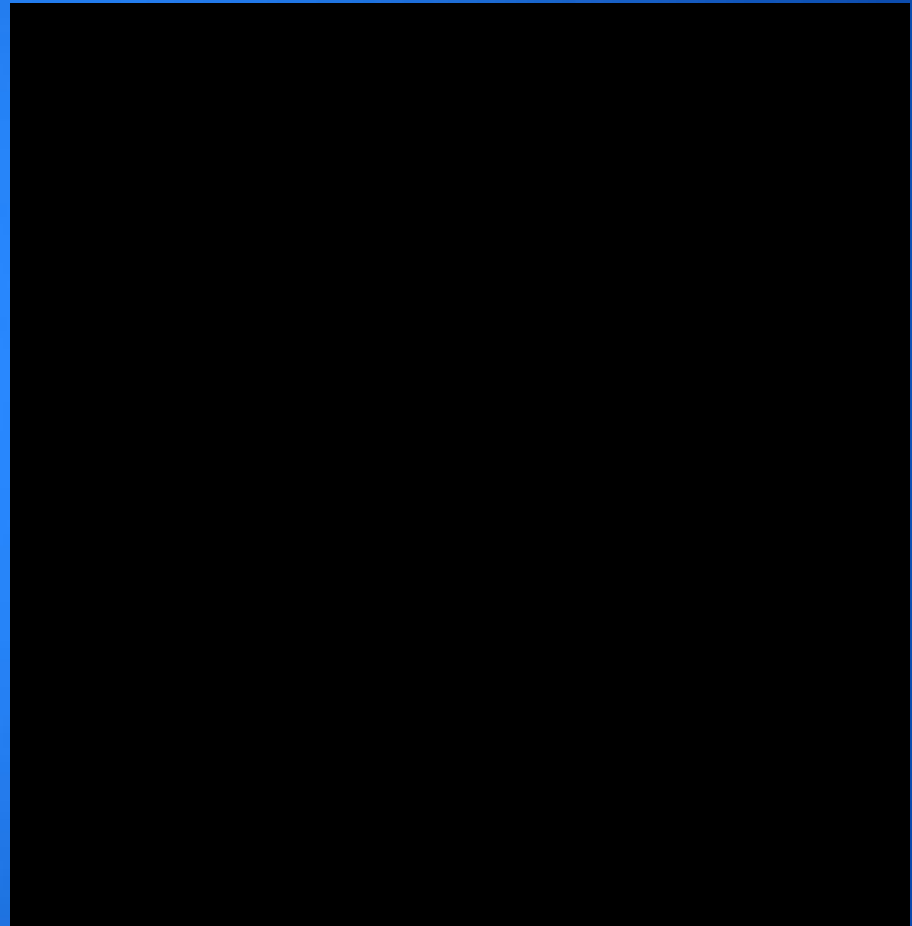
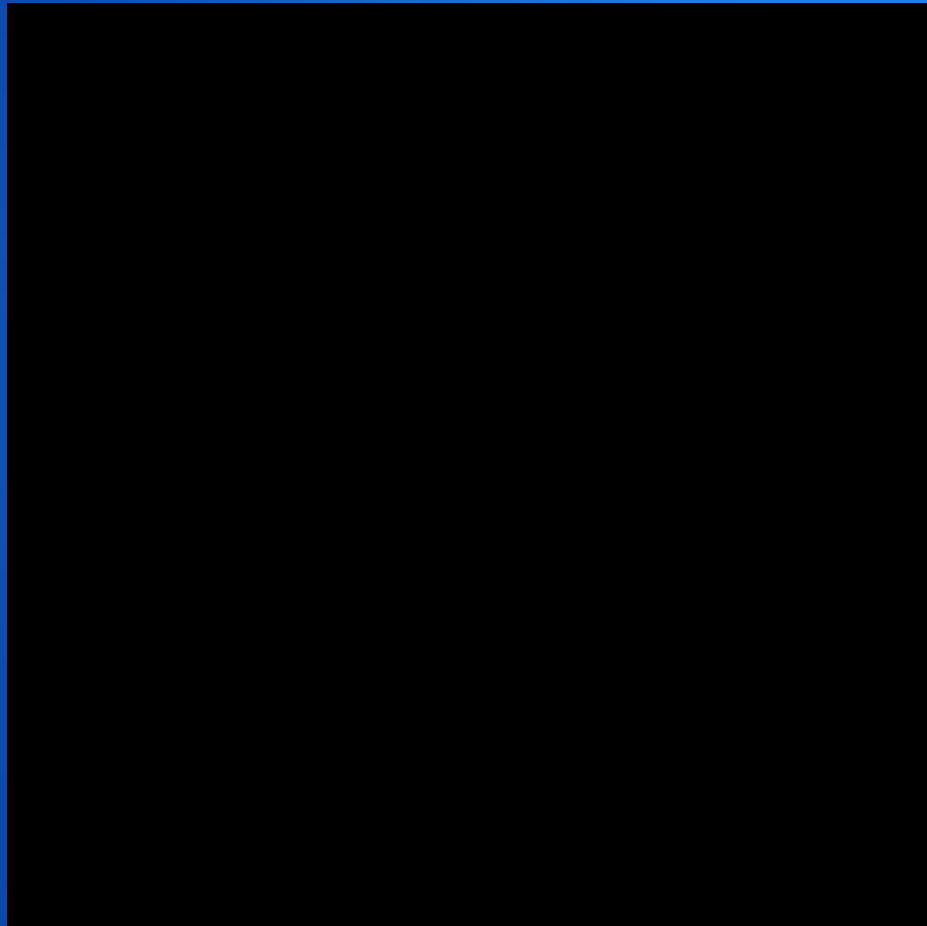
SW 0.68 mm

