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**Autor:** Watson-Jones, Reginald

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**Scientific Session held at the Occasion of the British-Swiss  
Medical Conference**

Sept. 21st 1946 at Basle

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**Surgical Rehabilitation**

**By Sir Reginald Watson-Jones, London**

Paper read to the Scientific Session of the Swiss Academy of Medical Sciences,  
21st September 1946

When I was a medical student I was taught that no London policeman ever went back to full duty after a Pott's fracture of the ankle. That was the day, little over twenty years ago, when malunion was accepted as the almost inevitable sequel of fracture. If a man went to his doctor and said "Look at this deformed and shortened limb" the doctor replied "But of course, you broke it. What did you expect?". A British Medical Association Committee, investigating the end-results of the treatment of fractures, found that there was malunion in over 50 per cent of cases and serious disability in many of the remaining 50 per cent. What is the position to-day? Is it still true that fractures and dislocations cause permanent disability in the majority of cases? Let me quote from the experiences of the recent war, and from the service which it was my privilege to organise—the Orthopædic service of the Royal Air Force.

Sergeant C. sustained a forearm injury. There were eight separate fractures of the shafts of the radius and ulna, with dislocation and comminution of the fractured upper end of the radius and dislocation of the inferior radio-ulnar joint. Moreover the skin was stripped in its whole thickness from a level four inches above the elbow joint to the junction of the middle and upper thirds of the forearm. Surely that limb must have been amputated! Surely that pilot was invalided from the service! There can be little doubt that until very recent years the limb would have been amputated on sight. But the destroyed skin was replaced by immediate skin grafting; the fractured bones were realigned; grossly displaced fragments were excised; the gaps were bridged by bone grafting; the fractured and dislocated head of the radius was excised; an arthroplasty was performed at the inferior radio-ulnar joint; the muscles of the limb were redeveloped; the injured joints were mobilised, and that sergeant is to-day flying "Typhoon" aircraft with a limb which is virtually normal.

In another patient the lower shaft of the humerus was blown out, the elbow joint shattered, skin destroyed, the radial nerve and median nerve both injured, but the brachial artery was intact. That pilot fell into the hands of a country general-practitioner surgeon in a remote cottage hospital and if ever the fate of a limb hung in the balance surely that one did! Would he amputate at once? He must have been sorely tempted. The destruction must have appeared irreparable. But no matter how alarming the destruction of the proximal part of the limb, if there is still a hand, and fingers which may move, and a blood supply which is undamaged, the hand is worth saving. This surgeon had been wisely taught. He had learned that the only indication for immediate amputation of a limb is irreparable damage to the main blood vessels. No matter how much skin is lost, even the whole of it, no matter how severe the damage to muscles, no matter how extensive the gap between the ends of a destroyed bone—these are not indications for primary amputation. To this everlasting credit that surgeon did not amputate; he excised the wound, applied a plaster cast and later transferred the patient to an R.A.F. hospital. Bone fragments were removed; infection was controlled; skin was replaced; the radial and median palsies both recovered; the humerus was grafted to the ulna and although the elbow joint is stiff there is good radio-ulnar movement, an almost normal hand, and that pilot is now back home, still a member of the Czecko-Slovakian Air Force and still engaged on flying duties.

In cases of crash landing it is difficult to imagine the violence of injury. The effect of an uncontrolled power dive is to fragment the human body into particles, the largest recognisable parts of which are no bigger than the head of the femur or the end of a thumb. To a lesser extent this is true of every crash landing. Bones are smashed and comminuted in a most bizarre manner, fragments are displaced in all directions and bone ends are driven violently through surrounding soft tissues. Skin flaps are avulsed. Bones are fractured at many levels; many bones are fractured at many levels. We often had to treat in one patient not one or two fractures, but six or eight fractures, or sixteen or eighteen fractures. An aircrew sergeant who crashed in August 1943 sustained sixteen fractures and dislocations of the left humerus, left shoulder joint, right shoulder joint, right humerus, right radius, right ulna, lumbar spine, right femur, right knee joint, right ankle, right foot and left thigh, and here we see the same boy jumping a hurdle in a race at the rehabilitation centre less than twelve months later.

