Hand Surgery in New Zealand

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J Hand Microsurg:2021;13:4–9

Abstract

Hand surgery in New Zealand has steadily grown from its origins in plastic surgery and orthopaedic surgery into its own discipline. There has been much progress and innovation in hand surgery that has originated from New Zealand and this review acknowledges the historical figures and events that have led to our present position. The current and future directions of hand surgery in our country are also discussed. As a small and remote country, we are very fortunate to have close relationships with other international hand societies. Through these relationships and the efforts of committed regional hand surgeons, the art and science of hand surgery in New Zealand continues to progress.

Keywords
- hand surgery
- orthopaedic surgery
- plastic surgery
- New Zealand

Introduction

As with many countries, hand surgery in New Zealand has its roots in both plastic surgery and orthopaedic surgery commencing in the middle 20th century. Regional plastic surgical units developed from the 1940s onward. In 1943, Burwood Hospital in Christchurch became the home of New Zealand's first plastic surgery unit. Dr William Manchester returned to Burwood Hospital initially to form this unit and then went on to establish the plastic surgery unit in Middlemore Hospital in Auckland in 1950. Since then, there has been steady growth in plastics subspecialization with there now being five regional plastic surgery centers in our larger cities (Auckland, Hamilton, Wellington, Christchurch, and Dunedin).

Orthopaedic surgery developed as a more widespread specialty from the 1940s. By the 1970s, orthopaedic departments in large city hospitals were subspecializing into their more individual disciplines, while in the small cities of the regional areas, orthopaedic surgeons remained more general.

Hand surgery therefore evolved, in the larger centers where plastic and orthopaedic surgeons with an interest in hand surgery, developed a hand service, within their own subspecialty. Eventually, this lead to the formation, in Auckland and Christchurch of dedicated Hand and Upper Limb surgical units, comprising specialized orthopaedic hand/wrist and plastic hand surgeons providing a comprehensive hand surgical service.

In the regional areas, generalist orthopaedic services continue to provide hand surgery, referring more complex pathology to the regional centers.

As a small country of 5 million, hand surgery in New Zealand continues to be delivered by plastic and orthopaedic surgeons, but increasingly by those who have undergone further specialty training and are now dedicated hand surgeons.

Key Figures in the History of Hand Surgery in New Zealand

Historically as a small and remote country with a young medical school, New Zealand did not offer postgraduate medical training in the beginning of the 20th century and due to its historical ties to Britain, many young New Zealand surgeons would travel to Britain (and later to the United States) to further their training.

Sir Harold Gillies and Sir Archibald McIndoe were both notable surgeons of New Zealand origin. Gillies and McIndoe are considered pioneers in plastic surgery who developed and honed their techniques in Europe during World War I and World War II. Sir William Manchester trained with both Gillies and McIndoe and would go on

published online
December, 31, 2020

DOI https://doi.org/10.1055/s-0040-1721568
ISSN 0974-3227.

to establish plastic surgery in Christchurch and Auckland. These surgeons and others of this time contributed greatly to the history of plastic surgery, forming the foundation of modern plastic surgery and hand surgery in New Zealand. Meanwhile orthopaedic surgeons in New Zealand would gravitate toward hand surgery from the 1970s onward as hand surgery was already established as a discipline worldwide at this time.

Sir Harold Gillies (1882–1960)

Sir Harold Gillies was born in Dunedin in New Zealand in 1882. He went on to study at Cambridge University in England in 1901. Gillies was 32 years old when the World War I broke out and during this time he was first exposed to tissue transfer surgery by French surgeons. Gillies was to become Britain's first plastic surgeon and was tasked with the responsibility of establishing the Cambridge military hospital. Gillies was a brilliant and creative surgeon who was driven by the aims of restoring function and improving aesthetics after significant injury or disfigurement. He became one of the founding fathers of the newly established discipline of plastic surgery. As a highly innovative and pioneering surgeon, he went on to develop many new techniques in plastic surgery and was involved in training hundreds of surgeons from various countries, including many from New Zealand.[1-3]

Sir Archibald McIndoe (1900–1960)

Sir Archibald McIndoe was also born in Dunedin. In 1925, he was awarded a fellowship to the Mayo Clinic in the United States of America where he developed a reputation as a quick thinking and skilled surgeon. He moved to London, England, in 1930 where he worked under Sir Harold Gillies and he too quickly became a leading figure in the field of plastic surgery. McIndoe established plastic surgical centers to treat soldiers and airmen disfigured and injured with burns to the face and hands.[3,4]

Sir William Manchester (1913–2001)

