



PIMS-TS [PAEDIATRIC INFLAMMATORY MULTISYSTEM SYNDROME TEMPORALLY ASSOCIATED WITH SARS-COV-2 (COVID-19)] IN A CHILD WITH NEW ONSET TYPE 2 DIABETES

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INTRODUCTION

PIMS-TS [Paediatric Inflammatory Multisystem Syndrome Temporally associated with SARS-CoV-2] is a unique clinical complication of COVID-19 infection in paediatric patients. We report a case of a child presenting with PIMS-TS and new onset type 2 diabetes.

PRESENTATION

A previously healthy, 15 year old boy of Bangladeshi origin presented to the emergency department (ED) with a 10-day history of polyuria and polydipsia, 4-day history of nausea, 1-day history of dry cough, abdominal pain and 1 episode of haemoptysis.

At presentation: Blood glucose 41mmol/l, pH 7.37, ketones 0.6mmol/l, lactate 5.0 → sc insulin started, IV Ceftriaxone and IV Clindamycin for sepsis (3 days)

Physical examination: He was febrile (38.5 °C), tachycardic, alert and oriented, had significant acanthosis nigricans and obesity [BMI: 28kg/m² (z-score: 2.38)].

Family history: type 2 diabetes of both parents
Zn transporter 8 Abs, anti-GAD and IA2 Abs: **negative**
→ **Diagnosis of type 2 diabetes was made**

PICU PROGRESS

Acute deterioration of neurological status (aggressive behavior, disorientation, confusion) → hypertonic saline given

- CT head: normal, no evidence of cerebral oedema
- Nasopharyngeal RT-PCR for SARS-CoV2 (D1 and D5 of PICU admission): negative
- SARS-CoV2 IgG antibodies: positive

Fulfilled criteria for PIMS-TS (Paediatric Inflammatory Multisystem Syndrome Temporally associated with SARS-CoV-2)

Treatment as per RECOVERY trial regime

- Methylprednisolone 10 mg/kg once daily for 3 days
- IVIG 2g/kg infusion
- Prophylactic dalteparin (5000units sc once a day
- Low dose aspirin (75mg) once a day
- Omeprazole (40mg) once a day
- Vitamin D 10,000 Units daily

DIABETES COURSE

Blood glucose levels continued to increase with sc insulin.

→sc insulin was stopped and IV insulin (0.1 unit/kg/h) with IV fluids was started.

He had significant insulin resistance and **required IV insulin doses of up to 2 units/kg/day to regulate his glucose levels.**

Insulin requirements improved after completion of a 3 day course of IV methylprednisolone (day 4 of PICU admission)

Day 3: started having regular diet

Day 7: MDI with Degludec → stable glucose levels

Day 9: Discharged from PICU to local hospital

Day 14: Discharged home

Final insulin dose on discharge 1.2 units/kg/day. Metformin was not started due to deranged liver function tests noted initially.

3m post discharge: Insulin 1.1units/kg/day, good control

PROGRESS

Neurological status returned to normal in 12 hours

Within 72h of commencing treatment with IVIG and methylprednisolone:

- weaned to room air
- cardiac function improved
- hemodynamic stability
- became afebrile

D3 cardiac echo: normalisation of cardiac function with normal coronaries

D7 cardiac echo: small but hemodynamically insignificant pericardial effusion requiring ongoing surveillance

Prophylactic dalteparin stopped on the day of discharge.

He continued on low dose aspirin (75mg) and Omeprazole 20mg

Table 1. Laboratory markers at diagnosis, at discharge from PICU and 1 month after discharge.

Tests	Day 1 of PICU	Day 8 of PICU-Discharge	1 month after discharge	Reference range
Ferritin (µg/L)	2466	722	186	21-173
Troponin T (ng/L)	87	21		0-13
Sodium (mmol/L)	134	134	137	135-145
Potassium (mmol/L)	4.6	6	4.6	3.5-5.0
Urea (mmol/L)	5.4	6.2		1.7-8.3
Creatinine (µmol/L)	75	73	64	25-85
Chloride (mmol/L)	105	96		98-107
Bicarbonate (mmol/L)	18			22-30
Anion gap (mmol/L)	18			8-17
ALT (IU/L)	912	167	57	4-59
Alk Phos (IU/L)		128	272	57-261
Bilirubin (µmol/L)			15	0-21
25 Hydroxy Vitamin D (nmol/L)	14		74	>50
Calcium (mmol/L)	1.99	2.44		2.15-2.55
Corr Calcium (mmol/L)	2.25	2.52		1.15-2.55
Protein (g/L)	54			
Albumin (g/L)	32	41	53	40-52
Creatinine Kinase (IU/L)	45	23		0-229
LDH (U/L)	629	310		120-300
Triglycerides (mmol/L)	2.59	2.54		<1.7
Amylase (IU/L)	19			0-99
CRP (mg/L)	131	3	3	0-4
Procalcitonin (µg/L)	5.3	0.15		0.00-0.05
NT-proBNP (ng/L)	6313	60		<400
Fibrinogen (g/L)	7.2	5.0		1.7-3.9
D Dimers (mg/l FEU)	8.76	1.75		
INR	1.4	1.1		0.8-1.2
APTT	0.8	1.0		0.8-1.2
Haemoglobin (g/l)	119	153	142	130-170
WBC	8.7	10.2	7.7	4.0-11.0 x10 ⁹
Lymphocytes	1.7	4.0	2.9	1.2-3.5 x10 ⁹
Neutrophils	6.4	5.7	4.0	1.5-7.0 x10 ⁹
Platelets	128	428	310	150-400 x10 ⁹
HbA1c (mmol/mol)	105			20-41
C-peptide (pmol/l)		2224		298-2350
Anti-GAD antibodies (U/ml)	1.0			0.0-4.0
IA2 Antibodies (U/ml)	0.8			0.0-7.4
Zn Transporter 8 antibody (U/ml)	8.3			0.0-14.9
Tissue transglutaminase Antibodies (U/ml)	0.8			0.0-7.0
SARS-CoV-2 IgG	Detected		detected	
SARS-CoV-2 RNA	Not detected			

INITIAL PROGRESS

Initially saturating 95% in air but progressively became more tachypnoeic, hypotensive and developed significant lactic acidosis (10mmol/L).

- Chest X-ray: mild perihilar interstitial thickening and left basal atelectasis
- ECG: sinus tachycardia
- Cardiac echo: severely impaired biventricular systolic and diastolic function with marked longitudinal impairment requiring inotropes
- Inflammatory and cardiac markers for PIMS-TS: elevated (see table)
- Coagulation markers: abnormal
- Vitamin D deficiency: 13nmol/l

Due to clinical deterioration → PICU

DISCUSSION

- This is the first reported case of new onset type 2 diabetes and PIMS-TS.
- The patient had symptoms of diabetes before presenting to the hospital and would have eventually presented with diabetes, but the hyperinflammatory pathway of PIMS-TS may have accelerated the process.
- Interestingly, he did not develop diabetes ketoacidosis.
- Low grade inflammation seen in obesity could have contributed to presentation.
- Corticosteroids used to treat PIMS-TS along with increased hepatic glucose production through increased counter-regulatory stress hormones made management quite challenging and insulin requirements were high.

REFERENCES

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