



Annual Report 1983-'84

Sree Chitra Tirunal
Institute for Medical Sciences and Technology
Trivandrum, Kerala



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PRELUDE

The growth of institutions which seek to unite science and technology with health care is influenced by several external determinants, the most important among them being national policies which reflect societal aspirations and needs. It follows that the record of growth of Sree Chitra Tirunal Institute for Medical Sciences & Technology should owe significantly to its degree of concordance with the policy statements of the Government of India on science and technology and health care which are both eloquent documents.

The scientific policy resolution is an admirable statement of the intention of the Government of India to support science through Governmental outlays and its recognition of the role of science as an instrument for promoting technology growth leading to national prosperity and welfare. The more recent Technology Policy statement has gone a step further and declared that "self-reliance is inescapable and must be at the very heart of the technological development." It has also emphasised

that "we must aim at major technological breakthroughs in the shortest possible time for the development of indigenous technology appropriate to national priorities and resources." Given the requirements of national policy and the wide range of inputs into health, the Institute has endeavoured to integrate biomedicine and technology and successfully attempted developmental efforts as an essential step in laying an indigenous base for biomedical technology development. This approach which mutually reinforces biomedicine and technology is inescapable if the health care system of our vast country is not to become dependent on imports for its day-to-day and essential requirements.

Similarly the location of the tertiary referral hospital of the Institute to serve a large population, its ready accessibility to poor patients and the commitment of its programmes to the development of medical industries are entirely in accord with the letter and spirit of the statement on National Health Policy which says "the basic objective of medical research and ultimate test of its utility would involve the translation of available know-how into simple, low cost, easily applicable appropriate technologies, devices and interventions suiting local conditions, thus placing the latest technological achievements within the reach of health personnel and to the front line health workers, in the remotest corners of the country. Therefore besides devotion to basic, fundamental research, high priority should be accorded to applied operational research." This quotation can be said to sum up the ethos of the Institute.

HOSPITAL SERVICES

Medical Superintendent :
Dr. (Maj.) K. A. Hameed

Setu Parvati Bayi Surgical Centre

A constant feature of hospital services over the years has been the surge in demand for cardiac and neurological care. The forces responsible for this phenomenon are undoubtedly the paucity of special care facilities in the region and the substantial claim on the hospital services by the economically weaker sections of the society (Fig.1). While a tertiary referral centre such as the hospital of the Institute must operate with sufficient bed capacity for special care patients and provide an active milieu for the development of technology and integrated programmes of training, the ever increasing pressure on services has nevertheless emphasised the need for pragmatic changes in the policy on patient referrals. These changes would involve, for example, restriction of the referral privilege to larger institutions and steps to prevent unnecessary referrals. Such readjustments in hospital policy from time to time are part of a global phenomenon and are unavoidable whenever social needs far exceed the service capability of institutions.

The Institute responded to the challenge of mounting needs by opening the outpatient clinics, CT Scan Unit, Division of Pathology and postgraduate class rooms in the Setu Parvati Bayi Surgical Centre toward the end of 1983. The opening of inpatient admissions which had fallen behind schedule was re-fixed to take place in May 1984.

The Setu Parvati Bayi Surgical Centre commands an area of 9000 Sq. metres and virtually seeks to double the capacity of the Hospital Wing for patient care. The location of facilities ranging from Central Sterile Supply in the basement floor to the faculty rooms on the ninth floor of the multistoreyed building is diagrammatically shown in Fig. 6.

Fig. Hospital data over the years

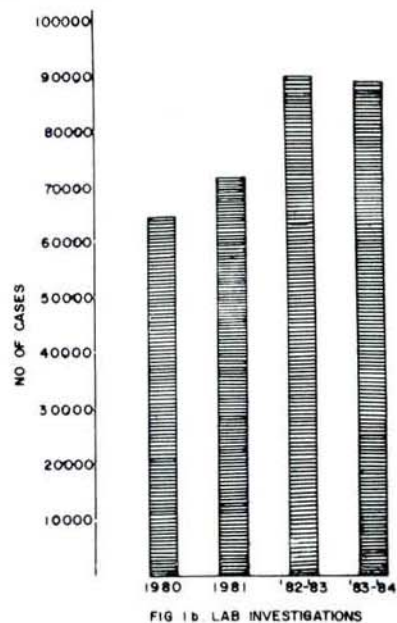
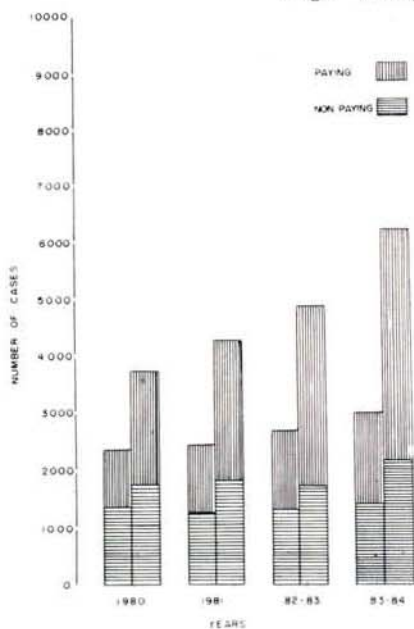


Fig. 1a. First and second column in each block represents inpatients and outpatients

