

A CLINICAL STUDY OF EPIDEMIC PAROTITIS (MUMPS) AS SEEN IN A GENERAL PRACTICE

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SYNOPSIS

This paper deals with the natural history, epidemiology, clinical presentation and complications of epidemic parotitis as seen in a representative family practice in Singapore. Particular emphasis is placed on the natural history and morbidity, treatment and prophylaxis of the disease.

INTRODUCTION

General

The general practice from which these cases are taken from consists of approximately

(a) adult medicine	35%
(b) paediatrics	30%
(c) surgery	15%
(d) obstetrics and gynaecology	10%
(e) other minor specialities	10%

The practice, essentially a family medical practice, has been in existence for 18 years and the number of registered patients is about 40,000. However, this does not include the casuals and the irregulars who occasionally drop in for treatment.

Historical

Mumps is an acute contagious generalized viral disease, in which painful enlargement of the salivary glands, mainly the parotids, is commonly the usual presenting sign. Hypocrates recognised this disease and its complication of orchitis as early as the fifth century B.C. In 1790 Hamilton observed orchitis as well as the involvement of the central nervous system in certain patients.

The viral origin was firmly established by Johnson and Goodpasture in 1934. In the present century the fact that other organs e.g. the pancreas, the gonads, the brain, the throat, heart and the kidneys, can also be infected, has been recognised.

Local

It is generally accepted that mumps is a disease without severe complications and does not require institutional treatment. Therefore the whole spectrum of the disease,—epidemic parotitis is largely seen in the private sector. The indigenous

people as a rule do not seek Western medical aid, but apply a blue dye (indigo) over any swelling appearing in the parotid region. However, the more educated and enlightened and especially those with severe symptoms, do seek medical aid.

MATERIAL AND METHODS

In 18 years of practice it was noted that mumps occurred with a periodicity, particularly in the hotter months of the year (May-July). This was in contrast to its occurrence in the temperate zones where the epidemics are more frequent in late winter and early spring. Therefore a clinical study was undertaken to ascertain and determine the natural history and clinical pattern as it occurs in general practice as distinct from an institutional practice which would include the more severe presentations and complications of mumps.

Out of 9,410 cases seen during the months of May-July 1975, all patients presenting with frank clinical signs of mumps as well as suspicious signs were included in the study. In the final analysis there were only 27 definite cases of epidemic parotitis. These are tabulated and reviewed.

Sex and Age Distribution

There were 11 female patients and 16 male patients. This represented a female to male ratio of 1 is to 1.45. There were slightly less female than male patients. Table I denotes the age distribution. The commonest age group was between 3 to 10 years, the next commonest being between 10 to 20 years. The youngest patient was 2½ years old and the oldest 38 years old.

SIGNS AND SYMPTOMS

(a) *Swelling* of the parotid glands was found in all patients (100%). Sixteen patients had unilateral swelling and 11 bilateral. Three patients who had unilateral enlargement eventually developed swelling of the corresponding opposite salivary gland. The swelling in most cases

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TABLE I
AGE DISTRIBUTION

Age Group (Yrs)	Under 3	Years 3-10	Years 10-20	Above 20
No. of Patients	1	14	8	4
% No. of Patients	3.7%	51.9%	29.6%	14.8%

TABLE II
SYMPTOMS

SYMPTOMS	NO. OF CASES	% OF TOTAL
FEVER	22	80%
PAIN	17	60%
ACUTE PAIN	5	18%
SORE THROAT (DYSPHAGIA)	14	50%
MALAISE	6	22%
NAUSEA/VOMITING	5	18%

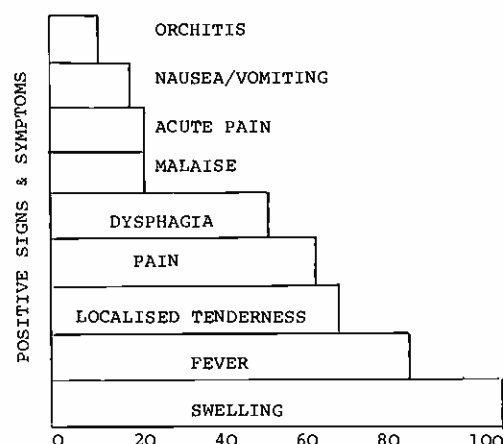
TABLE III
SIGNS

SIGNS	NO. OF CASES	% OF TOTAL
UNILATERAL SWELLING	16	60%
BILATERAL SWELLING	11	40%
LOCALISED TENDERNESS	18	64%
ORCHITIS	1	5%

appeared fairly rapidly, usually in one gland, reaching its maximum size in 1-3 days.

