P68

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY

TRIVANDRUM - 11

LIST OF PROCEDURES DONE

PROJECT REPORT

NAME : M. ZULFIKAR AHAMED

PROGRAMME : D. M. Cardiology

MONTH AND YEAR OF SUBMISSION : November, 1993

P68

CERTIFICATE

I, Dr. M.ZULFIKAR AHAMED .....hereby declare that I have actually performed all the procedures listed/ carried out the project under report.

Signature.....

Place : Trivandrum

Name in Dr. M.ZULFIKAR AHAMED .....

Date : 15-11-93 capital letters

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

Signature

Head of the department

LIST OF PROCEDURES DONE
PROJECT REPORT *

TITLE OF THE PROJECT: RELATION OF RETROGRADE ERP OF BYPASS TRACT WITH CYCLE LENGTH OF ORTHODROMIC ATRIOVENTRICULAR TACHYCARDIA

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PROGRAMME : D.M. CARDIOLOGY

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CONTENTS

INTRODUCTION; REVIEW OF LITERATURE;

Orthodromic Atrioventricular tachycardia is the commonest arrhythmia associated with A-V bypass tract, incorporating A-V bypass tract as the retrograde limb[1] AV bypass tract may be concealed with the tract capable of conducting impulse only retrograde or manifest where pre excitation of ventricle is evident in a 12 lead ECG and where the bypass tract conducts impulses both anterograde and retrograde. Today the term pre excitation encompasses all disorders in which anterograde Ventricular activation or retrograde atrial activation occurs in part or totally through anomalous pathway distinct from normal cardiac conducting system[2]. Orthodromic SVT forms 90% of arrhythmias observed clinically and inducible in the laboratory in manifest pre excitation (WPW Syndrome) and unless they form a retrograde limb of a circuit involving multiple pathways, concealed bypass tract (CBT) generally gives rise to orthodromic SVT[3]. Other forms of arrhythmias in pre excitation syndrome include antidromic SVT which account for 5% of all Arrhythmias in WPW and Atrial Fibrillation which can occur up to 30% in WPW[4].

Most of arrhythmias experienced by patients with pre excitation are troublesome but not life threatening. A small percentage may develop VF, as a consequence of AF with fast Ventricular response, where antegrade conduction property of bypass tract is the critical factor.

The anatomic substrates that cause pre excitation were traditionally named after the individuals who named them (Kent bundle, Mahaim fiber and so on). Now The European Study Group for Pre excitation has proposed an anatomic classification of accessory pathways[4]. 4 major groups are described - Atrioventricular connection, Atrio-fascicular tracts, Nodoventricular and fasciculo ventricular fibers. Morphologically accessory pathways are strands of normal myocardium that bridge the AV groove at any point around the annulus fibrosis on either side of heart. Locations are regionalised to left free wall (58%), posteroseptal (24%), Right freewall (13%) and anteroseptal (5%) sites[5].

With regard to electrophysiology of accessory pathways, in most patients in whom orthodromic SVT occur spontaneously, the anterograde refractory period of

accessory pathway should exceed that of AV conducting system thereby providing the substrate for unidirectional block required for initiation and maintenance of reentry[6]. In patients in whom orthodromic SVT is induced by programmed atrial stimulation ERP of AP is longer than that of AVCS and in whom programmed Ventricular stimulation induced SVT, RERP of AVCS exceeds that of AP.

In the electrophysiology lab, as a part of evaluation of SVT determination of properties of conduction and refractoriness of Accessory Pathway (AP) is an integral component. The properties of AP (Both anterograde and retrograde) have been studied and compared[7 8].

In examining conduction and refractory properties of AP accent has been on anterograde conduction properties of AP in manifest pre excitation because of obvious reasons. In the presence of AF, conduction through AP anterograde can cause fairly fast Ventricular rate leading to VF. Hence it becomes imperative to calculate AERPAP in these conditions[9]. Rate at which Anterograde block occurs is helpful in estimating the maximum rate that can be expected during atrial

arrhythmias which are conducted through AP. A good correlation exists between the refractory period of AP and shortest R-R interval observed in AF[9].

However the fact that Retrograde ERP of AP also could be a useful parameter to be studied during EPS, albeit a shade less important has not been highlighted in literature. RERPAP can have potential prognostic and therapeutic implications[10].