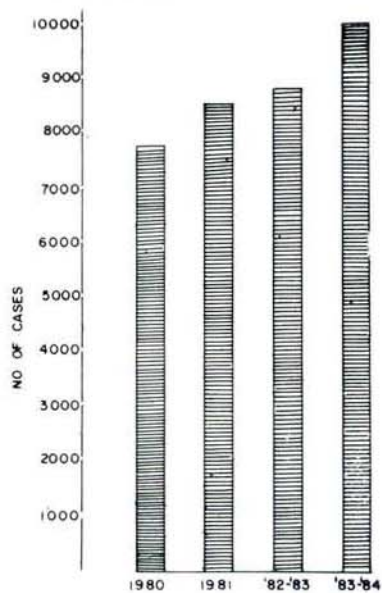


FIG 1c DIAGNOSTIC RADIOLOGIC PROCEDURES

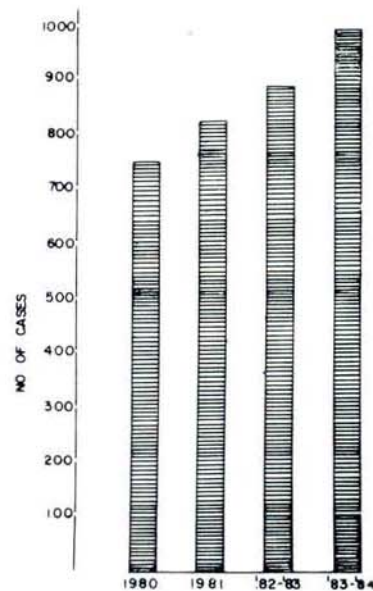


FIG 1d SURGICAL PROCEDURES

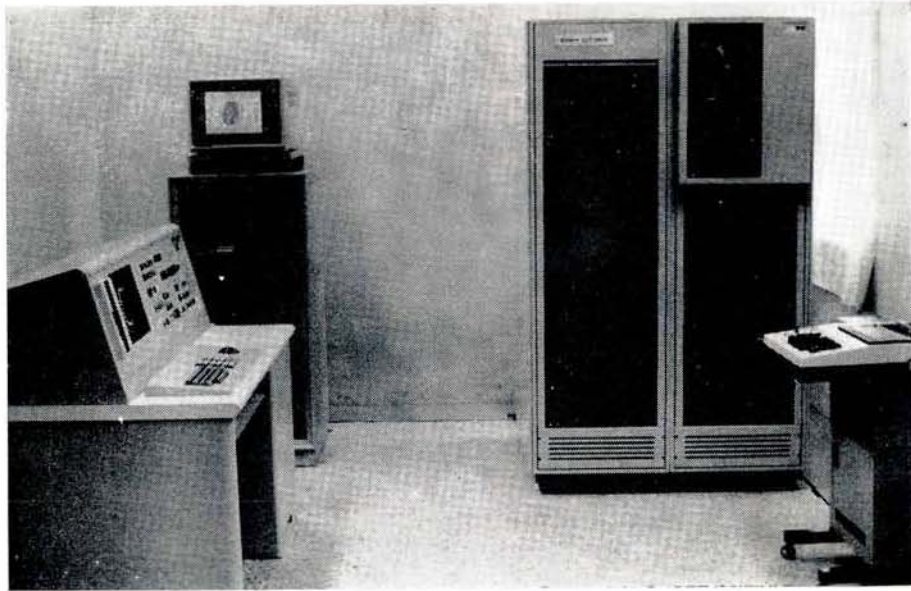


Fig. 2. CT Scan unit — Operator's control and computer

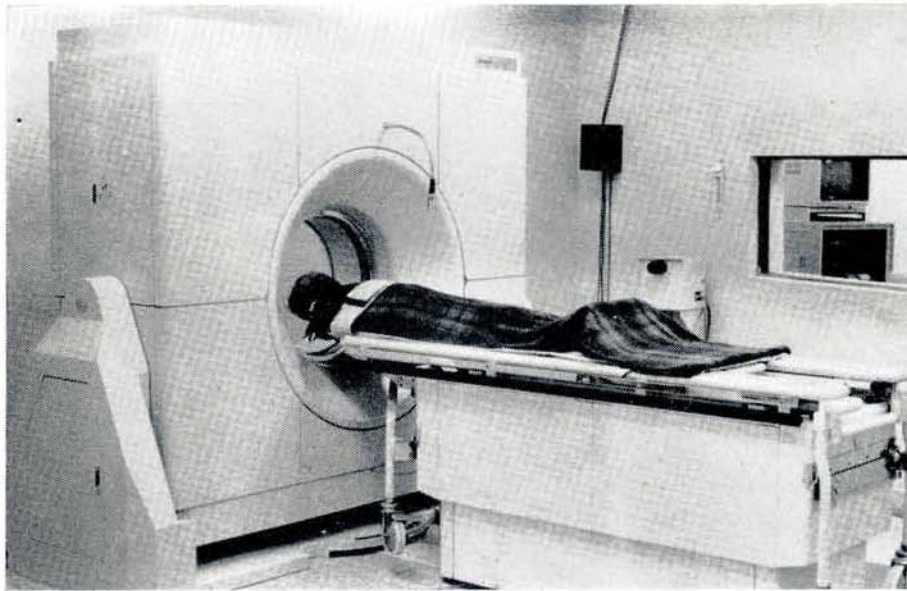


Fig. 3. A patient's head under scanning

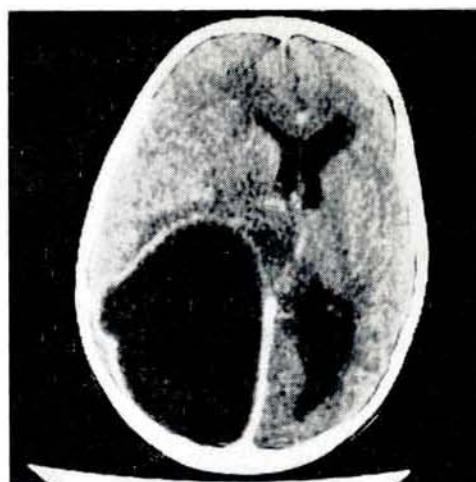
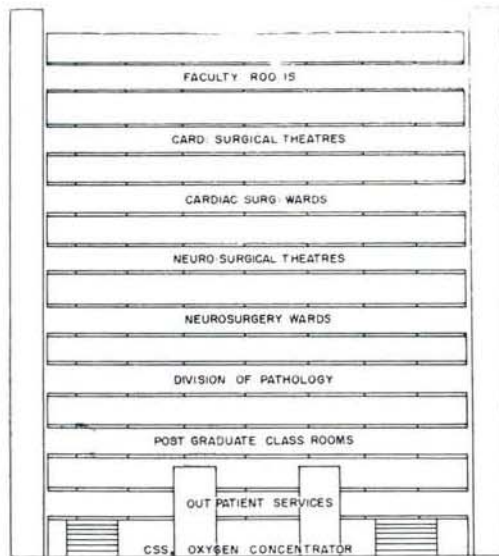


Fig. 4. A large abscess in the right half of the brain is seen in the CT image



Fig. 5. The hub of the new surgical centre is the operating theatre room complex. Its total system was designed and installed by Eschmann of U. K.



Facilities in the Setu Parvati Bayi Surgical Centre

Fig. 6. Diagrammatic representation of facilities in the Setu Parvati Bayi Surgical Centre



Fig. 7. A Ward in the Surgical Centre

Hospital Computer

The transfer of surgical programmes to the new block and the consequential expansion of several other Departments and Divisions such as Cardiology, Neurology, Blood Bank, and Microbiology in the existing buildings would also enhance the ability of the Hospital Wing to respond to the escalating demands of patient care and investigative medicine.

Among the qualitative improvements which occurred during 83-84, the most significant was the introduction of the OMNI Computer system which had been designed to meet the needs of medical records, patient billings, accounts and inventory control. Still under trial, the computer system would clearly make an important contribution to clinical studies based on medical records. Sample of a discharge summary retrieved from the computer is at page 13

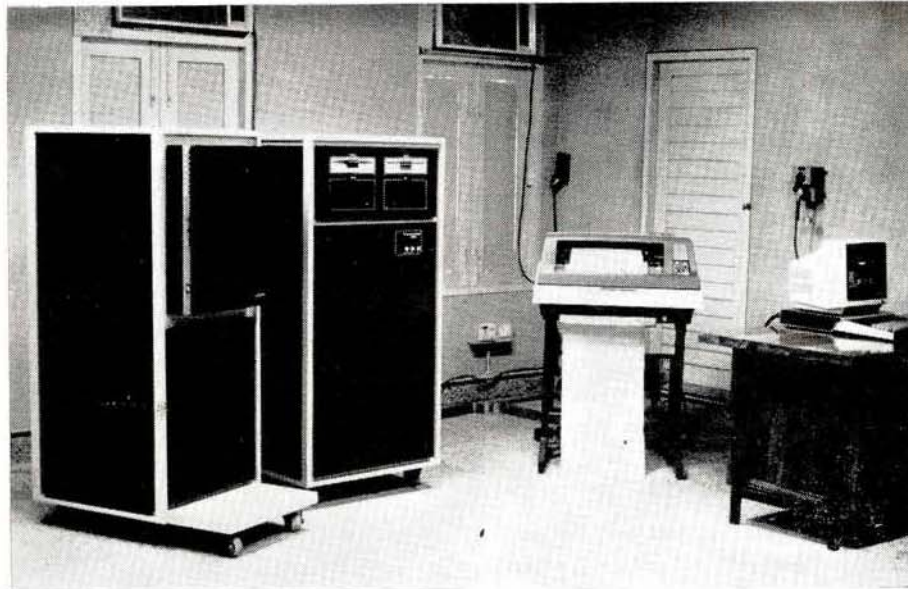


Fig. 8. Hospital Computer

DISCHARGE SUMMARY

WOS. NO - 00067.

REMA DEVI. R.

16 YEAR OLD COLLEGE GIRL WAS ADMITTED FOR ELECTIVE REPAIR OF A RUPTURED ANEURYSM OF SINUS OF VALSALVA.

A PRODUCT OF FULLTERM NORMAL DELIVERY, SHE WAS INITIALLY SEEN AT 7 YEARS FOR AN ASYMPTOMATIC CARDIAC MURMUR AND THOUGHT TO HAVE A RIGHT SIDED DUCTUS. AS SHE GREW UP NORMALLY AND REMAINED IN VIGOROUS HEALTH, HER PARENTS DEFERRED FURTHER INVESTIGATIONS UNTIL EIGHT YEARS LATER WHEN SHE BEGAN TO EXPERIENCE REPEATED CHEST INFECTIONS.

