

History of the Orthopaedic Specialty in Singapore

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Abstract

The Orthopaedic specialty service in Singapore began in 1952 with the appointment of J A P Cameron to the chair of Orthopaedics at the University of Malaya and the simultaneous establishment of the Department of Orthopaedic Surgery at the General Hospital, Singapore. A second department — a government department of orthopaedic surgery was established in 1959, under the headship of Mr D W C Gawne also at the General Hospital, Singapore to cater to the increasing workload. Although orthopaedic services were already available at Alexandra Hospital, Tan Tock Seng Hospital and Toa Payoh Hospital from as early as 1974, the formal establishment of a Department of Orthopaedic Surgery in these hospitals took place only in 1977. The pioneering local orthopaedic surgeons — Mr W G S Fung, Mr K H Yeoh, and Mr V K Pillay — joined the orthopaedic service in 1961. In 1967, Prof Pillay and Mr Fung took the leadership role at the University Orthopaedic Department and Government Orthopaedic Department, General Hospital, Singapore, respectively. Subspecialty services in orthopaedic surgery began in the late 1970s, and currently, at least 7 subspecialties have developed to divisional status at one or more hospitals. In 2001, there were 92 registered Orthopaedic specialists and just over a third were in private practice.

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Development of Orthopaedic Services

When the practice of orthopaedic surgery first began in Singapore, it was not a specialty in itself. There are no records as to when the first orthopaedic cases were managed, but it must have been when modern medicine was introduced into Singapore, at the beginning of the twentieth century or earlier. Orthopaedic cases, comprising mainly bone and joint infections, skeletal trauma and childhood disorders, such as poliomyelitis, were managed by general surgeons. In 1939, the Saint Andrews Orthopaedic Hospital was founded by a grant from the Viscount Nuffield and generous Singaporeans for the treatment of bone and joint tuberculosis.¹ After the Second World War, general surgeons continued to care for all orthopaedic problems until 1952.

In 1951, the Council of the University of Malaya (now the National University of Singapore) deemed it appropriate for orthopaedic surgery to be given added weightage in the undergraduate curriculum and specialty status, and created a chair in orthopaedic surgery.² Provisions were also made

for the formation of a Department of Orthopaedic Surgery in the Faculty of Medicine to be located in Norris Block at the General Hospital, Singapore (now Singapore General Hospital) (Fig. 1).

Mr J A P Cameron (Fig. 2), who was Consultant Orthopaedic Surgeon for the Federation of Malaya in Kuala Lumpur, was offered appointment to the chair in orthopaedic surgery. Mr Cameron was no stranger to the University of Malaya or the General Hospital, Singapore. In 1930, he had served as House Surgeon at the General Hospital.³ In 1939, he had served as Acting Clinical Professor of Surgery; and in 1941, Acting Professor of Anatomy at the King Edward VII College of Medicine (later renamed the University of Malaya).³ During the war years, he was interned; but after the war, he returned to the United Kingdom and obtained the Master of Orthopaedic Surgery in 1947. He returned to Malaya in the same year as Selangor State Surgeon.³

Mr Cameron assumed the chair in April 1952 and became the first Professor of Orthopaedic Surgery in Singapore.⁴

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Fig. 1. The Orthopaedic Department was housed at the tail end of Norris Block. The view that greeted the pioneering orthopaedic surgeons each day when they arrived for work.

He concurrently began the first department of orthopaedic surgery in Singapore, tasked with the dual duties of teaching orthopaedic surgery to undergraduates at the University of Malaya and providing specialty orthopaedic surgery service at the General Hospital, Singapore. The medical staff of the Department at inauguration comprised Dr Khong Ban Tze (a tutor), 1 medical officer and 3 house officers.⁵ Later that year, Dr Anders Karlen, a Swede from the Karolinska Institute in Stockholm, with Korean war experience, joined the department as a lecturer.⁵ That year, 1952, heralded the start of 50 years of development and astounding progress in Orthopaedic Surgery in Singapore.