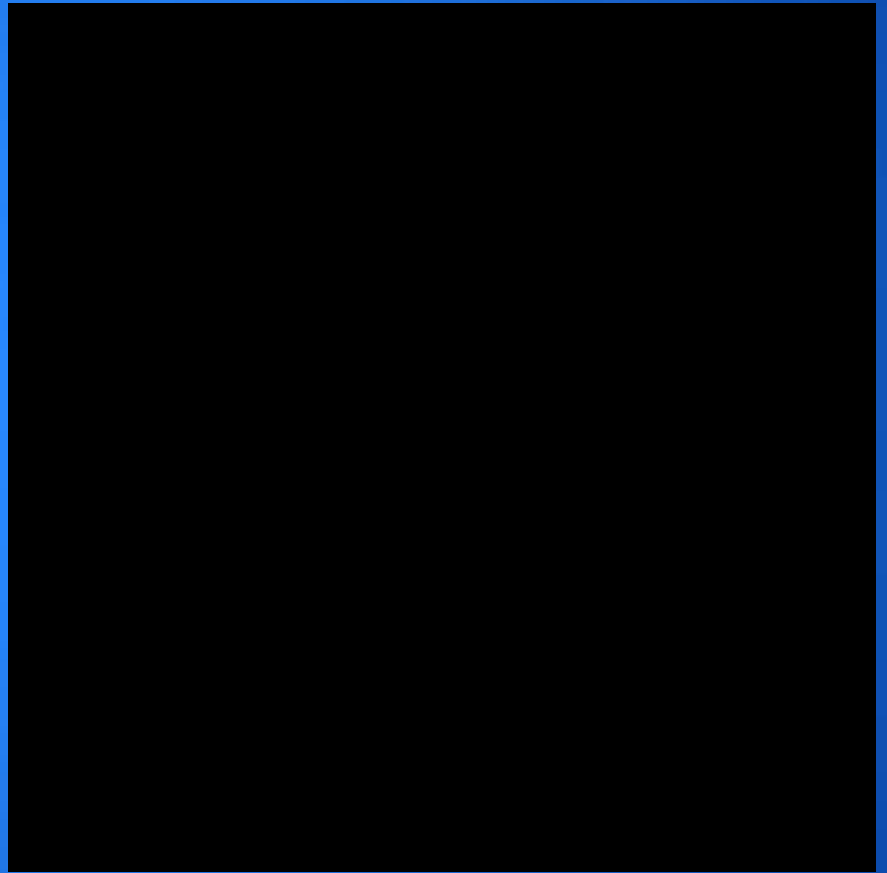
PHILIPS

RCA

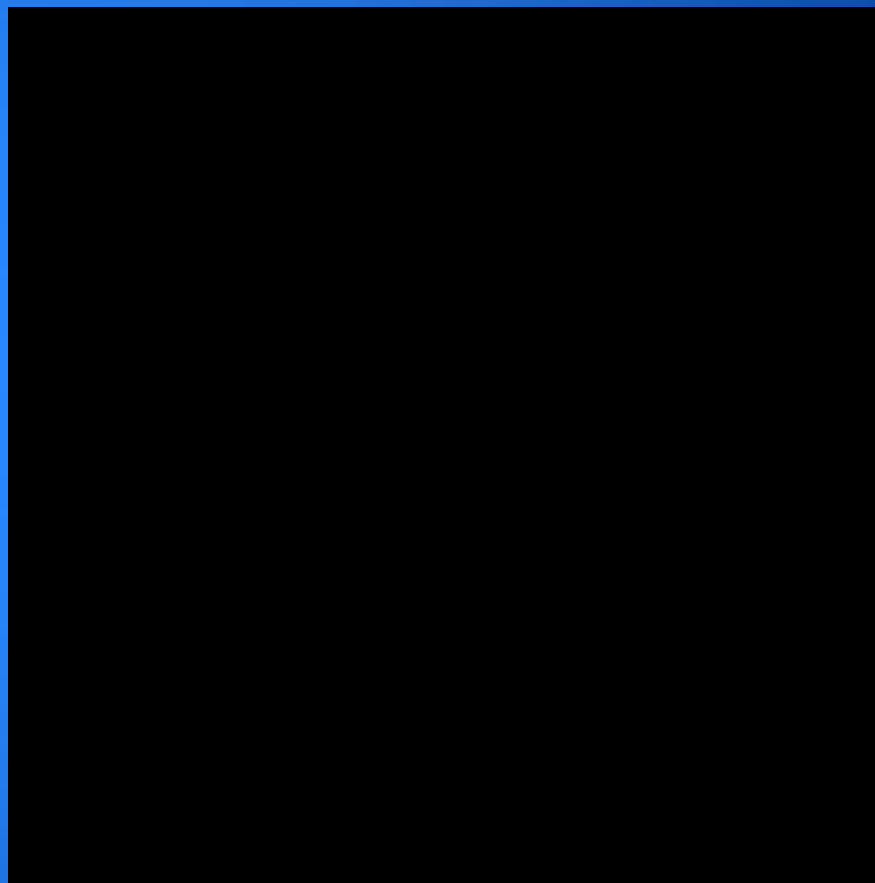
Olgu 3

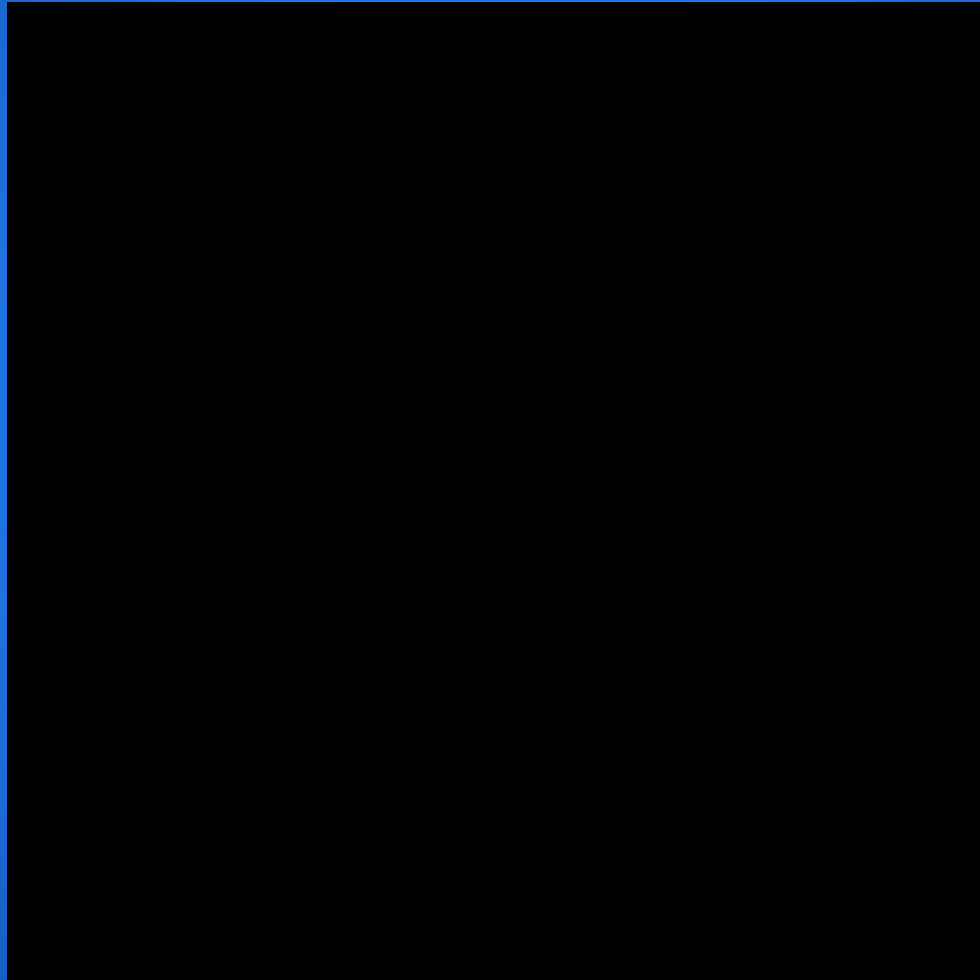




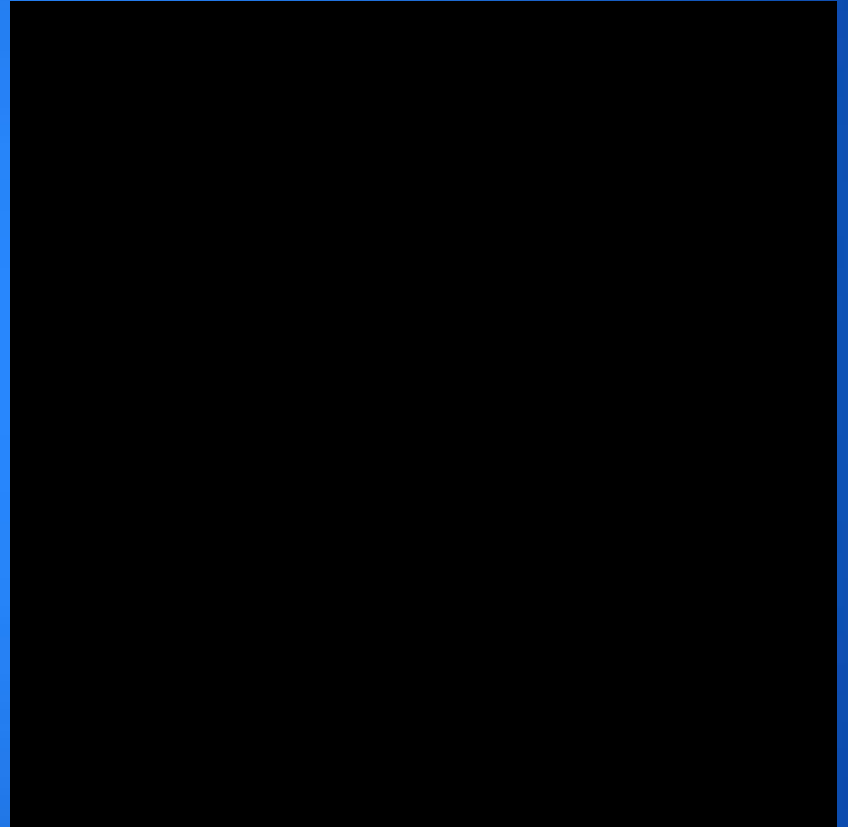
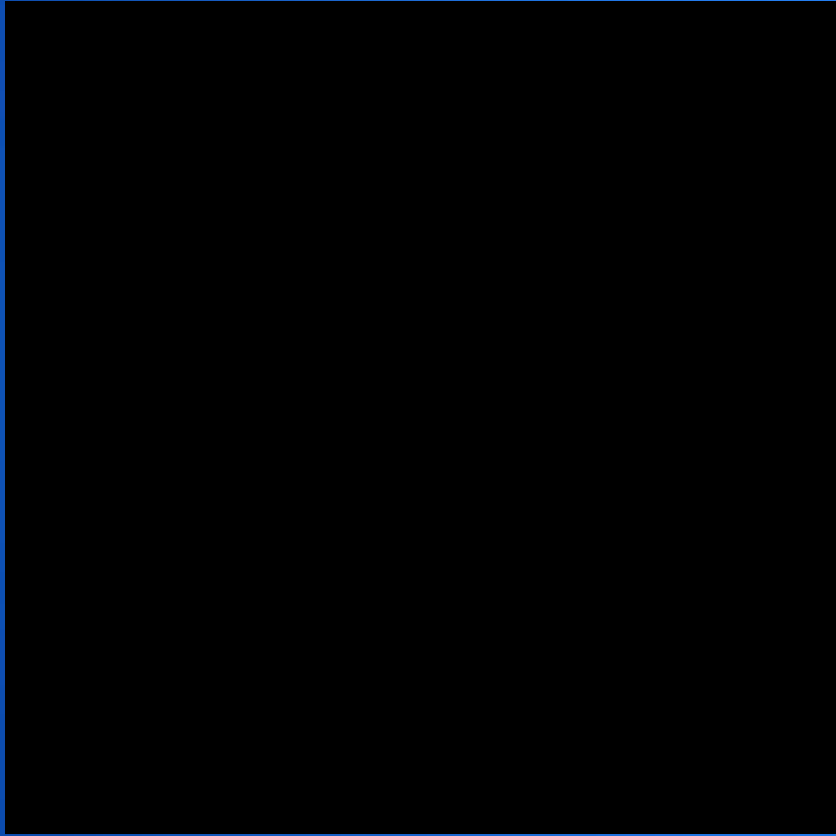


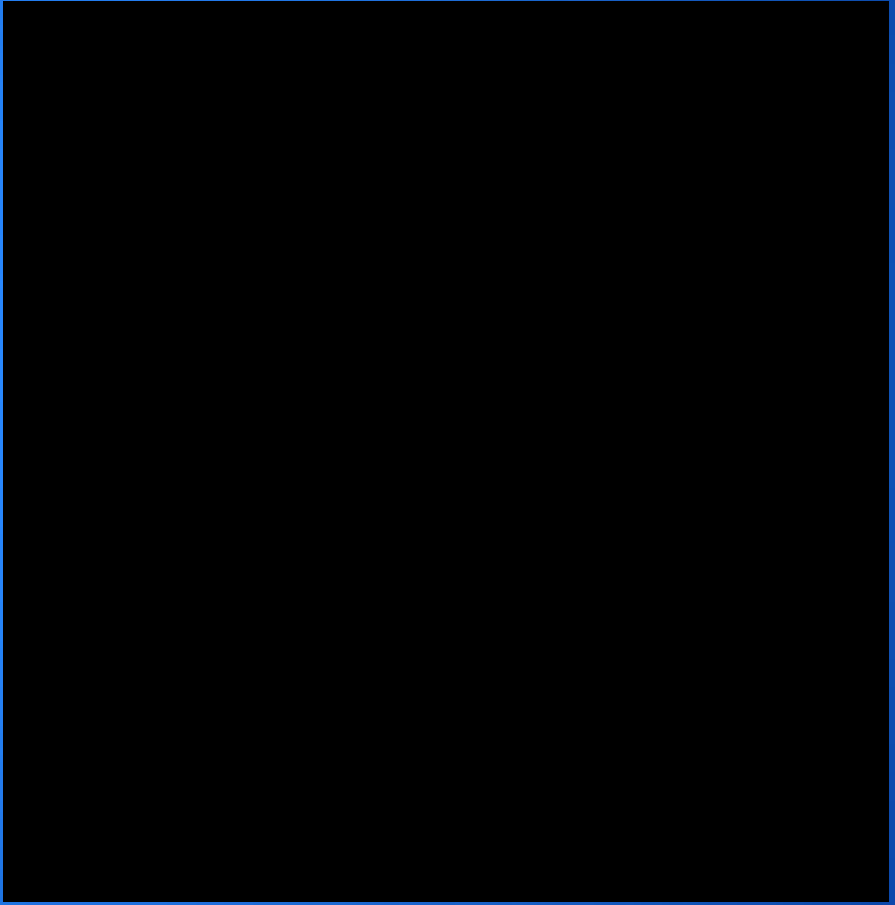
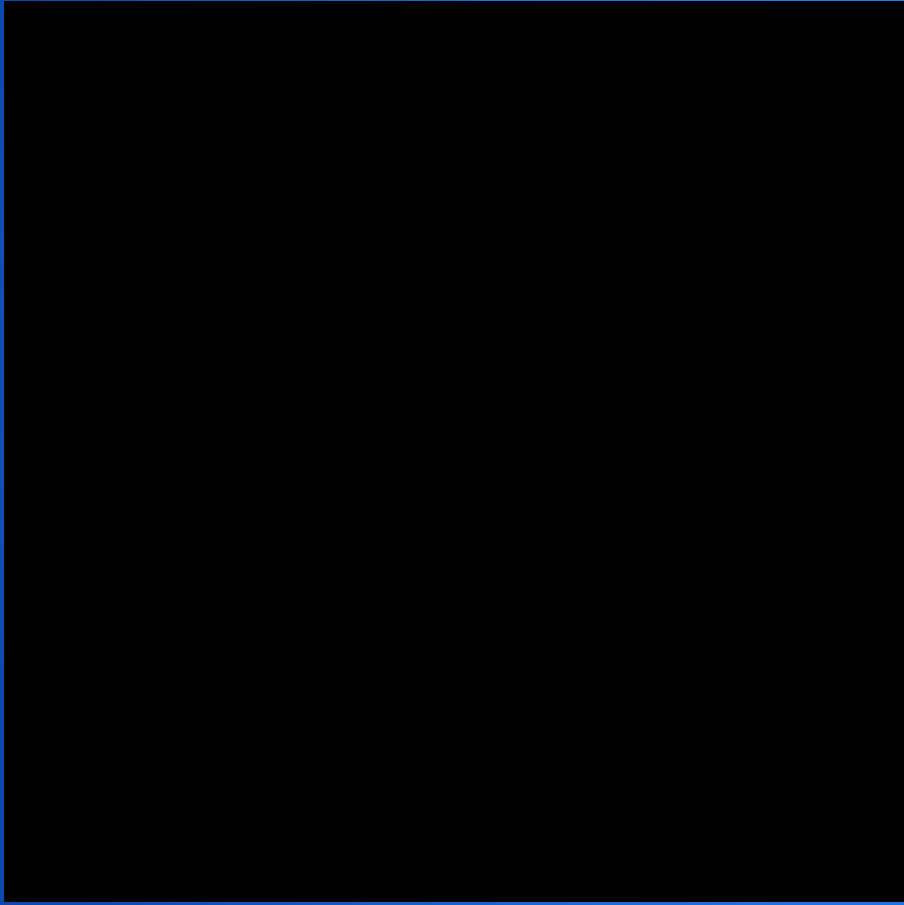


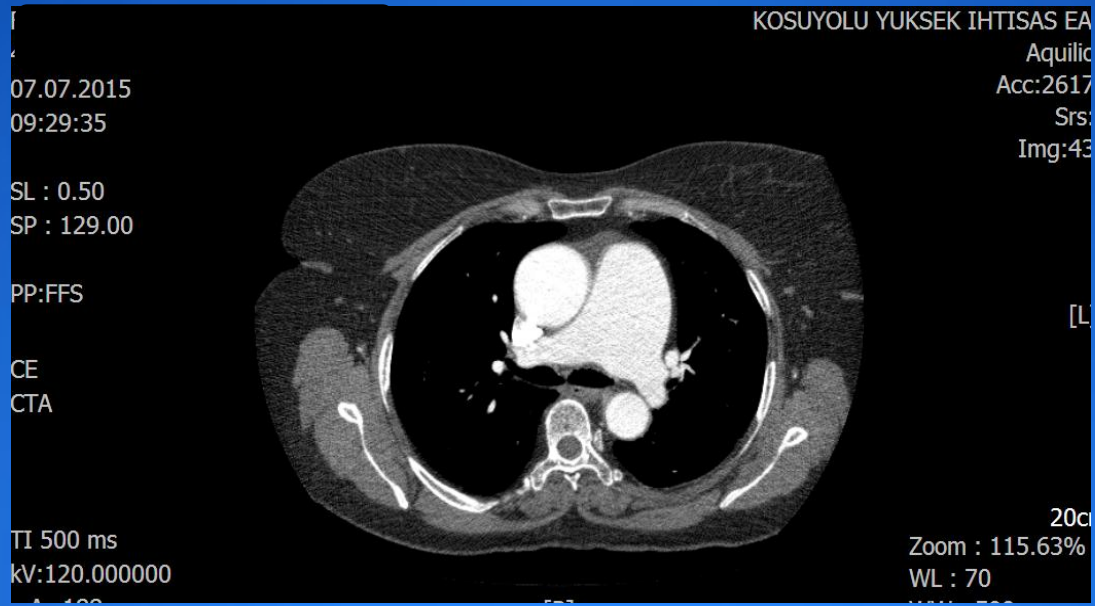


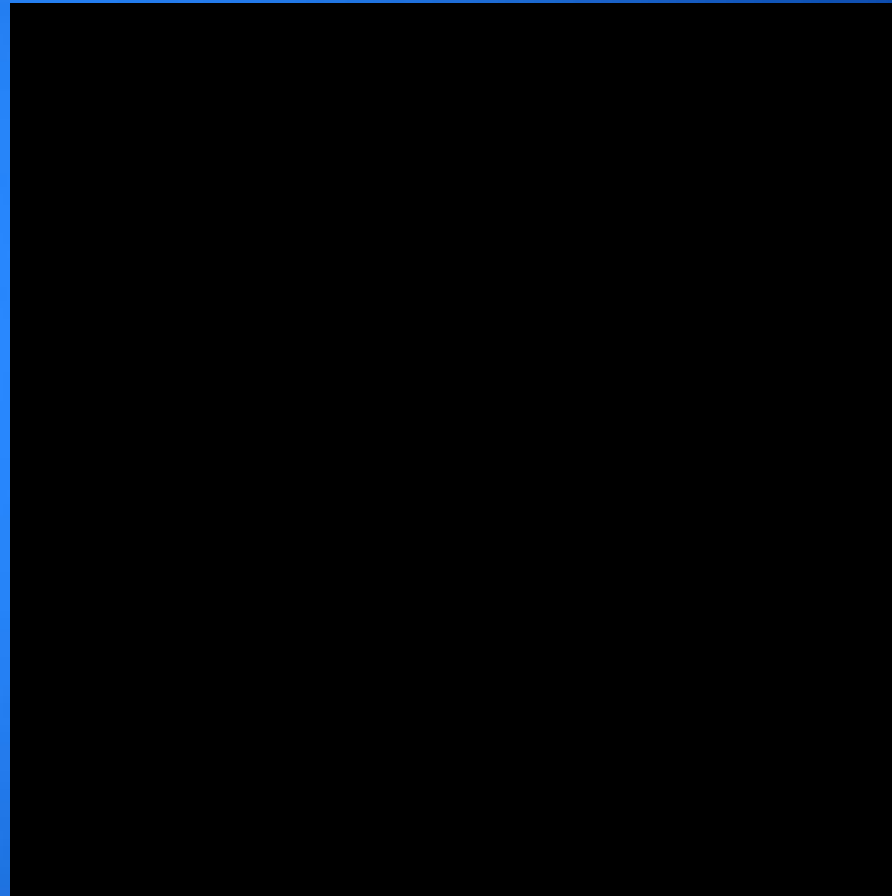
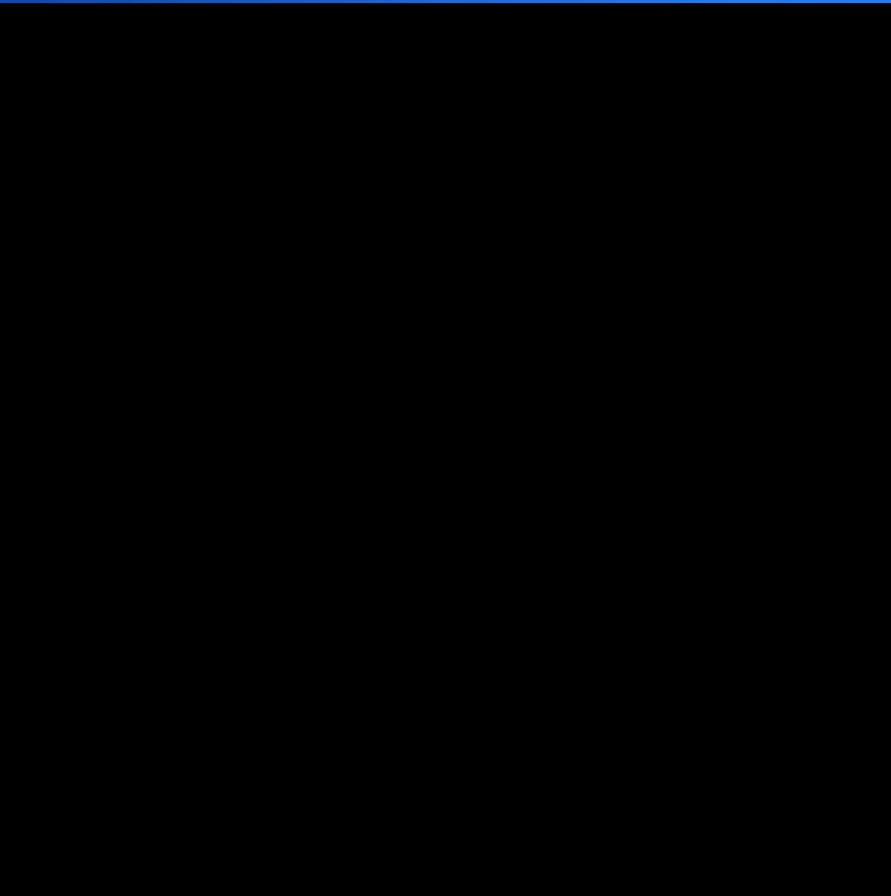


