



# A MURMURING LADY

INTER-HOSPITAL GRAND ROUND

20/5/2014



# PRESENTATION

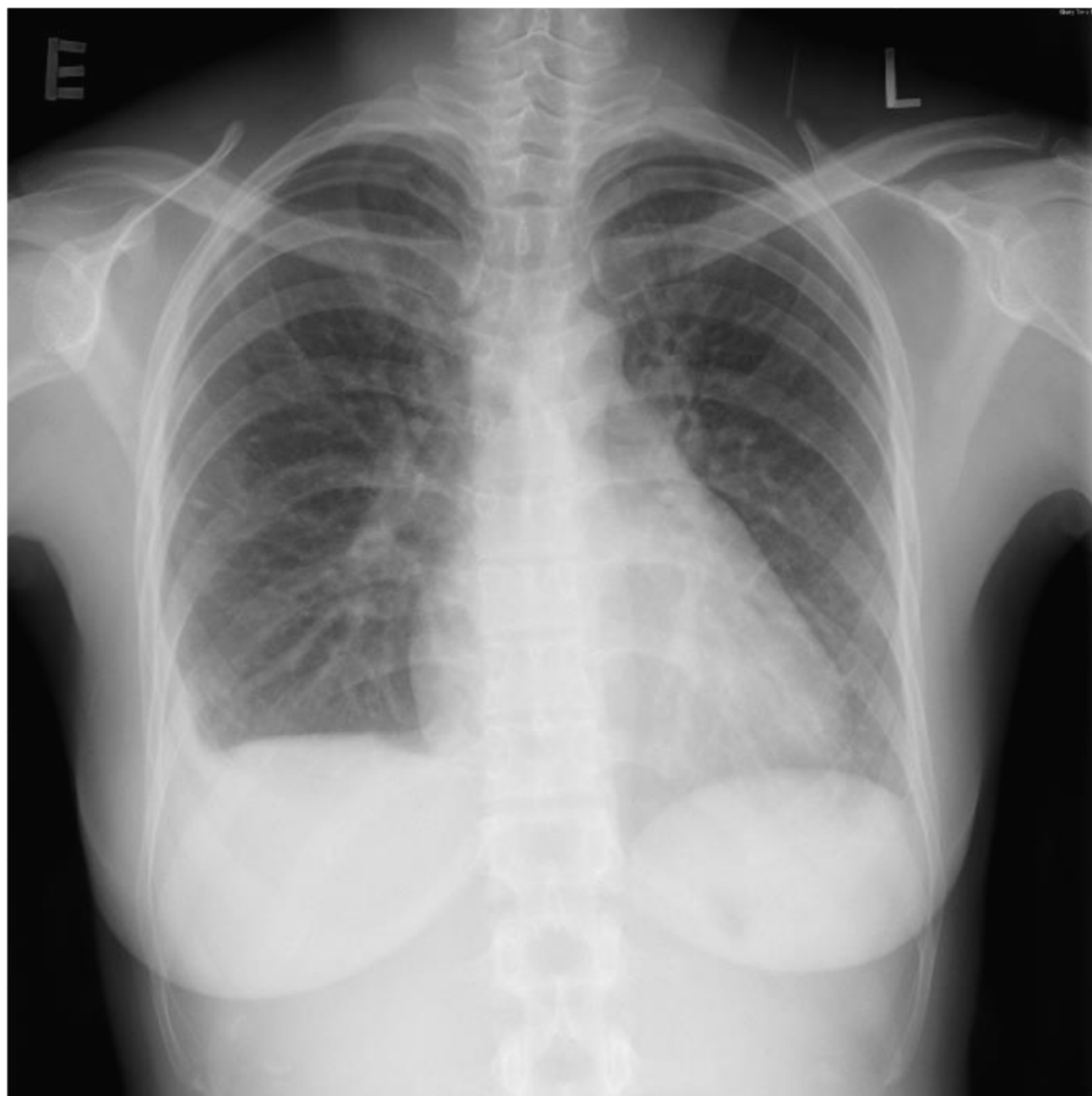
- F/29, INDONESIAN DOMESTIC HELPER
- GOOD PAST HEALTH
- ADMITTED TO MEDICAL 19/4/2014 FOR SOB, MALAISE, LOWER ABDOMINAL DISCOMFORT
  - NOT MUCH COUGH/SPUTUM/URI SYMPTOMS
  - NO DIARRHEA/VOMITING BUT POOR APPETITE
  - NO UROGENITAL SYMPTOMS
  - NO FEVER/CHILLS/RIGOR
  - TOCC -VE



- PHYSICAL FINDINGS:

- HYDRATION FAIR
- CHEST: DECREASED BILATERAL BASAL ZONE AIR ENTRY
- PAN-SYSTOLIC MURMUR
- ABDOMEN: SOFT, GENERALIZED TENDERNESS BUT NO GUARDING







# ECG ON ADMISSION

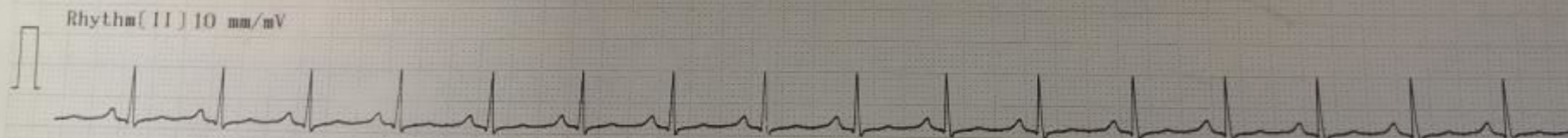
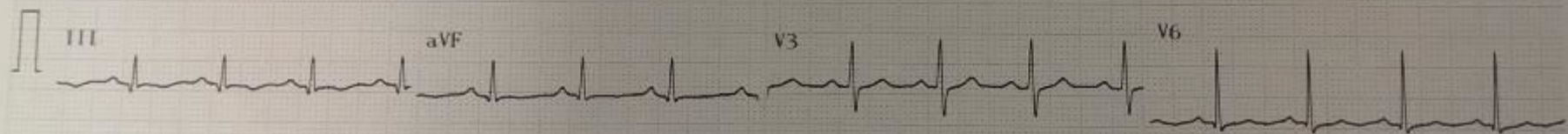
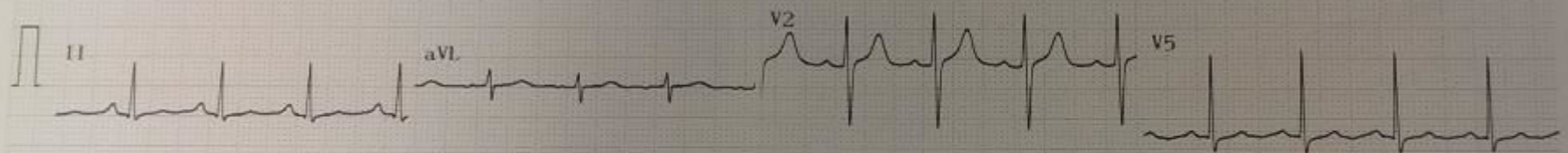
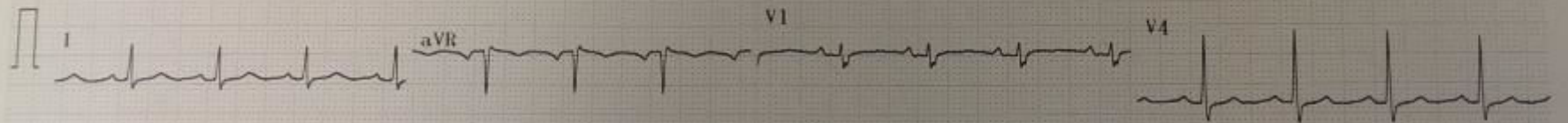
QRS dur 76 ms  
QT/QTc int 326/ 383 ms  
P/QRS/T axis 57/ 62/ -4 °  
RV5/SV1 amp 1.625/ 0.245 mV  
RV5+SV1 amp 1.870 mV

Unconfirmed Report  
Reviewed by:

10 mm/mV 25 mm/s Filter: H50 D 35 Hz 10 mm/mV

10 mm/mV

10 mm/mV





# LRFT ON ADMISSION



Collect Date :	19/04/14	19/04/14	19/04/14	20/04/14	20/04/14		
Collect Time :	16:36	16:36	21:09	07:28	14:23		
Arrive Date :	19/04/14	19/04/14	19/04/14	20/04/14	20/04/14		
Arrive Time :	17:11	17:12	22:33	09:07	14:53		
Request No. :	C5239432	C5239434	C5239575	C5239765	C5240086	Reference	Units
Emergency :	URGENT	--	--	URGENT	URGENT	Range	
Specimen Type: Blood							
Sodium	126 *			130 *	124 *	136 - 145	mmol/L
Potassium	5.1			4.8	4.8	3.6 - 5.2	mmol/L
Urea	14.7 *			13.8 *	14.2 *	2.7 - 7.2	mmol/L
Creatinine	87 *			73	74	55 - 83\$	umol/L
Total Protein	78				58 *	64 - 83	g/L
Albumin	40				32 *	35 - 50	g/L
Globulin	38				26		g/L
Total Bilirubin	16				22 *	3 - 21\$	umol/L
ALP	72				76	36 - 105\$	IU/L
ALT	691 *				514 *	< 49	IU/L
Calcium	2.14 *					2.20 - 2.60\$	mmol/L
Phosphate	1.28					0.76 - 1.40\$	mmol/L
CK				257 *	215 *	37 - 173\$	IU/L
Glucose		6.3					mmol/L
Serum Osmolality			T/F			See Below	mOsm/kg
Troponin-I	0.14 *			0.11 *	0.09 *	See Below	ng/mL



- BLOOD TESTS:

- DERANGED LFT: ELEVATED ALT 691, BIL 16, ALP 72, ALB 40
- RFT: UR 14, CR 87,
- HYPONATRAEMIA 126, SERUM OSMOLALITY 270, URINE OSMOLALITY 756, URINE NA < 20
- COAGULOPATHY INR 1.4



# PROGRESS

- LOW GRADE FEVER
  - BP/P STABLE ALL ALONG, SAO2 97% RA
  - SOB ON EXERTION, MALAISE
- 
- IMPRESSION:
    - DERRANGED LFT WITH HYPONA
    - FEVER AND PSM



- WHAT INVESTIGATIONS SHOULD BE DONE NEXT?

