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1843, aged twenty, after being confined for a fortnight in Kensington House Asylum. He had been admitted with delusions that his bed was on fire, refusing to go to bed at night, and having on one occasion returned home naked. He had struck a keeper at Kensington House, but was normally tractable and good tempered. His attack was said to have begun six months previously, that is at about the same time as Richard's. He was transferred to the Incurable Establishment after a year, and thereafter no notes were made until 1853:

Novr. 28th 1854. Was formerly violent but not now for some years. He is dull, slow and indolent unless when urged to work and then when he once commences he will work like a horse; coal carrying is an employment he excels in. At times he is stubborn generally silent, but now and then converses with considerable acuteness. He plays draughts and cards very fairly. His friends seldom or never visit him. His brother is confined in the Criminal Establishment for the murder of his father, and another brother has a private attendant. [There is also mention of a sister 'similarly afflicted' on the admission sheet, a note probably added some time after admission.] He was a clever workman employed in the Chatham Dock Yard.

28 Novr. 1854. Sometimes he spouts Shakespeare and knows a great many plays by heart. His favourite book is the Old Curiosity Shop, and it is always somewhere about him, if he is not reading it. He has acquired the name of 'Tiger' from the voracious manner in which he eats his meals.

The next note, apart from 'No change', was made in February 1868, when he was 'decidedly more imbecile, and has aged very considerably, his hair getting grey, & he has become more feeble, however he still does a great deal of work.' From October of the same year he suffered several pulmonary haemorrhages, in the course of one of which he died, on 6 November. Details of the post-mortem examination are given.

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THE 'BUBU'TU' LESION IN ANTIQUITY

MEDICAL knowledge in the Ancient Middle East was primitive, being based primarily on folk medicine associated with herbal remedies (Oppenheim, 1962). Although medical knowledge was rudimentary and the writings of the scribes were insufficiently detailed, we are fortunate insofar as the ancient records demonstrate a keen sense of observation for signs and symptoms, even if the interpretation of them is fallacious. As far as clinical medicine was concerned, the most important observations were made on the external surface of the body, and also on the lungs, heart and liver, similar anatomical areas to those used most commonly for divination in animals, especially sheep, goats and cattle.

In this article it is proposed to discuss the diagnosis of the Akkadian 'bubu'tu' lesion in the Old Babylonian and Standard Babylonian cuneiform texts.

THE EXTERNAL LESION

Evidence has already been presented that *bubu'tu* may be equivalent to the modern diagnosis of a vesicle.¹ In certain cases with *bubu'tu* lesions (AMT 61.1.6 and 10) we may justifiably make a diagnosis of herpes genitalis; the virus of which may possibly be implicated also in the stomatitis mentioned in text TDP 64.43. But this diagnosis does not account for the generalized, coloured skin lesions described elsewhere (TDP 28.91–95; 74.47–49; 170.21–23; AMT 78.7.4 and 8).

The symptoms and signs of disease with *bubu'tu* lesions are: a widespread skin rash which may involve the oral cavity and the face, but it may be localized to one area only; the lesion is infective: it is not found at birth nor in young children, but it may involve adults of both sexes; the skin lesion is variable in composition, being vesicular, pustular or even haemorrhagic; and there seems to be a wide variation in prognosis, some cases even dying from the disease. The characteristic lesion, however, appears to be the vesicle of the skin.

There are many generalized exanthemata that afflict man, and vesicles are frequently noted during the course of these diseases. The most important ones having the above-mentioned symptomatology are syphilis, variola (smallpox) and varicella (chickenpox); these diseases need to be considered in greater detail.² As far as is known at present, syphilis did not occur in the Ancient Middle Eastern countries. No clinical evidence of this infection has been found, in spite of widespread and diligent search of post-mortem and osseous material.³ The infectious secondary stage with papular and pustular eruptions, and the tertiary stage with gummata in the internal organs, cannot be seriously considered in this context. Variola and varicella however need greater consideration. The *bubu'tu* lesions of the skin and mouth (apart from the

¹ The word 'bubu'tu' has already been discussed (P. B. Adamson, *J. R. Asiat. Soc.*, 1969, pt. 1, 10–12). In this article, the difference between the external and internal lesions is briefly mentioned, and references to the medical texts are also given.