While Professor Cameron built up the specialty of orthopaedic surgery, he also instituted an undergraduate teaching programme separate from that of general surgery. For the many crippled children and adults who needed orthosis and prosthesis, he started an artificial limb centre in a building adjacent to the department. The department was also given the responsibility for the management of patients with burns at the General Hospital. Professor Cameron resigned in 1955 and returned to the United Kingdom.⁶

Dr Karlen then acted as head of the Department until February 1956 when he was appointed to the Chair in Orthopaedics.⁶ He started a separate Burns Unit in 1958 to care for patients with burns. This unit remained under the care of the University Department of Orthopaedic Surgery until the Department of Plastic and Reconstructive Surgery was formed in 1972 at the Hospital.⁷ In 1956, Dr Donald Gunn joined the Department as a senior lecturer.⁶

In 1958, the first 3 Singaporean orthopaedic trainees, W G S Fung, K H Yeoh and V K Pillay joined the University Department. Having passed their Part I Australasian Fellowship examination, they proceeded to the United Kingdom in 1959 to complete Part II of the Diploma



Fig. 2. Professor J A P Cameron the pioneer of Orthopaedic Specialty in Singapore.

examination of the Fellowship of the Royal College of Surgeons and then took a further year training in Liverpool for the MCh Orth degree.¹

With increasing demand for the specialised care now available for orthopaedic problems, a Government Orthopaedic Unit was established under the Headship of Mr D W C Gawne in 1959.⁸ The 2 departments worked together and continued to share many of the facilities like the operating theatres at Norris Block. The University Department was called 'C' Unit and the Government Department 'O' Unit.

In January 1961, Professor Karlen retired and Dr Donald Gunn succeeded him.⁹ Professor Gunn was a great teacher and an academician who organised and fine-tuned the undergraduate as well as postgraduate teaching and training. He organised meticulous record keeping and started building up a collection of teaching slides which, over the years, ran into thousands, each one meticulously labelled, catalogued and classified by one of the pioneer staff members of the department, Dr Khong Ban Tze. Dr Khong's dedication to the slide library was relentless. Two other persons who contributed with their tireless efforts were the department photographer, Mr Tow Siang Hong (from 1958 to 1994), and senior laboratory technician, Mr S Sathiamoorthy (from 1958 to 2001). The orthopaedic slide library was acclaimed to be one of the largest and most complete in the

world. This slide library laid the foundation for the first orthopaedic book titled “Orthopedic Surgery in South and East Asia” authored by Professor Gunn.¹⁰

Drs W G S Fung, K H Yeoh and V K Pillay returned from the UK in December 1961 as the first local orthopaedics surgeons and joined the other pioneers in building and upgrading the Orthopaedic services in Singapore.¹ Drs Pillay and Yeoh joined the University Department as lecturers, while Dr Fung joined the Government Unit. Subsequently, Dr P C N Wong (a New Zealander) joined the University unit and Dr C Y Tan the Government unit.

When Professor Gunn resigned and left for the United States in August 1967, Dr V K Pillay was appointed to the chair as the first local professor of orthopaedic surgery.¹¹ In the same year, Dr D W C Gawne also retired and Dr W G S Fung became the first Singaporean Head of the Government Orthopaedic Unit.⁷

Professor V K Pillay, Dr K H Yeoh and Dr W N Cheng resigned from the University Department in 1972 and left for private practice. Dr Pesi Chacha, who had joined the department in November 1967 as lecturer and was now Senior Lecturer, became the head of the department. Dr Chacha was subsequently promoted to Associate Professor in 1973 and to full Professor in 1978.

In 1968 at a Seminar on Orthopaedic Training, the then Deputy Director of Medical Services, Dr Andrew Chew, announced the policy of establishing Accident and Emergency Services in various hospitals throughout the island, to be headed by Orthopaedic Surgeons.⁷ This was a major and significant milestone towards development of Orthopaedic Services in other hospitals besides the Outram Road General Hospital (previously General Hospital, Singapore). The years between 1974 and 1977 saw an expansion both in the role of orthopaedic surgeons and orthopaedic services in Singapore.

