Occasional Review

Long-term recovery from tetanus: a study of 50 survivors

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Summary and conclusions

A follow-up study of 50 patients treated in the tetanus unit of the General Infirmary at Leeds from 1961 to 1977 showed that 29 patients had regained normal health, nine were still improving, but 12 considered that their health had been permanently impaired. In only two of these 12, however, was the deterioration serious and unequivocally linked to their illness and treatment. All but five of those previously working had returned to full employment. Sixteen patients had unpleasant memories of the illness and treatment, 19 had psychological after effects, and one suffered serious damage to mental function. Little evidence was found of pulmonary dysfunction after the disease and its treatment, and, although all the patients showed a tracheal stricture of some degree, few had directly associated disabilities.

The cause of stricture is multifactorial, the surgical technique being only one. A formal surgical closure of the trachea (if a flap has been used) and of the tissues of the neck in layers should lessen residual disability from the scar and strictured areas.

Introduction

The history, management, and complications encountered in a review of the last 100 patients treated in our regional tetanus unit were detailed in a previous paper.¹ Of these patients, 10 were known to have died during treatment, and an attempt was made to contact the survivors. A total of 50 were prepared to complete a questionnaire, and 42 agreed to attend for interview and examination, blood analysis, chest radiography, respiratory function tests, and tracheal tomography.

We were particularly interested to discover what effect the disease and prolonged paralysis (one to eight weeks) and life-support regimen had had on the health and work potential of the patients, and on their psychological and respiratory state.

Return to normal health and work

The patients were asked to assess their own health in terms of general well-being, activity, and capability, both before and after their illness. Out of the 50 patients, 26 reported a return to normal health, nine were still improving, and three (all older men) were convinced that they were in better health after the

episode of tetanus than they were before. Twelve patients however, considered themselves to be permanently disabled in some way.

As outlined previously,¹ the tetanus is classified into four grades, the least severe being an increase in muscle tone managed with sedation alone (grade 1). The moderately severe (grade 2) group have muscle hypertonicity but no severe spasms and can be managed with sedation and a tracheostomy. Both the severe and very severe (grades 3 and 4) forms need paralysis and ventilation, the distinguishing feature of the very severe group being autonomic dysfunction producing cardiovascular instability.

We found the grade 1 group (four patients) to be undamaged. The grade 2 group (two) had mild symptoms related to the tracheostomy site, but their general health was unimpaired. Thirty-six patients with the severe form and eight with the very severe form yielded a total of 12 patients who considered their health to be permanently impaired. The details of their complaints show that, although the tracheostomy had left both scar and stricture, no patient stated them to be the cause of ill-health. One patient was well, apart from the disability of a below-knee amputation, and seven patients appeared to have relatively minor complaints. Of the four remaining, all severely disabled, one, aged 77, has obstructive airways disease which was present before his tetanus and one, whose sciatica was his chief problem, admitted that this began years after his illness. So, out of the 50 patients reviewed, we were able to define only two whose health we considered to be permanently and seriously impaired as a direct result of the disease and its treatment. One of these men had undergone three laparotomies after stercoral perforation of the gut during his attack of tetanus, and still had a discharging sinus in his loin eight years later. The other patient, 12 years old at the time, needed gastrectomy during his illness because of massive haemorrhage due to acute gastric ulceration. He was away from school for a year and subsequently consistently resided at the bottom of the class, whereas before his performance had been average. On examination he was withdrawn, lethargic, and anaemic. He probably suffered a degree of hypoxic cerebral damage during his treatment.

Of the 50 patients, only two had been unable to return to work at all, two more had changed to lighter work, and one had been unable to find a suitable light job. Otherwise all those previously working had returned to full employment (table).

Memories

A total of 39 patients retained some memory of the illness, although 11 had no recollection whatsoever of events connected with their treatment from the moment the first dose of diazepam was given until it was withdrawn. Indeed, one patient remembers nothing of events for two weeks after her discharge from hospital.

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Only in 16 patients were the memories definitely unpleasant. Of these, the most striking was the agonising nature of the tetanic spasms. All the patients who remembered them emphasised how excruciating they were. Six patients remembered vividly their fear on disconnection from the respirator, and in three instances this had been accidental. Ten patients recalled the unpleasant nature of physiotherapy to the chest and tracheal suction; six remembered the discomfort of injections and the nasogastric tube; while six remembered distasteful dreams and hallucinations.

Length of time that 46 patients took to return to work

Severity of tetanus	Work	Return to	School
Grade 1	1-12 (mean 4) weeks	—	—
Grade 2	8 weeks	—	—
Grade 3	1-18 (mean 5) months	2-12 months (7 patients)	—
Grade 4	1-12 (mean 7) months	12 months (1 patient)	—

It is important to remind all staff that the patient, though paralysed and sedated, is probably aware and therefore must be treated as though conscious with careful analgesia and deliberate explanation of all procedures.

Interestingly, despite their recollections of the disease, 12 of the 50 had failed to maintain their immune state, even with careful explanation at the time of discharge that an attack of tetanus does not confer immunity.

Psychological effects

Where possible a relative was questioned separately in addition to the patient. Thirty-one patients were completely free of any psychological after effect.