PHYSICAL EXAMINATION REVEALED A THINLY BUILT GIRL IN NO DISTRESS. SHE HAD A LARGE VOLUME PERIPHERAL PULSE WITH NO ABNORMAL VENOUS OR ARTERIAL NECK PULSATINGS. BLOOD INTERCOSTAL SPACE IN BOTH ARMS. PMI WAS LOCATED IN THE FIFTH INTERCOSTAL SPACE IN THE MIDCLAVICULAR LINE. LEFT VENTRICULAR IMPULSE WAS HYPERDYNAMIC AND A SYSTOLIC THRILL WAS PRESENT OVER THE STERNAL BORDERS AND A SOFT A GRADE V CONTINUOUS MURMUR OVER BOTH OTHER SYSTEM REVIEWS DIASTOLIC RUMBLE AT THE APEX WAS HEARD. HER OTHER SYSTEM REVIEWS WERE NORMAL. CHEST RADIOGRAPH SHOWED NORMAL C/T RATIO. INCREASED PULMONARY VASCULARITY AND A PROMINENT RIGHT UPPER MEDIASTINAL SHADOW WHICH WAS REPORTED AS DILATED ASCENDING AORTA. ECG SHOWED NSR, QRS AXIS + 30 DEG AND FEATURES OF LV OVERLOAD. TWO DIMENSIONAL ECHO-STUDY SUGGESTED AN ANEURYSM OF THE SINUS OF VALSALVA WHICH HAD RUPTURED INTO THE RIGHT ATRIUM OR A PERIPHERAL TYPE OF AP WINDOW. CARDIAC CATHETERISATION REVEALED MILD ELEVATION OF PRESSURE IN RA, RV AND PA AND NORMAL PRESSURES IN THE LEFT SIDED CHAMBERS. A LARGE LEFT TO RIGHT SHUNT WITH OP/OS RATIO OF 3.6:1 WAS PRESENT AT HIGH SVC LEVEL WITH DILATATION OF SVC-LV ANGIOGRAM SHOWED NO VSD, DILATED AORTIC ROOT AND OPACIFICATION OF RIGHT ATRIUM AND SVC. AORTIC ROOT ANGIOGRAM SUGGESTED AN ANEURYSM OF THE CORONARY SINUS WITH CONTRAST FILLING SVC-PA JUNCTION. NO AORTIC REGURGITATION WAS PRESENT. HER BLOOD CHEMISTRY, URINALYSIS AND COAGULOGRAM WAS NORMAL.

AT OPERATION UNDER BYPASS ON 11-4-1984, THE FINDINGS INCLUDED AN ANEURYSMAL SVC AND AN ENLARGED LEFT SINUS OF VALSALVA WHICH SHOWED THE MOUTH OF AN ANEURYSMAL SAC BETWEEN THE LEFT CORONARY ORIFICE AND THE COMMISSURE BETWEEN THE LEFT AND NON-CORONARY CUSPS. THE ANEURYSM COMMUNICATED WITH THE RA AT ITS JUNCTION WITH THE SVC THROUGH A 5 SQ. MM OPENING. THE AORTIC OPENING OF THE ANEURYSM WAS CLOSED WITH A DACRON PATCH AND THE ATRIAL END WAS REPAIRED WITH PLEDGETED SUTURE. HER RECOVERY WAS UNEVENTFUL AND SHE WAS DISCHARGED ON 25-4-84. AT DISCHARGE, SHE HAD NO CARDIAC MURMUR AND SHE REMAINED IN SINUS RHYTHM WITH OCCASIONAL JUNCTIONAL INTERVALS. SHE WAS KEPT ON DIGOXIN 0.25 MG/DAILY.

In an effort to improve work efficiency in various sectors of hospital services, several experimental measures were initiated in collaboration with the Biomedical Technology Wing. These steps included the increasing use of gamma irradiation for the sterilisation of crystalloids and disposables in preference to the existing practice of autoclaving. The selective input of technology at various levels ranging from the computerisation of medical records to the gamma-ray sterilisation of day to day articles for clinical use is bound to contribute to the attainment of high standards of patient care which is enjoined in the Act.

Medical Records

The rapid rise in the number of out-patient visits was a challenge to the Medical Records Section which was also called upon to undertake the additional tasks of registration for the CT Scan Unit and the organisation of an X-ray film library. Apart from handling these responsibilities efficiently, the Medical Record Section provided excellent support to the academic staff who sought medical record data for clinical research, teaching and preparation of scientific papers. The imminent introduction of the OMNI computer was expected to produce further improvements in the storage and retrieval of medical record data for patient care and clinical studies.

Nursing

As the numerical strength of nurses grew to meet the needs of the Surgical Centre, continuing educational activities for nurses also showed greater momentum. Apart from contributions from several nurses to the one day symposia for over 50 nurses from other institutions, Mrs.

Edwards and Mrs. Xavier presented papers at the Satellite conference held by the Neurological Society of India in Madurai. Similarly Mrs. Aleyamma Cherian presented a paper at the Annual Conference of the Association of Cardiothoracic Surgeons in Madras. Miss Saramma, who was deputed for the M.Sc. course in Nursing at the RAK College, New Delhi became the second nurse to be sent by the Institute to the Colleges of Nursing in India for higher training.

BIOMEDICAL TECHNOLOGY WING

Head: Shri. A. V. Ramani

The blood bag system for the collection and component separation of blood, disposable oxygenator and cardiotomy reservoir which had been under intensive development were shown to satisfy, in the absence of international standards, the stringent criteria laid down by such agencies as the DHSS, UK and AAMI, USA. The status of these devices was reviewed by the Ethics Committee which cleared them for clinical trials in August 1983 at the Institute and other major medical centres in the country. The performance of all three devices was found to be uniformly satisfactory in a large number of clinical trials in the Hospital wing which, in fact, sought larger numbers of the devices for regular and continued clinical use. The Biomedical Technology Wing completed the arrangements to produce them in sufficient numbers by mid 1984 for the Hospital Wing and other participating medical centres in the country. The institutions which have agreed to take part in the multicentric trial of the blood bag systems are the following:

1. AFMC, Pune
(Prof. & Head, BTD)
2. Nair Hospital, Bombay
(Dr. (Mrs.) Z.S. Bharucha)
3. AIIMS, New Delhi (Dr. A. Nanu)
4. PGI, Chandigarh (Dr. J.G. Jolly)
5. SCTIMST, Trivandrum
(Dr. P.A. Jayaprakash)
6. Assemblies of God
Hospital, Calcutta (Brig. R.N. Datta)
7. Cancer Institute, Madras
(Dr. V. Shanta)

Transfer of Technology

While the intramural trials made good progress and multicentric trials were in the offing, the Institute entered into an agreement with the National Research & Development Corporation for channelising its technologies for commercial production. An immediate outcome of the agreement was the transfer of technology on a non-exclusive basis for the manufacture of blood bag systems, disposable oxygenator and cardiotomy reservoir by the National Research & Development Corporation to M/s. Penninsula Polymers Pvt. Ltd. who would set up their factory in Hyderabad in the joint sector. Under the agreement, the company would pay a lump sum fee of 3 lakhs and 3% recurring royalty on production and receive the technical support of the Institute for ten years. The manufacturer has already acquired land at Mahboobnagar near Hyderabad and made plans for the new factory to go into production during 1985. The experience gained by the Institute in the successful transfer of technologies will undoubtedly be an asset in the years ahead when similar transactions are expected to multiply.