In 1974, an orthopaedic service was established at the Alexandra Hospital. In the same year, an Accident and Emergency Unit was started at the Toa Payoh Hospital with Dr Lim Swee Keng as Head. Similar Accident and Emergency departments were set up at the Alexandra Hospital and Tan Tock Seng Hospital in 1976. In 1977, orthopaedic departments were established at the Alexandra Hospital, Toa Payoh Hospital and Tan Tock Seng Hospital, with Dr S Krishnamoorthy, Dr Tong G On and Dr Chan Heng Thye, respectively, as heads of the departments. Orthopaedic service was now available at all the major public hospitals in Singapore. The heads of the orthopaedic departments also ran the Accident and Emergency Departments in all the major public hospitals except at the Outram Road General Hospital, where Dr Lim Swee Keng was appointed as Head of the Accident and Emergency Department.

Professor Chacha resigned in July 1980 and was succeeded by Associate Professor Kamal Bose. In the same year, Dr Fung retired and Clinical Professor N Balachandran became the head of the Government Orthopaedic Unit.

When the new Singapore General Hospital was opened in 1982, both orthopaedic units moved into the new hospital from Norris Block. In 1985 with the commissioning of the National University Hospital, the University Department moved out of the Singapore General Hospital to the National University Hospital, but continued to retain a presence at the Singapore General Hospital. This ‘C’ unit was run by Professor R W H Pho until 1988, when all University staff moved to the National University Hospital. The ‘C’ unit was then taken over by the Singapore General Hospital.

In June 1988, Professor N Balachandran retired and Professor Tan Ser Kiat took over the Headship of the Orthopaedic ‘O’ unit. Dr S Krishnamoorthy was appointed head of the ‘C’ unit in October 1988. On 1 May 1995, when Dr S Krishnamoorthy retired and Professor Tan Ser Kiat assumed the post of head of the Surgical Division at the Singapore General Hospital, the ‘O’ and ‘C’ units were merged into a single Department of Orthopaedic Surgery with Clinical Associate Professor Tay Boon Keng as head.

At the National University of Singapore and National University Hospital, Professor Bose continued as Head of the Orthopaedic Department until 1998, when Professor E H Lee succeeded him. In 2001, when Professor Lee became the Dean of the Medical Faculty at the National University of Singapore, Professor K Satkunanantham was appointed Head of the Department of Orthopaedic Surgery National University of Singapore and National University Hospital.

Figure 3 outlines the development and leadership of the orthopaedic services in Singapore from 1952 to 2002.

Private Practice in the Orthopaedic Specialty in Singapore

Dr C Y Tan was the first Orthopaedic Surgeon to start his own private practice in the orthopaedic specialty in Singapore following his resignation from the Government Service in 1968. Since then, a significant number of orthopaedic surgeons have followed in his footsteps. Today, more than 30, or approximately one-quarter of the nation’s orthopaedic surgeons, are in private practice. They practise out of the 4 major private hospitals in Singapore—Mount Elizabeth Hospital, Gleneagles Hospital, Mount Alvernia Hospital and Raffles Medical Centre.

Rehabilitation Services

Rehabilitation services have been an integral part of the orthopaedic specialty services. From the very beginning, a rehabilitation unit or department was started in the hospitals as the orthopaedic services were started for inpatients and

Year	NUH	NUH, HRM	*SGH		SGH, Hand	AH	TTSH	CGH
			University 'C'	Govt 'O'				
1952								
			J A P Cameron					
1955			A G Karlen					
1959				D W C Gawne				
1961			D R Gunn					
1967			V K Pillay	W G S Fung				
1972			P B Chacha					
1977								
1980			K Bose	N Balachandran		S Krishnamoorthy	H T Chan	G O Tong
1984							G O Tong	Y P Low
1985						S K Tan	S Krishnamoorthy	
	K Bose		R W H Pho					
1988								
1989			S Krishnamoorthy	S K Tan	L C Teoh	S L Lim	Y P Low	H F See
		R W H Pho						
1995			B K Tay					
1998								
	E H Lee							
2000								
2001		B H Lim						
2002	K Satku						C S Yu	
								C O Low

