P62

CERTIFICATE

I, Dr. MAHESH K.SHAH .....hereby declare that I have actually performed all the procedures listed / carried out the project under report.

Signature.....M. K. Shah

Place : TRIVANDRUM.

Name in MAHESH K.SHAH

Date : 9.11.1991 capital letters

Forwarded. He has carried out the minimum requirement of procedures / etc.

Signature

Head of the department

DR.K.G.BALAKRISHNAN.

CONTENTS

Cardiac Catheterisation.

- Right heart studies (116)
- Left heart studies (50)
- Angiographies (92)
- Coronary angiography (19)
- Electrophysiology (26)
- Temporary pacemakers (12)
- Intervention (3)

Echo Cardiography (31)

LIST OF PROCEDURES DONE
PROJECT REPORT

TITLE OF THE PROJECT:

CREATINE KINASE AND ITS ISOENZYME MB IN PATIENTS AFTER OPEN HEART SURGERY: SUGGESTED UPPER NORMAL REFERENCE VALUES.

NAME..... DR MAHESH K.SHAH

PROGRAMME :.... D.M. CARDIOLOGY.

MONTH & YEAR
OF SUBMISSION :.... November, 1991.

Note:— (i) In the case compilation of procedures done, the contents and the subsequent pages should be made into different sections (a) Procedures done (b) Procedures assisted (c) Procedures participated (d) Procedures attended / participated etc. in Other Centres. Each section should be preceded by a leaf carrying the name of the section that is succeeding.

(ii) The Contents page will carry information as per model given under

PROCEDURES DONE

Closed Mitral valvotomy ---------- 124 (say)

Patent ductus arteriosus-ligation ---------- 10

Atrial septal defects ---------- 20

.....

PROCEDURES ASSISTED

Closed Mitral valvotomy ---------- 100 (say)

.....

(iii) In the subsequent pages details of each procedure done/assisted should be given in the format given below :—

Heading : Closed mitral valvotomy

Date	Name of the patient	Age	Sex	Patient No.

(iv) In the case of Project Report in the page immediately following the Certificate page the under-mentioned details should be given :—

(a) Title

(b) Duration

(c) Aim and scope

(d) 50 word summary of work done

Creatine Kinase and its Isoenzyme MB

in Patients After Open Heart Surgery:

Suggested Upper Normal Reference Values

Summary

Serum total creatine kinase(CK) and its isoenzyme MB (CKMB) were measured before and 4, 24, 48 and 72 hours after termination of cardiopulmonary bypass in 3 groups of patients undergoing (I) atriotomy, (II) Ventriculotomy and (III) coronary artery bypass surgery. All patients were free of postoperative complications and myocardial infarction as defined by clinical course, 12 lead ECG and 2D echocardiography. The peak elevation of CK and CKMB occured at 24^{th} and 4^{th} hour respectively and then gradually declined. There was no relation between the peak level of rise of CK or CKMB with cross-clamp time or bypass time. The 95^{th} pecentile values of absolute CKMB level at 4, 24, 48 and 72 hours (Table 5) may suggest perioperative myocardial infarction with specificity of 95%. In addition, the rising value of CKMB beyond 24 hours after the termination of bypass may also suggest occurence of myocardial infarction.

Key words: cardiopulmonary bypass, perioperative myocardial infarction, CK, CKMB, atrial septal defect, ventricular, tetralogy of Fallot, Coronary artery surgery.

ncomplicated cardiac surgery rise of cardiac enzymes is noted as result of obligatory cardiac and noncardiac tissue damage.[15,16] arious contributing factors include (1) chest muscle trauma; (2) andling, incision and suturing of atria or ventricles; (3) ffects of hypoxia, hypothermia, difibrillation and bypass on ardiac and noncardiac tissue; and (4) hemolysis.[17,18] Moreover ith altered microvasoular permiability and alteration in unction of hepatic and renal subsystems associated with ostbypass status, the kinetics of CK and CKMB release and isposal can possibly be altered.

Some of the previous workers have suggested establishment of rofile of enzyme release as sensitive and specific marker of MI.[1,6,13,19,20] The exact normal reference values are partly ffected by different methods of analysis,[21] the individual labo- atory standards and surgical and bypass techniques followed. ence it is important to establish the value for each institute, nd probably for each procedure.[5,19]

Materials and Methods

atients: Consecutive patients who underwent surgery for atrial septal defect closure (group I: atriotomy); transventricular repair of ventricular septal defect or tetrology of Fallot (group II: ventriculotomy); and coronary artery bypass surgery(CABG group III) were selected. Patients in group I and II were free of any clinically significant coronary disease. Any patient deve- loping significant postoperative hemodynamic compromise or PMI by clinical course, ECG or new regional wall motion abnormality on 2D echocardiogram were excluded.

rotocol: Routine ECG and 2D echocardiogram were recorded before urgery to rule out coronary artery disease in group I and II and o form a baseline for group III patients. Blood samples were ollected for analysis of CK and CKMB activity, within 24 hours efore the surgery (0 hour sample) and 4, 24, 48 and 72 hours fter termination of cardiopulmonary bypass. ECG and 2D echocardogram were recorded 1 week post-operatively to rule out occurece of PMI.

perative technique: Extracorporeal circulation was used with oderate hypothermia at 28°C using clear crystalloid prime. Membane or bubble oxygenators were used at the surgeon's discretion. yocardial protection was ensured by infusion of cold potassium ardioplegia (St. Thomas) at 4°C into the aortic root and pericadial iced saline slush repeated every 30 minutes. Atrial septal efect was closed by direct suture or Dacron patch closure. Ventricular septal defect was closed by transventricular approach sing a Dacron patch. Intra-cardiac repair for tetrology of allot was done with infandibular muscle resection and patch losure of ventricular septal defect. Saphenous venous grafts ere used in all patients in group III.

aboratory methods: Total CK and CKMB catalytic activity were stimated at 37°C using commercial reagent kits (Boehringer annheim, Manheim, GmbH). Total Ck was determined by the NAC ctivated method and CKMB was assessed by immunoinhibition method after inhibition of M subunit. The upper normal refernece value for normal population in our laboratory are 25 units/l for CKMB and 195 units/l for total CK.

Statistics: Mean + 1.96SD was taken as the upper normal cutoff value to give 95% specificity for diagnosis of PMI. Students t test was used with Bonferroni correction to find out the difference between the groups at each time point. A p value of <0.016 was considered as significant. Relation of bypass time and cross-clamp time to the peak rise of CK and CKMB was evaluated by coefficent of correlation. Age and sex wise analysis was not done as there were too few patients in these subgroups to make sensible comparisons.

Results

The baseline data of the patients and surgical procedures are shown in table 1. As shown in table 2 total serum CK and CKMB were normal in all 3 groups at 0 hour. There was a marked rise in both CK and CKMB in all patients after surgery. The mean peak CKMB occured at 4 hours. While the peak of total CK was broad based and ill-defined, there was a tendency towards peak at 24 hours. After the peak there was a continuous downward trend. CKMB reached normal values by 72 hours, while total CK was still significantly elevated as compared to baseline value. None of the patient showed a second peak in either CK or CKMB. Table 3 shows the number of patients showing peak values at different times. Time to peak was more uniform with CKMB as compared to total CK.

The mean + SE of mean values of both CK and CKMB at each point in time for each group are plotted in Fig. 1 and 2. The extent of overlap of ventriculotomy group with other 2 groups was minimal particularly for CKMB. Statistical significance of the difference between various groups is shown in table 4A. Overall

for both CK and CKMB group II had significantly higher values than either group I or II at each time point. Group I and III were similar for both CK and CKMB. All values were still high for ventriculotomy group at 72 hours. There was poor correlation between either bypass time or the crossclamp time and the peak level of CK and CKMB achieved in postoperative course (Table 4b).

Discussion:

This study confirms that open heart surgery, even in absence of complications, causes substantial release of CK and CKMB in postoperative hours. The minimal myocardial damage accompaning cardiac surgery as estimated by metabolic and ultrastructural studies of myocardial biopsy has been shown to be 2 gramequivalents only.[11] Major release occurs from extracardiac sources. Apparent extra release of CKMB activity runs parallel with massive release of CK activity from skeletal muscles damaged by surgery.[11]

Variety of biochemical markers have been evaluated and the suggested ones like LDH, HBDH and LDH1/LDH2 ratio are all late markers. They may have value in late confirmation of PMI particularly for long term management strategy and in evaluation of surgical or myocardial preservation techniqes.[22] But in early identification and management, CKMB will remain preferable to its alternatives. Also it is generally available, cheap and practical means of diagnosis of PMI. Rotensburg suggested that by establishing appropriate reference intervals at specific time points after surgery, one can assess a result of the value from a patient with suspected PMI. The important caveat is that separate

reference range of values are required to be established for each type of procedure for many specifftic time points.[19]

Many attempts have been made to define diagnostic cutoff for CKMB level. Graeber et al.[5] have reported it as 50 u/l while Balderman et al.[1] 90 u/l and Val et al.[6] 120 u/l (their mean +2SD). The differences in the various reported values may be due to differences in (1)surgical techniques and adequacy of myocardial protection. (2)method of CK and CKMB estimation.[21] Important differences have been found in diagnostic values by different methods of CK and CKMB assays (activity versus mass concentration, gel electrophoresis versus radioimmunoassay or immunoinhibition method).[21] Again these authors have taken mean +2SD of only the highest value to determine this cutoff and used this as diagnostic reference value at any postoperative time. But beyond the usual time of peak, values much lower than this suggested cutoffs may be associated with PMI.

To be able to diagnose PMI from one sample analysis of CK and CKMB, we have proposed upper normal reference values at 95% specificity (mean + 1.96SD) for 4 pionts in time; 4, 24, 48 and 72 hours after CPB (Table 5). In larger studies, probably, normal curves can be constructed for each institution, for each type of cardiac surgery and be used as reference for diagnosis of PMI at any time. The usual CKMB criteria applicable for normal i.e. nonperioperative persons should also apply to postoperative patients 72 hours after bypass.