² Although the differential diagnosis is very wide indeed, it can be narrowed down considerably. The various diseases can conveniently be divided into two main groups. Diseases in the 'allergic' group, such as urticaria, eczema and other allergic manifestations, are characterized by having an itchy rash which is often symmetrical in distribution. The rash is not usually a truly vesicular one. These diseases tend to have recurrences, but the prognosis is good. Diseases in the 'infective' group (which may include impetigo, acne, pemphigus and tinea circinata) usually produce some degree of pain, and secondary infection is common, leading to pustular lesions and scabs. True vesiculation is uncommon. The prognosis varies with the disease, but some diseases, pemphigus and leprosy for example, carry a bad prognosis.

More specifically we may note that rickettsial pox shows a 'herald' skin lesion at the initial site of infection, followed later by a generalized skin rash; the prognosis is good. Skin lesions in leprosy are often asymmetrical, show anaesthetic areas and may be depigmented. Kaposi's varicelliform eruption, a rare complication of infantile eczema, is a severe disease in children already suffering from some skin disease and carries a high mortality. Herpes zoster presents with pain; the lesions are vesicular but may develop into pustules and occur in localized crops along the distribution of the nerves. The disease is not highly infective and may be found in adults who have been in recent contact with children who were suffering from varicella. A consideration of the symptomatology, the age of the patient, the character and distribution of the skin lesions, and the prognosis will help to exclude the previously-mentioned diseases from diseases with *bubu'tu* lesions.

³ Although this is probably still correct, it should be pointed out that syphilis may have existed in pre-Columbian times. D. G. Rochlin (*Orvostörténeti Közlemények*, 1968, 44, 41–52) thinks that syphilis existed in European and Mongolian areas of Russia at least from the tenth century of the present era, and may have occurred possibly even earlier.

probable herpetic lesions which have already been mentioned) may point to a diagnosis of either disease. The variable colour of the bubu'tu lesion may also be accounted for by variations in severity of the disease or by the stage at which the disease is seen by the doctor, a point further emphasized by the change in prognosis: haemorrhagic lesions tend to carry a poor prognosis. The rash, of course, may be generalized, presumably involving both hands and feet, in both diseases (TDP 28.91–95).

To help decide on a likely diagnosis in these cases, attention may be paid to the early history of variola and varicella. A. Hirsch (1883) considered that the ancient sites of endemic smallpox were to be found only in 'India and the countries of Central Africa'.⁴ G. Elliot Smith (1912) described a variola-like skin eruption in the mummy of Rameses the Fifth (of the XXth dynasty; he died c. 1145 B.C.). M. A. Ruffer and A. R. Ferguson (1910) described a variola-like skin eruption in a male mummy of the XVIIIth dynasty (1575 to c. 1308 B.C.), the lesion being quite consistent with variola on histological study.

At all periods of early history there were continuous movements of people between Egypt, Syrio-Palestine and Mesopotamia as a result either of trading ventures or of military operations. Even as far back as the Archaic Period of Egyptian history there were similar dealings in Nubia. The political and military influences of Egypt were further widely extended into the Sudan, and even to Abyssinia and the Somali coast during the Middle and New Kingdom periods. Thus, every opportunity was offered to make contact with the 'countries of Central Africa' and thereby become exposed to such diseases as were epidemic in this area. Contacts with India on the other hand only became common from the sixth century B.C. onwards, and mainly took place between Mesopotamia and Persia. It is reasonable to assume that in antiquity any major epidemic would be reported by the scribes, and in fact we know that outbreaks of various plagues and epidemics were mentioned by the ancient authors.⁵

Now, variola major is both highly virulent and highly infectious; it is only too likely to produce large epidemics having a high mortality. Any large congregation of peoples would increase the risk of an outbreak, and such events as military cam-

⁴ A. Hirsch, *Handbook of Geographical and Historical Pathology*, vol. 1. London, 1883. Variola was first mentioned by Rhazes who assumed that Galen in the second century had been acquainted with the disease (p. 123). Endemic sites of smallpox are discussed in detail, but the authorities quoted only go back to early Christian times (p. 127). Apparently the differentiation between chickenpox and smallpox had still not been made by medieval times (p. 152–53).

