Letter to the Editor

The optimal age at Fontan procedure and the 'ticking clock' theory: do we have an answer?

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We read with interest the article by Pace Napoleone et al. [1]. The title of their report and their conclusion may, however, mislead the medical community to believe that the age at Fontan operation should be postponed to the latest possible date. The data on which they base their argument is the finding that the short- and midterm outcomes of their patients operated before and after the age of 7 were similar. In the present era, early outcomes after Fontan surgery have become so good that they are unlikely to show any disparities between patient subgroups. In a 2001 study of Fontan procedures performed in children and adults, differences in late outcomes only became noticeable after 15 years of follow-up [2].

There is a general consensus that we will observe a continuous attrition of the population of Fontan patients, but the factors contributing to this attrition are still largely unknown. The proponents of the 'ticking clock theory' advocate that any Fontan circulation will have a limited lifetime and that, therefore, the Fontan procedure should be postponed to the latest possible age. This theory has been solely based on the assumption that the long-term perspectives of Fontan patients are poor. This assumption, however, has been proven to be inaccurate in the present era [3].

This present report comes at a time when two recent investigations have shed new light on the impact of age at operation on outcomes after Fontan surgery [4,5]. Both have shown that the exercise capacity early after Fontan was improved if the surgery was performed at a younger age. In one of the few reports of serial exercise studies in Fontan patients, published in the same journal, it was observed that all patients see a progressive decline in their exercise capacity, but more importantly, the decrease in exercise capacity was accelerated if the Fontan surgery was performed in adolescents and adults rather than in children [4]. In a serial angiographic study comparing Fontan surgery before and after the age of 3 years, it was demonstrated that the cardiac index was preserved if Fontan surgery took place before 3 years of age, and progressively deteriorated if performed at a later age [5]. The exact reasons for these results are still unclear and need confirmation, but they bring, for the first time, objective evidence that delaying Fontan surgery may be deleterious.

Nonetheless, it remains our practice to avoid Fontan surgery before the age of 3 years, because we are reluctant to perform implantation of an extra-cardiac conduit smaller than 18 mm in diameter.

We thank the authors for demonstrating that later age at Fontan surgery is no longer a risk factor for early adverse outcomes. However, based on the present evidence, it does not seem that the medical community should be encouraged to postpone Fontan surgery, because it may adversely affect patients’ long-term outcomes.

References


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Reply to the Letter to the Editor

Reply to d’Udekem et al.

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We thank d’Udekem et al. [1] for their comments.

We agree with them that postponing the age at Fontan completion might not be the best way to delay the ‘physiological’ failure that seems inherent in this operation [2].

Despite much debate, the reasons for attrition in Fontan circulation are not known. Indeed, it is unclear whether associated factors such as ventricular unloading strategy and ventricular function, valve dysfunction or arrhythmias are the main cause for Fontan failure, or that Fontan operation ‘per se’ has a limited durability.

Fontan failure can happen in patients without any associated valvular/ventricular dysfunction or atrial arrhythmia. Thus, the followers of the 'ticking clock' hypothesis consider Fontan failure as inherent in the haemodynamic characteristics of Fontan circulation. Accordingly, a recent
study has shown that Fontan patients present a general trend for progressive reduction in exercise capacity at follow-up [3].

The purpose of our study was to understand if delaying Fontan completion could affect the medium-term results, and we had evidence that delaying Fontan completion beyond 7 years of age was not inferior to completion before 7 years of age. It is important to stress that the choice of delaying Fontan completion was based on individual clinical grounds and applied only to patients who maintain stable values of arterial saturation at follow-up. We clearly agree that postponing Fontan completion to late adolescence or adulthood is inappropriate, as reflected in our practice.

On the other hand, the followers of the ‘early Fontan completion’ advocate that early ventricular unloading might preserve cardiac function and exercise capacity at follow-up. However, no robust evidence exists to support this latter approach. Indeed, the recent study by Shiraishi et al. [4] studied a population very different from ours in terms of underlying ventricular morphology (100% left) and staging strategy (70% primary Fontan completion), and the interpretation of the results of that study have been appropriately criticised elsewhere [5].

With improved patient selection and intra- and post-operative care, early completion of Fontan operation, even in 1-year old children, is not a technical challenge anymore. Therefore, we think that the decision on the timing should only be driven by follow-up data. Indeed, if the ‘ticking clock’ hypothesis was correct, early completion could turn into early failure. Unfortunately, there are no data available yet to demonstrate that early completion translates into improved long-term results.

While awaiting such evidence, we suggest that delaying Fontan completion beyond the first few years of life with close follow-up of the candidates does not seem to impact on medium-term outcomes.

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Letter to the Editor

Epidural catheterisation for empyema thoracis: risk of epidural abscesses

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Keywords: Empyema thoracis; Epidural anaesthesia; Epidural abscesses

We read with great interest the article of Tacconi and colleagues [1] regarding the challenging application of sole thoracic epidural anaesthesia and analgesia to treat empyema thoracis (ET), videothoracoscopically. Their study about thoracoscopic surgery without general anaesthesia and tracheal intubation demonstrated a successful anaesthetic alternative, which may be beneficial to high-risk patients receiving general anaesthesia, especially those with pleural empyema. However, it necessitates further large-scale randomised study to compare epidural or general anaesthesia on minimising days of hospital stay and economic cost, while the resolving course of ET and complications may be determinants of days of hospital stay and postoperative outcomes, unlike thoracoscopic surgery for lung tumours [2].

Further, epidural catheterisation for ET is controversial due to the fear of rare but catastrophic consequence of epidural abscesses [3,4]. Reihaus and colleagues had concluded compromised immunity, disruption of the spinal column and potential source of infection as the main risk factors associated with epidural contamination after a meta-analysis study of 915 patients with spinal epidural abscesses [5]. Patients with ET are usually manifested with systemic sepsis due to intrathoracic pus accumulation at the time of surgery, although invariably receiving intravenous antibiotics. They are also usually immuno-compromised, presenting diseases such as diabetes mellitus, liver cirrhosis, human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), etc., as in this cohort of patients [1]. In addition, epidural catheterisation definitely creates an entry tract to facilitate haematogenous and cutaneous colonisation to epidural space and is usually accompanied with some bleeding from epidural venous plexus. The resulting haematoma then becomes an ideal culture medium for bacterial growth [3]. In this study, 16 patients, lacking of details of systemic infection such as fever, tachycardia and leukocytosis, in the fibrinopurulent stage of ET received epidural analgesia. The resulting haematoma then becomes an ideal culture medium for bacterial growth [3]. In this study, 16 patients, lacking of details of systemic infection such as fever, tachycardia and leukocytosis, in the fibrinopurulent stage of ET received epidural analgesia. The resulting haematoma then becomes an ideal culture medium for bacterial growth [3].

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