In the Allessie model of reentry known as leading circle type reentry which is the physiological basis of Reentry in orthodromic SVT in AP, to maintain reentry and hence tachycardia the refractory period of any part of circuit must be lower than length of circuit[11]. The length of circuit in the presence of tachycardia virtually means cycle length of tachycardia. The clear correlation between cycle length of SVT and RERP of AP had been investigated by Gallagher et al and demonstrated to be evident. The present study has been primarily intended to study relationship between RERPAP and cycle length of orthodromic SVT and the potential for prognostic and therapeutic significance of such relationship.

AIMS OF STUDY

The study was intended

1. To demonstrate a statistically significant relationship between Retrograde ERP of Accessory Pathway and cycle length of SVT.

2. To assess whether Retrograde ERP could be useful in predicting cycle length SVT

3. To assess whether basal or near basal R-ERP correlates with cycle length of SVT - in EPS laboratory driving cycle length is much above the cycle length of clinical or induced SVT and is probably closer to basal state; so particular interest was in knowing whether correlation between R - ERP and cycle length of SVT remains true with testing under near basal State.

SUBJECTS METHODS:

Patients included all with documented orthodromic SVT who were studied in the electrophysiology lab, SCTIMST from July 1990 to August 1991. All patients had presented with recurrent tachyarrhythmias and many of them were on drug therapy.

A careful history, physical examination and routine chest skiagram and 12 lead ECG were done in all patients. All had a full echo cardiographic study prior to EPS. Cardiac catheterisations was performed in some depending on the indication.

For EPS, informed consent was obtained and in all patients anti-arrhythmic therapy was discontinued at least 48 hours prior to study. They were studied in the post absorptive state. Diazepam 5-10 mg was administered as premedication. 4 catheters were introduced for intracardiac recording and stimulation. A 6F or 7F quadripolar catheter was introduced through REF, across TV to record HBE. A quadripolar catheter was placed through Lt subclavian vein into coronary sinus. 2 other

catheters were placed into RA and RV. In one patient who had ASD, electrode catheter was placed in LA instead of coronary sinus. Heparin 100 U/kg IV was given in all after introduction of catheters.

Intracavitory electrograms were obtained by filtering frequencies above 500 HZ and below 50 HZ. Simultaneous intracardiac and surface ECG were recorded using a Mingograf. The usual paper speed was 100 mm/sec.

A programmed stimulator delivered impulses with a pulse width of 1.9 msec at approximately twice diastolic threshold. Incremental pacing was done from Atrium and Ventricle. Programmed Ventricular and atrial extra stimuli were administered after a train of 8 beats. The driving of cycle length (A1A1 or V1V1) were 600 or 500 msec. Reciprocating tachycardia was induced in all but one. The site of earliest activation using Ventricular protocol was used to determine location of AP. Refractory period were measured with driving cycle length of either 600 msec or 500 msec. Apart from measurement of Antegrade ERP of AVCS and AP, ERP of Atrium and Ventricle, R-Erp of AP was measured and defined as longest V1V2 interval which failed to conduct over it[12].

Induction and termination of SVT was by appropriate extra stimuli.

Statistical analysis was done by calculating mean differences and confidence intervals for paired values.

RESULTS

1. AGE, SEX DISTRIBUTION

Figure-I shows the age and sex distribution of the patients studied.

9 patients were studied. Youngest was a 7 year old girl and oldest was a 58 year old man. Mean age was 26.4 years. 6 were male and 3 were female indicating an overall male predominance.

2. CLINICAL PRESENTATION;

Table I shows the clinical presentation.

The universal presenting feature which was expected was palpitation. Palpitations were mostly paroxysmal. Some required intravenous verapamil for termination. The higher number of patients with DOE represents the ones with underlying structural heart lesions. All of them were in NYHA class II. 6 of the patients were on regular medications and 2 had more than one antiarrhythmics. In those with medications clinical break through tachyarrhythmia occurred occasionally.

3. CARDIAC LESIONS:

5 Patients had structural heart lesions. One patients had Ebstein anomaly and had a hemodynamic study also. He had a RFW pathway. The patient with valvar PS successfully underwent BPV. ASD patient is waiting for surgical date. Both mitral valve disease patients had CMV prior to EPS. Cardiac lesions are listed in Table II.