AH: Alexandra Hospital; CGH: Changi General Hospital (before 1998-Toa Payoh General Hospital); NUH/HRM: National University Hospital, Hand and Reconstructive Microsurgery; SGH: Singapore General Hospital (before 1975-Outram Road General Hospital; before 1968-General Hospital, Singapore); TTSH: Tan Tock Seng Hospital; University: National University of Singapore (before 1980-University of Singapore, before 1962-University of Malaya)

Fig. 3. Development of orthopaedic services and leadership in Singapore, 1952 to 2002.

for short-term ambulatory patients. The need for specialised rehabilitation services with inpatient beds for an increasing number of patients, such as those with traumatic paraplegics and tetraplegics, was recognised early; and a Rehabilitation Centre was set up at the Tan Tock Seng Hospital in 1973.

Artificial Limb Centre

In the early years of the development of the specialty, polio deformities and bone and joint tuberculosis presented the major proportion of orthopaedic problems. Professor

Cameron recognised the patients' need for orthosis and prosthesis and started an Artificial Limb Centre in a building adjacent to Norris Block at the General Hospital. The centre remained there for almost 3 decades. In 1978, the Centre was moved to its current location at the Tan Tock Seng Hospital.

Accident and Emergency Services in Singapore

Orthopaedic surgeons in Singapore have played a major role in developing the Accident and Emergency services.

In 1964, Dr Gawne started the Casualty Unit at the General Hospital, Singapore. Subsequently, as the other public hospitals opened Accident and Emergency Departments to provide comprehensive service, it was the orthopaedic surgeon who was called upon to provide stewardship for the newly formed department. A succession of orthopaedic surgeons continued to provide the leadership until the close of the last decade. Accident and Emergency service, now called Emergency Medicine, is now recognised as a specialty and as more emergency medicine consultants are trained, the leadership to this service has been handed over to them.

Subspecialty Development

During the years of growth of orthopaedic surgery as a specialty individual orthopaedic surgeons began to develop subspecialty interest. The small number of orthopaedic surgeons in the early years precluded total commitment to a subspecialty and most practised general orthopaedic surgery with an interest in a subspecialty. Subspecialty practice began in earnest sometime in the early 1980s. The subspecialties that began to gel in this period included paediatric orthopaedic surgery, hand surgery, adult reconstruction, spine surgery, orthopaedic trauma surgery, orthopaedic sports medicine and orthopaedic oncology. It would be impossible to enumerate in detail the whole process but it would be of interest to highlight two of the earlier subspecialties.

Paediatric Orthopaedic Surgery

An article in this issue of the Annals details the development of paediatric orthopaedic service in Singapore. It was the polio epidemic of late 1950s which left many children with lower limb paralysis and limb length discrepancy that drew the attention of the attending orthopaedic surgeons to this subspecialty. All the pioneer surgeons had an interest in this subspecialty. Early work included corrective surgery for deformities of the musculoskeletal system, both congenital and acquired. Dr Chacha, who had joined the University Department of Orthopaedic Surgery in November 1967 as a lecturer, had brought with him Anderson's leg lengthening apparatus and began work equalising limb length discrepancies. Though now looked upon as rather primitive instrument compared to the more advanced devices, several tibial lengthening were done successfully using this apparatus.

Professor Cameron perhaps did the first scoliosis surgery in Singapore way back in 1952, fusing a thoracolumbar curve using a split tibial onlay graft. It was not until 1960 that Professor Gunn revived the interest in treatment of scoliosis and started using the Milwaukee brace. In 1965, he started the scoliosis clinic and in 1966 did the first Harrington instrumentation and fusion. After he left

Singapore, Professor Chacha and Professor Pillay in the University Department and Professor Balachandran in the Government Unit carried on the task of treating scoliosis. A school screening programme for early detection of scoliosis was introduced in 1983 and its pioneers were Professor P Balasubramaniam and Associate Professor J S Daruwalla. Introduction of Moire topography further enhanced the school screening programme which to date is perhaps one of the most comprehensive and well-recognised school screening programmes internationally. Paediatric orthopaedic surgery has come a long way over the 5 decades since Professor Cameron first fused a scoliotic spine with an onlay graft. Paediatric orthopaedic surgery has now acquired departmental status at the KK Women's and Children's Hospital, while at the National University Hospital, the only other Hospital where paediatric orthopaedic surgery is practised, the subspecialty maintains a divisional status. However, paediatric orthopaedic surgery continues to remain under the umbrella of orthopaedic specialty.

