

## MEDICAL PRACTICE

*For Debate . . .***Routine Smallpox Vaccination\***

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After Griffith<sup>1</sup> had shown that the complications and mortality from smallpox vaccination were greatest in the first year of life it was recommended that it would be preferable to vaccinate routinely in the second year.<sup>2</sup> At the same time the controversy on the advisability of routine smallpox vaccination was reopened. It was claimed that in non-endemic countries such as the United Kingdom and the U.S.A. the risks of vaccination complications may outweigh the benefits of routine vaccination.<sup>3, 4</sup> It is the purpose of this paper to see if the present practice of infant vaccination in Britain can be rationally supported. The practice differs considerably from the recommended policy of vaccinating in the first year of life, at school entry, and several times during adult life.<sup>5</sup> The acceptance rate for primary vaccination over the past 50 years has been about 40%, and apart from years when there have been outbreaks, revaccination has been done in only a handful of children.

**Risks of Vaccination**

A complete analysis of the complications and deaths from smallpox vaccination for 1951-60 was made by Conybeare,<sup>6</sup> and the complications reported by medical officers since then have been recorded in the annual reports of the Chief Medical Officer.<sup>7</sup> There is, however, much under-reporting, and few doctors like to attribute a death or complication to a procedure which they have recommended and in which they believe (Table I).

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TABLE I—Common Complications and Deaths per Million Primary Infant Vaccinations (given in Parentheses)

|                                    | 1951-60<br>(From Conybeare <sup>6</sup> ) |              | 1961-9<br>(Estimated Reports <sup>7</sup> ) |              |
|------------------------------------|---|--------------|---|--------------|
|                                    | Under<br>1 Year                           | At<br>1 Year | Under<br>1 Year                             | At<br>1 Year |
| Generalized vaccinia . . .         | 41 (0)                                    | 13 (0)       | 39 (0)                                      | 36 (0)       |
| Neurological complications . . .   | 15 (6)                                    | 3 (3)        | 11 (0)                                      | 11 (0)       |
| Eczema vaccinatum . . .            | 3 (2)                                     | 7 (0)        | 6 (2)                                       | 6 (0)        |
| Chronic progressive vaccinia . . . | 3 (3)                                     | 0            | 4 (3)                                       |              |

Neurological complications in a baby may be missed and other complications, such as hyperthermia, may go unrecognized, while thrombocytopenic purpura, bone involvement, and cardiac and other complications may be unassociated. The numbers of complications could be greatly reduced if more attention were paid to the contraindications to vaccination.<sup>8</sup>

Between 1951 and 1970 there were about 100 deaths from smallpox vaccination in England and Wales, about half of them from neurological complications; one can only guess at the number of individuals with residual brain damage attributable to vaccination.

**Epidemiology and Control**

To evaluate the benefit to the community of these deaths and complications it is necessary to consider the epidemiology of smallpox and its control. Since 1935, when smallpox ceased to be endemic in the United Kingdom, all cases have arisen from importations, and between 1951 and 1970 there were 13 importations giving rise to 103 cases and 37 deaths.

For more than a quarter of a century smallpox has been controlled in the United Kingdom by attempts to prevent importations, the isolation of cases, and the tracing, vaccination, and surveillance of known and probable contacts. This has been highly effective, otherwise there would have been severe outbreaks of smallpox. In this country there is no place for mass vaccination unless the control of an outbreak gets out of hand. It is the duty of the media to discourage mass vaccination in

outbreaks of limited proportions. This was not so in the outbreak of variola major in South Wales in 1962, when at least 18 people died during indiscriminate vaccination. Central leadership and help from the media are required to prevent demands for mass vaccination which hinder epidemiological control.

### Benefit of Infant Vaccination

To balance the 100 deaths from vaccination with the 37 deaths from smallpox in the past 20 years it is necessary to estimate what benefit this country is deriving from the present practice of vaccination.

#### INDIVIDUAL IMMUNITY

All evidence indicates that a fairly solid immunity lasts for three to five years after vaccination, but after 20 years vaccination appears to have little effect in preventing infection with variola major. Recent evidence on this comes from such data as those of Pandit *et al.*<sup>9</sup> and Downie *et al.*,<sup>10</sup> who noted that more than half of the cases of smallpox admitted to hospital in Madras showed the scars of primary vaccination earlier in life. I know of no evidence to suggest that any individual who has been successfully vaccinated will automatically have some protection for the rest of his life, and the protection acquired by recent vaccination or revaccination often falls far short of the average.<sup>11</sup>

It is generally assumed that an individual given primary vaccination as a baby (P.V.) and revaccination (R.V.) in the incubation period (I.P.) will be better protected than one who has received only a primary vaccination at that time. The available data for the death rates (1946-62) from variola major in England and Wales are given in Table II. The numbers in each group are small but the rates are not significantly different and do not support the assumption.