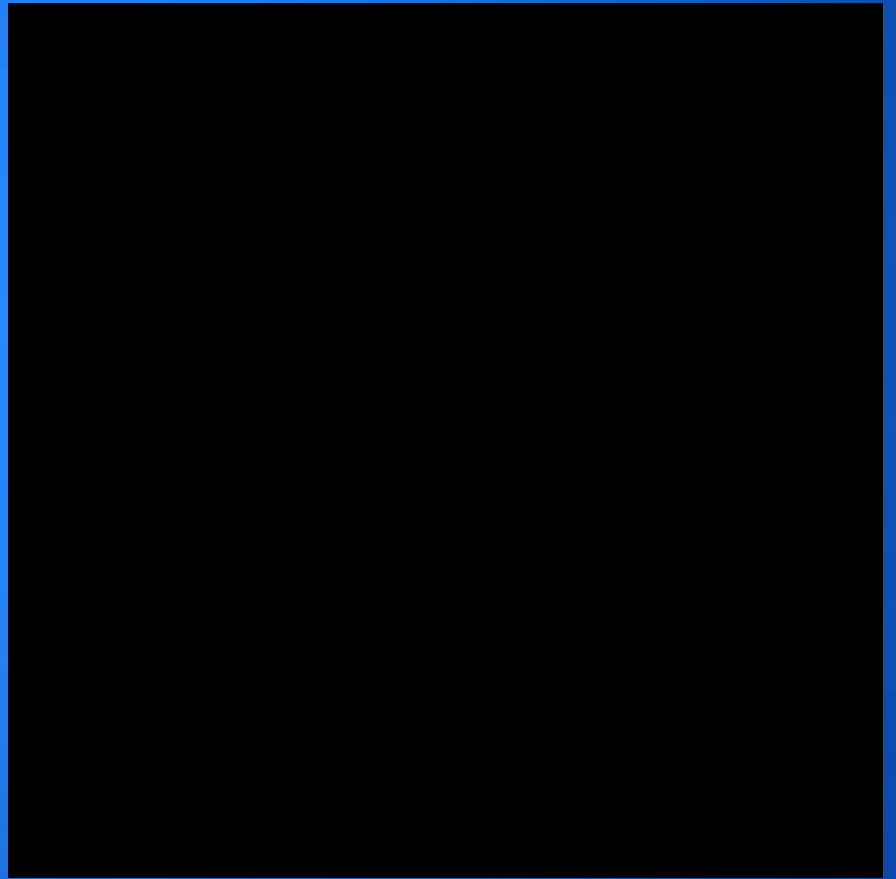
Olgu 4

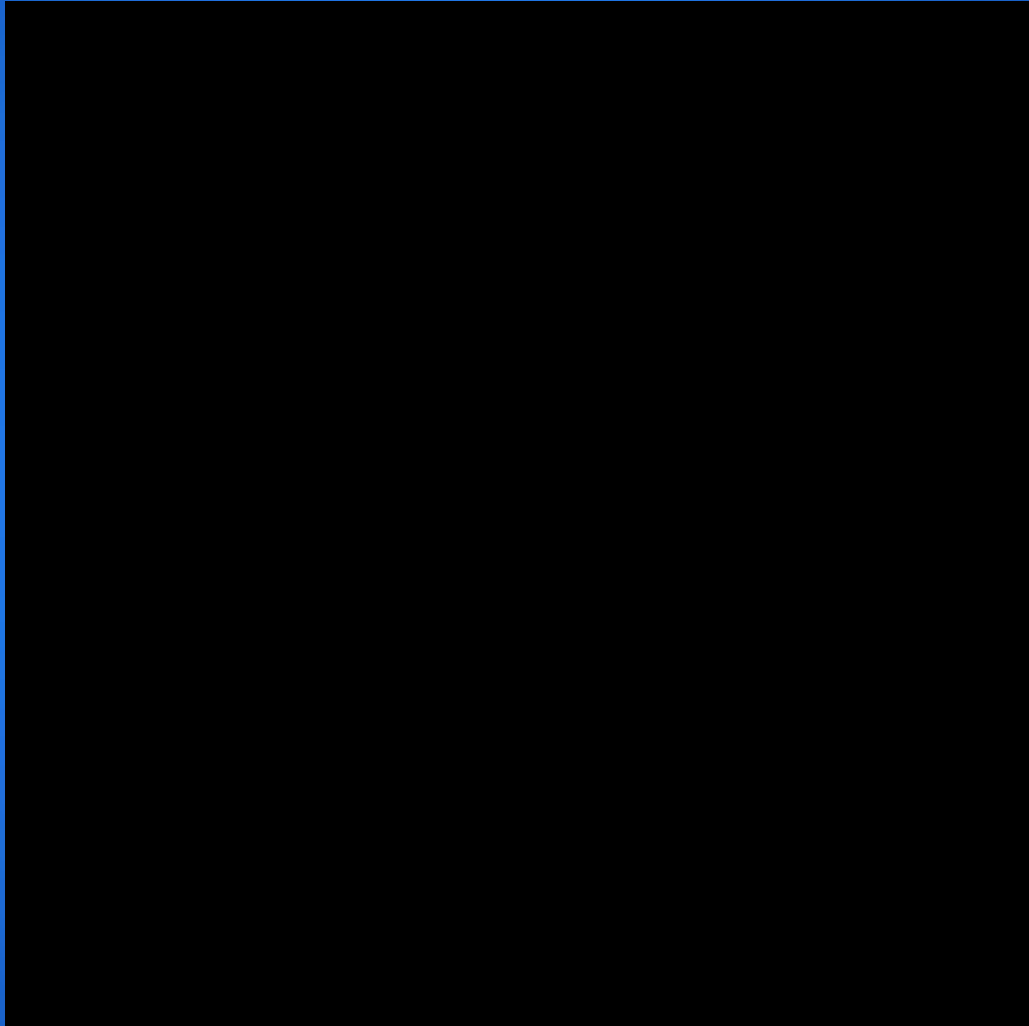




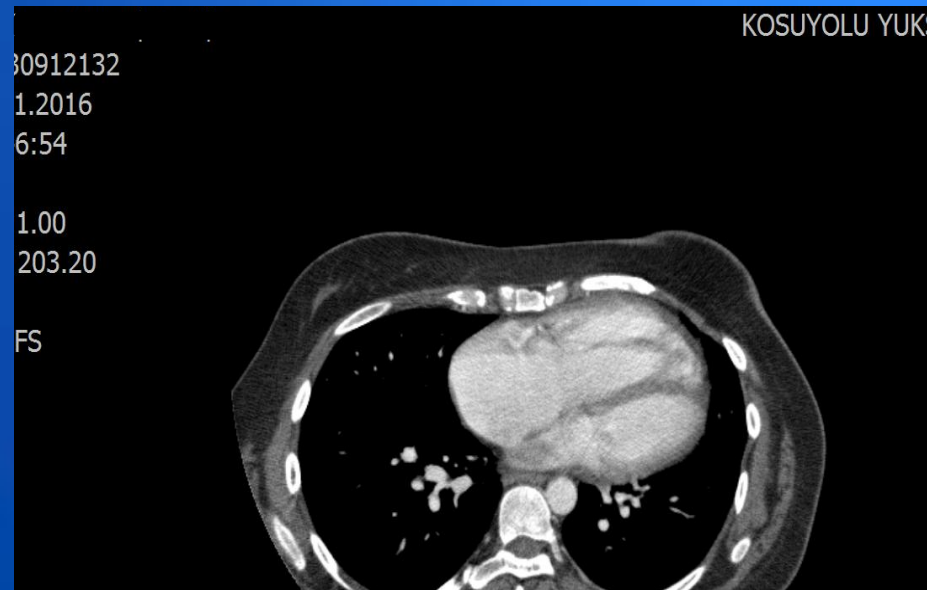
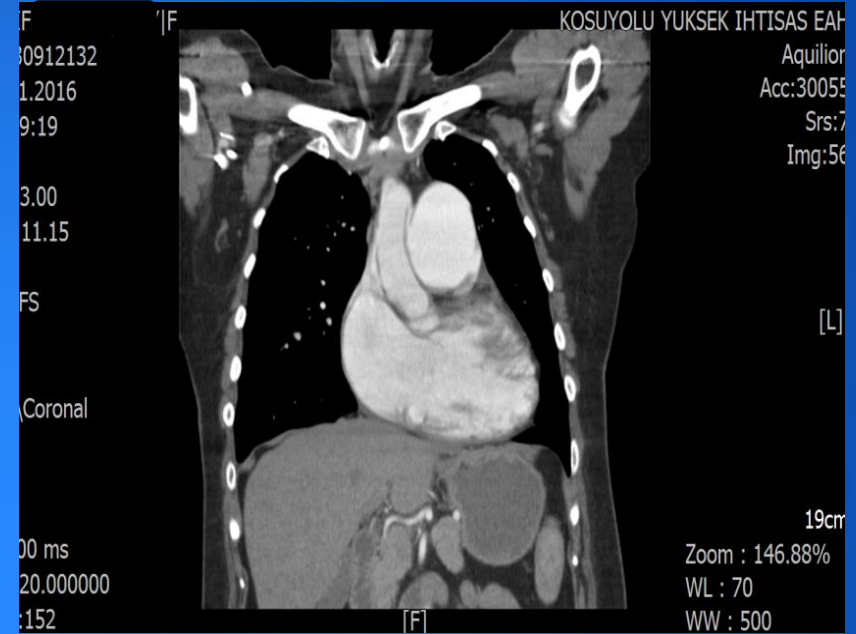
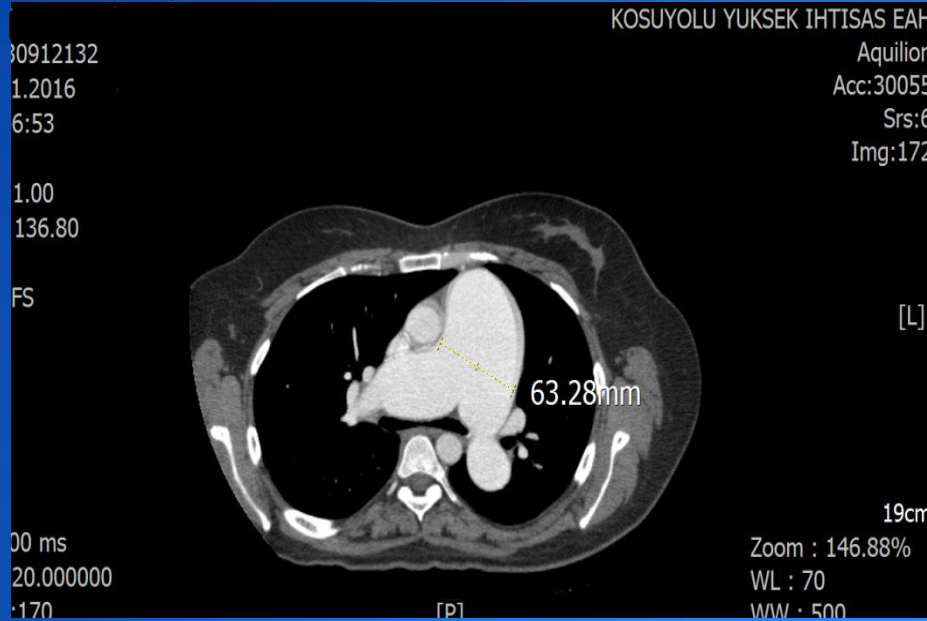


