



INCIDENCE OF ARRHYTHMIAS IN THE TRANSVERSE TRANSSEPTAL APPROACH FOR THE MITRAL VALVE PROCEDURES

Thesis submitted for partial fulfillment of the doctorate degree in
Cardiothoracic Surgery

By

Ehab Mohamed Nooh

(M.Sc) - Master of General Surgery, Ain Shams University

Under supervision of:

Mohammed Magdy Mostafa, M.D.

Professor of Cardiothoracic Surgery
Ain Shams University

Ashraf Abdullah Elsebaey, M.D.

Professor of Cardiothoracic Surgery
Ain Shams University

Hossam EL-Din Ashour Abdel-Hamid, M.D.

Assistant Professor of Cardiothoracic Surgery
Ain Shams University

Michael Weyand , M.D.

Professor of cardiac surgery
Erlangen University - Germany

Ain Shams University

Faculty of Medicine

2013

CONTENTS

	Page
LIST OF TABLES	II
LIST OF FIGURES.....	III
INTRODUCTION & AIM OF THE WORK	1
REVIEW OF LITERATURE.....	5
Historical Background	5
Related Surgical Anatomy	9
Surgical Technique	42
Exposure of the mitral valve	49
PATIENTS AND METHODS	67
STATISTICAL ANALYSIS.....	79
DISCUSSION	101
CONCLUSION AND SUMMARY	117
REFERENCES.....	122
ARABIC SUMMARY	-

LIST OF TABLES

Table No.	Title	Page
1	Demography of the Patients.....	81
2	Preoperative Rhythm in both groups	82
3	Preoperative Echocardiographic Assessment of Lt. atrial dimensions in both groups	83
4	Cross-clamp and Total bypass time in both groups.....	85
5	Procedure of Mitral valve intervention valve in both groups	85
6	Use of Inotropes in both groups.....	86
7	Intraoperative Rhythm in both groups	88
8	Mechanical ventilation in both groups	90
9	Bleeding volume in both groups.....	91
10	ICU stay in both groups.....	92
11	Postoperative Rhythm on ICU admission in both groups	94
12	Postoperative Rhythm on ICU admission in both groups	96
13	Late follow up rhythm after 3-6 months postoperatively in both groups	99

LIST OF FIGURES

Fig. No.	Title	Page
1	This Diagram Shows the location of the Sinus Node at the Superior Cavoatrial junction.....	9
2	Triangle of Koch.....	10
3	The AV bundle (bundle of His).....	11
4	Isolated Electrical conduction system of the heart	12
5	This Diagram Shows SA nodal action potentials three phases.....	13
6	Cardiac activation times in seconds.....	14
7	Effects of Sympathetic and Parasympathetic nerve activation on the AV Nodal Action Potential	16
8	Sinus Node artery	17
9	Lateral view of the interventricular septum, after opacification of the coronary Arteries	19
10	Interior of right atrium	21
11	The Fossa Ovalis.....	22
12	View of the base of the heart in anatomical orientation shows the spatial relations of the four cardiac valves.....	28
13	A dissection showing the left (L) and right (R) fibrous trigones revealed by removing the left and non-coronary aortic sinuses.....	30
14	Diagram showing the Mitral valve leaflet and commissures	32
15	The normal zones of the mitral valve leaflet	34
16	Dissection of the mitral valve showing the morphology of a basal cordae	34
17	The atrial surface of the mitral valve showing how the line of closure is some distance from the free edge of the valve.....	35
18	Commissural cords of the mitral valve	38

19	Ventricular view of the papillary muscle.....	40
20	Approaches to the mitral valve	49
21	A tourniquet is placed around the inferior vena cava	51
22	Extension of the incision inferiorly to the back of the heart	52
23	The Dubost transeptal technique	55
24	The right atrial incision is kept 2 to 2.5 cm away from, and parallel to, the atrioventricular groove.....	59
25	The stretched septum and fossa ovalis.....	60
26	Retraction of the interatrial septum and the right atrial free wall exposes the mitral valve	61
27	The Biatrial inferior transeptal Approach	65
28	Sex of group “A”	80
29	Sex of group “B”	80
30	Preoperative Rhythm in group “A”	81
31	Preoperative Rhythm in group “B”	82
32	Mean Left Atrial Diameter in both groups	83
33	Cross-clamp and Total bypass time	84
34	Intraoperative Rhythm of patients in group “A”	87
35	Intraoperative Rhythm of patients in group “B”	88
36	Structures of the angle of the anterior chamber.....	89
37	Mean Volume of Bleeding in both groups	90
38	Mean ICU stay in both groups.....	92
39	Postoperative Rhythm on ICU admission of patients in group “A”.....	93
40	Postoperative Rhythm on ICU admission of patients in group “B”	93
41	Follow-up Rhythm at the 10th postoperative day in group “A”.....	96
42	Follow-up Rhythm at the 10th postoperative day in group “B”	96