Flight-Lieutenant O'N. was in the same hospital at the same time. He sustained a dislocation of the left shoulder, a comminuted fracture of the

tuberosity of the humerus, paralysis of the circumflex nerve, traction injury of the inner cord of the brachial plexus, rupture of the thoracic duct with chylothorax and effusion persisting for four months, a central fracture-dislocation of the right hip joint with fracture of the ilium, dislocation of the sacro-iliac joint and disruption of the symphysis pubis, an adduction fracture-dislocation of the right ankle with bimalleolar fractures and interposition of a periosteal flap, injury of the cruciate ligaments and capsule of the left knee which gave rise to a difficult flexion contracture, abdominal injury causing paralytic ileus, head injury with unconsciousness and cerebral irritation in consequence of which he thought three days later that he was still engaged in enemy combat, and such a degree of shock that 8 pints of blood and blood plasma were needed to keep him alive; finally as a late complication in the convalescent stage he developed vesical calculi! Can there be any possible doubt that that patient was permanently disabled? He was only alive at all as a result of the magnificent work of pathologists and hæmatologists who taught us the futility of half pint blood transfusions and made it possible for us to use six and eight and ten pint transfusions. But although he was alive he was surely only just alive! The Pott's fracture-dislocation was the very least of his injuries. What of the fracture-dislocation of the shoulder with paralysis? What of the ruptured thoracic duct and the abdominal injury and the head injury? What of the hip joint injury with pelvic disruption; that alone must have made him a pensioner! His record is very simple. He crash landed on the 11th August 1943, he went back to flying duties on the 10th June 1944; he went back to operational flying, and engaged the enemy in combat on the 26th February 1945. Within eighteen months of sustaining the most appalling injuries he returned to full duty.

One of the reasons for the multiplicity of injuries in R.A.F. aircrew members was the multiplicity of hazards. An aircraft may have been shot up over the target. One or more members of the crew were injured—a hand blown off, a wound was sustained or a bone shattered. But that is only the beginning. The crew must still get home and the aircraft was also damaged. A hole may have been torn in the perspex nose of the machine and unless the bomb aimer escapes from the icy blast of frozen air which drives in at minus 20° centigrade and at a speed of several hundred miles an hour, his face will be destroyed by frostbite. In such conditions less than one minute exposure is sufficient to destroy a face for ever. In less than one minute the aircrew member who tries to repair the damage without the protection of gloves will inevitably lose all the fingers of both hands. As the half wrecked machine flies back to its base

it is exposed to the continued perils of anti-aircraft and cannon shells from enemy fighters. If he ever reaches his base a crash landing will be almost inevitable. There may be further fractures. The crashed machine may burst into flames and major fractures of the limbs be associated with major burns. This is a very difficult combination of injuries in which there is danger of lymphatic spread of infection from the burn to the fracture-hæmatoma so that the closed plaster treatment is dangerous and the risk of amputation for infection and gangrene is very much increased. The machine may never reach the base. It may crash on the open moors, in a ditch or on a mountain side where the crew may be exposed for many hours or days. Alternatively the pilot may instruct the crew to bale out, and unlike the relatively safe landing of paratroops through a danger-free hatch at an optimal height in chosen weather conditions and over a selected site, the bomber crew must land from a wrecked machine at any height, over any ground, or over the sea, and thus accept yet another series of perils—the peril of striking the tail plane of the machine and sustaining head injury, the peril of entanglement of the arm in the parachute cords causing shoulder dislocation or brachial plexus traction injuries, the peril of sudden opening of the parachute with a violent jerk of the harness which may disrupt the pelvis, the peril of heavy landing in the blackness of night on hard and frozen ground causing ankle and knee injuries, or perhaps of landing in the great branches of a tree causing perineal and other lacerations.