The kinetics of release of CK and CKMB in varous forms of ischemia differ. Hermens[11] suggested that after an uncomplicated

cardiac surgery, the patterns of CK and CKMB release from myocardium and from skeletal muscle have completely different time scales. Release from myocardium as depicted by CKMB levels is rapid, reaching maximum release within 8 hours after surgery and is approximately complete within 36 hours. Release from skeletal muscles depicted by total CK in uncomplicated postoperative course lasts much longer with peak more than 20 hours post operative and continuing for more than 100 hours.[11]

Usual non-perioperative acute myocardial infarction is associated with peak total CK rise occuring from 8 to 58 hours[23] with mean peak at 24 hours. While models of ischemia associated with reperfusion are characterised by earlier and higher peaks, as exemplified by successful thrombolysis, where total CK peak occurs around 12 hours of onset of myocardial infarction.[24,25] By logistics, the CPB and aortic crossclamp would resemble the reperfusion model. Although the confounding factors of noncardiac release of CK and CKMB will remain, it will be to a lesser extent with CKMB release. Occurence of myocardial infarction during bypass will be expected to give rise to a delayed peak. Any early graft reocclusion in immediate postoperative period resulting in myocardial infarction will most likely give delayed, sustained or secondary peak.[13] The studies on patients with proved PMI will be necessary to evaluate the criteria of time to peak CK and CKMB release.

Chapelle et al.[13] have shown that time to peak activity of total CK in uncomplicated CABG was 30.7 hours while for acute MI group it was 22.4 hours, and this is not a very large difference.

But CKMB was much more discriminatory, with peaks occuring at 6.4 and 19.1 hours respectively. Others have also noted peak to occur between 6 to 12 hours.[6,26-28] Deva noted that peak was delayed when an MI complicated CABG.[29] Baur also suggested similar guidelines.[27]

This study confirms that typical pattern of rise is characterised by a single peak occuring before 24 hours in CKMB and before 48 hours in total CK. Delayed peak, sustained release or secondary peaks are not seen, particularly so with CKMB levels. Serial or at least paired samples beyond the time of usual peak would be necessary for the criteria of time to peak to be helpful to diagnose PMI. If rising values of total CK beyond 48 hours and of CKMB beyond 24 hours are found it could suggest PMI. More frequent sampling in first 24 hours as shown by Balderman et al.[3] and Rotenburg et al.[5] would have timed the peak more precisely and criteria of time to peak (mean + 1.96 SD of time to peak) would have given more precise fine tuned value.

In conclusoin, the data presented here give the guideline to follow for diagnosis of PMI in broad groups of surgical techniques involving atriotomy alone, ventriculotomy alone or CABG. If the peak value on serial measurement is found 24 hours after srugery , or if on 2 consecutive samples 24 hours after surgery the value is rising possibility of PMI should be considered. If the absolute value is above the 95th percentile value for that time interval then also possibility of PMI is high. After 72 hours, the usual criteria for non-perioperative group should be applicable. The sensitivity of these methods for

iagnosis of PMI needs to be assessed in a study on patients aving PMI proved by a seperate gold standard.

cknowledgement: The authors thank Dr. Ramankutty, MD, for the elp with statistics and computer applications.

References

1. Balderman SC, Bhayana JN, Steinbach JJ et al. Perioperative Myocardial Infarction; A Diagnostic Dilemma. Ann Thorac Surg 30: 370, 1980.

2. Loop FD, Cosgrove DM, Lytle BW, Thurer RL, Simfendorfer C, Taylor PC, Proudfit WL. An 11 year evaluation of coronary artery surgery (1967-1978) Ann Surg 190: 444, 1979.

3. Kouchoukos NT, Oberman A, Kirklin JW, Russel RO, Karp RB, Pacifico AD, Zorn GL. Coronary bypasss surgery. Analysis of factors affecting hospital mortality. Circulation 62(Suppl 1): 84, 1980.

4. Keshgegian AA, Bhagat PK, Lease JA, Baiocchi J. Creatine kinase MM isoforms in serum after cardiac surgury. Clin Chem 34: 1067, 1986.

5. Graeber GM, Shawl FA, Head HD et al. Changes in serum creatine kinase and lactate dehydrogenase caused by acute perioperative myocardial infarction and by transatrial cardiac surgical procedures. J Thorac Cardiovas surg 92: 63, 1986.

6. Val PG, Pelletier LC, Hernandez MG et al. Diagnostic criteria and prognosis criteria of perioperative myocardial infarction following coronary bypass. J Thorac Cardiovasc Surg 86: 678, 1983.

7. Raabe DS, Morise A, Sbarbaro TA, Gundel WD. Diagnostic criteria for acute myocardial infarction in patients undergoing coronary artery bypass surgery. Circulation 62: 869, 1980.

8. Klein HM, Gross H, Rubin I. Transient electrocardiographic changes simulating myocardial infarction during open heart surgery. Am Heart J 79: 463, 1970.

. Shugoll G. Transient electrographic changes simulating yocardial infarction associated with shock and metabolic changes m Heart J 74: 402, 1967.

0. Bassan MN, Oatfield R, Hoffman I, Matoff J, Swan HC New Q aves after aortocoronary bypass surgery (unmasking of old nfarction). N Eng J Med 290: 349, 1974.

1. Hermens WT, Williams GM, Van Der Vusse GJ. Minimal myocardial njury after uncomplicated coronary bypasss surgeery. Various ources of overestimation. Clin Chem Acta 173: 243, 1988.

2 Tonkin AM, Lesteer RM, Guthraw CE etal. Persistance of MB soenzyme of creatine phosphokinase in the serum after minor ardiac trauma. Circulation 51: 627, 1975.

3. Chapelle JP, El Allaf M, Larbuisson R, Limet R, Lamy M, Heus- hem C. The value of serum CK-MB and myoglobin measurement for ssessing perioperative myocardial infarction after cardiac urgery. Scand J Clin Lab Invest 46: 519,1986.

4. Lee ME, Sethna DH, Conklin CM, Shell WE, Matloff JM, Gray RJ. K-MB releaase following coronary artery bypass grafting in the bsence of myocardial infarction. Ann Thorac Surg 35: 277, 1983.

5. Brewer DL, Bilbro RH, Bartel AG. Myocardial infarction as a omplication of coronary bypass surgery. Circulation 47: 58, 973.

6. Graeber GM, Cafferty PJ, Wolf RE, Cohen DJ, Zatjtcjuk R. oncentrations of creatine kinase and lactate dehydrogenase in he muscles encountered during median sternotomy and in the wall f cardiac chambers. Surg Forum 34: 337, 1983.

7 Dixon SH, Limberd LE, Roe CR et al. Recognition of postoperative acute myocardial infarction: application of isoenzyme techniques. Circulation 47,48(Suppl 3): 137, 1973.

8 Doherty PW, Mc Langhlin PR, Bicllingham M et al. Cardiac damage produced by direct current countershock applied to the heart. Am J Cardiol 43: 225, 1979.

9 Rotenberg Z, Squires JE, Johnson MT, Hoyt J, Gibson RS, Bruns E. Lactate dehydrogenase isoenzyme-1 in serum for detection of perioperative myocardial infarction after cardiac surgery. Clin hem 34: 2469, 1988.

0. Chapelle JP, El Allaf M, Heusghem C. Serum CK-MB after yocardial infarction and coronary bypass surgery: Superiority of ass concentration measurement over determination of catalytic tivity. Adv Clin Enzymol 5: 94, 1987.

. Chan DW, Taylor E, Frye R, Blitzer RL. Immunoenzymetric say for creatine kinase MB with subunit-specific monoclonal ntibodies compared with an immunochemical method and lectrophoresis. Clin chem 31: 465, 1985.

2 Wu A. Creatine kinase isoforms in ischemic heart disease eview). Clin Chem 35: 7, 1989.

Herlitz J. Time lapse from estimated onset of acute ocardial infarction to peak serum enzyme activity. Clin rdiol 7: 433, 1984.

. Lee TH, Goldman L. Serum enzyme asssays in the diagnosis of ute Myocardial infarction. Am Intern Med 105: 221, 1986.

. Ong L, Reiser P, Coromilas J, Schirr L, Morrison J. Left ntricular function and rapid release of creatine kinase MB in

cute myocardial infarction: Evidence of spontaneous eperfusion. N Engl J Med 309: 1, 1983.

5 Righetti A, Crauford MH, O Rourke RA et al. Detection of erioperative myocardial damage after coronary artery bypass raft surgery. Circulation 55: 173, 1977.

7 Baur HR, Steele BW, Preimesberger KF, Gobel FL. Serum yocardial creatine kinase(CKMB) after coronary arterial bypass urgery. Am J Cardiol 44: 679, 1979.

8 Rucker CM, Dugall JC, Ganter EL, Kartub MG. The detection of erioperative myocardial infarction in aortocoronary bypass surg. est 75: 300, 1979.

Delve E, Maille JG, Solymoss BC, Chabot M, Grondia CM, urassa MG. Evaluation of myocardial damage during coronary tery grafting with serial determination of serum CPK MB oenzyme. J Thorac Cardiovasc Surg 75: 467, 1978.

TABLE 1

Patient population and surgical procedure

GROUP	I	II	III
n=	25	12	26
Age(years)Range	9-38	6-33	39-69
mean±SD	19.6±9.2	16.0±8.1	51.6±9.06
Sex (m/f)	10/15	10/2	26/0
Diagnosis (no. of patients)	ASD 25	VSD 2 TOF 9	1 VD 2 2 VD 7 3 VD 15 LM 2
Surg Technique	Direct/patch closure	ICR	2 grafts 3 pts 3 grafts 5 pts 4 grafts 12pts 5 grafts 4 pts 6 grafts 2 pts mean 3.9 grafts/pt)
Bypass time (min)	43.4±9.2	139.5±25.1	165±43.6
Crossclamp time (min)	21.4±14.4	88.4±19.4	79.4±22.8

VD = vessel disease, LM = left main stem disease,
ASD = atrial septal defect, VSD = ventricular septal defect,
ICR = intracardiac repair, pt = patient(s).

