

Development of Perfusion Education in Denmark

By Pia Sprogø, ECCP

Chairmen, Ladies and Gentlemen. Thank you very much for the invitation to give the Charles Reed Memorial Lecture. I hope I can live up to the high standard of the previous speakers. Charlie visited Denmark and Scandinavia on several occasions and I am told that he had a soft spot for our part of the world.

You no doubt immediately associate Denmark and Scandinavia with the Vikings. In 1220 the famous writer Snorri Sturluson wrote the saga of the Foster-Brothers about the death of King Olav the Saint at Stiklestad near Trondheim in Norway on the 29th of July in the year 1030.



Thormod Kolbruneskjald one of the kings warriors, was unharmed at the end of the battle, but shortly afterwards he was hit by an arrow in his chest. He used a pair of tongs around the arrow shaft to remove the arrow. On the arrow head there were fibres from the heart, some red and some white. Then he said: "The King has fed us well this winter, the man here is white around the root of his heart." Having said that, he fell dead to the ground.

Maybe this is the oldest Nordic description of a traumatic penetrating heart injury.

Years went by and it was not until 1663 when the Danish doctor, geologist and bishop Niels Steensen (1638-1686) or

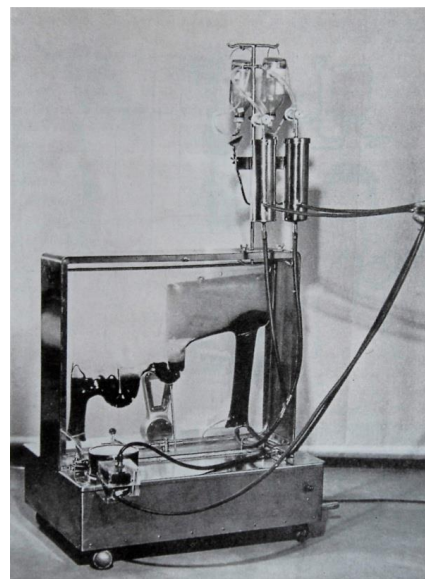
Nicolaus Stenosis in Latin - was the first to prove that the heart only consisted of muscle fibres and not of the spirit, vitality and emotions it was thought to be the centre of. In 1665



he described the congenital heart disease we in Denmark call Steno-Fallot Tetralogy and you call Tetralogy of Fallot.

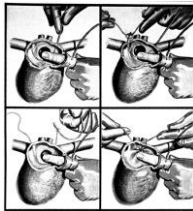
In 1955 Professor Erik Husfeldt at The National Hospital in Copenhagen started to experiment with a heart-lung machine made by Dr. Inge Haugdal Rygg and Erik Kyvsgaard. They also developed a disposable plastic sheet/bag oxygenator usually referred to as "The Rygg-bag"

Mr Kyvsgard founded the company Polystan on the 1st of January 1958. Polystan was bought by Jostra in 2001. Jostra was bought by Maquet in 2003.

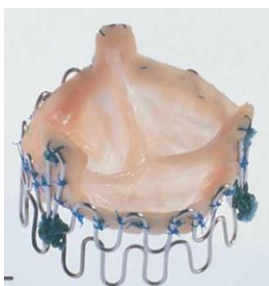


At the Municipal Hospital in Aarhus, Professor Tyge Søndergaard and Doctor Poul Ottosen made their own stainless steel bubble oxygenator and used it with a double finger Sigmamotor pump. It was not a success and after that the Polystan bubble oxygenator and heart lung machine were used. Professor Søndergaard also did a series of cross circulation experiments on animals.

He also developed a special technique for closing an Atrial Septal Defect Secundum without the use of a heart lung machine. and he founded the experimental laboratory in Aarhus.



Here you can see some of the early attempts at heart surgery in Denmark. They culminated in 1956 when the first operation using a heart lung machine was performed at The National Hospital in Copenhagen and four years later (1960) in Aarhus. These are the two main centres in Denmark. Heart surgery is also carried out in Aalborg, Odense and Gentofte.



In 1989 the cardiologist Henning Rud Andersen invented the transapical stented biological aortic valve for minimally invasive insertion

mounted on a balloon catheter. In 1992 the first valve was implanted in England using Andersen's patented valve. The Andersen Heart Valve patent was sold to Percutaneous Valve Technologies Inc who were subsequently bought in 2004

by Edwards Lifesciences for 125 million U.S. dollars. We have so far implanted 70 Andersen valves at Aarhus University Hospital, Skejby.