- SEPSIS WORKUP
- USG ABDOMEN
- ECHOCARDIOGRAM

- MANAGEMENT OF MEDICAL OFFICER:

- EMPIRICAL AUGMENTIN
- CONSULT GI TEAM/ ID TEAM



# DAY 3 AFTER ADMISSION

- MICROBIOLOGICAL WORKUP:

- BLD C/ST 19/4 –VE
- ANTI-HAV/ HEV T/F
- HBSAG –VE



# DAY 4 AFTER ADMISSION

- USG ABDOMEN REPORT:
  - MILDLY OEDEMATOUS GALLBLADDER WALL (4MM). NO OBVIOUS GALLBLADDER STONE OR FOCAL TENDERNESS
  - ASCITES
  - NO HYDRONEPHROSIS. BOTH KIDNEYS COMPARABLE IN SIZE WITH NORMAL ECHOGENICITY



- GI TEAM OPINION:

- DERRANGED LFT UNLIKELY DUE TO PRIMARY LIVER PROBLEM
- ? SEPSIS INDUCED DERRANGED LFT

- RENAL/ID TEAM OPINION:

- CHECK LEPTOSPIRA IGM, WEIL FELIX TEST, WIDAL TEST, BLOOD FILM FOR MALARIA
- ADD DOXYCYCLINE 100MG BD



## DAY 1-5 AFTER ADMISSION ...

Collect Date :	20/04/14	21/04/14	22/04/14	22/04/14	22/04/14		
Collect Time :	21:01	12:16	10:58	15:47	15:47		
Arrive Date :	20/04/14	21/04/14	22/04/14	22/04/14	22/04/14		
Arrive Time :	21:38	13:19	12:58	16:04	16:54		
Request No. :	C5240300	C5240743	C5242571	C5243770	C5244040	Reference	
Urgency :	URGENT	URGENT	URGENT	URGENT	--	Range	Unit
Specimen Type: Blood							
Sodium	125 *	124 *	119 *	116 *		136 - 145	mmol/l
Potassium	4.8	5.0	7.2 *	6.2 *		3.6 - 5.2	mmol/l
Urea	14.5 *	16.0 *	19.9 *	20.7 *		2.7 - 7.2	mmol/l
Creatinine	81	85 *	95 *	85 *		55 - 83\$	umol/l
Total Protein		57 *	60 *			64 - 83	g/l
Albumin		33 *	32 *			35 - 50	g/l
Globulin		24	28				g/l
Total Bilirubin		33 *	36 *			3 - 21\$	umol/l
ALP		79	102			36 - 105\$	IU/l
ALT		480 *	514 *			< 49	IU/l
LDH					534 *	128 - 245	IU/l



Clinical Details: R pleural effusion, raised ALT, fever ?cause, hyponatremia

Collect Date :	22/04/14	22/04/14	23/04/14	23/04/14	23/04/14	C
Collect Time :	18:32	23:47	04:59	10:14	16:21	
Arrive Date :	22/04/14	23/04/14	23/04/14	23/04/14	23/04/14	
Arrive Time :	19:12	00:48	06:44	11:47	16:56	
Request No. :	C5244230	C5244461	C5244608	C5245333	C5246922	
Emergency :	URGENT	--	--	--	--	Reference Range Units

Specimen Type: Blood

Sodium	115 *	116 *	118 *	117 *	117 *	136 - 145	mmol/L
Potassium	5.5 *	5.8 *	5.6 *	6.6 *	5.9 *	3.6 - 5.2	mmol/L
Urea	20.6 *	22.0 *	22.4 *	24.5 *	24.4 *	2.7 - 7.2	mmol/L
Creatinine	91 *	97 *	103 *	114 *	110 *	55 - 83\$	umol/L
Total Protein				62 *		64 - 83	g/L
Albumin				33 *		35 - 50	g/L
Globulin				29			g/L
Total Bilirubin				54 *		3 - 21\$	umol/L
ALP				90		36 - 105\$	IU/L
ALT				582 *		< 49	IU/L



# PROGRESSION

- 19/4 – 23/4:
  - DETERIORATION IN LFT
  - HYPONATRAEMIA
  - PERSISTENT HYPERKALAEMIA (HAEMOLYSED)
  - ACUTE RENAL IMPAIRMENT
  - COAGULOPATHY: INR 3.2, PLT 71
  - LEUCOCYTOSIS WITH LEFT SHIFT PATTERN





Collect Date :	23/04/14	23/04/14	24/04/14	24/04/14		
Collect Time :	10:14	22:10	10:14	16:13		
Arrive Date :	23/04/14	23/04/14	24/04/14	24/04/14		
Arrive Time :	11:10	22:46	10:23	16:59		
Request No. :	C5245110	C5247187	C5247683	C5249420	Reference	
Urgency :	URGENT	URGENT	URGENT	URGENT	Range	Units
<b>Specimen Type: Blood</b>						
Blood pH	7.38	7.36	7.42	7.35 *	7.35 - 7.45	
Blood pCO2	3.50 *	3.45 *	1.94 *	1.85 *	4.70 - 6.00	kPa
Blood pO2	3.37 *	4.24 *	13.3	12.6	10.7 - 13.3	kPa
HCO3 actual	15.1 *	14.4 *	9.2 *	7.5 *	20.0 - 26.0	mmol/L
Base Excess(vt)	-8.2 *	-9.1 *	-11.9 *	-14.9 *	-3.0 - 3.0	mmol/L
O2 Saturation	46 *	60 *	98	97	95 - 100	%

The reference ranges of blood gases analysis are for arterial blood sample only.

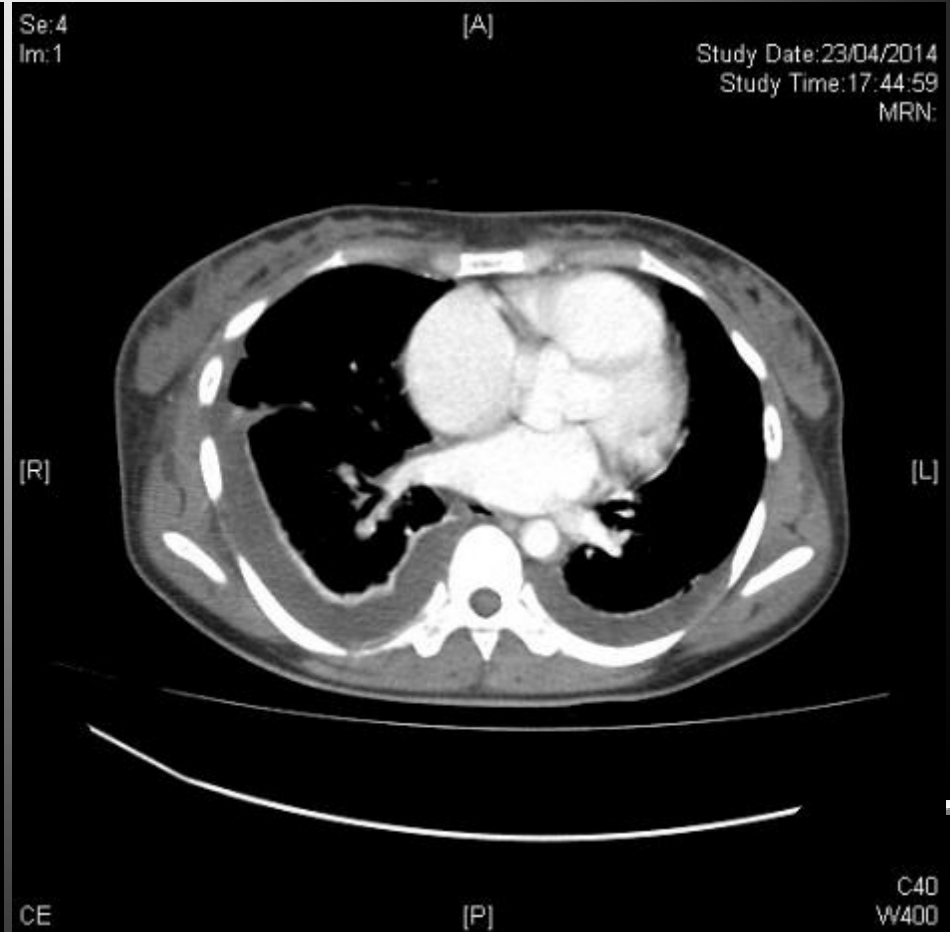
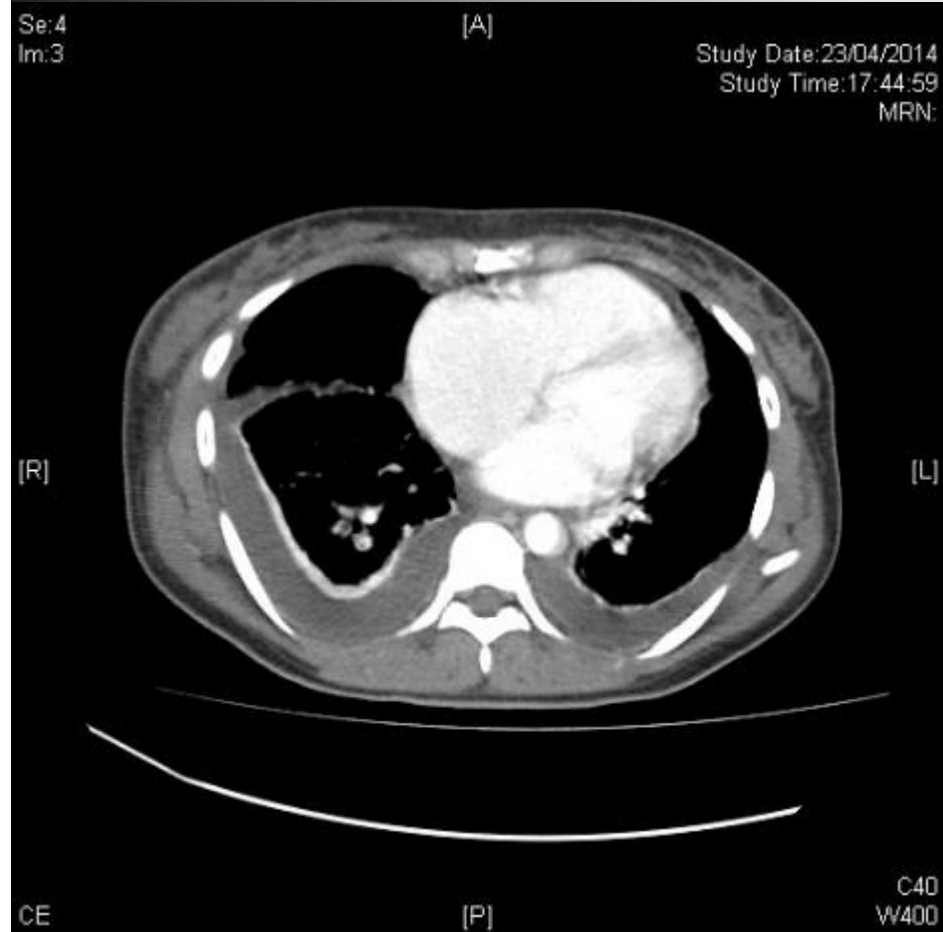