- (b) *Fever*—Twenty-one cases (80%) had fever. This was usually in the region of 37.2°C (99°F) to 38.8°C (102°F). The fever occurred almost simultaneously with the swelling of the gland, but there was no correlation between the extent of the swelling and degree of fever. Eight cases showed a leucopenia with relative lymphocytosis, 5 cases had a polymorphonuclear leucocytosis with a shift to the left, the other cases refused a blood test.
- (c) *Localised tenderness*—The swelling over the parotid gland is usually tender and painful, especially behind the ear lobe. However in this series, only 18 cases (64%) were tender on palpation.

TABLE IV



- (d) *Pain*—Seventeen patients (60%) complained of pain in the swollen glands,—five (18%) of whom complained of acute pain, while fourteen cases (50%) complained of difficulty in swallowing and sore-throat.
- (e) *Malaise and body pains*—About a quarter (25%) of the number of patients seen complained of malaise and body pains.
- (f) *Nausea and vomiting*—About 5% of the cases complained of nausea or vomiting and required symptomatic treatment.
- (g) *Complications*—Only one case in the series developed a complication of note. He was a male Chinese aged 38 (the oldest in the series) who was employed as a supervisor on board an oil rig. He had continued working in spite of his mumps parotitis. The swelling of his left testicle developed about 8 days after the onset of his parotitis. He came for treatment on the 9th day as he had developed fever, rigors and pain in his left testicle. The signs and symptoms settled after 5 days.

DISCUSSION

Mumps is a disease caused by myxovirus parotitis and belongs to the same family as the influenza viruses. Although it is a contagious disease, not all susceptible persons develop mumps, because the virus does not appear to be highly communicable. It is readily isolated from the saliva of patients with parotitis and from the cerebrospinal fluid of patients with meningoencephalitis. It produces interferon, haemolysin, haemagglutinin and complement fixing (C.F.) antigens. The C.F. antigens are of two types: a smaller, non-infectious,

soluble (S) antigen and a larger viral (V) antigen which is the viral particle.

Epidemiology—Although the myxoviruses is endemic in most urban areas, epidemics occur at irregular intervals and do not follow any cyclic pattern. However in our population in Singapore they occur more frequently in the hotter months (May-July) when the temperature is about 32.2°C (90°F). The epidemics have a slow rise and a slow fall because of the prolonged incubation period of 17 to 21 days. The virus is spread from a human reservoir by direct contact, air-borne droplets, fomites contaminated by infectious saliva and possibly by urine. Mumps virus is rarely cultured from stools. It is not known how long a patient may be infectious, but virus has been isolated from the saliva as long as 6 days before and up to 14 days after the onset of swelling. However, transmission does not seem to occur longer than 24 hours before the appearance of the swelling or later than 3 days after it has subsided. The source of the infection may be difficult to trace because about 20% to 40% of the cases are sub-clinical or inapparent infections. More often than not, close questioning of my patients did not reveal an identifiable clinical source of infection.

Mumps is primarily a disease of childhood, although it also appears throughout adolescence and adulthood. As seen in Table I, infections are hardly seen before the age of two, but increases in frequency, reaching a peak between the ages of five to ten.

It has been reported that transplacental antibodies seem to be effective in protecting infants during the first 6 to 8 months of life, and even up to one year. One attack of any type of clinical or sub-clinical mumps confers lasting immunity. Second or even third attacks have been reported but are most uncommon. The effects of gestational mumps virus infection on the human progeny are small (White LR 1967). However, in experimental studies (St. Geme J.W. Jr. *et al.*, 1974) parenteral infection of rhesus monkeys with mumps virus during early pregnancy resulted in late fetal and post-natal growth retardation. The precise mechanism for this experimental growth retardation in the rhesus monkey is not clear, and it is difficult to extrapolate this to the human fetus for obvious reasons.

