The Development of Plastic Surgery for War*

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Thank you General Pryn for the kind introduction, and thank you Surgeon Captain Wilkes and all concerned with organising the programme for inviting me to attend this 1983 Tri-Service Surgical Meeting – an annual event of high repute. It is a considerable privilege to be allowed to address you.

Ephebos was called up for Athenian National Service at 18 years of age and he has provided a title for the study of surgery of young men of military age, Ephebiatrics. In his McCombe Lecture delivered at Woolwich in July 1979, Major-General Norman Kirby, General Pryn’s immediate predecessor, drew my attention to this impressive word and also to an epigram by Sir Clifford Allbutt of Cambridge about the training of Service surgeons, “How fertile the blood of warriors in raising good surgeons”. I apply this to my audience today.

Pedicle flaps and free grafts

In plastic surgery all reconstruction is by pedicle flaps, free grafts or free flaps. Free flaps and the implantation of amputated parts involve the operating microscope, many hours of work, and have no place in conditions of active service. The design, raising and post-operative care of pedicled flaps limits their use to base hospitals. Free skin grafting must be practised by all military surgeons and although it would only very rarely be used in primary wound care it is part and parcel of delayed primary suture. That lesson has been learnt by civilian hospitals, as for example when a young German tourist’s hand was injured in July 1974 by a bomb placed in the Armoury at the Tower of London. Definitive repair was by a distant skin flap.

The history of reconstructive surgery is punctuated by four notable publications. Writing in Varanasi (Benares) in about 600 BC, Susruta Samhita devoted chapter 16 of his textbook to, “The techniques of ear puncture and plastic surgery”. Susruta is to be identified as the ‘Father’ of all surgery, but that is another story. Professor Gaspare Tagliacozzi published his surgical textbook in Bologna in 1597 in which he described in great detail, and with beautiful illustrations, how the nose may be reconstructed using a flap from the centre of the forehead, based on the supratrochlear vessels, is dropped downwards and turned raw-side downwards to reconstruct the nose. Certain families of the brick-maker class had been practising the technique since about 1,000 AD. The last classic book, to which I will return later, was published in 1920 by Major Harold Delf Gillies, RAMC, and is entitled Plastic Surgery of the Face.

Each of these marvellous publications concentrated on reconstruction by flaps, and even Gillies devoted little space to free skin grafting. The first human skin grafting was probably done by Sir Astley Cooper at Guy’s Hospital in 1817, when he cut skin from an amputated piece of thumb and used it to re-surface the stump. Giuseppe Baronio, in Italy in 1804, had shown that full-thickness skin grafts could be carried out on sheep and he had known of a female charlatan, Gambacurta, who toured fairs, and who had, in 1731, cut pieces of skin off herself, had replaced them and had shown them to be still living several days later. Apart from a German professor, Christian Heinrich Bünger, who beat a lady’s buttock in 1819 before removing skin from it to graft to her nose, skin grafting was not practised until 1869 when a Swiss house surgeon working in Paris, Jacques Louis Reverdin, demonstrated pinch grafting. Within the next six years the practical details of the art of partial skin thickness and full skin thickness grafting were fully described. Reverdin’s pinch grafts should be of historical interest only and the point is reinforced by the study of a photograph of keloidal donor sites taken in August 1970.

But in war time . . .

Forward military planning is based in part on analysis of previous wars, not, as is sometimes said, by re-fighting the last war. The ‘Wound Man’ of Hans von Gersdorf (Fig 1) published in Strasbourg in 1530 shows a non-statistical appreciation. It may be contrasted with a target profile chart (Table I) and with a historical statistical table (Table II) in which the numbers in brackets come from United States Army sources (October 1965) and were quoted in 1975 by Captain William C Dempsey, USN, Chairman of the

*A slide-illustrated lecture delivered at the Tri-Service Surgical Meeting at Alverstoke on 14th July 1983.
Department of Plastic Surgery of the National Naval Medical Centre, Bethesda, Maryland. Colonel Bruce McDermott, L/RAMC, from Woolwich, has helped me with the British numbers, in part from his personal experience, while the Trojan data of 1180 BC come from Homer and were analysed by a 19th century German surgeon, Fröhlich. The percentage of casualties surviving injuries to their head and neck, neuro- and maxillofacial cases, has remained fairly steady at about 20, but with high velocity missiles this must get smaller.

