Management of Tachycardia-induced Cardiomyopathy in children

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Objective:

- Persistent tachycardia causes

  elevated ventricular filling pressures

  severe biventricular systolic dysfunction

  reduced cardiac output

  elevated systemic vascular resistance

- Associated arrhythmias are
    - atrial fibrillation
    - atrial flutter
    - atrial tachycardia
    - reentrant supraventricular tachycardia
    - accessory pathway tachycardia
    - frequent ectopic beats
    - ventricular tachycardia

- Management and restoration of cardiac function is dependent on control of tachyarrhythmias

- Here we report a case serial including ten children with tachycardia-induced cardiomyoptahy in different types.

- Diagnosed as Tachycardiomyopathy in Baskent University Pediatric Cardiology Department between August 2014-2017

- Ten patient (3 female, 7 male)
- The mean age 10,1±4,3 (min 4- max 15,8)

- Seven of them had no medical problem or tachycardia history but three had prior heart surgery including Senning, TAPVC and VSD correction, respectively.

Age/ year	Arrhythmia	DC CV	ECMO	Medication	RFA	First EF %	Last EF %	Prior Heart Surgery	Follow-up period month	Evidence for improvement
15,8	VT	+/+	-	Metoprolol	+	47	68	-	23	Increased EF
11,8	Mahaim acc pathway + AVNRT	+/+	-	Amiodarone	+	42	78	-	16	Increased EF
14,5	VT	+/-	-	Amiodarone	+	44	62	-	22	Increased EF
7,9	AVRT	-	-	Amiodarone	+	38	69	-	11	Increased EF
13	Atrial tachycardia	-	-	None	+	17	37	-	6	Less Incr EF
14,5	PJRT	-	+	Sotalol	+	10	32	-	1	Less Incr EF
12,3	Atrial tachycardia	-	+	Amiodarone	+	18	62	-	27	Increased EF
7	Atrial tachycardia	+/+	-	Amiodarone	-	32	60	VSD corr	8	Increased EF
4	Atrial tachycardia	+/+	-	Sotalol	-	48	62	Senning	9	Increased EF
5	Atrial tachycardia	+/+	-	Sotalol	-	48	64	TAPVC corr	10	Increased EF