TABLE 2

CK and CKMB levels: units/litre (mean ± SD)

hours\GR	I	II	III
TOTAL CK LEVELS			
0	82.6±37.2	114.9±41.3	92.7±36.7
4	713.8±41.9	1483.2±451.9	867.5±423.3
24	1108.1±445.6	1744±1161.8	977.9±511.4
48	440.5±281.6	1436.1±1016.8	866.4±586.9
72	198.2±120.2	919.4±682.9	627.4±403
CKMB LEVELS			
0	9.6±6.6	10.8±3.0	6.7±3.9
4	64.1±33.7	143.3±61.9	82.4±49.0
24	42.2±22.2	86.5±45.6	37.3±22.5
48	29.4±18.5	38.6±12.6	19.4±9.9
72	18.3±7.5	27.5±10.7	13.9±6.3

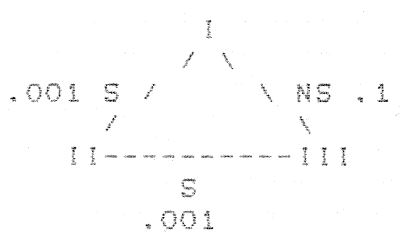
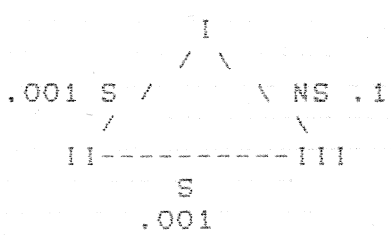
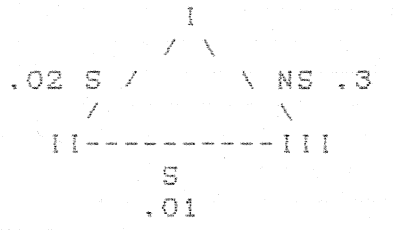
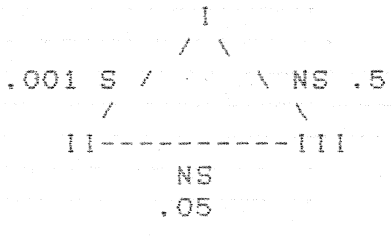
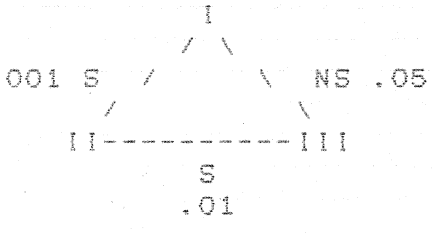
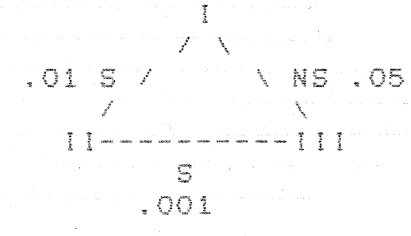
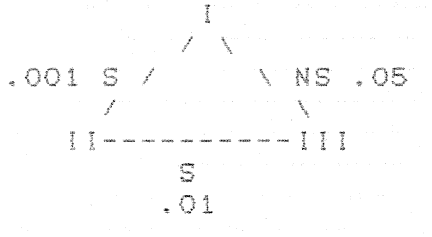
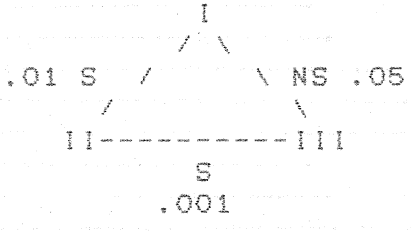
Table 3

Timing of peak enzyme value.

hours\gr	I	II	III
Total CK			
4	1	6	3
24	22	4	13
48	2	2	9
72	0	0	1
CKMB			
	25	12	24
4	0	0	1
8	0	0	1
2	0	0	0

TABLE 4
Statistical significance

A: p VALUES

HOURS	TOTAL CK:	CKMB:
4		
24		
48		
72		

S = significant, NS = not significant.

B: Coefficient of correlation (r values)

	BYPASS TIME	CROSSCLAMP TIME
PEAK TOTAL CK	0.008	0.016
PEAK CKMB	0.119	0.149

CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND
NOLOGY, TRIVANDRUM 695 011

TABLE 5

pper normal reference values for CKMB(mean+1.96SD; units/litre)

ours\GR	I	II	III
	130.2	264.6	178.4
4	85.7	175.8	81.4
8	65.7	62.3	38.8
2	33.0	48.4	26.2

LIST OF PROCEDURES DONE
PROJECT REPORT

TITLE OF THE PROJECT:

BISOPROLOL THERAPY FOR STABLE ANGINA PECTORIS: PRELIMINARY RESULTS OF EFFECT ON CLINICAL AND TREADMILL EXERCISE RESPONSE.

NAME..... DR.MAHESH K.SHAH

PROGRAMME :..... D.M. CARDIOLOGY.

MONTH & YEAR
OF SUBMISSION :..... NOVEMBER, 1991.

Note:— (i) In the case compilation of procedures done, the contents and the subsequent pages should be made into different sections (a) Procedures done (b) Procedures assisted (c) Procedures participated (d) Procedures attended / participated etc. in Other Centres. Each section should be preceded by a leaf carrying the name of the section that is succeeding.

(ii) The Contents page will carry information as per model given under

PROCEDURES DONE

Closed Mitral valvotomy ---------- 124 (say)

Patent ductus arteriosus-ligation ---------- 10

Atrial septal defects---------- 20

PROCEDURES ASSISTED

Closed Mitral valvotomy ---------- 100 (say)

(iii) In the subsequent pages details of each procedure done/assisted should be given in the format given below :—

Heading : Closed mitral valvotomy

Date	Name of the patient	Age	Sex	Patient No.

(iv) In the case of Project Report in the page immediately following the Certificate page the under-mentioned details should be given :—