Sir William Manchester was born in South Canterbury and joined the New Zealand Medical Corps in 1940. That same year, he was seconded for training in plastic and reconstructive surgery under Sir Harold Gillies and Sir Archibald McIndoe in Britain. After the World War II, Sir William returned to the Burwood Military Hospital in Christchurch in 1944 and then went on to set up the Plastic Surgical Unit at Middlemore Hospital in Auckland in 1950. Over the next 30 years Sir William would run the Plastic Surgical Unit at Middlemore Hospital in Auckland, helping it to achieve international acclaim. Sir William made a profound contribution to surgery in New Zealand by establishing plastic surgery as a discipline and he was one of the key figures in the legacy of hand surgery in this country.[5,6]

Early New Zealand Hand Surgeons

Many of our founding hand surgeons had no formal hand fellowship training but attended courses and visited hand centers throughout the world during their careers to develop this craft. Hand surgery was gathering momentum in New Zealand in the 1970s. In the Auckland region, early surgeons included M.W. Manchester, W. Pike, O. Nicholson, J. Cullen, E. Brown and J. Williams; in the Wellington region M.F. Hutter, C. Bossley, and M. Lovie; in the Canterbury region M.J. Lester, G. Blake, A. Rothwell, and S. Sinclair; and in the Otago region Prof. N. Nisbet and A. McKenzie.[7]

Orthopaedic surgeon Chris Bossley of Wellington recalls his personal journey into hand surgery and was serendipitously driven both by the demand for hand services and his interest in this discipline. When Bossley returned from 4 years in Britain in 1972, he was instructed that there was no one performing hand surgery in the southern half of the North Island, and he was assigned to the rheumatoid unit in Wellington. Once he established his practice there, he found himself busy there from the moment he started. Like others in their respective regions around this time, Chris Bossley dedicated his career to furthering hand surgery in New Zealand by teaching and fostering future surgeons into this discipline.

Earle Brown, plastic surgeon, recalls that in these early days they had to be innovative drawing inspiration from the jewelry trade to use binocular loupes and jeweler's forceps which were much finer than the plastic surgery instruments of the time. These fine instruments were to become essential in the emerging field of microsurgery at that time.

Emeritus Professor Alistair Rothwell

Alastair Rothwell was appointed as a consultant orthopaedic surgeon in Dunedin with a special interest in hand surgery in 1973. At the time, he had minimal training in hand surgery and like other New Zealand surgeons of this era, had to self-train by attending international courses and conferences. A consequence of having not completed a formal hand fellowship meant he was unfettered by dogma, giving him the freedom to innovate. An example of this was developing his own successful technique for repair of chronic posttraumatic boutonniere deformity.[8] He was interested in surgery for rheumatoid arthritis and he was able to focus on this when he moved to Christchurch in 1982, as a senior lecturer, where he established parallel clinics with the Rheumatologists over the next 25 years. Another of his major contributions was in procedures for the restoration of upper limb function in tetraplegia at Burwood Hospital. This surgery commenced in 1983 in partnership with Stewart Sinclair, plastic surgeon, after a visit from Mr Douglas Lamb from Edinburgh who was a pioneer for such techniques.

Over his career, Alastair Rothwell made vast contributions to hand surgery in New Zealand. He was a foundation executive member of the New Zealand Society for Surgery of the Hand (NZSSH) and was President of this society from 1980 to 1982. In 2014, the NZSSH instituted the Alastair Rothwell Lecture to be delivered at its biennial Scientific Meeting of the Society by a guest speaker in recognition of his contribution to hand surgery in New Zealand. In 2014, he was awarded a Life Achievement Award by the Australia and New Zealand Spinal Cord Society in recognition of 30 years of surgery for the restoration of hand and upper limb function for tetraplegia.

Beyond hand surgery, Alastair was to make many significant contributions to orthopaedic surgery in New Zealand. He achieved many accolades and prominent positions in New Zealand Orthopaedics during his distinguished career and he founded the New Zealand Joint Registry. In 2006 he received the New Zealand Order of Merit for services to Orthopaedics and he was awarded the Colin McRae medal by the Royal Australasian College of Surgeons in 2015 for the outstanding contribution to the art and science of surgery in New Zealand.