Results

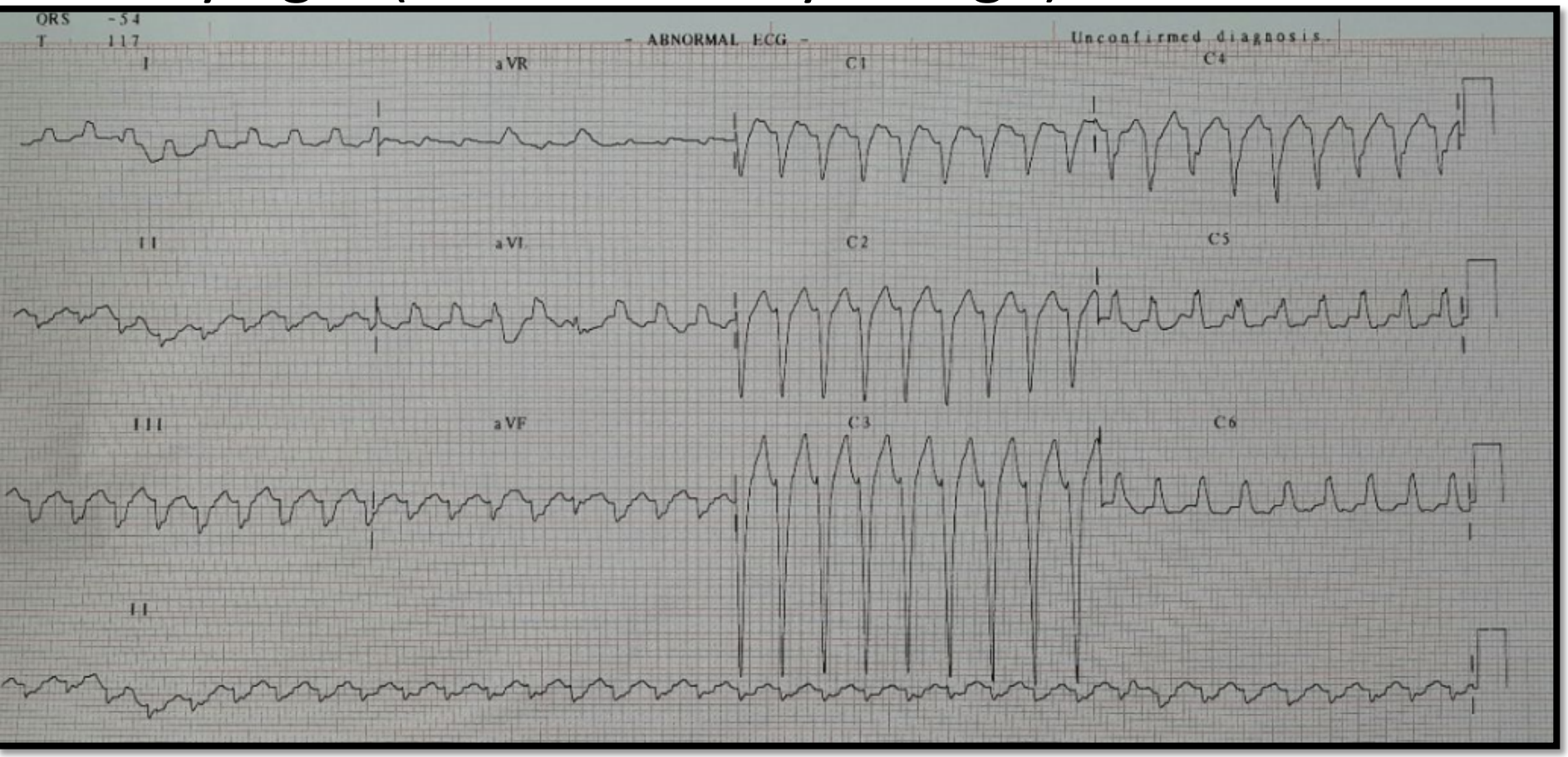
- EF **34±14 %(min 10- max 48)**

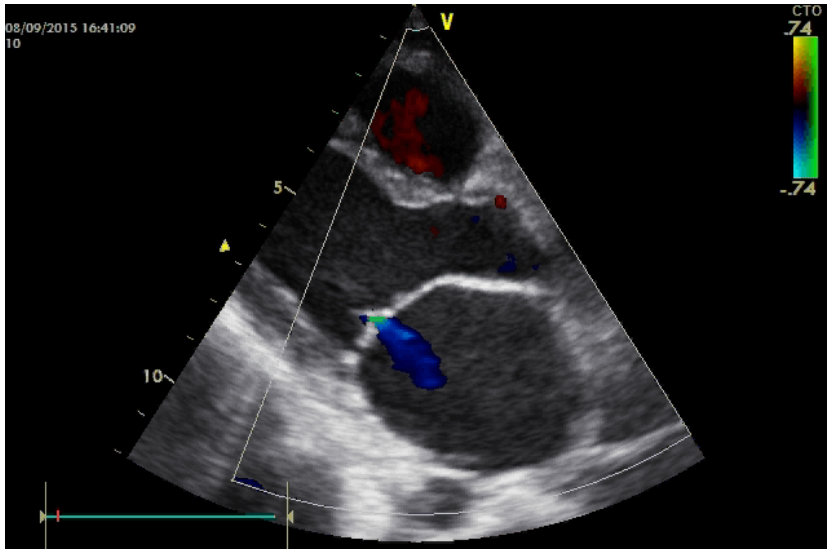
  FS 19,6± 5,5 % (min 8- max 25)

  LVEDD 55±12 mm (min 30- max78)
- After complete recovery

  EF **59±14 (min 32- max 78)**

- 12 yo girl (father died 6 year ago)

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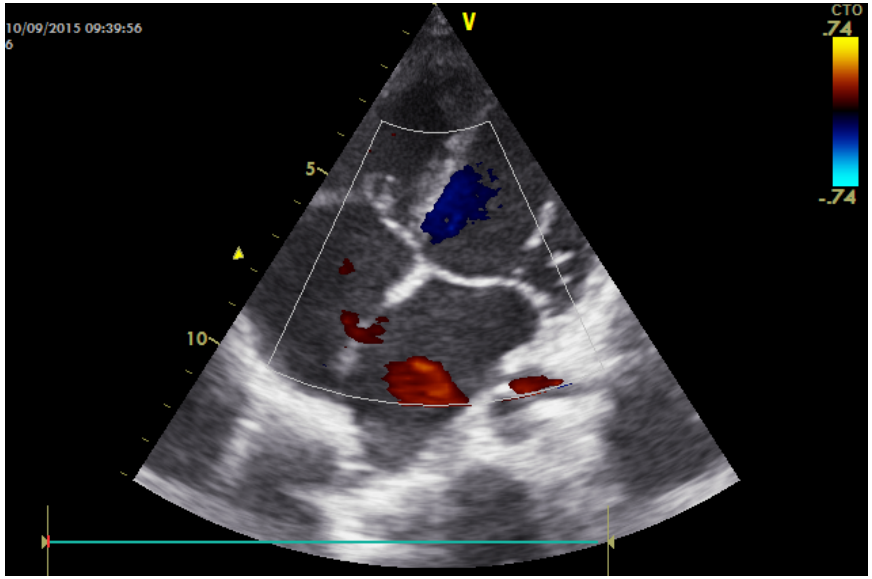
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- ARVD ? cardiac MRI normal, but has two different heterozygote desmoplakin mutation

  p.P450L (c.1349C>T), p.A2761T (c.8281G>A)

