

## ABSTRACTS FROM PAPERS

RESPIRATORY PHYSIOLOGY: Scientific Editors P. HUGH-JONES AND E. J. M. CAMPBELL, *Brit. Med. Bulletin*, Vol. 19, No. 1, Jan. 1963, pp. 1-96. 30s.

There is a high morbidity and mortality among acute paraplegic patients from chest complications. The cervical patients frequently suffer pulmonary emboli and develop pneumonia. Thoracic paraplegics may have additional fractures to their ribs causing haemopneumothoraces. Because of these complications the physician who looks after these patients must have an adequate understanding of the treatment of chest disorders, and this entails a knowledge of pulmonary physiology.

The January edition of the *British Medical Bulletin* is devoted to current trends in Respiratory Physiology. The panel of contributors is composed of a distinguished team of physiologists and physicians. They discuss such topics as the clinical and neurological regulations of breathing and the distribution of gas and the blood flow within the lungs.

J. G. Widdicombe's article is of particular interest. He reviews the significance of reflexes arising within the lungs, and their influence upon respiration and circulation. He points out the importance of irritant reflexes that cause the integrated act of coughing, and of pulmonary vascular reflexes whereby sudden increases of pressure within the lungs, caused by pulmonary congestion or emboli, may cause profound changes in the cardiovascular system. The Hering-Breuer inflation and deflation reflexes, first described in animals 1868, are discussed and it is suggested that they are weak in man. In another article on breathlessness E. J. M. Campbell and J. B. L. Howell describe a series of results obtained after respiratory loading of normal and anaesthetised subjects, that suggest that there are other more important reflexes which regulate breathing whose receptors are situated in the spindles of the muscles of respiration. They elaborate a new concept of length-tension inappropriateness within these receptors to explain the sensation of dyspnoea.

C. G. Caro discusses a complex subject in an article on the physics of blood flow through the lungs. He points out that the blood does not perfuse the lung in a steady continuous stream, but fluctuates greatly. He attempts to analyse this flow by resolving it into two components, the mean flow and the oscillatory flow. The mean flow is influenced by such factors as the physical properties of the blood and blood vessels, and the pressures developed within the chambers of the heart and within the lung substance and alveoli. The oscillatory flow depends upon the varying pressures imparted to the blood by the beating of the heart. These pressures are modified by the pulmonary blood vessels. Drs. Duke and De Lee describe some of the physiological and pathological mechanisms whereby the blood flow of the lungs is modified, and the significance of the interrelationship of the pulmonary and systemic circulations.

The whole symposium is written in a stimulating and provocative manner posing as many questions as it answers, but stressing for the physician concerned with the care of paraplegic patients that 'ours is surely an age of integration in Science where ideas and methods developed in one discipline are being applied to another'.

DISORDERS OF TEMPERATURE REGULATION IN ACUTE TRAUMATIC TETRAPLEGIA: H. G. PLEDGER (1962), *J. Bone Jt Surg.*, **44**, 110.

Following a short survey of the literature on the subject of thermoregulation in tetraplegia in man as well as animals, the author described a patient with a tetraplegia following fracture of the 5th and 6th cervical vertebrae, who developed hypothermia shortly after being rendered tetraplegic. In addition to a complete motor and sensory loss below C6, there was a bilateral Horner's syndrome with nasal congestion (Guttman's sign) and anhidrosis. The rectal temperature sank to 30.8°C. (87.4°F.), the electrocardiogram showed bradycardia (40 per minute), delayed conduction and J waves—all characteristic

of hypothermia. Following warming with an electric blanket, the temperature gradually rose during the next three days to 37°C. (98.6°F.) and the pulse rate increased to 72 per minute. Perusal of the records of six other patients with traumatic tetraplegia showed hypothermia in four during the first three days after injury. Hyperpyrexia occurred in three patients just before death. Necropsy done in five patients showed damage to the spinal cord but no evidence of damage to the brain stem or medulla. Causes and methods of prevention of hypothermia or hyperthermia are discussed.

ON DISTURBANCE OF THE BODY IMAGE IN PARAPLEGIA: JOHN H. EVANS (1962), *Brain*, pt. 4, p. 687.

Seven patients suffering from such diverse conditions as multiple sclerosis, vascular lesions and encephalomyelitis who had complete motor and sensory loss below a segmental level of lumbar 1 of at least three months' duration were encouraged to give a detailed account of subjective sensations referred to their legs.

The most common sensations experienced were pain, burning or pressure of bed clothes.

