

Parkinsonism associated with laryngeal spasm

C. J. VAS, MAURICE PARSONAGE, AND OLIVER C. LORD

From the Neurological and Ear, Nose and Throat Departments in the General Infirmary at Leeds

From time to time in the past various respiratory abnormalities, including laryngeal spasm, have been reported as occurring in association with encephalitis lethargica. Complications of this kind have occurred when a Parkinsonian type of syndrome was also present, but they only seem to have supervened either during the acute phase of the original illness or within a few months of its onset at the latest. As an extension of these observations we wish to present the case histories of two patients who suffered from both laryngeal spasm and Parkinsonism in the absence of a history of an antecedent attack of encephalitis lethargica.

CASE REPORTS

CASE 1 Mr. H. R., aged 37 years, was quite well until 1957 when he first began to notice a tremor in his left hand. A year later this began to involve his left leg as well. In 1960 he noticed that when excited he had great difficulty in breathing because of a marked stridor which, initially, lasted for a few minutes at a time. Thereafter the left-sided tremor gradually increased in severity, his speech became slurred, he salivated intermittently, and all his movements became slow. During this time he noticed a tremor in his right hand and six months later this was followed by complaints of hesitancy, frequency and urgency of micturition. Over the succeeding months the 'breathing attacks' increased in severity and frequency, and they were not always precipitated by emotional disturbance.

When first seen in March 1961, the attacks of respiratory distress were occurring at 30-minute intervals, both when the patient was awake and also during sleep. The stridor was so marked that it could be heard at a distance of some 40 yards from the patient. Examination revealed the signs of a bilateral Parkinsonian syndrome together with bilateral extensor plantar responses. There were, however, no other physical signs indicative of a bulbar disorder, and a general examination proved to be negative. There were no signs indicative of rheumatoid arthritis. The results of haematological, biochemical, and serological tests all proved to be normal. Air encephalography also revealed no significant abnormalities. Since the first appearance of the Parkinsonian syndrome the patient had been treated at various times with benzhexol (Artane), ethopropazine (Lysivane), phenothiazines, and bronchodilator drugs without benefit. At this stage, examination of the larynx was difficult, owing to the ease with which spasm of the vocal cords was

evoked. Only slight movement of the cords and arytenoid cartilages was evident. There was no pooling of secretions in the pyriform fossae and the patient was quite able to cough.

While under observation the patient's attacks of stridor continued to increase in severity and frequency, and three weeks after his admission to hospital he was found comatose in bed early one morning. An endotracheal tube was immediately inserted and the patient was successfully artificially respired. Later, a permanent tracheostomy was performed and a Negus tube inserted. This resulted in very satisfactory relief of the patient's stridor and enabled him to be discharged from hospital. The administration of spasmolytic drugs was continued and he was seen as an out-patient at regular intervals. No further developments were reported until October 1963 when it was learned that he had been found dead in bed at home one morning. Unfortunately, no necropsy examination was possible.

CASE 2 Mrs. D. E., aged 62 years, was first seen in October 1962. Some three years earlier she had first begun to suffer from what she described as attacks of choking. The first of these had lasted about 30 minutes, and had occurred while she was drinking some fruit juice. She had a second attack a year later and thereafter they began to occur with increasing frequency. They were associated with both inspiratory and expiratory stridor and would last from five minutes to two hours at a time; moreover, they were worse when the patient was emotionally disturbed and they were both diurnal and nocturnal in incidence.

On admission to hospital in October 1962 the patient was found to have a well-developed Parkinsonian syndrome, and this had apparently developed gradually over the previous three years. There was no evidence suggestive of rheumatoid arthritis. Laryngoscopy did not reveal any local cause for the stridor; there was no evidence of a recurrent laryngeal nerve palsy and the vocal cords relaxed adequately. The patient was not significantly benefited by treatment with orphenadrine and bronchodilator drugs.

In November 1963 the patient was re-admitted to hospital because her attacks had become much worse. Indeed, by this time the stridor had become so loud that those who lived with her could no longer tolerate it. Examination at this stage showed that the stridor was maximal on auscultation over the larynx. The Parkinsonian syndrome was unchanged and no other signs were found apart from some evidence of degenerative change in the retinal and peripheral arteries. Haematological,

biochemical (including an edetic acid test for hypoparathyroidism), and serological tests were all negative. Contrast radiography of the skull contents was not performed. A further laryngoscopic examination showed that the vocal chords moved sluggishly but were capable of adequate relaxation when they were not in spasm. The larynx was very sensitive to touch which readily induced spasm, but again no evidence of a recurrent laryngeal nerve palsy was found. The intravenous injection of 30 mg. of methyl phenidate (Ritalin) resulted in a marked decrease of both the Parkinsonian syndrome and the stridor for about two hours. During this time the patient was able to talk for much longer periods without pause. Later, following this temporary benefit, her attacks of stridor began to increase in frequency and severity until eventually it became necessary to perform an emergency tracheostomy. By this time it was found that the vocal cords moved only very sluggishly and that tactile stimulation of the larynx again readily induced spasm.