Very often physical injuries are associated with grave psychological injury. One pilot was involved in a mid-air crash—and having regard to the hundreds and sometimes thousands of planes which in the inky darkness congregated over the same target or over the same base-landing ground, it is perfectly astonishing that there were not more mid-air crashes. He tried to bale out from his wrecked aircraft, but his foot was trapped between the cockpit and the hood. The slip-stream of air dragged him back, forced him flat against the fuselage, pulled with such violence that it dislocated his knee joint, and at the same time completed the trapping of his foot. He could not escape. Despite all his struggles he could not escape. The wreckage was diving to earth and he was diving with it, gripped as in a vice, from a height of nearly 10000 feet to little over 1000 feet. Then by a miraculous chance an odd twist of the wreckage flung him clear. He pulled the ripcord and landed safely, but with a dislocated knee joint, and surely with a “dislocated mind”. He alone knows the torture of those awful minutes. Nevertheless within seven and a half months he was back on full operational flying duty.

Another young man was adrift in a dinghy in the North Sea for four-

teen days and fourteen nights, awash with the waves, cold, benumbed, hungry, thirsty, despairing of rescue. For many days he had no food or water; his life was saved by a seagull which took refuge on the dinghy. With great restraint the pilot awaited the right moment; then he clutched and caught the bird; he ate it with relish; he sucked its brains and ate a small fish in its belly. The fluid saved his life. His physical injuries were obvious. He developed immersion feet and suffered bilateral amputation. His mental torment was less obvious but it was no less real.

Another youngster, eighteen years of age, crashed into the side of a mountain in Scotland. He broke his neck and dislocated his shoulder, and when he looked down he saw the broken ends of his shin sticking out through his flying suit, bleeding profusely. He thought that he would bleed to death, so he took off his tie and tied it round the knee as tourniquet. This caused the worst of his injuries—ischæmia of the foot and frostbite of the toes, for he lay out on the mountain side in the depth of winter for two nights and three days before being found and rescued. But despite a broken neck, a dislocated shoulder, a compound fracture of the tibia, partial amputation of the foot, exposure, and mental suffering which is not easy to imagine, he went back to duty in eighteen months.

In a three year period which I specially investigated we treated just over 1000 patients with broken necks and broken backs. How many of these patients went back to duty? Was it 100; or perhaps 200? No less than 914=91 per cent returned to duty. Nearly 80 per cent went back to full duty; 12 per cent were grounded and retrained in light duties, and only 6.6 per cent were invalided. Here we see some of these men actively engaged in completing their treatment. The fractures have been reduced; plaster jackets have been applied; they have done special muscle exercises for five minutes hourly throughout the time that they were in hospital and they are now in a rehabilitation centre where games, recreations and gymnastics are added to their treatment. Their spinal muscles are like iron. They have in the muscles of their own backs a support which is infinitely better than any mechanically constructed spinal brace. It would be an obvious insult to those magnificent muscles to suggest the fitting of a support of leather and steel. And at the completion of treatment they have reached the standard we set up, that is to say a back which is *better* than it was before it was broken, with better poise and better muscle control. Every one of these boys, who are playing net ball have sustained at least one fracture of the spine—some have fractures at more than one level. The record for multiple spinal fractures was held by a sergeant pilot who sustained fractures of the vertebral bodies at eight different levels in the cervical, dorsal and lumbar regions.