Key Achievements in Hand Surgery in New Zealand

New Zealand Society for Surgery of the Hand

The NZSSH was formed in 1976 at a meeting in Auckland of 36 orthopaedic and plastic surgeons interested in hand surgery. This meeting was convened by Mr Alan McKenzie who was elected as the first President. Mr Earle Brown was the first secretary and the other elected members were M.G. Blake, J. Lester, O. Mehrotra, and A. Rothwell. Initially, it was called the New Zealand Hand Club but approximately 10 years later, the name was changed to The New Zealand Society for Surgery of the Hand. Early visitors to the NZSSH meetings included Harold Kleinert, Graham Lister, and Jim Strickland. Over the years, many prominent hand surgeons from all over the world have contributed to our meetings.[7]

The NZSSH conducts biennial meetings with invited international speakers. Over the time, our surgeons became more involved in the Australian Hand Surgery Society (AHSS), and this relationship was formalized in 2006 with many New Zealand hand surgeons becoming corresponding members of the AHSS.

The NZSSH has grown steadily to a membership of 100 with a 50/50 split of plastic and orthopaedic surgeons.

Development of Microsurgery

The first hand replantation was performed in New Zealand in 1974 by Pat Beehan, a plastic surgeon at Waikato Hospital. This was closely followed by a second replantation a few weeks later performed by Earle Brown and team at Middlemore Hospital in Auckland. Earle Brown recalls that this first replant had to be performed discretely as this was not in line with the practice of his senior colleagues at the time. It was by showing the results and benefits in performing replant surgery that microsurgical replant surgery grew in popularity. From that time, microsurgery rapidly developed into the integral part of hand surgery that is the standard for all Plastic surgical and specialized Hand Units.

Burwood Hospital Hand Unit

A Hand Unit originated at Burwood Hospital in Christchurch in 1982. The surgeons who established this unit were Alastair Rothwell and John Lester (orthopaedic surgeons) and Graeme Blake and Stewart Sinclair (plastic surgeons). Earlier in 1979, the Spinal Unit had opened at Burwood Hospital. This is one of two national spinal units, unique in the comprehensive inpatient care, which provides from acute injury through to long-term management with comprehensive surgical and medical collaborative care on site. Alastair Rothwell was intrigued by the work of pioneers in upper limb reconstruction in tetraplegia, including Douglas Lamb from Edinburgh, who visited Christchurch in 1982 for the NZSSH Meeting. Together with Stewart Sinclair, he embarked on a journey that was to change the lives of many profoundly disabled patients in New Zealand and influence the care of these patients around the world. The results of the first 57 patients were published in 1992.[9] This attracted considerable attention from others working in this field and many notable surgeons would go on to visit the Burwood Hand Unit such as Eduardo Zancolli, Prof. Michael Keith, Prof. Arvid Ejeskar, and Jan Friden to name a few. In 2004, Christchurch hosted the Combined Meeting for Upper Limb Surgery on Tetraplegia.

Today, the Unit's tendon transfer service continues with Khalid Mohammed and Gordon Beadel, orthopaedic surgeons, and Jeremy Simcock, plastic surgeon. The core procedures this unit performs are the deltoid to triceps transfer to provide elbow extension, brachioradialis to flexor pollicus longus transfer to provide thumb key pinch and the extensor carpi radialis longus transfer to flexor digitorum profundus to provide finger flexion. An ingenious tenodesis at the thumb interphalangeal joint, to stabilize the joint during key pinch, was devised by Stewart Sinclair and is informally known as the "Kiwi tenodesis." Many other hand balancing and tenodeses are performed on a case by case basis, with consideration to each individual patient's goals and injuries. Nerve transfer surgery has been a "game changer" with the main procedure being the "SPIN" procedure, transferring the functioning nerves from supinator to the non-functioning posterior interosseous nerve providing active hand opening that could previously not be achieved.[10]

Integral to the Burwood Hand unit is Dr. Jennifer Dunn, physiotherapist. Valuable academic and clinical contributions from physiotherapy colleagues have also been made by Anne Sinnott and Quin McNaughton.

By the end of 2019, upper limb reconstructive surgery had been performed on 271 patients through the Burwood Unit.

Middlemore Hospital Hand Unit

In Auckland, from the 1950s, hand surgery tended to be divided between orthopaedic and plastic departments on anatomical boundaries with orthopaedic surgeons fixing the bones of the hand and wrists while the soft tissues were repaired by the plastics department. As the orthopaedic work load increased, particularly with the advent of total joint replacement, less hand surgery was performed by the orthopaedic surgeons and the plastic surgeons at Middlemore Hospital provided most hand services until the middle 1980s, when orthopaedic surgeon John Tonkin, revitalized the orthopaedic hand interest and expertise. A versatile and intuitive upper limb surgeon, John was a major contributor to hand surgery in Auckland, initially in the public and later in the private sector. Dr. Karen Smith (the first woman New Zealand orthopaedic surgeon to be admitted to the Royal Australasian College of Surgeons) returned to Middlemore Hospital in 1990, and established over the next 10 to 20 years, with colleagues, Tim Tasman-Jones, Chris Taylor, Bruce Peat, and Wolfgang Heiss-Dunlop, the Middlemore Hand Unit. This comprises an orthopaedic hand surgical team of six hand/upper limb surgeons and six

plastic surgeons together with two fellows to provide a comprehensive regional hand service for the Auckland area.