TABLE II—Death Rates from Variola Major in England and Wales during 1946-62

|                  | P.V. in Infancy | P.V. in Infancy, R.V. during I.P. | P.V. during I.P. |
|------------------|-----------------|-----------------------------------|------------------|
| Deaths/cases (%) | 27/131 (20)     | 13/46 (28)                        | 10/30 (33)       |

It is also generally believed that once an individual has been primarily vaccinated his response to further vaccination will be an accelerated one. The revaccination response is variable and dependent on the interval between primary vaccination and revaccination; many adults develop what appears to be a primary take on revaccination, and there is no evidence that the ability to react with an accelerated response is durable.

#### COMMUNITY IMMUNITY

There is little doubt that a community which has at one time been vaccinated has an advantage, so far as death is concerned, over an unvaccinated community. The extent of this immunity is variable, however, and depends on the duration of the immunity and the numbers of vaccinated individuals. Taking absolute immunity against infection as five years and partial immunity another 25 years, Dixon<sup>12</sup> calculated that in 1947, even allowing for vaccination during the war and the variola minor outbreak in 1920-34, the total "herd" (or "community") immunity in England and Wales was under 20%. The community immunity today is probably less than 5%. But even if there were a 100% acceptance of infant vaccination outbreaks of smallpox could still occur. There are historical examples of this, such as the outbreak in Middlesbrough in 1897, where in a population of 90,000, all but 2% of whom had been vaccinated, there were 1,411 cases of smallpox, and no fewer than 1,213

(86%) of them had been vaccinated. In 1970 outbreaks passing into several generations occurred in the Logar Province of Afghanistan in a population of whom only 4% were assessed to be susceptible, and in Djakarta where less than 10% were fully susceptible.<sup>13</sup>

In order to have a high community immunity it would be necessary to have universal infant vaccination and revaccinations throughout life, but while this would restrict spread it could not be relied on to prevent it. If the recommendations of the Department of Health and Social Security to vaccinate and revaccinate had been universally followed the total number of smallpox deaths in the past 20 years might have been reduced to about 30, but the total number of deaths due to vaccination might have been at least 250.

### Reactions to Primary Immunization in Adults

If the present practice of infant vaccination is not building up an immune community in which spread of infection will be prevented, what is the reward for accepting the complications of infant vaccination? Many will say that complications are less in adults who are revaccinated than in those undergoing primary vaccination. This is true, and the numbers of such complications for 1951-60 are given in Table III, with the rates per million in parentheses.

TABLE III—Complications after Primary Vaccination and Revaccination in Patients aged over 15 (England and Wales) 1951-60

|                              | P.V.     | R.V.      |
|------------------------------|----------|-----------|
| No. vaccinated               | 407,513  | 1,004,962 |
| C.N.S. complications         | 6 (14.7) | 8 (8.0)   |
| Chronic progressive vaccinia | 0        | 0         |
| Eczema vaccinatum            | 4 (9.8)  | 8 (8.0)   |

Analysis of the data for 1961-9 gives very similar results, but the denominators have to be estimated. Spillane and Wells<sup>14</sup> reported 39 cases of neurological illness associated with vaccinations in 1962 of which 15 occurred in revaccinated individuals—this gives a ratio of neurological complications in primary: revaccinated individuals of 1.6:1.0, which is of the same order as that (1.8:1.0) in the 1951-60 data.

While the rate for neurological complications in adults is slightly greater after primary vaccination than after revaccination there is no difference in the death rates. In the 1951-60 data there was one death from neurological complications following primary vaccination (2.5 per million vaccinations) and three following revaccination (3 per million vaccinations), and in the past 10 years, in an estimated 5,000,000 adult vaccinations, there have been six deaths from C.N.S. complications, four of which occurred during the hysterical vaccinations of 1962. The only death in the data of Spillane and Wells<sup>14</sup> was in a revaccinated individual.

In the British Army from 1962 to 1969 there were no deaths in 230,000 vaccinated individuals of whom perhaps about 70% received primary vaccination, and in 2,000,000 or more primary vaccinations in the United States Army since the second world war not a single vaccination death has occurred.<sup>15</sup>

Revaccination carries two risks—that of primary vaccination plus the risk of revaccination. The sum of C.N.S. complications is shown in Table IV. It appears that the combined risks of primary vaccination under 1 year old and revaccination of adults of 15 years and over is about one-and-a-half times greater than that of primary vaccination in adults. Similar results are seen in the 1961-70 data when the rates for C.N.S. complica-

TABLE IV—C.N.S. Complications per Million Vaccinations (1951-60)

|                            | P.V. | P.V. | R.V. | P.V. + R.V. |
|----------------------------|------|------|------|-------------|
| Age in years               | 1    | ≥15  | ≥15  | 1 ≥15       |
| Rates/million vaccinations | 14.6 | 14.7 | 8    | 22.6        |

tions are used in babies aged under 1 year or in those at the age of 1 year.

