Modified Warden procedure using aortic homograft for superior vena caval translocation: Where is the evidence?

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September 28, 2022

Abstract

Background: Partial anomalous pulmonary venous connection (PAPVC) occurs when at least one pulmonary vein drains into the right atrium or its tributaries rather than the left atrium, most commonly connecting with the superior vena cava (SVC). The Warden procedure involves transecting the SVC proximal to the uppermost connection of the pulmonary vein followed by proximal SVC reattachment to the right atrial appendage. However, descending thoracic aortic homograft replacement for SVC translocation has recently been introduced as a modified technique. Aims: This commentary aims to discuss the recent study by Said and colleagues who reported their experiences with 6 PAPVC cases undergoing a modified Warden procedure using thoracic aortic homograft SVC translocation. Methods: A comprehensive literature search was performed using multiple electronic databases in order to collate the relevant research evidence. Results: The Warden procedure is associated with a 10% incidence of SVC obstruction with many requiring reintervention. Meanwhile, using the aortic homograft for SVC translocation, Said et al. observed no SVC obstructions. In addition, this modified technique does not require anticoagulation and has demonstrated an improvement in long-term SVC patency. Nevertheless, it can be considered an expensive procedure. Moreover, since the thoracic aortic homograft utilised is biological tissue, only long-term follow-up will determine whether calcification and graft degeneration is an issue. Conclusion: It can be concluded that the modified Warden procedure is a safe and effective method to reconstruct the systemic venous drainage into the right atrium when a direct anastomosis under tension might be prone to re-stenosis.

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Running Title: Modified Warden procedure for SVC translocation

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Keywords: Warden procedure, partial anomalous pulmonary venous connections (PAPVC), superior vena cava (SVC), homograft.

COI and funding: None

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Aims : This commentary aims to discuss the recent study by Said and colleagues who reported their experiences with 6 PAPVC cases undergoing a modified Warden procedure using thoracic aortic homograft SVC translocation.

Methods : A comprehensive literature search was performed using multiple electronic databases in order to collate the relevant research evidence.

Results : The Warden procedure is associated with a 10% incidence of SVC obstruction with many requiring reintervention. Meanwhile, using the aortic homograft for SVC translocation, Said et al. observed no SVC obstructions. In addition, this modified technique does not require anticoagulation and has demonstrated an improvement in long-term SVC patency. Nevertheless, it can be considered an expensive procedure. Moreover, since the thoracic aortic homograft utilised is biological tissue, only long-term follow-up will determine whether calcification and graft degeneration is an issue.

Conclusion : It can be concluded that the modified Warden procedure is a safe and effective method to reconstruct the systemic venous drainage into the right atrium when a direct anastomosis under tension might be prone to re-stenosis.

Partial anomalous pulmonary venous connection (PAPVC) occurs when at least one pulmonary vein drains into the right atrium or its tributaries rather than the left atrium. The PAPVC most commonly connects with the superior vena cava (SVC) and is often associated with an atrial septal defect. This persistent connection leads to a left to right shunt where some of the output from the right ventricle continuously recirculates oxygenated blood without entering the systemic circulation. This may, in time, lead to an increase in pulmonary artery pressure resulting in hypertension which is the reason for early stage intervention. The Warden procedure, first described in 1984, involves transection of the SVC proximal to the uppermost connection of the pulmonary vein. The proximal SVC is then reattached to the right atrial appendage (RAA) with the distal aspect draining blood to the left atrium (1).

We read with great interest the recent original article by Said et al. who reported their experiences with 6 cases undergoing thoracic aortic homograft replacement for SVC translocation as a modification of the Warden procedure in PAPVC (2). This series of 6 patients (5 female: 1 male) with a mean age of 19 years all had a significant left to right cardiac shunt. To avoid mobilisation of the RAA and the possibility of re-stenosis and SVC occlusion a modified technique was adopted where an aortic homograft is used as a

conduit from the divided cranial SVC to the right atrium. The follow-up period was 12 months, during which there was no evidence of SVC stenosis observed.

Other large series performing the Warden procedure had follow-up for a mean (range) of 5 years (1 month to 16 years). All the 30 patients identified who underwent this procedure were less than 24 months old and 7kg in weight. Direct reimplantation of the SVC into the RAA was performed, however, 3 patients (10%) developed SVC stenosis requiring reintervention. Cavo-atrial re-stenosis occurred in less than 12 days in the first two patients and by 11 months in the third (3). To reduce re-stenosis rates it is important all the muscular trabeculae within the appendage are removed under direct vision prior to any anastomosis being performed. Furthermore, accurate imaging and assessment of the anatomy of the PAPVC is crucial in planning any drainage procedure. Also, a differentiation must be made as to whether the level of the PAPVC is low or high. A low insertion is classified as close to the cavo-atrial junction, whilst high is considered to be near to the azygous vein termination. Direct surgery at the cavo-atrial junction may also cause trauma to the sinus node with possible onset of atrial fibrillation (4). For this reason DeLeon modified the procedure and performed two incisions: one on the distal SVC and the other on the crest of the RAA avoiding the sinus node (4).

The limitations of the Warden procedure for high anomalous PV drainage is the surgical length created after the SVC is divided. The cranial aspect of the SVC can be difficult to mobilise caudally and may require the azygous vein to be ligated in order that a tension free anastomosis can be performed to the RAA. Others have also stressed on the importance of adequate tissue mobilisation in order to reduce re-stenosis and sinus-node dysfunction rates (5). When the length between the cranial SVC to the RAA or atrium is considered excessive, or to avoid inordinate RAA mobilisation, there have been reports of manufactured ringed interposition grafts being used. This has the disadvantage of requiring long-term anticoagulation to maintain patency optimum patency rates in the slow flow venous system (6). On the other hand, others have reported the use of biological grafts, such as pedicled autologous pericardial flaps, as a conduit between the RAA and the SVC (7). The use of aortic homografts as a conduit in a modified Warden procedure has been described by others but invariably are limited to case reports with very few patients and short follow-up periods (8).

The modified technique described by Said et al may be considered expensive, however, one advantage is there is no need for anticoagulation as only long-term antiplatelet therapy is required. Furthermore, there is an excellent size match with the SVC cranially in addition to the ability to distend and increase in length which, in turn, improves long-term patency. The authors have proposed a safe and tension-free procedure to reconstruct the systemic venous drainage into the right atrium when a direct anastomosis under tension might be prone to develop re-stenosis. Since biological tissue in the form of an aortic homograft is utilised, only long-term follow-up will determine whether calcification and graft degeneration is an issue. It can be concluded that Said et al. have provided a useful additional method to modify and possibly improve long-term results of the Warden procedure for PAPVC (2).

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