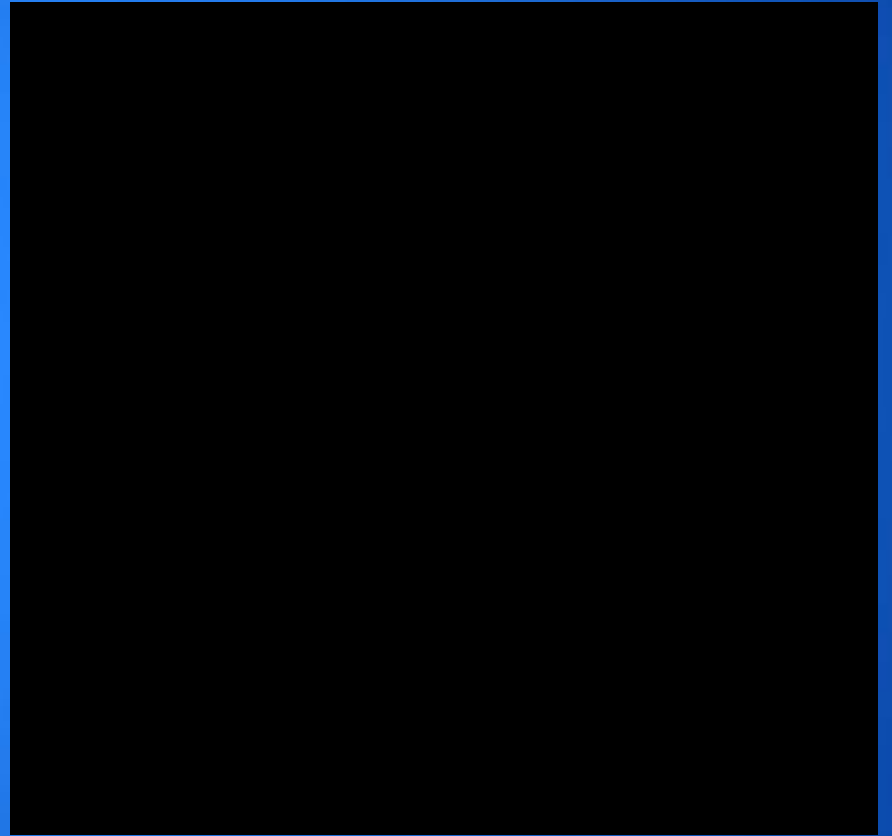
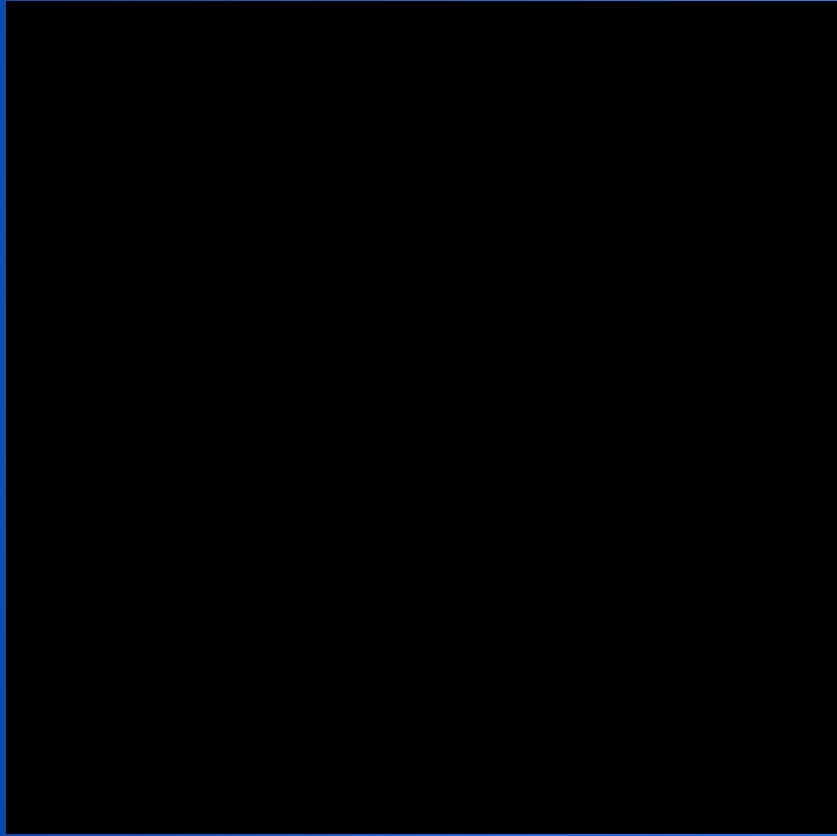


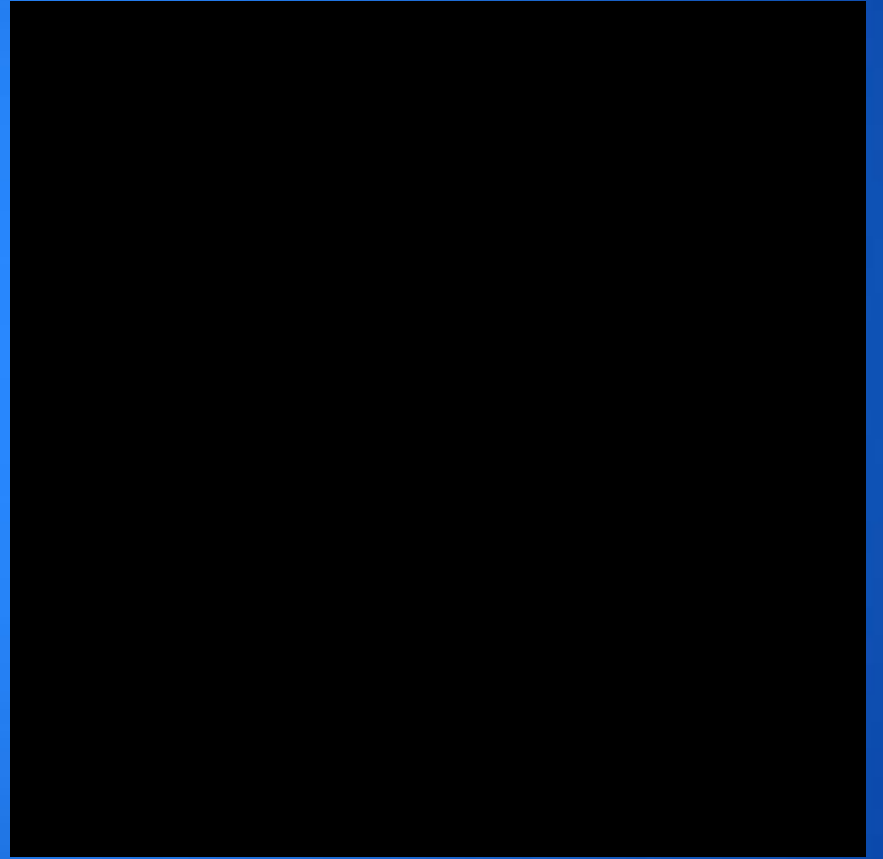
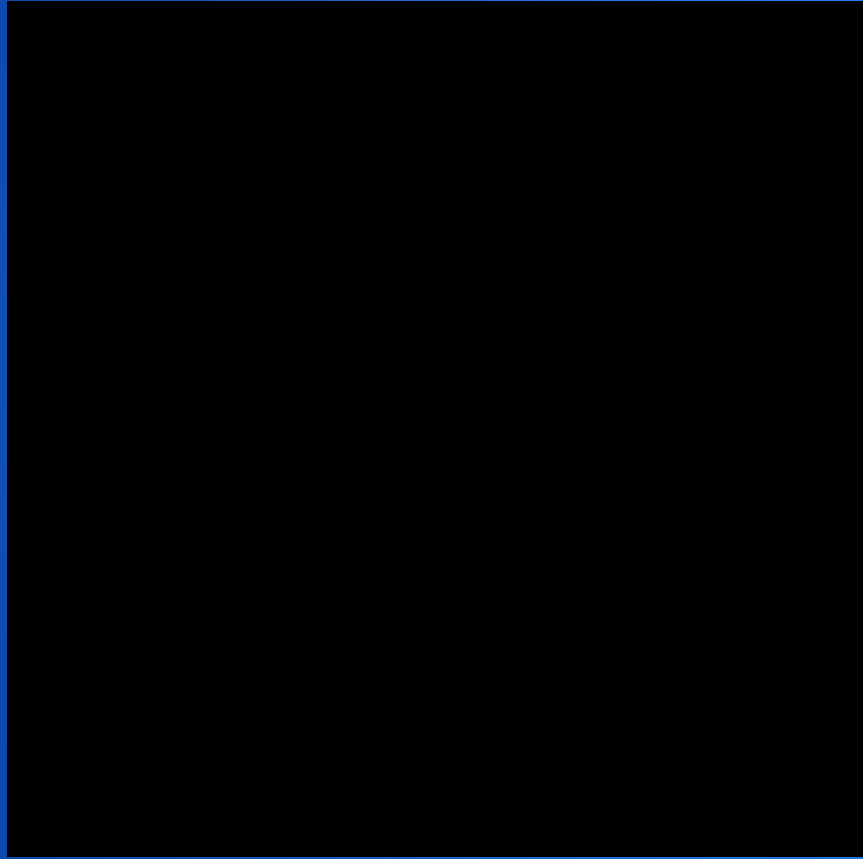


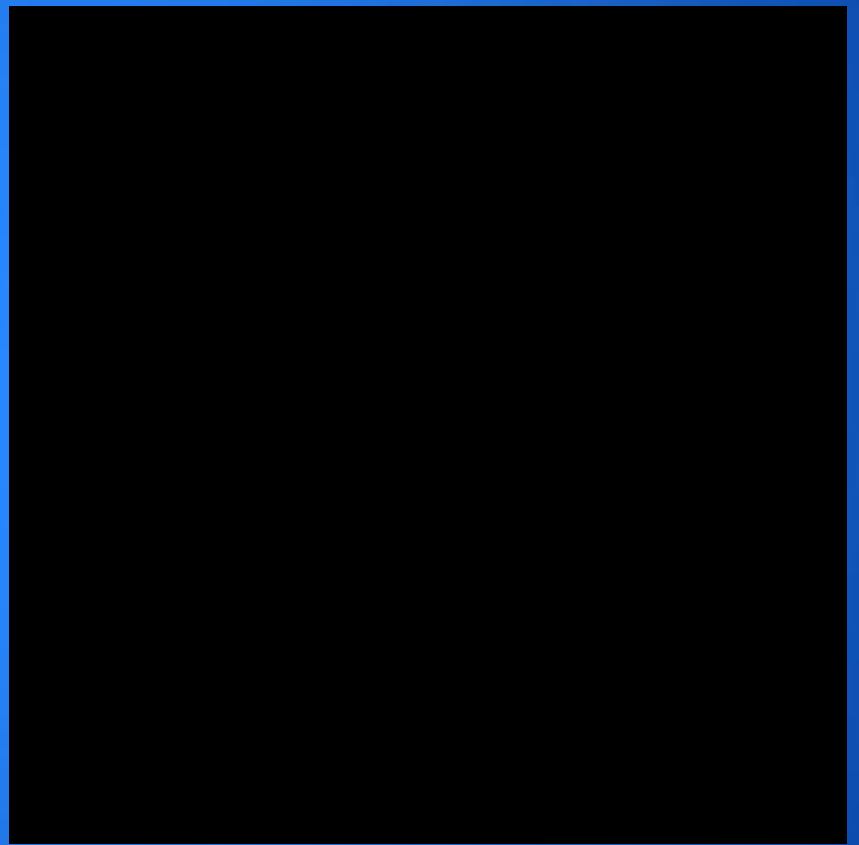


Olgu 5









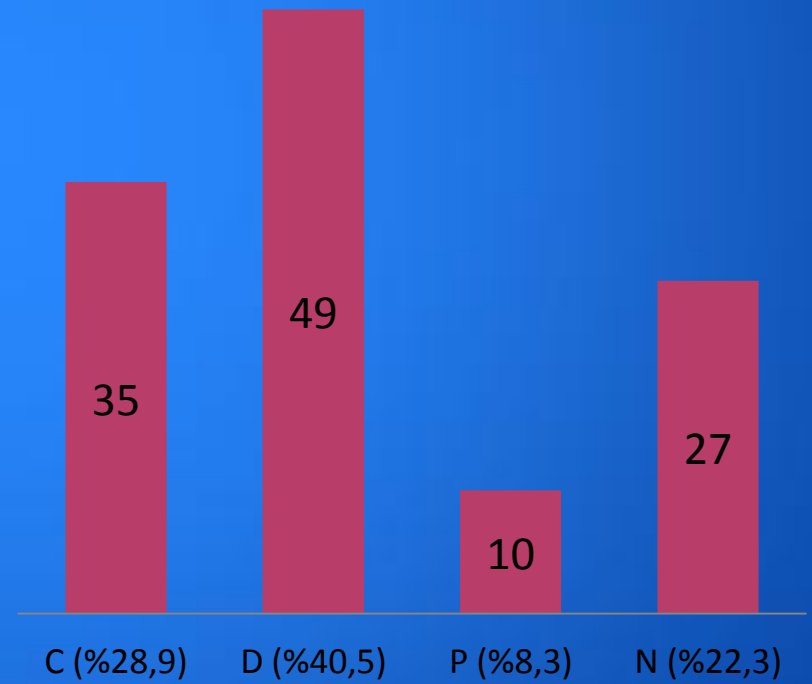
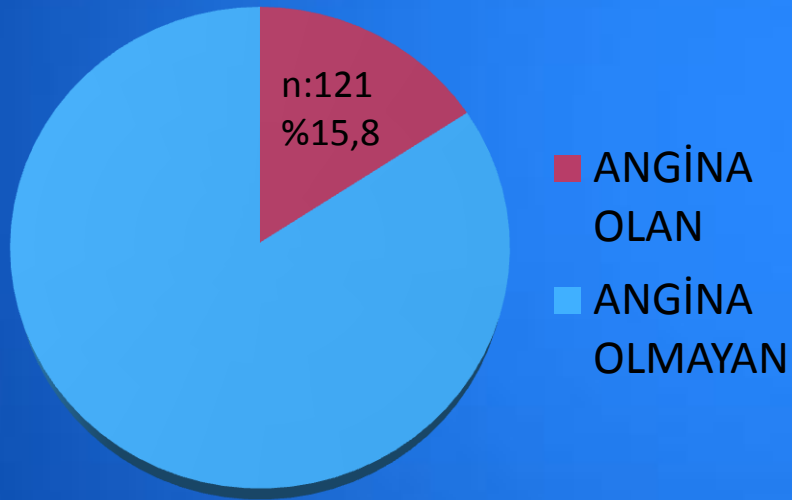
Sonuç

- Pulmoner arter anevrizması olan hastalarda ostial ana koroner basıları gözardı edilemeyecek bir komplikasyondur
- Ostial ana koroner basılarının tedavisinde halen kabul edilen görüş birliği yok
- PCI güvenilir ve etkili bir yöntem olarak görülmektedir
- Dual antiplatelet tedavi süresi ? kanama riski?