43	Late follow-up Rhythm after 3-6 Months postoperatively in group “A”	98
44	Late follow-up Rhythm after 3-6 Months postoperatively in group “B”	98

INTRODUCTION

The opinion is firm that cardiac surgery began on September 10, 1896, when Ludwig Rehn sutured successfully a myocardial laceration. Actually, as early as 1810 operative drainage of the pericardium was performed by a little Spanish Surgeon Francisco Romero, and the highly regarded Baron Larrey. (*Shumacker, H.B. Jr., 1987*)

As early as 1898, Shamways suggested the possibility of opening a stenotic Mitral Valve by digital splitting of the fused commissures. Souttar in 1925, reported the first successfully closed Mitral Commissurotomy, surprisingly he didn't attempt to repeat it. It was only 20 years later that Harken and colleagues restarted the digital dilatation of the stenotic valve through the left atrial appendage. (*Duran CG, 1989*)

During the late 1950's and especially during the 1960's the availability of a safe technique of cardiopulmonary Bypass made the visualization of the heart valves possible. The description by Carpentier and his colleagues of the concept of selective annulus remodeling by means of a prosthetic ring can be considered the origin of the reconstructive surgery of the atrioventricular valves. (*Carpentier A, et al., 1971*)

In the study by Rizzoli and his colleagues, they stated that mechanical valvular prosthesis have the advantage of longevity, although there is still a low incidence of reoperation. **(Rizzoli G, et al, 1999)** Planning the best approach to the mitral valve is an important part of any reoperation, however small left atrium, any adhesions between the heart, the lung, the mediastinum, and the sternum. These adhesions may cause severe or catastrophic bleeding at reentry. **(Stark J, and Pacifico AD.1989)**

Operation on the Mitral valve requires excellent exposure. Mitral valve visibility is impaired by the posterior location of the left atrium held by both venae cavae. The difficulty is especially significant in the presence of a small left atrium, this has given rise to a variety of surgical approaches. One of these approaches is the transseptal approach. **(Kumar N, et al., 1995)**

Optimal mitral valve repair or replacement requires an excellent exposure. The transseptal approach proved to offer an excellent exposure with less inherent complication, especially in case of redo operation, concomitant Tricuspid valve intervention, small left atrium, and in case of Mitral valve repair. The transseptal approach is also a very safe and reproducible technique for use in patients with friable tissues, and heavily calcified Mitral valves. **(El Saegh MM, et al., 1993)**

Utley and his colleagues compared the outcome of the atrial, the Superior and the transverse transseptal approach to the mitral valve. They found that in patients with Sinus Rhythm before the operation, 80% of the cases subjected to left atriotomy approach, 69% of the patients subjected to transseptal approach, 46% of the cases operated upon through the Superior Septal approach maintained the sinus rhythm on discharge. (*Utley JR, et al., 1995*)

AIM OF THE WORK

Through this thesis we are trying to know Incidence of Arrhythmias in the Transverse Transseptal Approach for the Mitral Valve Procedures.

REVIEW OF LITERATURE

HISTORICAL BACKGROUND

Significant progress has been achieved in cardiac surgery in the last 50 years. Mitral Valve surgery (especially for the relief of mitral stenosis) has paralleled the innovations and trends of cardiac surgery and often has served as the benchmark of the latest procedures, and techniques. A chronological survey of mitral valve surgery is presented, with emphasis on parallels to cardiac surgery in general and with highlights of key figures, and events that have conclusively altered the surgeon's approach to succeed, with cardiac dysfunction. A few surgeons promulgated the idea of cardiac surgery in the late 19th century, but mitral valve surgeries were not performed in earnest until Souttar's and Cutler's initial attempts in the 1920s and were not successful on large groups of patients until Bailey and Harken made independent breakthroughs in the 1940s. *(Mohammed Nasir Khan, 1996)*

Considerable amounts of experimental investigation during these years and after World War II in 1948 finally resulted in the widespread use of closed mitral commissurotomy, a successful therapy for noncalcified mitral stenosis. *(Cohn LH, Soltesz Eg, 2003)*

Before venturing further into the history of mitral valves, we must take a brief detour through the advances in open-heart surgery, as these techniques were critical to the advances of mitral valve surgery.

