

The Growth and Development of Orthopaedic Sports Medicine in Singapore

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Abstract

Orthopaedic sports medicine is currently a well established subspecialty of orthopaedic surgery in Singapore. It had its beginnings in the late 1960s and has since grown to be one of the major orthopaedic subspecialties. Knee, shoulder and ankle injuries constitute the majority of cases seen by the orthopaedic sports medicine specialists. Significant scientific contributions to the international literature have been made by our specialists over the years. Today, Singapore is a regional hub for the provision of orthopaedic sports medicine care and training.

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Introduction

Orthopaedic sports medicine in Singapore took form as a subspecialty of orthopaedic surgery over a number of years. Several individuals contributed to it being set up as an orthopaedic subspecialty. There was no external drive, but only the personal interest and commitment of those involved that saw it through its infancy. Despite its humble beginnings in Singapore, it is currently one of the more popular subspecialties with more than a fifth of our orthopaedic surgeons taking a special interest in it. There is a formal division of orthopaedic sports medicine at the Singapore General Hospital and interest groups under divisions such as adult reconstruction at the other hospitals. Even in the private sector, there are orthopaedic surgeons with an expressed interest in this subspecialty.

The Beginnings

Sports injuries were treated in Singapore by physicians and general surgeons before orthopaedic surgery was set up as a specialty. Knee injuries, in particular meniscal

injuries, were probably the most common. With the setting up of orthopaedic surgery as a specialty, such injuries were managed by general orthopaedic surgeons. The treatment for meniscal injuries was arthrotomy and total meniscectomy.¹ The prevalence of concomitant anterior cruciate ligament (ACL) injuries was generally not recognised. In the occasional instance when the injury was recognised the acute ACL injuries underwent primary repair² while chronic injuries were reconstructed by the Jones technique,³ both procedures being undertaken by arthrotomy.

The first individual to express special interest in orthopaedic sports injuries was Dr William Fung, who despite being Head of the Government Orthopaedic Department at the Singapore General Hospital, used to take time from his busy schedule to look after our national football team. He was subsequently succeeded by Dr S Krishnamoorthy who continued the excellent work. Many orthopaedic surgeons have since pursued an interest in orthopaedic sports medicine and have provided care for our injured athletes.

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Arthroscopy

Of special historical significance must certainly be the introduction of the arthroscope here in Singapore. Dr Yamazaki, an orthopaedic surgeon from Japan who had come to Singapore on a Japanese government programme in the later half of the 1960s, brought along the Watanabe 21 arthroscope (Fig. 1).⁴ He began performing diagnostic arthroscopy at the Singapore General Hospital but the procedure did not gain general acceptance. Dr Yamazaki returned to Japan in 1969. Later in 1975, Dr Yeo Khee Quan, on the encouragement of Dr Chacha, began performing diagnostic arthroscopy procedures with the Watanabe 21 arthroscope. After some years, therapeutic procedures, such as the removal of loose bodies and partial meniscectomies, were also undertaken. The procedure was fraught with difficulties. The light source, a bulb at the end of the scope, would sometimes fail and although rarely, even shatter within the joint. Visibility was also not always good as the telescope left much to be desired. The surgeon also had to peer down the telescope, which was sometimes a neck-breaking experience. All other staff in the operation theatre were excluded from the visual experience. It was difficult to convince surgeons of the value of arthroscopy given the instrumentation available then.

In 1975, television technology was applied to arthroscopy for the first time at a La Societe Internationale de Chirurgie Orthopaedique et de Traumatologie (SICOT) meeting in Copenhagen. Subsequent technological advances, including the Hopkins rod lens telescope and the microchip video cameras, made arthroscopy easy to perform. Such instrumentation became available in Singapore at the Singapore General Hospital in 1982.⁵ The subsequent progress in arthroscopy in Singapore has been phenomenal. Today, arthroscopic technique is an integral part of the advanced training programme for orthopaedic surgery.

Knee Injuries

One of the earliest recorded descriptions of knee injuries in the English literature was by William Hey in 1803.⁶ He introduced the term 'internal derangement of the knee' (IDK). Since then, there have been numerous publications on knee injuries piecing together evidence that today forms the basis of our current understanding of knee injuries.