The figures also reflect the quality of surgical care and here credit must go to air evacuation. Over recent years the techniques involved have been perfected, as many survivors from the South Atlantic can testify, but this was not always so and three historical photographs are revealing. The French Army is seen preparing for the evacuation of a simulated casualty (including his hat) at Villacoublay (Fig 2). The second photograph was taken in December 1916 at Maghdaba in the North Sinai desert.

![Fig 1 'The Wound Man' of Hans von Gersdorf](image1)

**Table I**
Target Area when Standing

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Head and neck</td>
<td>12%</td>
</tr>
<tr>
<td>Trunk</td>
<td>27%</td>
</tr>
<tr>
<td>Limbs</td>
<td>61%</td>
</tr>
</tbody>
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**Table II**
Percentage of Living Wounded from Missile Injuries

<table>
<thead>
<tr>
<th></th>
<th>Troy</th>
<th>American Civil War</th>
<th>WWI</th>
<th>WW II</th>
<th>Korea</th>
<th>Vietnam</th>
<th>Borneo</th>
<th>Northern Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and Neck</td>
<td>33</td>
<td>9</td>
<td>19 (9)</td>
<td>4 (16)</td>
<td>18</td>
<td>18</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Trunk</td>
<td>51</td>
<td>18</td>
<td>7 (17)</td>
<td>13 (15)</td>
<td>30</td>
<td>15</td>
<td>32</td>
<td>30</td>
</tr>
<tr>
<td>Limbs</td>
<td>16</td>
<td>73</td>
<td>74 (73)</td>
<td>83 (69)</td>
<td>52</td>
<td>67</td>
<td>56</td>
<td>50</td>
</tr>
</tbody>
</table>

![Fig 2 Air evacuation from Villacoublay (Wellcome Institute of the History of Medicine: Exhibition Catalogue No 4 1968)](image2)
and shows the plane carrying an injured officer carried in the observers seat about to take off (Fig 3). Air evacuation was common in World War II but the stowage of casualties within the fuselage occasionally left little room for movement and in-flight care (Fig 4).

Since the Second World War Britain has been involved in fighting in different areas under different conditions – Korea, Malaya, the Radfan, Borneo, Cyprus, Suez (for which I was called up), Jordan, Salalah and the Falklands plus the continuing urban guerilla war of Belfast. Guerilla war is not civil war and Private Burgan was a casualty of the American Civil War (1861–65), mainly from mercury poisoning. In New York Dr Gordon Buck\textsuperscript{16} performed five operations on his face between January and October 1863 and his vulcanite intra-oral prostheses were made by the dentist TB Gunning.

![Fig 3 Air evacuation from Maghdaba (With the RAMC in Egypt. Cassell. 1918)](image)

![Fig 4 Air evacuation in World War II (Cotterell A, RAMC. Hutchinson)](image)

The birth of plastic surgery

Plastic surgery became a specialty in 1916 and in a letter in the British Medical Journal fifty years later Patrick Clarkson\textsuperscript{17}, another Guy’s man, wrote that, “It was born as part of the preparations of the RAMC for the Somme. Its birth was almost entirely the work of Sir Harold Gillies working under his consultant, Sir William Arbuthnot Lane. Its effect on morale throughout the Army was widespread and entirely beneficial. For the first time the Army knew something was being done to return men to civilian life whatever their facial disfigurements after a wound of the face.” There is a drawing by Sir Henry Tonks entitled ‘The Birth of Plastic Surgery’. Gillies, who died in 1960 and the centenary of whose birth was celebrated in 1982, operated on casualties from the Navy, the Army and the Air Force. The Air Force did not have its own medical service until October 1918 (and did not hold the first of its continuing medical service formal dinners until the 16th November 1921).

