

Is Transesophageal Echocardiography Needed before Hospital Discharge in Patients after Bentall Surgery?

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Background: Whether transesophageal echocardiography (TEE) should be routinely performed before hospital discharge after Bentall surgery remains unclear. The investigators took advantage of this practice at their institution to evaluate its benefit.

Methods: All patients who had undergone the Bentall procedure at Bichat Hospital from January 2010 to March 2014 were included. For each patient, transthoracic echocardiographic and transesophageal echocardiographic data and clinical events were retrospectively collected from the various reports.

Results: One hundred ninety-eight patients underwent the Bentall procedure during the study period. Postoperative TEE was performed in 117 patients (59.1%), including nine with abnormalities observed on transthoracic echocardiography (a vibrating element on the new prosthetic valve, suspicion of peritubular complications in two patients, and aortic regurgitation in six patients). In 108 patients, routine TEE was performed (i.e., without clinical indication beyond baseline postoperative imaging). Patients with and those without routine TEE were identical, except for more frequent endocarditis as an indication for surgery in patients with routine TEE. Routine TEE did not reveal any new findings that prior transthoracic echocardiography had not shown. The most frequent finding on transthoracic echocardiography or TEE was periaortic hematoma, which sometimes led to the performance of computed tomography. This imaging did not change the care of the patients in this population.

Conclusions: This study does not support the performance of TEE after Bentall surgery during the in-hospital course in the absence of a specific indication. Baseline postoperative imaging using TEE or computed tomography should preferably be recommended beyond the early postoperative period after periaortic hematoma has resolved. (*J Am Soc Echocardiogr* 2016; ■:■-■.)

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The Bentall procedure has become the reference technique for treating the proximal ascending aorta (aneurysm, dissection) when the aortic valve cannot be spared (because of associated aortic valvular disease or intraoperative impossibility to keep the valve).¹ The Bentall procedure involves the surgical implantation of a composite graft to replace the aortic valve, aortic root, and a portion of the ascending aorta, with reimplantation of the coronary arteries into the graft. In addition to proximal and distal anas-

tomoses (usually at the annulus and in the tubular ascending aorta), the proximal coronary arteries are also anastomosed into the graft. Furthermore, in contrast to isolated aortic valve replacement, replacement of the ascending aorta is usually responsible for periaortic hematoma.

Numerous studies have described the main complications as well as long-term results and prognosis after this surgery.²⁻⁹ They concluded that transesophageal echocardiography (TEE) was useful to detect complications of this surgery, and some programs of systematic follow-up with TEE have been developed. However, few studies have focused on the early postoperative period. Those small studies were performed 20 years ago and included limited numbers of patients.¹⁰⁻¹³ As a result, there is no clear evidence supporting recommendations. The European Society of Cardiology guidelines published in 2014 recommend imaging 1 month after surgery of the ascending aorta, without specifying an imaging modality, and the American College of Cardiology and American Heart Association guidelines published in 2010 recommend imaging 1 month after ascending aortic surgery using computed tomography (CT) scan or magnetic resonance imaging.^{14,15} Both the European Society of Cardiology (2012) and the American Heart Association (2014)

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Abbreviations**CT** = Computed tomography**TEE** = Transesophageal echocardiography**TTE** = Transthoracic echocardiography

guidelines on valvular diseases recommend the performance of baseline postoperative transthoracic echocardiography (TTE) 6 to 12 weeks after aortic valve replacement, but they do not individualize with respect to Bentall intervention.^{16,17} The

French Society of Cardiology recommends the performance of baseline postoperative TTE 2 to 3 months after aortic valve replacement and the performance of TEE if surgery of the ascending aorta is associated (Bentall).¹⁸ Last, the European Association of Cardiovascular Imaging and the European Association of Echocardiography note the importance of postoperative TEE in aortic diseases, without further precision.^{19,20}

As a result, TTE is routinely performed after Bentall surgery before discharge from the hospital, but the indication for TEE during this early postoperative period remains unclear. It was nevertheless a frequent practice at Bichat Hospital in recent years to routinely perform TEE before discharge in patients after Bentall surgery. Bichat Hospital is a cardiologic medical-surgical center including a department of cardiac surgery in which >1,000 heart lung bypass procedures are performed per year, a department of medical cardiology, a department of vascular surgery, and the national reference center for Marfan syndrome and related diseases.