Provision is also made for teaching and research in hand surgery for plastic and orthopaedic trainees and for hand fellows. Since 2012, a research coordinator has been attached to the team allowing the development of a database of acute and elective cases and the expansion of research. To date, since 2012, the Middlemore Hand Unit has treated 23,119 acute cases and more than 6,275 elective cases.

In 2015, Drs. Alpesh Patel (orthopaedic spine and hand surgeon), Chris Taylor, and Wolfgang Heiss-Dunlop (both orthopaedic hand and peripheral nerve surgeons of the Middlemore Hand Unit) established, in cooperation with colleagues from the Burwood Spinal Unit, a second Tetraplegic Upper Limb Surgical Service for the upper North Island. The patients are cared for in a multidisciplinary team environment at the Auckland Spinal Rehabilitation Unit. Early nerve transfer surgeries, as well as all standard tendon transfers, are being performed and all outcome data are pooled in the National Registry for Tetraplegic Upper Limb Surgeries.

North Shore Hospital Hand Fellowship

In 2016, a Hand fellowship was started in Northshore Hospital in Auckland by Mr. Albert Yoon. This fellowship is an Orthopaedic focused fellowship concentrating on adult hand conditions. Fellows from various countries have trained here since its inception.

Research

Dr. Michael Flint joined the Middlemore hospital Plastics unit in the 1960s and led a research group in the Auckland School of Medicine. Flint trained under Sir Harold Gillies and had a strong background in soft tissue research and in the etiology of Dupuytren's contracture. Flint studied skin biomechanics and over the next two decades was to become an authority on wound healing biology and scar management.[11]

In the late 1980s, the Spinal Cord Upper Limb Research Group was set up by Prof. Alastair Rothwell in Christchurch. It has produced several publications on a diverse range of topics including reconstructive upper limb surgery particularly, as it relates to patients with tetraplegia. Together, the group has over 20 publications and many more proceedings and podium presentations.[9,12,13]

The Middlemore Hand Unit has also been involved in research for many years. The development of a database in 2012 has been instrumental in the presenting and publishing of the Unit's research and outcomes. This unit has researched on various topics ranging from hand infections, tendon, and nerve injuries through to rehabilitation after hand surgery.[14-16]

Present Status of Hand Surgery in New Zealand

New Zealand Health System

In 2017, New Zealand spent 9.2% of its GDP on health care which compared with 9.8% in the United Kingdom and 17.1% in the United States.[17]

The health system in New Zealand largely follows the Beveridge model of health care based on that of the National Health Service (NHS) in Britain. Our health care is mostly provisioned by this government funded Public health system. There are also other components for health care delivery in New Zealand, such as the Accident Compensation Corporation (ACC), which is a government agency which covers the costs of treatment deemed accidents, including medical misadventure. There is also a sizeable private health insurance sector. Our private health insurance companies are regulated and are generally not-for-profit organizations.

Overall, this model ensures that healthcare is generally well covered for in our patients.

Despite this, the demand on the Public health system is only increasing. The demand continues to exceed that which can be provided and surgeons face the challenge of which conditions can be treated to ensure the best use of the allocated resources.

The Public health system is divided into 20 District Health Boards (DHB's) spread throughout the country. Orthopaedic surgeons provide hand surgery throughout all 20 DHB's and there are plastic surgical units in the five largest centers.

Hand Therapy

As hand surgeons, we should never forget the importance of our hand therapists, we are very fortunate in New Zealand to have such well-trained and professional colleagues whose assistance is invaluable. As such, a history of New Zealand hand surgery would be incomplete without recognition of the New Zealand Hand Therapy Association.

With physiotherapy and occupational therapists initially self-training in hand therapy (Jennie Leyland in Auckland in the 1970s and Sue Sewell in Christchurch in the 1980s), a hospital-based program of training was then formalized into a nationally registered hand therapy status in the 1990s. Hand therapy training in New Zealand requires 2 years of postgraduate training (postphysiotherapy or occupational therapy). There are 318 hand therapists now registered in New Zealand.

