

with beta-blockers, angiotensin-converting-enzyme inhibitors, aldosterone antagonists, dual antiplatelet therapy with acetylsalicylic acid and clopidogrel, and statins. An echocardiograph prior to discharge showed a left ventricle ejection fraction of 45%. In this syndrome, ventricular function typically returns to normal levels after several weeks. Our patient lived in another autonomous region and consequently we do not have this datum.

The prognosis of Kounis syndrome is generally good, although complications such as pulmonary edema, arrhythmia and thrombus have been reported during the acute phase. Presentation as cardiogenic shock is extremely rare and only 1 similar case report has been published previously.⁵

There are no clinical guidelines for treating Kounis syndrome at present. There are too few cases to be able to reach any definitive conclusions on the treatment of this syndrome but, in general, these patients require treatment with corticosteroids, antihistamines, and antithrombotic drugs. Treatment with adrenaline is controversial, as it can worsen ischemia, prolong the QT interval, and induce coronary vasospasm and arrhythmia, but in general it must be administered in the event of severe hypotension or cardiac arrest. Vasodilator agents, including nitrates and calcium channel blockers, must be considered as first-line therapy for previously healthy young patients. The acute coronary syndrome protocol should be followed in patients with the type II variant.⁶

Kounis syndrome encompasses a group of symptoms that is probably under-diagnosed and should be included in the differential diagnosis of cardiogenic shock.

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Late Arterial Switch, Without Previous Preparation or Extracorporeal Membrane Oxygenation Back-up

Switch arterial tardío, sin preparación previa ni oxigenador de membrana extracorpórea de soporte

To the Editor,

Arterial switch is considered the treatment of choice for transposition of the great arteries (TGA). There is consensus that this procedure should be performed before 2 weeks of life, to prevent regression of the left ventricle (LV) in a subpulmonary position.¹ We report 3 cases of single TGA in which the intervention was performed beyond 14 days without prior preparation or extracorporeal membrane oxygenation (ECMO).

Case 1 was a child of 18 days admitted with cardiac arrest. TGA and *situs inversus* were diagnosed after cardiopulmonary resuscitation. An urgent Rashkind procedure was performed and, once stabilized, the child underwent surgery the following day.

Case 2 was a cyanotic boy referred from another hospital at 12 h of life and with prostaglandins. Hemodynamic status was poor, with severe ventricular dysfunction and 50% saturation. An urgent Rashkind procedure was performed after diagnosis of TGA. The child subsequently suffered *Klebsiella* pneumonia and sepsis as well as acute renal failure, forcing a delay in surgery until day 27 of life.

Case 3 was a 6-day-old boy who was referred from another hospital with low output and cyanosis. An urgent Rashkind procedure was performed. The child then suffered renal failure, which required peritoneal dialysis, and *Klebsiella* sepsis. On resolution of these problems, the patient underwent surgery at 28 days of life.

Most groups opt to correct TGA using the arterial switch before 2 weeks of life. There are anecdotal reports of the procedure being performed beyond 14 days, with the risk of left ventricular failure in the new systemic position.^{1,2} The two most common causes of this situation are late referral and contraindications for surgery.

Ultrasound criteria for subpulmonary LV exist³ and include paradoxical septal motion, reverse ventricular morphology (spherical right and left semilunar valves), and left free wall thinning, among others. Surgically, a simple measurement of pressures in both ventricles provides a right/left (LV/RV) relationship, with an arterial switch being inadvisable at a ratio <0.6.

Currently, the 3 main options proposed in this situation are: a) preparatory surgery using pulmonary cerclage and systemic-pulmonary fistula, followed by arterial switch in a second stage^{2,4}; b) arterial switch with ECMO support until ventricular remodeling occurs^{5,6}; c) discharge of the patient and atrial correction (Senning, Mustard) after a few months.⁶ *A priori*, the option of using ECMO as support (if necessary) seems the most appropriate.

A German team⁴ proposed a simple method based on the pressure ratio between the 2 ventricles after a 15–30 min trial period of pulmonary cerclage. After the trial period, the arterial switch is performed if the ratio is adequate (LV/RV > 0.6), or preparation via pulmonary cerclage and fistula is carried out followed by correction in a second stage. The work published by the Great Ormond Street Hospital almost 10 years ago and updated in 2004^{1,5} demonstrated similar survival rates in patients undergoing surgery between 2 weeks and 2 months, and indicated a greater need for inotropics and mechanical ventilation. Recently, another group published results in patients receiving surgery at 6 months,⁶ and showed higher than usual mortality, despite the use of ECMO. In the

Table 1
Preoperative Data

Age on admission, days	Emergency Rashkind	Age at surgery, days	Weight, g	Diagnosis	Complications	Aristotle score
18	Yes	19	3100	Simple TGA, <i>situs inversus</i>	Shock	25
1	Yes	27	3280	Simple TGA	Shock, sepsis, acute renal failure	22
6	Yes	28	3200	Simple TGA	Shock, sepsis, acute renal failure	24

TGA, transposition of the great arteries.

Table 2
Pre- and Postoperative Data

LV/RV, %	Extracorporeal circulation, min	Aortic clamping min	ICU lactate	Open chest, days	Intubation, h	ICU, days
45/55 (0.82)	149	68	3.9	1	96	6
40/50 (0.80)	180	70	8.1	2	96	7
	160	59	3.8	1	96	8

ICU, intensive care unit; LV, left ventricle; RV, right ventricle.

discussion section of the article,⁶ the authors suggest using an atrial switch (physiological correction) in this subgroup.

None of the children in our series had a prenatal diagnosis. All patients underwent an urgent Rashkind procedure on admission, after diagnosis of TGA (Table 1).

The surgical strategy was based on prioritizing the arterial switch option over preparation (lung cerclage with systemic-pulmonary fistula) if the LV showed no signs of involution. In cases 1 and 2 we relied on the calculation of intraoperative pressures described by Dabritz et al.⁴, as echocardiographic images showed paradoxical movement in the interventricular septum. In case 3 preoperative ultrasound revealed a normal biventricular and septal pattern, so we omitted the pressure calculations.

Cardiopulmonary bypass was carried out with peripheral vasodilatation to decrease the systemic LV afterload. Epicardial ultrasound-guided cardiopulmonary bypass output was therefore gradual, and was used for circulatory assistance, with vasodilator support (levosimendan, solinitrin) and adrenaline, and systolic pressures not exceeding 50 mmHg. The chest was left open prophylactically. Data from the immediate postoperative period barely differed from other common arterial switches (Table 2). LV contractility was considered normalized within 48 h. Peritoneal dialysis was required in cases 2 and 3 (the latter also required preoperative dialysis). The 3 children were extubated on the fourth day after surgery and remained in intensive care for between 6 and 8 days.

In conclusion, because of late referrals or transient formal contraindications, performing an arterial switch beyond 2 weeks may have to be considered. Intraoperative ultrasound and pressure criteria can help to decide between initial corrective surgery or preparation and correction in 2 stages. An aggressive strategy of perioperative and postoperative peripheral vasodilatation probably facilitates left ventricular remodeling. In our brief experience, recovery was rapid and complete, without the need for postoperative ECMO.

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