often both bones, and sometimes in both arms—has always been exceedingly common in Egypt in comparison with the incidence of other fractures. This is true of every period from the earliest known prehistoric times up till the present. The Egyptians have always indulged in fencing, both as an amusement and also as a serious method of attack; for both purposes they use the *naboot*, a very thick, heavy stick about 5 ft. long, which many Egyptian peasants habitually carry. No doubt the great majority of these fractures of the forearm were inflicted while the victim, with upraised arm, was defending himself or herself; for a considerable number of women, especially in prehistoric times, have suffered from this injury. In the Anatomical Museum in the Cairo School of Medicine there is an example of such a fracture of the left forearm in a girl of the time of the twenty-sixth dynasty (about 600 B.C.), whose bodily remains bear distinct traces, not only of the manner in which the injury was inflicted, but also of a possible reason for the fatal attack which had been made upon her. She was a young woman less than 20 years of age and in the sixth month

Fig. 3.—Diagram to show the opening of the sutures at the base of the skull. (Illustrating Dr. Wood Jones's paper, p. 736.)

of pregnancy; just when her condition was making itself evident she was murdered by a series of blows, one on the left forearm, another on the left shoulder breaking the acromion process, and others, the fatal blows, smashing the left side of the jaw, face, and cranium.* There is, perhaps, no such common motive for murder in Egypt at the present day as the discovery by a father or brother of delinquency on the part of a daughter or sister. This case seems to have been an ancient instance of a drama of daily occurrence in Egypt to-day.

There is one curious feature common to both sets of splints described in this communication, and that is, unlike the general usage of modern European surgeons, the old Egyptian employed more than two splints. In other words, he endeavoured to form a protective casing around the damaged limb to guard it against injury from outside rather than to hold the fragments of bone rigidly in position, and so avoid the greater danger of damage from within. It is a striking testimony to the stability of this idea, as well as of the extreme conservatism of the Egyptian, that three thousand years later he was using exactly the same form of appliance. I have recently described sets of splints found around the broken forearms of a young Christian woman, who was buried on an island near Philae in the 7th century A.D.³ Five rough wooden splints were applied around one of these damaged limbs.

In the year 1903 an expedition was sent by the Egyptian Ministry of Public Works to Lake Tsana in Abyssinia. On its return Mr. Hayes, the Medical Officer to the Expedition, told me that when they crossed into Abyssinia patients flocked to him from all the surrounding country; among them was a man wearing splints on a broken forearm which resembled those used in Egypt five thousand years before.†

Gorgy effendi Sobhy, Demonstrator of Anatomy in my department, tells me that the use of such splints as I have described in these notes is still widely prevalent in Egypt, although the rapid increase in the number of medical men trained by European methods and in accordance with Western ideas, and also the improvement in the educa-

* I unrolled this mummy two years ago in the presence of Sir A. W. Simpson, Emeritus Professor of Midwifery in the University of Edinburgh. Before we had any idea as to what was about to be revealed I told Professor Simpson, in answer to his query, that I had never seen the mummy of a pregnant woman.

† Unfortunately these splints were not brought away from Abyssinia, and I have only the verbal account of them given me by Mr. Hayes, who at that time had neither seen nor heard of the ancient splints in the museum of my department.

tion of the village barber-surgeons, threaten the extinction of this form of splint, which has been in vogue here or the past five thousand years. He informs me that most of the barbers, when they do not refer cases of fracture to a medical practitioner, make use of a pair of splints after the European model; but in most villages there are old women ready to take upon themselves the treatment of fractures. They make a kind of mat of a number of pieces of palm-stick (the axis of the leaf of a date palm) laid side by side, and wrap the broken limb in this, so as to form a tube around it like that found in the second case described above. Dr. Gorgy tells me that there is a much-venerated relic of an early Christian monk in one of the churches of Old Cairo with such a splint in position on a broken arm.

The modern Egyptian bonesetter uses the same type of

Fig. 4.—Fracture of the skull in which a rounded fragment was found inside the cranial cavity. (Illustrating Dr. Wood Jones's paper, p. 736.)

splint, but very often he uses a series of strips of rough wood instead of palm sticks.

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THE POST-MORTEM STAINING OF BONE PRODUCED BY THE ANTE-MORTEM SHEDDING OF BLOOD.*

By FREDERIC WOOD JONES, M.B.LOND.

[WITH SPECIAL PLATE.]

IN 1905, when Dr. Elliot Smith was engaged on the work of unwrapping the royal mummies at the Cairo Museum, he discovered in the body of Rameses V an *ante-mortem* wound of the skull, and around the wound he saw and described "a wide area of discoloration."¹ Although from this discoloration Professor W. A. Schmidt was unable to obtain any blood reactions, there is practically no doubt that it was in reality due to blood. The blood that causes the staining is only to be identified by blood tests for a certain lengthy period after its shedding, and 250 years is the limit of age of blood stains from which positive reactions have been obtained. It is therefore not surprising that the blood of Rameses V failed to show the blood reactions.