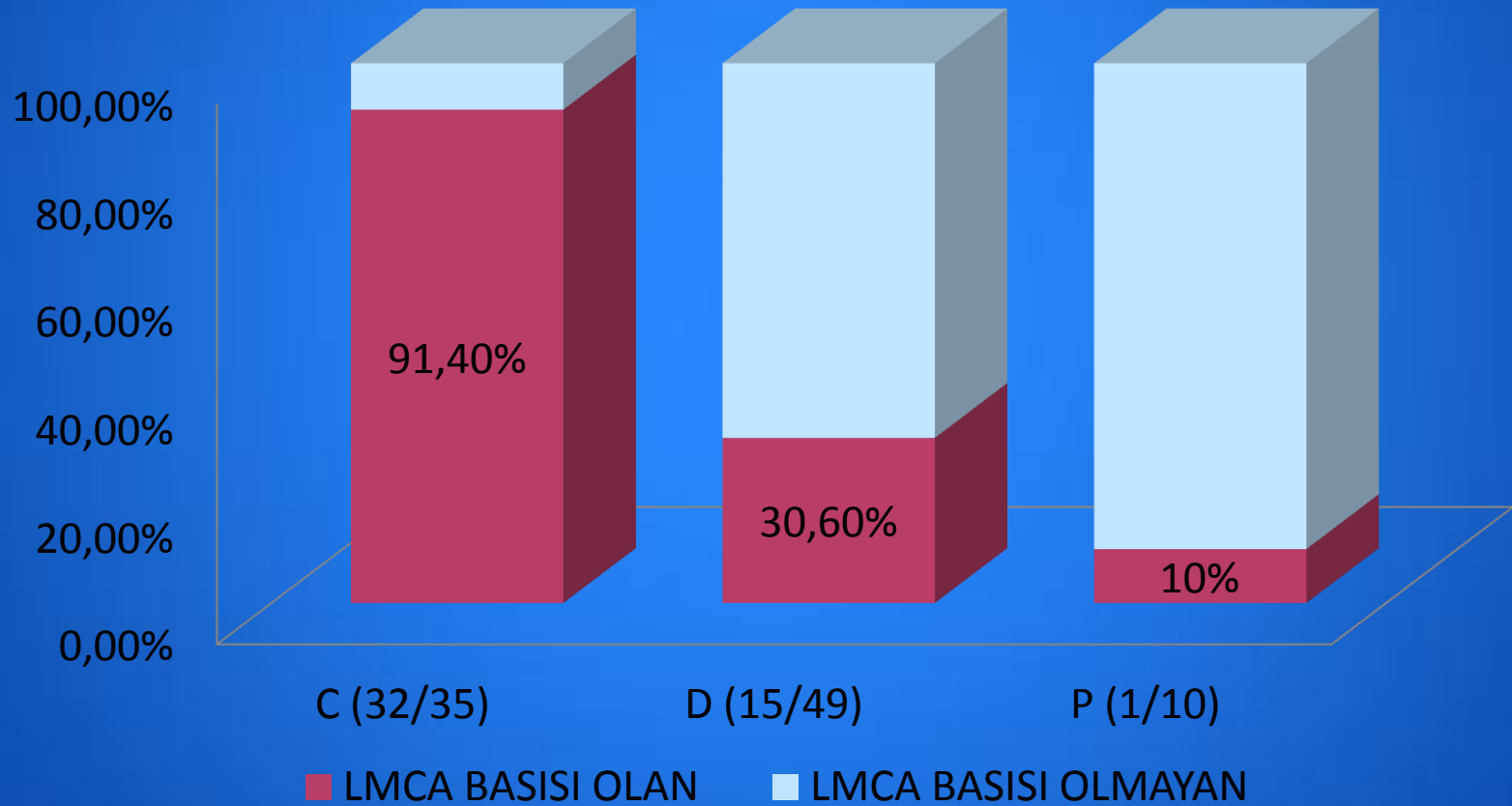
TEŞEKKÜRLER

TOPLAM: 765 HASTA

TOPLAM: 121 HASTA

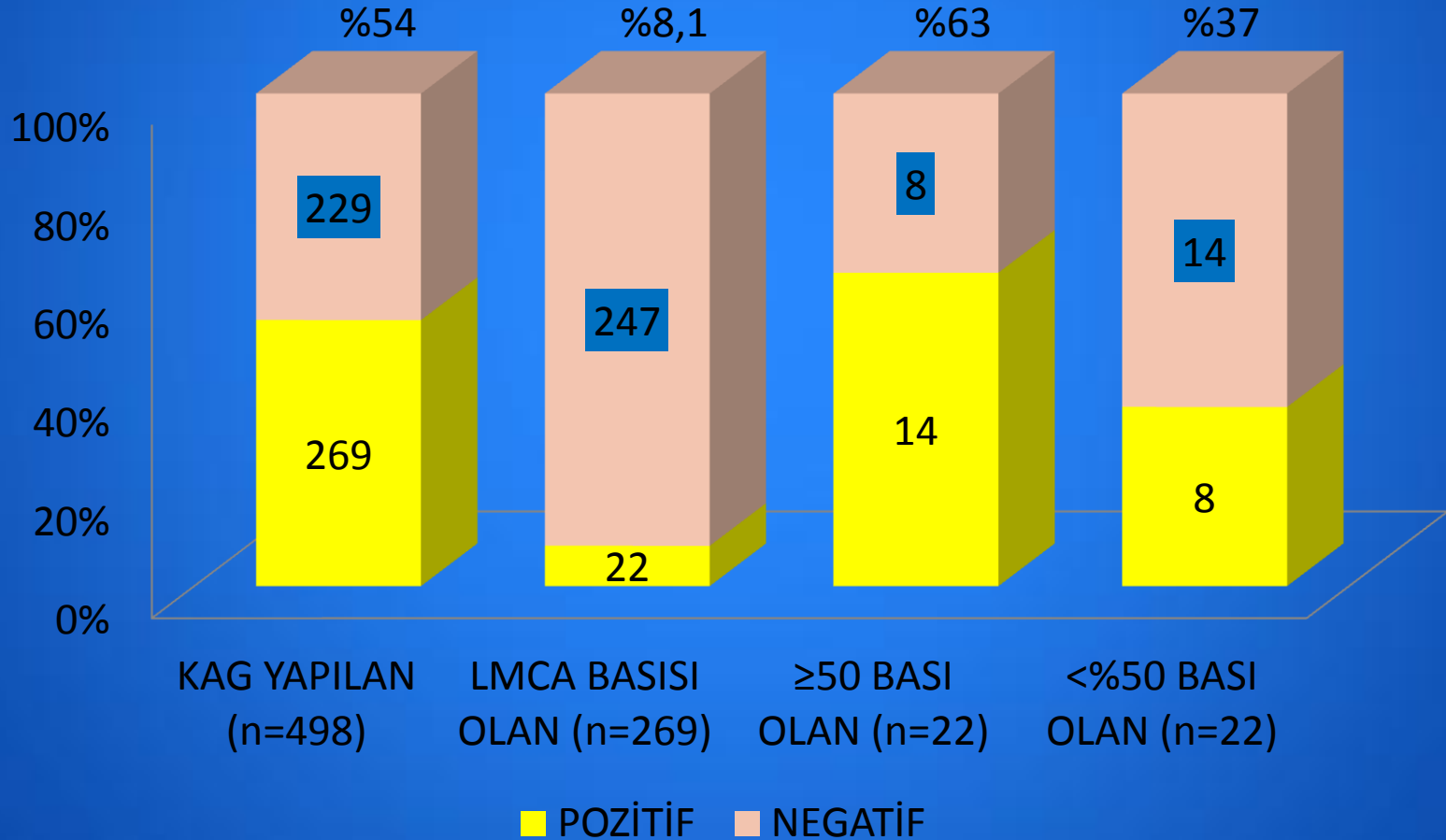


KAG' da LMCA basisi

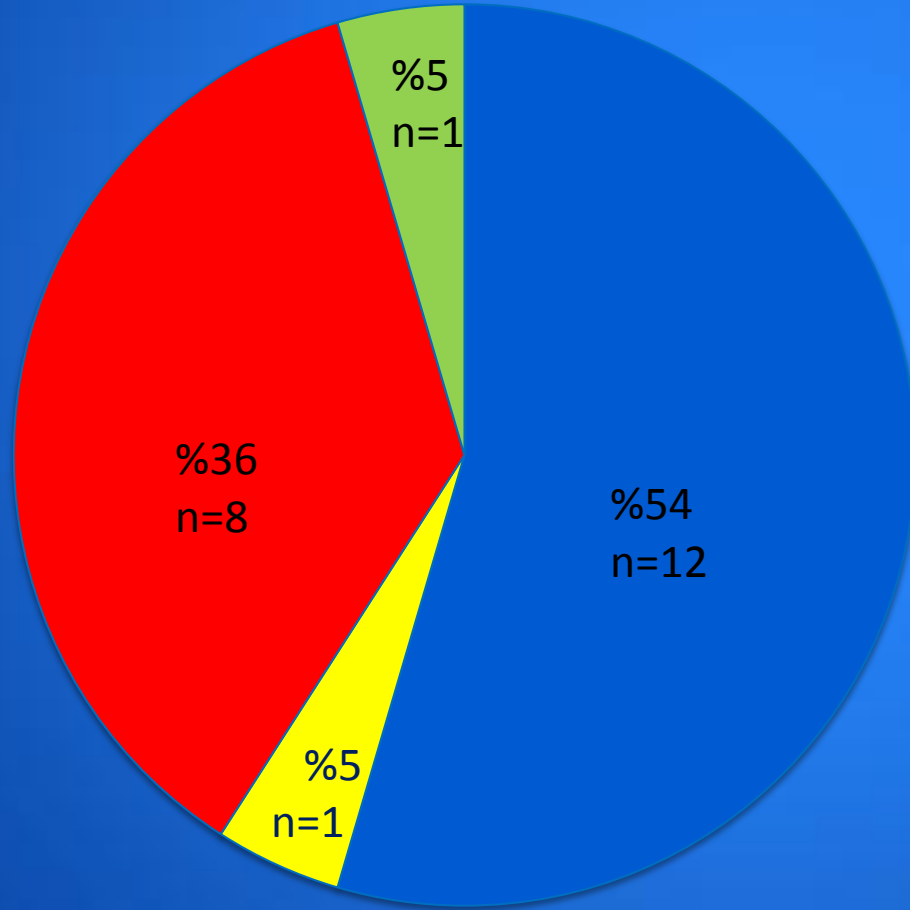


- Toplam hastaların % 6
- Anginası olan hastaların % 40
- LMCA basısı olan 48 hastanın 45' ne STENT,
- Ortalama 23 ay takip , mortalite yok
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- STENT efektif ve güvenli

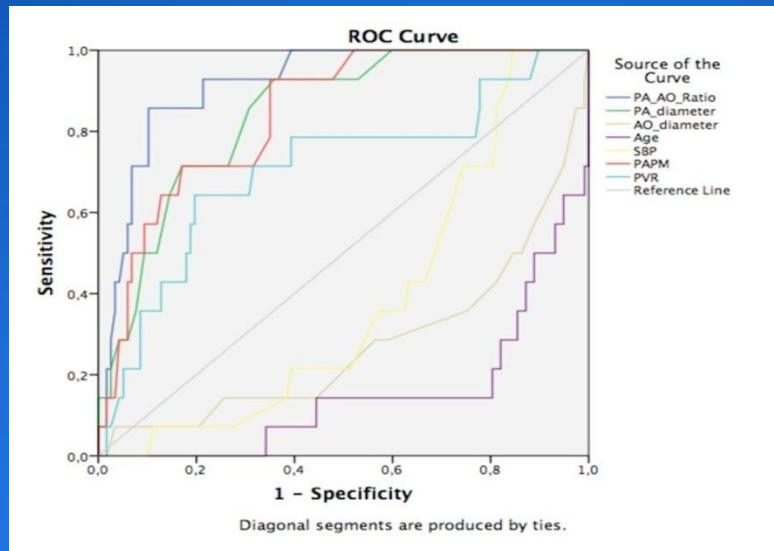
Koşuyolu hasta serimiz



Tedavi



- STENT İMPLANTE EDİLEN
N=12
- CERRAHİ DÜZELTME
YAPILAN N=1
- MEDİKAL TAKİP N=8
- ANİ KARDİYAK ÖLÜM N=1



Variables	AUC	95% CI	P value
PA diameter	0.842	0.751-0.934	<0.001
Aortic diameter	0.275	0.116-0.435	0.006
PA/Aortic diameter ratio	0.916	0.854-0.978	<0.001
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PADP	0.843	0.750-0.933	<0.001
Age	0.151	0.041-0.262	<0.001
SBP	0.385	0.257-0.512	0.160

	LMCA BASISI (+)	LMCA BASISI (-)	P
YAŞ	34,6±13,6	54,5±16,7	<0,001
KADIN CİNSİYET	54,5	62,3	0,175
ASD	23,8	9,8	0,047
VSD	23,8	9,8	0,047
PDA	40	3,1	<0,001
PAPsis (mmHg)	110±24	79,4±28,3	<0,001
PAPdia (mmHg)	72,5±18,7	47,7±19,3	<0,001
PAPmean (mmHg)	49,6±16	28,6±15,3	<0,001
PVR (W)	12,8 (5,9-19)	6 (4-10,8)	0,005
SVR (W)	22,8±7,6	22±9	0,414
ANA PA ÇAPI (mm)	46±8	32±7,2	<0,001
AORT ÇAPI (mm)	29±6,7	32 (29-35,7)	0,009

Sonuç

- Pulmoner arter anevrizması olan hastalarda ostial ana koroner basıları gözardı edilemeyecek bir komplikasyondur
- Ostial ana koroner basılarının tedavisinde halen kabul edilen yerleşmiş bir karar yok
- PCI güvenilir ve etkili bir yöntem olarak görülmektedir
- Dual antiplatelet tedavi süresi ? kanama riski?