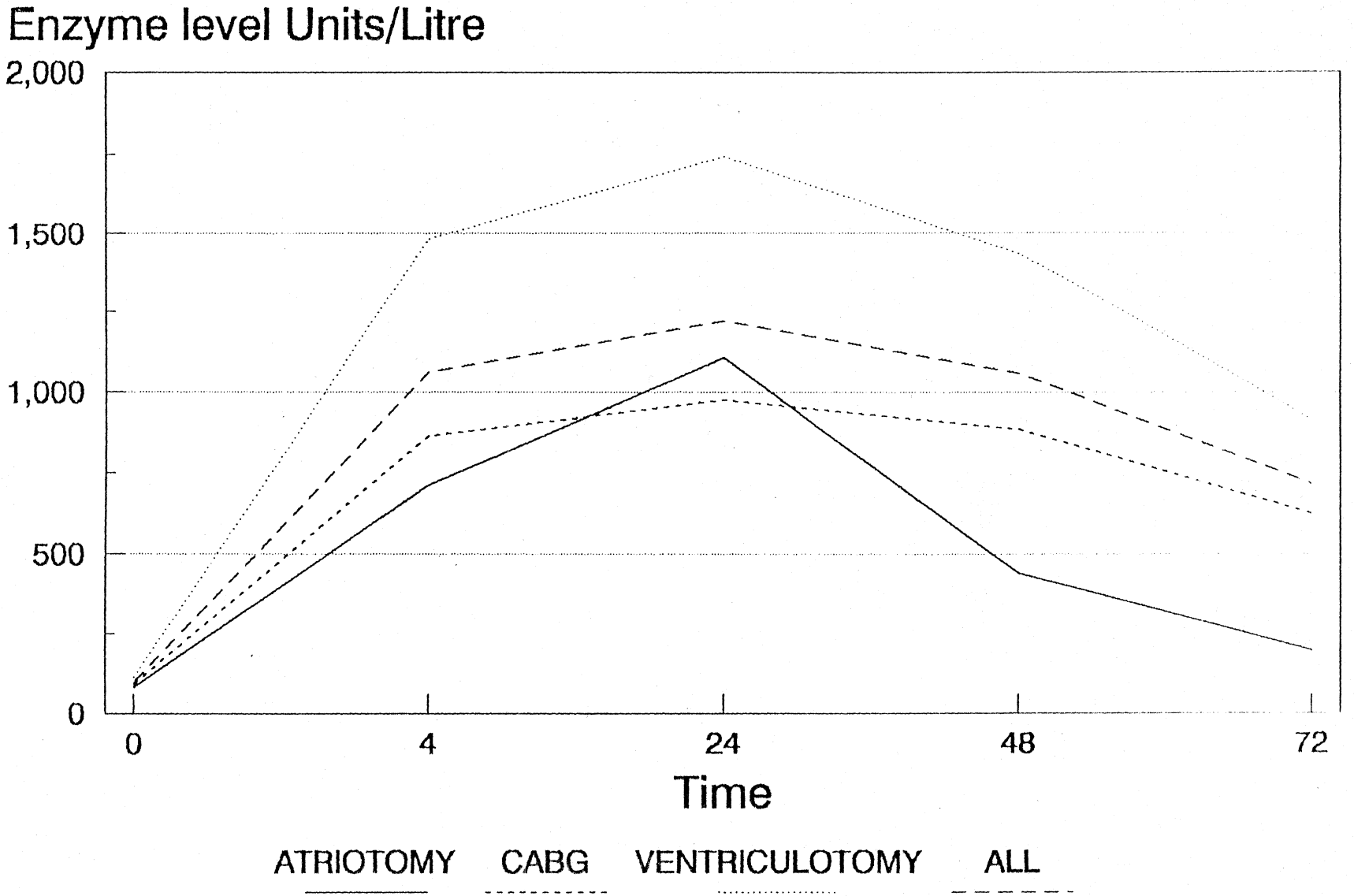
(a) Title

(b) Duration

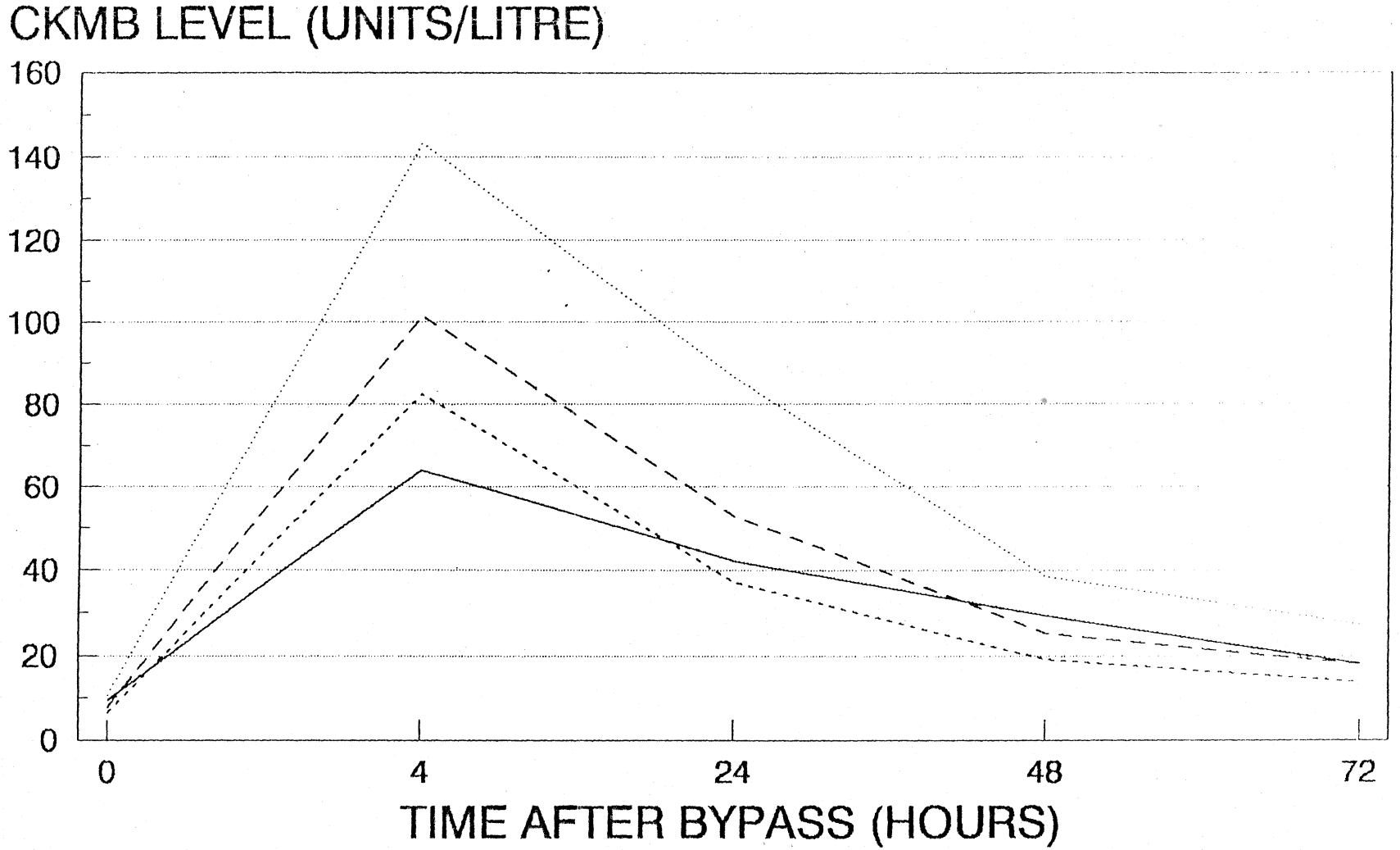
(c) Aim and scope

(d) 50 word summary of work done

Total CK levels



CKMB LEVELS


CKMB LEVEL (UNITS/LITRE)
160
140
120
100
80
60
40
20
0
0
4
24
48
72
TIME AFTER BYPASS (HOURS)

BISOPROLOL THERAPY FOR STABLE ANGINA PECTORIS :

Preliminary Results of Effect on

Clinical and Treadmill Exercise Response

INTRODUCTION

SOPROLOL is a new cardioselective betablocker without intrinsic mpathomimatic activity having long duration of action. It has asma elimination half life of 10 to 12 hours. It has been used fectively to treat both hypertension and angina in European untries since 1986[1]. To determine its efficacy and safety in eatment of chronic stable angina and to objectively study its fects on exercise test parameters , an open label crossover udy was conducted.

MATERIALS AND METHODS

UDY DESIGN:

HICS: The study protocol was approved by Drug Controller of dia. Informed consent was obtained from all the participating tients.

TIENT SELECTION: Patients having chronic stable angina were lected from the outpatient department. They had stable angina reshold and were having at least 3 episodes of angina per week. esence of coronary artery disease (CAD) was confirmed by at ast one positive exercise ECG test (horizontal or downsloping pression at ST-80 of >0.1mv). CRITERIA FOR EXCLUSION were

asthma, COPD, conduction blocks, valvular heart disease, peripheral vascular disease and insulin dependent diabetes mellitus, uncontrolled diabetes mellitus, recent myocardial infarction within 3 months, unstable angina, pregnancy, child bearing potential, lactating women and hepatic or renal insufficiency.

PROTOCOL: (fig.1) The study period was divided into 3 phases of 2 weeks each. Glyceryl trinitrite 0.5 mg sublingually was allowed for control of anginal episodes. Aspirin and noncardioactive drugs were permitted during the study. Period 1 was the wash out phase, when all antianginal medications including beta blockers were withdrawn gradually. Two weeks of drug free interval was allowed. Blood pressure, if necessary, was controlled with clonidine. At the end of phase 1, baseline physical examination, ECG, laboratory tests (hemogram, ESR, urinalysis, fasting plasma sugar, hepatic and renal function tests and serum cholesterol) and exercise ECG test were performed. In phase 2, patints were put on bisoprolol 5 mg per day to be taken at 7.00 AM. At the end of phase 2 patients were evaluated for angina control, physical findings, side effects and ECG changes. Dose of bisoprolol was increased to 10 mg per day if angina control was not adequate. In phase 3, bisoprolol was continued for another 2 weeks. At the end of phase 3 physical examination, ECG, laboratory tests and exersise ECG test were repeated.

<u>RECORDING AND OBSERVATIONS:</u>

CLINICAL: Patients maintained angina diary for the entire study period, from which angina frquency, severity (on a scale of 3 as described by the patient), duration and number of nitroglycerine tablets consumed were assessed. Only spontaneously reported side effects were noted.

EXERCISE TEST: Multistage symptom limited exercise treadmill test using standerd Bruce protocol was done on Marquttee Case 12. Convetional criteria for test positivity and test termination were employed.

STATISTICAL ANALYSIS:

Noncontinuous data is expressed as mean frequency ± SD and continuous data as mean ± SD. Several clinical and exercise test variables were compared between two states: off all antianginals (end of phase 1) and on bisoprolol treatment (end of phase 3). Statistical significance was evaluated by one tailed paired t test . Statistical significance was defined as: a p value of <0.05 (significant), <0.01 (moderately significant) , and <0.001 (highly significant).

RESULTS

PATIENT POPULATION: Thirty patints were enrolled for the trial. Two patints were excluded from the analysis; one because he did not satisfy the inclusion criteria and the other because he dropped out for unknown reasons. Twenty eight patients completed the trial. Twenty seven were males and one female. Mean age was 52.8±8.5 years (range 36 to 66 years).

CLINICAL PARAMETERS: (Table I) (Fig.2) There was a marked reduction in frequency, severity and duration of anginal episodes as well in nitroglycerine consumption during phases 2 and 3 as compared to phase 1. There was no significant difference in the same parameters between phases 2 and 3. Relation between the dose of bisoprolol and clinical efficacy was not ~~undertaken~~ evaluated as there were very few patients on 10 mg bisoprolol for the results to be conclusive.

EXERCISE TEST PARAMETERS: (Table II)

EXERCISE PERFORMANCE: Exercise test was performed at a mean interval of 252±145 minutes from the last dose of bisoprolol. Exercise time increased by 16.3%. Maximum work done increased by 11.1%.

ISCHEMIC THRESHOLD: Time to onset of angina improved by 33%. Time to onset of 1 mm ST depression also increased by 43% (Fig.2). Heart rate and rate pressure product at 1 mm ST depression also showed a significant decline of 13% and 9% respectively (Fig.4 and 5).

EXERCISE HEMODYNAMICS: Heart rate and rate pressure product at rest and at each stage of exercise test showed significant decrease (Fig.4 and 5).

SIDE EFFECTS:

No major adverse effects were noted. Minor side effects were noted in 3 patients. One patient complained of mild fatigue and loss of appetite, which was probably bisoprolol related; one

atient complained of mild gastric discomfort which also could robably be drug related; one patient complained of many symptoms ike mental agony and dullness, body pains, loss of taste, everishness and increased frequency of micturition. The mental ymptoms, body pain and loss of taste may probably be related to isoprolol but the relationship of feverishness and urinary requency to bisoprolol is doubtful.

ABORATORY PARAMETERS:

here was no overall significant alteration in total serum holesterol, glycemic state, blood counts and hepatic or renal unction tests. One patient developed a rise in SGPT from 41 to 13 units/liter and serum cholesterol from 263 to 340 mg.%. In ne patient ESR increased from 28 to 58, in association with olymorphonuclear leucocytosis, probably due to respiratory nfection. Barring sinus bradycardia, no significant changes were oted in ECG.

DISCUSSION

isoprolol, a long acting beta blocker without an intrinsic ympathomimetic activity, has been used with good efficacy for reatment of chronic stable angina[2,3,4] and hypertension[5,6,7], tc. Several studies are reported on its efficacy for treatment f exertional angina. It has been well tolerated in a dose of 0mg. without any significant limiting sides effects.

his study shows that in patients with chronic stable angina long erm administration of bisoprolol improves myocardial ischemia as

judged by clinical evaluation (i.e. subjectively) and by exercise test (i.e. objectively). The improvement in exercise test duration and time to onset of ischemia are comparable to the results obtained with other betablockers [8,9].

The results of this study also provide an insight into the probable actions and mechanisms of antianginal effects of bisoprolol. The reduction in resting rate pressure product suggests that the drug has no intrinsic sympathomimetic activity. In patients with exertional angina, increase in exercise duration with low rate pressure product at each stage and at peak exercise (Fig. 5) suggest a reduction in myocardial oxygen demand at a given external work load. But a closer look reveals something more. Rate pressure product at 1 mm. depression (ischemic threshold) was lower during bisoprolol treatment. This suggests that there was a lower rate pressure product at same degree of ischemia. This may be due to two reasons: 1) Higher oxygen consumption as compared to rate pressure product. It is well established that betablockers increase end diastolic volumes which increase the myocardial oxygen consumption and this is not reflected in rate pressure product[10,11]. 2) A true decrease in ischemia threshold due to decreased oxygen supply due to betablockade. Vasoconstriction due to betablockade is wellknown. Symptoms due to decreased blood flow to muscles is a known complication. Renal vasoconstriction leading to modest fall in renal blood flow and glomerular filtration rate is documented[12]. Vasoconstrictin may be all the more dominant in coronary circulation in patients with ischemic heart disease as alpha

receptors are known to be increased during ischemia[13]. Despite this modest reduction in blood flow, the effect of bisoprolol on reduced demand i.e. lowering of rate pressure product at a particular external workload may be much more and hence the clinical efficacy. As betablockers do not seem to potentiate sympathetic vasoconstriction at the level of epicardial coronary stenosis[14], it seems reasonable to assume that the phenomenon occurs in smaller vessels difficult to visualise by angiography. However, the possibility remains that betablockade may also improve myocardial perfusion by prolonging diastole, redistributing the transmural flow towards subendocardium and possibly, preventing epicardial coronary vasoconstriction[15].

