

Thrombolysis Is an Effective and Safe Therapy in Stuck Mitral Valves With Delayed Presentation as Well as Hemodynamically Unstable Patients: A Single Centre Study

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Abstract

Background: Thrombosis is a complication of prosthetic valves on oral anticoagulants which is associated with significant morbidity and mortality. A re-operation carries a substantial risk, with mortality rate from 10% to 15% in selected series, which may be 2- or 3-folds higher in critically ill patients. This study conducted in a tertiary care cardiology unit aimed to evaluate the effectiveness and safety of thrombolytic therapy in stuck mitral bileaflet heart valves.

Methods: As a prospective observational study, clinical symptoms and fluoroscopy were the mainstay in diagnosis of stuck mitral valve. Gradient across the valve by transthoracic echocardiography was used to monitor the therapy every 6 h. Fall of mean gradient more than 50% was considered as successful thrombolysis. And final results were again checked by fluoroscopy with documentation of improved leaflet movement.

Results: Totally we studied 34 patients. Patients receiving thrombolytic therapy with streptokinase achieved an overall 91.2% freedom from a repeat operation or major complications, a large subcutaneous hematoma occurred in one (2.9%), reoperation required in two due to failure of treatment (5.9%), allergic reaction in one (2.9%), one patient developed transient neurologic dysfunction (2.9%) and one patient died during therapy due to refractory cardiogenic shock (2.9%). All patients including those with delayed presentation (> 14 days) and hemodynamically unstable patients had good results similar to those who presented within 14 days and hemodynamically stable. Mortality was higher in unstable patients and reoperation was higher with delayed presentation.

Conclusions: Thrombolysis with streptokinase is highly successful and safe therapy in hemodynamically stable as well as unstable patients, or those with early or delayed presentation with stuck bileaflet

mitral valves, especially in centers where round the clock cardiothoracic surgery backup is not available.

Keywords: Stuck mitral valves; Thrombolysis; Prosthetic valve

Introduction

Presently bileaflet valves are the mechanical valves of choice in prosthetic mitral valve implantation. Data focusing on these valve models with respect to valve thrombosis are emerging only in the last decade [1-10]. This study enlightens some aspects unique to thrombosed bileaflet valves and their implications on the feasibility and safety of thrombolysis. Different prosthetic valve models may vary in their propensity for thrombosis, the relative interrelations and proportion of in-growth tissue and thrombus, the amount of thrombus needed to disturb leaflet motion and the vulnerable zones within the valve. Bileaflet valves are of special interest because their delicate mechanism may lead more easily to leaflet immobilization, even with a relatively small clot. On the other hand, if the offending clot is minor, thrombolysis may be easier and safer. Therefore, we sought to explore the role of thrombolysis in stuck bileaflet mitral valves based on our own experience and a literature review.

Methods

As a prospective observational study, we totally studied 34 patients admitted in our tertiary care intensive care unit from January 2017 to December 2017. Clinical symptoms profile of patient and fluoroscopy were the mainstay in diagnosis and evaluation of leaflet mobility in cases of stuck mitral valve. The desired acquisition angle was obtained in all cases. Transthoracic echocardiogram (TTE) was performed in all patients, using all standard views. The findings in TTE raised the suspicion of stuck valve and mandated further studies were increased mean diastolic transvalvular gradients (> 6 mm Hg) and failure to achieve at least one view demonstrating movement of both leaflets. Transesophageal echocardiography (TEE) studies were performed in all patients before throm-

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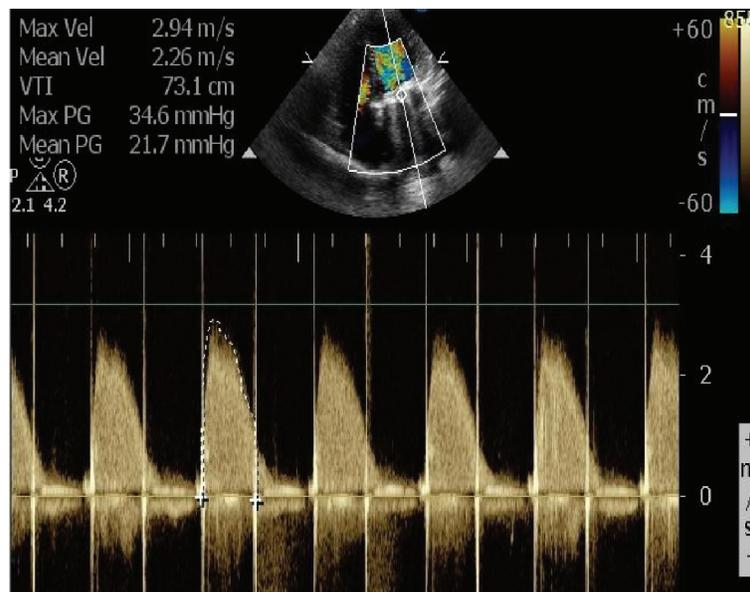


