Some Comments about Previous Pandemics

Bryan Rhodes, B.Sc, FRCS (Ortho), DHMSA

PART 2: SMALLPOX, VACCINATION AND LANCASTER'S HOSPITALS

INTRODUCTION

Last year I decided to study for a Diploma in the History of Medicine at the Society of Apothecaries (DHMSA) in London and a lecture covering the history of smallpox came just as we were hearing about the first Covid-19 cases in England. As a result of the pandemic, the last quarter of the course moved online via Zoom and the examination was delayed and changed to an online format. Anticipating that there may be a question about smallpox, I had already started research for this article when the examination took place in September. I can now state, with some justification, that working for the MBMJ may help you to pass an examination!

It is quite appropriate, as we enter the second wave of the Covid-19 pandemic, to be looking at the history of viral pandemics. Smallpox is probably the most important for historians to study as a comparison to coronavirus because it is also viral and led to the great breakthrough of vaccination. I highly recommend the book 'Angel of Death' by Gareth Williams and also a visit to Dr. Jenner's house in Berkeley, Gloucestershire (now a museum), where Jenner not only worked but also performed vaccinations in a small outbuilding in the corner of the garden. The story of how vaccination was developed, and the difficulties of producing a safe vaccine that can be mass produced, is a fascinating one and has great importance at the present time.

The Virus

Smallpox was caused by the variola virus, a member of the pox virus family. It is a large DNA virus (larger than coronavirus) and less likely to spread by air, though highly contagious. It is part of the same family of viruses as cowpox and vaccinia. There is evidence that another member of the family (taterapox: found in gerbils) could be the originator of the variola virus. There is no animal or insect vector for smallpox but it has two variants. Variola minor causes a rash and has a very low mortality rate, less than 1%. My surgical hero, Joseph Lister, probably caught this variety when he was a first year medical student (it led to a nervous breakdown from which he thankfully recovered). There is speculation that variola minor took over from variola major in America, reducing death rates there. Variola only affects humans and the v. major variant