- Mahaim tachycardia with right anterolateral accesory pathway and AVNRT were ablated

- 13 yo bo
- Referred
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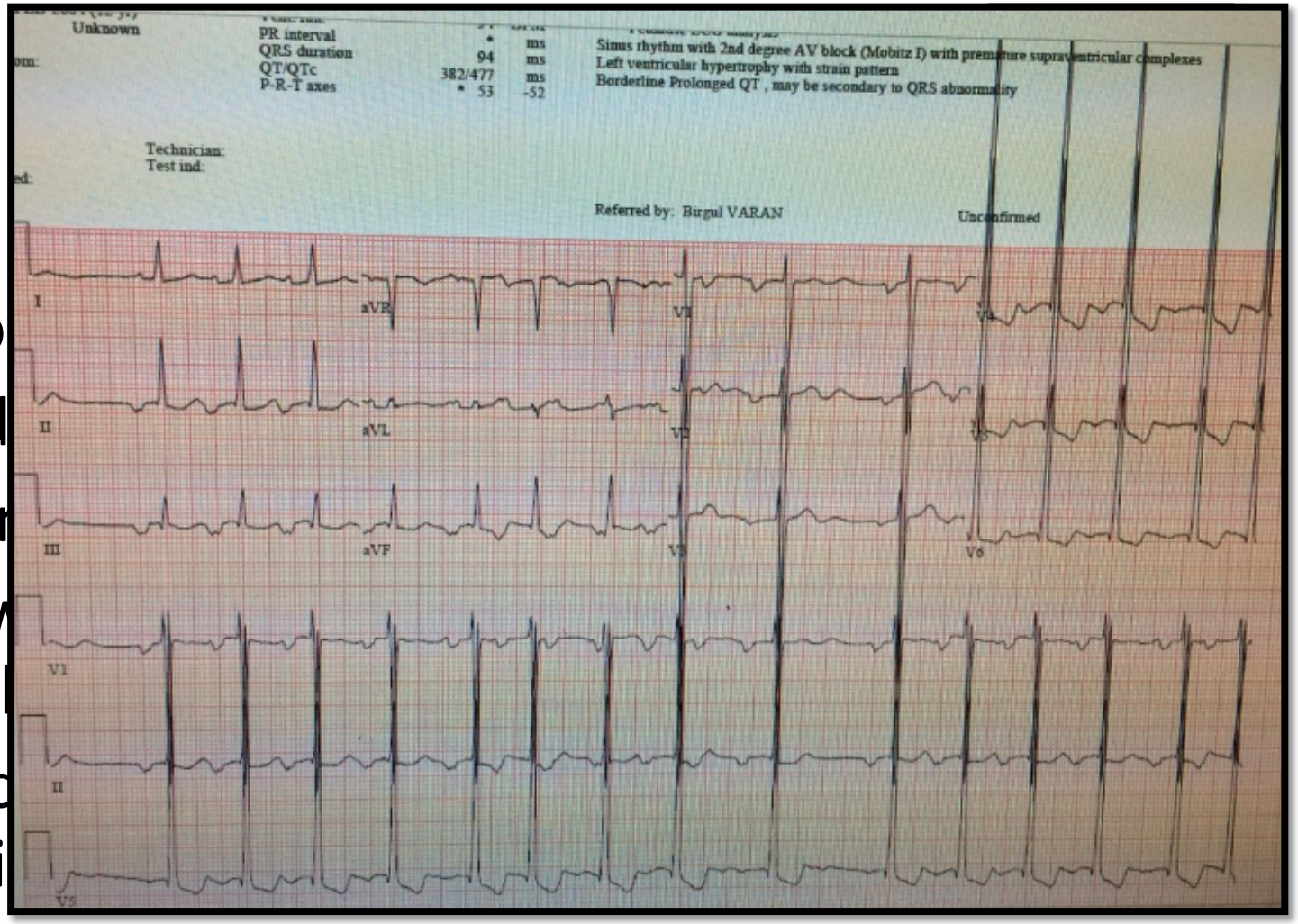
- EF was noted 37% after 3 months with better clinical symptoms (NYHA Class I-II).