Figure 1. TTE image before thrombolysis shows mean gradient of 21.7 mm Hg across stuck prosthetic mitral valve.

bolysis except those who were in frank pulmonary edema, to exclude a mobile large (8 mm) thrombus, which was considered a contraindication for thrombolysis in our institute [9]. Details of valve implantation, its model, size and position were gathered from the patient's record. Patients' symptoms were recorded, including symptom duration, heart failure (expressed as New York Heart Association (NYHA) class), embolic phenomena (peripheral, coronary, cerebral), palpitations and syncope.

Treatment protocol

Intravenous thrombolysis was given, using streptokinase (STK). Streptokinase was usually given as a 30-min loading dose of 150,000 to 250,000 U, followed by 100,000 U/h. STK was administered until valve reopening or for at least 24 h. Intravenous heparin infusion was started after termination of

thrombolysis. After stabilization concomitantly warfarin was administered to achieve target (2.5 - 3.5) international normalised ratio (INR) levels. Heparin was discontinued after two therapeutic INR levels were achieved, 24 h apart. In addition, all patients were started on aspirin (100 mg/day).

Evaluation of treatment outcome

Each patient underwent TTE evaluation every 6 h from the start of thrombolytic treatment and on a daily basis thereafter if full valve reopening was not achieved. Clues for valve reopening were clear-cut evidence of movement of both leaflets in a parallel fashion and a substantial (50%) decrease in transvalvular gradients (Fig. 1, 2). Confirmation of valve reopening was achieved by fluoroscopy, which was performed in each patient within 24 h after completion of thrombolytic course.

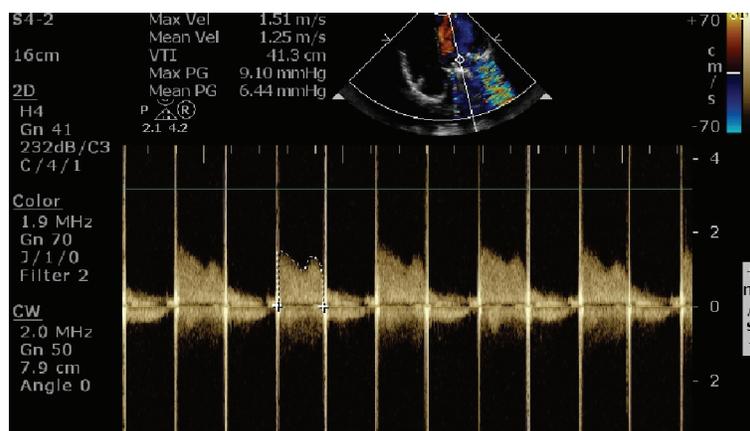


Figure 2. TTE image at 24 h of thrombolysis shows significant fall in mean gradient to 6.44 mm Hg.

Table 2. Overall Results of Thrombolysis in 34 Patients With Stuck Mitral Valves

Parameters	Results
Clinical success rate	31 (91.2%)
Re-operation required	2 (5.9%)
Mortality	1 (2.9%)
Complications	
Large subcutaneous hematoma	1 (2.9%)
Neurological deficit (TIA)	1 (2.9%)
Allergic reaction	1 (2.9%)

Complications

Major bleeding was defined as any bleeding that necessitated blood transfusion or was associated with a decrease of 3 g/dL or more in blood hemoglobin concentration. Otherwise, bleeding was termed minor. A careful neurologic examination and brain computed tomography were performed in any patient who had neurologic complaints during or after the thrombolytic infusion. Fever with chills and generalized rash were considered indicative of drug allergy, unless otherwise explained.

Follow-up after discharge

Each patient was discharged with detailed instructions about the importance of anticoagulation regimen, common factors interacting with the warfarin efficacy and maintenance of INR in therapeutic window of 2.5 - 3.5; also explained about signs and symptoms of stuck valve. Follow-up in the cardiology clinic included patient history, physical examination and echocardiography at 1 months followed by 3 monthly after discharge and biannually thereafter. Fluoroscopy was done in cases to rule out repeated restriction of leaflet motion whenever TTE showed high transvalvular gradients or leaflet motion seemed imperfect.