I would like to pay tribute to Richard Battle, who died in 1982, and who was Civilian Consultant in Plastic Surgery to the Army from 1954 to 1972: he succeeded Professor Kilner. He was the first plastic surgeon to go to France with the British Army after D-Day and was expert in treating facial injuries. He described how\textsuperscript{18}, “During 1940–41, General Wedell and Sir Harold Gillies got together and made improved arrangements. A number of maxillo-facial units were planned, each with complete theatre and staff, including an anaesthetist. The dental half of the unit was even stronger. It took at least two three-ton army vehicles to move such a unit which was on its arrival at its destination attached to a general hospital for rations, discipline and ward accommodation with nursing”. Air Vice Marshal George Morley’s chart (Fig 5) shows the RAF Burns Centres in the Second World War\textsuperscript{19}. Then and subsequently the Air Force has maintained high standards in the care of the burnt. In his 1963 Kay-Kilner Prize Essay Air Commodore Ronnie Brown RAF, reminds us that frost-bite can be as important as is burning in the production of casualties\textsuperscript{20}.

‘The Burns of Sea Battles’ is the title of a lecture delivered in March 1973 at the National Maritime Museum, Greenwich, by Surgeon Vice Admiral Sir James Watt; it has been published and should be read again and again\textsuperscript{21}. He traces the history of treatment from the Armada in 1588 when William Clowes, who served in the “Aide”, treated burns with a mixture of linseed and rose oils to which herbs had been added. Sir James points out that the most significant difference between Trafalgar and Jutland in the production of naval casualties had been the introduction of steam pipes, which burst. Incidentally I have a 1914 Field Service Pocket Book and under ‘Emergency treatment’ note, “Burns and Scalds:- Apply oil, vaseline or boracic
Fig 5  RAF Burn Treatment Centres 1942–1945.
The names in brackets are of the surgeons in charge

powder. Cover from air; quickly cut clothes off; never pull them off”.

I am interested in the influence of the Battle of Jutland on plastic surgery and crave a little space now to indulge an obsession with some of the sequelae of that fighting which took place on the 31st May 1916 - over 67 years ago.

At sea with the British fleet at Jutland

The battleship on which Fleet Surgeon E A Penfold RN was serving was struck forward by a heavy shell which killed 26 and injured 42 men. Twenty nine of the wounded were burnt, including 19 with more severe burns and two with additional injuries; one of the severely burnt died later in hospital. Adjacent to each six inch gun on the battery deck was a first-aid cupboard amongst the contents of which were packets of picric acid dressings for burns.

A number of casualties occurred amongst the medical personnel; this and damage to the ship made treatment of the wounded difficult both during and after the engagement. “The chief difficulty was to cleanse the wounds, which were of course in a very dirty state; even cold water was at first only obtained with difficulty and no hot water was available until much later, when it was safe for cooks to return to the galleys, and the amount was then limited to what was required for Bovril, tea, cocoa, etc., until the fresh water supply pipes had been repaired. Nearly all the burns were highly septic and could not be satisfactorily cleansed before being first dressed.” A photograph was taken on 2nd June 1916 on board H.M. Hospital Ship Plassy and shows sailors burnt in the battle (Fig 6).

Can a man take fire in his bosom and his clothes out burned?24

One of Penfold's published ‘Lessons learnt from action’ provided the stimulus which led to the provision subsequently of proper protective clothing for servicemen, a requirement which was then carried over into peace-time industry. In discussing the burns, which were confined to exposed parts, the face, the neck, hands and forearms, Penfold observed that, “These injuries would be rendered much less severe if less of the person is uncovered when exposed to flash or flame, so that the wearing of non-inflammable masks and gauntlets by all those especially exposed to the risk of cordite fire or flash from shell explosion is a wise precaution”. He goes on to suggest materials and designs, explaining that, “From what has been learned in this ship, as well as from others in this squadron, the eyes themselves and inside of the nose and mouth are probably undamaged by flash”.