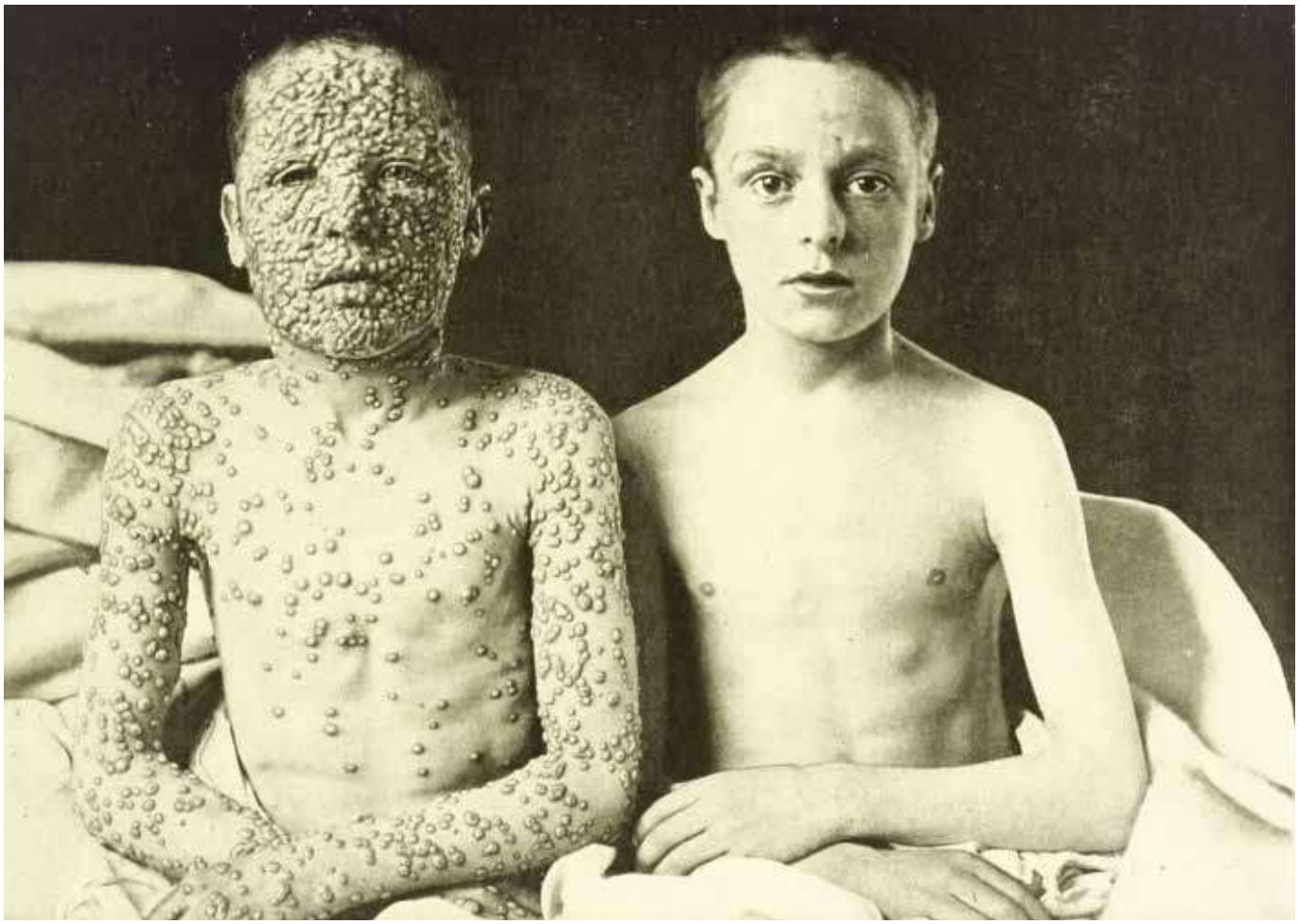

Figure 1: Photograph showing two boys from same class illustrating predilection of smallpox for the face and protective effect of vaccination. Photograph by Allan Warner *c.* 1900.

has about a 20% mortality rate (case fatality rate). Sadly Henry Gray, an aspiring surgeon and author of Gray's anatomy, was not as fortunate as Lister; he died from smallpox in 1861. The v. major virus has a predilection for sebaceous glands on the face which caused enormous anxiety in young patients.

Smallpox caused a blistering rash that spread across the body. This was confused in early times with measles but Rhazes described the differences in the 10th century. Dried scabs from smallpox blisters can transmit the variola virus for at least 10 years.

Peak prevalence for smallpox was from the middle ages to the nineteenth century and it is estimated to have killed about 8% of all mankind! Each year perhaps 600,000 died from it worldwide and an estimated 50 million in the 18th century. Sadly, children were particularly vulnerable and in the 18th century it is thought that over three quarters of patients were under the age of 10. Macauley said that smallpox was even worse than plague for filling the graveyards with corpses.

Treatment

Standard treatment for fevers in the 18th century included bleeding, purging and emetics. Bleeding was practiced widely up to the late 19th century. Because of the difficulty of applying leeches to blistered skin, in the 19th century Dr. Hubert Boens advocated anal application of leeches. I don't know if this was a popular treatment option! Physicians Richard Mead and John Woodward apparently had such a disagreement about whether purgatives or emetics were the best treatment for smallpox that they ended up in a swordfight.

Inoculation

There was a tradition in south Wales, according to Williams, of taking pus and blister scabs from smallpox victims and scratching it into a recipient's skin. This was termed 'buying the smallpox' and was first publicised in the 1720s. The inoculation of smallpox became known as 'variolation'. This practise had origins in two old traditions: one was Chinese and the other was Arabic/African. Chinese tradition dates from the 16th century and involved a 'nasal insufflation' technique. Mild cases were selected as donors and then dried blister scabs were ground up to make a powder for insufflation. The Arabic/African tradition involved skin inoculation. Clothing or pus from a victim was used to inoculate a recipient usually via a small scratch in the skin of the arm or leg.