What is the explanation of this amazing change from the day, in so very recent years, when a Pott's fracture invariably caused permanent disability, to the present day when men have been returned to duty despite multiple fractures of astonishing severity and with grave physical and psychological complications? Is it a simple illustration of the progress of surgical technique? Surgery has of course made very great strides in the methods of wound excision and secondary suture, the chemo-therapeutic control of infection with penicillin, the technique of skin grafting and bone grafting, and the surgery of joint reconstruction. But surgical progress is not the whole answer. Was it that in the Air Force we were dealing only with the cream of manhood? We were of course. In the R.A.F. we had the choice of supreme physical fitness in young healthy men. But when a man has been smashed and shattered and fractured in every limb, he is no longer the cream of manhood. There was some other factor. Was it a question of moral? There is no doubt whatever that the spirit of Britain was never higher than in the dark days of Dunkirk when a calculating calm descended upon every man and woman, with no panic or terror, but only grim determination. It was never higher than in the glorious days when the Royal Air Force fought the Battle of Britain. But the results of which I have spoken were continued through the war. They applied not only to the fighter pilots and the bomber crews with their halo of glory, but to the stolid, plodding electricians and fitters and armourers and engineers who worked in the hangars.

I suggest that this very striking change in prognosis, an amazing change to occur within the life time of a surgeon who is still young, was mainly the result of three developments of treatment; good surgery, good rehabilitation and good resettlement. The relative importance of these three can be assessed by tracing the development of surgical treatment since the time of the British Medical Association Committee to which I referred. Malunion then occurred in over 50 per cent of fractures. That was a challenge to the profession and the challenge was accepted. Methods of manipulation and operation were improved; we saw to it that angulation was corrected; over-riding was not allowed to occur; fractures were no longer allowed to unite with deformity. And when the surgeon was able to show an X-ray which confirmed sound union in good position he felt that he had solved the problem. He discharged the patient. We had reached the age of good surgery but bad rehabilitation and bad resettlement. The patient went home and was left to his own devices. He did not know what the X-ray looked like. What he did know was that the limb was weak and that it was painful. It was stiff. When he used it

it hurt and he obeyed the normal instinct to protect and rest it. He said to himself "If this limb is weak and painful now, how much worse will it be if I go back to work? And I have been discharged from hospital which means that they can do no more. I never shall be able to work. Even if I try, I will be dismissed as an inefficient workman". He feared the future. He had no financial reserves. His only asset was physical fitness and that he had lost. He turned to the only other protection he knew, the protection of lump sum settlement. He lost all idea of physical recovery; his whole mind was thereafter concentrated on the task of securing the greatest possible lump sum. And we had the audacity to call him a malingerer! I assure you that malingerers are made; they are not born. Malingering is a complication of fracture treatment no less under the control of the surgeon than malunion or non-union. It is our duty so to treat the patient that the problems which underlie malingering do not arise. From the first day the patient must be given confidence. He must have confidence in the future and he must never lose it. It is the surgeon's task to explain every stage of treatment, to secure the co-operation of the patient and to command his enthusiasm. Every word that is spoken is of importance. Surgeons must study with far greater care the words they use. These words are examined and re-examined; they are turned over and over in the mind of the patient during many hours of bed rest with its enforced idleness. This is the essential principle of rehabilitation—physical exercise, gymnastics and recreation are no more than part of the technique. It is our attitude to the patient, the words we use, and the mental reactions we inspire, which is the basis of this treatment. Does our behaviour react on the patient in such a way as to leave him depressed, dull and miserable; or does it inspire him with enthusiasm, with hope and with a determination to get well? This is the spirit of rehabilitation—and it applies not only to fractures and orthopaedic cases but to all surgical cases—and all medical cases. There is no aspect of treatment in which the correction of error presents greater difficulty. When a bone is allowed to unite with angulation, correction by osteotomy is easy; but when a mind is allowed to become warped, correction is far from easy.

