The Contegra bovine jugular valved conduit: Living up to expectations?

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The Contegra bovine jugular conduit marketed by Medtronic Inc. has now been commercially available for nearly a decade. Several reports of midterm performance have been published and the article by Holmes *et al.* from the British Columbia Children's Hospital[1] adds to the existing collection of data. It might be worthwhile at this juncture to analyze whether the Contegra has lived up to its expectations as the ideal substitute for the right ventricular outflow (RVOT).

A valved conduit is integral to reconstruction of the RVOT in the presence of pulmonary atresia, truncus arteriosus, or malposition of the great vessels. Currently available valved conduits include aortic and pulmonary homografts, porcine valve in Dacron tube graft (Hancock or Carpentier-Edwards), porcine valve in bovine pericardial tube (St. Jude), handmade pericardial or GoreTex conduits (made in the operating room), and the Contegra bovine jugular conduit. Of these, only the Contegra remains in reliable commercial supply, while homografts are available commercially only in some countries and in India are restricted to centers having a homograft valve bank. Despite decades of technological innovations however, no conduit has so far been developed that has either the ability to grow with the patient or the ability to resist time-bound degeneration.

The homograft valved conduit remains the gold standard against which all newer conduits tend to be compared. The Contegra matches the homograft in its suppleness and ease of handling. However, being a straight tubular structure of venous origin, it does not curve easily and needs dexterous placement to avoid kinks when the RVOT is acutely angulated. The commissural height of the jugular vein valve is higher than the homograft aortic or pulmonary valve, making it more prone to distortion and regurgitation. The wall of the Contegra tends to be thicker – more so in the larger sizes often creating an anastamotic mismatch when the native pulmonary artery is thin walled. In part, this may contribute to the higher incidence of distal anastamotic obstruction reported on midterm follow-up.

Clearly, the Contegra scores over the homograft in being available off the shelf and in a satisfactory range of sizes. The impact of its cost on its usage however remains debatable – affordable by standards of developed countries, but clearly expensive in developing countries where it may cost as much as the rest of the surgery itself. Nevertheless, it remains the only commercially available conduit in India and many other countries today and the only conduit available to centers who have no access to homografts.

Two recent articles have highlighted the midterm performance of the Contegra in sizable cohorts of patients. Breymann *et al.*,[2] presented the 7 year results of the European Contegra Multicentre Study involving 165 nonadult Contegra implants and concluded that results were comparable to homografts. At 5 years follow-up freedom from any event was 13% for infants. 58% for 1–10 year olds and 82% for those above 10 years. Protopapas and Athanasiou[3] reviewed published literature and analyzed midterm outcomes from 17 reports covering a total of 767 patients. After a total follow-up of 573 patient years, conduit stenosis was observed in 10.9% of the patients – more often in the smaller sizes. One series observed a 83.3% stenosis rate for the 12-mm-size conduit. Both publications highlight two observations 1) The Contegra conduit has acceptable function and longevity in the larger sizes, while in the smaller sizes it is predictably short-lived and 2) there is a fair degree inter-center variation in the nature and rate of late conduit related complications especially stenosis of the distal conduit anastamosis. The latter observation would suggest that factors such as intersurgeon variation in suturing technique, intraoperative handling of the conduit, positioning of the conduit, and selection of size play a role in the performance of a conduit equal to if not more than the nature of the conduit itself.

The fact that the Contegra has remained in the market for nearly a decade indicates that surgeons are not entirely unhappy with its performance. Having said that it is also true that there is no other commercially available tissue valved conduit to compete with. Till the time a better conduit presents itself the Contegra will continue to be a part of the pediatric cardiac surgeon's armamentarium.

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