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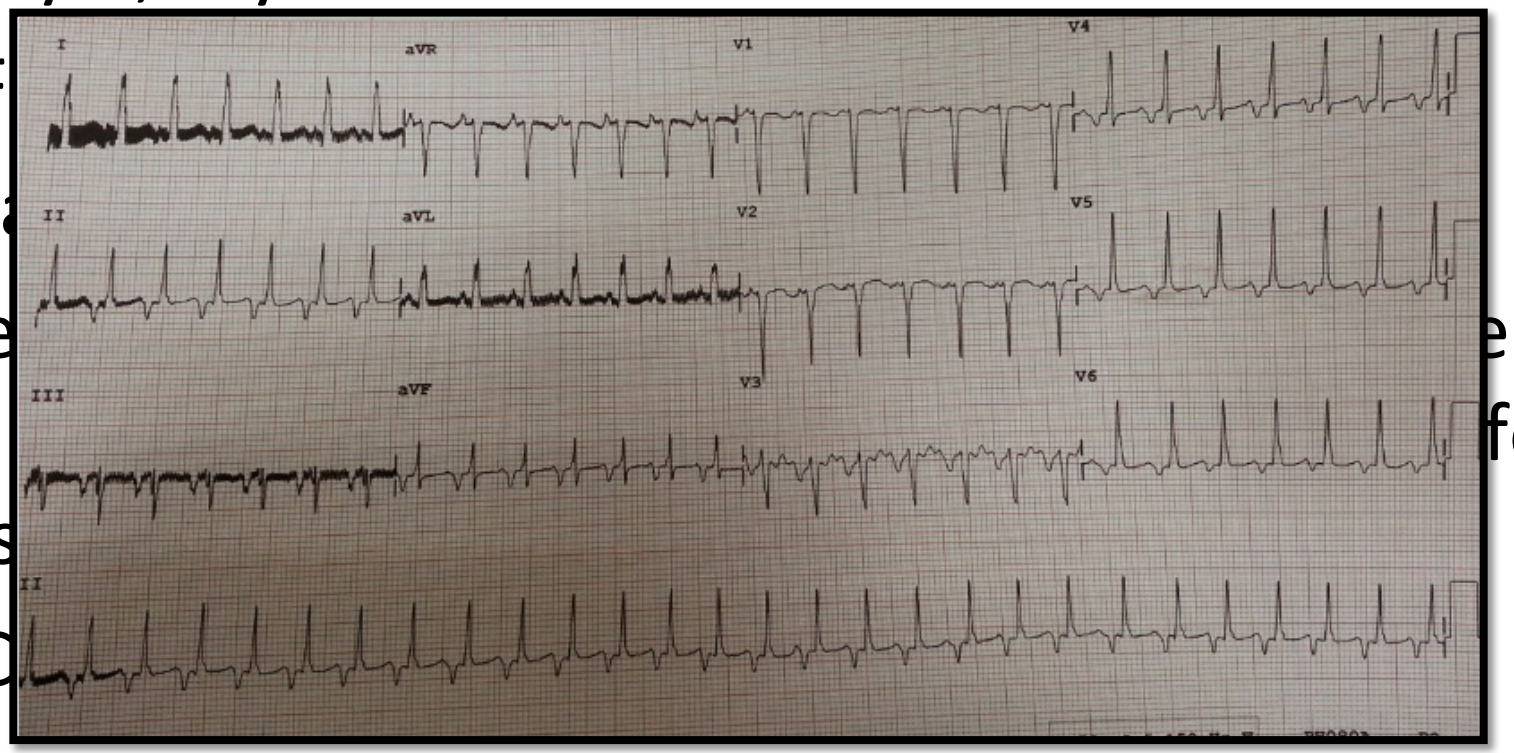