Pathogenesis—It is believed that mumps virus gains entry into the respiratory tract and after multiplication, is blood-borne to other organs, like the salivary gland, meninges, gonads, pancreas, thyroid, breast, heart, liver, kidneys and cranial nerves. Studies indicate that after a viremia the salivary glands, meninges and gonads are the most susceptible target organs.

Pathology—Very little is known about the lesions caused by mumps virus in human beings. The main pathological findings in the parotids are

periductal edema with lymphocytic infiltration, only rarely is damage to acini observed. In the affected testes, biopsies showed changes varying from mild interstitial edema to perivascular lymphatic cuffing with focal damage of germinal epithelium. Spermatogenesis was very rarely affected.

Clinical Manifestations

Salivary adenitis—The incubation period ranges from 14 to 24 days with extremes of 8 to 35 days being reported. Prodromal symptoms like malaise, anorexia fever and chills may precede the illness for one day, although it has been reported by other authorities to be a day longer. Prodromal symptoms are rarely seen in children. The swelling may involve one parotid, both parotids, the submaxillary or the sublingual glands, or all the salivary glands may become involved at one time. In this series there was a significant number of cases with unilateral swelling of the parotid gland. The degree of swelling, pain or discomfort may vary. This usually reaches its peak about 2 days after the onset and begins to subside between the 4th-7th day. At the time of maximal swelling, the gland is hard, tense and painful. The parotid swelling extends from the tip of the mastoid over the ramus of the mandible, forward to the cheek and downward towards the neck, thus obliterating the space between the tip of the mastoid and the angle of the mandible. Inability to feel the tip of the mastoid aids in differentiating between parotitis and cervical adenitis. The ear lobe is pushed out and upwards. Edema of the soft tissues may extend down the neck to the manubrium sternum as well as into the pharynx displacing the tonsil medially. However, in this series, edema was noted ranging from minimal to moderate. No cases had edema of the pharynx or tonsils. Difficulty in speech and deglutition is experienced and about 60% of cases in this series experienced it. During the prodrome Cowie's sign first appears, that is, swelling and outpouching of the opening of Stensen's duct on the buccal mucosa opposite the third upper molar. Similarly, the orifices of the submaxillary and sublingual glands become swollen and edematous. No cases of submaxillary and sublingual gland involvement was noted in my series but have been reported (oral) by my colleagues. Moderate fever ranging from 37.2°C (99°F) to 38.8°C (102°F) was recorded in about 80% of my patients.

COMPLICATIONS

1. **Meningitis**—The most common complications encountered in mumps are neurological manifestations such as encephalitis, encephalomyelitis and meningitis. It has been variously estimated that they occur in as few as 1% of cases and in as many as 50%. Encephalitis as a complication of mumps occurs approximately three times more frequently in children under 9

years of age than in the older age groups. Neurological symptoms may precede, coincide with, or follow other symptoms of mumps, or they may be its only manifestation. When the central nervous system becomes involved the normal period of elevated temperature is usually prolonged. Associated with it may be stiffness of the neck, headache, dizziness, delirium and convulsions. Lumbar puncture would show increased cerebrospinal fluid pressure, an increase in cell count predominately lymphocytes and a slight increase in protein. Generally, patients with aseptic meningitis or mild to moderate meningoencephalitis have a mild course and recover with no evidence of sequelae. Transient transverse myelitis and peripheral neuritis involving the cranial nerves have been reported. These also result in full recovery.

The frequency of permanent sequelae of mumps is still unknown. Such sequelae as muscle weakness, paralysis, psychic disturbances with or without headache, ear symptoms, epilepsy, obesity and peripheral neuritis are more apt to occur in those who suffered complications of encephalitis than complications of meningitis.

In this series no case of meningitis or encephalitis was noted on clinical grounds.

2. *Epididymo-orchitis*—This condition is the second most common complication of mumps, and is seen in about 20% of post pubertal males. Most often it follows parotitis, but it may precede it or occur without parotid swelling. It usually occurs about a week after the onset of parotitis, but may occur in the absence of parotitis. The orchitis appears after a recrudescence of malaise, chills and fever with temperatures ranging from 40°C (104°F) to 41.4°C (106°F). It has been reported that in about 75% of cases the swelling is unilateral. The testes is grossly swollen and very tender, and the epididymis may be involved. The temperature abates and the swelling subsides in about 7 days. There is progressive atrophy of the testes and even in bilateral atrophy sterility is not common.