It is difficult to single out 1 person or group of people who were responsible for the great strides in open-heart surgery, and even when a person is chosen, his work often is like the apex of a man-made mountain, an accumulation of research, experimentation, and previously failed attempts by him and many others before him.

John Gibbon performed the 1st successful open-heart operation on a human patient using a heart-lung machine on 6 May 1953. (*Aciemo LJ, 1994*)

The road to this triumph was fraught with setbacks, delays, and technical difficulties, yet Gibbon, through his determination, was able to pursue his dream to its end. He describes his 1st success as an "event that I hardly dreamed of in 1931," the year he was 1st inspired by the idea of extracorporeal circulation when he helplessly monitored the deteriorating condition of a woman with pulmonary embolus. (*Gibbon JH Jr, 1978*)

One of the immediate benefits of cardiopulmonary bypass was the possibility of operating directly upon damaged mitral

valves. At the outset, the strategy continued to be that of repair, but with a clear view and adequate time. Lillehei is credited with successfully completing the 1st surgical correction of mitral valve insufficiency in 1956. (*Aciemo LJ, 1994*)

Complete replacement with a mechanical valve initially fared no better than partial replacement. The 1st reported mitral valve replacement took place on 22 July 1955 in England, with Judson Chesterman performing the surgery. (*Norman AF., 1991*)

Coincidentally; Chesterman used a valve that closely resembled the Starr-Edwards valve in design.

An effective approach to surgery of the Mitral valve began with Harken and Bailey in USA, and Brock in England. During this time the approach to the Mitral valve through the left atrium becomes established. (*Cooley, 1996*)

The increasing variety and complexity of mitral valve operations led to the invention of alternative approaches to the mitral annulus. The traditional vertical atriotomy just posterior to the interatrial groove affords good exposure of the mitral annulus when the left atrium is enlarged. (*Hartz RS, Kanady KE, LoCicero J III, Sanders JH Jr, DePinto DJ, 1991*)

Early in the development of cardiac surgery, Julian and his colleagues described transseptal exposure of the mitral valve. Other authors advocated various technical modifications. Dubost transverse transseptal, the superior approach (dome incision of the left atrium) also provides good exposure of the mitral annulus.

In Summary, the treatment of Mitral valve disease has advanced far beyond its early beginnings. There has been constant progress towards improvement of the valvular prosthesis and techniques of repair. **(Cooley, 1996)**

RELATED SURGICAL ANATOMY

Anatomy of the SA node:

The sinoatrial (SA) node is a section of nodal tissue that is located in the upper wall of the right atrium. The SA node is also referred to as the pacemaker of the heart.

The sinus node is located at the junction of the right atrium at the crista terminalis, in a groove called sulcus terminalis a thick band of atrial muscle at the border of the atrial appendage, and the superior vena cava. The sinus node is located beneath the epicardial surface of the crista terminalis; there is a layer of atrial muscle between the node and the endocardium so that it does not occupy the entire thickness of the atrial myocardium. (Fig.1)

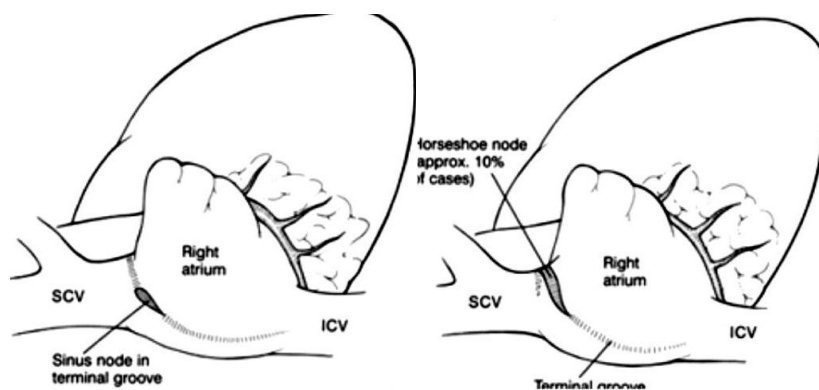


Fig. (1): This Diagram Shows the location of the Sinus Node at the Superior Cavoatrial junction. The node usually lies to the right side of the junction but may be draped in Horse Shoe fashion across the anterior aspect of the junction (*Mill et al. 1997*).