Plastic Kiwis – New Zealanders and the development of a specialty

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Abstract

Background

The First World War saw the evolution and development of three great surgical specialties: orthopaedic surgery, thoracic surgery and plastic/maxillofacial surgery. This last specialty came of age during the carnage of some of the bloodiest battles in history and required a close relationship between plastic surgeon and dentist in the management of facial injuries. Whereas the plastic surgeon dealt with the soft tissues, the hard tissue structures of the teeth and facial bones were managed by dental surgeons who, in turn, worked closely with the dental technicians who manufactured the appliances used to fix and immobilise the facial skeleton. The pioneers of facial plastic surgery included Harold Gillies, Percy Pickerill and later Archibald McIndoe and Rainsford Mowlem – four plastic surgeons with strong New Zealand connections.

Purpose

This article is an historical appreciation of the development of plastic and maxillofacial surgery especially during the First World War with a particular emphasis on the pioneers of the specialty from New Zealand.

Methods and Materials

Web-based on-line search engines (PubMed, Medline, and Google), and hand-searches of major journals and texts were performed.

For web-based on-line searches the following key words were used to identify relevant publications: world war one, plastic surgery, facial injuries, Gillies. An English language restriction was applied.

Conclusion

Many of the techniques and procedures currently taught to trainees in plastic and maxillofacial surgery were developed during the First World War and refined in the Second, with pioneers such as Gillies, Pickerill and McIndoe laying the foundations of surgical technique through their hard earned experiences treating war injuries. It is somewhat ironic that four imminent practitioners in plastic and maxillofacial surgery should hail from New Zealand given the small population of the country at the time.

Conflict of interest

The authors declare no conflict of interest and have not received any material or monetary gain in the preparation of this article.

Introduction

In the Herbert Moran Memorial lecture at the 2002 Annual Scientific Congress of the Royal Australasian College of Surgeons, it was stated that the development of craniomaxillofacial surgery could be traced back to the First World War 1. Particular mention was made of Gillies and his role in the development of Plastic and Maxillofacial Surgery and also to Harvey Cushing and the development of neurosurgery as a specialty. It was further mentioned that British military surgeons of the time were more prepared for the First World War than their continental counterparts due to their involvement and experiences in the South African or Boer War (1899-1902). However, despite that experience, no country (including Great Britain) was truly prepared for the sheer number and severity of battlefield casualties, soon to become legendary and which would help define the sense of human suffering in the First World War.

In terms of face and jaw surgery, it may be surprising to find that some of the pioneers of in this field were New Zealanders. This historical vignette is aimed at "fleshing out" who these surgeons were and giving some background to each person and their name.

Pioneering Days - The First World War

The First World War saw the evolution and development of three great surgical specialties: orthopaedic surgery, thoracic surgery and plastic/maxillofacial surgery. Injuries to the face became more common with the development of trench warfare as it was the head and shoulders that were often the most exposed. Prior to the First World War, management of injuries to the face and jaws remained primitive at best and were not widely recognised as a "mainstream" branch of surgery.

During the early stages of the war, the acknowledged leaders in the infant field of maxillofacial surgery were Germany and France. No doubt as a result of observations by German medical authorities of the mostly unsuccessful outcomes of face and jaw injuries from then recent conflicts like the Balkans War in 1913, hospitals in Berlin, Strasbourg, Hanover and Düsseldorf were already prepared to receive face and jaw injuries by 1914[2]. Among the more eminent maxillofacial surgeons of the time were Professor Christian Bruhn and Dr August Lindemann at the Düsseldorf Hospital, and Hippolyte Morestin at the Val de Grâce Hospital in Paris. Lindemann and Bruhn would later publish their experiences of gunshot injuries to the jaw which were seen at the Düsseldorf Hospital, their work no doubt being available to medical services of both allies and central powers alike [3]. The Germans in particular were quick to establish a multidisciplinary approach to face and jaw injuries involving teams of surgeons, dentists and dental technicians to manage various aspects of the surgery and reconstruction, which in time would become a template for other nations to follow.