Pulmonary infarction and priapism have been reported as a complication of orchitis, but are extremely rare.

3. *Oophoritis*—Pelvic pain and tenderness in the lower abdomen in female patients with mumps should be investigated. No cases of infertility as a sequel to mumps parotitis has been reported. No attempt was made to establish a clinical diagnosis of oophoritis, because there were no complaints noted from any of the females in this series referable to the pelvic area.
4. *Pancreatitis*—Mumps pancreatitis has been frequently implicated but not substantially clarified as a cause of diabetes. Severe involve-

ment of the pancreas is rare, but mild or sub-clinical infection may be more common than is recognised. Though mumps pancreatitis without parotitis has been reported in adults (O'Brien *et al*, 1965; Witte and Schanzer 1968) only two cases have been reported of mumps pancreatitis in children under 10 years, in one of which pancreatitis was the only clinical manifestation of mumps virus infection (Naficy, K. *et al*, 1973). It was found that the signs and symptoms were milder and the recovery speedier in children than in adults suffering from mumps pancreatitis. The clinical picture of sudden onset of generalized abdominal pains with pallor, nausea, vomiting tachycardia, clay-coloured stools and abdominal wall guarding between the seventh and tenth day of illness is not conclusive. A rising titre of serum amylase estimations and virological study is a prerequisite to establish a positive diagnosis. In this series, as this was a clinical study, no attempt was made to establish the serum amylase values.

5. *Deafness*—It is reported that deafness may be a more frequent complication of mumps than is usually believed. It is usually not recognized because it is often unilateral and without parotid swelling. Nonetheless, mumps is the leading cause of unilateral deafness, myxovirus being the etiological agent in 17% of all cases, the loss of hearing is always severe and permanent.
Acoustic nerve involvement may occur in the beginning of the illness or as late as the third week. Its onset may be abrupt or insidious, with or without pain, or it may begin with severe Meniere's disease.
6. *Ocular*—A variety of ocular complications of mumps, such as conjunctivitis, iritis, retinitis and uveitis have been described. Resolution usually follows but optic neuritis may sometime result in nerve atrophy and severe damage.
7. *Nephritis*—is a rare complication though myxovirus can be frequently demonstrated in the urine. When it occurs, it is usually severe and may be fatal.
8. *Thyroiditis*—A diffuse thyroid swelling following mumps parotitis and the production of thyroid anti-bodies has been attributed to the virus. A rare case of myxoedema following mumps has been reported.
9. *Myocarditis*—Severe clinical manifestations of cardiac involvement are extremely rare. Precordial pain bradycardia and fatigue have been observed in some adults and transient electrocardiographic changes (S-T depression) recorded.
10. *Hepatic*—involvement with alterations in liver function has been reported but liver damage is very rare.

11. *Thrombocytopaenic purpura*—As a complication of mumps parotitis has been described.
12. *Poly-arthritis*—migratory poly-arthritis is a rare complication of mumps and occurs mainly in adults. It is self-limiting and resolves completely without residual joint damage or recurrence. As it occurs about 3 weeks after the onset of parotitis, it should not be mistaken for acute rheumatic fever. No cases were noted in this series.

DIAGNOSIS

The diagnosis of mumps parotitis is simple from the symptoms and physical examination. During an epidemic it is obvious. However, the problem of diagnosis arises when only one of the less common clinical manifestation is seen per se. Routine laboratory tests reveal a leucopenia with relative lymphocytosis but occasionally a polymorphonuclear leucocytosis due to ? a secondary infection may be obtained as observed in our series of cases.

Serum amylase elevation is found in most cases, it rises to a peak in one week and returns to normal in about two weeks. Virus could be isolated from the saliva, urine, spinal fluid or blood. The C.F. antibodies show significant rise during convalescence. The S antigen reaches a peak during the illness and disappears within 6-12 months. The V antigen reaches a peak titre in about one month, remains stationary for about six months and then declines slowly in two years, to a low level at which it persists. Paired serums should be obtained and a four-fold rise in titre is necessary to confirm a recent infection.