In England, variolation was popularised by Lady Mary Wortley Montagu. Mary had already lost her brother William to smallpox when she contracted it herself in 1715. She developed a confluent rash and suffered severe facial scarring. After recovery, she accompanied her husband to Constantinople where he had been appointed British Ambassador. She wrote to a friend in England "*The smallpox … is here entirely harmless by the invention of ingrafting*". The technique involved placing smallpox material into a vein using a needle and she had her son inoculated with this method. A few years later, in 1721, a smallpox epidemic took place in England. Lady Mary had returned by this time and wanted her physician Dr Maitland to inoculate her daughter. Maitland agreed to do this and arranged for other physicians to witness the procedure and the outcome. Further clinical trials were set up and reported by Sir Hans Sloane. Royal patronage followed and the Royal princesses were subsequently inoculated.

In America, Rev. Cotton Mather (famous for the Salem witch trials) did most to promote inoculation. Mather's congregation purchased an enslaved African for him called Onesimus. Onesimus had been inoculated and told Mather about it. Mather was also aware of Turkish practice from letters published by the Royal Society. When an outbreak of smallpox started Mather persuaded a local surgeon, Zabdiel Boylston, to try the new method. Boylston's initial results were all good but stimulated opposition from local physicians. This resulted in Boylston and Mather both being attacked, the latter had a grenade thrown through his window with a note stating "*Damn you, I'll inoculate you with this …*" !!

The dangers of inoculation soon became apparent. In Boston, 2% of Boylston's recipients died from smallpox induced by the inoculum, and smallpox in inoculated recipients could be transmitted to other people. Also, other diseases could be introduced by non-sterile equipment.

Vaccination

Cowpox virus, unlike smallpox, can affect cows, rodents and humans. In 1765, a surgeon-apothecary called John Fewster presented a paper to the London Medical Society: *'Cowpox and its ability to prevent smallpox'*. This was never published and Fewster didn't try inoculation with cowpox himself. Fewster subsequently became an advocate of variolation.

The first known vaccination was actually performed by a farmer called Benjamin Jesty from Dorset who vaccinated his wife and sons in the 1770s with material from a neighbour's infected cow. His wife developed a severe arm infection but fortunately survived the experience. Jesty was criticised locally and the events were not publicised outside Dorset.

Edward Jenner was a medical practitioner in Berkeley, Gloucestershire. Jenner had been apprenticed to two surgeon-apothecaries in Chipping Sodbury before completing his surgical training in London at St. George's. The main influence during his training was the famous surgeon John Hunter, and they remained friends and correspondents after Jenner set up in independent practice. The famous quote: "*Why think, why not trie the experiment?*" was Hunter's advice in a letter to Jenner about his hedgehog research. Jenner was elected a fellow of the Royal Society as a result of pioneering work on the nesting behaviour of cuckoos.

Jenner was a friend of John Fewster and both were members of the Convivio-Medical Society (a society similar to Lancaster Medical Book Club) but it is unlikely that he knew of Jesty's experiment. Jenner had heard the local folklore that milk maids who had had cowpox were protected from smallpox. Jenner's first attempt at vaccination was many years later, in 1796. Jenner collected fluid from an ulcer on milkmaid Sarah Nelmes' hand. He scratched it into the arm of his gardener's son, James Phipps aged 8. Some weeks later Jenner deliberately inoculated Phipps with smallpox and, fortunately, he didn't show any

subsequent signs of infection. Jenner waited two years to publish his research. He paid to publish this privately after the Royal Society rejected his paper. Controversy followed but gradually vaccination, as it became known, replaced inoculation. Even Blossom the cow has become famous; several pairs of horns attributed to Blossom are in existence, one at the museum in Berkeley. Jenner's persistence paid off and he also achieved fame through for his work on vaccination.

However, other diseases could also be transmitted by vaccination and it wasn't until the late 19th century that safer preparations of vaccines were available. The dangers of unsafe preparations of vaccine included animal diseases and transmission of other human infections including syphilis. There is a famous cartoon showing how vaccination may cause recipients to turn into cows or develop horns! An anti-vaccination campaign became prominent, particularly in America, and has dogged all vaccine production ever since. In England, Leicester became the central location of the anti-vaccination campaign.