## DAY 5 AFTER ADMISSION...

- PERSISTENT ABDOMINAL PAIN/DISCOMFORT
- VBG :
  - PH 7.38, PCO<sub>2</sub> 3.5, HCO<sub>3</sub> 15.1, BE -8.2



# DAY 5 AFTER ADMISSION...





Se:4  
Im:6

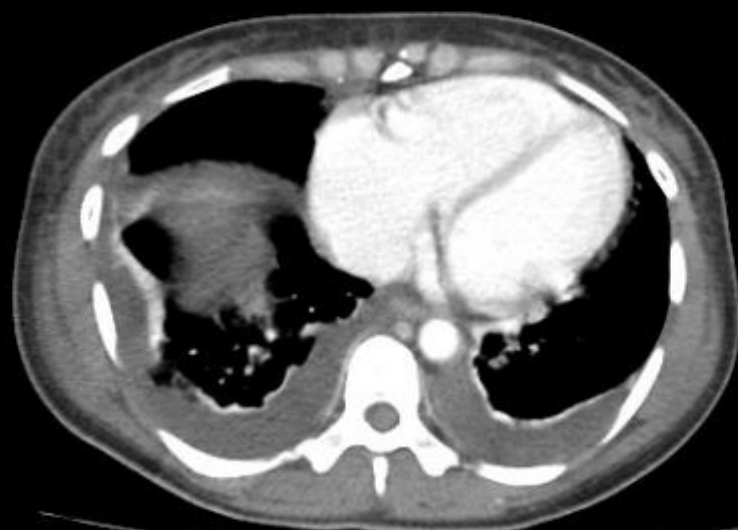
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Study Date:23/04/2011 Im:11  
Study Time:17:44:5  
MRI

[A]

Study Date:23/04/2014  
Study Time:17:44:59  
MRN:

[R]



[I [R]



[L]

CE

[P]

C4  
W40 CE

[P]

C40  
W400



Se:4  
Im:13

[A]

Study Date:23/04/2014  
Study Time:17:44:59  
M

[A]

Study Date:23/04/2014  
Study Time:17:44:59  
MRN:

[R]



[R]



[L]

CE

[P]

W CE

[P]

C40  
W400



Se:4  
Im:17

[A]

Se:4  
Study Date:2 Im:22  
Study Time

[A]

Study Date:23/04/2014  
Study Time:17:44:59  
MRN:

[R]



[R]



[L]

CE

[P]

CE

[P]

C40  
W400



Se:4  
Im:25

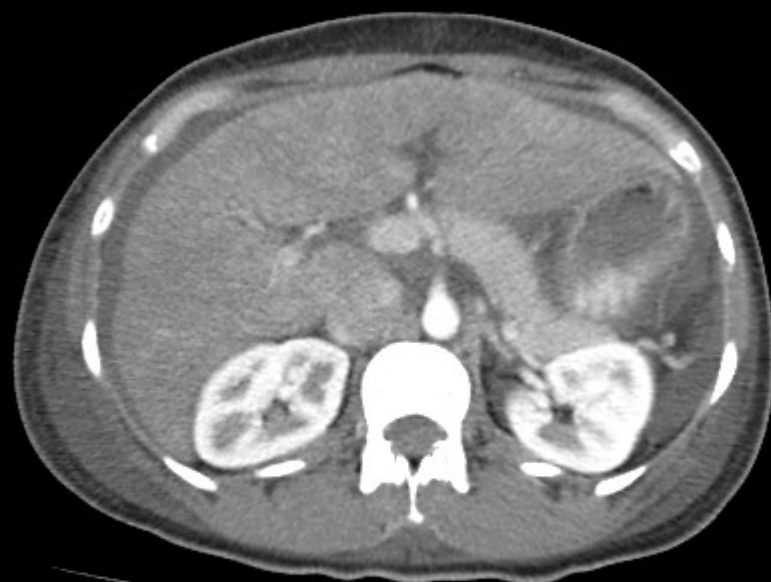
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Se:4  
Study Date:2 Im:36  
Study Tim

[A]

Study Date:23/04/2014  
Study Time:17:44:59  
MRN:

[R]



[R]

CE

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[L]

CE

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C40  
W400



## DAY 5 AFTER ADMISSION...

- CT REPORT:
  - NO PNEUMOPERITONEUM. SIGNIFICANT ASCITES.
  - MURAL THICKENING IN CAECUM TO PROXIMAL TRANSVERSE COLON WITH *EQUIVOCAL* ***HYPOENHANCEMENT*** *ESPECIALLY AROUND HEPATIC FLEXURE*
  - 3CM URACHAL REMNANT RELATED LESION.
  - DISTENDED IVC. GENERALIZED SUBCUTANEOUS STRANDINGS.
  - BILATERAL PLEURAL EFFUSIONS.



# CLOSE MONITORING OVERNIGHT ...


Collect Date :	23/04/14	23/04/14	23/04/14	24/04/14	24/04/14	<b>C</b>	
Collect Time :	16:21	22:10	22:10	04:05	10:14		
Arrive Date :	23/04/14	23/04/14	23/04/14	24/04/14	24/04/14		
Arrive Time :	16:56	22:43	22:44	05:07	10:23		
Request No. :	C5246928	C5247179	C5247181	C5247292	C5247684		Reference
Urgency :	--	URGENT	--	--	URGENT		Range
							Units
Specimen Type: Blood							
Sodium		111 *	111 *	119 *	113 *	136 - 145	mmol/L
Potassium		6.1 *	6.1 *	5.5 *	6.0 *	3.6 - 5.2	mmol/L
Chloride		89 *				102 - 109	mmol/L
Urea		23.1 *	23.3 *	22.0 *	26.3 *	2.7 - 7.2	mmol/L
Creatinine		109 *	107 *	99 *	131 *	55 - 83\$	umol/L
Total Protein					56 *	64 - 83	g/L
Albumin					31 *	35 - 50	g/L
Globulin					25		g/L
Total Bilirubin					55 *	3 - 21\$	umol/L
ALP					74	36 - 105\$	IU/L
ALT					700 *	< 49	IU/L
LDH					718 *	128 - 245	IU/L
Amylase	103					25 - 125	IU/L



## DAY 6 AFTER ADMISSION...

- WORSENING DYSPNEA ON EXERTION. PERIPHERAL OEDEMA
- NEARLY **ANURIC** OVERNIGHT
- TRANSFERRED TO ICU FOR *MONITORING*



- 
- ON ADMISSION TO ICU:
    - GENERAL CONDITION FAIR
    - COLD PERIPHERAL, WEAK PERIPHERAL PULSES
    - SPO2 MAINTAINED ON ROOM AIR, NO SIGN OF DISTRESS
    - BP MAINTAINED WITHOUT INOTROPE SUPPORT
    - OLIGURIC