Hand Surgery

With the increasing industrialisation of Singapore, hand injuries became common and hand clinics were started as early as 1964. Dr K H Yeoh ran these clinics until he resigned in 1967. The task of continuing to develop this subspecialty then fell on Professor Chacha, Dr Robert Pho, Dr Kanwaljit Soin and Dr Tan Ser Kiat. They not only developed hand surgery but also developed microsurgery as a technique to do free tissue transfer.

The vigour with which hand surgery was pursued led to hand surgery developing to department status in Singapore. The Hand Department at Singapore General Hospital was set up in 1985 under the headship of Professor Pho and later with the departure of Professor Pho to the National University Hospital in 1988, Dr Teoh Lam Chuan took over the Department as its Head. In 1989, a Department of Hand and Reconstructive Microsurgery was set up at the National University Hospital, with Professor Pho as the Head, to continue the pursuit of excellence in this subspecialty. In 1995, hand surgery was elevated to the rank of a specialty. Hand surgery is now recognised as one of 35 specialties in Singapore. Since then, trainee hand surgeons at the Singapore General Hospital and National University Hospital have a different training programme from the orthopaedic trainees. At the other hospitals, however, hand surgery continues to be practised as a subspecialty of orthopaedic surgery, but it will not be long before it is mandated that hand surgery is the province of specially trained hand surgeons.

The other subspecialties continue to develop as divisions under the umbrella of the individual orthopaedic surgery departments in the various restructured hospitals. The

number of orthopaedic surgeons who practice a subspecialty almost exclusively continues to increase.

Training the Orthopaedic Surgeon

In the early years, it was the training for the MCh Orthopaedics degree from Liverpool that was responsible for the metamorphosis of the general surgeon to an orthopaedic surgeon. Professor Cameron, Professor Gunn and the first 3 local orthopaedic surgeons all obtained the MCh Orthopaedics degree from Liverpool. Thus was the tradition for specialty certification set and it continued into the late 1970s.

As colonial influence waned and local expertise in orthopaedic surgery increased, it was felt appropriate for the new trainees, after securing the fellowship of one of the Royal Colleges of Surgeons, to train locally for 3 years before proceeding abroad to the United Kingdom, Australia or the United States for a year to do a practical attachment in general orthopaedics or a subspecialty in a centre of excellence to consolidate their training. The majority of orthopaedic surgeons trained and certified as specialists in orthopaedic surgery in the late 1970s and 1980s trained in this manner.

An orthopaedic training committee was set up by the Ministry of Health in the early 1980s with the objective of structuring the training programme. In 1991, the Academy of Medicine, Singapore was tasked to formalise the exit certification, and this process led to the formation of the Board of Orthopaedic Surgery in 1994, which performed the duties of exit certification for orthopaedic trainees. The training programme was similar but now more structured with an exit interview.

In 1999, with amendments to the Medical Act, the Specialist Accreditation Board was set up. This led to the formation of a Joint Committee on Specialist Certification and 35 Specialist Training Committees (STCs), including 1 for orthopaedic surgery. The STC for Orthopaedic Surgery continues the work of the earlier Board of Orthopaedic Surgery administered by the Academy of Medicine. The training process remains the same and includes a structured rotation within accredited centres over 3 years, documentation of performed procedures in a log book, regular progress reports from supervisors, attendance at clinical meetings and participation in the orthopaedic training examinations administered by the American Board of Orthopaedic Surgery. The exit certification consists of a review of the trainees' performance over the 3 years, a 1-day clinical and surgical attachment to 3 assessors and an oral interview with the members of the STC.