Serendipity had a part to play, it seems, in launching one of the greatest surgical careers of the 20th century. According to Gillie's biographer, in 1915 an American dentist by the name of "Bobs" Roberts, serving with the American Ambulance at Neuilly (American involvement was strictly voluntary at this stage as the United States of America did not enter into the war until 1917) had a copy of Lindemann's textbook and lent it to a promising young New Zealand-born British surgeon, remarking "*why don't you take this work up?*" [4]. The young surgeon was of course Harold Gillies, serving at the time as a volunteer with the Red Cross in France and who subsequently wrote "*I felt I had not done enough to help the wounded and that I must bestir myself … I realised that I had struck a branch of surgery that was of intense interest to me. My first inspiration came from the few pictures in that German Book*".

The First World War indeed followed the Hippocratic dictum that "war is the greatest school of surgery", as many pioneering techniques and innovations were developed by surgeons out of necessity and by trial and error. There were no comprehensive reference materials or more experienced colleagues to consult with – the field of plastic and maxillofacial surgery at that stage was truly in its infancy and the surgical principles of the time were inadequate to deal with the types of injuries involving the face and jaws. Contemporary photographs of soldiers with facial injuries are available and some of the post-operative outcomes are truly astonishing given the physiologic state of the soldier patient, wound contamination, the lack of antibiotics and inadequate intraosseous fixation (Figures 1–3)

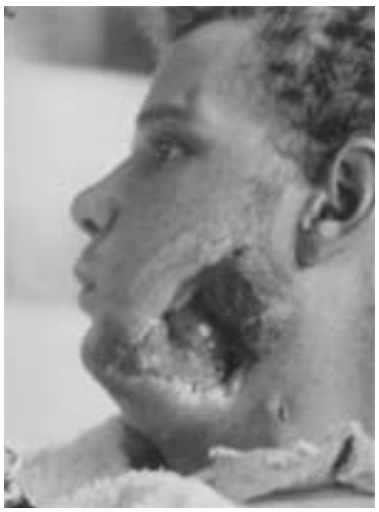

Figure 1.

Figure 2.

Figure 3.

Figure 1–3: Pre- and post-operative photographs of a soldier with a jaw injury sustained during 1918. The cosmetic result is as good as can be expected given the management at the time. (University of Otago Health Sciences Library)

Custom made dental appliances and a detailed knowledge of dental occlusion were paramount in the adequate fixation and immobilisation of facial fractures, as no satisfactory means of internal fixation of bony fractures existed at the time. External fixation using pins and frames was considered state of the art, often using dental appliances as an anchorage point for these appliances (Figures 4 and 5).

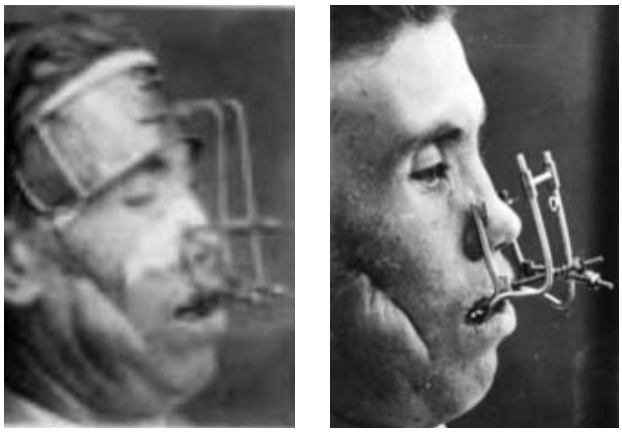

Figure 4 & 5: Midface skeletal traction device utilising a dental appliance fitted to the maxillary dentition. Although the quality of figure 4 is poor, it gives an overall appreciation of the appliance in situ. (By kind permission of Dr Harvey Brown)

Many nations of the British Empire answered the call to arms for King and Country during the First World War, contributing not only troops but also medical teams to work with the British on the Western Front or based in the United Kingdom. In the area of plastic and maxillofacial surgery, Gillies was widely regarded as the leader but he was not the only surgeon of distinction. Plastic and maxillofacial surgeons from the Dominions who worked with Gillies at the Queen's Hospital at Sidcup included Captain Fulton Risdon of Canada, Colonel Henry Newland from Australia and Major Percy Pickerill from New Zealand[4]. Equally impressive surgeons from the United States of America included Vilray Blair, Robert Ivy and Varaztad Kazanjian – Kazanjian being afforded the accolade as the "miracle man of the Western Front" for his oral and maxillofacial reconstructive work. Kazanjian was given further recognition by being decorated personally by King George V himself after the war[5]. However there is little doubt that the great achievement of Gillies was to bring so many surgeons (and patients) to one place. In an infant specialty this allowed for a growth of experience in managing different facial problems that was unparalleled anywhere; it is difficult to learn alone and Gillies himself said that it was harder to get a good case than hide a bad one.