Meniscal Injuries

The weight bearing function of the meniscus had long been recognised¹ even before the often quoted work of Walker.⁷ William Hey had already recounted the possible role of the 'semilunar cartilages' in the internal derangement of the knee.⁶ It was, therefore, not surprising that meniscectomy became the panacea for internal derangements of the knee. In the early days of orthopaedic surgery as a speciality in Singapore – the 1950s, 1960s and

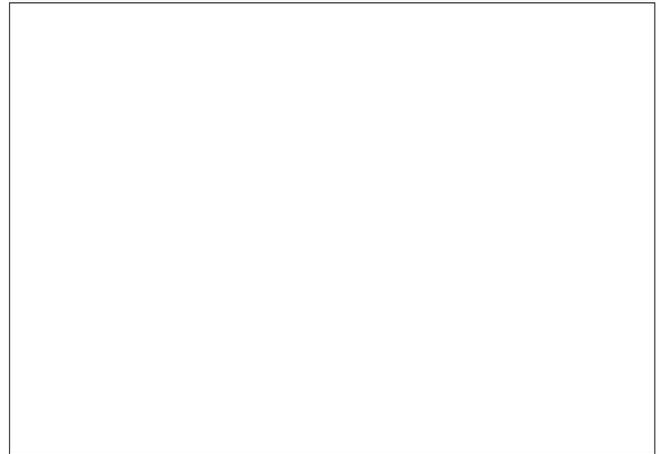


Fig. 1. The Watanabe 21 arthroscope with light source and manual.

early 1970s – this was the situation in Singapore. The slide library at the university department of orthopaedic surgery has numerous slides of total meniscectomy specimens undertaken during this period. This, despite the warnings of Fairbank⁸ and others that meniscectomy would lead to degenerative changes in the knee because the great knee surgeons of those days like O'Donoghue,² Smillie⁹ and Helfet¹⁰ recommended removal of the damaged meniscus.

The growing knowledge of the function and biology of the meniscus^{7,11} coupled with the increasing evidence of deterioration following meniscectomy⁸ and the availability of the arthroscope led to more conservative surgery for meniscal injuries and repairs for peripheral tears. Today, approximately 20% of all acute meniscal tears in the young are amenable to repair. Although the inside out technique for meniscal repair still remains popular, there is a growing number of surgeons using the all-inside technique to secure meniscal healing.

The concomitant presence of ligamentous injury in many young patients with meniscal injuries has also been recognised.

Ligament Injuries of the Knee

Although first degree and second degree injuries¹² of the medial collateral ligament are more prevalent, it is the ACL that has predominantly occupied the interest of the orthopaedic surgeon in the last three decades.

Anterior Cruciate Ligament Injuries

In the early years of the development of orthopaedic surgery in Singapore, the diagnosis of acute ACL injury was made infrequently. It was more common to encounter patients with chronic ACL injuries. Patients with severe disability had some form of reconstruction done, the Jones technique being among the more popular techniques.³ However, by the the mid 70s it was clear that the Jones

reconstruction for ACL injuries generally gave poor results.¹³ The report on the Lachman test for the diagnosis of ACL injuries saw a sudden surge in the clinical prevalence of ACL injuries.¹⁴ There was now a void in the surgical armamentarium of the orthopaedic surgeon confronted with ACL injuries.

Coincidentally, at about this time, the rotatory nature of knee instabilities had been established. Reorientating the pes anserinus was claimed to provide dynamic stability to the knee with anteromedial instability.^{15,16} Strangely, most ACL injuries were said to have anteromedial instability, possibly because of the widespread awareness of the O'Donoghue's unhappy triad.² The "Slocum operation" which was easy to do and was designed to dynamically correct anteromedial instability filled this void in the surgeon's armamentarium and became the most popular surgical procedure in knee surgery during the late 70s.¹³ In the Slocum operation, the pes anserinus insertion was altered to make it a dynamic internal rotator of the tibia and was designed to prevent anteromedial rotatory instability. Despite growing evidence that it was ineffective, it continued to be done well into the 80s because it was a simple procedure.