Recognising that this system is still inadequate, the STC has mandated that all trainees must sit for the orthopaedic specialty examinations administered by the Royal College

of Surgeons, Edinburgh, and to obtain the FRCS Orth Ed diploma from 2002.

Research in Orthopaedic Surgery

Research in orthopaedic surgery began well before orthopaedic surgery was established as a specialty in 1952. The numerous orthopaedic articles in the *Malayan Medical Journal* before 1952 attest to this.¹² Most of the research then was, as it is now, clinical in nature. One of Singapore's early and significant contribution to research in orthopaedic surgery was the work on quadriceps contracture induced by intramuscular injections.¹³

In 1964, Professor D Gunn set up the Orthopaedic Research laboratory in the attic of Norris Block and paved the way for basic research in orthopaedic surgery. Over the years, Singapore has continued to contribute to the advancement of orthopaedic surgery internationally through research work done in Singapore. The increasing number of publications in leading academic journals attests to this. The pursuit of research is also reflected in the number of orthopaedic surgeons with research MD qualifications. One of our youngest orthopaedic surgeons, Dr Wilson Wang has set a new trend by being the first to obtain a PhD degree for his research on pathological bone resorption.

Singapore Orthopaedic Association

The Singapore Orthopaedic Association (SOA) was formed in October 1967 with the object of promoting the science and art of orthopaedic surgery and of promoting relations between itself and like organisations abroad. The association was formally registered with the Registrar of Societies in March 1968. The first president was Dr W G S Fung, with an initial membership of 7 members. Today, there are over 130 members.

SOA's first Scientific Meeting was held in April 1968 and was a combined meeting of the Association and the Singapore Surgical Society. The 3rd meeting was held in September 1968 and was the Association's first International Meeting in Singapore. In the subsequent years, scientific meetings were held at irregular intervals but since 1986, the meeting has been held annually.

The first Singapore-Malaysia orthopaedic meeting was held in 1971. This meeting was held annually, with both Singapore and Malaysia taking turns to host it until the formation of the ASEAN Orthopaedic Association (AOA). The AOA is a federation of national orthopaedic associations from the ASEAN region. This year (2002), the SOA will hold its 25th Scientific Meeting and host the 22nd ASEAN Orthopaedic Association Scientific Meeting.

Promotion and Development of Orthopaedic Surgery in the Region

Twenty years after the inauguration of orthopaedic surgery

as a specialty in Singapore, Singapore had built a reasonable expertise and was in a position to assist our neighbours to develop orthopaedic education and services in their country. Our surgeons, Professor N Balachandran and Professor P B Chacha, responded in 1970 to CARE MEDICO's request to serve in Indonesia to train orthopaedic surgeons there.

The subsequent years saw other training programmes being instituted and among these were the Lee and Shaw Fellowships that were started in 1974 to facilitate and fund annually 4 trainee orthopaedic surgeons from the neighbouring countries to do part of their training in Singapore. This fellowship is administered by the Academy of Medicine, Singapore. The programme has to date benefited more than 100 individuals from countries such as Indonesia, Malaysia, India, Philippines and Thailand. In 1975, the World Orthopaedic Concern (WOC) was formed and registered in Singapore for the dual purpose of promoting postgraduate education and orthopaedic service in developing countries.¹⁴ One of the major projects of the WOC was to bring orthopaedic surgeons from developed countries to developing countries to train orthopaedic surgeons in their own setting. The Hasanuddin University in Ujung Pandang in East Indonesia has been one of the beneficiary of this project.

Over the years, a large number of additional programmes, administered by almost all the restructured hospitals and also by the National University, provided training for surgeons from all around the world. We have had surgeons from as far away as the United Kingdom and Japan in addition to those from our neighbouring countries to train with us here in Singapore.

Conclusion

Over the last 50 years, the specialty of orthopaedic surgery has continued to grow at an extremely rapid speed

and there are signs that it may become fragmented as subspecialties develop. Whatever form it takes, it must be the patient who must benefit. During the last 50 years, the orthopaedic surgeons in Singapore have contributed immensely to a healthy nation and will certainly continue to do so.

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