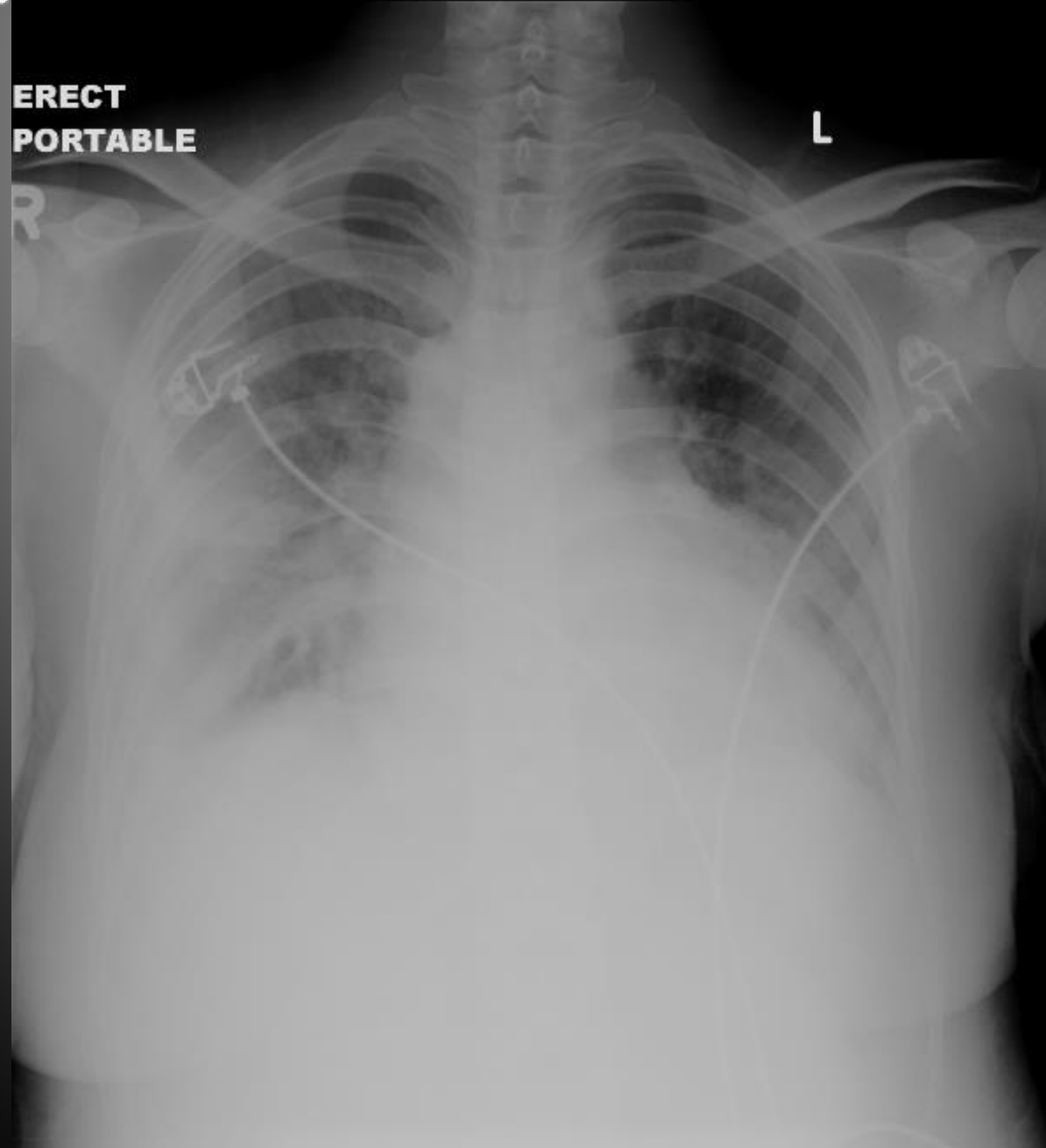
- ELEVATED JVP
- CHEST: ? MURMUR OVER L STERNAL BORDER, BILATERAL BASAL CREPITATION
- ABDOMEN: SOFT, NOT DISTENDED, EPIGASTRIC AND RUQ MILD TENDERNESS
- PITTING OEDEMA OVER TRUNK AND BILATERAL LL



ERECT  
PORTABLE

L

R





# LAB RESULTS ON ICU ADMISSION

Clinical Details: R pleural effusion, raised ALT, DIC, hyponatremia

Collect Date :	24/04/14	24/04/14	24/04/14	24/04/14	24/04/14		
Collect Time :	16:12	16:13	16:56	18:46	18:46		
Arrive Date :	24/04/14	24/04/14	24/04/14	24/04/14	24/04/14		
Arrive Time :	17:06	17:03	18:01	19:23	19:36		
Request No. :	C5249432	C5249427	C5249462	C5249556	C5249559	Reference	
Emergency :	URGENT	URGENT	URGENT	URGENT	URGENT	Range	Units

Specimen Type: Blood

Sodium	113 *			113 *	136 - 145	mmol/L
Potassium	6.1 *			5.4 *	3.6 - 5.2	mmol/L
Chloride	88 *				102 - 109	mmol/L
Urea	27.7 *			27.6 *	2.7 - 7.2	mmol/L
Creatinine	180 *			197 *	55 - 83	umol/L
Total Protein	58 *				64 - 83	g/L
Albumin	32 *				35 - 50	g/L
Globulin	26					g/L
Total Bilirubin	61 *				3 - 21	umol/L
ALP	75				36 - 105	IU/L
ALT	818 *				< 49	IU/L
Calcium	2.19 *				2.20 - 2.60	mmol/L
Phosphate	2.29 *				0.76 - 1.40	mmol/L
Lactate	6.76 *			T/F	0.50 - 2.20	mmol/L
Serum Osmolality			279		See Below	mOsm/kg

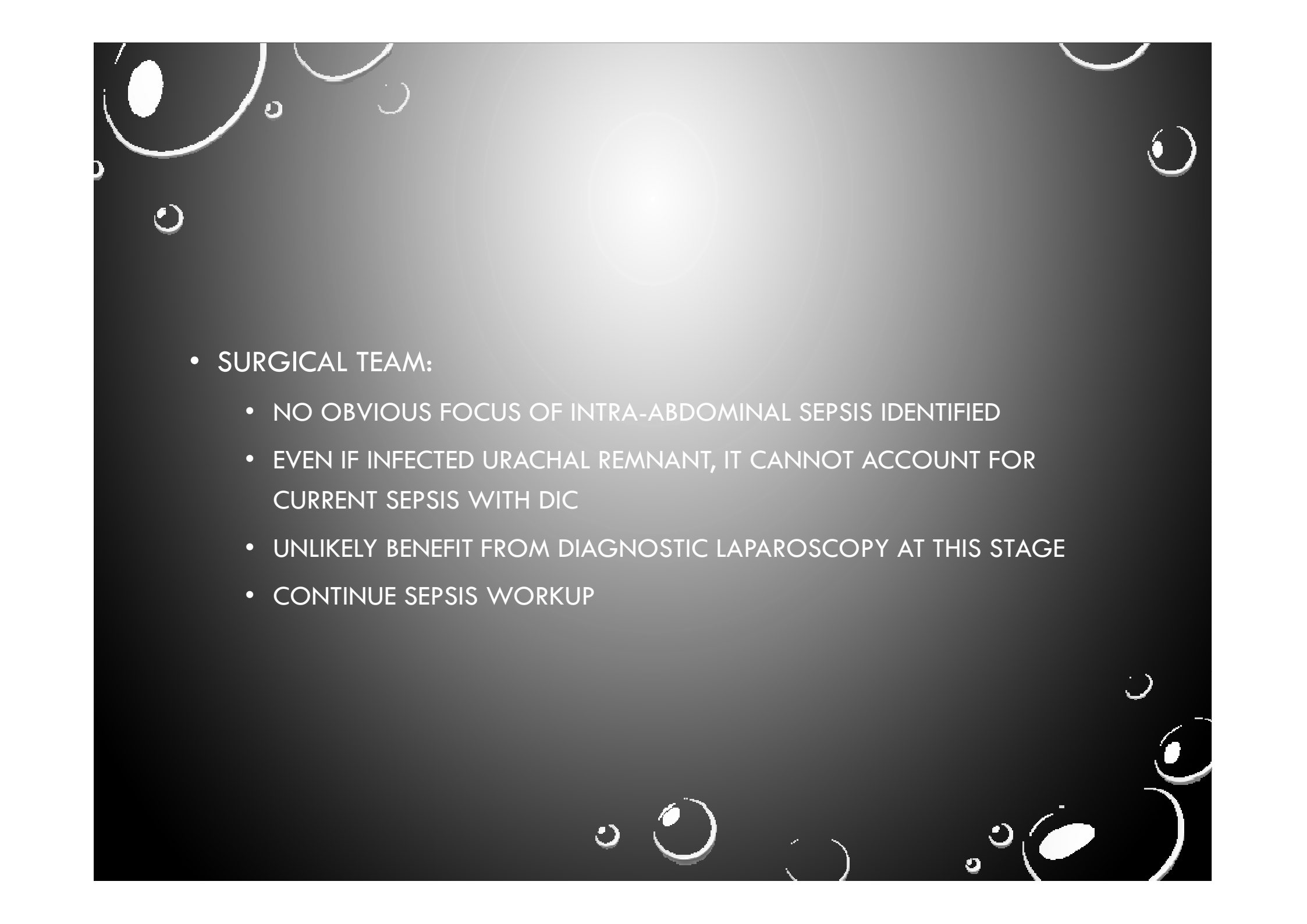






- WHAT IS THE CAUSE OF?
  - ACUTE RENAL AND LIVER FAILURE
  - METABOLIC ACIDOSIS
  - MICROBIOLOGY WORKUP –VE ALL ALONG
- CT ABDOMEN:
  - BIL PLEURAL EFFUSION AND ASCITES
  - MURAL THICKENING FROM CAECUM TO PROXIMAL TRANSVERSE COLON WITH HYPOENHANCEMENT AROUND HEPATIC FLEXURE
  - DISTENDED IVC. GENERALIZED SUBCUTANEOUS SWELLING



- 
- SURGICAL TEAM:
    - NO OBVIOUS FOCUS OF INTRA-ABDOMINAL SEPSIS IDENTIFIED
    - EVEN IF INFECTED URACHAL REMNANT, IT CANNOT ACCOUNT FOR CURRENT SEPSIS WITH DIC
    - UNLIKELY BENEFIT FROM DIAGNOSTIC LAPAROSCOPY AT THIS STAGE
    - CONTINUE SEPSIS WORKUP



- WHAT IS THE **CAUSE** OF?
  - ACUTE RENAL AND LIVER FAILURE
  - METABOLIC ACIDOSIS
  - MICROBIOLOGY WORKUP –VE

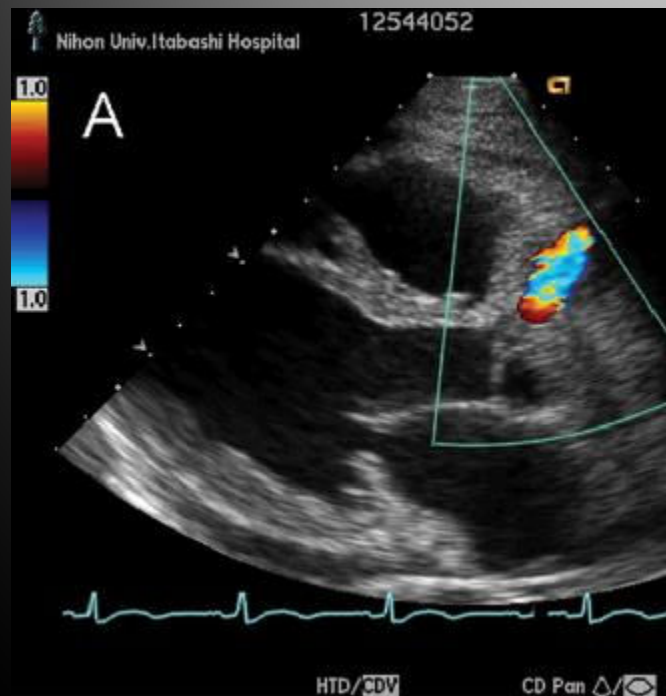
**+ A MURMURING LADY**



# TRANSTHORACIC ECHO

- TTE

- MARKEDLY DILATED RA/RV, SEVERE TR WITH SUSPICIOUS VEGETATION BASE OF TV; NORMAL LV SIZE AND SYSTOLIC FUNCTION, *INCREASED **TURBULENCE** AT BASE OF TV*