Fortunately by the late 70s, there was a growing interest in anterolateral instability. The Pivot Shift Test¹⁷ for anterolateral instability, and procedures such as the MacIntosh Tenodesis¹⁸ and the Ellison procedures¹⁹ became established. Dr Chacha, the then Head of the University Department of Orthopaedic Surgery, must be credited with instilling interest in sports medicine in both Dr K Q Yeo and Dr K Satku and providing them the intellectual stimulus to challenge the conventional processes. Despite the popularity of the Slocum procedure, most of our patients were recognised to have anterolateral instability and had anterolateral stabilising procedures such as the MacIntosh tenodesis. In this procedure, a distally based strip of iliotibial band was looped deep to the fibula collateral ligament and lateral intermuscular septum and sutured to itself to create a static restraint to anterolateral subluxation of the tibia.

In 1982, Dr K Satku had returned from a training stint with Dr E L Trickey in the United Kingdom and began using free autologous patella tendon grafts for the reconstruction of the ACL.²⁰ Initially, the graft was placed "over the top" and later some time in the late 1980s undertaken arthroscopically by outside in technique and in the early 1990s by the all-inside technique.²¹ The use of a free graft was a turning point in ACL reconstruction. Other pioneering surgeons who used free grafts to reconstruct the ACL included Dr B K Tay. In 1995, Dr P Chang started using hamstring grafts to reconstruct the ACL.²²

During these early years, a number of important contributions to the international literature were made

from Singapore to further the understanding of knee injuries and their treatment.^{21,23,24}

Today, ACL reconstruction is one of the most frequently performed orthopaedic sports medicine surgical procedures, with more than 250 such operations performed annually here in Singapore. More than 80% of patients can be expected to benefit from the procedure. Also, deterioration of the knee is retarded following successful reconstruction. (Fig. 2).²¹

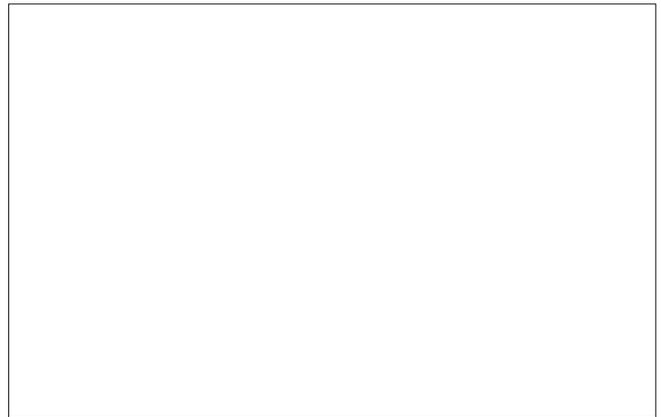


Fig. 2. The weight bearing anterior posterior and lateral X-rays of a patient who had ACL reconstruction 20 years ago showing minimal degenerative joint disease.

Despite the success achieved in ACL reconstruction, a significant number of our patients continued to be managed conservatively. A poll amongst our surgeons suggests that the proportion of patients managed conservatively is approximately a quarter, with most of these patients being older or leading a sedentary lifestyle.

Other Knee Ligament Injuries

Isolated medial collateral ligament injuries are probably more common than ACL injuries, but have not attracted much attention amongst the orthopaedic surgeons here as the majority tend to be managed by sports physicians. In the early years, the more severe third degree injuries used to be managed surgically but today, most are managed conservatively and give good clinical results.

Isolated posterior cruciate ligament injuries, which are more often sustained in road traffic accidents rather than in sports, are infrequently encountered but have good results with conservative treatment.²⁴ However, the more severe injuries with gross posterior instability pose a significant disability and need surgical stabilisation. Reconstruction is undertaken with free grafts, but the number of cases so treated remain few in number, although there is an increase in the number compared to a decade ago. The results of posterior cruciate ligament reconstruction still remain

inferior to those of ACL reconstruction.

Combined ligament injuries and other rotatory instabilities, like posterior lateral rotatory instabilities, are also relatively infrequently encountered and are surgically managed when indicated.

The Future of Sports Knee Surgery in Singapore

With the growing interest in sports, knee injuries will continue to increase. Today, we are able to manage most injuries relatively well. ACL reconstruction has come a long way from the 1970s and we are now able to do quicker rehabilitation with better functional results. We have also begun to collect data on our patients so that racial anatomical variations can be addressed during reconstruction.²⁵

However, results are as yet not uniform and there is room for improvement. The future of all ligament surgery will lie with continued improvements in the understanding of the kinematics of the ligaments and the knee, gene therapy to facilitate graft incorporation and tissue engineering to grow new ligaments and menisci for joint reconstruction. This is a challenge that all our sports surgeons must undertake and we presently have several colleagues engaged in such programmes in world renowned centres.