We took advantage of this practice at our institution to evaluate the potential benefit associated with the routine performance (without clinical indication beyond baseline postoperative imaging) of TEE before hospital discharge after Bentall surgery.

METHODS**Population**

All patients who had undergone the Bentall procedure at Bichat Hospital from January 2010 to March 2014 were included.

For each patient, we retrospectively collected data from the hospital files, as follows:

- demographic characteristics (age and sex);
- medical history (previous cardiac surgery, diabetes, hypertension, obesity, chronic renal or respiratory failure, indication for surgery and its timing [emergency or not], and the presence or absence of Marfan syndrome);
- surgical data (presence or absence of a bicuspid aortic valve, names of the surgeon and the responsible senior medical doctor, and type of prosthetic valve implanted [biological or mechanical]);
- medical events during hospitalization (atrial fibrillation, pericardial effusion requiring drainage, pacemaker implantation, stroke, fever, pneumonia, heparin-induced thrombocytopenia);
- duration of hospitalization (after surgery, after ultrasound evaluation);
- transthoracic and transesophageal echocardiographic evaluations before hospital discharge (date, left ventricular ejection fraction, mean and maximal aortic transvalvular gradient, presence or not and quantification of intra- or paraprothetic regurgitation, maximal thickness of the periaortic hematoma and its location [if the hematoma was qualified as small and no measure had been made, we considered that the thickness was 5 mm], other remarkable features, and modifications of care after TEE); and
- electrocardiographically gated cardiac and aortic CT, including computed tomographic angiography using an iodinated contrast

Table 1 Indications for Bentall surgery

Indication for surgery	n (%)
Aneurysm and AR	98 (50)
Aneurysm and AS	35 (18)
Aneurysm	31 (16)
Aortic dissection	13 (6.6)
Endocarditis	12 (6.1)
Aneurysm, AR, and AS	8 (4.0)
False aneurysm after previous Bentall procedure	1 (0.5)

AR, Aortic regurgitation; AS, aortic stenosis.

agent (performance or not and its clinical consequences on care).

Only planned TTE and TEE performed in the echocardiography laboratory, when patients were out of the intensive care unit, were considered (TEE in the intensive care unit was always performed because it was required by the clinical course of the patient).

This study was an observational retrospective study. The conduct of the study did not interfere with the usual care of patients. TEE, TTE, and all examinations were performed in the context of care. In accordance with French law, no institutional review board approval was required.

Statistical Analysis

Data are expressed as mean \pm SD (quantitative variables) or as numbers and percentages (qualitative variables). Comparisons were made using unpaired *t* tests (quantitative variables) or χ^2 tests (qualitative variables). The program JMP version 7.0.1 was used (SAS Institute, Cary, NC).

RESULTS**Overall Population**

Bentall procedures were performed in 198 patients between January 2010 and March 2014 in the Department of Cardiac Surgery at Bichat Hospital.

Indications for surgery are presented in Table 1. Clinical characteristics of the patients are summarized in Table 2. Most of the patients were men (83%), with a mean age of 55.6 years. Marfan syndrome was diagnosed in 24 patients (12%). Bicuspid aortic valves were observed in 79 patients (40%).

In-Hospital Course

Clinical events occurring before discharge were new-onset postoperative atrial fibrillation in 73 patients (36.9%), pneumonia in 26 patients (13.1%), persistent atrioventricular block requiring pacemaker implantation in 24 patients (12.1%), pericardial effusion requiring surgical drainage in 24 patients (12.1%), stroke in 13 patients (6.6%); 12 ischemic strokes with one hemorrhagic transformation and one transient ischemic attack), and heparin-induced thrombocytopenia in six patients (3.0%). In-hospital mortality was 3.5%.

Echocardiography

Among the 198 patients, seven underwent neither TTE nor TEE in the echocardiography laboratory, because of early death. One

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