It is apparent that Penfold had found the picric acid first-aid dressings unsatisfactory, since, in his paper published in April 1917, he reports that, “As an additional dressing for burns, sterillised olive oil with 5% eucalyptus oil and 10% lime water is now provided and kept in air-tight tins (easily opened if necessary) distributed in various parts of the ship. Boracic ointment is also provided at the 6 in guns”. Fig 6  The burnt on board HMHS ‘Plassy’ (Imperial War Museum, London)
In Scotland

Temporary Surgeon C P G Wakeley, TN\textsuperscript{25}, was stationed at the Naval Hospital at South Queensferry, which is in Scotland near Edinburgh and the Firth of Forth, some 400 miles from the battle zone. Forty burn cases, in age between 17 and 50 years, were admitted under him after Jutland. Almost all had burnt faces, most burnt hands in addition, and some also burns of the arms, legs and trunk. It is not stated how soon the burn was brought ashore but for some time it was as long as seven days after injury. “Sepsis was well advanced by the time the patient arrived in hospital, and this was in the majority of cases before shock had passed off; in the majority of cases the burns were sharply defined to the exposed parts of the body, and the cases had without exception been primarily treated with picric acid dressings.”

Removal of the then dry picric acid first-aid dressings caused great pain and further tissue damage. Picric acid was condemned by Wakeley as being unsuitable for other than first-aid purposes and by no means ideal for this. For superficial burns which hurt, Wakeley used dressings of lint soaked in 2\% aluminium acetate and for those without much pain, boracic lint dressings. For deep burns, however heavily infected, an oily application was dabbed on with cotton wool; this was made by adding 3 grains of menthol (200 mg.) and 3 minims of eucalyptus oil (0.2 ml.) to one fluid ounce (28 ml.) of Carron oil. The application was allowed to dry and the burns were not dressed. Carron oil, a mixture of lime water (CaOH) and linseed oil, had been used for burns since 1759\textsuperscript{26}. Treatment by dressings and this treatment by exposure are contrasted: “The terror of waiting for the next dressing, the groans which accompany such a dressing, and the comparative air of comfort and well-being of the other are not quickly forgotten”. It was observed that burns treated by exposure showed less sepsis and also that the oily application acted as a deodorant. The wounds were cleaned with normal saline.

The then frequent complication of acute nephritis did not develop in any patient, presumably because the haemolytic streptococcus had been kept under control. Continuous saline baths were found to be excellent and soothing for burns of the extremities. Although described in 1857 (Passavant)\textsuperscript{27} such bathing was not in common use in 1916. Later, as the dead burnt tissues became better defined, eusol, normal saline or hypertonic saline was used to encourage the separation of slough.

The exposure treatment of burns was first described in 1850 (Buisson)\textsuperscript{28} but it had never been popular and to Wakeley goes full credit for its reintroduction. His systemic treatment of the severely burnt was exemplary and was, once again, far ahead of his surgical time. Routine treatments included morphine to control pain and favour rest; a stimulant such as strychnine, where shock is present; intravenous and subcutaneous injections of normal salt or Fisher's solution and digitals internally.

Five of the 40 died – three who were very extensively burnt and one of whom had, in addition, a compound fracture of the leg were lost within sixteen hours of admission. The two other deaths occurred on the fifth day after admission, both because of overwhelming sepsis. The survivors all healed and two patients only were skin grafted at South Queensferry, cases 6 and 29. Thiersch's method was employed; “no dressings were applied on top of the grafts, a wire eage was fixed over the hand or face and the patient was kept in the sunshine as much as possible. By this method the grafts took very well and there was very little serious exudate from them.” The open method for grafts had been first described in 1905 (Sneve)\textsuperscript{29}.

Later, in the south of England

In his 1920 book, Plastic Surgery of the Face\textsuperscript{3,8}, Gillies describes his case 338. “This poor sailor was rendered hideously repulsive and well-nigh incapacitated by terrible burns received in the Battle of Jutland. How a man can survive such an appalling burn is difficult to imagine until one has met one of these survivors from fire, and realised the unquenchable optimism which carries them through almost anything. In addition to the total face burn – viz. destruction of the nose, lips, eyelids (not the lid edges) – the ears and neck were burnt; and the hands were contracted into frightful deformities”.

The distribution corresponds closely with that of Wakeley's case 29. Gillies operated in the Queen's Hospital, Sidcup, in Kent, in the south of England, and the patients were transferred to his care from all over the United Kingdom. Gillies outlines his surgical plan for case 338. “The process of thought on the problem led one to decide on a double-pedicled chest-flap, the pedicles to be tubed to prevent their being infected or exposed, to leave attached to these pedicles as large a chest-flap as was deemed viable, and then to place this large flap on the face, excising the area covered by it. It was hoped to swing the pedicles, at a second stage, up to the eye region for the cure of the ectropion; but, as will be seen by the progress of the case, a much better eyelid operation was, in the meantime, evolved (see case 152), and this left the pedicles available for other purposes”.