⁵ Plagues and epidemics were undoubtedly reported by the ancient chroniclers. Not all plagues were caused by the organism *Pasteurella pestis*; a plague was only some severe outbreak of infection that afflicted a group of people. In the second millennium B.C., for example, an outbreak of plague (probably in this case, of true pneumonic plague) broke out among the Philistines (S. H. Blondheim, *Bull. Hist. Med.*, 1955, 29, 337–45), and an unidentified plague ravaged the land of Hatti (A. Goetze, *ANET*, p. 394–96). In the first millennium, there was the great plague of Athens which was certainly not due to a *Pasteurella* infection (Thucydides, *Hist.*, 1, 23.3; 2, 47–52. W. P. MacArthur, *Bull. Hist. Med.*, 1958, 32, 242–46), as well as a severe unidentified plague which occurred in Sicily (Diodorus Siculus, *Hist.*, 14.70.4–71.4). J. Filliozat (*The Classical Doctrine of Indian Medicine*, Delhi, 1964, p. 229–37) comments on possible communication between India, Greece and Egypt from the sixth century B.C. Although such contacts must have existed—Cambyses of Persia, for example, conquered Egypt in 525 B.C. and thus formed a land bridge between Egypt and India—it does not follow that there actually was a great deal of trade between Egypt and India except in secondary merchandise. Egypt was geographically and politically orientated towards Asia Minor and Nubia rather than to the distant land of Persia. Likewise, Persia was more concerned with affairs in Mesopotamia and India than with African ones.

paigns, sieges or transportation of slaves would certainly provide suitable milieux for the commencement of such an epidemic. The clinical condition is so striking that it surely would have been mentioned by the acute observers in antiquity, yet we have no clear record of any typical outbreak ever having occurred in very ancient times. Variola minor (alastrim) on the other hand, causes only a low mortality, may leave some residual scarring, and might have been confused with many other diseases in which vesicular and pustular rashes occurred. Varicella is also a highly infectious disease and is capable of causing large epidemics, but the mortality remains low in nations that are often at risk. It is however a disease more frequently found in childhood and the younger age groups than variola, which may attack at any age. Thus, variola is a more likely diagnosis than varicella in the present context.

It is most probable that either variola or varicella did occur in ancient Egypt. The generalized skin lesion of Rameses the Fifth and the skin eruption of the mummy from the XVIIIth dynasty strongly suggest the diagnosis of smallpox in both cases. As no major epidemics of this disease have been recognized by the ancient chroniclers, the balance of probability therefore is in favour of a diagnosis of variola minor in these cases, but this by no means denies the possibility that varicella, or even variola major, did not also occur in ancient Egypt—in our present state of knowledge we are unable to differentiate clearly between these diseases in antiquity.

Akkadian texts do not help to distinguish between the diseases of variola and varicella. The disease postulated to have been found in the mummies in Egypt was probably identical to that described in the Akkadian texts; the infective virus could readily have been disseminated between the peoples of Egypt and those of Asia Minor. Thus, although no actual post-mortem material that could be diagnosed as of variolar origin has yet been discovered in Asia Minor, the Egyptian lesions make the occurrence of variola in Mesopotamia a very strong probability. Some of the Akkadian texts relating to the *bubu'tu* lesions date from the Old Babylonian period (c. seventeenth century B.C.), having been copied from older texts. It is probable therefore, that the Egyptian disease was known to physicians in the early part of the second millenium in Mesopotamia, a period of time that would agree quite well with the reported case of suspected variola from the XVIIIth dynasty in Egypt. At this period of history there was close co-operation between physicians in Egypt and Mesopotamia, both of whom employed doctors in their own royal courts and loaned physicians to other courts in Asia Minor.

THE INTERNAL LESION

It has already been stated why the internal *bubu'tu* lesion may be considered to represent a different disease from the external one.¹ When found in the internal organs, the lesion appears as a simple vesicle, i.e. as a clear-walled cyst. From the texts, the liver and gall-bladder show multiple *bubu'tu* lesions which are not only found under the capsule but do not necessarily involve the neighbouring organs. These lesions are found in omen texts and refer to physical signs found at post-mortems done on sacrificial animals. The usual animals sacrificed in this manner were sheep and kids, but cattle and bulls may also have been used on great ceremonial occasions; the commonest animal however appears to have been the sheep. Only

apparently healthy animals were suitable for sacrifices.