Recognition - The Second World War

A little over twenty years later, the world was once again plunged into global conflict and medical services were mobilised to meet the requirements of the military. Plastic surgery by this stage had become a bona fide specialty in its own right; although many of the surgeons who worked in the maxillofacial units during the First World War had returned to their pre-war surgical practices, a few continued on with plastic surgery in their respective countries.

Gillies was still the doyen of the art but others, such as Archibald McIndoe, Tommy Kilner and J. Barrett Brown would establish names for themselves in the next global conflict.

At the beginning of the Second World War, the four recognised specialist plastic surgeons in the United Kingdom (known as the "the big four") were Harold Gillies, Tommy Kilner, Archibald McIndoe and Rainsford Mowlem [6,7] . As three of the "big four" were originally Kiwis (Gillies, McIndoe and Mowlem), New Zealand has great claim to fame in the development of the specialty. Furthermore McIndoe, like Mowlem, graduated MBChB from the University of Otago before travelling abroad for further surgical training (see below). The Kiwi connection through Gillies was very important in shaping at least the early careers of his younger colleagues.

Gillies and Kelsey Fry (who had been a front line medical officer before joining Gillies at Sidcup) were asked by the British Ministry of Health to make planning arrangements for specialised plastic and maxillofacial units mainly for civilian air raid casualties. The War Office had plans to form an Army Maxillofacial Hospital but only if the numbers justified the formation [4]. The re-opening of Sidcup was considered, but the risk of air attack (it was under the bomber route to London) precluded this and a dispersed plan was agreed.

Gillies remained the Civilian Consultant in Plastic Surgery to the British Army, based at Rooksdown Hospital, Basingstoke, but recommended McIndoe to succeed him as the Civilian Consultant Plastic Surgeon to the Royal Air Force (RAF) with a subsequent appointment at the Queen Victoria Hospital, East Grinstead. Mowlem was similarly appointed as a Civilian Consultant with the RAF and was based at Hill End Hospital in St Albans [6,8]. Kilner, who like Kelsey Fry had worked at Sidcup, worked at Roehampton.

During the Battle of Britain in the summer of 1940 most of the air battles were fought over South East England and the majority of the airmen requiring plastic surgery were sent to East Grinstead, which would be a major factor in establishing the reputation of East Grinstead as a plastic and maxillofacial unit and also make McIndoe a household name.

Figure 6: Harold Gillies as a volunteer medical officer in the Red Cross, 1915 (By kind permission of Dr Andrew Bamji, Curator, Gillies Archives, Queen Mary's Hospital, Sidcup UK)

Sir Harold Gillies (1882 -1960)

Harold Delf Gillies was the youngest of eight children, born in Dunedin on 17 June 1882. His father was a successful surveyor and business man who later became a member of parliament and his mother was a niece of Edward Lear – the famed author, illustrator and artist who wrote *A Book of Nonsense* and popularised the use of limericks – a connection perhaps explaining Gillies' own fondness for the genre, as evidenced in the frontispiece of Gillie's Principles and Art of Plastic Surgery which he wrote with Ralph Millard [9].

Gillies was educated at Wanganui Collegiate School before travelling to England to receive his medical training at Gonville and Caius College, Cambridge, qualifying in 1904. After further training at St Bartholomew's Hospital in London he quickly acquired his MRCS and LRCP in 1908 and FRCS in 1910, whereupon he joined Sir Milsom Rees, the preeminent Ear, Nose and Throat surgeon of the time, as his surgical assistant [7,10].

Apart from medicine, Gillies was gifted in other areas such as golf, fly-fishing, water colour painting and violin, prompting his biographer to write "*It was as if the gods had exempted him from the need to serve any of the apprenticeships*" [4].

Gillies was to need all his artistic talents to combine with his medical skills in the dark days ahead.

When war was declared in 1914, both plastic and maxillofacial surgery were unknown entities in many of the medical services of the various armed forces, with perhaps the exception of Germany. Gillies volunteered as a medical officer with the Red Cross in 1915 (Figure 6) and as described earlier, was shown Lindemann's text by an American dentist, although there is some anecdotal evidence that suggests it was not Lindemann's text but rather a French book on rhinoplasty that was lent to Gillies [11].