Patent Applications

An index of the technological activity of the Institute would be the number of patent applications which had been filed on its behalf during the current year. Consisting of eleven design patents and three devices patents, they relate to blood bag system, heart valve assembly, ring support for heart valve disc, blood oxygenator (adult and junior), Cardiotomy reservoir cum-filter etc. and reflect the innovativeness of the scientists of the Institute.

Panbit

The availability of the Panoramic Batch Irradiator made it possible to sterilise biomedical devices and hospital disposables on a regular basis without the necessity to send them elsewhere for gamma irradiation. The Unit was also used frequently for radiation bonding and for the study of radiation induced changes in polymeric surfaces.

EDUCATIONAL PROGRAMMES:

Registrar: Shri. V. Narasimhan

The generous response to postgraduate admissions continued to vindicate the objective of the Institute to develop specialists whose outlook would be scientific toward disease, technological toward hospital care and compassionate toward the patient. Whereas two students from among 100 applicants were selected for D. M. and M.Ch. on the basis of MD and MS qualifications for Cardiology, Neurology and Cardiovascular & Thoracic Surgery respectively, two candidates with MBBS from 45 applicants were admitted to the 5 year M.Ch. course in Neuro Surgery for the first time. Unlike the postdoctoral certificate course in Anaesthesia which continued to be popular, the corresponding course in Radiology did not seem to attract suitable candidates. Dr. Sankarkumar passed the M.Ch. Part II examination in Cardiovascular and Thoracic Surgery in March 1984 and became the first claimant for a degree of the Institute.

The Institute had approved a scheme for the registration of internal candidates for Ph.D. in Biochemistry, Microbiology, Pathology, Biomaterials Science and Biomedical Engineering under certain conditions including the availability of a competent guide from within or outside the Institute. During the current year, two candidates sought registration for Ph.D. in biomedical engineering and one each for biomaterials science and pathology. All except one candidate had external guides who were recognised as teachers of the Institute. This novel scheme proved to be a source of academic encouragement to talented young scientists and a means for attracting intellectual inputs for the Institute from eminent scientists elsewhere.

The opportunity for training in the various Departments of the Institute was sought and utilised by several institutions in the country during the year. Notable among the trainees were Dr.B.P. Panigrahi of the SCB Medical College, Cuttack and Dr. Pankaj Shrivastava of the Calcutta Medical Research Institute who spent extended periods of training in the Departments of Anaesthesia and Blood Transfusion Service respectively.

Under the joint auspices of the Institute and the Neurological Society of India a national seminar on 'Recent Advances in Neurosciences' was held on 14 and 15 December 1983 which attracted a number of neuroscientists from India and abroad including Prof. Theodore Rasmussen from Montreal, Prof. Tetsuo Kanno from Japan and Prof. Peter Rasmussen from Denmark.

The Division of Microbiology organised a national workshop and symposium on 'Serological markers of Hepatitis B virus' from 10th October to 15th October 1983 with the cooperation of several national institutions. The enthusiastic response to the workshop underlined the importance and topicality of the subject.

A one day symposium was held by the Nursing Staff with 'subarachnoid haemorrhage and valvular heart disease' as its focal themes for nurses from various hospitals in Kerala who welcomed the event and sought the educational programmes to be offered on regular basis.

In accordance with the regulations of training programmes leading to DM and M.Ch., postgraduate students were posted

for short periods to other teaching institutions in the country such as GB Pant Hospital, New Delhi, National Institute for Mental Health and Neurosciences, Bangalore, Madras Medical College and Madurai Medical College to widen their professional outlook and experience. This phase of itinerant studentship proved to be a source of enrichment to the training programmes of the Institute.

During the year, the Institute became a member of the Association of Indian Universities.

DEPARTMENTAL REPORTS

HOSPITAL WING

Department of Anaesthesia

Dr. K. Mohandas, M.D.	Associate Professor
Dr. V. Padmanabhan, M.D.	Associate Professor
Dr. R.C. Rathod, M.D.	Assistant Professor
Dr. Annapurna Rout, M.D.	Assistant Professor
Dr. H.D. Waiker, M.D.	Lecturer
Dr. K. Muralidhar, M.D.	Lecturer
Dr. N.S. Kodandaram, M.D.	Lecturer
Dr. V.K. Tambe, M.D.	Candidate for postdoctoral certificate course
Dr. S.M. Upadhyaye, M.D.	-do-

The central responsibility of the Department continued, as in previous years, to be the provision of anaesthetic and ventilatory support for surgical and other procedures which had increased in number. The day-to-day management of the growing array of equipment was streamlined by putting them under the charge of a Chief Anaesthetic Technician. The Department also played an important role in the pre-commissioning exercises for the new operating rooms and intensive care units in the Setu Parvati Bayi Surgical Centre.

The postdoctoral certificate course proved popular among young anaesthetists from many parts of the country

and led to requests for additional training opportunities for shorter periods as well. The training programmes laid as much emphasis on practical experience as on theoretical instruction through journal clubs and lectures.

The research project on the development of intravenous lipid emulsion was continued in collaboration with the Central Food Technology Research Institute, Mysore. The staff of the Department also took an active part in major operative procedures such as valve replacement at the Biomedical Technology Wing and the development of satisfactory animal models for specific experiments.

Division of Biochemistry

Dr. K. Subramonia Iyer, Ph.D.

Associate Professor

Mrs. Santha A. George, M. Sc.

Lecturer

The Division carried out nearly 33,000 routine and sophisticated biochemical investigations requested round the clock by the clinical departments. The auto-analyser became particularly useful in these procedures.

Thanks to the support from Lady Tata Memorial Trust, the laboratory made significant progress in the isolation and identification of abnormal protein components from the sera of patients with endomyocardial fibrosis as part of the effort to investigate the role of serum markers in the pathogenesis and diagnosis of this endemic problem. In collaboration with the Department of Cardiothoracic Surgery, the laboratory participated in the bio-chemical

evaluation of the Chitra disposable oxygenator during its clinical trials.

The Division received a grant of Rs. 9.7 lakhs from the Department of Science and Technology for organising a new research programme entitled "Studies on the interaction between human serum proteins and manmade materials used as implants and storage devices." Utilising these funds, new equipment like Beckman Du-7HS recording spectrophotometer, Biomed densitometer, LKB fraction collector and Radiometer titration system are being added to the laboratory. The project is primarily designed to explore the grey zone of systemic responses to implants which are local or regional in the body.

Division of Blood Transfusion Services

Dr. P.A. Jayaprakash, MBBS, DIBT
Dr. (Mrs) Jaisy Mathai, MBBS, DCP
Dr. P.V. Sulochana, MBBS

Chief Blood Transfusion Officer
Junior Blood Transfusion Officer
Junior Blood Transfusion Officer

During the year, two thousand volunteers were enrolled in the donor panel and the volume of blood collection and transfusion increased by 30% over the previous year's level. Blood component therapy and plasma exchange therapy were continued in selected cases.

The Division continued to provide the necessary clinical inputs for the research and development of PVC blood bags and conducted clinical trials with single and double bags with excellent results. Dr. J.D. Cash and Dr. W.J. Lockyer from the United Kingdom were among the various experts who visited the Blood Bank and held discussions with the staff of the Division.

Department of Cardiology

Dr. K.G. Balakrishnan, MD, DM	Associate Professor
Dr. C.G. Venkitachalam, MD, DM	Assistant Professor
Dr. R. Subramoniam, MD, DM	Assistant Professor
Dr. V. Ramakrishna Pillai MD, DM	Assistant Professor
Dr. Thomas Titus, MD, DM	Lecturer
Dr. Jagamohan Tharakan MD, DM	Lecturer
Dr. K. Suresh, MD	Candidate for DM
Dr. M. V. Joseph Joy, MD	-do-
Dr. R. Krishnan, MD	-do-
Dr. K. Venugopal, MD	-do-
Dr. S. Gobisankar, MD	-do-
Dr. K. Srinath, MD	-do-
Dr. A. Geevar Zachariah, MD	-do-

The increase in the volume of patient care which amounted to 20% over the previous year was marked by a rise in the number of stress tests and coronary angiograms for patients with coronary artery disease. This was incidentally in accord with the trend observed in other large institutions in the country during the same period.

