

A retrospective survey of the complications of mumps

From the Association for the Study of Infectious Disease

SUMMARY A retrospective survey is described of 2,482 cases of mumps (1,513 males and 969 females) treated in a number of infectious disease units in England and Wales. About half the patients were under 15 years of age. Complications were recorded in 42 per cent of all cases (53 per cent of males and 25 per cent of females), the commonest complication in both sexes being involvement of the central nervous system. Three patients died, but in two of these there was serious underlying illness unrelated to mumps and in the remaining case a review of the records suggests, in retrospect, some doubt about the diagnosis of mumps. Deafness due to involvement of the eighth cranial nerve was the only permanent sequel recorded and occurred in five patients.

From the results of this survey it is concluded that there is little need for general vaccination against mumps, although there might be an indication for vaccinating certain groups of the male population.

Introduction

Mumps is usually regarded as a relatively mild disease which does not often cause serious complications or permanent sequelae. For this reason little interest has hitherto been taken in its prevention, but the advent of an effective live attenuated mumps virus vaccine in the U.S.A. (Hilleman *et al.*, 1967) has prompted a review of the disease to assess the need for such a vaccine and its probable use in any future vaccination programme.

Mumps is not notifiable in England and Wales, hence there is no precise information as to its incidence. However, it is likely that most serious cases or cases with complications will be admitted to hospitals dealing with communicable diseases, and it was considered that a valid appreciation of important manifestations or complications of mumps might be obtained from a retrospective analysis of cases of mumps admitted to such hospitals in various parts of the country.

Plan of survey

Through the Association for the Study of Infectious Disease 16 infectious disease units agreed to participate in a retrospective survey covering the years from 1958–69. The hospitals concerned were sited as follows: seven in London and one each in Oxford, Cambridge, Weymouth, Taunton, Sheffield, Coventry, Swansea, Maidenhead, and Liverpool.

Each hospital was asked to complete a form giving the patient's age, sex, date of admission and discharge, manifestations or complications of mumps, particularly salivary gland involvement, orchitis, meningitis, encephalitis, deafness and sequelae on discharge or later. When meningitis, encephalitis or deafness were reported the hospital index number was noted in case further enquiries were necessary.

Results

The information on completed forms was analysed by the Statistics and Research Branch of the Department of Health and Social Security. Where doubt was expressed about the presence of a complication it was assumed that none existed. In the tables each patient is listed once only and multiple complications are indicated by a special subdivision.

A total of 2,482 patients was reviewed (1,513 males and 969 females). The findings are summarised in table 1. About half the patients were children under 15 years of age, the age groups 5–14 years being predominantly involved. Complications were recorded in 42 per cent of all patients, the proportion being higher in males than in females; 53 per cent of males showed one or more complication (31 per cent if orchitis is excluded), compared with 25 per cent females.

CNS complications

The most commonly noted complications of mumps involved the central nervous system in both males and females. Usually this was meningitis or more rarely encephalitis or meningoencep-

TABLE 1
 CASES OF MUMPS ADMITTED TO 16 INFECTIOUS DISEASES HOSPITALS 1958-69 SHOWING TYPES OF COMPLICATION IN EACH AGE GROUP

Age in years	0-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	11-14	15-19	20-24	25-29	30-34	35-39	40-49	50-59	60+	Total
<i>Males—all cases</i>	39	87	73	93	138	117	67	44	40	25	54	108	211	133	123	76	68	12	5	1513
Uncomplicated cases	28	67	56	66	77	63	31	18	25	17	25	44	87	40	27	20	15	6	2	714
Meningitis	4	11	7	12	42	35	28	18	11	6	12	12	15	12	6	7	2	1	—	241
Encephalitis	1	—	2	3	1	3	4	2	—	1	2	—	3	2	2	—	1	—	—	27
Meningitis and encephalitis	—	3	—	5	7	4	2	2	1	1	2	1	4	—	4	—	1	—	—	37
Orchitis	2	—	1	—	—	—	—	—	—	—	9	38	80	62	54	42	38	5	2	333
Orchitis with meningitis or encephalitis	—	—	—	—	—	—	—	—	—	—	2	9	15	13	18	5	8	—	—	71
Pancreatitis	—	1	2	—	4	7	2	4	2	—	2	1	6	4	8	2	1	—	—	47
Other complications	4	5	5	7	7	5	—	—	—	—	—	3	1	—	4	—	2	—	—	43
<i>Females—all cases</i>	27	53	36	46	76	60	50	27	19	19	42	113	170	93	62	38	20	11	7	969
Uncomplicated cases	20	44	28	37	54	49	36	16	15	11	25	101	139	65	41	18	15	9	4	727
Meningitis	4	2	2	3	10	5	9	7	3	6	7	5	17	16	13	8	2	2	—	121
Encephalitis	1	3	—	1	2	2	1	1	—	—	1	3	2	4	1	5	—	—	—	27
Meningitis and encephalitis	—	1	1	3	1	3	1	—	—	1	1	1	2	5	2	3	1	—	—	26
Oophoritis	—	—	—	—	—	—	—	—	—	—	1	—	2	—	1	—	1	—	—	5
Pancreatitis	—	—	—	1	2	1	2	2	1	1	3	1	3	3	3	3	1	—	1	28
Other complications	2	3	5	1	7	—	1	1	—	—	4	2	5	—	1	1	—	—	2	35
Total cases of mumps	66	140	109	139	214	177	117	71	59	44	96	221	381	226	185	114	88	23	12	2482