Recognising the potential need for such surgery, Gillies managed to persuade the Director General of Army Medical Services, Sir Alfred Keogh, to provide a unit for receiving casualties with facial injuries. In 1916 Gillies was posted to the Cambridge Military Hospital, Aldershot "for special duty in connection with plastic surgery" [6].

In these early days of the unit, the fear of disbandment was often at the forefront of Gillies' mind and he went so far as to have self-addressed casualty labels printed out of his own pocket so that wounded soldiers requiring his services could be sent to him directly. He need not have worried: following the Battle of the Somme he received over 2000 casualties requiring his services. The sheer numbers quickly overwhelmed the 200 bed facility at Aldershot and a new hospital was rapidly planned, opening as the Queen's Hospital at Sidcup, Kent in June 1917 which was to become, in modern parlance, the centre of excellence for the treatment of facial injuries (Figure 7).

Figure 7: The Queen's Hospital, Sidcup, County Kent. Note the horse-shoe layout with various departments radiating from a central receiving area. (By kind permission of Dr Andrew Bamji, Curator, Gillies Archives, Queen Mary's Hospital, Sidcup UK)

As the mark of a great surgeon, Gillies was aware of his limitations and when Kelsey Fry suggested to Gillies "*…I"ll take the hard tissues. You take the soft…*" a partnership was cemented, not only between the two men but also between dentistry and medicine. It illustrated the unique nature of treating face and jaw injuries where often the boundaries were blurred, as described by Anson in the History of the New Zealand Dental Corps during the Second World War: "*… it is impossible to label a case as purely medical or purely dental when destruction of half the face occurs*" [4,12]. Among the many innovations developed by Gillies, the one for which he is perhaps most famous is the invention of the tube pedicle flap, which to Gillies' great disappointment was independently developed by ophthalmic surgeon Vladimir Filatov of Odessa and Hugo Ganzer of Berlin [4,6,13]. Despite this independent development of the tube pedicle, Gillies certainly had a major part to play in its acceptance and utilisation for reconstruction. Later in life, Gillies reflected that his claim to fame was the establishment of a set of principles that formed part of his seminal work with Ralph Millard – *The Principles and Art of Plastic Surgery* [9]. Gillies also displayed a great deal of compassion towards his soldier patients and often "broke the rules" concerning the relationship between officers and other ranks. He was known to have played cards with the men after a long day of operating and according to Private R Evans of the Hertfordshire Regiment, whose jaw had been avulsed, he thought it remarkable that "*…ordinary soldiers received as much care as officers*" [4]. Exuding an outwardly calm and supremely confident manner, Gillies gave, above all, hope to soldiers with facial disfigurement, acknowledging not only the surgical aspects of management but also their psychosocial needs as well. Interestingly Captain Tommy Rhind NZMC, another Kiwi surgeon who served under Pickerill at Sidcup, expressed his unease about the light-hearted way in which Gillies treated his patients. Perhaps history has shown that Gillies was right and, indeed, an early pioneer of a less distant doctor-patient relationship.

The First World War earned Gillies the well deserved accolade of "father of modern plastic surgery" and although he may not have been the easiest person to work with at times, this remarkable surgeon has left a legacy of innovation and surgical prowess that few could equal – then and now.

Henry Percy Pickerill (1879-1956)

Pickerill's association with New Zealand was not due to birthplace or training but rather as the first Dean of the School of Dentistry at the University of Otago.

Born in Hereford, England on 3 August 1879, the eldest and only surviving son of the family, Pickerill was educated locally in Hereford before receiving his dental and medical education at the University of Birmingham [14].

The University of Birmingham was the first university in the United Kingdom to offer a BDS degree and Pickerill became the first graduate from this programme in 1904. Prior to graduating with his BDS, Pickerill had already done a two year apprenticeship in dentistry (as was the norm) and successfully gained the LDSRCS (Eng) in 1903.

Due to common courses in both dental and medical curricula, Pickerill was able to complete the requirements for the MBChB and graduated in 1905, quite an accomplishment having gained three qualifications in such a short time.

He was to continue this trend adding the MDS and MD degrees again from the University of Birmingham in 1911. It remains an anomaly however that Pickerill did not attain a membership or fellowship from one of the Royal Colleges of Surgeons during this time and anecdotally perhaps was to ultimately disadvantage him in terms of peer recognition later in life.

