

PECULIAR SEPTIC RESPONSES IN TRAUMATIC TETRAPLEGIC PATIENTS

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Summary. Patients with a high level tetraplegia from a spinal injury have only been able to survive the critical initial period since the development of modern resuscitation techniques including artificial respiration. However, their lives are still threatened by many complications, such as decubitus ulcers, infections and respiratory failure. We describe four young tetraplegic patients who developed an unusual sepsis pattern several years after the injury. The sepsis was accompanied by hypothermia, leukopenia and mental deterioration. This peculiar 'silent' sepsis may also occur in elderly people who are not paralysed. The question arises, therefore, if the chronic spinal cord injured patient may become 'prematurely aged'.

Key words: Traumatic tetraplegia; Infection; Survival.

Introduction

INFECTION in spinal cord injured patients is common. The majority of infections occur in the urogenital tract as a consequence of the spinal paralysis (Guttmann and Frankel, 1966; Rosen *et al.*, 1976). In view of the sensory deficit the early symptoms of cystitis, namely dysuria and frequency, are absent. Respiratory infections are common due to obstructive and restrictive dysfunction. In most of the patients lethargy, loss of appetite, pyrexia and spasticity may be the initial symptoms of infection. Four patients who developed sepsis are described; in three sudden mental deterioration was the presenting sign, and other more common clinical features of infection were absent. It is, therefore, suggested that a special pattern of sepsis may develop in young chronic traumatic tetraplegic patients, as well as in non-paralysed old people.

Case Reports

Case 1. K.A. a 27-year-old male soldier was injured in 1958, sustaining a gun shot wound which caused an incomplete C8 spastic tetraplegia. During his rehabilitation he gained some urinary bladder sphincter control and became almost independent in his daily living activities. His medical follow-up to 1975 was uneventful and all haematological and biochemical tests were within the normal range. The patient was examined in his home in January 1976 by his family physician for a complaint of nausea and was found to be pyrexial (39°C). A

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tentative diagnosis of urinary tract infection was made and was treated with oral tetracycline (500 mg \times 4) and Paracetamol (500 mg \times 4) but no improvement occurred. Four days later, on admission to hospital, he was pyrexial (40.4°C), his blood pressure was 60/40 (torr) and a failing renal output was recorded. There was no cardiopulmonary abnormality, and there was no disturbance of consciousness and no additional neurological abnormality. These abnormal laboratory results were found:- leukopenia of 2000 per cu ml; a blood urea nitrogen of 60 mg per cent and serum creatine was 2 units (normal 0.8–1.2 mg per cent). The patient was treated with intravenous fluids, cortico-steroids and antibiotics (Penicillin, Gentamycin). The haemoglobin fell to 8 g per cent, and a blood transfusion of three units was given. Bone marrow investigation revealed complete agranulocytosis with an arrest in the promyelocytic phase and within 48 hours the white blood count dropped to 200 per cu ml. Disseminated intravascular coagulation developed, along with severe pseudomonas bronchopneumonia, and septic shock followed. The patient died 3 days later, the post mortem confirming the clinical diagnosis. This patient had suffered from urinary tract infection with rapid clinical deterioration and the blood culture showed pseudomonas. There was no alteration of mental status.

Case 2. S.O. a 21-year-old female soldier developed a C6 complete tetraplegia as a result of a motor vehicle accident in 1971. On admission to our unit in 1973 the patient's family reported that for the previous 10 days she had suffered from 'attacks' of mental deterioration, characterised by confusion and delirium, which had lasted for 24 hours and then passed off. On admission the patient responded only to painful stimuli, and was afebrile (35°C). Her cardiovascular status was stable BP 110/70 mmHg, pulse 44 per minute and regular. Crepitations were heard over both lung fields, and her left leg was red, warm and swollen. An electrocardiogram, lumbar puncture, chest roentgenography and laboratory investigations (including thyroid evaluation), were all negative except that the erythrocyte sedimentation test was raised (28/31 Wintrop). Blood culture was negative. She was given intravenous fluids and antibiotics (Penicillin), but the stupor, bradycardia and hypothermia persisted for 36 hours; 24 hours later her blood pressure suddenly fell to 70/40 (torr). Aramine and hydrocortisone were administered intravenously to maintain the blood pressure but 3 days later the patient died in a state of shock. Pseudomonas was grown in blood cultures. An autopsy was not performed.

Case 3. P.A. a 22-year-old male soldier, sustained a gunshot injury resulting in complete C4 tetraplegia in 1967. Since the initial injury the patient had been repeatedly admitted to hospital for urinary tract infections and decubitus ulcers. In 1976 he was re-admitted, because of acute mental deterioration with confusion, delirium and restlessness. On admission the patient was hypothermic (35°C), leukopenic (3000 cells/cu ml), and thrombopenic (40000 per cu ml). All other clinical and laboratory investigations were normal. Sulphonamides was given and a diagnosis of urinary tract infection was made *E coli* and *Klebsiella* being confirmed. With appropriate antibiotic (Penicillin) therapy the 'personality' disorder disappeared and the patient was discharged. Blood culture was negative.