New Zealand hand surgeons have very close links to their regional hand therapists which is essential to delivering quality care for hand conditions. Many of our NZSSH meetings have included our hand therapy colleagues.

The New Zealand Society for Surgery of the Hand

The NZSSH consists of a six-member executive which is comprised of both orthopaedic surgeons and plastic surgeons. This group is involved in advocating for issues regarding hand surgery in New Zealand, liaising with our membership and service providers and for convening scientific meetings.

Our most recent meeting in 2020 was curtailed by the emergence of the novel coronavirus disease 2019 (COVID-19). This was to have been a combined meeting with the Asia-Pacific Federation of Societies for Surgery of the Hand held in Melbourne, Australia. However, the international outbreak of COVID-19 that emerged just prior to this meeting, significantly affected the numbers attending forcing many New

Zealand surgeons to withdraw from the meeting. Prior to this, we have had biennial scientific meetings of the NZSSH.

COVID-19

In New Zealand, due to our geographic isolation, low population density, and proactive leadership, we are placed in a fortunate position in dealing with the coronavirus pandemic compared with many nations. Our hospitals were not overwhelmed with COVID-19 cases during this time, and the urgent care for hand conditions has continued throughout. We noticed a significant reduction in hand injuries during periods of lockdown with more people away from work and less engaged in their usual activities. However, this pandemic has been hugely disruptive for our society and the treatment of nonurgent hand conditions. The impact of this initial wave of the pandemic will be felt for some time not to mention the likelihood of further outbreaks causing further havoc.

Future Directions for Hand Surgery in New Zealand

We are facing a time of steady growth for hand surgery in New Zealand. As we move forward, we are seeking to continue and improve the collaboration of plastic surgeons and orthopaedic surgeons to offer improved care of hand conditions. This may lead to the development of further hand units throughout other centers in New Zealand. There are good models for this in New Zealand in the Burwood Hospital and Middlemore Hospital Hand Units. As we grow, we hope that further opportunities to promote and perform research will be undertaken. The formation of these specialized hand units has successfully promoted this and reproducing this in more regional centers would foster this throughout New Zealand.

The NZSSH is working with the New Zealand Joint Registry to develop a registry for Wrist and Hand Arthroplasty Implants, as we feel this would be valuable in understanding the performance of our implants. Many of our hand surgeons do not perform many wrist and hand replacement procedures and we feel that collecting this data in a registry will be hugely valuable to surgeons both nationally and internationally to drive improvement. Particularly, given that most National Joint Registries do not include Wrist and Hand Arthroplasty.

Although New Zealand is a small country, it helps to provide leadership for its "neighboring" smaller Pacific Island nations. There are already established outreach programs in plastic surgery (Interplast) and Orthopaedic surgery (Orthopacifix) to these regions and to South-East Asia. There is the potential to develop outreach programs for hand surgery independently or by linking into these existing organizations.

A large challenge we face within New Zealand is service provision. As previously mentioned, the New Zealand health care system, like many throughout the world, faces the issue of increasing demand on health services in an environment where more treatment options can be offered. This leads to the constant challenge of trying to provide quality care to as many people as possible. Hand surgeons in New Zealand and the NZSSH will continue to navigate these challenges to ensure the best of care for hand conditions within the resources available.

Another major challenge is equity in health care in New Zealand. Like in many countries, people in New Zealand experience different social circumstances that can result in avoidable differences in health. The Maori and Pacific Island peoples in New Zealand experience higher levels of chronic illness which leads to higher morbidity, mortality, and inequitable health outcomes. While this link is known, there remains the continued effort to systematically target this. The recent and current situation of dealing with the effects of the coronavirus pandemic highlight some of the challenges that our communities face. Past and future lockdowns will have a significant impact on service provision in our society. The present challenge is to ensure that we can recover from this and that this does not lead to greater inequity in healthcare.

Hand surgery in New Zealand has grown over the past 70 years from its origins in plastic and orthopaedic surgery to 100 hand surgeons in our country presently.

New Zealand has a relatively small population and is geographically isolated and therefore, it is essential that hand surgeons in New Zealand continue to foster links to other international societies to maintain a service of the highest quality.

While there are continued challenges ahead in improving access, quality, and consistency in the treatment of hand conditions, we are well placed in New Zealand to meet these challenges as a committed group of hand surgeons. The NZSSH has helped to navigate and drive improved care for hand conditions in New Zealand, and the development of regional Hand Surgical Units has been instrumental in improving quality and research for conditions of the hand in New Zealand.

Conflict of Interest

None declared.

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