Depression followed discharge from hospital for 11 patients but all resolved within a year, except for one patient still receiving antidepressants two years after the disease. He was not clinically depressed when seen. Pronounced mood swings were noted in a further seven patients. Four patients complained of loss of powers of memory and concentration, but this did not cause any loss of earning capacity.

Altogether 19 patients had noted some psychological symptoms, but in most cases these had been evanescent.

Pulmonary function tests

Studies were carried out by one technician, who measured the lung volumes, tested the mechanics of forced expiration and inspiration, and measured the transfer factor.

Of 38 patients tested, 28 had normal function. All of these 28 patients were also symptom free, except that six had symptoms referable to the tracheostomy site, such as stridor on exertion and difficulty in clearing phlegm. In eight patients the results suggested obstructive airways disease, mild in seven and severe in one. Four of this group were clinically normal, and four had symptoms of mild bronchitis, one of whom stated his symptoms to be worse since the tetanus. In two patients the transfer factor was low, and while one patient was clinically normal the other had mild bronchitis.

All the patients had a chest radiograph that showed healed scars of atelectasis or infarction in eight, bronchiectatic changes in three, and emphysema in four.

We were unable to establish any direct relation between the pulmonary function tests and the severity of the tetanus, the length of time intubated, or the degree of stenosis of the trachea found on tomography. Given the constant battle against recurrent pulmonary complications during treatment,¹ there was little evidence of significant long-term deterioration of lung function.

Tracheal problems

Two patients had received dilatation for early developing stricture while in hospital, and their symptoms had settled without further treatment. One patient had a fistula open for two years before surgical closure was performed. Otherwise, all the tracheostomy wounds had been allowed to heal spontaneously, and none of the patients had received any treatment for their tracheal symptoms.

There were two groups of symptoms. Firstly, those related to the scar, where nearly half of the patients examined were conscious of the operation site, either because of tethering when swallowing or because of the ugly nature of the scar. In addition, one patient complained of a mucus discharge from the wound continuing for over 12 years. Review of the operation notes showed that the transverse scar healed with less tethering and less cosmetic disability. Only one patient took pains, however, to cover her admittedly very disfiguring wound.

The second group of symptoms clearly related to the stricture. These were stridor in five patients, difficulty in clearing sputum

FIG 1—Stenosis due to constriction at stoma site.

FIG 2—Stenosis from constriction due to cuff.

FIG 3—A pronounced "pouch" in lateral view where flap had been affected in healing of stoma.

in six, and a change of voice in one. We could find no relation, however, between these symptoms and the age at the time of operation, the duration of ventilation, or the results of the respiratory function tests.

Tracheal tomography

We performed tomography of the strictured area and measured the degree of stenosis in the lateral and in the antero-posterior view, taking an average radius for the calculation of the area of trachea at the stricture. This figure we expressed as a percentage of the normal tracheal area separately measured. The results show that all of the patients examined had a stenosis of some degree, varying from 12% to 84% of the normal tracheal area. This conflicts with previous findings.³⁻⁷

It was difficult always to be certain of the site of the stricture relative to the tracheostomy stoma, although the scar was located by a skin marker. Our impression was that almost all stenoses (37) were due to constriction at the site of the stoma (fig 1) and only in three patients was there clearly a stricture due to the cuff (fig 2). In each of these there was also a stricture at the stoma site.

We found that the average area of the strictured trachea was 49% of normal, and in those patients with symptoms referable to the lesion the stenotic area was 40% of normal, whereas in the symptom-free group it was 56% of normal. Therefore, although it was not possible to establish a close relation between the stenosis and functional disability, as reported by some authors,⁸ these figures suggest that symptoms increase with the degree of stenosis, although some patients with pronounced stricture formation had no observable disability. It was revealing to encounter a fit young football-playing dental student who had undergone tracheostomy when 13 years old, and had an average tracheal diameter of only 3 mm at the stenosis (12% of normal). He had no exercise intolerance, and his only symptom was some stridor, accompanied by a remarkable whistling sound, which instantly located him on the field of play. He had a mildly increased residual volume measurement, and his distal tracheal diameter was larger than that proximal to the stenosis.

It was not possible to relate the degree of stenosis to the method of tracheostomy used. Of recent years in this hospital a flap has been used, but several patients had developed a pronounced "pouch" in the lateral view where the flap had been involved in the healing of the stoma (fig 3). One patient volun-

teered that he had to put his finger over the stoma when coughing to raise sputum, and the pouch appeared to be behaving like a hernia.

The cause of stricture is multifactorial.⁴⁻⁹ Of the many reasons given, the surgical technique is only one. Infection, the size of the tube, the movement of the tube due to the ventilator, the changing of position of the patient, the inflation of the cuff, the duration of the cannulation, have all been incriminated, and all probably contribute. We gained the impression that our results are improving slightly but this may be due to improved equipment and nursing care as much as to improved surgical technique.

It seems that too little attention has been given to the closure of the tracheostomy stoma, and it would appear that a formal surgical closure of the trachea (if a flap has been used) and of the tissues of the neck in layers should lessen residual disability from the scar and from the strictured area.

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