Definition	Characteristics ^a	Clinical group(s) ^b
PH	PAFm ≥ 25 mmHg	All
Pre-capillary PH	PAFm ≥ 25 mmHg PAWP ≤ 15 mmHg	1. Pulmonary arterial hypertension 3. PH due to lung diseases 4. Chronic thromboembolic PH 5. PH with unclear and/or multifactorial mechanisms
Post-capillary PH	PAFm ≥ 25 mmHg PAWP > 15 mmHg	2. PH due to left heart disease 5. PH with unclear and/or multifactorial mechanisms
Isolated post-capillary PH (Ipc-PH)	DPG < 7 mmHg and/or PVR ≤ 3 WU ^c	
Combined post-capillary and pre-capillary PH (Cpc-PH)	DPG ≥ 7 mmHg and/or PVR > 3 WU ^c	

1. Pulmonary arterial hypertension

- 1.1 Idiopathic
- 1.2 Heritable
 - 1.2.1 BMPR2 mutation
 - 1.2.2 Other mutations
- 1.3 Drugs and toxins induced
- 1.4 Associated with:
 - 1.4.1 Connective tissue disease
 - 1.4.2 Human immunodeficiency virus (HIV) infection
 - 1.4.3 Portal hypertension
 - 1.4.4 Congenital heart disease (Table 6)
 - 1.4.5 Schistosomiasis

1'. Pulmonary veno-occlusive disease and/or pulmonary capillary haemangiomatosis

- 1'.1 Idiopathic
- 1'.2 Heritable
 - 1'.2.1 EIF2AK4 mutation
 - 1'.2.2 Other mutations
- 1'.3 Drugs, toxins and radiation induced
- 1'.4 Associated with:
 - 1'.4.1 Connective tissue disease
 - 1'.4.2 HIV infection

1''. Persistent pulmonary hypertension of the newborn

5. Pulmonary hypertension with unclear and/or multifactorial mechanisms

- 5.1 Haematological disorders: chronic haemolytic anaemia, myeloproliferative disorders, splenectomy
- 5.2 Systemic disorders: sarcoidosis, pulmonary histiocytosis, lymphangioleiomyomatosis, neurofibromatosis
- 5.3 Metabolic disorders: glycogen storage disease, Gaucher disease, thyroid disorders
- 5.4 Others: pulmonary tumoral thrombotic microangiopathy, fibrosing mediastinitis, chronic renal failure (with/without dialysis), segmental pulmonary hypertension

2. Pulmonary hypertension due to left heart disease

- 2.1 Left ventricular systolic dysfunction
- 2.2 Left ventricular diastolic dysfunction
- 2.3 Valvular disease
- 2.4 Congenital / acquired left heart inflow/outflow tract obstruction and congenital cardiomyopathies
- 2.5 Congenital /acquired pulmonary veins stenosis

3. Pulmonary hypertension due to lung diseases and/or hypoxia

- 3.1 Chronic obstructive pulmonary disease
- 3.2 Interstitial lung disease
- 3.3 Other pulmonary diseases with mixed restrictive and obstructive pattern
- 3.4 Sleep-disordered breathing
- 3.5 Alveolar hypoventilation disorders
- 3.6 Chronic exposure to high altitude
- 3.7 Developmental lung diseases (Web Table III)

4. Chronic thromboembolic pulmonary hypertension and other pulmonary artery obstructions

- 4.1 Chronic thromboembolic pulmonary hypertension
- 4.2 Other pulmonary artery obstructions
 - 4.2.1 Angiosarcoma
 - 4.2.2 Other intravascular tumors
 - 4.2.3 Arteritis
 - 4.2.4 Congenital pulmonary arteries stenoses
 - 4.2.5 Parasites (hydatidosis)

Title:

Extrinsic Compression of the Left Main Coronary Artery by Enlarged Pulmonary Artery in Patients with Pulmonary Arterial Hypertension.

Authors:

E. Monti, F. Saia, A. Manes, G. Dall'Ara, G. Mazzanti, M. Palazzini, C. Marrozzini, V. Russo, M. Zompatori, A. Marzocchi, N. Galie; University of Bologna - Bologna/IT

Institution and Department where the work was carried out:

Departement of Specialized, diagnostic and Experimental Medicine – DIMES- Bologna/IT, Bologna, Italy
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Presenting Author's Name: Enrico Monti

Presenting Author's Country of Residence: Italy

Abstract Category: Pulmonary hypertension clinical

Abstract:

Rationale: Extrinsic compression of the left main coronary artery (LMCA) by an enlarged main pulmonary artery (mPA) is a recognized cause of angina and sudden death in patients with pulmonary arterial hypertension (PAH). The aim of the study was to evaluate prospectively the prevalence of LMCA compression in PAH patients and to identify the predictors of compression.

Methods: Consecutive patients with PAH who experience angina or angina-like symptoms underwent coronary computed tomographic angiography (CTA). Four radiologic patterns were described: 1) LMCA compression (C); 2) LMCA dislocation (D) (take-off angle $<60^\circ$ without compression); 3) close proximity (P) (<1 mm) of PA to LMCA; 4) normal (N) (distance PA-LMCA >1 mm). Patients with the first 3 patterns underwent coronary angiography (CA). In case of LMCA obstruction $\geq 50\%$, percutaneous coronary intervention with stenting (PCI) or mPA surgical reduction in case of planned surgical correction of congenital heart defects or urgent lung transplantation were performed without complications. Logistic regression and ROC curve were used for statistical analysis.

Results: the clinical evaluation of 765 patients with PAH identified the presence of angina or angina-like symptoms in 121 patients (15.8%). All of them underwent CTA that showed C in 35 patients (28.9%), D in 49 (40.5%), P in 10 (8.3%) and N in 27 (22.3%). The 94 patients with C, D and P patterns underwent CA and LMCA stenosis $\geq 50\%$ was found in 48 of them (48/121=39.7%); the percentage of LMCA stenosis $\geq 50\%$ in C, D and P patterns is shown in the table.

Conclusions: Prevalence of LMCA compression in patients with PAH and angina is high and can be safely treated.

Extrinsic Compression Of The Left Main Coronary Artery By Enlarged Pulmonary Artery In Patients With Pulmonary Arterial Hypertension

N. Galie¹, F. Saia¹, A. Manes¹, G. Dall'Ara¹, E. Monti¹, G. Mazzanti^{1, 2}, M. Palazzini¹, C. Marrozzini¹, V. Russo¹, M. Zompatori¹, A. Marzocchi¹

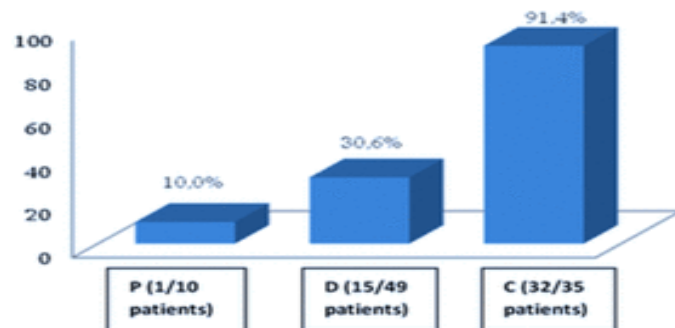
¹University of Bologna, Bologna, Italy, ²

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lmca.png



Legend: percentage of LMCA stenosis $\geq 50\%$ at CA according with the CTA patterns

Forty-five patients underwent PCI and stenting of LMCA and 3 underwent mPA surgical reduction without major complications.

Symptomatic improvement was observed in all patients and after a mean follow-up of 23 months no deaths were observed. Logistic regression and ROC analysis identified a mPA diameter (mPA_d) > 40 mm assessed at the CT scan as a predictor of LMCA stenosis $\geq 50\%$.

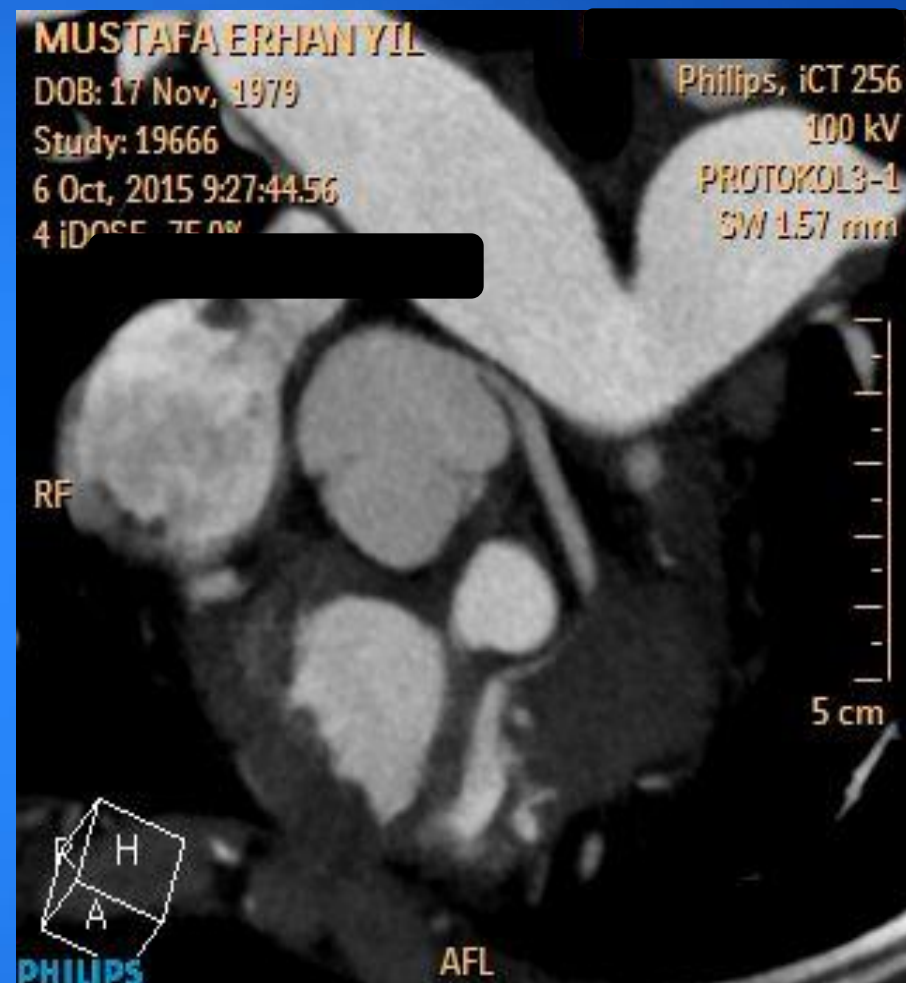
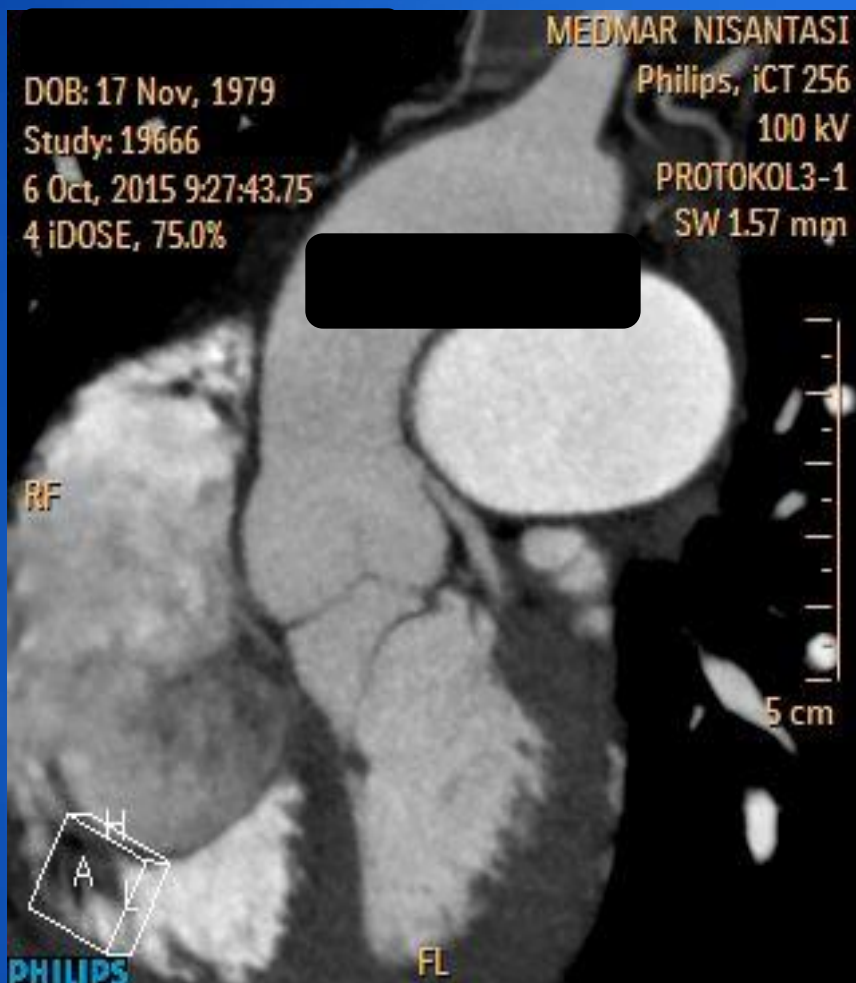
CONCLUSIONS: the prevalence of extrinsic compression of LMCA in our population is quite high ranging from 6% of all PAH patients to 39.7% of those presenting with angina or angina-like symptoms. CTA is useful as a screening tool in symptomatic patients and CA is the gold standard for the final diagnosis. PCI with stenting is a safe and effective procedure. A mPA_d >40 mm at CT scan is the best predictor of LMCA compression.