In 1975 The Danish Society for Extra-Corporeal Technology,



DANSECT, was founded by Doctors Erik Berg from Aarhus and Inge Rygg from Copenhagen. To day we are 40 members from 7 hospitals – 2 of which are private.

In 1980 The Scandinavian Society for ExtraCorporeal Technology, SCANSECT, was founded by DANSECT, NORSECT, SWESECT and FINSECT. In 2005 ICESECT joined with



their 3 members. We are now 150 members, but that is without the Finish perfusionists because they are anaesthesiologists and have their own society.

Initially, and as it was in many countries in the early days, there was no formal education for perfusionists in Denmark - it was learning by doing.

The first Perfusionist in Denmark to receive a formal perfusion education was from the Municipal Hospital in Aarhus, who in July 1980 sent a perfusionist to attend the school in Houston.

It was not until 1991 after two cardiologists from Aarhus and Gentofte made a report to The Danish National Board of Health of how many patients died on the waiting list for revascularisation, that more trainee perfusionists were employed and the need for formal education was put onto paper.

At that time the only centre in Denmark with an education programme was at the Aarhus University Hospital, Skejby where in 1992 there was a 3 week course in perfusion technique.

In 1994 the Danish government gave more money to the heart centres in order to increase the number of revascularisation procedures.

DANSECT prepared a report that described the work and responsibilities of a perfusionist and details of the Perfusion Course in Gothenburg, Sweden were also included. There was though no guarantee that the course in Gothenburg started every year. This report was handed over to The Danish National Board of Health and a group was formed with a representative from DANSECT, The Danish Society of Cardiothoracic Surgery and The Danish Society of Thoracic Anaesthesiologists with the task to make a plan for the formal education of perfusionists.

In 1995 The Danish Perfusionist School was established with Tommy Madsen as the Principal. Tommy was educated and worked as a biomedical engineer and perfusionist before moving into Industry. He was active in DANSECT and the first general secretary of SCANSECT. In the period from 1995 to 2004 five classes of students graduated from the School: 21 from Denmark, 10 from Norway, 1 from Sweden and 3 from Iceland. As a special consideration each Danish heart centre could send one senior for each attending student to join the programme at no cost. In the 7 year period 15 seniors completed the education programme.

The Basic Perfusion Course in Extracorporeal Circulation at Gothenburg was started in 1987 by Christer Ericson. 7

classes graduated consisting of 60 students from Denmark, Sweden and Norway. However with the new millennium the number of trainees decreased and there were not enough students for two schools in Scandinavia.

In November of 2003 SCANSECT arranged a video conference with representatives from DANSECT, NORSECT and SWESECT, the General Secretary of SCANSECT, the General Secretary of the Scandinavian Association for Thoracic Surgery, the Principals of the two schools in Aarhus and Gothenburg and the perfusionists at the heart centres in Denmark, Norway and Sweden.

The main topic was a new Scandinavian education programme, where the school should be placed and should it be partly internet teaching or only teaching at the school.

All agreed on ONE school for the whole of Scandinavia and a master's degree. It was also a request from all "older or senior" perfusionists that they be able to get an upgrade to a master's degree.

The result of this meeting was the foundation of a new school in 2005. The Scandinavian School of Cardiovascular Technology, also called SCANS CAT. The students graduate with a masters degree in cardiovascular technology with specialty in cardiopulmonary bypass.

The school fee is €14.000.

The school cooperates with The Faculty of Health Science, University of Aarhus, Engineering College of Aarhus and Aarhus University Hospital, Skejby.

The purpose of the programme is:

- To give the student the necessary qualifications to mind and manage extracorporeal circulation and

circulatory support units that are used during and after cardiac surgery.

- To give the student scientific skills that are necessary to practise actively in clinical research within the cardiovascular area.

In order to enter the programme the student must have a relevant Bachelor's degree in, for example nursing, biomedical engineering or laboratory biotechnology and at least 2 years of relevant clinical or biomedical technical experience.

The English language programme is based on part-time tuition over 4 semesters, with a total duration of 2 years. One theoretical module each semester consists of full-time tuition covering 6 weeks, starting September and February.

Here you see a summary of the course structure and content. There are four modules, where the fourth and last is the Master Thesis. Each module scores ECTS points. These are defined by the European Credit Transfer System and are directly related to the number of hours of full time tuition.

