

An Outbreak of Cerebrospinal Fever in a 19th Century British Mediterranean Naval Base

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SUMMARY: Epidemic Meningococcal meningitis first made its definite appearance in Europe in the beginning of the nineteenth century. The first recorded epidemic in the Maltese Islands, which straddled the sea-routes of the Mediterranean, occurred in the late nineteenth century. This paper describes a manuscript report prepared at the request of the Lieutenant Governor regarding this epidemic in the light of the contemporary knowledge about the infection.

Introduction

Meningococcal meningitis, previously referred to as Cerebrospinal Fever, was recognised as a serious menace to health at the beginning of the nineteenth century, and it is possible that epidemic meningococcal disease is a relatively new condition. Cerebrospinal fever was first recorded as an epidemic in Geneva by G Vieusseux in 1805, and in the following year was reported from Medfield, Massachusetts by Danielson and Mann. During 1806-07 it attacked the Prussian Army. A classic treatise is that published in New York by Elisha North in 1811, wherein he referred to the disease as "spotted fever". This description may have in fact contributed to this disease being confused with petechial typhus, a confusion that hampered further progress until the mid-nineteenth century. It is possible that epidemic meningococcal disease is a relatively new condition since, because of the characteristic features of the disease, it seems unlikely that epidemics would have remained unreported had they occurred at an earlier date. However D J Plazak has found a report indicating that an epidemic of meningitis may have affected the Sault Ste. Marie Indians of Michigan as far back as 1670 (1). The disease made its appearance in North Africa in 1840 as an epidemic among French troops stationed in Algeria. Other reports came from southern Italy, Denmark, Ireland, Germany and the USA. Reports of the disease emanated from Sweden, Germany and Russia in the 1860s and 1870s. The disease was particularly virulent during the American Civil War (1861-1877), while other epidemics were reported from Asia and Africa (1). It appears that the disease has, in fact, shown a gradual increase, both in its geographical range and in the number of persons it attacked. From 1805 to 1830 the disease was most prevalent in the United States; from 1837 to 1850 France was attacked most severely; from 1854 to 1874 epidemics occurred both in Europe and in America; and from 1875 onwards not only these two continents but Asia, Africa and Australia had been invaded (2).

By 1886 it was known that meningitis might be caused by an organism indistinguishable from the pneumococcus.

The causative organism for meningococcal meningitis was identified as *Neisseria meningitides* by A Weichselbaum of Vienna in 1887. Weichselbaum reported finding in six post-mortem cases "*an entirely different kind of bacteria*". In stained films of meningitic exudate and ventricular fluid he found a moderate number of cocci which "*remind one of gonococci*". He cultivated the organism on nutrient agar, confirmed that large doses could kill experimental animals, and identified the staining properties of the organism. He named the cocci "*Diplococcus intracellular meningitidis*" (3). Weichselbaum's findings were not confirmed until 1895 when Jager reported the presence of similar diplococci in twelve cases of epidemic meningitis in Stuttgart. Thus it was only by 1896 that the basic facts relating to the bacteriology of meningitis were accepted, though there was still considerable obscurity concerning the epidemiology of the disease. This was rectified in 1898 when W J Councilman, F B Mallory and J H Wright published their investigation of the 1896-97 meningitis outbreak in Boston (4). Their monograph gives a full and excellent account of the epidemiology, clinical features, morbid anatomy and bacteriology of the disease. Little was added to their contribution until the studies undertaken during the First World War (5).

Meningococcal meningitis is now known to be caused by *Neisseria meningitidis* of groups, A, B, C, D, X, Y, Z, W135 and 29E, of which A and B are the commonest. The meningococcus lives as a parasite in the nasopharynx and in non-epidemic times the meningococcus is present in 2-8 percent of healthy civilians. Relatively few develop disease. The carrier rate increases tenfold prior to an epidemic. Infection is transmitted by droplets, and many factors probably play a role in determining clinical illness, including prior immunity, physical stress, and immediately antecedent viral infections. The development of meningococcal disease is favoured by complement deficiencies especially C7-C9. Disease caused by the meningococcus ranges from an inapparent infection of the nasopharynx to the fulminating Waterhouse-Friderichsen syndrome characterized by circulatory shock and collapse proving fatal within a few hours. In between come a

number of different clinical manifestations, the commonest being an acute purulent meningitis (2).