The clinical research activities of the Department continued to focus on the characteristics and natural history of endomyocardial fibrosis. Among the important studies carried out was an attempt to demonstrate the haemodynamic correlates of clinical improvement following palliative surgery for endomyocardial fibrosis.

The training programme for DM entered the third year with the admission of two students during the current year.

Dr. Titus rejoined the Department after successfully completing DM at the AIIMS, New Delhi. Dr. R. Subramoniam went on leave of absence for special training in paediatric cardiology at the Green Lane Hospital, Auckland, New Zealand.

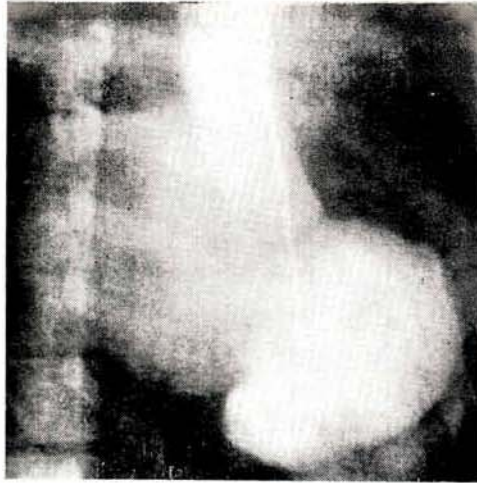
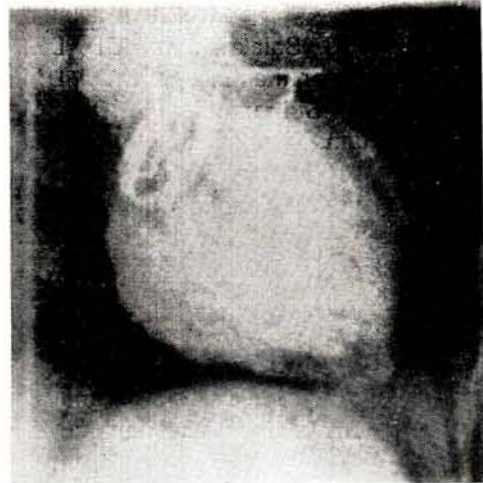


Fig. 10. Left ventricular angiograms in endomyocardial fibrosis (a) before palliative operation



(b) after mitral value replacement and left ventricular endocardietomy. Note the restoration of normal ventricular contour and the disappearance of mitral regurgitation.

Department of Cardiothoracic Surgery

Dr. M.S. Valiathan, Ch. M. (L'Pool), FRCS (Edin), FRCS (Eng.) FRCS(C), FACC, FAMS, FNA, FASc.	Professor
Dr. M. P. Mohansingh, FRCS (Eng) FRCS (Edin)	Associate Professor
Dr. K.S. Neelakantan, M.S., M.Ch.	Lecturer
Dr. R. Sankarkumar, MS, M.Ch.	Lecturer
Dr. A.K. Shrivastava, MS, M.Ch. MNAMS	Lecturer
Dr. K.G. Shyamkrishnan, MS, M.Ch.	Lecturer
Mr. D. Ranjit, BE	Perfusionist
Dr. M. Unnikrishnan, MS	Candidate for M.Ch.
Dr. C.P. Shrivastava, MS	-do-
Dr. K.S.V.K. Subba Rao, MS	-do-
Dr. H.L. Subba Rao, MS	-do-
Dr. Baljitkumar Sharma MS	-do-
Dr. A.B. Bhoyar, MS	-do-

The Department continued its threefold activities of clinical surgery, research and postgraduate training which grew in range and volume. While the total number of surgical procedures showed a moderate increase, the preponderance of corrective operations for congenital and valvular heart disease remained unchanged from previous years. The large experience of the Department with endocardiotomy and replacement of mitral or tricuspid valves confirmed the beneficent role of surgery in treating endomyocardial fibrosis.

The serious problem of the waiting period of patients, particularly those with valvular disease, continued to defy a satisfactory solution.

As national and international organisations hold thoracic surgery to be inseparable from cardiac surgery, the Institute had made a policy decision earlier to establish a thoracic unit which would lay special emphasis on pulmonary and oesophageal surgery. The Department accordingly finalised plans to create a new unit of 20 beds with modern equipment and facilities for thoracic work during the ensuing year.

The research activities of the Department ranged from the aetiological studies on endomyocardial fibrosis on the basis of the analysis of surgically excised tissues to the development of the tilting disc valve, polyester vascular graft and disposable oxygenator which called for continuous dialogue and participation in experiments with other Divisions notably, Pathology, Extracorporeal Devices and Artificial Internal Organs.

The third batch of candidates was admitted to the M.Ch. course which continued to be popular.

Dr. Valiathan served as a Visiting Professor at the Institute of Postgraduate Medical Education and Research, Chandigarh and received the Fellowship of the Indian National Science Academy.

Prof. Paul Walter, Head of Department of Cardiovascular surgery, University Hospital, Antwerp Belgium visited the Department and delivered a lecture on 'the current status of coronary artery surgery.'

Division of Microbiology

Dr. J. Shanmugham, Ph.D.	Associate Professor
Dr. Ashalatha Nair, M.D.	Lecturer
Mr. M. Ravindranath, B.Sc.	Scientific Assistant
Miss Molly Thomas, M.Sc.	Scientific Assistant

While the bacteriology laboratory of the Division provided support to the hospital by carrying out investigations for patient diagnosis and surveillance of hospital infections, the virology laboratory added one more cell line bringing the total to four cell lines for virus isolation, identification, antigen production, antibody titration and antisera standardisation.

The first National Workshop on Serological Markers of Hepatitis B virus was organised by the Division in October, 1983 in collaboration with other national institutions. Twenty participants who were selected from over hundred applicants received training in upto date techniques under the supervision of the internal

faculty and guest scientists including Dr. K.M. Pavri, Dr. Jacob John and Dr. S. Subramoniam. The Division also held a Symposium on 'Hepatitis B. Virus Infections' in collaboration with the Department of Gastroenterology, Medical College Trivandrum.

Two distinguished visitors to the Division were Dr. Jiri Rotta, Director of the WHO collaborating Centre for Research and Reference on Streptococci, Prague and Dr. Carrace, Director-General of Pasteur Institute, Lyon, France. The Division continued to take part in the International Quality Control Programme organised by WHO under the convener-ship of Prof. J. Vande Pitte, Leuven Belgium

Department of Neurology

Dr. Vimla Virmani, MA (Psy,) FRCPE, FAMS	Visiting Professor
Dr. P.K. Mohan, MD, DM	Assistant Professor
Dr. John Tharakan, MD, DM	Lecturer
Dr. P.K. Saha, MD, DM	Lecturer
Dr. A.B. Taly, MD, DM	Lecturer
Dr. C. Sarada, MD	Candidate for DM
Dr. A. Anandkumar, MD	-do-
Dr. N.K. Ravisubramanya, MD	-do-
Dr. K. Venkateswarlu, MD	-do-
Dr. Chetan Trivedi, MD	-do-
Dr. G.M.Wali, MD	-do-

The arrival of the CT Scanner had a significant impact on neurological services which could ensure rapid turn over of patients in the context of increasing demand.

Research activity was mainly centred on intracranial infections and juvenile, non-familial motor-neurone disease and

the solution of their diagnostic problems. The Department took an active part in organising a national seminar on 'Recent Advances in Neuro Sciences' and contributed papers to the sessions on meningitis and juvenile motor-neurone disease.