halitis. Males were more often affected than females (25 per cent and 18 per cent respectively). The incidence was highest in the 5-14 age groups, although in females the incidence was equally high in patients aged 25 years and over. The proportion of cases of encephalitis or meningo-encephalitis reported varied considerably between hospitals. Most patients appeared to recover completely.

TABLE 2
RETROSPECTIVE ANALYSIS OF CASES OF MUMPS MENINGITIS AND ENCEPHALITIS
ADMITTED TO INFECTIOUS DISEASES HOSPITALS 1958-69

	Sex	Age in years				
		0-4	5-14	15-24	25+	All ages
Meningitis	M	34	154	45	58	291
	F	11	47	22	41	121
Encephalitis	M	6	14	5	14	39
	F	5	7	5	10	27
Meningitis & Encephalitis	M	8	19	9	10	46
	F	5	7	3	11	26
Total cases		69	248	89	144	550

Involvement of the eighth cranial nerve was recorded in five patients causing deafness which appeared to be permanent although long-term follow-up examinations were not always undertaken.

Orchitis

Next to CNS involvement, orchitis was the most frequently noted complication of mumps, being reported in 27 per cent of males. There were no recorded sequelae.

Other reported complications or manifestations included pancreatitis (75 cases), oophoritis (five cases), hepatitis (one case), myocarditis (one case), thyroiditis (one case) and thrombophlebitis (one case).

Deaths

Three patients died. In two of these there was serious underlying disease and mumps may have been unrelated to the cause of death. The remaining patient, however, was a healthy well-nourished boy, aged 20 months, who was admitted to hospital with a provisional diagnosis of mumps and a suspected throat infection of two days duration. The family doctor had treated him with oral penicillin. On admission there was an erythematous rash on the upper arms and on both legs a purpuric rash which was considered to be probably due to penicillin allergy. His temperature was 38.3° Celsius (101° F) and during the course of the next two days varied between 37.2-39.4° Celsius (99° F-103° F). The pulse rate varied around 130 per minute, the highest rate recorded being 152 per minute. The respiration rate increased progressively rising to 48 per minute just before death which came suddenly and unexpectedly on the third day after admission. At necropsy yellowish brown areas, about one centimetre in diameter, were noted on the shoulders and upper arms. Purpura was not seen on the legs but there were a few small haemorrhages in the skin over the abdomen. The heart was dilated and there was pericardial effusion. The pulmonary artery contained a firm blood clot which appeared to have formed ante-mortem, but its site of origin could not be established. There was some parotid enlargement and also evidence of patchy, purulent, bronchitis. No other abnormality was noted. In retrospect the diagnosis of mumps must be doubted in this patient.

Discussion

With lack of precise information of the incidence and severity of mumps it is difficult to evaluate the possible need for a vaccine. Experience in the United States of America suggests that over 90

per cent of children have had mumps by the time they reach the age of 14 years, more than half the cases occurring in the age group five to nine (Witte and Karchmar, 1968). Mumps virus can affect many organs in the body including rarely the kidneys (Dastur, 1968), but there seems to be general agreement that the most frequent complications are those involving the central nervous system. (Azimi *et al.*, 1969). There are conflicting opinions as to the frequency of CNS involvement in mumps. In one study where routine examination of the cerebrospinal fluid was done on all patients suffering from mumps parotitis, CSF pleocytosis was found in 56 per cent of patients although more than half of these had no clinical evidence of meningo-encephalitis (Bang and Bang, 1943). Other authors consider that meningeal involvement is so frequently associated with mumps virus infection that it should no longer be regarded as a complication but rather as an integral part of the disease (Radl, 1969). Whether meningitis is regarded as part of the mumps syndrome or as a complication there seems to be a general consensus that it is a benign condition rarely giving rise to sequelae (Miller *et al.*, 1956) which is in keeping with the results of this survey.

Encephalitis is encountered much more rarely but may give rise to persistent sequelae. It is generally recognised that encephalitis associated with mumps is much less common than that associated with either measles or chickenpox. The diagnosis of encephalitis is often a matter of clinical judgment which probably accounts for the variation in the proportion of cases reported from different hospitals in this series.

Four of the five cases of deafness in this series were in adults. It is possible that in young children deafness in association with mumps may be overlooked at the time of the illness and only discovered at a later date when the relationship with mumps may be difficult to establish. This may indicate the need for a prospective study in children to ascertain whether mumps is a more common cause of deafness than has hitherto been recognised.