At the tender age of 28, Pickerill became the Director of the newly opened Otago Dental School and Hospital in Dunedin, New Zealand in 1907 and shortly after became the first Dean of the Dental School. His academic prowess and personal drive was well suited for the position and Pickerill quickly established himself as a prolific author, researcher and teacher on a wide range of subjects including cariology, oral physiology and oral and maxillofacial surgery.

Pickerill was appointed to establish a jaw unit for No 2 NZ General Hospital based at Walton-on-Thames, south-west of London in 1917 and his association with Gillies during the First World War began when he and the NZ Face and Jaw unit was transferred to the Queen's Hospital at Sidcup in 1918 (Figure 8).

Figure 8: Major Henry Percy Pickerill, NZMC (By kind permission of Dr Andrew Bamji, Curator, Gillies Archives, Queen Mary's Hospital, Sidcup UK)

The NZ section at Sidcup not only treated NZ soldiers but also other British and Empire soldiers as well and Pickerill earned a well deserved reputation as a first rate plastic and maxillofacial surgeon. One may argue that due to his dual training in dentistry and medicine, Pickerill was a more complete plastic and maxillofacial surgeon than Gillies. Pickerill did not in fact want to go to Sidcup and did so under duress, perhaps this sowed the seeds of later disagreement with Gillies as it is clear that due to strong personalities a rivalry developed between the two surgeons, especially when Pickerill became better known for procedures in his own right such as reconstruction of the upper lip[7]. It is of interest to note that by the time Pickerill published his text on facial surgery in 1924 based on his time at Sidcup there is no acknowledgement of Gillies at all or any other of the section leaders[14]. Pickerill continued on as a plastic and maxillofacial surgeon and for many years was the sole surgeon in Australasia to limit his practice in this field[6].

Pickerill's youngest son Paul would follow in his father's footsteps and see action in the Second World War as an officer of the NZ Dental Corps. His paper on the treatment of maxillofacial cases presenting at a casualty clearing station[15] was so complete and informative that it was used as a reference for dental officers in the field after the war[12].

Sir Archibald McIndoe (1900-1960)

Although too young to have been surgically involved alongside Gillies and Pickerill in the First World War, for some the name McIndoe is just as synonymous with plastic surgery as Gillies (Figure 9).

Figure 9: Sir Archibald McIndoe (www.historylearningsite.co.uk)

Archibald Hector McIndoe was born in Dunedin on 4 May 1900, the second of four children[6]. He was educated at Otago Boys High School (where the science building has been named after him) and completed his medical degree at the University of Otago with high honours, winning the junior clinical medical and senior clinical surgical prizes. McIndoe continued his success by receiving the first fellowship offered to New Zealand by the prestigious Mayo Clinic where he subsequently trained in abdominal surgery and no doubt would have stayed on as a member of Faculty if he had not been lured to London on the promise of a Professorship in Surgery (which never eventuated). Jobless, living in a basement flat with his wife and child, these were dark times for McIndoe until his first cousin, the newly knighted Sir Harold Gillies, offered a chance to join his plastic surgery clinic and helped secure a junior post at St Bartholomew's Hospital in London.

Like Gillies, McIndoe trained in a different field of surgery but entered into plastic surgery by opportunity – an opportunity that would lead to greatness.

In 1938, Gillies indicated to the Ministry of Health that McIndoe should succeed him as the Civilian Consultant Plastic Surgeon for the RAF and perhaps of "the big four" Mcindoe was the first experiencing serious surgical action owing to the Battle of Britain and the RAF's early involvement in the Second World War.

McIndoe's surgical expertise was in managing aircrew who survived baling out or crash landing from blazing aircraft and led to a reputation as the leading expert in burn injuries. Like another famous surgeon, Ambroise Paré (1510-1590?), who revolutionised gunshot wound injuries by not pouring boiling oil into the wound 16, McIndoe and Gillies defied standard protocols of treating burn injuries with tannic acid (McIndoe was almost violent in his opposition) and instead recommended the use of saline bath immersions as an initial treatment, following observations that pilots who baled out into the sea fared better in wound management. Like Gillies, McIndoe had no time for class structure and ceremony (perhaps a down-under trait) and treated officers and other ranks equally. However, he went one step further in his holistic approach by insisting that his patients become part of the local community and to have the local community take part in the psychosocial rehabilitation of these disfigured airmen[17].