Although it now seemed likely that this patient's stridor was an integral part of her Parkinsonian syndrome it was felt that a bronchoscopic examination was desirable. This was undertaken by Mr. David Watson on 5 March 1964. He reported that the right vocal cord was slightly oedematous, but that the larynx and subglottic region appeared normal. In addition, the trachea and main bronchi showed no evidence of posterior compression or emphysema. On completion of the anaesthetic a marked spasm of both the true and false vocal cords was observed.

This patient's stridor has since been completely relieved by the maintenance of a permanent tracheostomy, even though the laryngeal spasm has persisted. In February 1965 she was re-admitted to hospital for further study. Laryngoscopy confirmed that the spasm of the vocal cords was still evident and it was found that it could not be abolished by spraying the larynx with 2% lignocaine. The spasm, however, decreased while the patient was deeply anaesthetized with thiopentone and nitrous oxide. A similar decrease in the spasm was observed during the lighter stages of anaesthesia, first, after the intravenous injection of suxamethonium chloride (50 mg.) and secondly, on a subsequent occasion, after the injection of methyl phenidate (20 mg.) under similar conditions. On each occasion the relaxation of the vocal cords was only partial, suggesting that perhaps the cords had contracted to a certain extent.

DISCUSSION

It is clear that both our patients exhibited undoubted evidence of a Parkinsonian syndrome and associated stridor due to laryngeal spasm. The absence of any local disease in the larynx or trachea, of a recurrent laryngeal nerve palsy in the early stages in either case, and of an underlying metabolic disorder, suggested to us that the associated stridor might also be the result of basal ganglia disease and not merely of fortuitous occurrence. We have not, however, been able to find any reference in the literature to the association of Parkinsonism and laryngeal spasm

in the absence of a history of a recent attack of encephalitis lethargica. Turner and Critchley (1925) stated that respiratory disorders, such as tachypnoea or polypnoea, periodic apnoea, Cheyne-Stokes breathing, respiratory tics, and spasmodic cough had been observed to occur in association with encephalitis lethargica. They did not, however, appear longer than three years after the original illness. Even so, it is interesting to note that Parkinson himself, in his original 'Essay on the shaking palsy', published in 1817, refers to a patient who 'fetched his breath rather hard'. Nevertheless, his description does not seem to us to be indicative of stridor.

It occurred to us that the stridor and associated laryngeal spasm might well be comparable to the segmental spasms of the musculature of the proximal portion of the oesophagus which are known to occur in cases of Parkinsonism. This phenomenon has been well described by Penner and Druckerman (1942). These authors have shown that the oesophageal spasm could be sufficient to cause severe dysphagia and that it could be relieved by the administration of atropine. However, in both the cases they describe, gastrostomy was necessary for feeding purposes. In their discussion of this phenomenon these authors refer to evidence in support of their view that the oesophageal spasm is due to basal ganglia disease. First, there is anatomical evidence that the lower motor neurone pathway consists of the nucleus ambiguus and its descending axons in the vagus nerve trunk. The nucleus ambiguus itself, however, appears to be under the control of impulses stemming from a variety of sources including both the cerebral cortex and basal ganglia (Morgan, 1927). In the second place there is physiological evidence which indicates that both these supranuclear pathways are concerned in the central regulation of deglutition, as has been pointed out by Jakob (1923). Furthermore, the latter author has also shown that destruction of the globus pallidus leads to a 'deficit' in both coordinated and so-called succession movements in the oesophagus. Assuming this to be so, then it would not be difficult to accept the view that basal ganglia disease could result in dysphagia as well as Parkinsonism.

By analogy it seems to us that a somewhat similar state of affairs might well prevail in the case of the laryngeal musculature in cases of Parkinsonism, since both the oesophageal and laryngeal musculature come under the influence of the nuclei ambiguus. The probable neural pathway involved would then consist, in the first place, of the nucleus ambiguus in the medulla and its descending axons in the vagus nerve trunk and its recurrent and superior laryngeal nerve branches. Presumably, the basal

ganglia are also concerned in the neural regulation of laryngeal as well as oesophageal function, and it would seem possible, therefore, that disease of these structures might well lead to laryngeal spasm and stridor. Indirect evidence in favour of these theoretical considerations has been provided by Grewel (1957), who, in a study of dysarthria in post-encephalitic Parkinsonism, stated in passing that 'rigidity and celerity with diminished extensivity' of the movements of the vocal cords did occur. In support of this he quotes Cislser's observations (1927) that the mobility of the vocal folds had diminished in half his patients with post-encephalitic Parkinsonism and that the opening of the glottis proceeded slowly. Schilling (1925) further stated that there was a 'rigor' of the vocal cords with dominance of the adductors.