Let us now consider the differential diagnosis of clear-walled cysts found in the liver, gall-bladder or lungs of animals, of which the sheep is the most important. Occasionally simple cysts are found in the liver and lung, but not in the gall-bladder without concomitant disease. However, the cuneiform texts (CT 20.33.101–104; 30.50.13) clearly mention multiple lesions, and we would expect to find simple cysts subcapsularly in the liver and not distributed in the hepatic parenchyma. The cestode, *Echinococcus multilocularis*, forms multilocular cysts in rodents that are highly pathogenic to the host's tissues; it may also infest man. The cysts are often distorted by pressure and are usually found in the liver, actually invading and destroying liver tissue. The vesicles contain a gelatinous material, not a clear fluid. On the other hand, the related cestode *Echinococcus granulosus* usually has a well-formed capsule, and the cyst, which is unilocular, contains a clear, watery fluid. These cysts are found in sheep and cattle as natural hosts, but man may also become infested. The cysts are considered to be practically harmless unless complications ensue—a leaking cyst wall, secondary infection of the cyst, rupture of the cyst, or development of pressure symptoms in organs. The life-cycle of this parasite alternates between dogs, foxes and wolves as definitive hosts and sheep and cattle as alternative hosts, with man becoming infested occasionally. The cestode, *Multiceps multiceps*, infests dogs and leads to coenurus infection in the brain of sheep (and perhaps of goats as well). These cysts are relatively small, have a well-developed fibrous capsule and contain a clear fluid. Very few human cases have ever been described. *Taenia hydatigena* in the dog develops its larval stage in the liver of sheep. The cysts in the liver are usually multiple, have a definite capsule and contain clear fluid. This tapeworm is not pathogenic to man.⁶

The internal bubu'tu lesion strongly suggests infestation by a cestode, but it is by no means clear which tapeworm is involved. The texts give little help in solving this matter; they merely state the anatomical sites of infestation and the multiplicity of the lesions. However, by a process of elimination we may clarify the position considerably. First of all, we may note that the liver is involved and therefore *Multiceps* infestation is most unlikely. Next, *Taenia hydatigena* larvae are not found in the lung or gall-bladder. Thirdly, the cyst of *Echinococcus multilocularis* is a relatively rare infestation in man, but fairly common in cattle and sheep; the sponge-like, growing mass contains this gelatinous material which can easily be distinguished from clear, vesicular fluid. This leaves the cestode *Echinococcus granulosus* to be considered. The cyst of this parasite is not uncommon in man. The close association between dogs, sheep, cattle and humans, found frequently in pastoral and farming communities, is reflected in the infestation rate of hydatid disease among herbivores and humans. The cyst is most frequently found in the liver (hydatid disease of the liver), but it may be found in many other organs of the body. It contains clear fluid and may be quite symptomless even though growing slowly.

The probability therefore is that the internal bubu'tu lesion represents infestation

⁶ A. S. Chandler and C. P. Read, in their *Introduction to Parasitology*, New York, 1961, p. 360–66, give an excellent outline of some of the life-cycles of parasites that may be found in livers and lungs of animals.

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by the parasite *Echinococcus granulosus*, forming hydatid disease of the internal organs. In ancient Mesopotamia, pastoral and farming communities were widely scattered throughout the land, so that the spread of infestation could readily occur through the agency of sheep and cattle. The relevant texts are from the library of King Assurbanipal (seventh century B.C.) and are copies of Old Babylonian texts. Thus, the date of the occurrence of this infestation in Mesopotamia may go back at least to the early part of the second millenium.⁷

SUMMARY

The bubu'tu lesion is considered to be a vesicle and is a symptom of various diseases, which are either of infective or parasitic nature. Both groups are considered in detail.

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⁷ T. D. Kelly and N. Izzi (*J. Fac. Med. Baghdad*, 1959, 1, 3, 115–40) state that the first references to hydatid disease are found in the Talmud, where 'water bladders' are described. But in the fifth century B.C. the Hippocratic author of the *Aphorisms* (Bk. 7, 55) also mentions 'water bladder' cysts, thus suggesting hydatid disease. J. V. Kinnier Wilson (*Diseases in Antiquity*, Springfield, Illinois, Thomas, 1967, p. 197), suggests that the Akkadian word *erishtu* may refer to echinococcal cysts in the liver of sheep.

It is interesting to speculate on the possibility of infestation among the Israelites. In the time of the Patriarchs (probably during the first part of the second millenium) we are informed in some detail about the nomadic habits of the ancient Hebrews. Indeed, Abraham himself should be considered as a typical nomadic sheikh, rich in portable goods, including many animals (*Genesis*, 13, 2), and lived part of his life in Mesopotamia. Job was also an important sheikh who owned large herds (*Job*, 1, 3; 42, 12). The close association of domestic animals with human beings certainly may have led to cases of hydatid disease, although we have no information on this subject. It should be noted that in Ancient Mesopotamia sheep were frequently eaten at festivals.