The side effects observed with bisoprolol were mild and occurred in only three patients, not requiring discontinuation. The rise in serum enzymes observed in one patient suggests some degree of hepatitis. The patient was not an alcoholic. Rise in serum cholesterol also may occur with damage to hepatic cells. Bisoprolol is not known to produce these side effects. As the baseline values were also elevated, the further rise was presumably due to an extension of same pathology, unrelated to bisoprolol treatment.

LIMITATIONS OF THE STUDY:

1. The study was not blinded. However, the selection of objective endpoints such as rate pressure product at and time to 1 mm. ST depression, and computarised analysis of electrocardiogram should overcome this drawback partly. Maximum exercise duration and time

o onset of angina may be highly subjective, but parallel trends n both subjective and objective parameters suggests the true fficacy of bisoprolol.

. A limitation in objective endpoint is also found. Efficacy of raining on sequential exercise test performance and natural ariability can be the confounding factors for the results. ultiple exer cise tests can lead to enhanced exercise erformance[16]. Increasing familiaraty of the patient with the quipment and exercise protocol may lead to enhanced exercise apacity. Training effect from repeated exercise testing may ecrease the submaximal rate pressure product. This can be vercome by performing more number of exercise tests at each hase, at similar time of the day .

. Bruce protocol has relatively large increase in workload at ach stage and measurement of ischemic threshold may not be ccurate with this protocol.

. As the exercise test was done 252±112 minutes after the last ose of bisoprolol, its efficacy over the 24 hour duration can ot be commented upon. Its efficacay upon asymptomatic ischemia ccuring during day to day life (silent ischemia) was also not valuated.

. Comparison with other convetional betablockers would have been ore useful to ascertain the superiority of bisoprolol.

CONCLUSIONS

Thus, there is no doubt that bisoprolol is atleast as ffective as other betablockers in treatment of severe chronic

able angina. However, larger, better designed comparative ials with other antianginal drugs and other betablockers are eeded to evaluate its merits and demerits and for adequate and ccurate assessment of its relative place in the therapy of ronic stable angina. other

CKNOWLEDGEMENT: We acknowledge the financial help and isoprolol tablets (Bios 5mg) receieved from E. Merk India ltd.

TABLE I: CLINICAL PARAMETERS

CINICAL PARAMETERS	PHASE I	PHASE II	PHASE III	DIFFERENCE BETWEEN I&II	DIFFERENCE BETWEEN I&III
	MEAN ± SD	MEAN ± SD	MEAN ± SD	MEAN ± SD	MEAN ± SD
ANGINAL ATTACKS/WEEK	3.2 ± 2.3	1.3 ± 1.6	1.0 ± 1.3	-1.9 ± 2.0	-2.2 ± 2.0
SEVERITY SCORE	1.1 ± 0.3	0.7 ± 0.6	0.6 ± 0.6	-0.4 ± 0.6	-0.5± 0.6
ANGINA DURATION(MTS)	5.4 ± 4.3	2.3 ± 3.0	2.6 ± 4.4	0.0 ± 0.0	0.0± 0.0

TABLE II STRESS TEST PARAMETERS

PARAMETER	BEFORE	AFTER	DIFERENCE
	MEAN±SD	MEAN±SD	MEAN(%)
MAX WORK (METS)	9.0±2.8	10.0±2.9	1.0(11.1)
MAX EX DURATION (SEC)	461.2±156.6	525.7±164.2	64.5(16.3)
MAX ST DEP	2.5±0.8	2.2±0.9	-0.3(-11.5)
TIME TO ONSET OF ANGINA (SEC)	284.3±91.8	368.4±146.1	84.1(33.0)
TIME TO ONSET 1MM ST DEP (SEC)	263.1±142.9	325.9±163.6	62.8(43.0)
HR AT 1MM ST DEP	121.6±16.9	169.8±18.1	-48.2(-9.7)
RPP AT 1MM ST DEP	184.1±38.2	160.4±34.5	23.7(-13.0)
HR AT REST	79.2±11.3	60.6±7.9	-18.6(-24.0)
HR STAGE I	114.7±24.2	96.6±9.6	-18.1(-15.8)
HR STAGE II	130.9±17.3	104.4±21.6	-26.5(-20.2)
HR AT PEAK EX	143.4±22.2	126.0±23.0	-17.4(-11.9)
RPP AT REST	11111±2807	7833±1882	-3278(-28.0)
RPP AT STAGE I	17002±2887	13173±2361	-3829(-15.6)
RPP AT STAGE II	20209±3501	15898±2939	4310(-20.2)
RPP AT STAGE III	24287±4809	18471±3510	-5815(-24.6)
RPP AT STAGE IV	26190±1795	21362±5530	-4827(-19.6)