The image of the legs did not decrease with the passage of time.

This was in marked contrast to the shortening of the phantom limbs of amputees. It was suggested that the paraplegics could verify the true length of their limbs by frequent visual checks—and that some afferent impulses did reach the cerebrum from the anaesthetic limbs via intact fibres within the spinal cord and the sympathetic chain but that the pattern was so abnormal that they became distorted and gave rise to the sensation of pain.

FRACTURES, DISLOCATIONS AND FRACTURE-DISLOCATIONS OF THE SPINE: F. W. HOLDSWORTH (1963), *J. Bone Jt Surg.*, 45, 6-20.

In his Watson-Jones lecture, delivered at the Royal College of Surgeons, England, on the 11 January 1962, the author reports on his experience in the treatment of vertebral fractures, in which he follows the views of Nicoll. In discussing the anatomy of the vertebrae, emphasis is laid on the posterior ligament complex in relationship to stable and unstable fractures. In classifying the four types of violence resulting in fractures of the spine, flexion and rotation, extension and compression, the importance of rotation or flexion-rotation in the development of fracture-dislocation of the lumbar spine is stressed.

With regard to treatment of stable injuries, he considers that the simple wedge fracture does not require reduction or immobilisation. All that is necessary is rest in bed for two or three weeks followed by active exercise for six to eight weeks. In compression burst fractures, it is necessary to immobilise the spine by a plaster applied in the neutral position. Reduction of the deformity is not important. In his experience of fracture dislocations, stability of the spine cannot be depended upon even after months of immobilisation. Therefore, stability must be restored by bone grafting, and it is necessary to fuse only the two affected vertebrae. In the cervical spine, reduction of the dislocation is effected by manipulation under anaesthesia with the additional aid of skull tongs or calipers. In rotational fracture-dislocations, the author states that stability can best be achieved by internal fixation of the unstable spine by plates bolted to the spinous processes.

The author has modified his original views regarding operative reduction and plating of the thoraco-lumbar fracture-dislocations as immediate treatment in patients with cord involvement, as compared with his earlier publication (F. W. Holdsworth and A. Hardy (1953), *J. Bone Jt Surg.*, 35, 4, 540-550). He now limits indication for this operation to only those unstable fracture dislocations with cord involvement where there is some hope of recovery. He states that as far as the spine is concerned, the results are excellent provided the operation is properly performed. However, no figures are given from which

one could assess the number of cases of unstable fracture-dislocations with cord involvement at that level in which the hope of cord recovery has been fulfilled. Moreover, the author no longer makes the claim that this operation is simple—a statement which in the past has doubtlessly led to indiscriminate use of this operation.

**FRACTURES AND DISLOCATIONS OF THE CERVICAL SPINE: T. R. BEATSON**  
(1963), *J. Bone Jt Surg.*, **45**, 21-35.

The author reviewed 59 cervical fractures seen at Oswestry from 1945 to 1962 on the evidence of case notes and radiographs. On cadaver specimens he studied the radiological interpretation of fracture-dislocations and found that two oblique right lateral views were needed to distinguish dislocations of the right and left facets, semiprone and semisupine views. He also compared the extent of ligamentous damage in specimens subjected to acute flexion, flexion plus rotation and very severe combined displacements.

Accordingly he divided his clinical material into three groups: bursting fractures, dislocations by less than half and by more than half of the antero-posterior depth of the vertebral body. Group 1 contained 16, group 2, 23 and group 3, 20 cases. Cord damage was more frequent in groups 1 and 3 than in group 2. Reduction was attempted in 40 patients of groups 2 and 3. Fourteen patients were treated by operation at varying intervals after the accident. Of five patients with tetraplegia, operated on within the first three days after the accident, two died within 12 hours, one after 9 months, the remaining two remained tetraplegic. Two patients with tetraplegia operated on after 10 days and 4 weeks remained tetraplegic. These unfortunate results of early operation speak for themselves. One patient with 'root signs', another with 'spasticity' operated on several months after their accidents were 'free from symptoms'. The remaining five patients had no involvement of the cord.

This is a careful and well-written account. As in other papers from the schools of Holdsworth and Roaf one cannot help noticing the contrast between the detailed analysis of anatomical and radiological data of the spine and the absence of exact information about the signs of cord-injury. One would like to know whether 'tetraplegia' means a complete or an incomplete lesion, what were the changes in level and extent of paralysis before and after treatment, etc. Without detailed neurological data it is impossible to assess the value of diagnostic or therapeutic measures which are recommended.