Moreover it is not enough to inspire the patient with confidence and hope and then let him down by failing to complete the treatment. Why should a man who has fractured a limb be discharged from our care, as we used at one time to do, simply because the X-ray shows good union. Why should we expect him to mobilise joints and redevelop muscles himself. He has no experience; he knows no pathology; he cannot distinguish the pain of stretching adhesions which calls for more exercise

from the pain of an unexpected complication which calls for more rest. It would be as reasonable to expect him to treat the fracture itself. Why did we not consider our duty done when we had completed the first aid treatment? Why not deliver the man in an ambulance on his front door step and say "We know that you have never treated a fractured femur before; but get on with it; do the best you can"? We were no more rational when we said "We know that you have never treated adhesions and stiff joints and wasted muscles before, but get on with it and do your best". There must be specific instruction in exercise; there must be close supervision. Every patient in a fracture ward has special exercise to perform. Moreover, although the surgeon will instruct, he cannot supervise hourly throughout the day. He must therefore train rehabilitation orderlies or physiotherapists and post one to every ward, whose sole task is the hour by hour supervision of active exercise, active muscle development and active mobilisation.

We must not assume that a patient will succeed in teaching himself to walk without a limp. From the first day that he gets out of bed in a walking plaster his limp must be corrected. He must be shown how to walk. Every patient at first tends to limp in the same way—the bad foot is slowly put forwards; the good foot is hurriedly brought level but not in front; he looks to the ground; and he leans on a stick. He must be taught equal length of step, equal timing and the upright position. When a limp has already developed it may persist for months or years. One of the last patients I saw before I left London was a girl of 16 who had walked with a stiff knee for two years—and she believed that she could not do otherwise. Yet the knee was not actually stiff and after ten minutes instruction—breaking up the elements of gait into its component movements and exaggerating each of them, she walked quite normally.

Before discharging from hospital a patient who has broken her leg do you always make sure that she can go up and downstairs—or is it possible, without you being aware of it, that that patient's home is disorganised, and will remain disorganised for many months in the future, in order that a ground floor bedroom shall be arranged because she has not been taught how to manage stairs. Have you always made sure that they can run? It is surprising how many patients have recovered in every other respect but believe that they cannot run. I saw a boy whose ankle joint I had arthrodesed; I was following him up after twelve months. I asked him if he had any pain. "None at all" was his reply. "How far can you walk?" "Any distance—ten miles or more". "Are you at work?" "Yes, I have been working for one year". "You can

run?" "Oh no", he said, "I cannot run. I nearly missed my train this morning because I could not run". And although there was nothing whatever wrong with his limb, he could not run. If he tried he fell over his own feet. He had forgotten how to run—he had lost the co-ordination. I took him by the arm and said "Mark time with me" and we marked time together. "Now on tip toe", and we marked time on tip toe together. "Now move forward one inch each step—a little quicker—quicker—quicker still" and before he knew what had happened—to his own utter amazement—that boy was running.

At this point a film was shown, demonstrating older methods of treatment of fractures which caused stiffness of joints, swelling and œdema of limbs and wasting of muscles, contrasted with newer methods of treatment of the same fractures in which, after immobilisation of the fracture in plaster the free joints of the limbs were mobilised and the muscles exercised. Later treatment was also shown in special rehabilitation centres where recovery was completed by recreation, swimming, cycling, games and gymnastics. The film was of historic significance because it was the first film ever to be prepared on the subject of rehabilitation after physical injury. It had been shown 15 years ago at a private dinner in London to H.M. the King of England who had maintained his interest and enthusiasm for this aspect of medical treatment.

We have reached the stage of good surgery and good rehabilitation. Whether our patient has sustained a fracture, undergone an abdominal operation, or suffered a medical disorder, we have completed the treatment. We have restored the tone of his muscles, regained good movement of his joints, taught him to walk and run and encouraged him to play games. Surely our task is now complete. But it is not. Our task is complete only when the patient is fully restored as an independent and self-supporting citizen, fully engaged in the life of the community, and normally engaged in work.