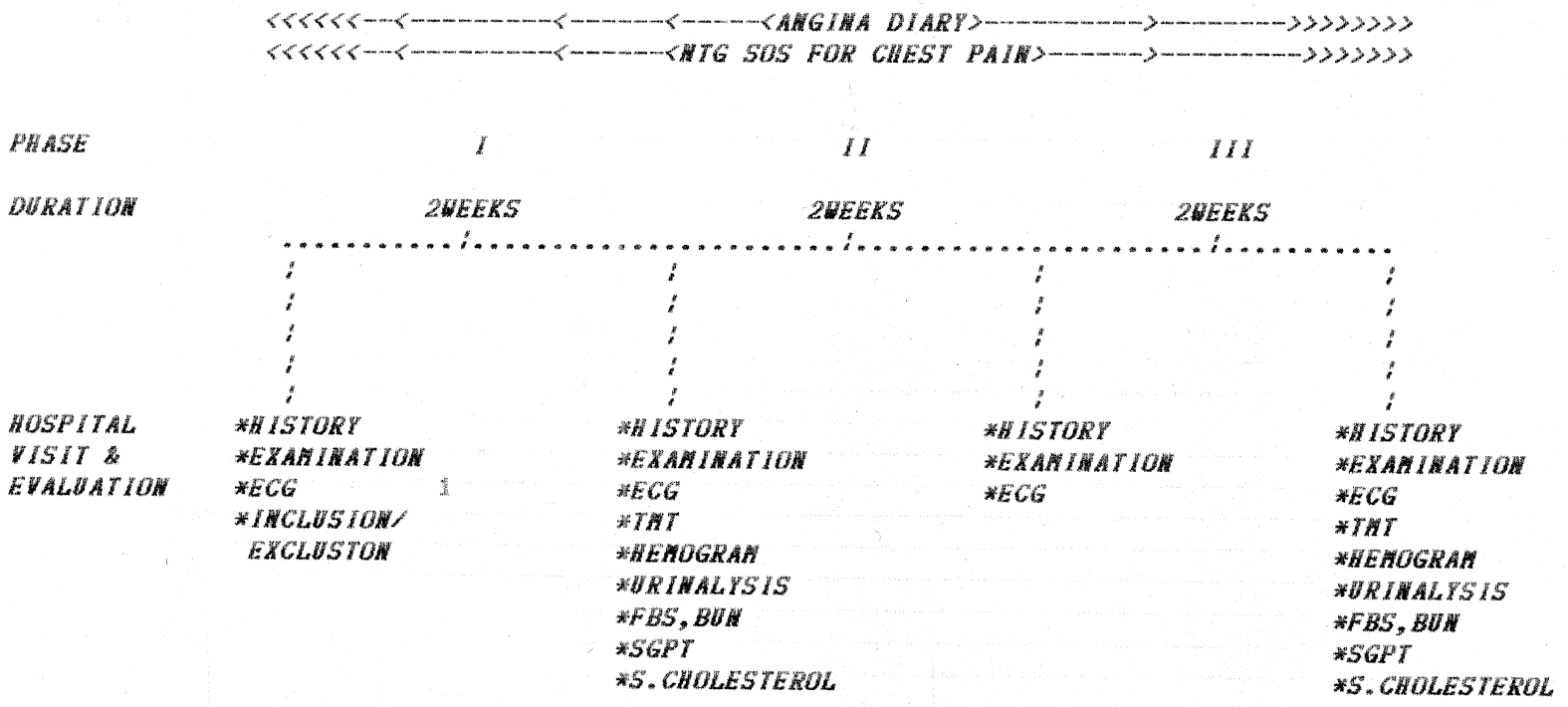


Fig. 1 Protocol

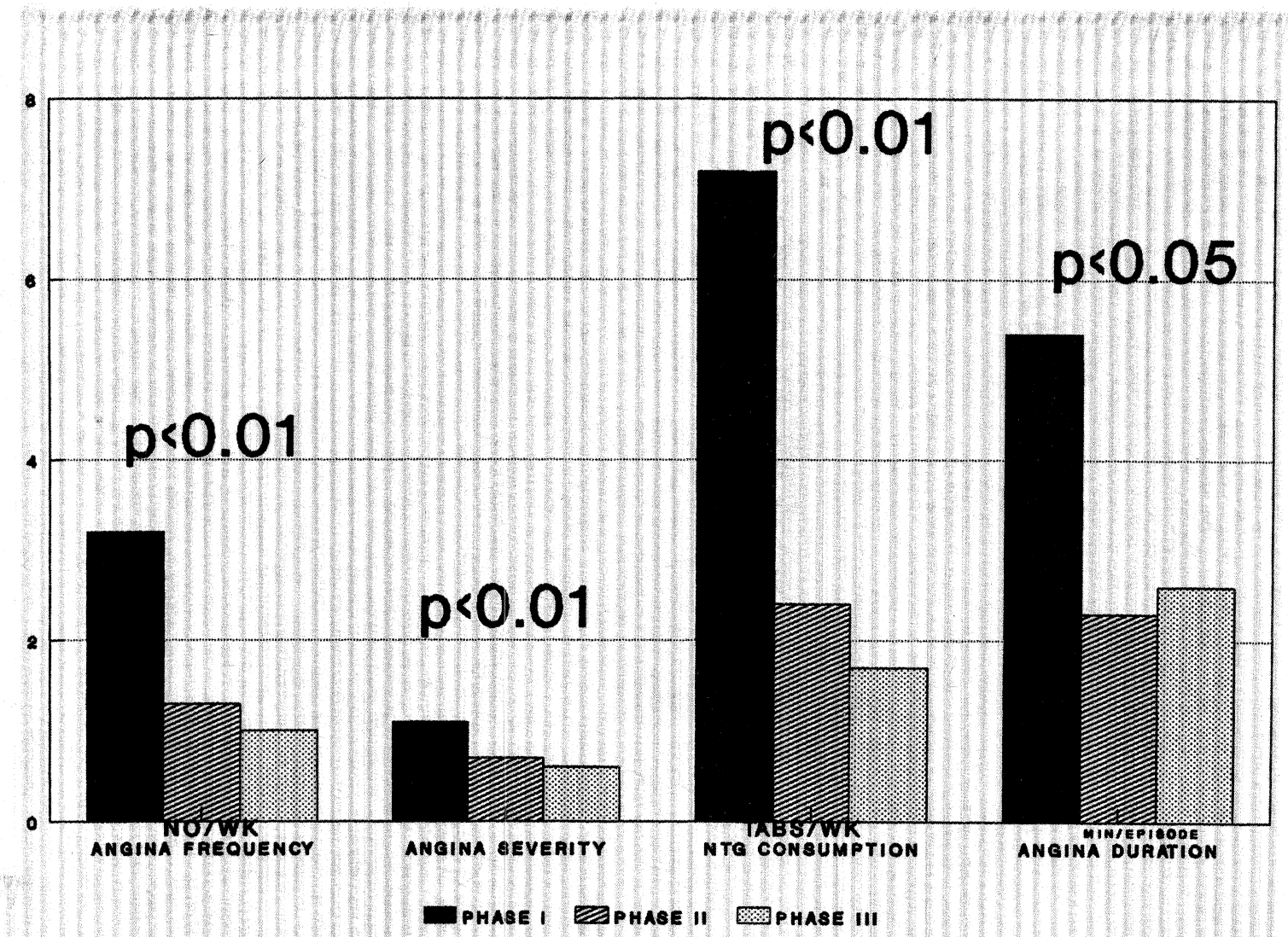


Fig 2 Change in Clinical Parameters after bisoprolol Therapy

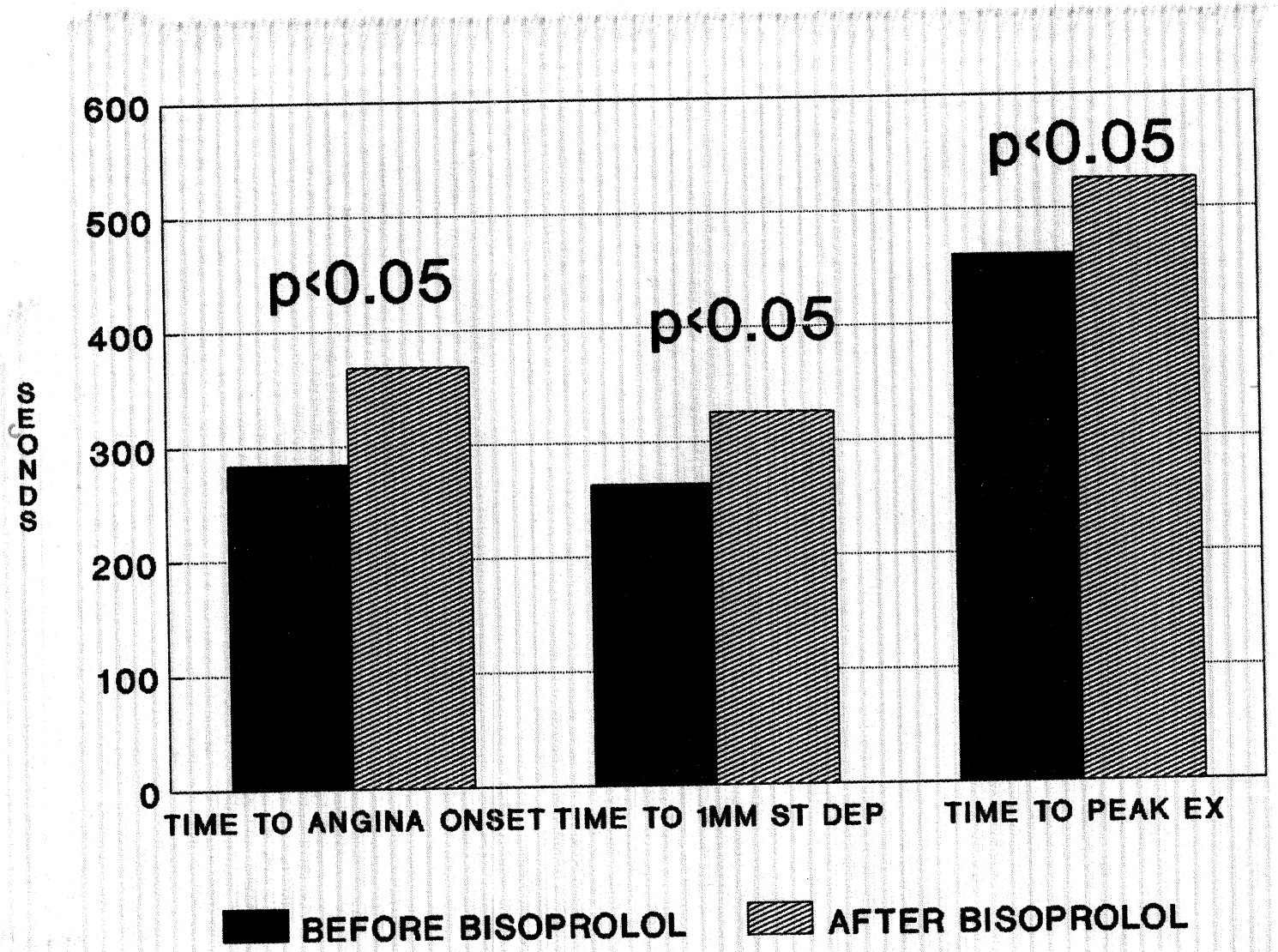


Fig.3 Changes in various exercise intervals before and after bisoprolol therapy

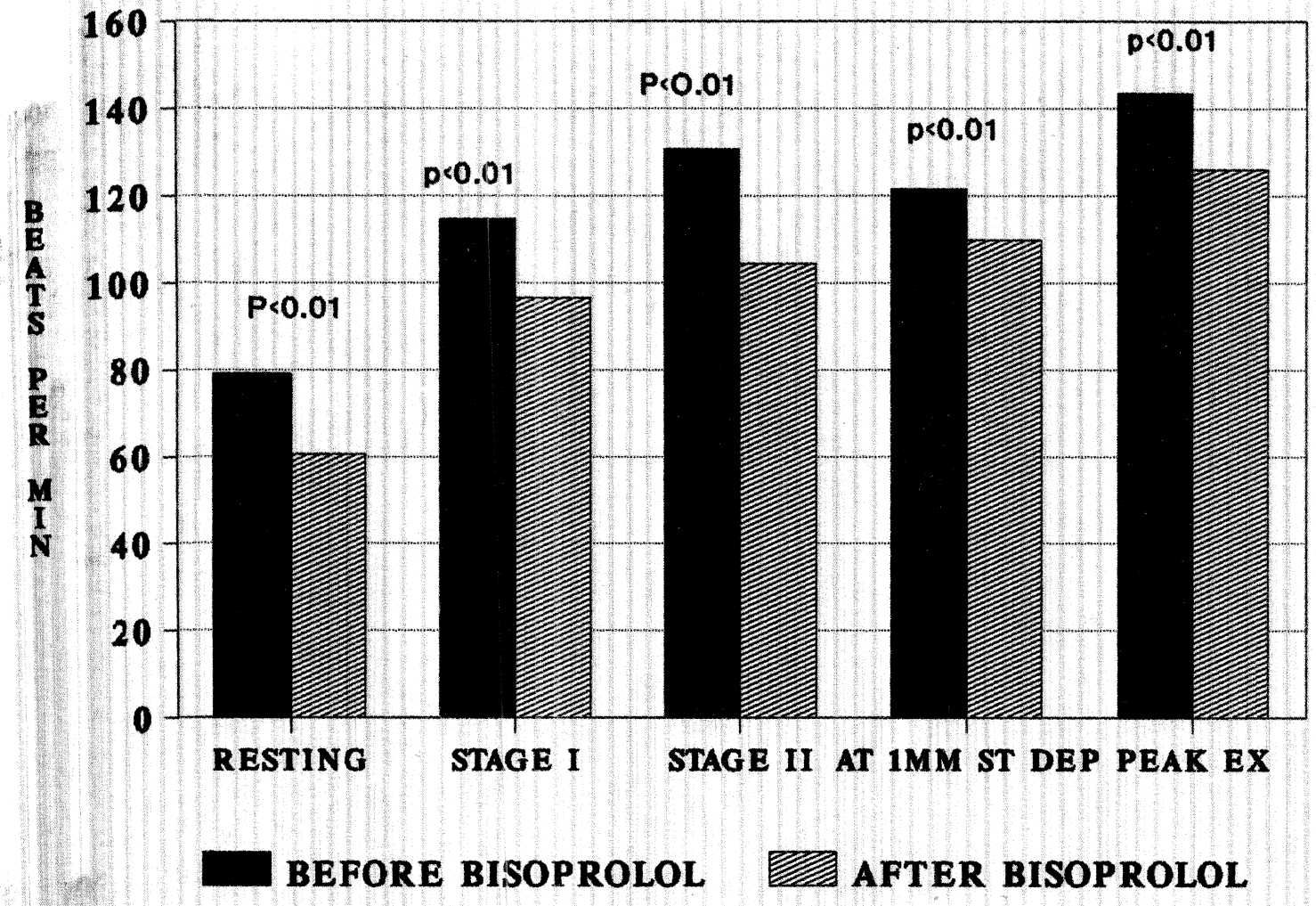


Fig. 4

Heart rate changes during exercise test before and after bisoprololtherapy

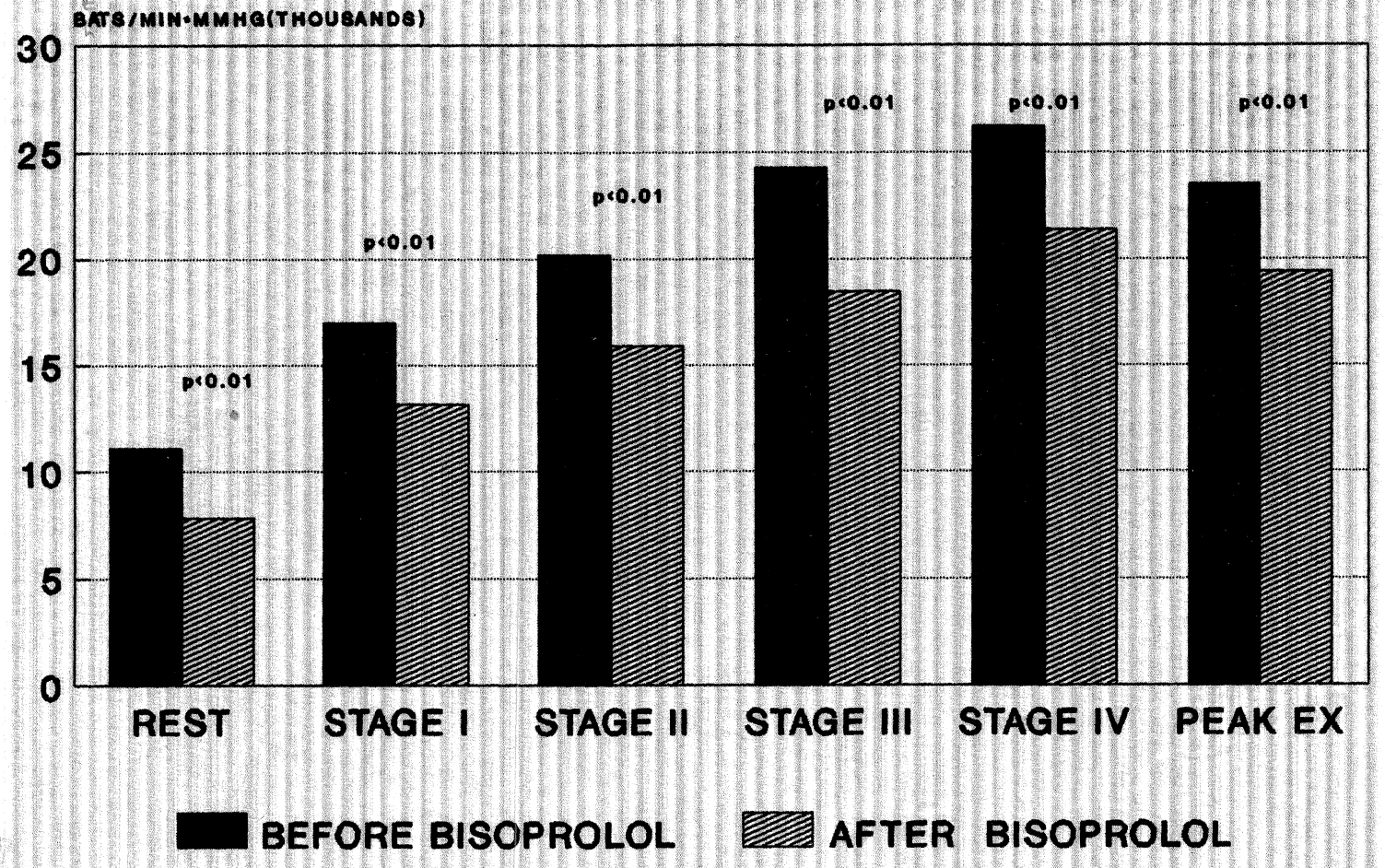


Fig.5 Ratepressure product changes during exercise test before and after bisoprolol

REFERENCES

1. Lancaster SG, Sorrkin EM. Bisoprolol: A preliminary review of its pharmacodynamics and pharmacokinetic properties and therapeutic efficiency in hypertension and angina pectoris. Drugs 1988; 36:256-285.

2. de Munick E, Wagner G, v.d. Ven LLM, Lie KE. Comparison of the effects of bisoprolol on exercise tolerance in exercise-induced stable angina pectoris. Eur Heart J 1987; 8(Suppl. M):31-35.

3. Kato K, Niitani H, Kanazawa T, Shimomura K, Toyama S. Clinical evaluation of bisoprolol in patients with stable angina pectoris: a preliminary report. J Cardiovasc Pharmac 1986; 8(Suppl. 11):S96-S159.

4. Frances Y, Collet F, Sans PH, Balansard P, Luccioni R. Comparative study of the efficacy and of the tolerance of bisoprolol (10mg and 20mg) versus atenolol (100mg) in essential hypertension. Abstract. Clinical and Experimental Hypertension 1987; A9:1966-1967.

5. Lithell H, Weiner L, Selinus I, Vessby B. A comparison of the effects of bidoprolol and atenolol on lipoprotein conentrations and blood pressure. J Cardiovasc Pharmac 1986; 8(Suppl. M):37-42.

6. Buhler FR, Berglund G, Anderson OK, Brunner HR, Scherrer U, et al. Double-blind comparision of the cardioselective betablockers bisoprolol and atenolol in hypertension: the bisoprolol international multicentric study (BIMS). J Cardiovasc Pharmac 1986; 8(Suppl 11):S122-S127.

7. Kohli RS, Lahiri A, Raftery EB. Management of chronic stable angina with once daily bisoprolol or atenolol and long term efficacy of bisoprolol.J Cardiovasc Pharmac 1986; 8(Suppl 11):S148-S153.

8. Maltz MB, Dymond DS, Nathan AW, Camm AJ. A comparison of once daily bisoprolol, 5 or 10mg, and atenolol 100mg in the treartment of angina pectoris. Eur Heart J 1987; 8(Suppl. M):37-42.

9. Chamberlain DA. Effect of beta adrenergic blockade on heart size. Am J Cardiol 1966; 18:321-325.

10. Parker JO, West RO, Gigiorgi S. Hemodynamic effects of propranolol in coronary artery disease. Am J Cardiol 1968; 21:11-19.