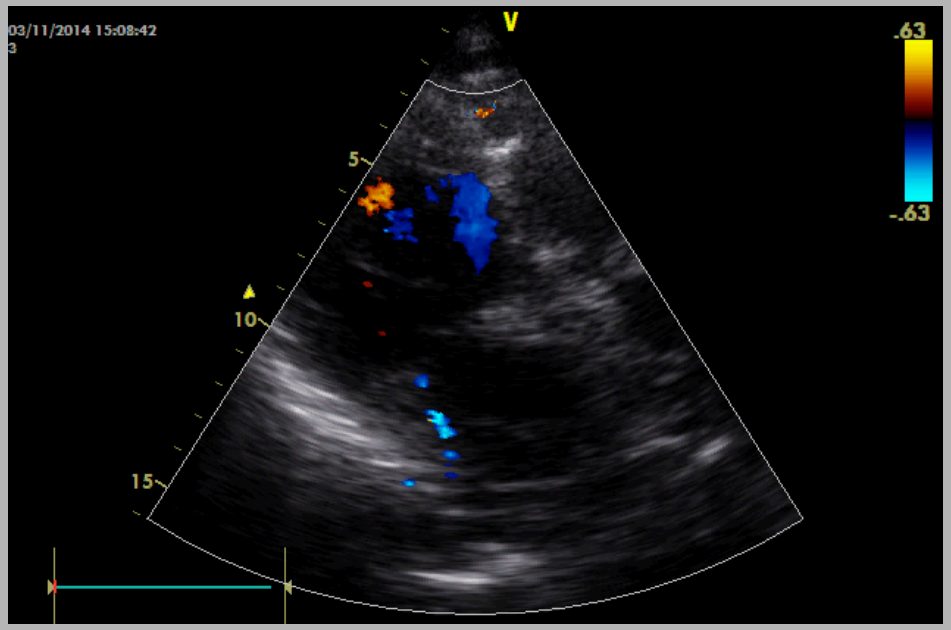
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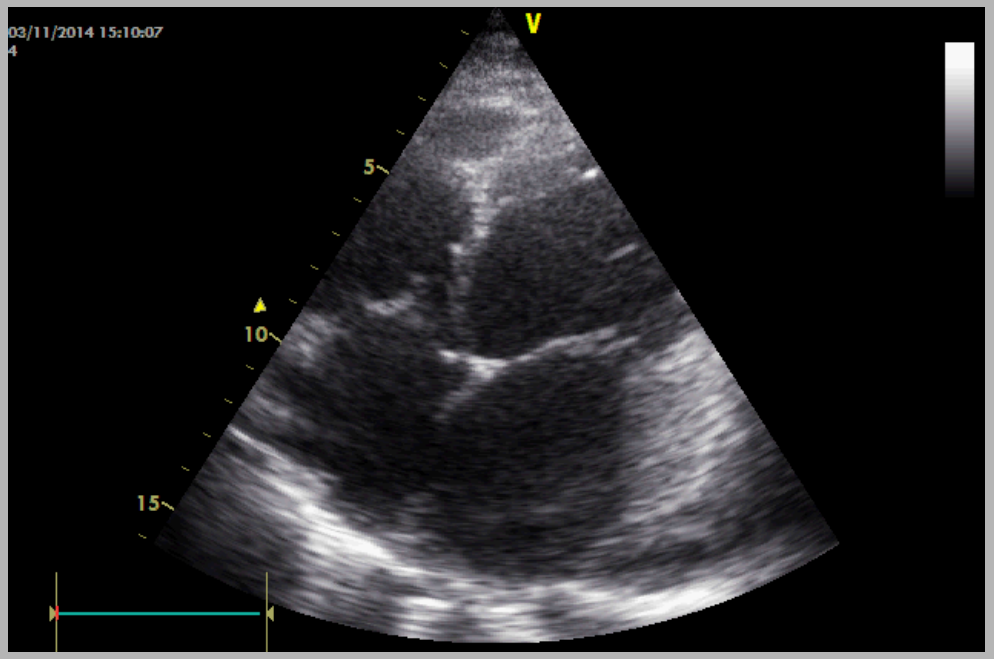
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- After 5 days he was supported with a ventricular asist device
- Following a month, second radiofrequency catheter ablation was successfully applied.
- Systolic heart function improved within a week.
- After three months of LVAD EF was noted 56 % without any cardiac complaint and pump was successfully removed