There is little to support the argument that if we stopped infant vaccination we would run into large numbers of post-vaccinal deaths in adults. The above figures put the risk of complications and death from primary vaccination in adults in proper perspective, but *in any event the vaccination policy which I outline below will require many fewer vaccinations to be done and thus result in fewer complications and deaths.*

It should be remembered that the babies whom we are now subjecting to the complications of vaccination will grow up in a world in which smallpox has virtually disappeared, for during the past four years the number of reported cases has declined from 131,000 to 27,369, and while 42 countries reported cases in 1967 only 21 did so last year.<sup>16</sup> It is expected that by 1971 endemic smallpox will be restricted to six countries.

So far as vaccination requirements for travel are concerned they will become less and less necessary. Even now evidence of vaccination is *not* required for persons entering the United States unless they have been in a country reporting smallpox within the previous 14 days.<sup>17</sup> This procedure is bound to be followed at ports of entry of other countries. The infants and children whom we are at present damaging by vaccination will not need vaccination for travel in the future.

**“But Every Little Helps”**

Having accepted (1) the high risks of complication and death from infant vaccination, (2) the similarity in the death rates of contacts revaccinated in the incubation period compared with those given primary vaccination in the incubation period (see above), (3) the fact that protection against infection is not durable, (4) that the accelerated response to revaccination is in general variable and appears to fall off with time, and (5) that smallpox is being eradicated throughout the world, a senior administrator responded, “but every little helps.” Everyone would agree that every little help in preventing smallpox is worth having, but where is the evidence that routine infant vaccination has been of help in the control of smallpox in the United Kingdom in the past 50 years? Even so far as variola minor is concerned the “distribution of variola minor in England and Wales has certainly not been determined by the local acceptance of infantile vaccination.”<sup>18</sup>

It is well known, so far as “every little help[s]” is concerned, that the skin of an individual who has to be revaccinated is generally more resistant to vaccination than that of a primary vaccinee. It may thus be more difficult to get a “take” when it is really required—for example, during epidemiological control—in a person who has received primary vaccination as a baby compared with an individual being vaccinated for the first time. Thus an individual vaccinated in infancy may as an adult be at a disadvantage if he has to be revaccinated.

Secondly, from the point of view of the community the difficulty of recognizing a modified attack of smallpox in a previously vaccinated individual is well known. Thus if numbers of modified cases are occurring in previously vaccinated individuals the tracing of cases and contacts will be more complicated, and the community may be at a disadvantage so far as epidemiological control is concerned.

Any “little help” which infant vaccination might provide to the population of a non-endemic country might accrue to a few contacts who had their primary vaccinations perhaps not more than 30-40 years previously.

**Importations**

The possibility of importations of smallpox into this country will always exist, but the probability becomes less every year. As already mentioned, over the past 20 years there have been 13

importations giving rise to 103 cases and 37 deaths. Since the present scale of infant vaccination has produced 100 deaths from vaccination during the past 20 years we may expect about 150 deaths from now till 2000 if the acceptance rate remains the same. Since past experience has shown that on average there have been three deaths per importation, then, from now till the end of the century there will have to be more than 50 importations to outweigh the hazard of 150 deaths from vaccination. These importations might be distributed as shown in Table V. Such a situation seems highly improbable, for during the past 20 years there appear to have been only 13 importations of variola major, distributed as follows: in 11 years, 0; in each of 7 years, 1 (total 7); and in each of 2 years, 3 (total 6).

TABLE V—Distribution of Smallpox Importations needed over next 30 Years to Outweigh Death Hazard from Vaccination

|                             | Importations |       |
|-----------------------------|--------------|-------|
|                             | No.          | Total |
| In each of 23 years .. .. . | 1            | 23    |
| In 1 years .. .. .          | 2            | 2     |
| In 1 year .. .. .           | 3            | 3     |
| In each of 3 years .. .. .  | 4            | 12    |
| In 1 year .. .. .           | 5            | 5     |
| In 1 year .. .. .           | 6            | 6     |
| Total .. .. .               |              | 51    |

It thus seems highly unlikely that the death hazard of vaccination will be outweighed by the expected number of deaths from importations. Things will, of course, change in the next 30 years and we may expect a reduction in the number of vaccination deaths, but there will also be fewer importations.

**Present Policy**

“The arguments for immunization for a disease which only occurs infrequently in a country and which affects a very small area are quite different from those supporting immunization against a disease which is endemic.” It is difficult to make out a case for the present practice, for it provides less individual and community protection for the amount of vaccination done than almost any other conceivable one. In addition it is most unsatisfactory that the practice should deviate so obviously from the recommended policy. It is, however, virtually impossible to get public co-operation for a vaccination and revaccination programme which carries considerable hazards to combat a decreasing low-risk disease which is not highly infectious and is readily controlled.

