SPECIAL ARTICLE

Perfusion science: an international and Pakistani perspective

Hasanat Sharif, Mayera Tufail

Section of Cardiothoracic Surgery, Department of Surgery, Aga Khan University Hospital, Stadium Road, Karachi (Pakistan).

Correspondence: Dr Hasanat Sharif, Section of Cardiothoracic Surgery, Department of Surgery, Aga Khan University Hospital, Stadium Road, Karachi (Pakistan); Phone: 02134864708; hasanat.sharif@aku.edu

ABSTRACT

Surgery on the heart was considered out of bounds till the invention of the bypass machine in 1953. Since then the significant advancements have been made in the heart lung machine, as it evolved over time. In the initial era, it was operated by operating room technicians or physicians, but with its increased use in the 1960s, a need was soon felt for more trained professionals to operate the machine. Hence, a new breed of professional cardiovascular perfusionists came into existence with formal certification and accreditation.

In United States, Ohio University started formal training of perfusionists in 1969. This was followed by the creation of various organizations to facilitate the accreditation process, such as The American Society of Extra-Corporeal Technology (AmSECT) and American Board of Cardiovascular Perfusion (ABCP). In Europe, The European Board of Cardiovascular Perfusion (EBCP) was founded in 1991 by Cardiovascular Perfusionists, which continued to certify perfusionists. In Pakistan the Pakistan Society of Clinical Perfusionists (PSCP) was formed in 2009, to facilitate former education and certification in perfusion sciences.

Increased demand for quality assurance and to maintain standards of practice in the field of perfusion sciences, has led to the creation of International Consortium for Evidence Based Perfusion (ICEBP). With constant improvements in the heart lung machine to make bypass safer, the perfusionist must be familiar with updated protocols and knowledge to ensure the safety of the patient during cardiac procedures.

Key words: Perfusion; Heart-lung machine

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Operating on the heart was thought to be impossible until the invention of the cardio pulmonary bypass in the 1950s. In fact Billroth as President of the World Congress of Surgeons declared in 1896 that any attempt made to suture the heart shall be futile. Ludwig Rehn proved him wrong by successfully performing a repair of a stab wound to the heart.[1] In 1953, Gibbon successfully performed an open heart procedure using a heart lung machine, which worked on the principle of extracorporeal oxygenation; this laid the foundation for modern day techniques used in cardiothoracic surgery.[2, 3] From when it was first invented by Gibbon, the cardiopulmonary bypass techniques have constantly evolved, this not only applies to the apparatus and circuit used for the heart lung machine but also to protocols and standard of work. With the constant advancement of cardiopulmonary bypass, attempts are being made to lessen its less desirable effects. [4] In the 1950s and early 1960s, the operators of the heart lung machine, were often laboratory personnel or physicians. Observation from the laboratory and as well as successive cases in the operating room, imparted necessary skills required for operation of the heart lung

machine. With the growth of cardiac surgery and extracorporeal technology in the 1960s, disposable devices and manufactured heart lung machines were born that created a need for more knowledgeable staff.[5, 6] The role of a perfusionist, operating the heart lung machine, came into limelight with the rapid evolution of cardiac surgical services. In the past decade there was a concern regarding the availability of the perfusion man power, thus the occupation of a cardiovascular perfusionist attained a professional status in past 25 years. This was validated by creation of structured processes for the certification of perfusionists and the authorization of perfusionist training programs.[7]

In the United States of America, perfusionist training programs were established to provide training and education to technicians to work in a variety of clinical scenarios, not being limited to the sponsoring institution. The first university sponsored program was created in 1969 at Ohio State University.[8] The training programs become advanced and more structured, The American Society of Extra-Corporeal Technology (AmSECT) started the examination procedure for certification of perfusionists in 1972 led by James Dearing and Louis Toth. The American Board of Cardiovascular Perfusion (ABCP) created in 1975, was an independent organization to assist the process of examination and to oversee the accreditation of perfusion training programs. The Joint Review Committee for Perfusion Education (JRC-PE) was established in 1977, merging the AmSECT and ABCP accreditation principles in the Council on Allied Health Education and Accreditation (CAHEA).[9] CAHEA was replaced by the Commission on Accreditation of Allied Health Education Programs (CAAHEP)in 1994, it sustained providing certification for a structured perfusionist training and education.[10] In Europe, perfusion scientists formed the European Board of Cardiovascular Perfusion (EBCP) in 1991. EBCP as an independent entity in perfusion education and training is involved in creating, supervising and maintaining quality of practice and certification of perfusionist training programs as well as authorizing an European certificate of training in perfusion sciences.[11] Trained perfusionists are accredited through a European Certificate on Cardiovascular Perfusion (ECCP).[12]

The first heart lung machine in Pakistan was also operated by a cardiologist in the 1976 at the National Institute for Cardiovascular Diseases (NICVD) in Karachi. Operating room technicians and nurses acquired the skills through on job training and some semi structured programs. The need for patient safety and ensuring quality perfusion was a challenge and to this effect the Pakistan Society of Clinical Perfusionists (PSCP) was formed in 2009. The Dow University of Health Sciences (DUHS) recognized the importance of this highly skilled set of personnel and decided to accredit perfusionists with more than five years' experience into a Bachelors degree following successful completion of a didactic/ interactive course and a final examination. DUHS now has a structured four year bachelors program leading to a BS in clinical perfusion. Other institutions have also developed similar programs. The PSCP is awaiting legislation for Allied Health in the Government of Sindh to commence licensure for perfusionists. The requirements to practice perfusion will require graduation from an accredited program, one year of internship with maintenance of a log of cases. License renewal will depend upon provision of evidence showing a minimum number of cases performed per year and obtaining continuing education credits to keep abreast of the current knowledge in this highly technical field.

Cardiovascular perfusionists have always been keen on maintaining quality standards, mostly in the form of machinery maintenance and data recording. It was primarily developed more as a safety perspective, to reduce variability and improve clinical outcomes.[13,14] The society of perfusion scientists has acknowledged the significance of creating, promoting and implementing perfusion quality practices on the basis of evidence-based medicine. This has led to the birth of the International Consortium

for Evidence Based Perfusion (ICEBP).[15]

Perfusion safety is not a secluded component of cardiac surgery, but is multifactorial including machinery and tools, safety devices, conduct of perfusion, surgical technique, awareness, and communication within the boundaries of the operating room. The safety concerns with the heart lung machine during perfusion include oxygenator failures, mechanical failures, electrical failures, massive air embolization, and preventive maintenance.[16,17] Many improvements over the past 45 years have consequently made the cardiopulmonary bypass a safer procedure. This includes advancements from different areas, such as circuit design, engineering and development of the equipment, education and training of cardiovascular perfusionists, implementation of policies, protocols and standards, surgical techniques, and the conduct and management of perfusion.[18] The AmSECT Board of Directors in October 1994, accepted the "Guidelines for Perfusion Practice" and inculcated it into the organization by 1995 in the United States, which provided standards for quality assurance. Safety during cardiopulmonary bypass is accomplished by the development of a critical structured approach, unvarying attention to detail, and relentless quest of quality by the perfusionist and the whole operating team.[19,20]

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