Results

we studied total 34 patients; 10 males (29.4 %) and 24 females (70.6%); 24 were < 40 years (70.6%) and 10 were > 40 years (29.4 %) who experienced one or more episodes of stuck valve over a 12-months period and received thrombolysis with streptokinase. A total of 27 patients (79.4%) were presented within 14 days, and seven patients (20.6%) after more than 14 days of symptoms. Functional class at initial episode was NYHA I-II in 12 patients (35.3%) and NYHA III-IV in 22 patients (64.7%), 25 patients (73.5%) were hemodynamically stable and nine patients (26.5%) were hemodynamically unstable (i.e. blood pressure (BP) < 90 mmHg systolic) on presentation (Table 1). During study period, patients receiving thrombolytic therapy with streptokinase achieved an overall 91.2% freedom from a repeat operation or major complications, a large subcutaneous

Table 1. Patients' Characteristics

Patients characteristics	Result
Number of patients	34
Age	
Less than 40 years	24 (70.6%)
More than 40 years	10 (29.4%)
Gender	
Male	10 (29.4%)
Female	24 (70.6%)
Symptoms duration	
Less than 14 days	27 (79.4%)
More than 14 days	7 (20.6%)
Initial functional class	
I - II	12 (38.3%)
III - IV	22 (64.7%)
Hemodynamically	
Stable	25 (73.5%)
Unstable	09 (26.5%)

hematoma occurred in one (2.9%), reoperation required in two (5.9%), allergic reaction in one (2.9%), one patient developed transient neurologic dysfunction (2.9%) and one patient died during therapy due to refractory cardiogenic shock (2.9%) (Table 2). All patients including those with delayed presentation (> 14 days) and hemodynamically unstable patients had good results similar to those who presented within 14 days and hemodynamically stable patients. Mortality was higher in unstable patients and reoperation was higher with delayed presentation.

Discussion

Bileaflet valves are the mechanical valves of choice at the present. Different prosthetic valve models may vary in their propensity for thrombosis, the relative interrelations and proportion of ingrowth tissue and thrombus, the amount of thrombus needed to disturb leaflet motion and the vulnerable zones within the valve.

Data on the pathologic findings in patients with stuck bileaflet valves are sparse. The most extensive data comes from Deviri et al, who studied 112 cases of explanted thrombosed valves, of which 41 (36.6%) were bileaflet. Among these 41 patients, in 30 (73.2%) the thrombus was at the hinge site, causing impairment of both leaflet motion [11]. Vitale et al studied 87 explanted thrombotic prosthetic valves, of which only 12 (13.8%) were bileaflet [1]. It seems that the amount of thrombotic material needed to cause interruption of leaflet motion in bileaflet valves is minimal, especially if it catches the hinge of the valve. A small thrombus may even entrap the hinges of both leaflets [3, 11]. The lack of disabling embolic events in our patients reflects the careful selection of patients, i.e., the exclusion of patients with large or pedunculated mobile

thrombi. In addition, our policy is to advocate thrombolysis as the first line of therapy in stuck valve, even in mildly symptomatic or low-risk patients. In contrast, the two largest series (engulfing nearly half of the patients receiving thrombolysis for stuck mitral valve reported in the literature) included patients either on the basis of advanced heart failure or those who were so critically ill that the operative mortality was considered prohibitive [2, 4]. Above all, we believe that TEE should always be performed before thrombolysis in left-sided valves to exclude large thrombi. In a literature review of 182 left-sided thrombotic episodes, there were 23 episodes of transient or permanent neurologic damage or peripheral emboli (12.6%) [6]. Fourteen of these episodes were taken from a single study [2] in which TEE was performed only in 11/74 episodes (14.9%): 9/41 (22.0%) in stuck mitral valve and 2/33 (6.1%) in stuck aortic valve. In the other studies altogether, the above-mentioned complications occurred in 9/108 (8.3%), with only two cases of permanent neurologic damage (1.9%), one of which occurred when thrombolysis was given, despite the visualization of a mobile thrombus in TEE [12]. We believe that the high rate of cerebral and peripheral emboli reported in the literature reflects poor patient selection, that is, inclusion of patients in whom large left-sided thrombi were not excluded by TEE.

Conclusions

By comparing data from the main reports on thrombolytic therapy in stuck bileaflet mitral valves, it is evident that the outcome in this study ranks among the best reported in the current literature. In patients with stuck bileaflet mitral valves without large clots, thrombolysis offers a valid alternative to surgery with a high success rate and minimal complications and low mortality. This therapy may be implemented in a wide variety of patients, regardless of symptom duration or severity. Since recurrent episodes may be subclinical, frequent follow-up echocardiograms are advocated after a successful thrombolysis, and fluoroscopy should be liberally instituted to evaluate leaflet motion. Further studies are required to substantiate the encouraging results of our study and to establish the best thrombolytic regimens.

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Conflict of Interest

None.

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