Operating under general anaesthesia on the 3rd October 1917 Gillies developed a ‘masonic collar’ flap, raised it to the face on paired “tubed” pedicles (not tube pedicles), and button-holed it to encircle the mouth (Fig 7). Plaster of Paris held the neck in flexion. The secondary surgical defect on the chest was dressed, not grafted. There was a small loss of flap tissue over the nose tip. Thirteen days later the left pedicle was divided and 16 days after that the right, both under local anaesthesia.
Fig 7  Gillies' design for his first tubed pedicles

Three months respite from surgery was then allowed and by the New Year, early in 1918. “Attached to the check on each side were two loose tubed pedicles of skin, and they were available for parts other than the eyelids, owing to the development, in the meantime, of the ‘outlay’ method.” Further operations on the face were performed by Gillies under general anaesthesia in February 1918, May 1918 and March 1919. At the first the left tube was lifted and spread over the nose using local tissues for lining and both upper lids were grafted by an ‘epithelial outlay’. At the second the nose was trimmed, the right pedicle was spread across the right cheek and the lower lids again grafted by an epithelial outlay. At the third the nose was reshaped further, a homograft of cartilage was used to build up the nasal bridge, and full-thickness scalp hair-bearing grafts were taken from the margin of the scalp above and behind each ear and used for eyebrows. All the free skin-grafts took successfully. Between the second and third facial operations hand surgery was carried out.

It is worth noting Gillies case 152, that of a soldier, a gunner who was burnt on the 22nd October 1916 and who developed severe ectropion. This was relieved at an operation performed on the 23rd November 1917 by the setting in of Thiersch grafts applied over moulds of Stent’s composition, a technique invented for this patient by Gillies after he had studied the description of the intra-oral ‘epithelial inlay’ which was first published in English in April 1917 (Esser)³⁰.

The challenge of the reconstruction of one sailor’s burnt face inspired the invention of the tubed pedicle in October 1917. That the tubed pedicle had first been invented in Odessa in September 1916 (Filatov)³¹ detracts nothing from the value of the independent discovery. The surgical ‘delay’ and, to use current technical jargon, the consequent axialisation of a random flap within a closed surgical system (avoiding bacterial contamination) together with mobility, flexibility and versatility of the tube, made it the method of choice for moving flap tissue any great distance for nearly half a century.

Within six weeks of his first employment of his tubed pedicles, and eleven days only after division of the second pedicle on his first case, Gillies used them again on his case 364, that of a naval warrant officer whose face had sustained a severe cordite burn in the Battle of Jutland. The description of the burn injury in Wakeley case 4 and in Gillies case 364 is identical and I was excited to discover that the photograph shown by Wakeley (Fig 8) is the same as that in Gillies’ book (Fig 9).
which is from a photograph of a printed reproduction of a photograph. They were one and the same patient. Gillies does not mention Wakeley’s skin grafting nor acknowledge the source of the copied photograph, and Wakeley does not mention referral of patients to Gillies.

Let war yield to peace, laurels to paens\(^32\)

It is a sad irony that advances in surgery come from war and from the Battle of Jutland came protective clothing to avoid burns, improved first-aid for the burnt, the exposure treatment of burns and the tubed pedicle. The contributions of Fleet-Surgeon E A Penfold RN – awarded the DSO, Temporary Surgeon C P G Wakeley RN – later Sir Cecil and a distinguished general surgeon, and Major H D Gillies RAMC – later Sir Harold, are part of the heritage of the specialty of Plastic and Reconstructive Surgery.