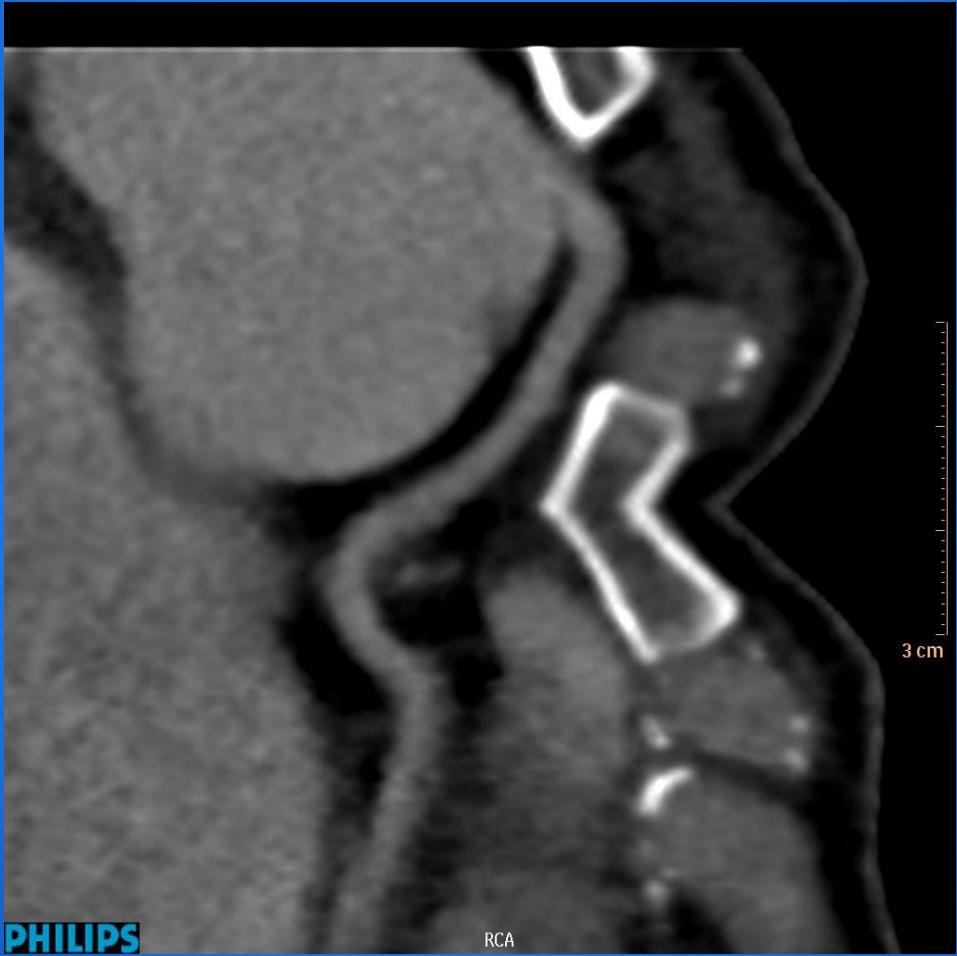
This abstract is funded by: None

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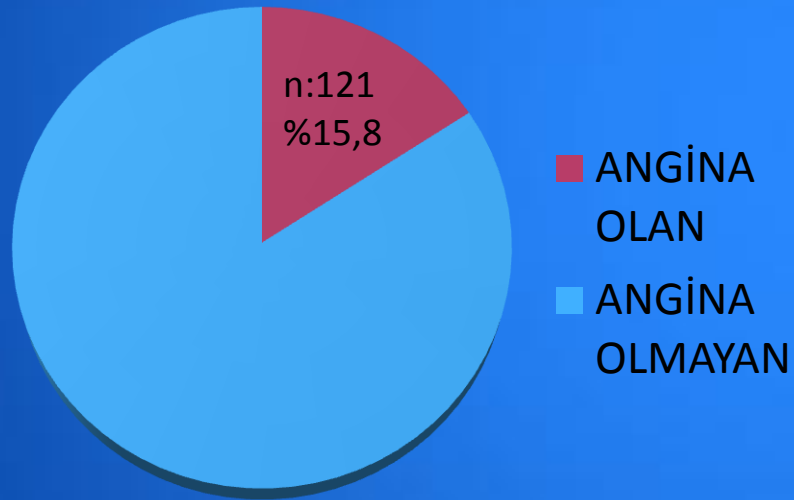




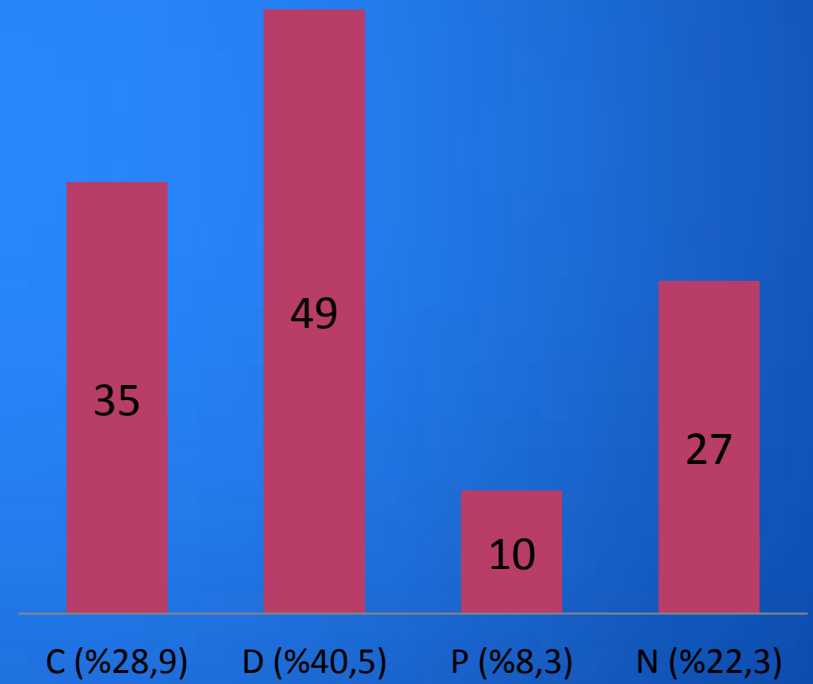
PHILIPS

RCA

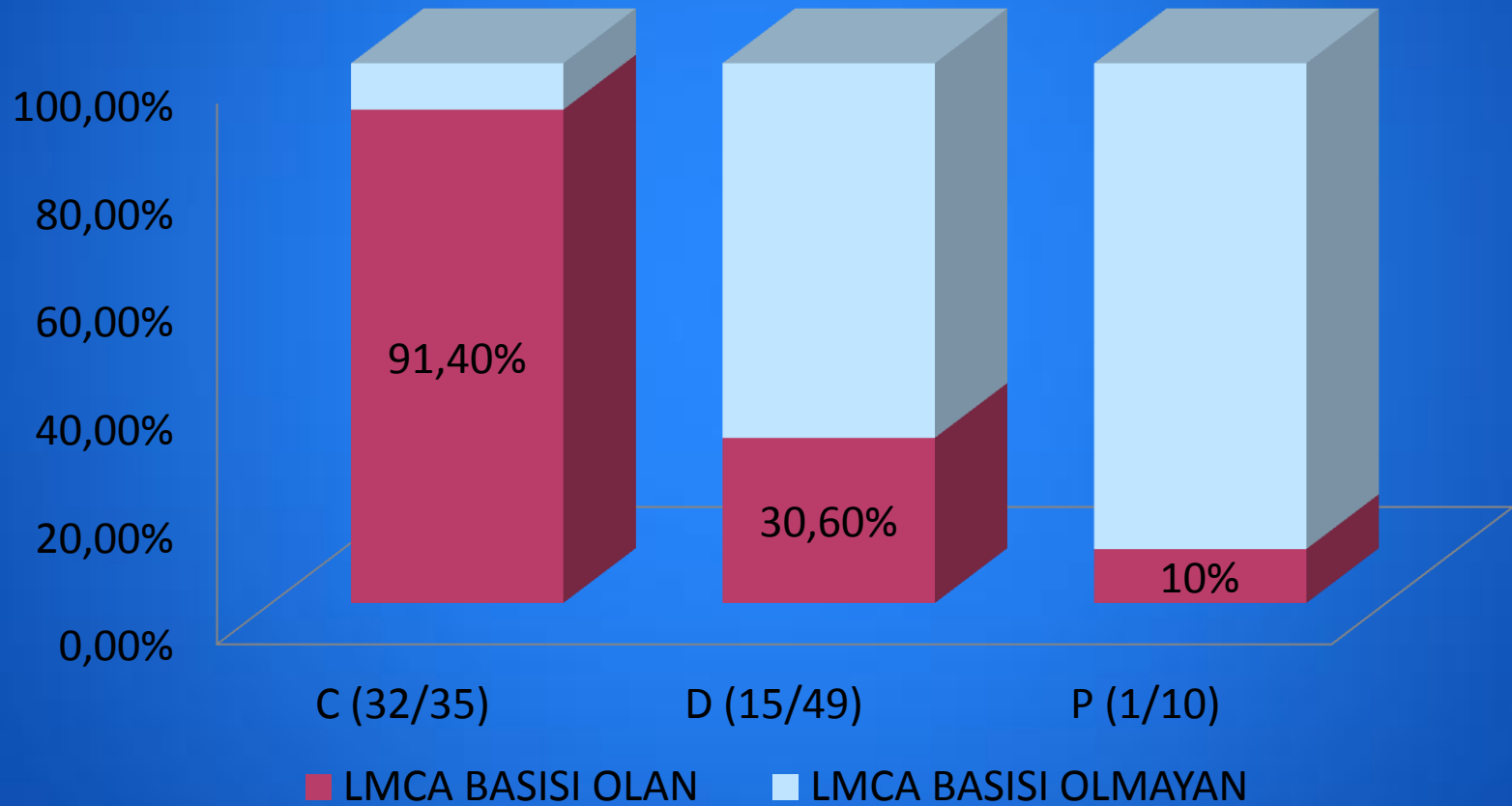
TOPLAM: 765 HASTA

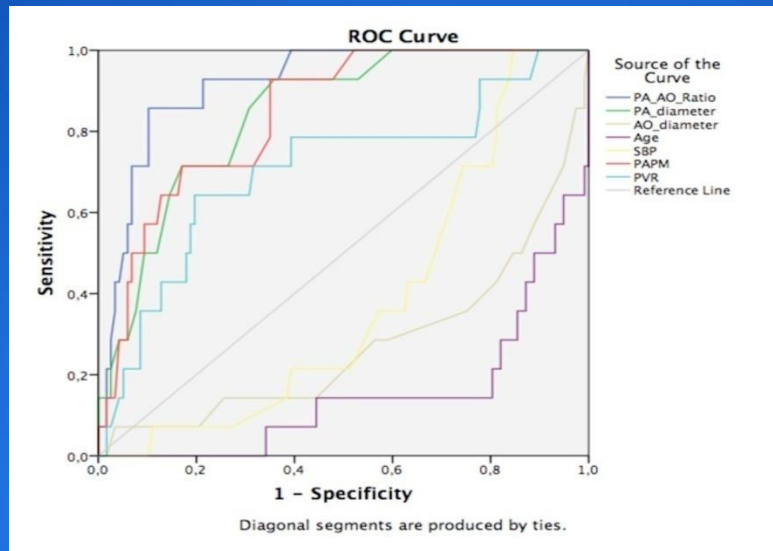


TOPLAM: 121 HASTA



KORONER ANJİYOGRAFİDE LMCA BASISI ORANLARI





Variables	AUC	95% CI	P value
PA diameter	0.842	0.751-0.934	<0.001
Aortic diameter	0.275	0.116-0.435	0.006
PA/Aortic diameter ratio	0.916	0.854-0.978	<0.001
PVR	0.704	0.544-0.864	0.013
PASP	0.820	0.710-0.929	<0.001
PAMP	0.841	0.744-0.942	<0.001
PADP	0.843	0.750-0.933	<0.001
Age	0.151	0.041-0.262	<0.001
SBP	0.385	0.257-0.512	0.160

Variables	LM Compression	No LM Compression	P Value
Age, years	34.6 ± 13.6	54.5 ± 16.7	<0.001
Sex (Female %)	54.5	62.3	0.175
WHO-FC (median)	3	3	0.765
6 MWD, meter	286 (190-363)	268 (160-340)	0.311
Group, %			
Group 1	90.5	48.1	0.003
Group 2	0	5.4	
Group 3	0	15.1	
Group 4	9.5	31.4	
Group 1, %			
IPAH	31.6	43.6	0.077
APAH-CTD	0	12.8	
APAH-CHD	68.4	43.6	
PDA, %	36.4	2.8	<0.001
ASD, %	23.8	9.8	0.047
VSD, %	23.8	9.8	0.047
Heart Rate (/min)	92.8 ± 16.8	87.8 ± 16.9	0.204
EF %	63.2 ± 3.7	61.8 ± 8.1	0.826
D-shaped septum, %	95	64.8	0.023
PA Diameter, mm	46 ± 8	32 ± 7.2	<0.001
Aortic Diameter, mm	29 ± 6.7	31.2 ± 7.5	0.009
PA/Aortic diameter ratio			
SBP, mmHg	108 ± 27	124 ± 27	0.017
DBP, mmHg	72 ± 11	72 ± 16	0.968
RA pressure, mmHg	7.2 ± 2.3	9.5 ± 5.3	0.068
PASP, mmHg	110 ± 24	79 ± 28	<0.001
PADP, mmHg	49.6 ± 16	28.6 ± 15.3	<0.001
PAMP, mmHg	72.5 ± 18.7	47.7 ± 19.3	<0.001
PVR, wood units	12.8 (5.9-19)	6 (4-10.8)	0.005
SVR, wood units	22.8 ± 7.6	22 ± 9	0.414
CO, L/min	4.7 ± 2.2	4.6 ± 1.3	0.421
PH targeted treatment,%			
No	15.8	29.6	0.287
Mono	73.7	65.7	
Dual	10.5	4.7	

Etiyoloji

- Konjenital: PDA, VSD, ASD, hipoplastik aort kapak, PS, PY ... , Marfan snd, Ehlers-danlos snd. vb...
- Kazanılmış: Enfeksiyon, vaskülit, PAH, CTEPH, neoplasmlar, iyatrojenik
- İdiyopatik

- Klinik:

Genelde asemptomatiktir

Klinik bulguları nonspesifiktir. Göğüs ağrısı, nefes darlığı, hemoptizi, hoarseness, senkop ...

