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We walked toward Samos for 18.6 kilometers, avoiding the first 4 kilometers that run parallel to the road because they required reaching the top of a peak at kilometer 4.7 and had difficult sections for the support vehicles. We felt that the next section, Sarria-Portomarín, was inappropriate, with too many parts unsuitable for vehicular traffic.

Stage 3. Portomarín (350 m above sea level)-Palas de Rey (5650 m above sea level), 23 kilometers. This is very rough terrain with an initial climb toward the Gonzar road (540 m above sea level), followed by a flat section of 4 kilometers and 2 more climbs to reach 700 m above sea level and another downhill section, and another climb to cross the Ligonde mountain range (580 m above sea level). This orography can disrupt the discipline of the gait and cause angina crises.

Stage 4. Palas de Rey-Melide (455 m above sea level), 15.7 kilometers, and 5th stage, Melide-Arzúa (390 m above sea level), 13.6 kilometers. These stages run over hills and valleys crossed by 6 rivers that empty into the Ulla, with a continuous up-and-down path that tires the climber, and results in safety problems. Some sections pose difficulties for vehicular traffic.

Stage 6. Arzúa-Arca (305 m above sea level), 18 kilometers, and stage 7, Arca-Monte del Gozo (345 m above sea level), 15.7 kilometers, flat and with no problems.

All patients completed the route successfully with no incidents. Therefore, we consider that the route is appropriate for the needs of the program when precautions that place a high priority on safety are incorporated.

We believe that this experience has many positive aspects:

a) it proposes a challenging goal that would normally be unthinkable and therefore can enhance the patient's confidence in his or her physical and psychological capabilities;
b) it is undertaken with similar patients, which allows synergies to be established that help achieve the objectives;
c) it includes a touristic element as a pleasant addition to the program and represents an ideal setting for social interaction among the participants and for the training activities;
d) it includes the participation of the patients' partners, which can help mitigate the adverse aspects of cardiac disease on the social and family environment and help to achieve heart-healthy practices; and
e) it attempts to convey a message to patients and the general population about leading a normal life that may help demystify the limitations of this disease.

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REFERENCES

A Hybrid Approach to Hypoplastic Left Heart Syndrome

To the Editor:

We present the case of a newborn brought to our service with cardiogenic shock. She was diagnosed with hypoplastic left heart syndrome (HLHS) and admitted to the neonatal intensive care unit to initiate treatment with prostaglandins (PGE1), inotropic agents, and support...
measures. The echocardiographic study showed an extreme HLHS morphology, with mitral-aortic atresia, and very severe ascending aorta hypoplasia (ascending aorta diameter, 2 mm) with retrograde ductal-dependent coronary flow from the aortic arch (Figure 1).

Because the results of the Norwood procedure used for initial correction of HLHS are highly influenced by the patient’s anatomy and clinical condition,1-2 a decision was made to perform a hybrid technique as an alternative to initial Norwood correction.

Surgery was performed through a midline sternotomy, in which the typical HLHS anatomy was found: dilated pulmonary trunk, a large systemic ductus, absence of left ventricular chamber, and an extraordinarily hypoplastic ascending aorta (smallest diameter, 2 mm) (Figure 1A).

In view of the patient’s extreme anatomy and hemodynamic state, we performed a hybrid procedure, inserting a 6-mm diameter, 18-mm long coronary stent (LifeStent SDS) in the ductus to keep it open permanently and to ensure systemic blood flow. The stent was placed by purse-string suture at the base of the pulmonary trunk, then deployed and dilated by digital control in its correct location, securing the distal end in the aortic isthmus and the distal proximal end at the origin of the left pulmonary branch. The procedure was completed by bilateral pulmonary artery banding to adequately balance pulmonary flow and systemic flow. Five days later, an atrioseptostomy was performed in the interventional cardiology room to achieve drainage without restriction of the left atrium (Figure 2).

Postoperative progress was unremarkable under digitalis, diuretic, and antiplatelet therapy. At the time of writing, the patient was receiving follow-up that included echocardiography to assess stent patency while waiting to undergo the future second phase by reconstruction of the ascending aorta and bidirectional Glenn anastomosis.

The mean survival of the Norwood procedure is 60% to 70% in experienced centers,1,2 and closely related to the anatomical shape of the HLHS. In cases with extremely hypoplastic aorta (diameter ≤2-3 mm) and retrograde coronary flow, the outcome of this procedure is considerably poorer.1-4

The hybrid procedure described here fulfills the objectives of the classic Norwood procedure: it uses a stent to ensure systemic blood flow to keep the ductus open permanently.

**Figure 1.** Preoperative status. A: diagram of the pathophysiology of the hypoplastic left heart. The arrows indicate the predominant direction of blood flow, highlighting the passage from the PA through the ductus toward the aortic arch, and in retrograde fashion toward the ascending aorta. B: echocardiographic image of the hypoplastic left heart. Aa indicates aortic arch; Ao, hypoplastic ascending aorta; D, ductus; LA, left atrium; PA, pulmonary artery; RA, right atrium; RV, right ventricle; LV, left ventricle.

**Figure 2.** Post-hybrid treatment status. A: diagram of the hybrid treatment. B: catheterization image 5 days after hybrid treatment, during which atrioseptostomy was performed. As indicates area of percutaneous (Rashkind) atrioseptostomy; B, banding of both pulmonary branches; S, stent placed in the ductus from its origin in the pulmonary artery up to its insertion in the aortic isthmus (shown in red in A).
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open and uses bilateral pulmonary artery banding to control pulmonary pressure and ensure adequate balance between pulmonary and systemic flow. Percutaneous atrial septostomy is always needed to allow nonobstructive drainage of the left atrium over time.

This procedure permits a second phase consisting of reconstruction of the ascending aorta and aortic arch with larger anatomical structures, thus posing a lower risk than the Norwood procedure in newborns with extreme forms of HLHS.

The hybrid surgery does not require extracorporeal circulation or deep hypothermia with circulatory arrest, which facilitates the inevitable repeat surgery in these patients and decreases the risk of neurological lesions.

Our team has decided to use this hybrid technique in extreme forms of HLHS, which, in our experience, show poorer outcome with the Norwood technique. The advantages of the hybrid technique are short procedure time, gradual control of pulmonary flow, and no requirement for extracorporeal circulation. The good initial results obtained by groups in other countries\(^1,5\) (this is the first report on a successfully treated patient in Spain) is encouraging for future use of this technique in patients with more extreme forms of HLHS. Nevertheless, larger patient groups are needed to verify the adequate patency of stents placed in the ductus and to assess the morbidity induced by bilateral pulmonary artery banding until the optimal time is reached to complete the second phase of surgical correction among these HLHS patients.

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REFERENCES