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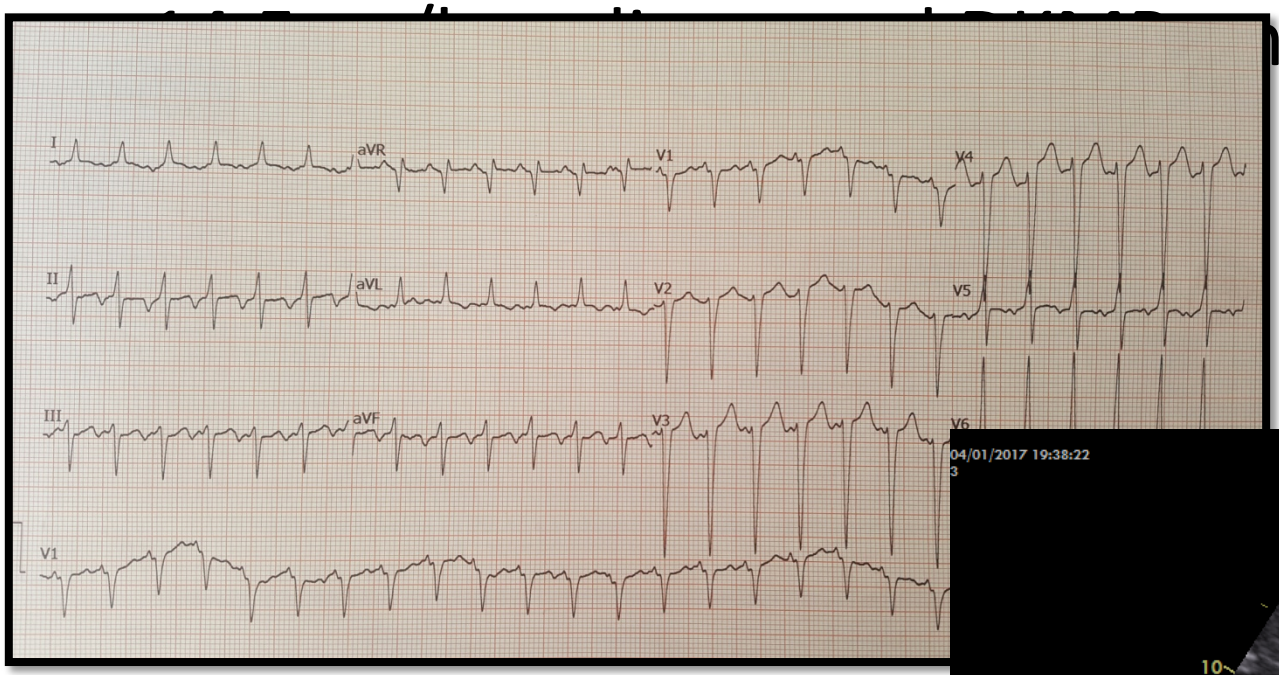