- Tedavi

- 1- Medikal izlem

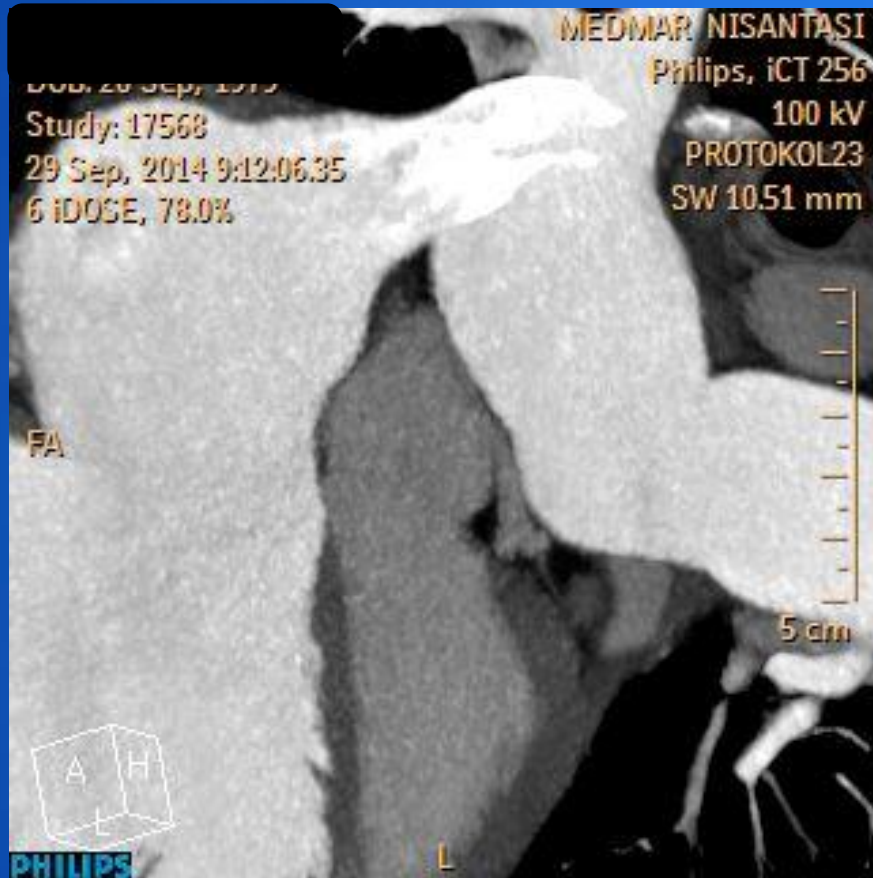
- 2- Cerrahi

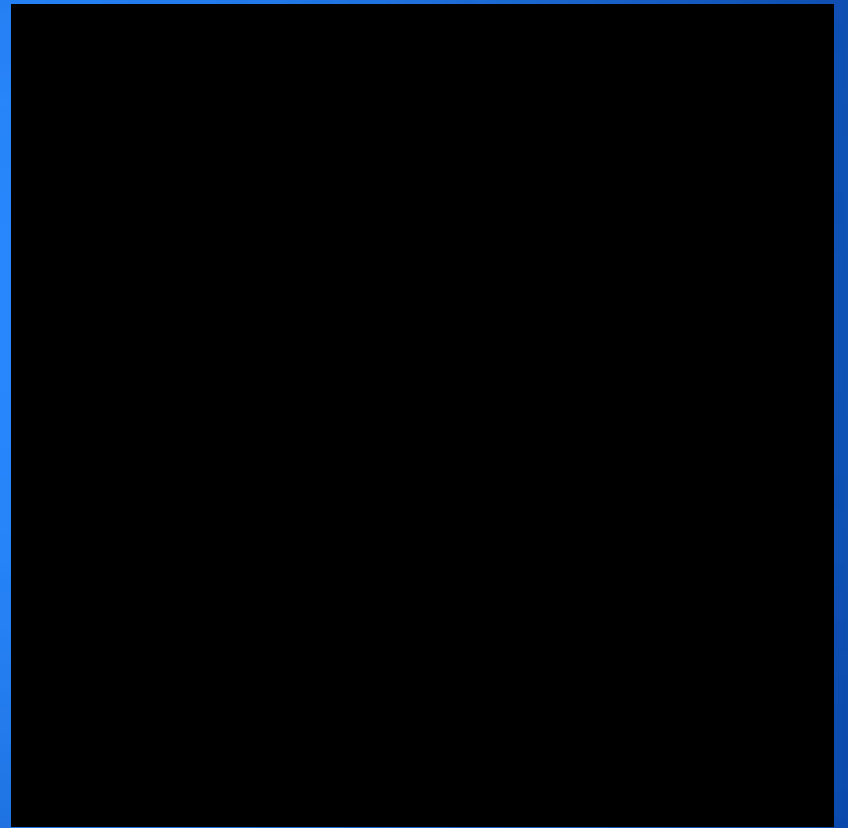
- 3- perkütan girişimler

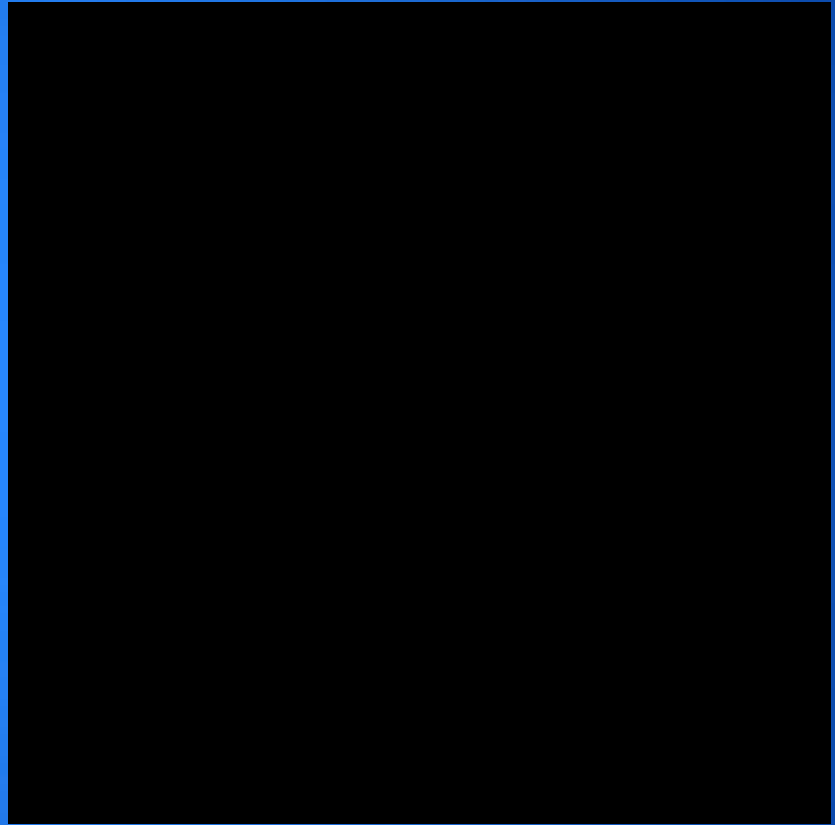
Cerrahi öneriler

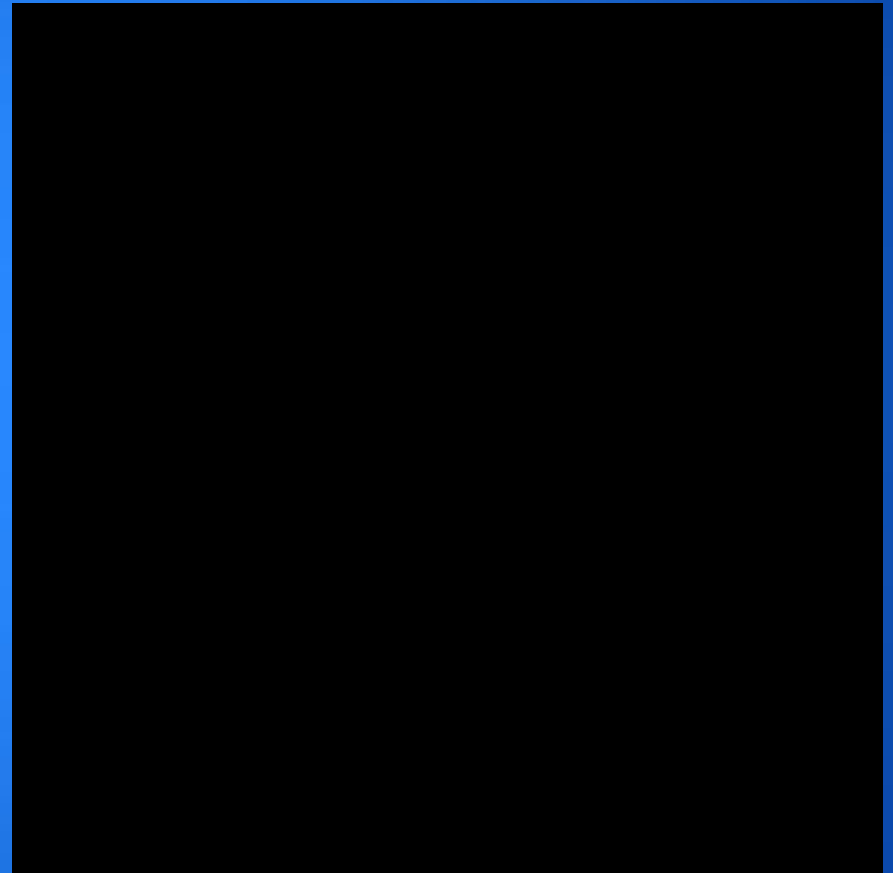
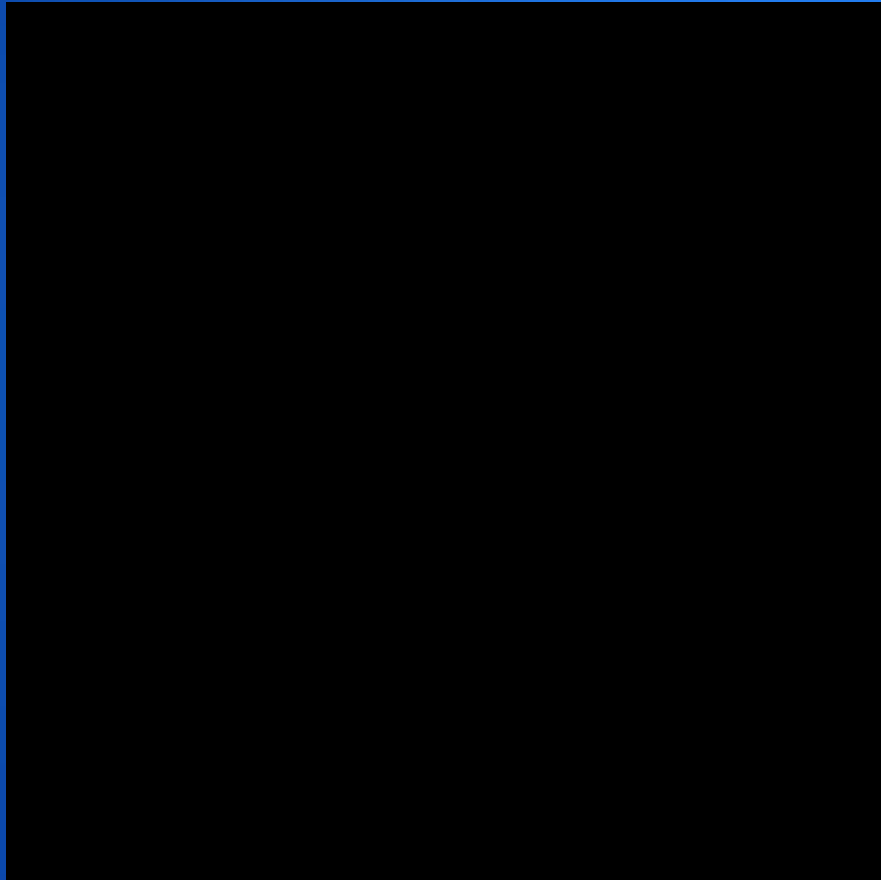
- PA çapı $>5,5$ cm
- Çap artış hızı $>0,5$ cm / 6 ay
- Komşu dokulara bası
- Anevrizma içinde trombüs
- Şikayetlerin ortaya çıkması
- Valvuler patoloji ve şant akımlarının olması
- PAH
- Ruptür veya diseksiyon

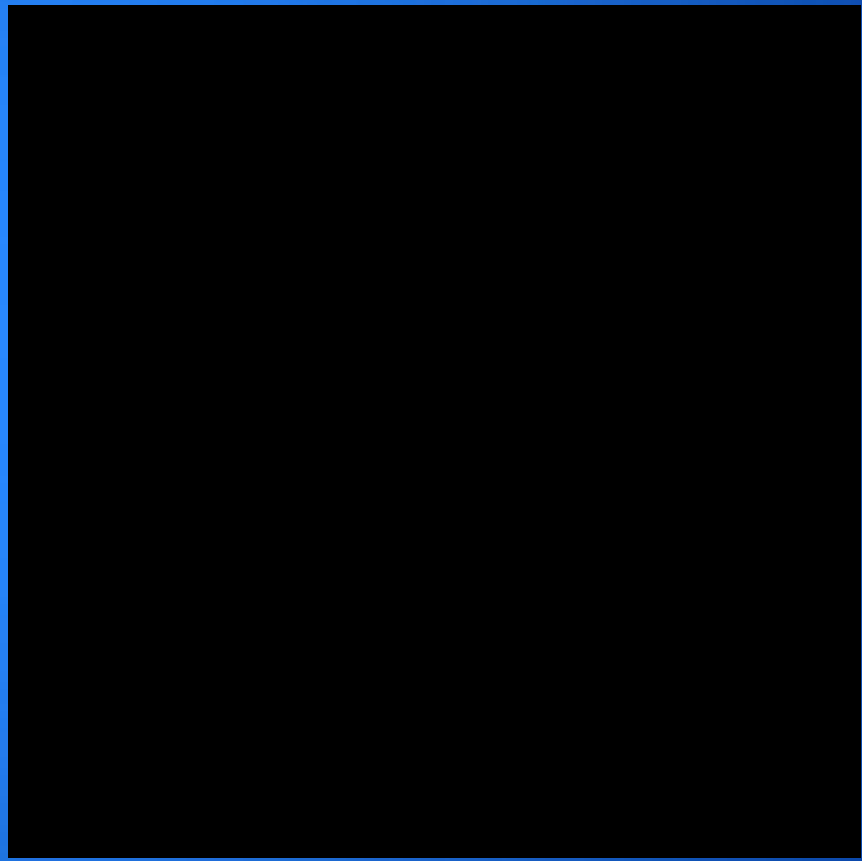
Olgu 4











Olgu 3