Sodium hypochlorite

To leave Jutland but to continue with ships, Surgeon Commander Charles Chapman RN, to whom I am grateful for much sound advice, drew my attention to Dakin and Carlisle’s article published in The Journal of the Royal Army Medical Corps in 1916\(^33\) wherein is described the first production at sea of electrolytic hypochlorite, Dakin’s solution. “On a recent trip on the HS ‘Aquitania’, thanks to the kindly interest of Lieutenant-Colonel Fuhr, it was possible to use the electrolytic hypochlorite on a number of suppurating injuries, many of them originally due to frost-bite. The results are clinically similar to those observed with hypochlorite prepared from bleaching powder but it is well to use a slightly lower concentration. The seawater, electrolysed for five minutes, using about 65 to 70 amperes at 110 volts, contained two to two-and-a-half parts per thousand of sodium hypochlorite; it is a good concentration for general use, and may be used also for irrigating purposes. It is most important that the solution be used freely, and that the whole surface of the wound be kept thoroughly moist with the antiseptic solution”.

Electrolytic hypochlorite was an Army first but its very successful use in the envelope treatment of burns was described at the Royal Society of Medicine in 1940 by a dental surgeon, Surgeon Lieutenant Commander John Bunyan, RN\(^34\) who is, I am delighted to say, fit and well and active!\(^*\) The burnt area was first hosed down with a 5% solution at 100 degrees Fahrenheit, the envelope was then applied and sealed to the limb above the burn, after which there was a continuous irrigation using a solution of 2\(1/2\)% electrolytic hypochlorite in \(1/2\) normal saline. Other solutions and regimes could be equally successful. The envelope was not disturbed until the burn was healed or was ready for skin grafting. The treatment was comfortable and popular with the nursing staff, as is the now more frequently used freezer bag containing silver sulpha-diazine but this, to remain effective, has to be changed each 48 hours. Bunyan bags have always been made by William Stannard and Son. The photograph (Fig 10) lent by Charles Chapman, shows from left to right a modern, rather thick, bag taken from NATO stock; an early Stannard plastic bag; an emergency mitt provided for tank and aircraft crew which contains 7.5 grams of sulphadiazinamide powder; and an original 1940 pattern Bunyan-Stannard bag made of bakelite coated silk for his irrigation treatment. The book, my only contribution, is one of the series of Oxford War Manuals published in 1941, and written by A B Wallace\(^35\) – the ‘Rule of Nines Wallace’ – no relation! It is seen in the lower right corner of the photograph.

\(^*\)Mr J Bunyan died suddenly in December 1983.

\(\text{Tannic acid}\)

The rise and fall (forever, I hope) of the use of tannic acid as an emergency application for the acute burn started in about 5000 BC in China when strong tea was used. Its use was revived in 1925 by E C Davidson\(^36\) of Detroit but its two great disadvantages, local and systemic, were fortunately recognised early during World War II. At the Royal Society of Medicine on the 6th November 1940, Surgeon Rear-Admiral Sir Cecil Wakeley\(^37\) reported that, “At the outbreak of hostilities the treatment of burns by tannic acid was considered completely satisfactory. Experience disproved this.” McIndoe’s\(^38\) condemnation was damning indeed! “Totally crippled hands”, he reported, “and severe facial deformities with loss of vision, which must be considered the direct result of coagulation therapy and not of the burn, have too often been seen and, as most war-time burns involve the face and hands, this problem is a serious one”. In 1944 Wakeley\(^39\) stated that about 50% of those burnt on small ships which did not carry a medical officer and who were treated by tannic acid, died, while of those treated with triple dye 5% only died.
Accommodation for the burnt

Wakeley and Battle each recognised the importance for survival of the physical and climatic conditions in which the severely burnt are nursed. Wakeley, first, writing in August 1941 about the “Treatment of shock. Warmth and rest are just as essential as the relief of pain and can easily be given under most conditions”. Just for once he was a little too optimistic. Battle, wrote in 1958, “In the climate of the British Isles, with ambulances as they are today, and in improvised buildings without adequate heating, it stands to reason that the severely burnt patient will usually do better if his burns are dressed than if he is exposed to the elements”.