History of Disease in Maltese Islands

The first mention of Cerebrospinal fever on the Maltese Islands, situated in the central Mediterranean, dates to the year 1887 when a number of cases and deaths were reported and attracted the attention of local medical men and the local administrative authorities. About that year, the disease was epidemic in almost all the countries bordering on, and in the islands of the Mediterranean, and the infection was no doubt imported from one or other of the affected places (6). The fortnightly reports on the "Statement of Mortality in Malta and Gozo for 1887", indicate that four deaths attributed to cerebrospinal fever occurred in the rural village of Sannat in Gozo during the period from 1 March to 15 May (Table 1). No further details about this epidemic can be obtained from published sources, however, a detailed description of the outbreak identified as one of "Cerebro Spinal Meningitis" can be found in one of the correspondence books for Victoria Hospital in Gozo (8). The report, dated 31 May 1887 and about eight and a half pages long, was prepared at the verbal request of the Lieutenant Governor by Dr B Mercieca, Medical Superintendent for Victoria Hospital, and addressed to Mr P Trapani, Assistant Secretary to Government in Gozo. Dr Mercieca was assisted in the preparation of the report by Drs G Debono and N Tabone, Professors G O Galea and S L Pisani, and the Army Surgeons Drs Reed and Coats. The outbreak as described in the report made its appearance in February and affected at least seven individuals of the same family, of whom only the youngest two survived (Table 1).

The report starts by attempting to identify the aetiology of the disease, however Dr Mercieca reported that "As it is the case with other countries, no satisfactory result whatever has been arrived at in Gozo, as to the cause of the disease. The spot where the cases broke out was inspected; the food and water used by the patients was examined, as also their external relations etc but all to no avail. When the disease broke out the general state of health in the island was very good: and no epidemic prevailed at the time". While postmortems had been

performed as part of the investigation of the outbreak, the report fails to mention any microscopic studies on the cerebral exudate (8). The first experiments with the microscope in Malta were recorded by G Gulia, Professor of Legal Medicine in 1871, though microscopic examination of organs removed at autopsy was carried out at the Military General Hospital in 1860 and probably earlier (9, 10). By 1887 bacteriology on the Maltese Islands was a well established branch of medical investigation. In 1887 Dr David Bruce and Dr G Caruana Scicluna prepared paraffin section of spleen tissue from soldiers dying from Malta Fever and identified the *Brucella melitensis* organism. In the same year the same workers confirmed the association of Koch's comma spirillum with cholera (11, 12). While microscopy studies were common in the main island Malta, the investigative procedure was however unlikely to have been available for use in the study of the 1887 outbreak in smaller island of Gozo since the hospital there was a peripheral one.

The outbreak, as described, was one of a severe nature with evident signs of meningitis. The progress of the disease was described "under two forms: vir - one acute or fulminant - (Meningite foudroyante Niemeyer), and the other intermittent (Niemeyer) and of long duration". The characteristic features of the illness appeared to be fever, chills, headaches, neck pain, nausea and vomiting. The convulsions which occurred resulted in nuchal and back rigidity, with unconsciousness and death ensuing. One chronic patient developed an ophthalmic complication in that "her eyeballs became much ignited, symptoms came in; suppuration followed, which ended in the total destruction of the eye-balls and complete blindness". At postmortem, large haemorrhagic spots were noted, while dissection of the cerebral structure showed hyperaemia, an adherent opaque arachnoid membrane, and exudation in the subarachnoid space with haemorrhages in the cerebral convolutions (8). The clinical and pathological features fit in with those described for meningococcal meningitis (2). Dr Mercieca and his helpers appear to have been familiar with the literature relating to the disease, while the Army surgeons Drs Reed and Coats were further familiar with the disease because of their previous experience in the epidemic occurring in Dublin (Ireland) (8). The description uses the same classification as that given in the reports of J Burdon-Sanderson published by the New Sydenham Society (13). Copies of the said Society's publications are in the holding of the Malta Medical School Library, while D Bruce seems to have derived his knowledge of bacteriology techniques from the New Sydenham Society 1886 publication *Microparasites in Disease* which consisted of English translations on many papers by Koch and his pupils (5).

