life (2). Patients in the Joffe et al. study are younger overall than most of the previous studies on the subject of arrhythmias and tetralogy of Fallot. However, most of these patients had undergone a previous palliative surgery (Blalock-Taussig shunt, 62%), and all of them were >1 year old (mean age 4, range 1.2 to 7.7). The timing of operation, therefore, was not "early" for a significant number of these patients, and the question of potential long-term benefits of early repair remains unanswered.

The authors have classified the patients into two groups: 21 with "uncomplicated" and 8 with "complex or repeated" operations. This approach is unprecedented in previous large studies; the available rates of prevalence and incidence of ventricular arrhythmia are obtained from patients with tetralogy of Fallot as a whole. Therefore, the low prevalence of ventricular arrhythmia in the Joffe et al. "uncomplicated" group should not be compared with the higher rates in previous studies that include both the "uncomplicated" and "complex" patient groups. In the patients in the Joffe et al study, the overall prevalence of late ventricular arrhythmias was 28%, which should not be considered "rare."

The prevalence of significant ventricular arrhythmias after tetralogy of Fallot repair has been shown to increase with time, and most studies with long-term follow-up (up to 28 years) show a prevalence of ~40% to 45% (3,4). The Joffe et al. study also demonstrates the effect of passage of time on detection of ventricular arrhythmias: 14% of patients had significant ventricular arrhythmias at early compared with 28% at late follow-up. However, the authors concluded that this difference was not significant because statistical comparison between the two groups yielded a p value >0.1. A higher p value may have been due to small numbers and a low statistical power (type II error). It is likely, therefore, that the patients in the Joffe et al. study had the same outcome as those with later repair. Furthermore, as the authors correctly point out, one of the still unsettled controversies regarding patients with tetralogy of Fallot is that ventricular arrhythmias may be a part of the natural history of the disease rather than secondary to operation. The long follow-up period (mean of 11.8 years) of the study, for which the authors should be commended, is still not long enough to rule out this possibility (the oldest patient evaluated was 21 years old).

We, therefore, believe that it is premature to draw any valid conclusions from the study by Joffe et al. regarding the potential benefits of "early" correction of tetralogy of Fallot in the prevention of late ventricular arrhythmias.

HESSAM FALLAH, MD
SUDHIR K. MEHTA, MD, FACC
MetroHealth Medical Center
Division of Pediatric Cardiology
2500 MetroHealth Drive
Cleveland, Ohio 44109-1998

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Reply

In Joffe et al (1) we reported that late ventricular arrhythmias were less common after "early" repair of tetralogy of Fallot and when repair was "uncomplicated." As Fallah and Mehta point out, although our patients were younger than the series reported from the early surgical era, many still had a two-stage approach to their repair, with initial palliation. No long-term data have been published using ambulatory electrocardiographic (ECG) monitoring in patients who underwent primary repair in infancy, but follow-up standard ECG data support our conclusion that early repair is likely to be beneficial (2).

We classified our patients into "uncomplicated" and "complex" repair groups to illustrate the difference in prevalence and progression of ventricular arrhythmia in these two groups. The lower prevalence in the uncomplicated repairs is of interest in terms of etiology of late arrhythmia. We do not make direct comparisons between the prevalence of arrhythmia in our prospective study and those of earlier retrospective reports.

Fallah and Mehta state that the prevalence of significant ventricular arrhythmia after tetralogy of Fallot repair increases with time. This has not been demonstrated because no prospective data have been reported. They fall into the trap of assuming that because ventricular arrhythmias are common in older patients with long follow-up after repair, they are increasing with time. The group that we studied was indeed small, and we cannot be confident that with increasing time there may not be an increase in arrhythmia in both groups during even longer follow-up. However, we emphasize that the references Fallah and Mehta quote do not address the issue of increasing incidence of arrhythmia with follow-up, as they suggest (3,4).

We and others (5,6) have previously published data that suggest that late ventricular arrhythmia may be part of the natural history of tetralogy of Fallot as a result of myocardial damage in the uncorrected heart rather than secondary to operation. This natural history is interrupted by correction, and it is hard to see how longer postoperative follow-up would address this issue, as Fallah and Mehta imply.

JOHN E. DEANFIELD, MD
Cardiothoracic Unit
Hospital for Children
Great Ormond Street
London WC1N 3JH, England, United Kingdom

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