- DDX:

- VALVULAR DISRUPTION

- VEGETATION

- *RUPTURED SINUS OF VALSALVA WITH  
INTRA-CARDIAC SHUNT*



# TRANSESOPHGEAL ECHO

- TEE: RUPTURE OF RIGHT SINUS VALSALVA WITH CONTINUOUS SHUNT FROM AORTIC ROOT TO RA



# MANAGEMENT IN ICU

- CONSULTED QMH CTS UNIT FOR SURGICAL REPAIR
- PUT ON CVVH FOR RENAL SUPPORT
- HAEMODYNAMIC REMAINED STABLE, NO INOTROPE REQUIRED
- NO MECHANICAL VENTILATION REQUIRED
- METABOLIC ACIDOSIS AND ELECTROLYTES GRADUALLY CORRECTED
- LFT: ELEVATED ALT UP TO 1580 THEN GRADUALLY RECOVERED



- MICROBIOLOGY RESULTS:

- WEIL-FELIX, WIDAL 23/4 –VE
- MALARIA SCREENING –VE
- LEPTOSPIRA AB IGM 23/4 –VE

- AUTOIMMUNE MARKERS


- ANA, ANTI-ENA, ANCA, RF -VE
- C3/ C4 LOW



## DAY 6-11 AFTER ADMISSION (ICU)

Collect Date :	26/04/14	26/04/14	27/04/14	27/04/14	28/04/14		
Collect Time :	06:12	14:34	05:58	14:40	05:52		
Arrive Date :	26/04/14	26/04/14	27/04/14	27/04/14	28/04/14		
Arrive Time :	06:45	15:31	06:56	15:12	06:39		
Request No. :	C5252493	C5253266	C5253616	C5253949	C5254365	Reference	
Urgency :	URGENT	URGENT	URGENT	URGENT	URGENT	Range	Units
Specimen Type: Blood							
Sodium	125 *	125 *	126 *	124 *	126 *	136 - 145	mmol/L
Potassium	4.0	3.9	3.3 *	3.3 *	3.1 *	3.6 - 5.2	mmol/L
Urea	16.8 *	15.4 *	10.8 *	10.1 *	8.4 *	2.7 - 7.2	mmol/L
Creatinine	164 *	169 *	130 *	123 *	125 *	55 - 83\$	umol/L
Total Protein	51 *	59 *	60 *	59 *	62 *	64 - 83	g/L
Albumin	26 *	33 *	32 *	31 *	33 *	35 - 50	g/L
Globulin	25	26	28	28	29		g/L
Total Bilirubin	67 *	71 *	83 *	84 *	80 *	3 - 21\$	umol/L
ALP	67	76	89	87	101	36 - 105\$	IU/L
ALT	963 *	865 *	1074 *	1258 *	1459 *	< 49	IU/L
Calcium	2.11 *	2.22	2.33	2.25	2.29	2.20 - 2.60\$	mmol/L
Phosphate	1.27	1.42 *	0.91	0.79	0.52 *	0.76 - 1.40\$	mmol/L





Collect Date :	28/04/14	28/04/14	29/04/14	29/04/14	29/04/14	C	Reference Range	Units
Collect Time :	14:15	21:05	05:43	19:10	19:10			
Arrive Date :	28/04/14	28/04/14	29/04/14	29/04/14	29/04/14			
Arrive Time :	14:31	21:30	06:08	20:00	20:02			
Request No. :	C5256237	C5257116	C5257313	C5259788	C5259792			
Urgency :	URGENT	URGENT	URGENT	URGENT	URGENT			

Specimen Type: Blood

Sodium	124 *	127 *	127 *		129 *	136 - 145	mmol/L
Potassium	3.2 *	3.3 *	3.2 *		3.3 *	3.6 - 5.2	mmol/L
Urea	9.7 *	9.0 *	10.5 *		10.0 *	2.7 - 7.2	mmol/L
Creatinine	129 *	132 *	145 *		130 *	55 - 83\$	umol/L
Total Protein	61 *		63 *		67	64 - 83	g/L
Albumin	32 *		33 *		34 *	35 - 50	g/L
Globulin	29		30		33		g/L
Total Bilirubin	76 *		83 *		91 *	3 - 21\$	umol/L
ALP	101		114 *		114 *	36 - 105\$	IU/L
ALT	1580 *		1365 *		988 *	< 49	IU/L
Calcium	2.13 *	2.32	2.22			2.20 - 2.60\$	mmol/L
Phosphate	1.09	0.80	0.79			0.76 - 1.40\$	mmol/L
LDH	1459 *					128 - 245	IU/L
Lactate					5.21 *	0.50 - 2.20	mmol/L




Collect Date :	26/04/14	26/04/14	26/04/14	27/04/14	27/04/14	
Collect Time :	00:23	06:12	14:34	05:58	14:40	
Arrive Date :	26/04/14	26/04/14	26/04/14	27/04/14	27/04/14	
Arrive Time :	00:36	06:37	15:24	06:52	15:11	
Request No. :	C5252333	C5252463	C5253247	C5253592	C5253944	Reference
Urgency :	URGENT	URGENT	URGENT	URGENT	URGENT	Range Units

**Specimen Type: Blood**

Blood pH	7.45 *	7.46 *	7.51 *	7.50 *	7.49 *	7.35 - 7.45	
Blood pCO2	2.93 *	3.25 *	2.87 *	3.55 *	3.50 *	4.70 - 6.00	kPa
Blood pO2	17.5 *	15.4 *	12.4	10.6 *	14.7 *	10.7 - 13.3	kPa
HCO3 actual	15.1 *	17.1 *	16.7 *	20.2	19.6 *	20.0 - 26.0	mmol/L
Base Excess(vt)	-6.5 *	-4.6 *	-3.9 *	-1.4	-2.0	-3.0 - 3.0	mmol/L
O2 Saturation	99	99	98	97	98	95 - 100	%

The reference ranges of blood gases analysis are for arterial blood sample only.





Collect Date :	28/04/14	28/04/14	28/04/14	29/04/14	29/04/14		
Collect Time :	05:52	14:15	21:05	05:43	19:10		
Arrive Date :	28/04/14	28/04/14	28/04/14	29/04/14	29/04/14		
Arrive Time :	06:19	14:31	21:15	06:05	20:00		
Request No. :	C5254355	C5256231	C5257108	C5257305	C5259786	Reference	
Urgency :	URGENT	URGENT	URGENT	URGENT	URGENT	Range	Units

Specimen Type: Blood

Blood pH	7.52 *	7.52 *	7.52 *	7.52 *	7.46 *	7.35 - 7.45	
Blood pCO2	3.58 *	3.40 *	3.12 *	3.43 *	2.81 *	4.70 - 6.00	kPa
Blood pO2	9.95 *	16.7 *	12.4	11.2	11.5	10.7 - 13.3	kPa
HCO3 actual	21.5	20.4	18.5 *	20.5	14.6 *	20.0 - 26.0	mmol/L
Base Excess(vt)	0.3	-0.6	-2.4	-0.7	-6.7 *	-3.0 - 3.0	mmol/L
O2 Saturation	97	99	98	97	97	95 - 100	%

The reference ranges of blood gases analysis are for arterial blood sample only.



**Operative Diagnosis:**

(\*Modifier: ?=Provisional; C=Complications)

Sinus of Valsalva aneurysm from right coronary sinus (ruptured, aorta to RA fistula) (747.29)  
Congestive heart failure (428.0)  
Acute hepatic failure (570)  
Acute renal failure (584.9)

**Procedure:**

Repair of arteriovenous fistula, aorta (ruptured Sinus of valsalva aneurysm) (39.53)  
Cardiopulmonary bypass (39.61)  
Transoesophageal echocardiography (88.72, 42.23)  
Insertion of central venous catheter (38.93)  
Systemic arterial pressure monitoring (89.61)  
Invasive mechanical ventilation (96.70)  
Insertion of Tenckhoff catheter (54.93)

**Specimens sent for Pathological Examination:**

**Findings:**

Very very distended RA  
Sinus of Valsalva aneurysm ruptured at RCC with windsock extended into RA, fistula defect around 1cm  
TV normal looking leaflets, no VSD  
LV function ok  
left Coronary ostial site normal, Right double orifice ostia at normal position, both very small ( only 5mm below aortotomy )  
No sign of infective endocarditis



**Procedure Record:**

Median sternotomy  
CPB setup by aortic ( EOPA Fr18) and bicaval ( DLP Fr28/ RMI Fr34) cannulation  
LV vent at R SPV  
Aortic cross clamp  
Aortotomy  
Heart arrested by antegrade blood cardioplegia to ostia  
SVC/IVC snared  
RA opened  
Defect at Right coronary sinus identified at both aortic and RA side  
Bovine pericardial patch repair at RA side done using 5/0 prolene continuous; Bovine pericardial patch repair at aortic side using 6/0 prolene continuous  
Saline test over TV showed minimal leakage  
Aortotomy closed with 4/0 prolene continuous  
RA closed with 4/0 prolene continuous  
Deairing was done at aortic root before removal of aortic clamp  
Heart beat with SR  
Patient was then weaned from CPB with stable haemodynamics  
TEE showed very small jet ~1mm at site of repair, mild to mod TR  
Haemostasis, insertion of drains ( pericardial, mediastinal )  
pericardium closed  
Sternum closed with wires  
Wound closed in layers