4. ELECTROPHYSIOLOGICAL DIAGNOSIS

All Patients had mapping done on them. 4 had WPW and all except one with Ebstein anomaly had LFW. All patients with CBT had LFW pathway. In the literature the

incidence of LFW, postoroseptal, RFW and anteroseptal are 50%, 30%, 15% and 5% respectively[5].

ELECTROPHYSIOLOGIC FINDINGS:

Table IV shows the basal electrophysiological findings and certain ERPs.

Basal HBE was normal as expected. Measured Ventricular ERP were within normal limits as well as ERP of AV conducting system. In 4 patients with WPW, antegrade ERP of AP were determined and mean valve was 277.5 + 71.4 msec.

Generally AERP of AP is longer than RERP of AP at a comparable cycle length10. In the present study only 4 had WPW. Antegrade ERP of among them was a shade higher than RERP of those 4 patients. But the number was too small to reach a meaningful conclusion.

RELATIONSHIP BETWEEN RERP OF AP AND CYCLE LENGTH OF SVT

Table V and VI summarise the relationship between cycle length of SVT and both antegrade and retrograde ERP

of accesory pathway.

The mean cycle length of SVT is significantly higher than R-ERP of Accessory pathway. Though cycle length was higher than A -ERP also, statistical significance was not reached. In order to determine the statistical significance between paired values of cycle length and ERP, mean difference and 95% confidence intervals were calculated. In the case of R-ERP, C-Intervals were on positive side meaning that cycle length SVT is likely to be higher than R-ERP with 95% confidence.

DISCUSSION: Study group consisted of both concealed and manifest bypass tracts. Manifest pathway (WPW) has been reported in all ages and its incidence is supposed to decrease with age[13]. Concealed bypass tract occurs mostly in young but has been reported in an octogenarian[1]. One patient in our study was a 58 year old man with a concealed pathway. He later on underwent a LFW ablation which was however not fully successful. There is no sex predilection reported in either pathways in literature.

Generally both concealed and manifest pre excitation do not have associated cardiac lesions, more so with concealed. However several congenital anomalies may have association with pre excitation. One such example is Ebstein anomaly which is associated with a RFW pathway[14]. Incidence appears around 10% and can be as high as 25%. In the present study, Ebstein had RFW pathway as expected. Pre excitation has also been reported in coorctation of Aorta, HCM, MVP and VSD[2]. The present series had 2 patients with Rheumatic MS, the significance of which remains unclear. This could be probably a reflection of the commonness of the rheumatic lesions in our adult population.

The majority of bypasstract in the present study i.e. 8/9 were LFW pathways. In the literature also, LFW is the single Most common pathway, followed by postero septal (30%), RFW (15%) and anteroseptal (15%)[5] 10% may have multiple accessory pathways and some of them may be familial[15].

AERP of Accessory pathway is a useful parameter of risk of AF in patients with manifest pre excitation. A good correlation exists between AERPAP and shortest

interval observed in AF[16]. An ERP of AP less than 220 msec has been associated with extremely rapid ventricular rate in AF and potential for VF very high[9]. In the present study mean value was 277.5 m sec which is a good prognostic feature as far as ventricular response to potential AF is concerned.

For circus movement tachycardia, to utilise the AP for retrograde conduction, it would appear necessary that RERPAP at cycle length of tachycardia to be less than the cycle length. In the present study RERPAP was determined at a driving cycle length far higher than the cycle length of SVT - mean value of 555 msec. It is well known that there is a positive correlation between cycle length of driving cycle and RERP of AP. As cycle length increases, RERp also increases[17]. Hence ERP of AP at the time of SVT must be lower than ERP measured in the lab where cycle length is much higher. So this should lead to a spuriously high estimate of RERP AP which would obtain during tachycardia. Inspite of this; there was not a single case in whom RERPAP was greater than cycle length of SVT. The mean difference between CL of SVT and RERPAP was remarkable and was on the positive side. This mean difference could be utilised to predict the maximum heart

rate of SVT if it occurs, although predicted heart rate may not be the actual rate. Hence RERPAP can be said to have a definite prognostic significance especially on those who are on drugs and who may occasionally develop a break through SVT.