In former years our method of resettling industrial injury cases with residual disability was through the medico-legal machinery of the County Courts. The patient had long since been forgotten by the surgeon who treated him. The Insurance Company had paid him compensation week by week—and sooner or later they got tired of it and said "Settle it. Get him off our books. Take it to the Courts". And there the poor unfortunate workman found himself, utterly bewildered by the unfamiliar scene. Barristers and attorneys, with gowns and wigs, talked a language of which he understood not a word. And then his own attorney would take him into the corridor: "The case is not going well. We might lose everything. I think you had better take that 1000 francs they are offering". Settlement by fear! A thousand francs—ten thousand francs—within a year he had lost it all. He had nothing left from his lump sum but he still had his disability.

Great progress is being made in Britain in this respect. In the future

there is to be no lump sum settlement. An injured workman does not know what to do with ten thousand francs. He is not trained to invest money wisely. Instead, exactly as in the case of military casualties, a pension is to be fixed at a reasonable level having regard to the degree of disability, a pension which will remain whether he works or not and which thus will prove no deterrent to work. To protect the partly disabled man who may not prove as efficient as his fellow workmen, and who therefore may be the first to be dismissed in days of relative unemployment, the Disabled Person's Employment Act has been passed. Every employer must now engage a proportion of disabled persons—not only the disabilities of war casualties and industrial injuries, but every type of disability whether congenital or acquired, whether surgical or medical. At the moment the figure is 3 per cent, which is enough to cover the three quarters of a million disabled persons in Britain who have registered. The final figure will probably be from one to two millions, and the proportion of disabled people who must be engaged by every employer will probably be in the region of 6 per cent.

Not only is employment thus guaranteed to the disabled, but special training workshops have been set up in which, for example, the one-handed man is taught engineering trades. The man who cannot continue his former work because he has a crippled hand or because he has silicosis or a duodenal ulcer is taught a new trade. For the man whose disability is still more grave, so grave that even after treatment and after training in a new trade, he could not compete on an economic basis with his fellow-workmen, special factories are being built, factories which may not be economic from the industrial point of view and will need to be subsidised, but which will offer at least part-time employment—perhaps only for two or three hours a day—to every disabled individual who is handicapped in seeking or keeping employment. There are to be special factories for the tuberculous, and for those with fractured spines and paraplegia. Why should a man with permanent paralysis of the legs and paralysis of the bladder never work again? He has two good arms! He will be a happy man only when he is self-supporting, independent, leading a useful life, and offering at least some contribution to the community.

Mr. Chairman—Gentlemen—In discussing three developments of treatment, namely, good surgery, good rehabilitation and good resettlement, I have told you of the progress we have made during the last twenty years. But I would remind you that the principle of rehabilitation was known two thousand years ago. If you look up the writings of Plato you will find it: "This is the greatest fault in the treatment of

sickness, that there are physicians for the body and physicians for the soul, and yet the two are one and indivisible". The doctor's task is the treatment not only of the body, but also of the mind. And whether we are physicians or surgeons, nurses or gymnasts, rehabilitation orderlies or physiotherapists, when we engage in relieving the disability of our patient, completing the treatment, teaching him to walk and run, restoring power to his muscles and movement to his joints, relieving his anxieties, removing his fears, explaining his problems and restoring him to the full life of the community—to its pleasures, its recreations and its work—then indeed are we physicians of the body and the soul.

### *Summary*

Twenty years ago even simple fractures nearly always caused permanent disability. There was malunion in over 50 per cent of cases and serious incapacity due to muscle wasting and joint stiffness in many of the remaining cases. To-day the position is very different. During the years of war, in the orthopædic service of the Royal Air Force, thousands of men sustained multiple fractures of astonishing severity. One patient often sustained six or eight, or sixteen or eighteen major fractures. Severe bone injury was often combined with skin destruction, third degree burns, visceral injury, or the effects of frostbite and exposure. Physical injury was often combined with grave mental and psychological injury. Nevertheless over 90 per cent of these men went back to duty and even to operational flying; less than 5 per cent were invalided. Of 1000 men with broken backs and broken necks no less than 914 returned to duty.