In the anthropological work of the Egyptian Government Archaeological Survey of Nubia, Dr. Elliot Smith and I have come to recognize that, though the stains of ancient blood may not be amenable to laboratory treatment, still they are, none the less, signs of the utmost importance in the diagnosis of *ante-mortem* wounding, even in the most

* An account of the circumstances which have made such an investigation as this possible will be found in the first *Bulletin of the Archaeological Survey of Nubia*. This note is published with the permission of the Egyptian Ministry of Finance and Captain H. G. Lyons, F.R.S., Director-General of the Survey Department, under whose direction the Archaeological Survey of the country to be flooded, when the Assouan dam is raised, is being carried out. For the determination of the age of the materials used in this investigation I am indebted to Dr. George A. Reisser, who conducted all the excavations and the archaeological work of the expedition.

ancient of bodies. Among the several thousand bodies that we have already examined in cemeteries excavated in that tract of Nubia between Shellal to the north and Dabod to the south, we have found a great number of cases of wounds that have caused the death of their recipients. Some of these wounds were doubtless the outcome of accidents, but the great majority were those that it is but natural to expect at the frontier line of two ancient kingdoms. Several were caused by sharp instruments, especially in those bodies buried in cemeteries dating from Roman times; whilst others of the same period were produced by hanging, or by blows upon the head. Amongst the bodies in the earlier cemeteries, and especially in the prehistoric* burials—the commonest *ante-mortem* wounding that caused death, is a general smash of the skull, at times so extensive that portions of the head or face of the victim are missing from the grave.

Many factors go, in these bodies, to determine the *ante-mortem* or *post-mortem* origin of the wounding, and, as a rule, in undisturbed burials there can be little doubt as to their real nature. Bodies that have met with violent deaths, so far as we have observed, are buried without ornaments, even though the cemetery of their interment may be one in which rich ornamentation is the rule.

Other circumstantial details may at times contribute to the certainty of the diagnosis; hair and brain and fragments of skull bones have been found, firmly clotted into a solid mass, within the cranial cavity; and, in the pitch-made mummies of the Ptolemaic period, we have come across a man within whose skull the fragments of bone derived from an *ante-mortem* fracture were embedded in the embalming bitumen.

The question that usually demands an answer in the archaeological investigation of broken and disturbed human remains is that of the time of the infliction of the fracture; was it produced before the death and burial of the individual, or was it caused by grave plunderers after the interment of the body? It is in such cases as this that the diagnostic value of blood staining of bone is so well demonstrated, for in disturbed burials all traces of circumstantial evidence of *ante-mortem* wounding may easily be absent. The diagnostic differences between the appearance of fractures inflicted before death and those inflicted after death may be very slight indeed; and in dealing with large quantities of disturbed and broken bones these slight differences are easily overlooked.

* In Egypt any grave earlier than the time of the first dynasty is called "prehistoric." It implies an age of about six thousand years—G. E. S.

There are many factors at work that may make the differential diagnosis uncertain or impossible; the effects of long-continued grave pressure are extremely confusing, and the erosion of surfaces that were once clean cut may produce a very perfect picture of *ante-mortem* splintering. Fractures of the limb bones and of ribs are apt to present peculiar difficulty, for then one single broken bone may be the only trace of very extensive and fatal wounding. The element of doubt surrounding such cases is usually cleared up by the discovery of the dark-red stains of blood, shed presumably by the act of wounding. The stain may be limited to the fractured surfaces, and then a characteristic appearance is produced, for the rough fragments become deeply dyed, and the recesses of the cancellous tissue show darker areas by reason of their more abundant supply of the pigment; it is an appearance that cannot be easily mistaken, and its most noteworthy feature is that, even in most ancient bones, it looks strangely recent.

As a rule, the staining is by no means limited to one fractured bone, but involves wide areas around the seat of injury; this is especially well marked in fractures of the cranium, where very extensive reddish stains are, as a rule, present upon the flat surfaces of the skull bones.

Amongst the bones with which this survey has had to deal there are no other discolorations with which these stains may be easily confused; and even on the deeply-yellow bones that are found in bodies buried in goat skins, or bones turned brown by mummy wrappings, the *ante-mortem* blood stain shows vividly enough. In a Ptolemaic mummy, with an extensive smash of the head, the blood was not visible upon the pitch-stained

Fig. 2.—Skulls showing the lesions of the base caused by hanging. (Illustrating Dr. Wood Jones's paper, p. 736.)

bones, but was well marked upon the front surfaces of the incisor teeth; and in a prehistoric body the recently-broken surfaces of the teeth were deeply stained with blood.

It is a remarkable thing that the blood spilled by the killing of a prehistoric Egyptian should make a stain so asting that to-day it is the best evidence of his violent death. By the most careful archaeological dating and the most critical interpretation of chronology, the age of some of these stains must exceed 5,000 years, and yet they still are remarkably vivid. It may be that, in other parts of the world, where the wonderful preservation of bodies that is so common in Egypt is not found, this blood-staining may be more transient, and may not be of such great importance as a diagnostic sign, but amongst the thousands of bodies with which we have had to deal, it has proved to be a point of the utmost value.