On the 3rd February 1953 there was a petrol explosion on the Aircraft Carrier HMS ‘Indomitable’, there were 34 burnt survivors and these were given intravenous plasma infusions during the voyage to Malta. Six of the eleven whose burns were greater than 69% died but none of the twenty-three whose burns were less than 64% died. Very creditable statistics but achieved with difficulty despite the early transfer of the burnt to a well-established base hospital, and I quote from Surgeon Captain W Beech’s published account:

“Most of the burns were circumferential and, unlike the usual case of flash-burn, there was no sound-area of skin upon which they could lie. The closing of all windows and doors, and lighting of all available fires, produced no diminution in the complaints of cold. Very reluctantly, therefore, it was decided that it was quite impracticable to treat all these patients by exposure and a compromise was necessary. As their conditions improved they were moved to the theatre and, beginning with one table, and ending with four beds, they were treated according to the following routine:-

a. Face, hands, ears, necks and some chests were treated by exposure.

b. Limbs and trunks were treated by absorptive dressings.

For the next 24 hours, despite the closure of all doors and windows and the production of a most oppressive temperature, they still complained bitterly of cold and resented the opening of any small window. More blankets had to be added, and only on the face and heads could exposure be maintained. There were not sufficient electric cradles to supply the demand.

Feeding constituted a major problem as all had to be fed, since all hands were burned. By the second day all the eyes were closed by oedema, a fact which greatly affected the patients’ mental condition. Many volunteers were needed to assist with feeding and nursing.

Observing the rapid overall improvement in patients when their dressings could eventually be removed, one is left with the conviction that if adequately heated accommodation is available treatment by exposure is the method of choice.”

Before speaking today I had meant to seek the opinion of my naval friends on the Roehampton transport dressing for burns first described by Dr Joachim Kohn in the Journal of the Royal Army Medical Corps. It certainly has a place in the Army and Air Force and a considerable role in civilian life. These dressings of polyurethane foam are cheap and light but bulky to store. Kitchen type ‘Cling’ film has been recommended as a first-aid dressing.

An historic criticism

Dr John Staige Davis of Baltimore, born January 1872, died December 1946, was to the American Armed Forces in World War I rather what Gillies was then to the British Armed Forces, although Davis remained a civilian. During that war there were also Service Advisors to the American Surgeon General’s Office; in plastic surgery it was Major Vilroy P. Blair and in dental surgery it was Major Robert H. Ivy. During World War II I believe that the advisors to the Surgeon General’s Office were all civilians, there was Davis again, Ivy again, and another plastic surgeon, Jerome P. Webster. Subsequently Service Consultants in Plastic Surgery were appointed and in North West Europe, for example, there was Lieutenant Colonel J Barrett Brown and a dentist named Bricker. Twelve months before he died, Dr Davis addressed the Southern Surgical Association in Hot Springs, Virginia, and some of the informal criticisms he made then of the American Armed Forces plastic surgery set-up bear repetition. I quote some length:-

“The tables of organisation in the Army failed utterly to make adequate provision for plastic surgery in World War I and repeated in World War II.

After World War I, scant interest was taken in plastic surgery by the regular Medical Corps of the Armee Services, and there were no surgeons in either of the services, who were specially trained for, or who showed any special ability to do this work. In fact, there was little official recognition of the scope and necessity of plastic surgery by the Medical Corps of either the Army or the Navy before we entered World War II, as the tables of organisation show.

The first idea about utilization of plastic surgery in World War II was that there should be a large number of plastic and maxillofacial teams made up of a plastic surgeon and a dental surgeon, and that these teams should accompany troops to the Front, where they would give early plastic care to those requiring this service. A number of four and six week courses were given in different parts of the country to train men for this work. There were also two or three month courses given in different clinics, which were very much better.

After a time, all of these courses were discontinued, as it was realised that most of the real plastic surgery, after early closure of face wounds at Evacuation Hospitals,
should be done in the Zone of Interior.

No-one in authority had any idea that plastic cases would be nearly as numerous as they have turned out to be in both services, and for that reason, the facilities at first provided turned out to be quite inadequate.

In the Navy in World War I, there were not many plastic cases as compared with those in the Army, and there was no special service organised for their care. In World War II, the same procedure was followed at first, as it was said that the Surgeon General of the Navy did not see the necessity of a Plastic Section, and thought that any Naval surgeon should be capable of doing plastic work. However, when a considerable number of men requiring real plastic reconstruction began to come in, this misconception was soon rectified, and with the help of a group of Naval Reserve medical officers, who were skilled plastic surgeons in civil life, several Plastic Centers were organised.