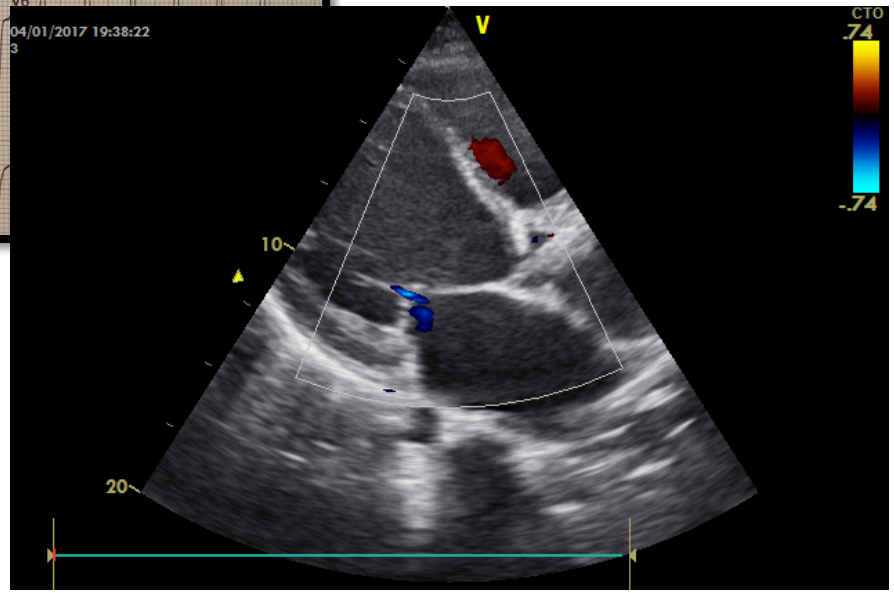
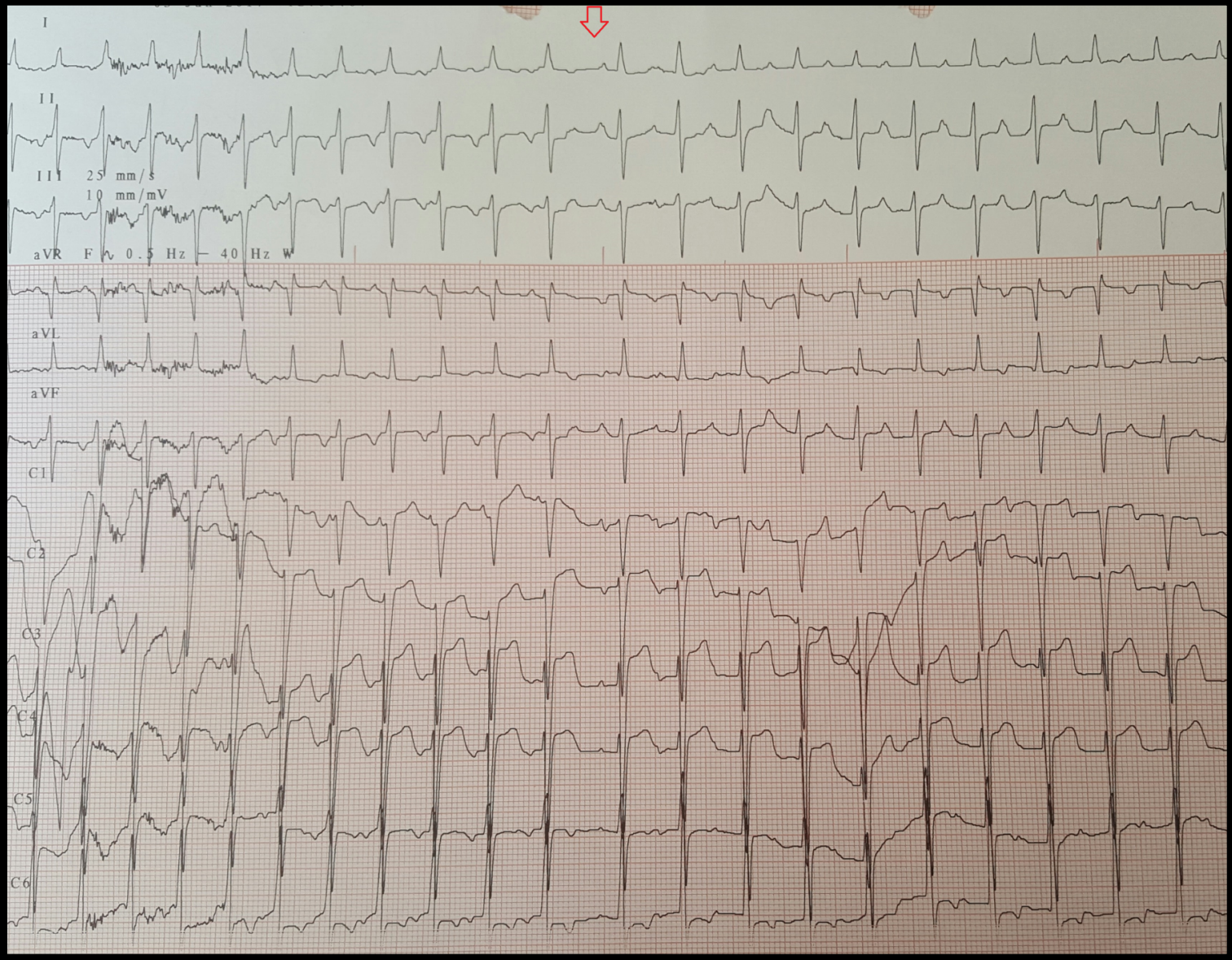