It is a point that should be carefully looked for and noted in future archaeological work, for if it may not be a sign that is of actual medico-legal importance, it may help to throw some light upon the life conditions of an ancient people.

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THE EXAMINATION OF THE BODIES OF 100 MEN EXECUTED IN NUBIA IN ROMAN TIMES.*

By FREDERIC WOOD JONES, M.B.LOND.

It is not often that the examination of a large number of bodies of people killed by various wounds falls to the share of the anatomist. Such cases as reach our museums are, for the most part, isolated instances of death from violence inflicted by accident, and the medico-legal interest attached to the damage of soft parts so greatly outweighs the importance of the bony injuries that the *post-mortem* evidences to be found in the skeleton may easily be overlooked or neglected. Among the vast number of bodies that Dr. Elliot Smith and I have handled during the first three months' work of the Egyptian Government Archaeological Survey of Nubia, we have been fortunate enough to find much material that possesses the advantages of being dated with historical accuracy and of being preserved in the wonderful manner that is common among bodies interred in this part of the world.

No burial site could be better suited to the study of the effects of violence inflicted upon the human frame than the region around the Pillars of Konosso that mark the frontier line of Ancient Egypt. Vast cemeteries of most historic and prehistoric periods lie in this neighbourhood, and the bodies that have been buried in these cemeteries are those of the peoples who have come from the north and from the south, as traders or as soldiers, to this boundary line of commerce and of politics. So far as any records go back, this region of the first cataract of the Nile has been an arena for all those contending peoples

who have lived and fought, who have died and been slain, in the myriad frontier battles waged around Shellal by the Nubians from the south and the more highly-cultured dwellers, or conquerors, from the north.

From isolated instances a great quantity of material has been examined that has been of the utmost interest in the study of *ante-mortem* wounding, but the cases to be described are those of two interments only. The bodies from these burials date from late Roman and Byzantine times, and the trenches in which they were thrown were portions of an extensive Roman fort, built upon the eastern bank of the Nile, and facing the historic island of Philae. In one trench 62 bodies were thrown in one confused mass, and in the other were 40 more (Fig. 1).^{*} Both burial trenches are of the same date, and in both cases all the bodies in the trench were thrown in at one act of

burial. All the skeletons were those of males, and, with the exception of a youth of about 18, all were grown adults in the prime of life. Each corpse was wrapped around with coarse linen, and the cords that bound their legs together, and trussed their arms to their sides, were not even removed before burial. Even the rope with which the great majority had been hanged was found *in situ* around the neck of one of the victims, and in a great many other cases thinner cords encircled the cervical vertebrae in firmly knotted loops. The injury most commonly found, and the one of the greatest interest, was that inflicted upon the skull by the process of hanging. The lesion is a peculiar and very constant one, and although it is not the injury most naturally expected, still its origin is easily seen, and all its features are readily explained. In all cases the lesion was confined to the base of the skull; no *post-*

Fig. 5.—Exit wound of a spear thrust through the loin from the front.

mortem evidences of hanging were to be found in the spinal column, there being no single case of damage inflicted to a cervical vertebra in the whole series of over 100 bodies. The injury to the skull consists of a dragging open of the sutures running antero-posteriorly, and a tearing apart of the whole of the cranial base, so that the lateral halves of the skull tend to be disunited (Fig. 2).

The final effect is an oblique opening of the sutures, so that the one portion of the skull, represented by the occipital and one temporal bone, becomes pulled aside from the other portion, represented by the facial part of the skull and the other temporal bone. The basilar suture in most cases becomes disunited, and so the median axes of the front and back portions of the base of the skull are not continuous.

* Figs. 1, 6, and 7 will be found in the special plate.

* An account of the circumstances under which these bodies were found by Dr. Reissner, to whom I am indebted for the determination of their age, will be found in the first *Bulletin of the Archaeological Survey of Nubia*. This report is published with the permission of the Egyptian Ministry of Finance and Captain H. G. Lyons, F.R.S., Director-General of the Survey Department, under whose direction the survey of the country that will be submerged in the Assouan reservoir is being carried out.

TO ILLUSTRATE DR. WOOD JONES'S PAPER ON THE *POST-MORTEM* STAINING OF BONE.

Fig. 1.—The skull of an Egyptian (Ptolemaic Period) exhibiting a fracture surrounded by blood stains.

Fig. 2.—The fractured mandible of a prehistoric Egyptian showing blood stains.

TO ILLUSTRATE DR. WOOD JONES'S PAPER ON THE EXAMINATION OF THE BODIES OF 100 MEN EXECUTED IN NUBIA.

Fig. 7.—Skull showing the passage of a sharp instrument that severed the head from the body.

Fig. 1.—View of the bodies undisturbed in the trench.

Fig. 6.—Sword cut of the parietal bones.