DIFFERENTIAL DIAGNOSIS

In the differential diagnosis, parotitis and orchitis of other origin should be considered. The Cocksackie A virus and lymphocytic choriomeningitis virus affects both organs and can be distinguished by specific laboratory tests.

Pre-auricular or anterior cervical lymphadenitis from infected tonsils, pharynx, infected molar teeth as well as Ludwig's angina and otitis externa should be ruled out.

In suppurative parotitis pus can be expressed from the duct. A calculus in the duct causing intermittent swelling can usually be felt or demonstrated by a sialogram.

The parotid tumours like the mixed tumour takes a more indolent course. Lymphosarcomas, Hodgkin's disease or sarcoidosis may produce swellings in the neck.

Parotid swelling caused by alcoholism and malnutrition should also be considered.

Orchitis caused by other viral and bacterial infections of the testes must be ruled out. Bacterial prostatitis or seminal vesiculitis may also cause orchitis. Gonorrhoea rarely gives rise to orchitis.

TREATMENT

There is no specific treatment for mumps parotitis. It is entirely symptomatic—mouth care, analgesics and a bland soft diet is recommended. A new therapeutic agent claiming a wide antiviral spectrum named isoprinosine (methisoprinol) has been used in the treatment of mumps but, the author has not used the drug in the treatment of mumps parotitis. Isoprinosine enhances protein and nucleoprotein synthesis, thus preserving polyribosomal functions. The drug acts on the virus by interfering with the transfer of viral genetic code which stops viral multiplication in the affected cells. (The dosage for children under five years old is 50 to 100 mg/kg daily in divided doses; for older children and adults 40 to 100 mg/kg daily. Simultaneous antibiotic therapy in bacterial superinfections may be given. The treatment is continued for one to two days after symptoms subside). In the treatment of orchitis and epididymo-orchitis various methods of treatment e.g. depression of testes, estrogens, convalescence serum and antibiotics have proved ineffective. Bed-rest and support is useful in alleviating pain. Adrenal steroids are beneficial in reducing pain and testicular swelling. (A large stat dose of 60 mg prednisolone plus another 60 mg is given in divided doses for the first day. The dosage is tailed off in one week). Steroids do not prevent atrophy. Adrenal steroids are not useful in the treatment of meningitis or pancreatitis but have a place in the treatment of thyroiditis and poly-arthritis resulting from mumps.

PROPHYLAXIS

Passive immunization with hyperimmune gamma globulin is not effective. In fact it may actually increase the incidence.

Active immunization. A live, attenuated mumps virus vaccine produced in chick embryo cell culture is available alone and in combination with measles and rubella vaccines. Administration of 5,000 TCID₅₀ (approximately 0.5 ml) of this vaccine results in the development of mumps antibody in greater than 95% of recipients: the vaccine has not been known to cause clinical reactions, including fever. Since its introduction 7 years ago, there had been no evidence of loss of protection against natural mumps in vaccinated individuals. Because of its availability combined with measles and rubella vaccines, the mumps vaccine may be considered for use at about 12 months of age. Except as it is used in combination with the other attenuated vaccines in younger children, active immunization against mumps should be directed primarily towards susceptible children approaching puberty, adolescence, and adults, particularly males who have no history of mumps. Use of this vaccine might also be considered among persons (younger children included) in closed populations, such as institutions, where mumps might represent a special hazard or inconvenience. Vaccine is not recommended for children under 1 year of age nor for children in whom thera-

peutic procedures or underlying diseases alter resistance to an extent that infection with attenuated mumps virus might be potentiated.

In concluding I would like to state that mumps, contrary to popular believe, is not so innocuous a disease. The risk of severe and sometimes dangerous complications, discomfoting and disabling sequelae, and even death should revise our once held impression that mumps is a benign disease. The primary physician, the general practitioner, should be aware of all the dangerous complications of mumps that he may come across. Our goal should be to reduce the number of unvaccinated children, particularly one to four years old and to thereby reduce the incidence of serious complications associated with the natural disease.

We should strive to bring about awareness that unvaccinated children are everywhere, in every

income group. The reasons are many, but the result is the same—an unvaccinated child. It is therefore our duty to promote planned vaccination programmes that are vigorous, on-going and flexible.

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