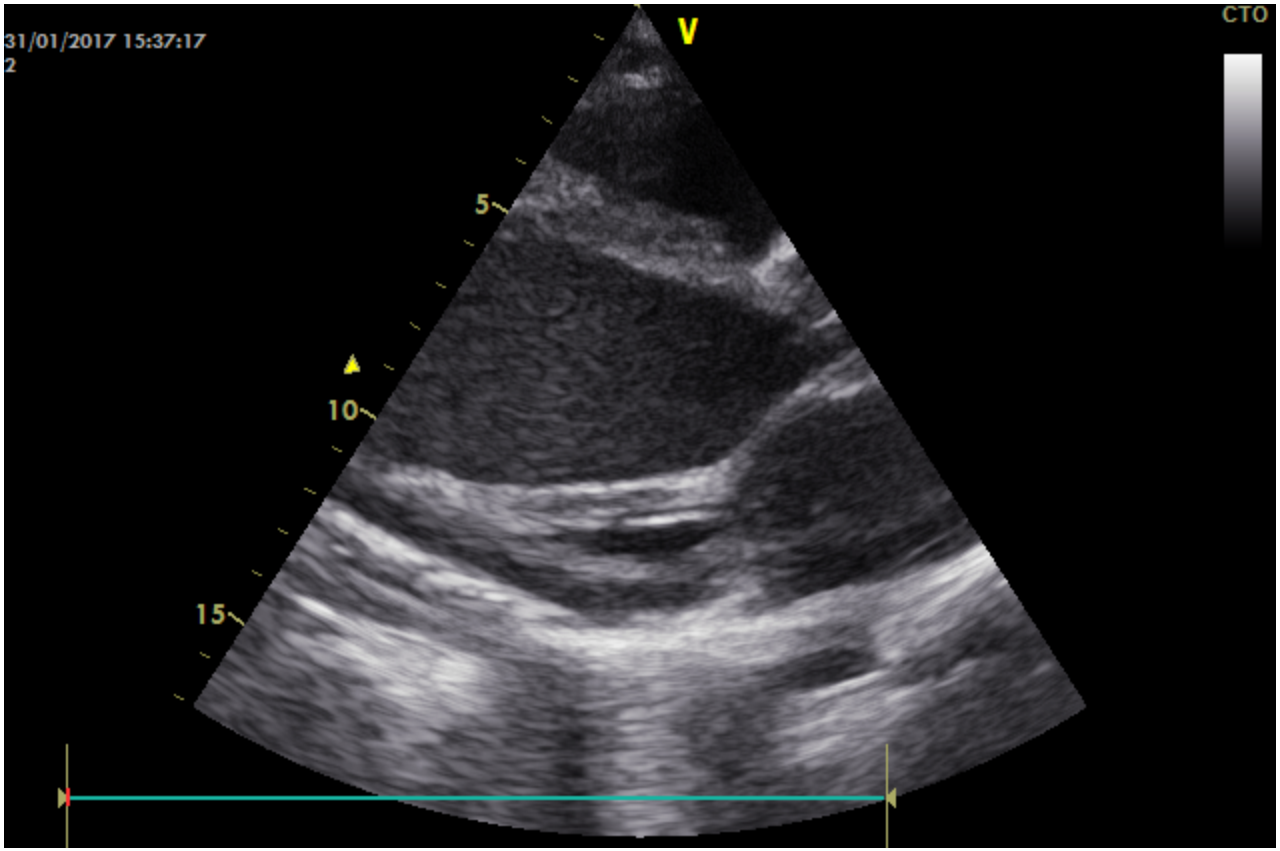


Diagnosed PJRT



- EF was 10%
- As soon as left ventricle catheterisation VF developed , multiple DF required
- After 2 hours with continuous CPR, ECMO was applied
- He was extubated and inotrope drugs were decreased the following day

- Anaphylactic shock was developed during amiodarone infusion at second day
- Sotalol 80 mg twice a day was applied
- After 7 days on ECMO second radiofrequency catheter ablation was successfully applied
- Ecmo was ended after three days of ablation
- Ten days later EF was 32% and he was discharged from hospital with oral heart failure medication (without any central nervous system sequelae)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Discussion

- The clinical presentation is symptoms of tachycardia and/or HF signs

- It can be difficult to determine whether an arrhythmia is the initiator or consequence of cardiomyopathy in a patient with tachycardia and HF.

Thus, AIC raises a "chicken or egg" question

Discussion

- No absolute Echo parameters
- Therefore patients in whom arrhythmia-induced cardiomyopathy is suspected should undergo **close cardiac monitoring**

Management

- To achieve ventricular heart rate control or to restore
- Options for the restoration of sinus rhythm include electrical cardioversion, antiarrhythmic drugs, and catheter ablation of the arrhythmia
- Close follow-up is required even after successful ablation because of the tendency for cardiomyopathy if tachycardia recurs

- In the largest pediatric series of AIC, AET (59%) and permanent junctional reciprocating tachycardia (PJRT; 23%) were the most common arrhythmias represented

- AET usually occurs without structural heart disease, but has been described after congenital heart disease surgery

- Previous small reports describe weeks to months for functional recovery and years for reverse remodeling, the median time to recovery in a larger study was **<2months** in children

- Failure to recover should instigate a search for factors--- subclinical arrhythmia recurrence?

  an underlying cardiomyopathy

- Sudden cardiac death has been reported in AIC patients following symptom recovery and LVEF normalization (suggesting a greater risk in patients with **severe baseline LV dysfunction**)

Conclusion

- AIC has a wide range of clinical manifestations, from asymptomatic tachycardia to cardiomyopathy to end-stage HF

- Early recognition is critical, and aggressive treatment aimed at controlling or eliminating the arrhythmia results in symptom resolution and recovery of ventricular function

Conclusion

- However, cellular and extracellular ultrastructural changes can persist and can contribute to a rapid decline in cardiac function with arrhythmia recurrence, as well as confer a risk of sudden cardiac death