Articular cartilage resurfacing is another difficult problem which is being addressed currently. Periosteal transplants, mosaicplasty with osteochondral grafts and autologous chondrocyte implantation are carried out by several knee surgeons in Singapore. It is too early to predict the outcome. We have, however, performed animal experiments to determine the usefulness of these procedures.²⁶⁻²⁹ When we can predictably regrow cartilage to resurface large surface defects in the knee joint with minimal morbidity, we may be able to prevent and possibly cure osteoarthritis in the future.

Shoulder Injuries

To date, shoulder sports injuries have attracted less attention than knee injuries because of their lower prevalence. Shoulder instability, the most frequent of shoulder injuries, is just as frequently encountered in trauma as in sports.

The early development of shoulder surgery in Singapore had strong influence from the United Kingdom. From 1960 to 1980, many orthopaedic surgeons from Singapore undertook training in the United Kingdom where the surgery of choice for shoulder instability was the Putti-Platt procedure. As a result, most of the recurrent shoulder dislocations in Singapore during the 70s and early 80s were treated with plication of the subscapularis after failed conservative treatment. Rowe et al³⁰ published their long-term results on the Bankart procedure for shoulder instability in 1978. Our surgeons have since the early 80s increasingly

performed this procedure. With the increasing use of the arthroscope, the Bankart procedure is also undertaken endoscopically. The first arthroscopic Bankart repair was undertaken by Dr KS Khong in 1988 using the transglenoid suture technique. Since then, suture anchors have also been used endoscopically to do the Bankart repair.

Neer and Foster³¹ reported on multidirectional shoulder instability in 1980. Prior to that time, although orthopaedic surgeons were aware of persons who had atraumatic instability who did very poorly after surgery, the diagnostic category of multidirectional instability was not recognised. These patients have inherent ligamentous laxity. The prevalence of joint hypermobility locally was found to be 17%.³² This may explain the perceived higher incidence of multidirectional instability in recurrent dislocators locally.

In 1985, Dr V P Kumar together with Dr P Balasubramaniam contributed to the literature on shoulder instability with the publication of their experimental study on "*The Role of Atmospheric Pressure in Stabilising the Shoulder*".³³ Their simple but elegant study showed that negative pressure and muscle tone were among the main static stabilisers of the shoulder rather than the joint capsule. This study has been widely quoted in the orthopaedic literature.^{34,35} Dr V P Kumar and co-workers³⁶ also investigated the role of the long head of biceps brachii in the stabilisation of the head of the humerus and found through their experimental study that sacrifice of the intra-articular segment of this tendon in surgical procedures of the shoulder may produce instability and dysfunction.

Another common shoulder condition drawing increasing attention locally is the impingement syndrome, with or without rotator cuff injury. Today, the decompression of the subacromial space is undertaken by both the open technique, anterior inferior acromionectomy, and by the endoscopic method. Basic science research work by Dr V P Kumar and colleagues³⁷ on the anatomy of the anterior origin of the deltoid, drew attention to the possible weakening of the anterior deltoid muscle due to inadvertent detachment of the deltoid fibres arising from the anterior and anterior-inferior surfaces of the acromion and the clavicle during endoscopic subacromial decompression.

Concomitant rotator cuff tears continue to be repaired by conventional open techniques or by mini-open techniques using suture anchor.

Despite the lower prevalence of shoulder injuries in Singapore, our specialists have contributed to the understanding of some common shoulder problems. The low prevalence of shoulder injuries requires our surgeons to continue to train in overseas centres of excellence to provide optimal care for our athletes. New knowledge and treatment techniques, like thermal capsulorrhaphy for multidirectional instability and endoscopic rotator cuff