11. Banner JH. Adrenergic blocking agents and the kidney. J Clin Hypertension 1985; 3:199.

12. Kerm MJ, Ganz P, Horowitz JD, et al. Potentiation of coronary vasoconstriction by beta adrenergic blockade in patients with coronary artery disease. Circulation 1983; 67:1178-1185.

13. Ganglione A,Hess OM, Corin WJ, et al. Is there coronary vasoconstriction after intracoronary beta adrenergic blockade in patients with coronary artery disease? J Am Coll Cardiol 1987; 10:299-310.

14. Buck JD, Gross GJ, Waretier DC, et al. Comparative effects of cardioselective versus noncardioselective beta blockade on subendocardial blood flow and contractile function in ischemic myocardium. Am J Cardiol 1979; 44:657-663.

15. Atkins TM. Repeated exercise testing in patients with angina pectoris: reproducibility and follow up results (Abstr). Circulation 1971; 44(Suppl II):II-76.

CARDIAC CATHETERISATIONS DONE

NAME	AGE &SEX	HOSP NO	DIAGNOSIS	TYPE
ABU	30 M	8323	DORV VSD	RT,LT,ANGIO
ALINI	1.5F	8350	ASD VSD PAH	RT,ANGIO
BBY	13 M	8375	ASD MVP MR	RT,LT,ANGIO
AFIA	35 F	8377	ASD PAH	RT,ANGIO
AFIA	35 F	8377	uSD PAH	RT,ANGIO
AISON	11 M	8404	VSD PAH	RT,ANGIO
UMARESHAN	24 M	8415	ASD MILD MR	RT,LT,ANGIO
MAN	44 F	8422	RVEMF	RT,LT,ANGIO
NESH	27 M	8423	SVASD PAPVC PAH	RT,ANGIO
NSHIRA	11 F	8443	TOF RT BT SHUNT	RT,LT,ANGIO
DEERA	1.5F	8445	DTGA VSD PS	RT,LT,ANGIO
LINA	13 F	8447	VSD AR	RT,LT,ANGIO
DEEJAKUTTY	38 F	8453	CALCIFIC PDA NO PAH	RT,LT,ANGIO
ANDRIKA	30 F	8470	RVEMF MR	RT,LT,ANGIO
JIL	7 M	8477	ASD	RT
RASWATHY	8 F	8476	ASD PAPVC	RT
NAN	15 M	8495	COMPLEX CYANOTIC CHD	RT,LT,ANGIO
EPA	14 F	8496	TRICUSPID ATRESIA VSD PS	RT
SEEK	5 M	8513	ASD	RT
INABA	28 F	8516	ASD PAH	R
TNAMMA	32 F	8517	ASD	RT
NIKANDAN	17 M	8519	ASD MR	RT,LT,ANGIO
THAI	54 M	8528	ASD	RT
EEMON	4 M	8533	TOF	RT,LT,ANGIO
IPAL	3.5M	8534	VSD	RT,LT,ANGIO
DUL	7 M	8535	TOF MPA LPA STENOSIS	RT,ANGIO
ADEEP	21 M	8538	ASD PAH	RT
AMSUDDIN	26 M	8543	TOF	RT,ANGIO
CHAEL	16 M	8544	ASD PAH	RT
NIKUTTY	13 F	8546	COMPLEX CYANOTIC CHD	RT,ANGIO
JAN	46 M	8548	ASD	RT
RIAMMA	42 F	8555	ASD PAH	RT,ANGIO
ROJAM	42 F	8560	BVEMF	RT,LT,ANGIO
AVAN	37 F	8564	ASD	RT,ANGIO
ISHNANKUTTY	10 M	8567	VSD	RT,ANGIO
ANDRAKUMAR	17 M	8572	SUPRACRISTAL VSD	RT,LT,ANGIO
SHAL	24 F	8582	ASD PAH	RL
IKUTTY	20 M	8585	SVASD PAPVC	RT
NOJ	6 M	8592	TOF	RT,LT,ANGIO
AMINATHAN	14 M	8593	ASD VSD PAH	RT,LT,ANGIO
ELA	45 F	8602	SVASD	RT
NU	11 F	8608	SVASD	RT,ANGIO
FEEQ	11 M	8627	ASD MILD PAH	RA
MALA	39 F	8635	ASD MOD MR	RT
SKARAN	44 M	8636	ASD	RT,ANGIO
INA	27 F	8641	HEMIANOMALOUS PULM VENOUS	RT,LT,ANGIO
SEPH	38 M	8655	RVEMF	RT,LT,ANGIO
LOCHANA	19 F	8656	LUTEMBACHER SYNDROME	RT,LT,ANGIO