The third batch of students was admitted to the DM course.

Department of Neurosurgery

Dr. Damodar Rout, MS, M.Ch.	Associate Professor
Dr. R.N. Bhattacharya, MS, M.Ch.	Assistant Professor
Dr. S.M. Pillai, MS, MNAMS	Assistant Professor
Dr. Ajay Sharma, MS, M.Ch.	Lecturer
Dr. P. K. Mishra, M.S., M. Ch.	Lecturer
Dr. Bharat Mittal, MS, M.Ch.	Lecturer
Dr. A.K. Gehlot, MBBS	Postgraduate Student for M.Ch.
Dr. K.N. Krishnan, MBBS	-do-

The Department registered a steady increase in the volume of its clinical services with special emphasis on the surgical management of intracranial vascular malformations, cranio-vertebral anomalies and trans-sphenoidal surgery. The radio opaque silastic spheres developed by the Biomedical Technology wing was put into clinical use during this year for therapeutic embolization of cerebral AV malformations with the approval of the Ethics Committee of the Institute. The Department looked forward to the development of intracranial microsurgical work with the opening of the Setu Parvati Bayi Surgical Centre.

In collaboration with the Divisions of Radiology and Pathology, two research projects ie. (i) "Radiological exploration of the craniovertebral anomalies" and (ii) "The Role of hyaluronidase in experimental cryptococcal infections of the central nervous system and in clinical practice," sponsored by the Indian Medical Research Society, Bombay were continued during the year. A collaborative study with the Department of Anaesthesia suggested the significant role lignocaine hydrochloride in the reduction of intracranial tension. When used in adequate dosage it proved superior even to mannitol for major intracranial operations. A multicentric trial of this observation is in progress.

The multidisciplinary "National seminar on recent advances in Neuro Sciences" was organised at the Institute on December 14 and 15th with Dr. D. Rout as the Co-ordinator. The two-day seminar encompassed seven scientific sessions including five symposia on major neurological topics.

The first batch of two candidates joined the Department for M.Ch. degree course in Neurosurgery during this year. Academic programmes in the form of seminars, symposia, lectures and group discussions were instituted as a part of the M.Ch. training programme.

Dr. D. Rout was elected as a member of the Executive Committee of the Neurological Society of India during the year for a period of three years.

Division of Neurochemistry

Dr. Debkumar Basu, Ph.D.	Professor
Dr. P. S. Appukuttan, Ph.D.	Lecturer
Mrs. K.I. Annamma, B.Sc.	Scientific Assistant
Mr. G. Suresh Kumar, M.Sc.	Candidate for Ph.D.
Mr. Farhat Azimkhan, M.Sc.	-do-
Miss P.N. Sarasija, M.Sc.	-do-

Following the completion of the project on the isolation and characterisation of two lysosomal enzymes from placental tissue, the Council of Scientific and Industrial Research funded an additional project to characterise the enzymes which are α mannosidase and α galactosidase. These studies are in progress.

In view of the regional importance of endomyocardial fibrosis, the Division took part in the ongoing studies on the problem at the Institute by seeking to localise eosinophil basic protein on endocardial tissues by immunological methods. Efforts were also made to identify surface carbohydrates in normal and abnormal myocardium by the use of fluorescent labelled lectins of known characteristics. These studies were supplemented by chromatographic separation of plasma proteins from patients with endomyocardial fibrosis and their characterisation.

Dr. Basu presented a paper on α -D-galactose specific lectin of *Artocarpus integra* and the effect of physico-chemical conditions of its interaction with galactomannan at the 7th International Glycoconjugate Symposium at Roneby-Lund, Sweden.

Division of Pathology

Dr. V.V. Radhakrishnan, MD	Associate Professor
Dr. C.C. Kartha, MD	Assistant Professor
Dr. Mrs. Sandhyamony, MD	Lecturer
Dr. Pushpa Mahadevan, MD.	Lecturer
Mrs. Annamma Mathai, M.Sc.	Scientific Assistant

The Division moved into its new location on the second floor of the Setu Parvati Bayi Surgical Centre which offers 9400 Sq. feet and provides ample space for laboratories and offices.

The workload in terms of clinico-pathological investigations increased by 15% over the previous year and, among the wide range of investigations on blood and tissue samples, the use of cryostat with an accuracy rate of over 90% was particularly welcomed by the clinicians for establishing quick surgical diagnosis. The new category of laboratory tests which came into vogue related to immunologic investigations such as phagocytic index, in-vitro chemotaxis, macrophage migration inhibition factor, latex agglutination test and immunofluorescent techniques on tissue sections. The overall necropsy rate averaged 30% and played a significant role in improving the quality of post-graduate teaching as well as clinical practice.

As the patient data and material at the Institute did not support the hypothesis of hypereosinophilia as the causative factor in endomyocardial fibrosis, an intensive search for other aetiologic factors was made on the basis of microanalytic studies of tissue samples obtained at surgery or necropsy. Other projects related

to the immunologic studies of peripheral nerves in ascending infectious polyneuritis and the therapeutic role of hyaluronidase in experimental cryptococcal infections.

Division of Radiology

Dr. V.R.K. Rao, MD	Associate Professor
Dr. Ravimandalam, MD	Assistant Professor
Dr. P.N. Jayakumar, MD	Lecturer
Dr. Richard Sequeira, MD	Lecturer

The addition of the computerised Tomographic Scanner during the year was instrumental in increasing the speed of diagnosis and the efficiency of bed utilisation. Apart from its impact on neurologic services, the whole body scanning facility was also planned to provide diagnostic support to the Thoracic Surgical unit which was being organised. To optimise the use of the costly equipment and as a service to the public, the CT Scanning facility was extended to patients from outside the Institute with the result that more than 55% of the total scans performed were accounted by outpatients alone.

A new 1000 mA x-ray unit started functioning in the outpatient floor of the Setu Parvati Bayi Surgical Centre.

The collaborative studies with the Departments of Neurosurgery and Neurology were related to a radiological evaluation of the cranio-vertebral junction and embolotherapy for inoperable cerebral arterio venous malformations. The development of barium-impregnated silastic spheres by the Biomedical Technology Wing for embolisation was regarded as the forerunner of further linkages between the technologic groups of the Institute and the radiologic service.

BIOMEDICAL TECHNOLOGY WING

Head Mr. A. V. Ramani, B.Sc., (Chem. Tech)

Department of Biomaterials Sciences

(i) Laboratory for technical evaluation of biomaterials:

Dr. M. Jayabalan, Ph.D.	Scientist-in-charge
Mr. K. Sreenivasan, M.Sc.	Scientific Officer
Mrs. Prabha D Nair, M.Sc.	Scientific Officer

The laboratory continued to provide support for inhouse and sponsored projects by undertaking mechanical, chemical and thermal methods of characterisation for materials after varying interventions. This support was particularly significant in the characterisation of PVC and raw materials used for its compounding.

A problem of special interest to the Division was the presence of oligamers on the surface of polyethylene terephthalate regardless of whether it was imported or indigenous. This was investigated in detail and new criteria for the autoclaving of polyethylene terephthaate were suggested. A method to determine the purity of microcrystalline collagen was also developed during the year.

(ii) Laboratory for Thrombosis Research

Dr. M. Jamaluddin, Ph.D.	Scientist-in-charge
Mrs. Lissy Kalyanakrishnan, M.Sc.	Scientific Assistant

The new haemoprotein described by the group and purified by improved methods was shown to bind prostaglandin endoperoxides, PGGZ and PGHZ as well as the stable synthetic PGHZ analogue

U-46619. On the basis of experimental findings, the group postulated that the new protein was the pre-aggregatory endoperoxide receptor of platelets. It was also suggested that the allosteric alteration of the receptor was responsible for the inhibitory action of the high concentration of this haemoprotein on platelet aggregation induced by low concentrations. In the course of experimental work to confirm this view, it was found that the currently used methods for aggregometer assay were unsuitable for studying the kinetics and mechanisms of platelet aggregation because they gave theoretically inexplicable results. Minimising artifactual light scattering fluctuations, the group could produce theoretically expected curves for ADP. It could also be shown that the prevalent view of adenosine and ATP as competitive inhibitors of ADP induced platelet aggregation was untenable and that these agents, in fact, act at mutually exclusive sites.