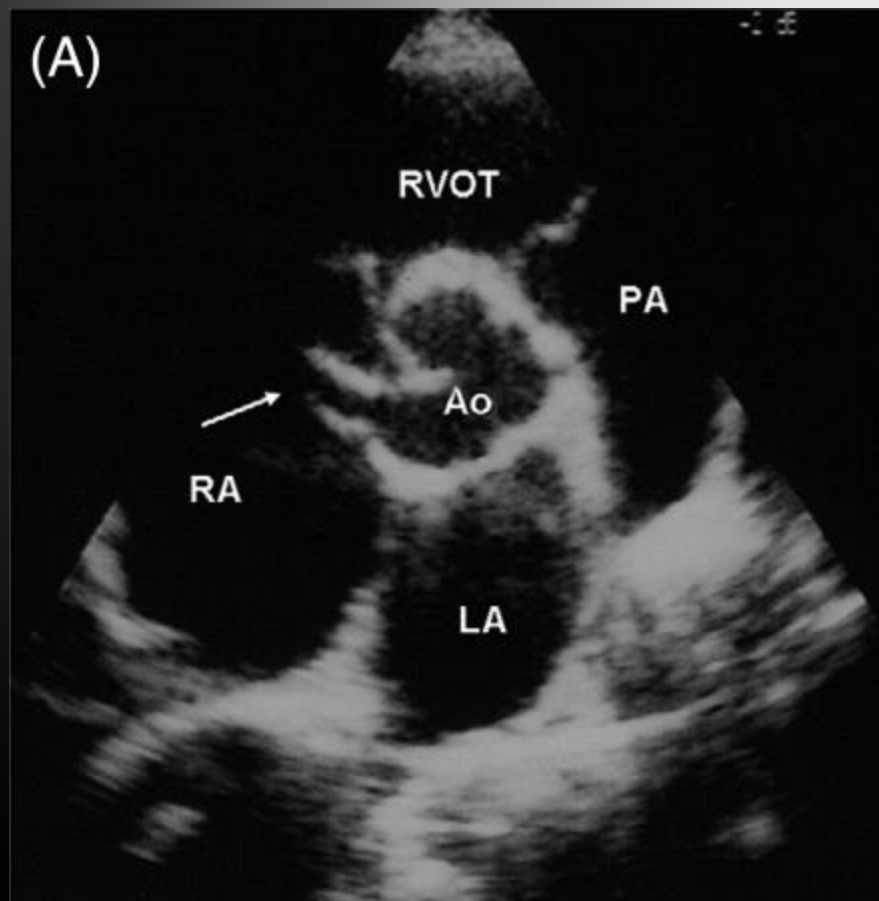
Total aortic cross clamp time 72mins, total bypass time 100mins



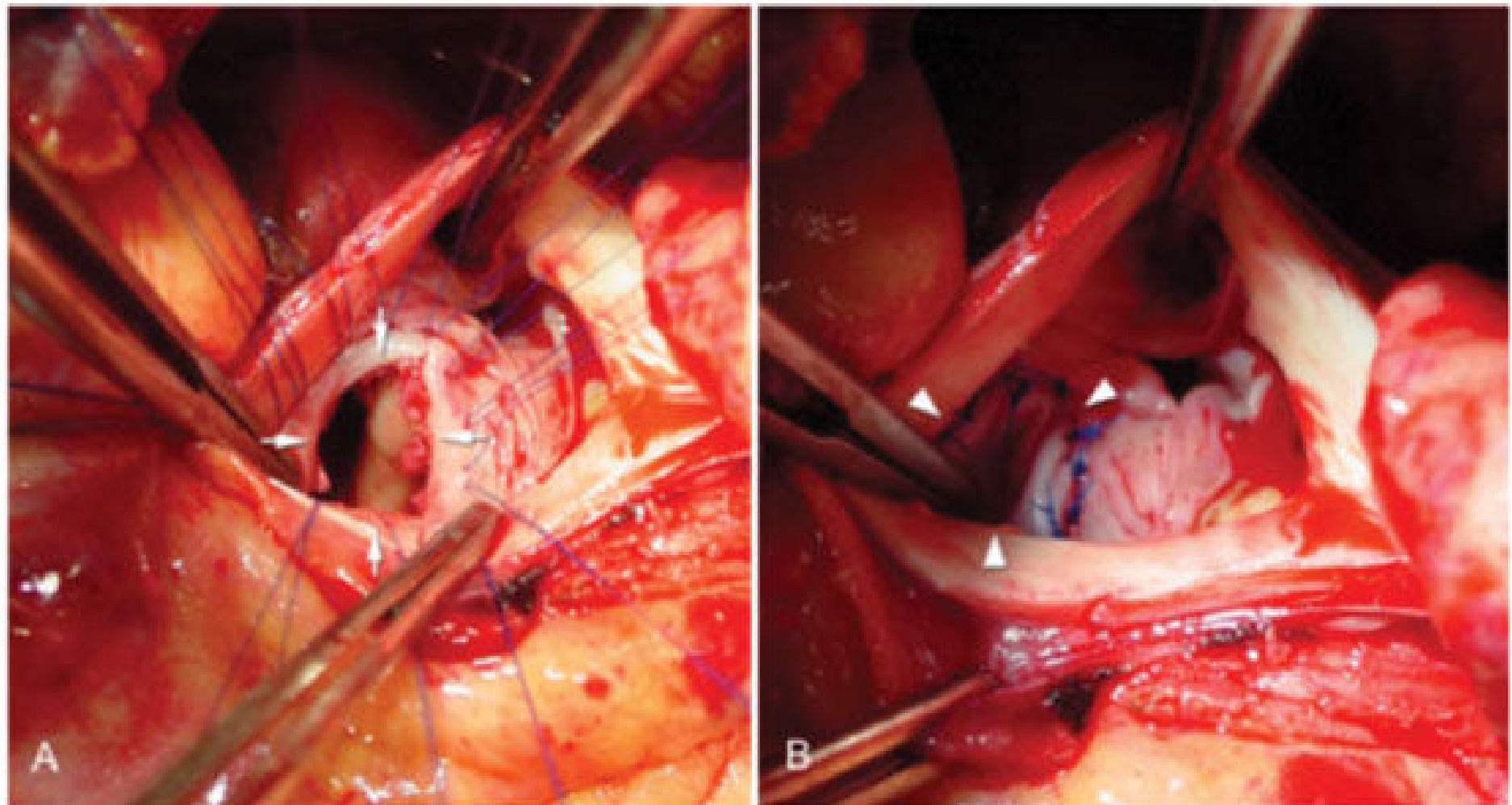
- OT DONE ON 30/4 IN QMH
- INTRAOP FINDINGS:
  - VERY DISTENDED RA
  - SINUS OF VALSALVA ANEURYSM RUPTURED AT RIGHT CORONARY SINUS WITH **WINDSOCK** EXTENDED INTO RA, FISTULA DEFECT ~1 CM
  - TV NORMAL LOOKING LEAFLETS, NO VSD
  - NO SIGN OF INFECTIVE ENDOCARDITIS
- BOVINE PERICARDIAL PATCH REPAIR AT RA AND AORTIC SIDE; WEANED FROM CPB; TEE: VERY SMALL JET ~1 MM AT SITE OF REPAIR, MILD TO MOD TR
- OT DURATION: 4 HR 4 MINS



## THE WINDSOCK EXTENDING INTO RA







**Figure 2** - Intra-operative pictures; A - Closure of the aortic orifice of the right sinus of Valsalva aneurysm (arrows); B - Closure performed with a bovine pericardial patch with separate 5-0 prolene sutures (arrowheads).

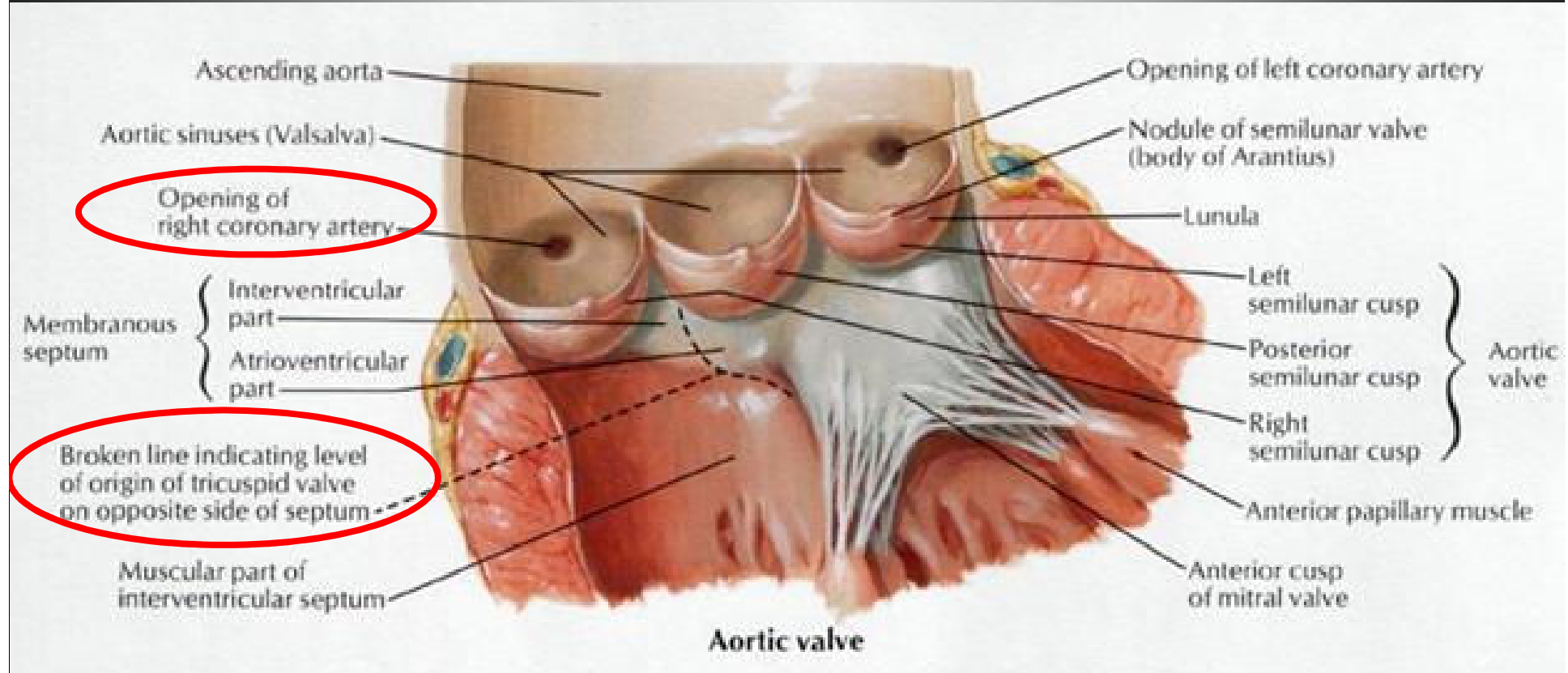


The background of the slide is a dark gray gradient, transitioning from a lighter shade at the top to a darker shade at the bottom. Scattered across the background are numerous white circles of varying sizes, some of which have a bright white highlight, giving them a three-dimensional, bubble-like appearance. The text is centered in the middle of the slide.