Our findings following the intravenous injection of methyl phenidate in our second patient are fully in accord with observations previously reported by Cole and Glees (1956), by Carter and Maley (1957), and by Halliday and Nathan (1961). We feel, however, that it was particularly significant that both the Parkinsonism and the stridor were simultaneously alleviated, even if only temporarily, and that this effect adds further support to our view that the two phenomena were of common origin in both our cases.

The more recent pharmacological studies performed on our second patient revealed that the intense laryngeal spasm seen earlier was still present and involved both the false and true cords. It was noteworthy, however, that there was only partial abduction of the latter when the patient was either deeply anaesthetized or under the influence of suxamethonium chloride and methyl phenidate during the lighter stages of anaesthesia. This might well be due to shortening as a result of secondary contracture of the cords consequent upon intense, longstanding spasm.

With regard to the question of the underlying pathology, it appears that the previously described respiratory disorders associated with Parkinsonism have only been seen in post-encephalitic cases. In neither of our cases was there a history of antecedent encephalitic illness, although excessive salivation and bilateral extensor plantar responses were observed in our first patient who was only 37 years of age. These features are at least suggestive of a post-encephalitic aetiology. However, there can be no certainty about this in the absence of confirmatory pathological findings. On the other hand, cerebral atheroma could be the pathology in our

second case. Nevertheless, whatever the nature of the underlying pathology in our two cases, we conclude that the Parkinsonism and the laryngeal spasm are both due to basal ganglia involvement.

SUMMARY

Two cases of Parkinsonism associated with laryngeal spasm and stridor have been described.

A review of the literature has not disclosed any previous reference to this association in the absence of a history of a recent attack of encephalitis lethargica.

No evidence has been found which indicated that the stridor might have been due either to cord paralysis and local disease in the larynx or trachea, or to an underlying metabolic disorder.

It is postulated that the mechanism of the stridor consists of recurring spasm of the laryngeal musculature.

A possible neural pathway for the mediation of the spasm has been suggested and it is concluded that both the Parkinsonism and laryngeal spasm can be regarded as the reflection of basal ganglia disease.

We are greatly indebted to our medical and surgical colleagues for their assistance in the investigation and care of our patients. We should particularly like to thank Dr. John Ablett, consultant anaesthetist, and Mr. David Watson, consultant thoracic surgeon.

REFERENCES

- Carter, C. H., and Maley, M. C. (1957). Parenteral use of methylphenidate (Ritalin). *Dis. nerv. Syst.*, **18**, 146-148.
- Cislser, I. (1927). Sur les troubles du langage articulé et de la phonation au cours de l'encéphalite épidémique. *Arch. int. Laryng.*, **6**, 1054-1057.
- Cole, J., and Glees, P. (1956). Ritalin as an antagonist to reserpine in monkeys. *Lancet*, **1**, 338.
- Grewel, F. (1957). Dysarthria in post-encephalitic Parkinsonism. *Acta psychiat. scand.*, **32**, 440-449.
- Halliday, E. M., and Nathan, P. W. (1961). Methyl phenidate in Parkinsonism. *Brit. med. J.*, **1**, 1652-1655.
- Jakob, A. (1923). Die extrapyramidalen Erkrankungen. Mit besonderer Berücksichtigung der pathologischen Anatomie und Histologie und der Pathophysiologie der Bewegungsstörungen. Springer, Berlin. (Heft 37 of Monogr. Geb. Neurol. Psychiat., 1.)
- Morgan, L. O. (1927). The corpus striatum; a study of secondary degenerations following lesions in man and of symptoms and acute degenerations following experimental lesions in cats. *Arch. Neurol. Psychiat. (Chic.)*, **18**, 495-549.
- Parkinson, J. (1817). *An Essay on the Shaking Palsy*. Sherwood, Neely and Jones, London. Reprinted in *Arch. Neurol. Psychiat. (Chic.)*, (1922), **7**, 681-710.
- Penner, A., and Druckerman, L. J. (1942). Segmental spasms of oesophagus and their relation to Parkinsonism. *Amer. J. dig. Dis.*, **9**, 282-287.
- Schilling, R. (1925). Experimentalphonetische Untersuchungen bei Erkrankungen des extrapyramidalen Systems. *Arch. Psychiat. Nervenkr.*, **75**, 419-471.
- Turner, W. A., and Critchley, M. (1925). Respiratory disorders in epidemic encephalitis. *Brain*, **48**, 72-104.