Tonkin et al from Duke University had studied both AERPAP and RERPAP in 47 Patients with WPW syndrome, Measurement were done at various cycle lengths. RERP of AP was shorter than the cycle length reciprocating tachycardia in all but one of 21 patients. The cycle length at which refractoriness was determined averaged 110 msec greater than cycle length of tachycardia. They also felt that determination of RERPAP was helpful in prognosis and had possible therapeutic implications.

As an extension of this information, it will be interesting to postulate that if we give a class I A drug (which prolongs RERP of AP) to those with SVT, it could increase the ERP thereby increasing the cycle length of SVT. This increase in cycle length of SVT would clinically mean that rate of SVT will come down if patient develops breakthrough SVT while on class I A drug. So it would be fair to assume that RERPAP also has

a therapeutic implication. However it has to be borne in mind that in the chronic management of SVT there are other safer drug options like verapamil, B-blockers which act antegradely on AV conducting system.

CONCLUSIONS

1. It has been convincingly shown that cycle length of SVT is greater than R-ERP of Accessory pathway when measured near basal state.

2. Cycle length of SVT is likely to be higher than A-ERP of Accessory pathway also though statistical significance was not reached.

3. Because of the distinct correlation between cycle length and R-ERP it would be safe to assume that drugs which prolong the RERP of Accessory Pathway are likely to prolong the cycle length of tachycardia and hence reduce rate of SVT.

4. Calculation of R-ERP can be useful in predicting the maximum possible heart rate of tachycardia, even though the actual heart rate can not be predicted.

Table I

CLINICAL PRESENTATION (n-9)

Palpitation	- 9
Syncope	- 2
Dizziness	- 3
Dyspnea	- 6
Duration (MO)	- 49.6 ± 35.4
Range (MO)	- 12 - 90

Table : 2

CARDIAC LESIONS (n-9)

No structural lesion		- 4
CHD	Ebstein	- 1
	ASD	- 1
	PS	- 1
RHD	MS	- 2

Table:3

ACCESSORY PATHWAYS (n-9)

WPW	LFW	- 3
	RFW	- 1
Concealed	LFW	- 5

Table-4

EPS FINDING (n - 9)

(in Msec)

1. AH	- 96.7 ± 17.3
2. HV	- 39.4 ± 15.1
3. Ventricular ERP (n - 7)	- 238.6 ± 17.7
4. AVCS - ERP	- 305.7 ± 41.6
5. AERP - AP (n - 4)	- 277.5 ± 71.4

Table No: 5

RELATIONSHIP BETWEEN RERP OF AP AND CYCLE LENGTH OF SVT

	Mean	SD (Msec)
1. Cycle length of SVT	- 339.4	24.8
2. ERP of AP (R)	- 288.9	29.4
3. ERP of AP (A)	- 277.5	71.4

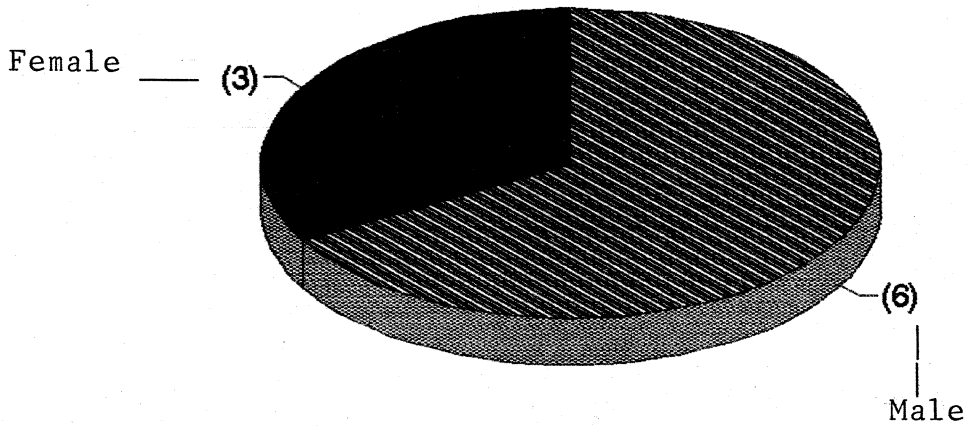
Table No:6

MEAN DIFFERENCE WITH 95% C.I

	DIFF	95% C.I
1. Cycle length - R-ERP (n-9)	50.6	+27.8 + 73.4*
2. Cycle length - A-ERP (n-4)	67.5	-36.7 + 61.7