The treatment used in the 1887 Gozo epidemic followed the suggested modalities in the literature being "generally reconstituent and sedative - Broth, Beef-tea & Portwine were given in large scale. At the outbreak of the disease, aperients and cold lotions on the head were

Table 1
1887 Gozo Epidemic - Case (7,8)

Clinical Type	Fortnightly Mortality Reports			Manuscript Report		
	Sex	Age	Date of death	Sex	Age	Date of death
1. Acute	M	25-35	1-15/3/1887	Three died of the disease		
2. Acute	F	15-20	1-15/3/1887	under this form and their		
3. Acute	?	?	?	ages were between 18 and 27		
4. Chronic	F	25-35	1-15/4/1887	F	22	4/4/1887
5. Chronic	F	45-55	1-15/5/1887	F	?	7/5/1887
6. Chronic	?	?	?	?	8	survived
7. Chronic	?	?	?	?	13	survived

prescribed. Afterwards sedatives such as opium and chloral hydrate, but the best results were attained through hypodermic injection of morphia". In spite of the efforts of the medical practitioners, the mortality rate reached 71% (8). The contemporary literature reported the narcotics to be the most effective therapy, though in New York potassium bromide was favoured. The prognosis of the disease was reported to be generally bad with a mortality of 20-40% (13, 14).

The 1887 Gozo outbreak of Cerebrospinal meningitis appears to have been considered an isolated occurrence by subsequent health authorities, since until 1916 no cases of the disease were further reported among the local population, the one or two cases reported being actually imported or occurring among the military servicemen (6). The first significant outbreak in Malta of cerebrospinal meningitis confirmed by bacteriological studies occurred in March 1916. This outbreak started in the residences of two Malta Militia privates spreading to the population affecting 12 individuals with three deaths. Other non-typical cases may have occurred but were not diagnosed as such. The 1916 outbreak was confined to five villages in Malta - Naxxar, Zabbar, Zejtun, Tarxien, and Ghaxaq - by isolation of patients and contacts, the disinfection of clothes, bedding and houses, and house to house inspections in the affected regions to ensure a standard of hygiene (6, 15). After this outbreak, meningococcal meningitis appears to have become endemic with cases being reported in the civilian population nearly every year (Fig 1).

Discussion

The relatively late introduction of endemic Cerebrospinal meningitis to the Maltese Islands is surprising in view of the special situation of the islands throughout the nineteenth century. Situated in the Central Mediterranean, the Islands straddled the sea-routes. Seaborne trade had grown rapidly in Malta from the early 1850's as the general tempo of Mediterranean commerce had amplified. The Peninsula and Orient Line, for

Incidence per 100,000 pop.