# SINUS OF VALSALVA ANEURYSM



# SINUS OF VALSALVA





# SINUS OF VALSALVA ANEURYSM (SVA)

- FIRST DESCRIBED BY JOHN THURNAM IN 1840
- RARE CONGENITAL ANOMALY
- USUALLY CLINICALLY SILENT → DETECTED IN ROUTINE ECHO EXAM
- ANATOMICAL ORIGIN
  - 65-85% FROM RIGHT SINUS OF VALSALVA
  - 10-30% FROM NONCORONARY
  - <5% FROM LEFT SINUS



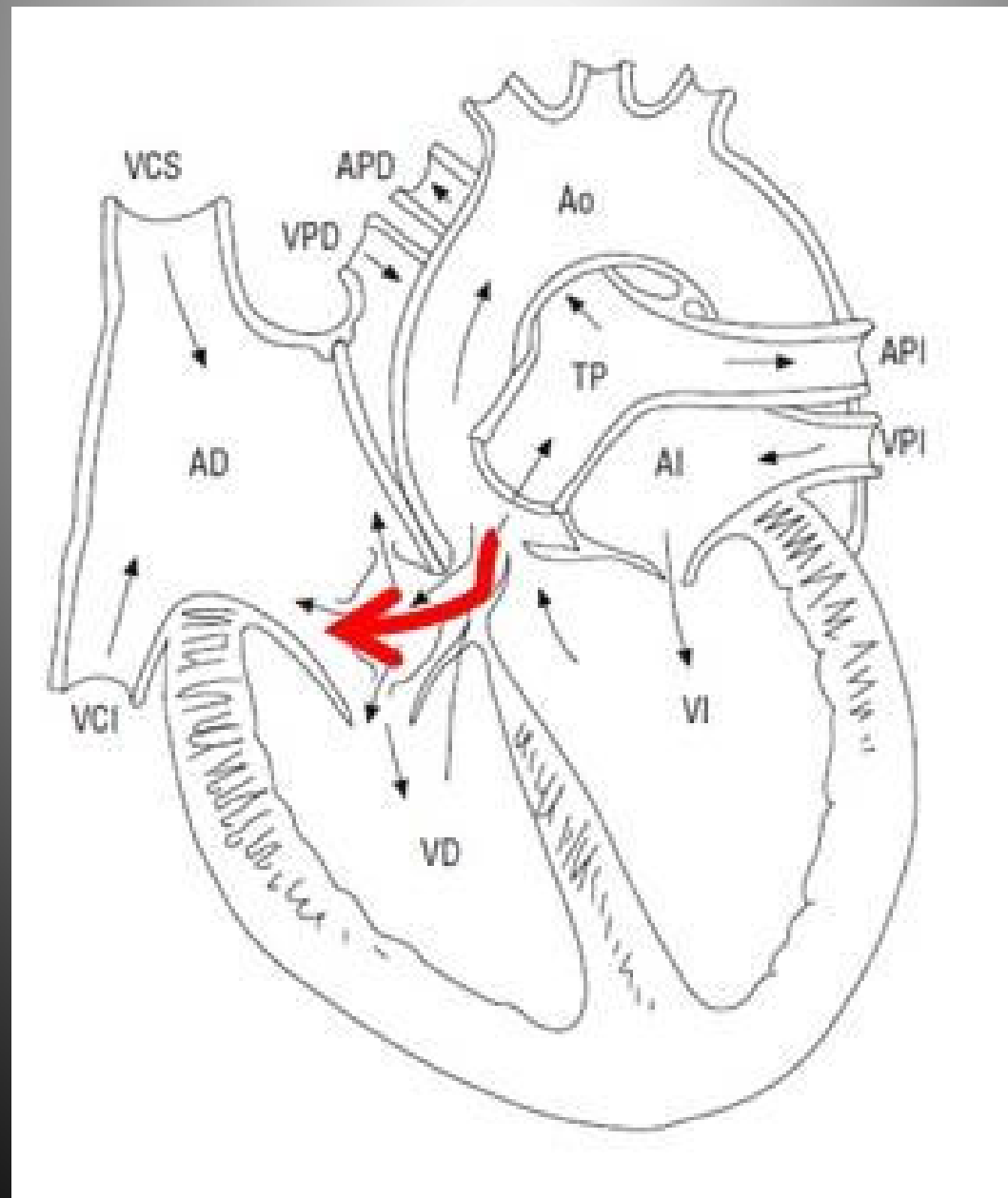
# PATHOPHYSIOLOGY

- CONGENITAL (USUALLY INVOLVE A SINGLE SINUS):
  - DEFICIENCY OF NORMAL ELASTIC TISSUE
  - ABNORMAL DEVELOPMENT OF BULBUS CORDIS
- OTHER DISEASE PROCESSES THAT INVOLVE AORTIC ROOT:
  - ATHEROSCLEROTIC ANEURYSMS
  - SYPHILIS
  - ENDOCARDITIS
  - CHEST TRAUMA
- → MAY INVOLVE MULTIPLE SINUSES



- RUPTURE OF DILATED SINUS → INTRACARDIAC SHUNTING
  - RIGHT VENTRICLE (60-90%)
  - RIGHT ATRIUM (10% → GERBODE DEFECT)
- IF RUPTURE INTO PERICARDIAL SPACE → CARDIAC TAMPONADE







# EPIDEMIOLOGY

- 0.09% OF CADAVERS IN A LARGE AUTOPSY SERIES
- MORE PREVALENT IN ASIAN SURGICAL SERIES (0.46-3.5%)
  - 0.14-0.23% IN A WESTERN SURGICAL SERIES
- UNRUPTURED SVA IS USUALLY ASYMPTOMATIC
- CLINICAL COMPLICATIONS → THE INITIAL PRESENTATION



# HISTORY

- RUPTURE MAY OCCUR SPONTANEOUSLY, PRECIPITATED BY EXERTION, TRAUMA OR CARDIAC CATHETERIZATION
- MOST RUPTURED SVAS OCCUR FROM PUBERTY TO AGE 30 YEARS
- A RUPTURED SVA PROGRESSES IN 3 STAGES BY BLACKSHEAR AND COLLEAGUES:
  1. ACUTE CHEST OR RIGHT UPPER QUADRANT PAIN
  2. SUBACUTE DYSPNOEA ON EXERTION OR AT REST
  3. PROGRESSIVE COUGH, DYSPNOEA, EDEMA, OLIGUIRA

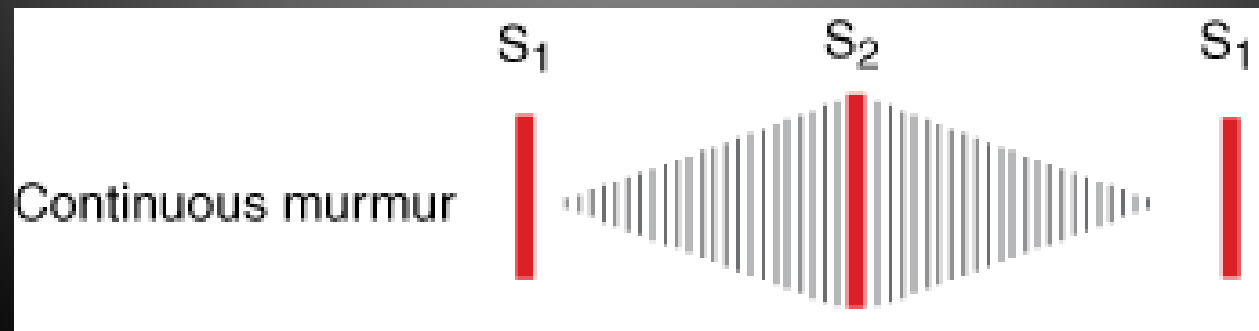


- 
- PALPITATION OR SYNCOPE SECONDARY TO OBSTRUCTION OF LV/RV OUTFLOW TRACT (COMPRESSION BY UNRUPTURED ANEURYSM)



## PHYSICAL EXAM

- UNRUPTURED SVA IS OFTEN ASYMPTOMATIC AND HAS ALMOST NO PHYSICAL SIGNS
- WHEN SVA RUPTURES → LEFT-TO-RIGHT SHUNTING
- LOUD, SUPERFICIAL, 'MACHINE-TYPE' CONTINUOUS MURMUR IS ACCENTUATED IN DIASTOLE (40%)
- PALPABLE THRILL ALONG RIGHT OR LEFT LOWER PARASTERNAL BORDER
- ASSOCIATED AORTIC REGURGITATION (44%)





- 
- ASSOCIATED CONGENITAL DEFECTS
    - VENTRICULAR SEPTAL DEFECT
    - AORTIC INSUFFICIENCY
    - COARCTATION



# IMAGING

- TTE: DETECT UP TO 75% OF SVA
- TEE: PRECISE IDENTIFICATION OF STRUCTURAL ANOMALIES AND SHUNT LOCATIONS FOR PERIOPERATIVE ASSESSMENT
- MRI: CONFIRM DIAGNOSIS AND FOR PERIOPERATIVE ASSESSMENT



