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PERIOPERATIVE ASSESSMENT AND EARLY RESULTS OF AORTIC VALVE REPLACEMENT USING STENTLESS XENOGRAFT

(In Comparison with Prosthetic Valves)

Thesis

Submitted for Partial Fulfillment of
MD Degree in Cardiothoracic Surgery

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ABSTRACT

Objectives: Stentless porcine valves in the aortic position offers many advantages, their clinical performance had been evaluated in comparison with prosthetic mechanical valves.

Materials and Methods: This study included 50 patients with aortic valve replacement; 30 of them using the Toronto stentless porcine valve (SPV) (Group I) and 20 of them using bileaflet mechanical valve (Group II. All the patients were clinically evaluated and echocardiography follow up was done for 6 months. Rheumatic fever was the main aetiology and aortic regurge was the predominant pathology.

Results: There was significant improvement in the functional class of patients in both groups. There was significant reduction in the postoperative left ventricular dimensions and this was more in group I. The peak systolic gradient across the aortic valve was significantly lower in group I. The overall survival was 93.3% in group I and 95% in group II

Conclusion: The Toronto SPV offers promising results and needs further follow up.

Key Words: Aortic valve replacement - Toronto stentless porcine valve – Mechanical prosthetic valve.

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محضـر

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الطبيب / محمد احمد حلمي يوسف

توطئة للحصول على درجـة الماجستير / الدكتـــوراة

في جراحة القلب والصدر

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INTRODUCTION AND AIM OF WORK

Aortic valve replacement with stentless aortic valve xenograft was first reported by Binet and his collaegues in their report of five patients who underwent aortic valve replacement with stentless pig and calf valves (Binet et al., 1965). O'Brien and Clarbrough began to replace the aortic valve with stentless formaldehyde-preserved porcine aortic valves in 1966 (O'Brien and Clarbrough, 1966).

With the development of tissue fixation using glutaraldhyde, porcine aortic valve xenograft became commercially available and mounted in a frame and the interest in stentless xenografts vanished for sometime.

The renewed interest in stentless valves revieved by the shortened durability of stented bioprosthesis and poor hemodynamic characteristics caused by the stents resulting in reduction of the effective prosthesis orifice area. The lack of flexibility of the stents that support the commisures caused unphysiologic mechanical stress, leading to leaflet calcification as reported by Morris et al. (1976).

The stentless valve provides superior hemodynamic characterestics with better effective orifice area, and lower gradient. Its hemodynamic performance is similar to that of the aortic homograft in the early period after implantation (Jin et al., 1995). The stentless porcine valve provides the patient with almost no evidence of valve thrombosis and relative freedom from the risk of

anticoagulant-related hemorrhage, thus providing the patient with a superior quality of life (Fradet et al, 1995).

The clinical use of homografts is restricted by the limited availability of donor organs in our country. Stentless xenografts add immediate availability of valve size and on shelf.

The aim of this study is to evaluate the early clinical results, hemodynamic performance and the technique of insertion of stentless valves for aortic valve replacement in comparison to prosthetic valves.

REVIEW OF LITERATURE

ANATOMY

The Aortic valve is situated between the left ventricle and the aorta.

ANATOMY OF THE AORTIC VALVE

The Aortic valve consists of the following:

1- A fibrous "annulus" of complex form".

2- Three semilunar cusps attached basely to the annulus.

3- Three dilatations of the aortic wall (aortic sinuses corresponding to the cusps).

The overall shape approximate a truncated cone.

The Aortic Fibrous Annulus

It consists of three almost semicircular condensations of collagen forming three scallops anchored to the fibrous skeleton (Duran, 1996).

Semilunar Cusps or Valvules

They are three in number. They are reduplications of the endocardium enclosing a central lamina fibrosa (Each cusp posseses a thickened basal attached border) which is deeply concave when viewed from the aortic aspect, and an approximately horizontal free border. Peripherally the cusps are very

thin at the commisures, but at the mid point of the leaflet a substantial aggregation of fibrous tissue forming the nodule of arantii (which is the contact area). On each side of the nodule the lamina fibrosa is tenuous and the valvular tissue is thin lucent and occasionally fenestrated. The aortic surface is rough than the ventricular surface (Clark and Finke, 1974).

The right and left coronary arteries are connected to the right and left coronary sinuses. The corresponding cusps are named according to the respective coronary arteries: right and left coronary arteries. The sinus that does not have the origin of the coronary artery is called the non-coronary sinus which is coupled to the non-coronary cusp.

Most of the non-coronary leaflet and ½ left coronary cusp are continuos with the aortic leaflet of the mitral valve (Aorto-mitral fibrous continuity). The right and left cusps are related to the septum muscle.

The aortic Sinuses are prominent dilatations of the aortic root wall above the attached cusps and is limited above by a well defined circumfrential supravalvular ridge when viewed from the luminal aspect (Sinotubular junction). The ostia of the coronary arteries usually open at the level of this ridge. The left coronary ostia opens slightly at a lower level.

The wall of the sinuses are largely collagenous near the fibrous annulus but the proportion of collagen diminishes and the amount of elastic tissue increases in the upper part of the sinus.

At midsinus level its wall is about one half the thickness of the supravalvular aorta, and less than one quarter of supravalvular ridge. Also, at this level the luminal diameter of the aortic root is almost double that of ascending aorta (Reid, 1970).