A cold room was added to the facilities of the laboratory.

Department of Biomedical Engineering

Mr. G.S. Bhuvaneshwar, B.Tech., MS
Mr. A.V. Raviprakash, B. Tech.

(i) Division of Artificial Internal Organs

Biomedical Engineer
Scientific Officer

While the Division made good progress in developing an all integral, Titanium cage valve with a corundum disc and supra, intra or infra annular sewing rings and the model proved highly satisfactory in terms of hydraulic function and wear, the animal trials continued to pose difficulties. Whereas dogs proved too small for valve implantation, the porcine model failed to provide longterm survivors in

spite of the excellent operating conditions it offered. Therefore a beginning was made in switching the implantation studies to calf or sheep which seemed to be superior in terms of capability for long term survival.

In a second major project, protocols were developed for the post-fabrication cleaning of polyester grafts which performed as well as imported grafts in the thoracic aortic position of pigs. The histopathological evaluation of these grafts after one year of implantation is under way with examination at two years to follow.

At the conclusion of the durability tests, the device is expected to be put up to the Ethics Committee for its approval for preliminary clinical trial.

(ii) Division of Biomaterials Technology

Mr. A.V. Ramani, B.Sc. (Chem. Tech.)

In accordance with the recommendation of the Technology Development Committee, a start was made in organising a new laboratory for the preparation and evaluation of non-polymeric materials. As its initial activity, the Division identified the evaluation of carbon-carbon composites for biomedical applications which would be done in collaboration with the National Physical Laboratory as a sponsored project of the Department of Science and Technology. The new area of composites is potentially of great importance to skeletal and dental applications.

(iii) Division of Biosurface Technology

Dr. Chandra P. Sharma,
M.S., Sc.D., MEBE
Mr. Thomas Chandy, M.Sc.

Scientist in charge
Scientific Assistant

Using ^{125}I labelled albumin and fibrinogen, the Division showed that Vitamin C caused increased deposition of fibrinogen on polymer surfaces. Similar techniques were used in investigating protein-polymer interactions by proteases like trypsin, thrombin and plasmin and the kinetics of their interfacial phenomena. In another series of experiments, it was shown that immobilisation of Prostaglandin E1 on albuminated surfaces enhanced the antiplatelet effects of the surface in vitro. Preliminary studies with amino sugars like glucosamine, galactosamine and mannosamine indicated the greater importance of the special arrangement of functional groups over such factors as molecular structure. An attempt was also made to improve the properties of bare plasticised PVC surface by gelatin and poly electrolyte coating.

Under a Department of Science & Technology project, hydrogel coatings and natural rubber derived polyelectrolyte coatings were shown to adsorb albumin preferentially. A grant from the Board of Research in Nuclear Sciences enabled the Division to study glow discharge techniques in conjunction with glutaraldehyde fixing and/or gamma irradiation for developing a permanent bonding of albumin to polymeric surfaces.

Mr. Mani Ramaswamy of IIT, Delhi was assisted in completing practical work for his MS dissertation.

Mr. V.S. Venkatesan, BE
Mr. Thampi Koshi, BE

(iv) Division of Extracorporeal Devices

Biomedical Engineer
Scientific Officer

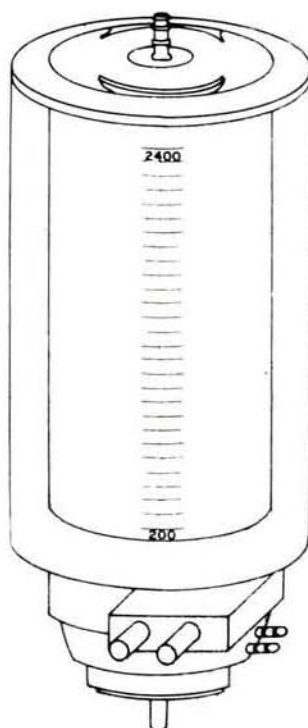


Fig. 11 The Chitra oxygenator technology has entered the second generation and features a rigid shell design and an integral heat exchanger.

Mr. S.N. Pal, M. Tech.
Mr. Kalyanakrishnan, M.Sc.

The soft shell cardiomy reservoir with an integral filter and the bubble oxygenator developed by the Division were used in extended clinical trials with excellent results in the Hospital Wing. Apart from proving their clinical acceptability, the trials also supplied feed back information which enabled marginal improvements to be incorporated in the devices. As the technology for the soft shell oxygenator and cardiomy reservoir entered the phase of commercial production, the Division crystallised plans for the development of a second generation oxygenator and obtained a grant from the Department of Science & Technology for a project on a rigid shell 'variflow' oxygenator with an integral heat exchanger. The prototype of the new oxygenator has already demonstrated good function in vitro experiments. Simultaneously, work on a hard shell Cardiomy reservoir is also making progress.

In keeping with the perspective plan of the Division to develop advanced oxygenators, preliminary work on membranes for special applications was also initiated.

A scientific officer joined the Division during the year.

(v) Division of Polymer Technology

Chemical Engineer
Scientific Officer

The blood bag system and radioopaque silicone beads developed by the Division were approved by the Ethics Committee

for clinical trials which were successfully carried out by the Blood Transfusion Service and Department of Neurosurgery. A major effort was subsequently made to produce batches of single and double bags in sufficient numbers for controlled clinical trials in six major centres in the country by May 1984. The Division also provided inputs whenever necessary for the Technology Transfer Cell in producing technology transfer packages. On another front, significant progress was made in the project funded by Board of Research in Nuclear Sciences on the development of improved radiation sterilisation PVC formulation for biomedical applications.

As in previous years, the Division continued to produce polymer components for the developmental projects of other Divisions.

(vi) Division of Technology Transfer

Mr. H. Vijayakumar, B. Tech.

Biomedical Engineer

As the final test for the success of technologies developed by the Institute will be their commercialisation and availability to the health care system, the Division of Technology Transfer played a key role in the preparation of a project profile on disposable devices for the benefit of potential entrepreneurs and in all other activities connected with the transfer of technology. These activities covered a wide spectrum ranging from a market and consumer preference survey for blood bags to the filing of patent applications. The progress of this Division reaffirmed the well known concept that planning for technology transfer should be closely integrated with the development of technology at all stages.

(vii) Division of Tool Room & Engineering Services

Mr. O.S. Neelakantan Nair, B. Sc (Eng)

Tool Room Engineer

A major responsibility of this Division was to provide infrastructural support to the laboratories and R&D efforts which called for diverse skills. These activities included the setting up of a 4°C cold room with the help of M/s. Richardson and Cruddas, a central suction unit for the animal operating room and the streamlining of the PANBIT operation to undertake regular service activities for the Hospital Wing.

The Tool Room succeeded in fabricating new special purpose jigs and fixtures for fast and precise machining of Titanium valve cages in collaboration with the Division of Artificial Internal organs. All the welding dies and fixtures for the blood bag were made by the Division which also made a beginning in the fabrication of components for the hard shell oxygenator.

(viii) Division of Materials Toxicology

Dr. P.V. Vedanarayanan, BVSc, Ph. D.

Senior Materials Toxicologist

Dr. A.C. Fernandez, Ph. D.

Scientist

Mr. K. Rathinam, M. Sc.

Scientist

Seventeen candidate materials for various devices were screened for Toxicologic properties during the year. The test reports were of considerable help to the user Divisions in their R&D work.