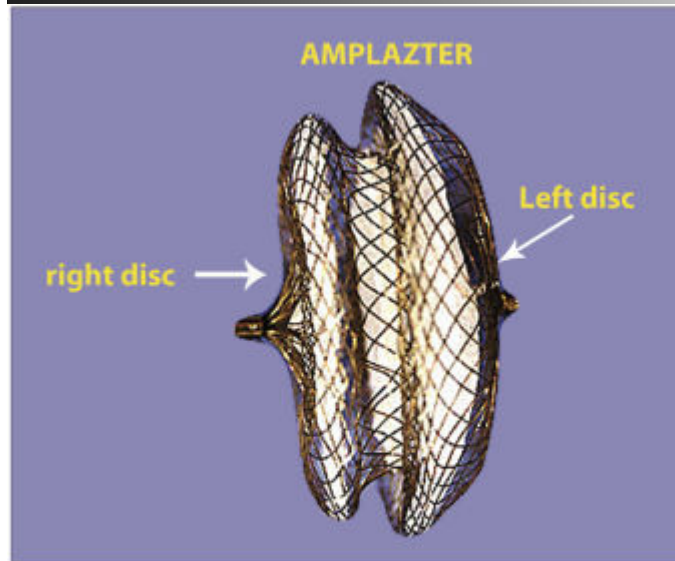
# TREATMENT

- MEDICAL: OPTIMIZING MEDICATIONS FOR HEART FAILURE AND PERIOPERATIVE ASSESSMENT AND MANAGEMENT
- SURGICAL: URGENT SURGICAL REPAIR (PATCH CLOSURE) FOR RUPTURED SVA ESP WITH INTRACARDIAC SHUNTING
  - AGGRESSIVE SURGICAL CORRECTION OF UNRUPTURED SVA IS OFTEN RECOMMENDED
- TRANSCATHETER CLOSURE OF RUPTURED SVA E.G. AMPLATZER DEVICES

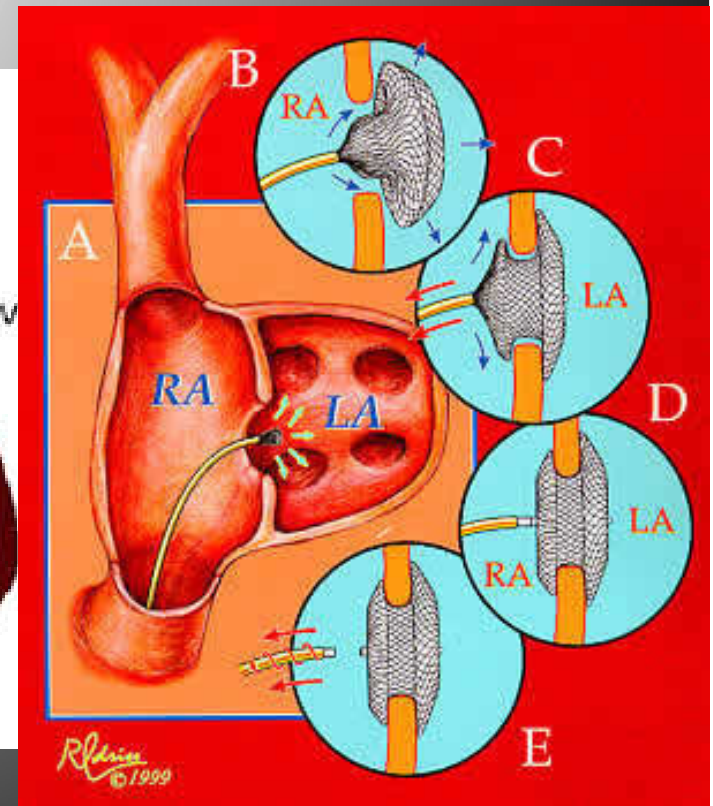
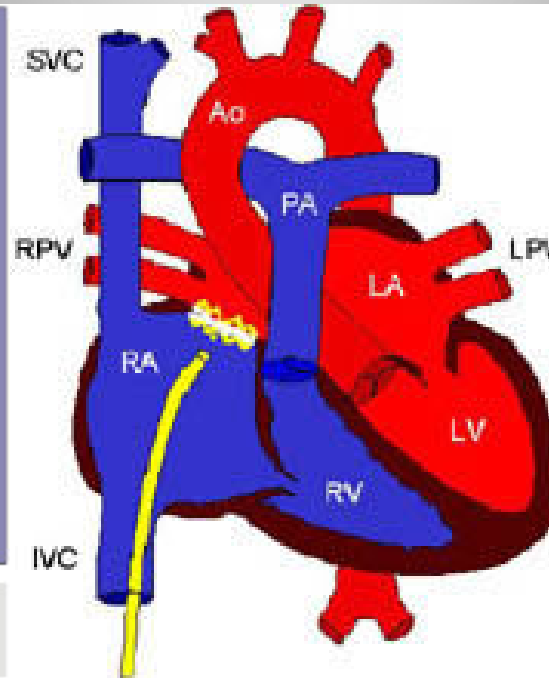




# AMPLATZER DEVICE



**Figure 2:** AMPLAZTER septal occluder device (AGA Medical Corporation, now St. Jude Medical).





# COMPLICATIONS

- MYOCARDIAL INFARCTION
  - CORONARY ARTERY COMPRESSED BY ADJACENT UNRUPTURED SVA
- COMPLETE HEART BLOCK
  - COMPRESSION BY ADJACENT UNRUPTURED SVA
- RVOT OBSTRUCTION
- INFECTIVE ENDOCARDITIS
- CEREBROVASCULAR EMBOLI



# OUTCOME OF OUR PATIENT...

- TRANSFER BACK TO CARDIAC REHAB BED ON POST-OP D5
  - LOW GRADE FEVER INITIALLY, SUBSIDED AFTERWARD
  - SEPSIS WORKUP –VE
  - NOT IN HEART FAILURE, FOR A SHORT COURSE OF CARDIAC REHAB
  - ECHO ON POST-OP DAY 8:

**DIAGNOSIS :** Normal LV size and systolic function with EF ~60%  
Structurally normal heart valves with trivial MR, mild TR, trivial PR  
RVSP ~25mmHg  
No pericardial effusion  
No obvious residual shunt seen

**COMMENTS :**



Collect Date :	29/04/14	30/04/14	30/04/14	01/05/14	01/05/14		
Collect Time :	21:42	14:11	20:01	06:29	06:29		
Request No. :	C4301215	C4303030	C5010503	C5010561	C5011323	Ref. Range	Units
Remark :	per op	per op	per op.Mask Type =Ventilat	per op.Mask Type =Ventilat	per op		
-----							
Comment		Below		Below	Below		
Mask Type	--	--	Ventilator	Ventilator	--		
Flow Rate	--	--	0.0	100.0	--		L/min
% inspired O2	--	--	40	100	--		%
pH	--	--	7.55 H	7.58 H	--	7.35 - 7.45	
pO2	--	--	18.2 H	10.7	--	10.6 - 14.0	kPa
pCO2	--	--	4.1 L	4.6 L	--	4.7 - 6.0	kPa
HCO3-	--	--	27 H	32 H	--	22 - 26	mmol/L
Base excess	--	--	4 H	9 H	--	(-4) - (+2)	mmol/L
Na (WB)	--	--	138	140	--	137 - 145	mmol/L
K (WB)	--	--	3.3 L	2.7 L	--	3.6 - 5.0	mmol/L
Na	--	141	--	--	145	136 - 148	mmol/L
K	--	4.1	--	--	2.9 L	3.6 - 5.0	mmol/L
Chloride	--	94 L	--	--	96 L	100 - 109	mmol/L
Urea	--	13.7 H	--	--	17.6 H	2.5 - 6.4	mmol/L
Creatinine	--	169 H	--	--	186 H	49 - 82	umol/L
F Glucose	4.4	--	--	--	--	< 6.1	mmol/L
Total Protein	--	48 L	--	--	55 L	67 - 87	g/L
Albumin	--	24 L	--	--	34 L	39 - 50	g/L
Globulin	--	24 L	--	--	21 L	26 - 40	g/L
Total Bili	--	97 H	--	--	146 H	4 - 23	umol/L
ALP	--	62	--	--	62	32 - 93	U/L
ALT	--	382 H	--	--	354 H	7 - 36	U/L
AST	--	303 H	--	--	260 H	14 - 30	U/L
LDH	--	366 H	--	--	343 H	107 - 218	U/L
CK	--	282 H	--	--	206 H	40 - 161	U/L



Collect Date : 06/05/14 07/05/14 08/05/14 12/05/14 13/05/14  
 Collect Time : 08:19 15:29 08:17 09:55 09:03  
 Request No. : C5061464 C5072945 C5081392 C5121862 C5131628 Ref. Range Units  
 Remark : rupture rupture rupture rupture rupture  
 SOV SOV SOV SOV SOV

Comment				Below	Below		
Na	140	135 L	134 L	141	137	136 - 148	mmol/L
K	3.5 L	3.5 L	3.7	3.9	4.1	3.6 - 5.0	mmol/L
Chloride	97 L	97 L	96 L	104	99 L	100 - 109	mmol/L
Urea	9.0 H	6.9 H	6.7 H	1.6 L	1.7 L	2.5 - 6.4	mmol/L
Creatinine	77	64	67	54	47 L	49 - 82	umol/L
Total Protein	59 L	61 L	68	70	73	67 - 87	g/L
Albumin	31 L	29 L	33 L	32 L	33 L	39 - 50	g/L
Globulin	28	32	35	38	40	26 - 40	g/L
Total Bili	124 H	91 H	88 H	46 H	44 H	4 - 23	umol/L
ALP	117 H	167 H	221 H	167 H	150 H	32 - 93	U/L
ALT	184 H	155 H	151 H	92 H	84 H	7 - 36	U/L
AST	70 H	74 H	82 H	61 H	59 H	14 - 30	U/L



The background is a dark gray gradient, lighter in the center and darker towards the edges. Scattered throughout are numerous white, bubble-like shapes of various sizes. Some are simple outlines, while others have a small white highlight inside, giving them a three-dimensional appearance. The bubbles are more concentrated in the top-left and bottom-right corners.

THANK YOU