

MITRAL VALVOTOMY AN OLDEST CARDIAC SURGICAL PROCEDURE FOR MITRAL STENOSIS

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INTRODUCTION:

Rheumatic fever and Rheumatic Heart Disease are found world wide in all climates and in all races (Cosh and Lever 1988)

The literature of Mitral Stenosis dates back to 1668 AD when John Mayow recorded extreme constriction of mitral orifice in a young man (Rolleston 1940).

Rheumatic fever and Rheumatic carditis following Group A Bhaemolytic strestococcal throat infection is responsible for the development of mitral stenosis in a long run (Gold Stein et al 1967)

In the beginning of 20th Century Rheumatic Fever and Rheumatic Heart Disease was common in western countries and used to be important cause of morbidity and mortality among the population. (Padmavati 1978).

With the upliftment of socio-economic condition in western countries rheumatic fever and Rheumatic heart disease has become a rare in developed world (Padmavati 1978)

In developing countries including Nepal even at the end of 20th century Rheumatic Fever and Rheumatic Hearth disease is common, and Rheumatic Heart disease is one of the important cause of morbidity and mortality in our population at large.(Agarwal 1981).

Mitral Stenosis was and is one of the commonest acquired valvular heart disease in our population posing challenge to both physician and surgeons (Agarwal 1988).

The course of Mitral Stenosis from the inception during acute carditis to the point of severe Mitral Stenosis, where surgical treatment becomes mandatory, normally spans a period of few years to several decades. (Selzer and Cohn 1972).

The time gap between the Rheumatic Carditis and Critical Mitral Stenosis was found to be shorter in developing countries with the emergence of new disease entity “ Juvenile Mitral Stenosis” Critical Mitral Stenosis below age of 18 years. (Roy et al 1963)

Cardiac Surgery has altered the natural history of patients with Mitral Stenosis. Before the surgical relief for Mitral Stenosis was available it was invariably a fatal disease, leading to earlier death of patients. (Rapaport 1975).

DIAGNOSIS :

Clinically the patient of Mitral Stenosis with decreasing mitral valve areas (MVA) gradually experiences difficulty in breathing on exertion. With increasing severity of Mitral Stenosis to critical

level of MVA of 1 cm^2 and smaller, the patient experience difficulty in breathing even at rest. (Smith 1985).

The degree of dyspnoea and disability was clinically graded by New York Heart Association into Class I, II, III and IV.

NYHA class I includes patient with Mitral Stenosis without dyspnoea

NYHA class IV includes patients with dyspnoea at rest (Anonymous 1973)

On clinical examination of patient there will be a mid-diastolic murmur at cardiac apical region. The time of mid diastolic murmur getting longer with increasing severity of mitral stenosis.

For diagnosis of mitral stenosis Echocardiography is a simple modern non invasive technique to define the presence of mitral stenosis, and regurgitation, its severity, measurement of mitral valve area, pliability of mitral valve cusps, calcification of mitral valve cusps, study the presence of clot in left atrium and to interpret the results of surgery and development of mitral restenosis.

Echocardiography with Doppler study is a gold standard for assessment of mitral valve before, during and after mitral valve surgery, (Goldman 1986).

TREATMENT:

The only treatment for critical mitral stenosis is to dilate the stenotic mitral valve (Mitral valvotomy) (Ellis et al 1973).

Mitral Valvotomy may be done with

- I Closed Mitral Valvotomy (Aventura 1986)
(Mitral Valvotomy with beating heart)
 - (a) Digital Commissurotomy
 - (b) Transventricular Mitral Valvotomy with Tubb's Dilator
- II Open Mitral Valvotomy (Spencer 1990)
With-help of Heart Lung Machine and extra corporeal circulation.
- III Ballon Mitral Valvotomy
Non operative procedure
In this procedure stenotic mitral valve is dilated with percutaneous ballon Catheter. (Loya 1991, Kumar 1999)

The criteria for closed mitral valvotomy are :

- 1) Pliable mitral valve leaflets
- 2) No calcification of mitral valve leaflets
- 3) No mitral regurgitation
- 4) No clot in left atrium

Disadvantages of closed mitral valvotomy are

- 1) Risk of peripheral embolisation of clot
- 2) Calcium embolisation from calcified valve

3) Mitral valve insufficiency

In 1923 Levin and Cuttler at Harvard Medical School, USA were the pioneering surgeons to be bold enough to do successful mitral valvotomy in a beating heart in a young girl of 11 years with mitral stenosis. The girl survived many years. But many patients following her died of mitral insufficiency and the procedure was abandoned. (Davis et al 1981)

In 1925 Sir Henry Soutter of London Hospital did one successful digital mitral commissurotomy.

Mitral valvotomy was abandoned for almost 25 years.

During 2nd World War many surgeons had an opportunity to operate on injured heart.

Following Second World War in 1948, mitral valvotomy was successfully started independently in different centres of world et, by

Dwight Harken in Boston

Russel Brook in London

Charles Bailey in Philadelphia

All successfully started mitral valvotomy almost simultaneously.

Mitral valvotomies gave rewarding results to the patients with severe mitral stenosis. The procedure got popularity and acceptability among surgeons around the world.

In England in 1954 Tubbs developed an instrument to dilate mitral valve through transventricular approach. (Logan and Turner 1959).

Surgical Techniques in Closed Mitral Valvotomy (Aventura 1986).