The 16 hospitals which participated in the survey embraced many of the major infectious diseases units in the country, and the cases admitted to these hospitals can be regarded as representing not only urban and rural areas of the country as a whole, but also a large proportion of cases of mumps requiring treatment in hospital. The fact that, out of a total of 2,482 patients with mumps admitted to these hospitals over a period of years, there were only three deaths (in two of which there were other associated factors) and five cases with persistent sequelae amply confirm the essentially benign nature of the disease.

Perhaps the single complication of mumps which gives rise to more anxiety than all others, and concerning which there is intense controversy, is orchitis. There appears to be an almost universal dread among males of the possibility of sterility following mumps orchitis, particularly bilateral orchitis. It has been estimated that 15–25 per cent of men contracting mumps develop orchitis and in about 10–20 per cent of these it is bilateral and so may lead to sterility (Penttinen *et al.*, 1968). In a relatively limited retrospective study evidence of sterility following mumps orchitis was not found (McKendrick and Nishtar, 1966). No attempt was made in the present survey to follow-up patients with orchitis in order to assess the possibility of sterility. The practical difficulties associated with such a study are formidable and, on the evidence at present available, it seems probable that the likelihood of sterility after mumps orchitis has been overstressed although, clearly, the possibility cannot be entirely discounted and will need to be borne in mind when the possible use of mumps vaccine is being considered.

Conclusions

This retrospective survey of 2,482 cases of mumps admitted to 16 infectious diseases units throughout the country was undertaken with a view to providing the answer to three questions:

- (a) What is the risk of serious or permanent sequelae following mumps?
- (b) Is there need for a mumps vaccine and, if so,
- (c) How could it best be used?

The survey has shown that mumps is a relatively benign disease. There were three deaths but in two of these other serious conditions were present and in the remaining patient some doubt must, in retrospect, be entertained about the validity of the diagnosis of mumps. Central nervous system involvement was common, but in only five patients was there evidence of persistent sequelae. The survey confirmed that mumps orchitis is common in postpubertal males, but provided no information as to the likelihood of consequent sterility.

It seems clear from the results of this survey that there is little need for general vaccination

against mumps, although there might be an indication for vaccinating certain groups of the male population. Such groups might include postpubertal boys before admission to residential institutions, including boarding schools, and male recruits to the services. It should be borne in mind that serological studies have shown that 90 per cent of boys aged 14 years and over have already been infected with mumps; consequently there may be a case for preliminary antibody screening and only those males in the above groups who are found to be seronegative need be vaccinated.

Acknowledgements

Information was obtained from physicians at the following hospitals: Brookfields Hospital, Cambridge; Coppetts Wood Hospital, London; Eastern Hospital, London; Fazakerley Hospital, Liverpool; Hill House Hospital, Swansea; Hither Green Hospital, London; Lodge Moor Hospital, Sheffield; Maidenhead Isolation Hospital; Neasden Hospital, London; The Royal Free Hospital, London; Slade Hospital, Oxford; St. George's Hospital, London; South Middlesex Hospital, Middlesex; The Taunton Chest and Isolation Hospital; West Haven Hospital, Weymouth; Whitley Hospital, Coventry.

The recorders were E. H. Brown and W. H. Dunnett of the Association.

REFERENCES

- Azimi, P. H., Cramblett, H. G. & Haynes, R. E. (1969). *Journal of the American Medical Association*, **207**, 509-512.
- Bang, H. O. & Bang, J. (1943). *Acta Medica Scandinavica*, **113**, 487-505.
- Dastur, F. (1968). *Practitioner*, **201**, 796-797.
- Hilleman, M. R., Weibel, R. E. & Buynak, E. B. (1967). *New England Journal of Medicine*, **276**, 252-258.
- McKendrick, G. D. & Nishtar, T. (1966). *Public Health*, **80**, 277-278.
- Miller, H. G., Stanton, J. B. & Gibbons, J. L. (1956). *Quarterly Journal of Medicine*, **25**, 427.
- Penttinen, K., Weibel, R. E. & Buynak, E. B. (1968). *American Journal of Epidemiology*, **88**, 234-244.
- Radl, H. (1969). *Deutsche Medizinische Wochenschrift*, **94**, 1599-1603.
- Witte, J. J. & Karchmer, A. W. (1968). *Public Health Reports*, **83**, 95-100.

CHARTERHOUSE RHEUMATISM CLINIC

(founded 1928)

56-60 Weymouth Street, London, WIN 4DX. Telephone 01-935-1264

President: H.R.H. Princess Alice, Duchess of Gloucester, *CI, GCVO, GBE*

The Charterhouse Rheumatism Clinic is a medical unit wholly devoted to the diagnosis and treatment of the chronic rheumatic disorders. It is a registered Charity outside the National Health Service.

A complete service is housed in one building including radiological and pathological facilities and a comprehensive physiotherapy department. The X-ray equipment was completely modernised in 1973.

No new patient can be seen without a written introduction from his or her general practitioner.

Every patient is given an appointment and remains under the care of the same physician throughout.

Standard charges are made but these can be considerably reduced for patients of limited means according to their circumstances.