**MANAGEMENT OF LONG-BONE FRACTURES IN PARAPLEGIC PATIENTS:**  
S. N. EICHENHOLTZ (1963), *J. Bone Jt Surg.*, **45A**, 299-310.

A survey is given of methods of treatment and their results in 34 fractures of the long bones in paraplegics. The author describes the disasters that followed the application of the otherwise acceptable methods of fracture-treatment to the limbs of paraplegics. Local and general sepsis, amputation, disarticulation and two deaths were the price which had to be paid, before it was realised that treatment of the general condition by blood-transfusion, turning of patient and healing of pressure-sores, as well as reduction of urinary infection, were the only basis on which treatment of the fractures could safely be based.

Once the author adopted conservative treatment on well-padded splints, which were frequently removed for the prevention of pressure sores, he found that fractures healed well and, if anything, more rapidly than normal. Large fracture-haematomata due to vasomotor paralysis produced a large callus, even if reduction was imperfect.

The paper shows signs of having been hastily written. No distinction is drawn between fractures associated with the spinal injury and the late fractures due to osteoporosis, anaemia and sepsis. While 32 fractures are said to be the material surveyed, 34 fractures are reported on. Moreover, the two cases of para-articular arthroplasty at the ankylosed hip are really unrelated in the context. The author's present attitude is unduly pessimistic as to the chances of treating fractures in paraplegic limbs so that alignment is restored without causing complications. But, where the rate of operative infection is as high as stated, no operative treatment of fractures should ever be attempted.

OUR PARAPLEGIC FELLOWMEN AT WORK: L. GUTTMANN, Proceedings European Seminar, Cambridge University, 1962, *Rehabilitation*, 43, 8.

An analysis is given of a statistic of 2500 paraplegics and quadriplegics treated at the National Spinal Injuries Centre, Stoke Mandeville, between February 1944 and March 1962.

The majority of patients, 1658 (66·4 per cent.), were traumatic lesions—of these, 19·6 per cent. cervicals, 9·9 per cent. T1-T5, 45 per cent. T6-T12, and 25·5 per cent. cauda equina lesions. The mortality rate (excluding those who died from causes unrelated to the paraplegia, such as cancer, etc.) was 11·5 per cent. The mortality rate of service personnel and pensioners from World War II, who had received their injuries 17 to 23 years previously, was only 20·8 per cent. at the time of the statistics. The mortality rate of civilians, most of them admitted after the war with a survival rate of 10 to 17 years, was only 7·7 per cent.

With regard to domestic resettlement, the great majority of the patients discharged (1682) live in their own homes within the community, and the author considers this as the ideal resettlement of paraplegics. Only 233 live in special settlements set up for ex-service pensioners by the Red Cross after the war or in hostels and homes for the disabled. The need for special adjustment of houses for paraplegics, such as widening of doorways, building of ramps, installing special fittings in the bathroom and toilet (which should be large enough to enable the patient to negotiate his wheel-chair), and the provision of garages are emphasised. Special mention is made of the Ministry of Labour hostel for paraplegics in London—the Duchess of Gloucester House—which was specially built for paraplegics and opened in 1949. Here, 72 men and 6 women are accommodated, but only those who are physically fit and willing to accept full-time employment in factories or offices in the neighbourhood of the hostel. With the exception of 6 residents, who had only recently been admitted, all are employed in a great variety of jobs. Throughout the years, more than 300 paraplegics have been through this hostel. Several have married and now live in the same area, continuing their employment. At present, over 100 paraplegics are employed within a radius of 12 miles of the hostel. From all experience, it can be said that they can hold down their jobs in competition with the able-bodied, and absenteeism is by no means worse than that of the able-bodied workers. As wage-earners, they have to pay income tax and also pay for their board and lodging. The picture of the working life of a paraplegic at the Duchess of Gloucester House is symbolic of the over-all picture of the employment of paraplegics.

At the time of the statistics, 1700 of all paraplegics and tetraplegics were available for employment. Of these, 1444 (85 per cent.) were gainfully employed, of which 972 (67·3 per cent.) were in full-time employment. Of the 1658 traumatic paraplegics and tetraplegics, 1165 were available for employment. 959 (82·3 per cent.) were employed, and of these 622 (64·9 per cent.) full-time.

Finally, a detailed analysis of the 256 (206 traumatic) is given, who at the time of the statistics were unemployed, and the reasons for this discussed.