Patient in supine Position

After general anaesthesia with endotracheal intubation, left sided antero-lateral thoractomy is done through 4th intercostal space. Pericardium opened and heart exposed.

The left atrial appendage is palpated to exclude any clot. The base of left atrial appendage is encircled with purse string suture with non absorbable suture and protected with tourniquet.

The left atrial appendage is opened with knife and scissors and right index finger is introduced inside left atrial chamber. Mitral valve and its orifice are palpated and assessed.

For digital splitting of mitral valve commissure pressure from right index finger is applied over anterior and posterior mitral commissures from various positions. This digital manoeuvres and pressure may satisfactorily dilate mitral valve orifice. If the mitral valve commissurotomy is satisfactorily with this procedure, right index finger is removed from left atrium and left atrial opening is closed with non absorbable Ethibond sutures.

If the digital splitting of the mitral valve is not satisfactory, steps are proceeded for transventricular dilatation of mitral valve with Tubbs dilator.

Left ventricular apex is exposed. A through and through U-suture is placed at the apex of left

ventricle in an area free from blood vessels. The myocardium in the U-loop is then transected with pointed scalpel and dilated with Hagger dilator.

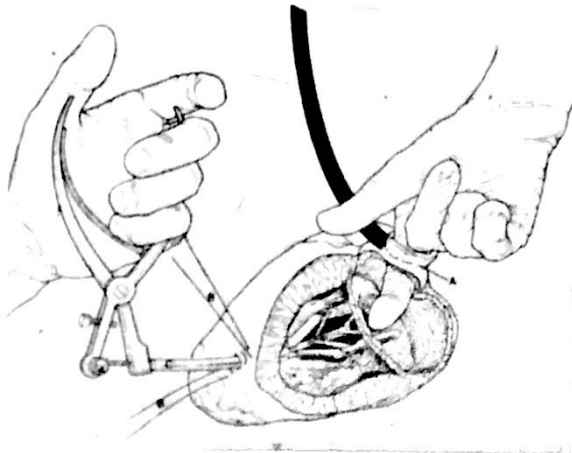
A Tubbs dilator is introduced inside the left ventricular chamber through ventriculotomy wound using left hand.

With the Rt index finger in the left atrium Tubbs dilator in left ventricle, the tip of the Rt index finger guide the tip of the Tubbs dilator through the orifice of mitral valve. The Tubbs dilator opening adjusted by outside screw to the desired size and Tubbs dilator is opened to split stenotic mitral valve. Satisfactory valvotomy is assessed with Rt index finger. After satisfactory valvotomy Tubbs dilator removed from left ventricle and Rt index finger removed from left atrium.

Lt ventricular opening is closed. Lt Atrial opening is closed with no absorbable suture.

The procedure of closed mitral valvotomy is not without complication. The immediate complication of closed mitral valvotomy is tear of Lt atrial appendage and tear of left ventricle myocardium which may cause surgical catastrophe.

Besides that the procedure being blindly carried out may lead to severe mitral regurgitation and requiring urgent mitral valve replacement.



Diagrammatic Mitral Valvotomy



During Surgery

DISCUSSION:

In Indian Sub Continent, Prof. Stanley John was the first surgeon to start closed mitral valvotomy in Christian medical College, Vellore in 1950's. He has got the experience of longest series of mitral valvotomy more than 3000 cases. (John S. 1983)

The procedure of Closed Mitral Valvotomy was introduced in Bir Hospital during late 1980's.

Closed Mitral Valvotomy was successfully started in Shree Birendra Military Hospital in the year 1995 by the author.

The history of cardiac surgery had sudden turn and advancement with the development of heart lung machine and facility for extra corporeal circulation by Gibbon in 1953.

In 1953 Gibbon was the first surgeon to do Open Heart Surgery to Close Atrial Septal defect using Heart Lung machine.

With the development of Heart Lung Machine surgeons can stop the heart for some time open the heart chamber and correct the defects and damage inside and outside of heart under direct vision and change the damaged valve and Bypass (replace) the closed coronary arteries with leg veins. (CABG)

In 1955 Lilehei and Kirklin were the first to do mitral valvotomy under direct vision with the help of heart lung machine.

Gradually open mitral valvotomy became popular procedure during 1970's and 1980's. (Vivie 1985). Recently facility for Open Mitral Valvotomy is available in TUTH Hospital.

In 1961 Starr and Edward were first to replace damaged mitral valve with artificial valve.

In developing countries with lot of patient with rheumatic mitral stenosis and with limited medical resources and shortage of skilled manpower closed mitral valvotomy is still a popular cardiac surgical procedure giving good relief to patients of mitral stenosis.

In many studies carried out in developing countries the early result of closed mitral valvotomy was as good as open mitral valvotomy in selected patients. (Aryanpura 1978 Rajbhandary GL 1994).

In a research study carried out by the author to see the early results of closed mitral valvotomy, open mitral valvotomy and mitral valve replacement in juvenile mitral stenosis, closed mitral valvotomy was found to be effective and safe surgical procedure in young mitral stenosis patients. (Rajbhandary GL 1992).

CONCLUSION:

Even with an advancement of cardiac surgery to successful Heart Transplant and Development of artificial heart, the oldest cardiac surgical procedure Closed mitral valvotomy is still a time tested procedure and closed mitral valvotomy is still a procedure of choice for the surgical relief of mitral stenosis patient in selected group of patients in our developing countries

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During Mitral Valvotomy



Patient after Mitral Valvotomy