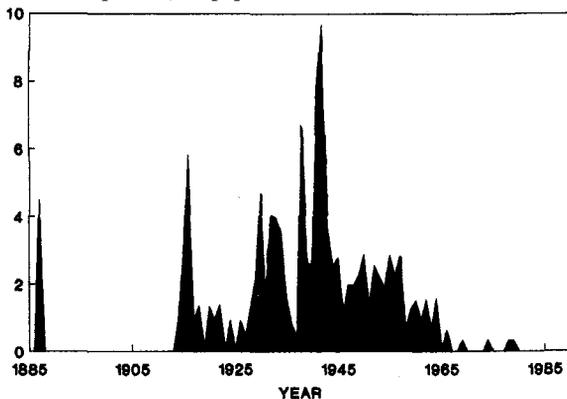


Fig 1: Incidence: Cerebrospinal Fever

example, carried increasing quantities of traffic through the Mediterranean and in 1858 the company opened a railway route which linked Alexandria to the Suez, thus facilitating the transport of goods and passengers across the neck of land which separated the Mediterranean from the Red Sea. The Suez Canal, which came in operation in 1869, further strengthened this link. After 1869 there was a rapid rise in the number of ships calling at the Grand Harbour, and in 1880 Malta was firmly established as the chief coaling station for vessels plying between Britain, India and the East (16). In addition, contacts were maintained by the civilian population with North Africa since emigrating Maltese went principally to these lands. By the end of the nineteenth century there were well over 50,000 Maltese living around the shores of the Mediterranean, particularly in Algeria, Tunis, Tripoli and Egypt (16). Cerebrospinal meningitis was eventually introduced to become an endemic disease in the early twentieth century. It was not the only disease which was introduced to the Islands. The continued naval and military contact allowed the introduction of a number of epidemic infections to the Islands, which however were controlled. Typhus, introduced to the Islands on a number of occasions in the late nineteenth and early twentieth century, eventually became endemic after the 1944 epidemic (17).

The risk of introduction of epidemic infections to the Maltese Islands required the British Naval, Military and Civil authorities to undertake rigorous efforts to control and manage infectious disease. The 1887 Report reflects the active investigative efforts which were made whenever an epidemic threatened the population and the British garrison. The investigation was initiated by the Lieutenant Governor who was responsible to the Colonial Office for the administration of Gozo. The British Admiralty nominated two commissioned officers of the British Medical Service - Drs Reed and Coats - both of whom had previous experience with the disease in a previous epidemic in Dublin (8). The only medical officer with the surname Coats who held a commission with the British Army at the end of the nineteenth century was a James Coats who was born on 24 July 1848 and qualified MD with honours from Glasgow in 1869. He was appointed Staff Assistant Surgeon on 1 April 1871, becoming Surgeon-Major on 1 April 1883, and Surgeon-Lieutenant-Colonel on 1 April 1891. He was put on retired pay on 15 April 1896, during which time he was employed at Ayr until 5 July 1909. There appears to be no medical officer by the name of Reed commissioned with the British Medical Service during the period, though a number of officers with the surname of Reade and Reid have been listed (18).

The Civil Government was represented by five doctors. Dr B Mercieca, the author of the report, was the Medical Superintendent to Victoria Hospital in Gozo, Dr N Tabone was the Resident Medical Officer to the Hospital eventually becoming Medical Superintendent, while Dr G

Debono was the District Medical Officer for the capital city of Gozo. These doctors were helped in their investigation by two Professors of the University of Malta. G O Galea was the Professor of Medicine of the University, while Professor S L Pisani was at the time of the investigation the Chief Government Medical Officer, Pisani was born on 27 May 1828 and qualified from the University of Malta in 1850 and from the Edinburgh Medical School in 1853. He volunteered to serve as a surgeon with the British Army in the Crimean War, returning to Malta in 1855. He was appointed professor by the University of Malta to the Chair of Anatomy and Histology (1858-76), of Midwifery and Gynaecology (1858-69) and of Surgery (1869-85). In 1885 he was appointed to the post of Chief Government Medical Officer, a post he retained until 1902. His publications include an exhaustive report on the cholera epidemic of 1887 which reports the isolation of the bacillus by Dr J Caruana Scicluna and D Bruce (8, 19).

The necessity of controlling infective disease, particularly whenever epidemics threatened or broke out among the local population, resulted in a continuous drive in the late nineteenth century to understand the aetiology and clinical course of infective disease. This resulted in investigations of endemic infectious disease such as Malta Fever and Kala Azar, and epidemic outbreaks of Cholera (1887) when D Bruce and J Caruana Scicluna confirmed the association of Koch's comma spirillum with cholera, and the typhoid epidemic (1892) when Dr M L Hughes demonstrated the typhoid bacillus in all the fatal cases of the disease (10, 11, 12). The interest of the British administrators was primarily financial as evident by the attitude reported towards Malta Fever. "This fever was seriously undermining the strength of the twenty-five thousand soldiers and sailors of the Mediterranean. In fact, in 1891, it was calculated that the Malta garrison was costing the State, on account of the disease alone, an expense equal to that of a whole regiment one thousand strong in hospital for twenty-five days" (20).

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