levoventricular loop (right ventricle to the left, left ventricle to the right), progresses with an inverted looping, and finishes with an inverted spiral septation of the outflow tracts and the great arteries. Therefore the spiral shape of the heart is the consequence of an asymmetric formation, and it derives from coordinated developmental mechanisms involving, in a 3-dimensional fashion, the segments of ventricles and great arteries. In contrast to patients with situs ambiguus the genetically determined anomalies of lateralization⁶ cause, at the cardiac level, an interruption of the helicoid pattern consisting in isomerism of the atria, random ventricular loop, and transposition of the great arteries. This is particularly frequent in patients with right isomerism (asplenia syndrome).³ To summarize these observations, the helicoid shape of the heart is genetically determined and may be clockwise in situs solitus, counterclockwise in situs inversus, and absent or interrupted in situs ambiguus.

The helicoid shape of the heart is interrupted in other types of complex congenital heart defects. In congenitally corrected transposition of the great arteries [S,L,L], there is situs solitus of the atria, but with a levoventricular loop and a transposition of the great arteries. The resulting anatomic pattern is neither clockwise nor counterclockwise. In this complex malformation, the helicoid shape of the heart is inverted at ventricular level and interrupted at the level of the great arteries. In complete transposition of the great arteries [S,D,D], despite the presence of situs solitus of the atria and dextroventricular loop, the parallel position of the great arteries shows the interruption of the spiral pattern of the heart. Experimental research on animals,⁷ clinical studies on familial recurrence,⁸ and results of human genetic mutations⁹ suggest that both these complex cardiac defects, congenitally corrected transposition of the great arteries and complete transposition of great arteries, could be included in the pathogenetic group of the defects of lateralization.

In conclusion, the concept of a spiral pattern of the heart may have important implications not only for the fields of myocardial morphology, pathophysiology, and cardiac surgery¹ but also for our understanding of the segmental morphogenetic

mechanisms of some complex congenital heart defects. There is no doubt that the helicoid shape of the heart recalls some structural aspects of plants and animals, and also patterns observed in the microcosm and macrocosm alike.^{1,3} The physic and genetic causes of these similarities will advance our efforts toward comprehension, if we will be able to maintain the attitude of the student.¹

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Cardiac transplantation in prisoners To the Editor:

I have just finished reading Drs McKnealy's and Sade's thoughtful editorial regarding cardiac transplantation in prisoners. A number of years ago I attended a transplant ethics conference. In the course of the meeting a case was presented of a young prisoner. He was suffering from heart failure and the issue arose as to whether he should be offered cardiac transplantation. Although I was only a conference attendee, the moderator recognized that I was the surgical director of our cardiac transplant program. The moderator asked me if such a patient would be offered cardiac transplantation at our institution. I stated that one of the cardiac transplant selection criteria was a stable psychosocial background. I did not believe that incarceration fulfilled that criterion. Thus, I informed the group that we would not offer such a patient a cardiac transplant.

Although I understand the ethical right that a prisoner has to this therapy and I am sensitive to the cost that such care imposes on the prison system, I have a more practical concern about offering transplantation to prisoners. Nelson Mandela aside, can we rely upon these individuals to participate in the close posttransplant follow-up necessary to ensure the success of this treatment? Can these patients be trusted to comply with their immunosuppressive drug regimen? I suspect that the answer to these questions is "no." The donor heart is a precious commodity and as such should be offered only to patients in whom there is a reasonable chance for long-term survival.

Thank you for providing us with a starting point for ongoing discussion of this very relevant dilemma.

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