Lancaster's Isolation Hospitals

At a meeting in the Town Hall in July 1815 it was resolved that Lancaster was 'frequently visited by contagious fevers' and that a 'House of Recovery' and a Board of Health should be established. A house in a cul-de-sac on the then outskirts of Lancaster (off Bulk Street, now a car park) was identified and rented. With just five beds and a live-in matron, this was Lancaster's first fever hospital and dealt with cases of scarlet fever and typhus as well as occasional smallpox cases. Medical supervision was provided by the staff of the Lancaster Dispensary.

In late 1832 the new 'Lancaster Dispensary and House of Recovery' was opened in Thurnham Street and the two previous institutions closed soon afterwards. To reduce the transmission of infection the rules of the new combined hospital included a stipulation that, before admission, the Apothecary was to visit all infectious patients at home and that they were to be washed and clothed in *"garments of the House"*. Also, *"fever patients are admitted by the yard door only and the Dispensary is so arranged that there is no communication with the interior of the House"*. The 1858 annual report stated that there were 23 inpatient cases of smallpox (1 death) out of a total of 44 fever cases.

In 1870 the onset of the Franco-Prussian war triggered the 'Great Smallpox Pandemic' across Europe. In Lancaster there were only five inpatient cases in 1871 but the annual report recorded growing concern that this would increase due to growing numbers of smallpox cases in nearby towns. The pandemic reached Lancaster in 1876 and the outbreak was so severe that the smallpox ward was "walled off" to protect other patients. Some staff contracted smallpox.

Motivated by this pandemic and empowered by the Public Health Act of 1875, Lancaster Corporation decided

Figure 2: "Dr Jenner performing his first vaccination, 1796." Oil painting by Ernest Board. Credit: Wellcome Collection.

to open a new isolation hospital and a site off New Quay Rd was chosen. Built in 1880, the Luneside Hospital lasted just 11 years before it was moved further downriver. By 1891 the expanding Lune Mills had demolished and built on the original site, now part of the new Riverside housing development.

In 1891 the second Luneside Hospital was opened. Although it lasted longer it suffered from severe flooding in October 1927 resulting in the death of three patients and heroic efforts to rescue the other patients. A framed commendation from the Mayor to the nursing staff of the Hospital about these events has recently been donated to the Lancaster Health and Medical Museum Collection. Although the hospital building has since been demolished, the remains of the temporary smallpox block and fumigation rooms can still be seen on satellite maps of the area.

Well beyond the town boundaries and close to Langthwaite reservoir there is a small site that was Lancaster's most intriguing and isolated isolation hospital. The building of the Littlefell Smallpox Hospital appears to have been related to a Lancaster Castle prisoner from Bradford contracting the disease. Opened circa 1900 it was little used and was eventually made available for military use in 1939. The site is now occupied by two private bungalows.

Lancaster and District Isolation Hospital, later renamed Beaumont Hospital, was the last purpose built infectious disease hospital in the district and the largest in Lancaster's history. Opened in 1934, the hospital had individual patient cubicles to reduce the risk of transmission of infection. After 1948 it became a more general hospital specialising in ENT but still retained an isolation ward. It finally closed in 1990.

Eradication of Smallpox

Eradicating smallpox from Africa proved especially difficult but the World Health Organisation declared that smallpox had finally been eradicated in 1980. It remains the only human viral infectious disease to have been eradicated by human actions. The smallpox vaccine was the only vaccine against a viral infection until Louis Pasteur developed the rabies vaccine in the second half of the 19th century. Fingers crossed we get a good one soon for coronavirus Covid-19!

ACKNOWLEDGMENTS

Special thanks to Naomi Parsons of Lancaster City Museum for information regarding Lancaster's Isolation Hospitals.

FURTHER READING

Williams G. (2010). Angel of death: the story of smallpox. London: Palgrave Macmillan.

Blacktop JG. (1995). In times of need: the history and origin of the Royal Lancaster Infirmary. Publisher: John G Blacktop.

Parsons, N. (2020). Isolation and infection: Lancaster's isolation hospitals. Available from: https://www.facebook.com/lancastercitymuseum/posts/560179227859981 (accessed 10.11.2020).