Mass burns casualties

When serving in the Territorial Army and stimulated by Battle's publications I became increasingly interested in the problem presented by Mass Burns Casualties, and published the concept of a specially trained burns nursing orderly. My rather depressing conclusions were based on the well-known data of Bull and Fisher (1954) which, it is emphasised, refer to burns treated under the ideal conditions which would not be available in war.

A modification of the long established practice of triage can be used in sorting. Since any necessary life-saving treatment must be started within eight hours of the burning, the casualty must be correctly assessed when first seen. Fortunately, all the data needed to effect clinical and administrative grouping can be obtained by a specially trained intelligent nursing orderly, with a degree of accuracy fully acceptable in the difficult conditions envisaged.

In Reception the burns nursing orderly records five groups of facts:-
1. Patient's name, rank, number, unit etc.
2. Patient's age.
3. The time and date at which he (the orderly) makes his examination (see below).
4. The time and date of burning.
5. The immediate cause of the burn.

The burns orderly records a further five facts:-
6. Patient's personal dosimeter reading.
7. Patient's pulse rate; this is useful later to gauge clinical progress.
8. Whether or not the patient's face is burnt.
9. The percentage surface area of the body burnt. The simple 'rule of nines' is understood easily; it is in its application that the specialised training of the burns orderly particularly demonstrates its value.
10. The presence of additional injuries such as lacerations and fractures.

The patient's chance of survival, his personal prognosis, is predicted from these data.

The treatment of burns is difficult and a 1646 picture by Wilhelm Fabry of Hilden in Germany of a severe dorsal contracture of a burnt hand may be compared with an almost identical hand of a patient who was referred to me at Bart's in September 1966.

Training and research into the treatment of burns must go hand-in-hand in the Armed Services as it does in civilian practice and, in respect of training, I make no excuse for quoting (anonymously) from an appreciation made by a senior regular Service medical officer early in 1982. "Apart from training in the principles of war surgery medical officers in all the Armed Forces must train realistically for a war role. There is very little sign of this. It is primarily to the Territorial Army that we look for efficient training in such matters. The majority of Service casualties in Europe would be treated in the general hospitals and field ambulances staffed by the medical Territorial teams made up of the sponsored units, responsible to UKLF, and the independent units trained by their individual COs. These units have regular training sessions outside their civilian appointments and annual camps in the field with nursing units and technical auxiliaries."

**The future?**

In research, I must mention the very important project, masterminded by Dr Peter Shakespeare and Mr James Laing, of Odstock Hospital, Salisbury, the Honorary Civilian Consultant in Plastic Surgery at Haslar, on the use for the deep burn of a sheet of dermal collagen covered with a soup of the patient's own epithelial cells grown in vitro. A successful outcome of this work would be a great step forward. We all hope that Jim Laing will have better luck with his health in 1983 than he did in 1982.

Research also includes analysis of the lessons learnt from recent campaigns. As the worst type of observer, that is both civilian and armchair, I guess that it will be necessary to alter the establishment of Service surgical specialists to allow both for the increasing incidence of burns (Table III) and for the increasing proportion of limb injuries with skin loss, many with fractures exposed

### Table III

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*Very sadly, Mr J E Laing died prematurely in October 1983.*
- more plastic surgeons and more orthopaedic surgeons.

To conclude on a philatelic note I show four Argentinian stamps from my collection as a brief postscript to the symposium on "The Falkland Islands Campaign" held at the Royal College of Surgeons in London in February 1983. These stamps were issued in January 1936, February 1937, May 1945 and December 1966, the last commemorating the Argentine South Pole Expedition. The four maps reveal those unacceptable territorial aspirations which have now cost lives.

Thank you gentlemen very much for letting me ramble on about events long past, albeit with an up-to-date message, and for letting me beat my plastic drum - for so long!

Acknowledgments

I am grateful to Col R Scott, L/RAMC, who suggested that I should submit this lecture script unaltered for publication; to my secretary Diana Goodwin and to the Department of Medical Illustration at St Bartholomew's Hospital for their patient help.

REFERENCES

4. Tagliacozzi, G. De curtorum chirurgia per insitionem. Venice, 1579.
47. Hildanus, F. De combustionibus, Frankfurt, 1646.