In view of the world smallpox situation the policy proposed by the Department of Health and Social Security<sup>5</sup> is going to become less and less acceptable to many doctors and parents in the future. In a few years’ time the infants who are now undergoing the risk of vaccination will be living in a world where smallpox will have been virtually eradicated, where the treatment of smallpox with drugs may be possible, and where safer means of prevention of smallpox may be available for persons at high risk. On the other hand, if the present policy is not changed and more *mindless* computers take over for the call-up of infants for immunizations, then, with increased acceptance rates the complications and deaths will increase. If a doctor believes in the routine vaccination of babies against smallpox he must realize that primary vaccination is “the first of a series of vaccinations to be given through childhood to adult life.”<sup>6</sup> Obviously this should be the policy for children living in endemic areas.

If a policy of vaccination and revaccination were followed in this country what would be the signal to stop it? Should we go on vaccinating and revaccinating after smallpox has been eradicated from all but the most isolated parts of the world? When should we stop?

### Future Policy

The alternative policy is to abandon routine infant vaccination and to defer vaccination until it is required for travel or for outbreak control. Individuals requiring vaccination for travel and outbreak control are relatively few, and the number is going to decrease as smallpox becomes eradicated and fewer countries require vaccination for entry.

At the same time it is highly important to vaccinate and revaccinate all high-risk groups such as doctors, nurses and other hospital personnel,\* and the military for a few more years. Medical and public health personnel have all too often become indigenous cases and contributed to the dissemination of infection, and greater efforts should be made to ensure that vaccination and revaccination is given to this group of high-risk individuals. This policy of selective vaccination will carry a certain amount of morbidity, but it will be less than the morbidity and death associated with our present practice.

There is little doubt that we shall move in the direction of selective vaccination, and now is the time to make the change. It has been said that before the policy of infant vaccination could be abandoned there would have to be *certainty* that an outbreak in an unvaccinated community could be controlled as effectively as experience has shown it to be possible in a partly vaccinated community. The sense of that statement is that the present policy will be recommended ad infinitum (but fewer and fewer doctors will carry it out).

The conservative traditionalists should be reminded that if we now abandon infant vaccination a sudden nightmare situation is not going to arise,† for there can be no sudden shift in the community immunity (which is minimal anyway), and the policy can be changed with any unlikely upsurge in the global prevalence of smallpox or in a world emergency.

Though this policy of deferring vaccination until required was suggested some years ago we are, perhaps, waiting for the Americans to lead us, for Lane and Millar<sup>15</sup> and Foege<sup>19</sup> have recently argued that in the U.S.A. the benefits of childhood

\*Though not infectious during the incubation period smallpox patients are highly infective at the onset of the illness—before the rash appears. The disease is difficult to diagnose at the onset and health personnel who have not been recently revaccinated are at high risk.

†The immune population, in any event, in the United Kingdom at present, are essentially the under 5-year-olds, who are unlikely to make much contribution to the control of a disease which spreads essentially in adults in this country.

vaccination no longer outweigh its risks, and they have suggested that consideration should be given to its discontinuance. In Canada in the past 20 years there has been only one fatal case of smallpox but 21 deaths from vaccination complications. It is little wonder that some epidemiologists in Canada are saying that a case can now be made out to reconsider the benefits of vaccination vis-à-vis the risk of death from it.

Many years ago Sir Graham Wilson said, "it is much easier to introduce a given measure into the public health practice of this country than to remove it once it has become firmly established."<sup>20</sup> The time is overdue<sup>3 21</sup> to debate the advantages and disadvantages of retaining smallpox immunization as one of our routine procedures.

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## Contemporary Themes

### Morale and the Planning of Psychogeriatric Services\*

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The psychiatric care of the elderly has become an urgent issue. At the turn of the century the over-65s comprised less than 5% of some 33 million people in England and Wales; now they total over 12% of nearly 50 million, and the number and

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proportion of the very old has risen even more steeply. Admissions of old people to psychiatric hospitals are increasing, and the chronic inpatient population is ageing. Advances in medical and psychiatric treatment and services and the development of the specialty of geriatrics mean that there is now much more to offer to elderly patients—and a good thing too, since they occupy some 45% of both psychiatric and general hospital beds.<sup>1 2</sup> Changes in society have increased expectations of well-being generally and of well-being in old age, and families, too, rightly expect some relief from the often huge burden of caring for mentally disordered old people. Despite this close on 95% of old people were at home, at least in the early 1960s, rather than in hospitals or other institutions.<sup>3</sup>