In its research for alternatives to animal methods for toxicologic screening, the Division explored the possibility of using

cultured tracheal rings of new born chicks and rabbits. Studies were also initiated to estimate the effect of extraction conditions on the evaluation of the acute systemic toxicity of polymers.

Mr. Rathinam delivered special lectures on general toxicology for M.Sc. students at the Postgraduate Institute for Basic Medical Sciences, Madras.

(xi) Division of Patho-physiology

Dr. Mira Mohanti, M.D.
Dr. N. Jayakumari, Ph.D.

Scientist
Scientific Officer

During the year, the laboratories became fully organised with additional space and modern equipment for histopathological work. A large claim on the time and resources of the Division arose from a wide range of R & D projects which sought haematological, biochemical and histopathologic information on experimental samples. As a sequel to the blood compatibility studies on plastic bags, the group became interested in the development of haemoglobin solutions for temporary blood substitution which could assume great significance for hospital practice in the country. A project on these lines received the approval of the Department of Science and Technology for funding and was expected to begin soon.

Dr. Arthur Vijayan Lal, BVSc.
Dr. Bhaskara Rao, M.V.Sc., B.V.Sc.

(x) Division of Vivarium

Veterinary Scientist
Veterinary Surgeon

In collaboration with the Division of Artificial Internal organs and the cardiac surgical group, continued efforts were made in evolving a suitable animal model for longterm studies of the valvular prosthesis. These efforts involved the study of species specific responses to cardiopulmonary bypass, assisted ventilation and other interventions. Other collaborative projects where the Division participated effectively included the development of blood bags, hard shell oxygenator, vascular grafts and parenteral administration of lipid preparations.

Besides the routine activities of the Division in the care and maintenance of both stock and experimental animals, assistance was also provided to various laboratories in the design and performance of experimental procedures in animals, supply of sterile blood samples from different species and other services of the vivarium.



Fig. 12. Temple Fantasia : "A picture lives its life like a living creature" said Picasso. In this oil painting gifted to the Institute, CK Ra has transfigured temple celebrants in a harmonious blend of lines, colours and forms.

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ADMINISTRATIVE BODIES

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Director Dr. M.S. Valiathan

Institute Body

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| 1. Dr. B. K. Bachhawat,
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Indian Institute of Chemical Biology,
4, Raja Subodh Mullick Road,
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CLRI, Madras, |
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National Institute of Virology, Pune |
| 3. Dr. K.P. Bhargava,
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Government of India, New Delhi |
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Trivandrum. | 12. Mr. A. V. Ramani,
Head, Biomedical Technology Wing,
Sree Chitra Tirunal Institute for
Medical Sciences & Technology
Trivandrum. |
| 5. Shri O.J. Joseph,
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| 8. Secretary to Government
(Representative of Union Ministry of
Health & Family Welfare)
Niman Bhavan, New Delhi | |

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Trivandrum |
| 17. Mr. M. G.K. Murthy (Ex-officio)
Secretary Health,
Department of Health, Trivandrum | 20. Dr. N.H. Wadia,
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Jaslok Hospital and Research
Centre, and Consultant
Neurologist,
J.J. Group Hospitals,
and Grant Medical College, Bombay. |
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Vice Chancellor
Kerala University, Trivandrum | |

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2. Dr. D.B. Bhist (Ex-officio)
Director General of Health Services,
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3. Dr. S. Vasudev (Ex-officio),
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4. Prof. S. Ramaseshan,
Director,
Indian Institute of Science, Bangalore
5. Dr. N.H. Wadia,
Director of Neurology, Jaslok
Hospital and Research Centre,
and Consultant Neurologist,
J. J. Group Hospitals and
Grant Medical College, Bombay.
6. Dr. M.S. Valiathan, (Ex-officio)
Director, Sree Chitra Tirunal Institute
for Medical Sciences & Technology,
Trivandrum.
7. Mr. A.V. Ramani, (Ex-officio)
Head, Biomedical Technology Wing,
Sree Chitra Tirunal Institute for
Medical Sciences & Technology,
Trivandrum.
8. Prof. D.K. Basu,
Professor of Neurochemistry,
Sree Chitra Tirunal Institute for
Medical Sciences & Technology,
Trivandrum.

STANDING COMMITTEES

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Director, VSSC, Trivandrum.
Financial Adviser to the Department
of Science & Technology,
Government of India.

Member of the Institute representing
Department of Science & Technology.

Financial Adviser & Chief Accounts
Officer of the Institute (Convenor)

Dr. M. P. Mohansingh,
Associate Professor, Sree Chitra Tirunal
Institute, Trivandrum.

Dr. Damodar Rout,
Associate Professor,
Sree Chitra Tirunal Institute, Trivandrum.

Prof. (Mrs) Vimla Virmani,
Visiting Professor of Neurology,
15 Golf Links, New Delhi.

Sri. A.V. Ramani, Head BMT Wing,
Sree Chitra Tirunal Institute, Trivandrum.

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Director, Institute of Chemical Biology,
Calcutta.

Prof. G.B. Parulkar,
Director Professor of Surgery,
KEM Hospital, Bombay.

Prof. R.M. Varma,
Professor Emeritus,
NIMHANS, Bangalore.

Prof. P.S. Bidwai,
Professor of Cardiology,
PGI, Chandigarh.

Prof. D.K. Basu,
Professor,
Sree Chitra Tirunal Institute for
Medical Sciences & Technology,
Trivandrum.

Technology Development Committee

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Director, Indian Institute of Science,
Bangalore.

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Unit, Indian Institute of Science,
Bangalore.

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Addl. Director General, ICMR, New Delhi

Mr. A.V. Ramani,
Head, BMT Wing,
Sree Chitra Tirunal Institute, Trivandrum.

Dr. P.V. Vedanarayanan,
Senior Materials Toxicologist,
BMT Wing,
Sree Chitra Tirunal Institute, Trivandrum.

Sri. G.S. Bhuvaneshwar,
Biomedical Engineer,
BMT Wing,
Sree Chitra Tirunal Institute, Trivandrum.

Building Committee

Director (Chairman)

Health Secretary,
Government of Kerala
Construction Engineer,
VSSC, Trivandrum

Head, BMT Wing,
Sree Chitra Tirunal Institute, Trivandrum

Financial Adviser & Chief Accounts Officer,
Sree Chitra Tirunal Institute, Trivandrum

A member to be coopted by the Director
as and when necessary.

Senior Staff Selection Committee

Director (Chairman)

Dr. N.H. Wadia,
Director of Neurology,
Jaslok Hospital and Research Centre
and Consultant Neurologist J. J. Group
Hospitals and Grant Medical College,
Bombay.

Head,
Biomedical Technology Wing,
Sree Chitra Tirunal Institute, Trivandrum.

A nominee of the Secretary,
Department of Science & Technology
of the Central Government.

An expert from outside the Institute
nominated by the President

A senior Professor of the Institute.

Junior Staff Selection Committee

Medical Superintendent of the Institute

Head, Biomedical Technology Wing
of the Institute

Sri. V. Narasimhan,
Registrar, SCTIMS & T

Dr. C.G. Venkitachalam,
Asst. Professor,
Sree Chitra Tirunal Institute, Trivandrum

Miss Saramma Abraham,
Nursing Superintendent, SCTIMS & T

A representative of the academic wing of
the Institute nominated by the Director

Ethics Committee

Honourable Justice Shri K. Sukumaran,
Chairman
High Court of Kerala, Ernakulam.

Director

Dr. (Mrs.) Leila Ramakumar,
302, Sector 35A, Chandigarh.

Dr. N. Balakrishnan Nair,
Jawaharlal Nehru Fellow &
Head of the Department of Aquatic
Biology, University of Kerala

Dr. M. Jamaluddin, Scientist, BMT Wing,
SCTIMS & T

Dr. C.G. Venkitachalam,
Asst. Professor SCTIMS & T