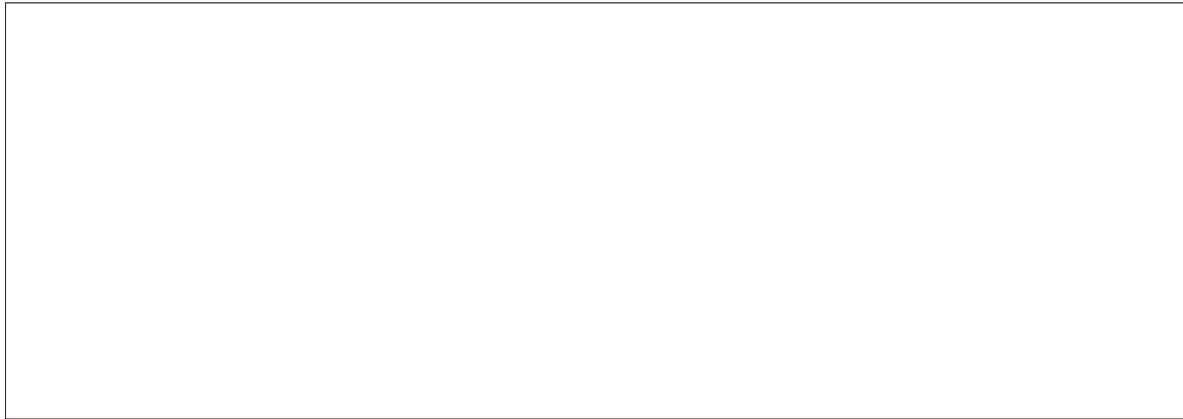


Fig. 3a. Intact peroneal retinaculum.

Fig. 3b. The peroneal retinaculum stripped off fibula surface creating a potential space for the subluxed peroneal tendon

repairs, need to be learned, evaluated and administered for our patients. The fraternity has benefited from visiting experts in shoulder surgery including Professor Rockwood who visited us in 1989, Dr Harvard Ellman who visited us in 1994 and Dr Simon Bell who visited us in 2001.

Ankle Injuries

Ankle injuries have also similarly attracted an interest group and both Dr S Das De and Dr A K Mitra had played a pioneering role in developing an ankle sports service in Singapore. The work by Dr Das De and Dr Balasubramaniam on the treatment for subluxating peroneal tendon will probably go down in history as one of Singapore's enduring contributions to the international orthopaedic sports scene.³⁸ The recognition of a Bankart type lesion as the essential pathology in this condition that had eluded surgeons before them was their contribution (Fig. 3).

Other Regions

Injuries at other regions, like the elbow, wrist, hand, and hip, are less frequently encountered. The low prevalence of these injuries makes it difficult for a practising orthopaedic sports medicine specialist to excel in their management. Oftentimes, the regional specialist, who is more familiar with the region, is able to better care for the sports person with an injury affecting these areas – for example, a wrist injury due to a triangular fibrocartilage complex injury is often referred to a hand surgeon for better management.

Organisational Structure

Although there is no formal organisation in Singapore to promote orthopaedic sports medicine, the surgeons interested in orthopaedic sports medicine have formed liaisons, both locally and internationally, to achieve a critical mass of professionals to support the interest of the group. Together with the sports medicine physicians in Singapore, The Sports Medicine Association (Singapore)

was formed in 1991. Together with orthopaedic sports medicine specialist in the Western Pacific Region, the Knee and Orthopaedic Sports Medicine Section of the Western Pacific Orthopaedic Association was formed in 1987. The Asia Pacific Orthopaedic Society for Sports Medicine Association (APOSSM), registered in Singapore, was formed in 1997 to include all nations in the Asia Pacific Region. This latter association is linked to the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS).

Through the Knee and Orthopaedic Sports Medicine section of the Western Pacific Orthopaedic Association, we have received a number of international visitors and have in turn benefited from sending our doctors for fellowships abroad to learn new techniques and knowledge and network internationally. The orthopaedic sports medicine specialist in Singapore today has links with both regional and international organisations and like specialists and is able to keep himself current in the specialty.

We have also, through the Academy of Medicine, Singapore, built liaisons with the Royal College of Surgeons, England, and have run arthroscopy courses for our trainees and trainees from the region.

Conclusion

Orthopaedic sports medicine has developed appreciably over the last 30 years and is now an established subspecialty of orthopaedic surgery with a cohort of dedicated surgeons. Our surgeons have, while continuing to care for the injured athlete, also contributed significantly to advances in this specialty. Singapore has in this period become a training hub for orthopaedic sports medicine in the region. We must continue to innovate and further develop our surgical skills by learning new techniques and keeping abreast of developments if we are to maintain our position of excellence regionally and internationally.

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