In between the four modules of the master education, the student is expected to work fulltime as a perfusionist trainee. Deviation from this must be discussed with and accepted by the school.

The master-education itself may be carried through with little practical experience, but an extensive practical training is a precondition for fulfilling the demands stated in the logbook, which are an absolute condition for passing all parts of the education as a perfusionist. Between the second and the third module focus must be on "special techniques".

At the end of this practical training period most logbook instructions, internal and external, must have been carried out.

Before the major workload of the master thesis in the fourth module, it is recommended to have fulfilled the logbook, including the performance of 100 independent perfusions.

As stated in the logbook, the state of practical training will be evaluated 3 times before the final approval: at the start of the second and the third module, and at the practical examination.

A master's degree in cardiovascular technology with speciality in cardiopulmonary perfusion technology will, when complemented with clinical practice approved by The National Board of Health and the European Board of Cardiovascular Perfusion (EBCP), qualify the student to perform the following tasks:

- Set up and supervise extracorporeal circulation using a heart-lung machine during open heart surgery.
- Set up and supervise circulatory support, including the use of an aortic balloon pump, extracorporeal membrane oxygenation, ventricular assist devices or an artificial heart.
- Supervise surgical procedures concerning treatment of heart rhythm disorders, including pacemaker implantation.
- Be part of an interdisciplinary collaboration involving research and development of new methods for surveillance, diagnostics and treatment of cardiovascular patients.
- Collaborate with the biomedical industry concerning exploitation of research results for development of new equipment within the cardiovascular field.

- Assess new methods and equipment in the cardiovascular field.
- Teach the theoretical background and practical application of new cardiovascular methods and instrumentation.

From 2007 and until 2011, 3 classes have or will graduate from the School with 10 students from Denmark, 7 from Norway, 19 from Sweden and 2 from Ghana.

In 1991 England took the initiative to start a society, with the aim to ensure a high and unified education of perfusionists in Europe. The society was named The European Board of Cardiovascular Perfusion (EBCP).



In 1995 all perfusionists who applied received a Grand Person Clause Certification and have to be recertified every three years.

The different schools in Europe have to apply for European Board accreditation every five years and after three accreditations do not have to apply anymore unless there have been significant changes in the curriculum and content the school can apply for harmonization so the students do not have to set the EBCP exam. SCANSCAT is accredited by the EBCP, so the graduates are ECBP certified and can write ECCP after their name.

The criteria for attending the SCANSCAT upgrade programme is that the perfusionist has a diploma from an EBCP accredited school. The old programme equalled 45 ECTS's and the new 60 ECTS's. It is a two week course in medical research covering the theory of science, research methodology, ethics,

planning of experiments, biostatistics, literature search, abstract / posters, publication techniques and oral presentation techniques. After that a Master's thesis has to be completed and defended at the student's own hospital. To date 3 perfusionists from Denmark, 2 from Norway, 1 from Sweden and 8 from Germany have completed the master thesis and 7 students are currently working on their theses.

The fee for the course is €3.200.

In 2007 SCANSECT arranged a meeting between European Perfusion Societies, who were applying for Statutory Regulation and those who had already obtained it. Norway got their statutory regulation in 2002 and Sweden and Denmark are applying at the moment. In Denmark we have applied three times for statutory regulation and are still waiting for an answer.

The first application was in 1998.

The second application was in 2002. The reason for not giving us a Statutory Regulation was the same as four years ago:

“Most of the Danish perfusionists already have a regulation as nurses and so far there has been no problem – so why change things!”

The most recent application was in 2008. Well there is a saying: “No news is good news”, and in the UK they have been waiting for an answer for 10 years! We still have annual meetings, continue lobbying, discussing all aspects of perfusion, learning from each other and getting good ideas.

I started this presentation with the Vikings and I will end it with the Vikings. The Vikings started as heathens but all Danes were made Christians by King Harald

Bluetooth in Denmark in 965 (King from 940-986) and in 1030 by St. Olav in Norway. King Harald Bluetooth raised this stone after his father King Gorm the Old and his mother Queen Thyra The text on our famous Jelling Stone, also called Denmark's birth certificate, confirms that we are no longer heathens but friendly and peaceful citizens of the world.

Thank you very much for your attention. Please come and visit Denmark. You are all very welcome both professionally and privately.