Case 4. B.M. a 32-year-old male, was involved in a motor vehicle accident, sustaining a complete spastic C4 tetraplegia. The initial rehabilitation period and 2 years subsequent follow-up passed uneventfully, until the patient was admitted to hospital because of severe acute depression, presenting clinically as general apathy and insomnia which changed soon after admission when he became psychotic with visual hallucinations, incoherent speech and disorientation in time and place. On examination his cardiovascular state, and temperature (37°C) were normal. His condition was controlled with Halidol 3 mg daily and Elatrollette 10 mg daily. On the eighth day he became hypothermic (35°C), and had bradycardia (40 per

minute). He remained normotensive. Clinical examination was negative, and the blood chemistry and urinalysis were normal. The haematological picture showed leukopenia (2900 per cu ml) and thrombocytopenia (40000 per cu ml). Suspecting bone marrow depression all medication was stopped, but 6 days later the patient developed acute dyspnoea. A chest X-Ray demonstrated right sided bronchopneumonia and a small pneumothorax. Assisted respiration was required and crystalline Penicillin (20 million units daily) and Gentamycin (80 mg t.d.s.) were administered. Within a week the patient had fully recovered and his psychiatric condition became normal.

Whether the infective process caused the psychosis or whether the pneumonia developed as a result of drug-induced leukopenia is unknown. What was noted was that the successful treatment of the pneumonia cured the psychiatric condition. The W.B.C. count returned to normal values and blood cultures became negative.

Discussion

We have described sepsis in four cervical spinal cord injured patients. What were the common features? The concept of sudden 'silent' sepsis is not new and has been well recorded in the elderly. The hypothesis that old age leads to an exhaustion of the immunological system (Hayflick, 1979; Goldstein and Harley, 1979), and that antigen insults no longer provoke an antibody response may be correct, but does this correlate with the situation in young tetraplegic patients? Are these patients prone to 'premature ageing'? In connection with this observation we have observed many patho-physiological changes in some spinal cord injured patients after a long time interval following their injury:

1. Decreased resistance to infection with the development of incidents involving pulmonary and urinary infections, pressure sores etc. required repeated treatment with antibiotics.
2. Paraplegics in their forties and fifties may develop prematurely high blood pressure and cardiovascular disease. Whether this is due to renal or to adrenal imbalance or accelerated arteriosclerosis is unknown.
3. The incidence of bladder (Melzak, 1966 El Masri and Fellow, 1980), prostatic (Ito *et al.*, 1976) and bowel carcinomatosis is higher than in the non-paraplegic community. Whether chronic infections predispose to such cancer is not yet known.
4. Stasis of body fluids may occur, and patients may develop deep vein thrombosis, lymphoedema, urinary tract infection, conjunctivitis, otitis, bronchial and pulmonary infection. We doubt that stasis is the only aetiology.
5. Alteration in temperature regulation. A severe cervical cord injury can cause changes in temperature regulation and other autonomic disturbances. The pattern of sweating is completely changed.
6. Psychological impact. Self-destructive behaviour and depression may well affect the outcome of rehabilitation. The relationship between spiritual strength and morbidity, or recovery from various medical situations is well known.
7. Appropriate hydration is of paramount importance. It is possible that a certain degree of dehydration can be extremely dangerous and can result in hyperosmotic coma, manifested either as excitation or as stupor.

We believe that in some patients with traumatic tetraplegia various clinical changes may develop from neurological, psychological and biochemical disturbances, but we are not able to answer all the questions and much study and research has yet to be done.

The life span and quality of life in cervical cord injured patients have drastically improved since Guttmann and others introduced the concept of conservative—comprehensive care (Guttmann, 1979). The occurrence of immediate death has been reduced (Messard *et al.*, 1978; Kraus *et al.*, 1979), but the danger of infection still exists, the urinary tract being the most susceptible due to urinary stasis and from repeated instrumentation. The 'poikylothermic' tetraplegic patient, who is wheelchair bound and exposed to repeated infection, is particularly likely to react to infection in a manner closely similar to that seen in the elderly.

RÉSUMÉ

Les tétraplégiques ne sont en mesure de survivre la période critique initiale que depuis le développement des techniques de réanimation moderne et de respiration artificielle. Cependant, de nombreux dangers menacent encore leur vie: les escarres, les infections, la septicémie et l'échec respiratoire. Nous décrivons 4 jeunes tétraplégiques présentant un type de septicémie inhabituel, des années après le traumatisme. La septicémie était accompagnée d'hypothermie, de leucopénie relative et d'une détérioration mentale. Cette singulière septicémie 'silencieuse' est connue chez les patients d'un certain âge. La question se pose si le traumatisé chronique de la moëlle épinière est exposé à un vieillissement précoce.

ZUSAMMENFASSUNG

Tetraplegiker können die kritische Anfangsperiode erst seit der Entwicklung moderner Belebungs- und Atemtechniken und des künstlichen Atmens überleben. Ihr Leben, jedoch, wird noch immer von verschiedenen Ursachen gefährdet: Schorfbildung, Infektionen, Sepsis und Atemversagen. Wir beschreiben 4 junge Tetraplegiker mit einem ungewöhnlichen Sepsismuster, Jahre nach der Verletzung. Die Sepsis war von Hypothermie, relativem Mangel an weissen Blutkörperchen und von einer Verschlechterung des gestlichen Zustandes begleitet. Diese sonderbare 'stumme' Sepsis ist bei älteren Patienten bekannt. Es stellt sich die Frage, ob der chronisch Rückenmarkverletzte Patient einem vorzeitigen Altern nicht ausgesetzt ist.

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