This striking change in prognosis is due to progress in three directions—good surgery, good rehabilitation and good resettlement. The developments of surgery are important—the treatment of shock by massive blood transfusion, the chemotherapeutic control of infection by penicillin, the technique of wound excision, of skin grafting and bone grafting, and the surgical reconstruction of bones and joints. But the developments of rehabilitation are no less important—the active exercise of muscles and mobilisation of joints, the treatment of disabilities by games, recreations and gymnastics, the art of re-education in walking, running and jumping, and the completion of treatment in every detail. Finally, resettlement in the life of the community by removing financial anxieties, resolving doubts and fears, instilling confidence and hope, and restoring not only the ability to work but the opportunity for work, must be accepted by the surgeon as part of his duty.

### *Zusammenfassung*

Vor 20 Jahren verursachten selbst einfache Frakturen nahezu immer dauernde Arbeitsunfähigkeit. Man sah in über 50% der Fälle schlechte Vereinigung der Bruchstücke und bei einer Reihe anderer Patienten schwere körperliche Beeinträchtigung infolge Muskelatrophie und Gelenkversteifung. Heute bietet sich ein ganz anderes Bild. Während der Kriegsjahre wurden vom orthopädischen Dienst der Royal Air Force Tausende von Patienten behandelt, welche multiple Frakturen von erstaunlicher Schwere erlitten hatten. So passierte es oft, daß ein Patient 6–8 oder gar 16–18 große Frakturen aufwies. Schwere Knochenbrüche waren oft mit Zerstörungen der Haut, Verbrennungen dritten Grades, inneren Verletzungen oder schweren Kälteschäden verbunden. Körperliche Schäden gingen oft mit schweren psychischen Störungen einher. Trotzdem konnten über 90% dieser Männer wieder heeresdienstfähig gemacht werden und sogar ihre Fliegertätigkeit wieder aufnehmen. Weniger als 5% blieben invalid. Von 1000 Männern mit Hals-, Brust- und Lendenwirbelbrüchen kehrten nicht weniger als 914 in den Heeresdienst zurück.

Diese auffallende Wendung in der Prognosestellung beruht auf Fortschritten, die sich in 3 Richtungen auswirken: im Ausbau der chirurgischen Methoden, in der Wiederherstellung der Bewegungsfähigkeit des Patienten und in seiner Wiedereinfügung in Beruf und Gemeinschaft. Von Bedeutung sind die Entwicklungen in der Chirurgie: die Behandlung des Schocks mit massiven Bluttransfusionen, die chemotherapeutische Behandlung der Infektion mit Penicillin, die Technik der Wundexzision, der Haut- und Knochentransplantation und die chirurgische Rekonstruktion von Knochen und Gelenken. Doch sind die Fortschritte in der Wiederherstellung der Beweglichkeit durch das Trainieren von Muskeln und Gelenken, durch die Wiedererziehung zum Gehen, Laufen und Springen und durch die Vollendung der Behandlung in jeder Einzelheit nicht minder wichtig. Schließlich gehört zum Pflichtenkreis des Chirurgen auch die Wiedereinfügung des Patienten in das Leben der Gemeinschaft durch Behebung von finanzieller Not, von Zweifel und Furcht, durch Einflößen von Vertrauen und Hoffnung und nicht nur durch Wiederherstellung der Arbeitsfähigkeit, sondern auch durch Beschaffung einer günstigen Arbeitsgelegenheit.