Together with his aircrew patients, the "Guinea Pig" club was formed, poking fun at the experimental nature of many of the procedures undertaken for his patients, a not-so-funny aspect harking back to the First World War pioneering days of plastic and maxillofacial surgery (Figure 10).

Figure 10: Men of the Guinea Pig Club surrounding Sir Archibald McIndoe (sitting at piano) (www.historylearningsite.co.uk)

McIndoe deservedly became a household name and rose to great prominence in his surgical career not only as a plastic surgeon but also as a teacher and inspiration to a new generation of plastic surgeons, including Tord Skoog from Sweden and Paul Tessier from France[18]. The relationship between McIndoe and Gillies became cooler as McIndoe became more famous. Perhaps Gillies was stung by the success of his former protégé, who not only was a superb surgeon but was also politically aware and "acceptable" among the surgical elite at the Royal College of Surgeons of England. More an indictment on personalities rather than merit, the contrast between the two surgeons was dramatically highlighted in 1956 when Gillies failed to be elected to the Council of the Royal College of Surgeons of England whereas McIndoe was elected as vice-president that year [4]. Such was his involvement at the Royal College of Surgeons, McIndoe would have become the next president had it not been for his untimely death at the age of 60[18].

Rainsford Mowlem (1902 -1986)

Mowlem was born in Auckland on 21 December 1902 and perhaps is the least known among the kiwi plastic surgeons. Educated at Auckland Grammar, he was at the University of Otago medical school at the same time as McIndoe but was his junior by one year, graduating MBChB in 1924[6]. Like the vast majority of colonial doctors at the time, Mowlem travelled to the United Kingdom for further medical training and qualified FRCS in 1929. He started his career as a general surgeon but was introduced to plastic surgery as a locum at a hospital where Gillies had some patients. Mowlem went into partnership with Gillies and McIndoe before the Second World War and became established as one the "big four" which no doubt helped secure his appointment as a Civilian Consultant plastic surgeon for the RAF along with McIndoe (Figure 11).

Figure 11: Rainsford Mowlem (Author's personal collection, original source unknown)

Under Mowlem, the plastic and maxillofacial unit at Hill End, St Albans became a teaching centre throughout the war, although not quite reaching the level of recognition of East Grinstead. Mowlem was small in stature but in not in skill and was known as a meticulous surgeon and an excellent teacher but could be brusque at times[19,20]. He was a strong influence in the founding of the British Association of Plastic Surgeons, becoming president in 1950 and 1959.

Mowlem never returned to New Zealand but was very kind to Australian and New Zealand postgraduates who worked with him and no doubt kept up the down-under profile among his British colleagues.

Mowlem was not a prolific writer but among his few works of note was his monograph on bone grafting in which he describes the osteogenic potential of the cancellous portion of bone grafts[21]. Disillusioned by the bureaucracy of the recently adopted National Health Service in Great Britain, Mowlem opted for early and complete retirement and spent the rest of his life in Spain, dying at the age of 83, respected by his colleagues and pupils but not quite reaching the pantheon of fame as his older colleagues Gillies and McIndoe.

Four New Zealanders, whose work span two global conflicts, either largely unknown or mistaken for Englishmen, have contributed to the early days of plastic and maxillofacial surgery through their expertise, innovation and personalities to establish the specialties among the conservative surgical fraternity at the time.

Such names as Gillies and Kelsey Fry are indelibly imprinted on the annals of war surgery in the First

World War, whereas McIndoe is synonymous with his management of burn injuries and the formation of the Guinea Pig Club during the Second World War. Rainsford Mowlem, the junior partner, although known and respected among his colleagues remains less recognised except for those familiar with surgical history. Perhaps the least known outside New Zealand is the figure of Percy Pickerill, a brilliant academic and skilful surgeon who nonetheless, perhaps by an unorthodox approach to his surgical career, did not find acceptance among his surgical peers but deservedly should take his place alongside Gillies in his pioneering maxillofacial work during the First World War.

As to why New Zealanders feature so prominently in the early days of plastic and maxillofacial surgery can only be surmised. Perhaps it is a field of surgery that attracts innovative and highly practical people – a "down-under" trait one may say, or perhaps it is merely fate that surgeons from the Dominions should send their best and brightest overseas. And who said kiwis cannot fly?

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