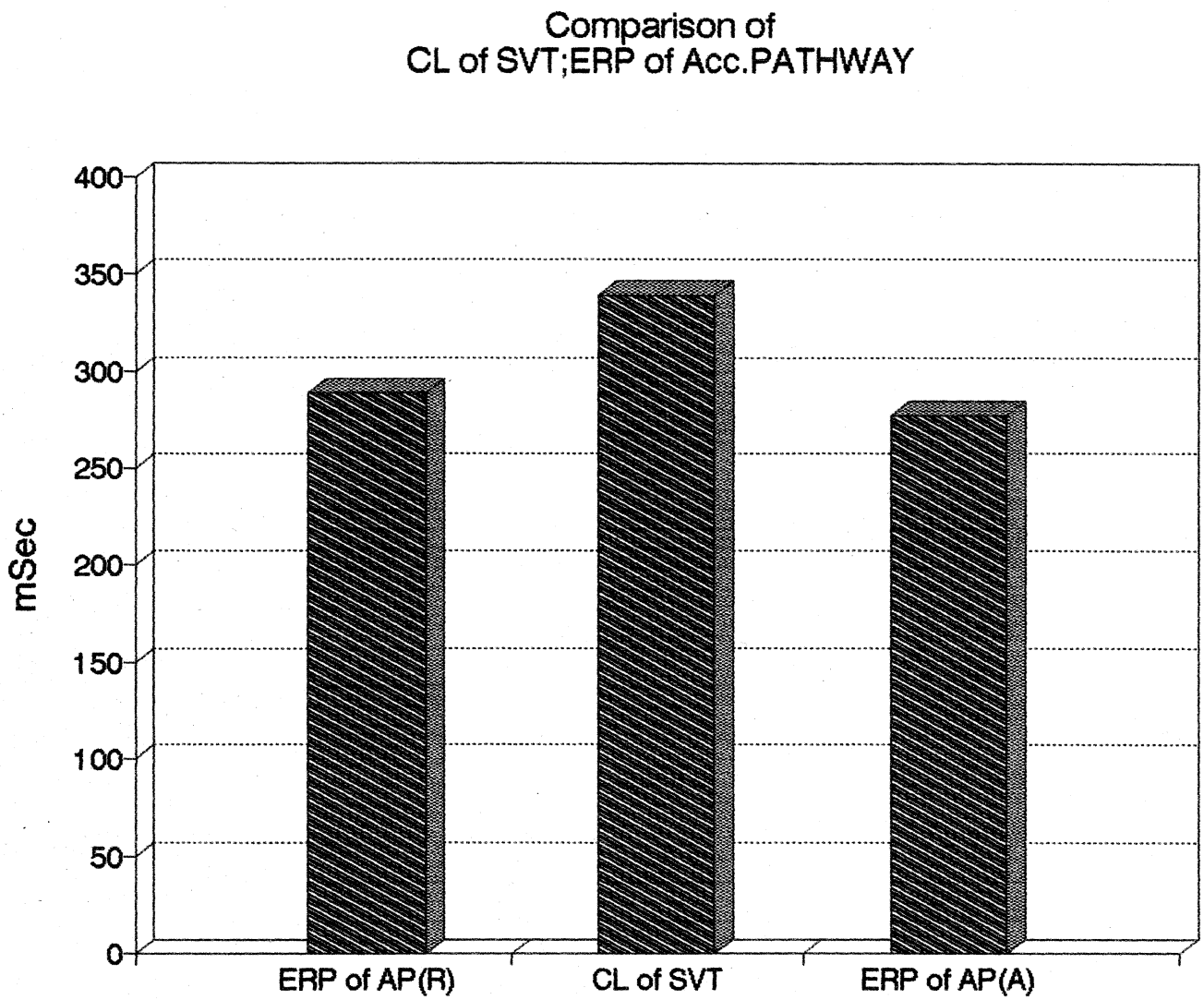
*Statistically significant.

AGE-SEX COMPOSITION OF SUBJECTS



Mean Age : 26.4 + 15.7

Range : 7 - 58 years


Comparison of
CL of SVT;ERP of Acc.PATHWAY
mSec
400
350
300
250
200
150
100
50
0
ERP of AP(R)
CL of SVT
ERP of AP(A)

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