### *Résumé*

Il y a 20 ans, une simple fracture était presque toujours suivie d'une invalidité permanente. Dans plus de la moitié des cas, la réduction était mauvaise, et dans la majorité des autres cas, il subsistait une sérieuse

incapacità, due à la fonte musculaire et à l'ankylose. La situation aujourd'hui est bien différente. Pendant la guerre, les services orthopédiques de la Royal Air Force virent des milliers d'hommes supporter des fractures multiples d'une extrême gravité. Souvent, un blessé était atteint de 6 ou 8, et même de 16 ou 18 fractures majeures. De graves blessures osseuses se compliquaient de destruction de la peau, de brûlures du 3e degré, de blessures viscérales ou d'effets de gelure et d'exposition aux éléments. Aux blessures corporelles s'ajoutaient souvent des troubles graves d'ordre mental ou psychologique. Malgré cela, plus de 90% de ces hommes reprirent leur activité et même leurs opérations de vol. Moins de 5% restèrent invalides. Sur un millier d'hommes atteints de fractures de la colonne vertébrale, il n'y en eut pas moins de 914 qui retournèrent à leur activité.

Ce changement frappant dans le pronostic des fractures est dû aux progrès réalisés dans 3 domaines: perfectionnement de l'intervention chirurgicale, bonne rééducation physique et réadaptation professionnelle et sociale. Les méthodes chirurgicales modernes ont leur importance – traitement du choc par des transfusions sanguines massives, de l'infection par la pénicilline, technique du nettoyage des plaies, greffes cutanées et osseuses et reconstitution chirurgicale des os et des articulations. – Mais les nouvelles méthodes de rééducation ne sont pas moins importantes – exercices musculaires actifs, mobilisation des articulations, rééducation à la marche, à la course, au saut, et parachèvement du traitement dans chaque détail. Et pour finir, le chirurgien doit considérer, comme faisant partie de sa tâche, de s'occuper du retour du blessé à la vie commune, en lui ôtant toute préoccupation d'ordre financier, le préservant de la peur et du doute, lui inspirant confiance et espoir, et restaurant non seulement sa capacité de travail, mais lui procurant aussi du travail.

### *Riassunto*

Venti anni fa, una frattura semplice era quasi sempre seguita di invalidità permanente. In più della metà dei casi, la riduzione era mal fatta e nella maggioranza degli altri, restava, una incapacità grave provocata dall'atrofia muscolare e dall'anchilosi. Oggi la situazione è del tutto cambiata. Durante la guerra, i servizi ortopedici della R.A.F. hanno visto migliaia di uomini affetti da fratture multiple di estrema gravità. Molte volte un ferito portava 6 o 8, e anche 16 o 18 fratture. Le ferite ossee gravi erano complicate da distruzione della pelle, da scottature di terzo grado, da lesioni viscerali o da manifestazioni di congelamento e da esposizione alle intemperie. Alle ferite corporali si aggiungevano spesso

dei disturbi gravi di ordine mentale o psicologico. Malgrado tutto questo, il 90% di questi uomini riprese la propria attività, persino quella aviatoria. Meno del 5% rimasero invalidi. Su un migliaio di uomini con fratture della colonna vertebrale, 914 poterono riprendere la loro attività.

Questo cambiamento considerevole nella prognosi delle fratture è dovuto ai progressi realizzati in 3 campi: perfezionamento dell'intervento chirurgico, buona rieducazione fisica, riadattamento professionale e sociale. I metodi chirurgici moderni hanno la loro importanza - trattamento dello shock colle trasfusioni sanguigne massive, dell'infezione colla penicillina, tecnica del trattamento delle piaghe, innesti cutanei e ossei, ricostituzione chirurgica delle ossa e delle articolazioni. Ma i moderni metodi di rieducazione non sono meno importanti - esercizi muscolari attivi, mobilitazione delle articolazioni, rieducazione alla marcia, alla corsa, al salto e perfezionamento del trattamento in ogni dettaglio. Il chirurgo deve anche considerare come suo compito l'occuparsi del ritorno del ferito alla vita normale, sopprimendo in lui ogni preoccupazione di ordine finanziario, preservandolo dalla paura e dal dubbio, cercando di dargli fiducia e speranza, e non soltanto di restituirgli la sua capacità di lavoro, ma anche procurargli un impiego.