~~ABEEYAMMA~~	~~28~~	~~F~~	~~8666~~	~~NORMAL HEMODYNAMICS~~	~~R~~
RESHMIRANI	16	F	8671	ASD	R
SAKINA	45	F	8687	HCM APICAL	RT,LT,ANGIO
KRISHNAN	34	M	8691	RESIDUAL PDA	RT,LT,ANGIO
BREGITHA	30	F	8705	HCM OBSTRUCTIVE	RT,LT,ANGIO
NELSON	24	M	8706	EFF CONST PERICARDITIS	RT,LT,ANGIO
SANTHAN	24	M	8707	ASD MR	RT,LT,ANGIO
Sanal	10	m	10213	SAVSD,AR	rt,lt,angio
Savithri	26	f	10214	VSD,PAH	rt,lt,angio
LAILA	18	F	10232	RV HCM, small PDA	rt,lt,angio
Natarajan	23	m	10234	Valv &subvalv as	rt,lt,angio
Jophy	8	m	10241	postop open infadibulectomy	RT,ANGIO
Ajitha	19	f	10242	DCRV,VSD	RT,LT,ANGIO
Indira	37	f	10260	Occult const pericarditis	RT,LT,ANGIO
Reshma	11	f	10266	VSD,AR	RT,LT,ANGIO
Alliamma	21	f	10267	Primum ASD,severe MR	RT,LT,ANGIO
SIJI	10	f	10271	VSD,PS	RT,LT,ANGIO
Pareed	48	m	10272	BVEMF, MR	RT,LT,ANGIO
Geetha	24	f	10299	Lutembaker syndrome	RT,LT,ANGIO
Rethnamma	25	f	10300	ASD, severe MR	RT,LT,ANGIO
Nizar	16	m	10302	ASD	RT
Pankeyraj	35	m	10303	HOCM	RT,LT,ANGIO
Subhalekshmi	21	f	10307	Post balloon, restudy	RT,ANGIO
Jose	42	m	10310	Ebstein anomaly, RVEMF	RT,LT,ANGIO
Rajesh	1.9	m	10316	VSD,PAH	RT,LT,ANGIO
Amina	22	f	10325	Postballoon ps	RT,ANGIO
Sherifa	15	f	10343	pulmonary AV fistula	RT,ANGIO
Raji	5	f	10357	VSD, large shunt	RT,LT,ANGIO
Urmila	54	f	10359	ASD,PAH	RT,LT,ANGIO
THRESIA	38	F	10369	ASD SV TYPE PAPVC	RT,ANGIO
BABY L	6	F	10376	MULTIPAL VSD PAH	RT,LT,ANGIO
RABIDATTA	18	M	10383	VSD PAH	RT,LT,ANGIO
FLORENCEA	26	F	10384	LUTEMBACHER SYNDROME	RT,LT,ANGIO
FLORENCEA	26	F	10384	LUTEMBACHER SYNDROME	RT,LT,ANGIO
SAMLEENAA	5	F	10385	PINK TOF	RT,ANGIO
SAMLEENAA	5	F	10385	PINK TOF	RT,ANGIO
ROSILY	38	F	10392	SEVERE AR	RT,LT,ANGIO
GEORGE	60	M	10394	CAD 3VDMAIN OSTEL STENOSIS	INF ANEURYSM
SREEVALY	15	F	10406	POST BALLOON COARCT	RT,LT,ANGIO
JOYKUTTY	26	M	10408	ASD PAH	RT
MURLEEDHARAN	38	M	10409	SEVERE AR	RT,LT,ANGIO
SARASHWATY	38	F	10410	ASD PAH LARGE SHUNT	RT
SUBHASHH	10	M	10416	POST BALLOON COARCT	RT,LT,ANGIO
ANSUL	5.5	M	10427	TA ASD VSD PS	RT,ANGIO
SAHABUDDIN	18	F	10441	VSD AR	RT,LT,ANGIO
MOLLY	23	F	10446	TOF SPELLS	RT,ANGIO
BAIJU	5	M	10453	COMPLEX CYANOTIC CHD PAH	RT,LT,ANGIO
BAJITHA	6	F	10455	ASD PERIPHERAL PS	RT,LT,ANGIO
SREEDHARAN	20	M	10457	ASD EISENMENGER	RT,ANGIO
SHANTHAMMA	45	F	10458	PPH	RT,ANGIO
RAHESHVRY	27	F	10461	SVASD MS, LUTEM	RT,LT,ANGIO
SMITHA	9	F	10466	ASD VSD PAH	RT,LT,ANGIO
PRAVEEN	9	M	10468	TOF AV CANAL VSD	RT,ANGIO

AJIKUMAR	20 M	10469	AP WINDOW PAH	RT,LT,ANGIO
MANQA	27 F	10471	POST OP EBSTEIN	RT,ANGIO
AMODARAN	19 M	10477	PRIMUM ASD	RT,LT,ANGIO
EKHA	13 F	10478	ASD PERI PS	RT,LT,ANGIO
ALSALA	20 F	8991	NSHD	RT,ANGIO
OSEPH	57 M	8992	CALCIFIC MITRAL STENOSIS	RT
JO JOSE	6 M	9000	TOF	RT,LT,ANGIO
UNIL KUMAR	15 M	9003	BVEMF	RT,LT,ANGIO
ALPANA DEVI	15 F	9009	PRIMUM ASD MR	RT,LT,ANGIO
ETHULVEL	17 M	9013	ROJERS VSD	RT,ANGIO
EEMA	13 F	9014	POST OP RESI PRIMUM ASD MR	RT,LT,ANGIO
AILASH BAJORIA	37 M	9020	CONSTRICTIVE PERICARDITIS	RT,LT,ANGIO
OSEPH	42 M	9025	HCM NONOBSTRUCTIVE	RT,LT,ANGIO
ANI	11 M	9031	PRIMUM ASD MR	RT,LT,ANGIO
HARATHY	19 F	9032	POST OP PDA MILD PAH	RT,ANGIO
UNJAPPAN	23 M	9044	PRIMUM ASD MR	RT,LT,ANGIO
NURAJ	2.5M	9048	TOF SPELLS	RT,ANGIO
ITYANANDAN	5.6M	9049	TOF SPELLS	RT,LT,ANGIO
OSE	14 M	9053	COA	RT,LT,ANGIO
HANKAM	46 F	9065	ASD	RT,ANGIO
AJAN	45 M	9069	TOF AP COLLATERALS	RT,LT,ANGIO

CORONARY ANGIOGRAPHIES DONE

AME	AGE &SEX	HOSP NO	DIAGNOSIS
oraham	63 m	10244	POST OP CABG PATENT GRAFTS
hamsuddeen	37 m	10268	ant MI,ant aneur,nl cor
thuvan	56 m	10296	CAD LM STENOSIS NLV
abhakaran	49 m	10329	CAD 3VD NLV
ukumaran	55 m	10344	NORMAL CORONARIES
ntonyamma	47 f	10350	CAD 1VD CIRC FROM RCA
ethambaran	55 m	10353	CAD 1VD NLV
HANMUGA	58 M	10377	SEVERE AS MOD AR NL COR
ALAKRISHNAN	58 M	10388	CAD 3VD NLV
ALAKRISHNAN	58 M	10388	CAD 3VD NLV
AJAN	58 M	10389	CAD 3VD NLV
ASUDEVAN	48 M	10393	CAD LT MAIN OSTEL STENOSIS
OHANAN	56 M	10401	CAD 3VD NLV
RISHNAN	54 M	10422	CAD 3VD NLV
ORINCHU	31 F	10447	NL COR POOR LV
AYACHANDRAN	36 M	10448	CAD 1VD NLV
ADHA	23 F	10449	CAD 3VD NLV
RIAN	66 M	10454	CAD 1VD ACQ VSD PAH
AINLABBUDIN	42 M	10470	CAD 2VD NLV
EDU	54 M	9011	CAD 2VD NLV

ELECTROPHYSIOLOGIC STUDIES DONE

AME	AGE &SEX	HOSP NO	DIAGNOSIS	
umaran	76 m	8303	ASD MR	eps

Y MATHEW	29	M	8419	SSS POST OP ASD	EPS
NORAMA	61	F	8493	CHB	EPS
NTHAJER	28	M	8621	RBBB LAHB	EPS
DIRA	33	F	8626	VSD SSS	EPS
ANDRACHODAN	42	M	8637	SSS	EPS
DIRA	33	F	8659	SSS	EPS
ZEENA	35	F	8688	CAD 1VD NLV	EPS
nayyamma	52	f1	0229	junctional tachycardia	eps,svt
omas	70	m1	0263	SSS	eps,tpi
yed	62	m1	0264	SSS	eps,tpi
abhakaran	53	m1	0269	SSS	eps,tpi
nsoor	22	m1	0281	Automatic atrial tachy	eps,svt
likutty	26	f1	0298	WPW syndrome	eps,svt
nu	65	m1	0314	SSS	eps,tpi
ly	27	f1	0326	Lt. lat concealed acc. bypass	eps,svt
zar	16	m1	0334	ASD	eps,svt
ly Eldose	27	f1	0348	LV FREE WALL CONCEALED BYPASS	eps,svt
ARUSHABEEVI	27	F1	0395	WPW SYNDROME	EPS SVT
HILIP	52	M1	0396	SSS	EPS SSS
ADHA	34	F1	0444	TOTAL ATRIAL PARALYSIS	EPS
REENIVASAN	49	M	8993	CHB	EPS
AMACHANDRAN	39	M	9002	SSS	EPS
EELAMA	45	F	9033	SSS	EPS
ANKAJ	13	M	9066	CHB	EPS
OSA	56	F	9070	SSS	EPS

TEMPORARY PACEMAKER INSERTION

AME	AGE &SEX	HOSP NO	DIAGNOSIS
eela	43 f	8292	SSS
ohamad	65 m	10218	SSS
alakrishnan	50 m	10236	CHB
lykutty	12 f	10248	CHB
Oseph	34 m	10257	SSS
unjabdullah	61 m	10293	CHB
ADEEJA	52 F	10437	SSS
AINLABBUDIN	40 M	10445	AV BLOCK JUN RHYTHM
UNNIPARAN	56 M	10473	SUPRAHISSIAN AV BLOCK
ASHIDHARAN	40 M	8987	SSS
USHPAVALLY	30 F	8998	SSS
UKUMARAN	56 M	9072	VT

INTERVENTIONS DONE

AME	AGE &SEX	HOSP NO	DIAGNOSIS	TYPE
ULAIMAN	16 M	10431	VALV PS	BPV
EORGA	5 M	10440	COA	BCD
ARRIS	17 M	9026	VALV PS POSTR BALLOON	BPV REPEAT