

IV.

NOTES ON PREHISTORIC TREPANNING IN THE OLD AND NEW WORLDS. By ROBERT MUNRO, M.D., SECRETARY.

In the paper which I communicated to this Society on 14th December 1891, my primary object was to describe a trepanned skull (fig. 1) which had been found a few years previously by the Marquis of Bute in an early Bronze-Age burial in the Island of Bute. As this was the first discovery of the kind known within the British Isles, I took the opportunity of reviewing, by way of comparison and illustration, some analogous discoveries in foreign countries, more especially in France, where the subject had already given rise to much speculative interest. From the continued and growing importance of these inquiries, I thought myself justified in republishing my essay on prehistoric trepanning, after due enlargement so as to embrace the later researches, as one of a group

of problems recently published in book form under the title of *Pre-historic Problems*. In some of the reviews of this work which appeared in current scientific journals, notably that in *Nature* (vol. lvi. p. 390), and that in *Natural Science* (vol. xi. p. 274), the importance of this essay is emphasised on the ground that it illustrates primitive surgery and folk-lore, or, as put in the former, "how craniology may throw light upon the surgical and religious practices of prehistoric folk." But this, in my opinion, gives only partial expression to the results which are likely to accrue to the history of early civilisation when this subject comes to be more deeply studied. The interesting researches which

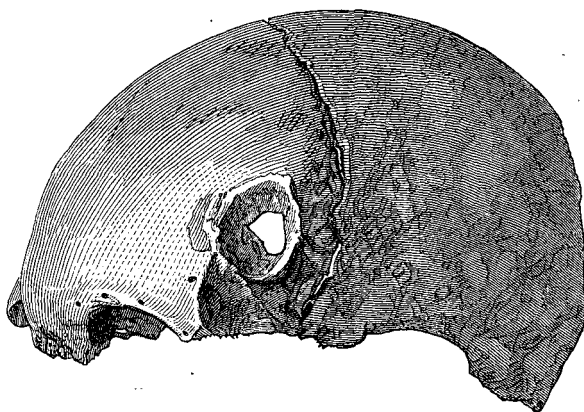


Fig. 1. Skull from a Cist at Mountstuart, Bute. ($\frac{1}{2}$.)

have been going on throughout Europe since the appearance of Broca's memorable essay in 1876, though they have considerably enlarged our knowledge of the objects and rationale of primitive trepanning, cannot be regarded as having finally settled either the extent of the data or the deductions founded upon them. The operation of trepanning is by no means such a simple process as to have been readily invented by a barbarous race without some kind of transmitted instruction; for even at the present time, notwithstanding the advantages of vastly improved appliances, it is regarded as one of the boldest the surgeon has to face.

That the custom had independent centres of development seems to

me, therefore, less probable than that it spread to distant countries and different races by culture, contact, or emigration. From this point of view, the prevalence of trepanning among the prehistoric peoples of Europe and North-Western Africa, as well as among the extinct Guanches of the Canary Islands, and its survival to the present day among some of the less civilised races who have been left behind in the side eddies of the current of modern civilisation, are phenomena of the utmost significance when taken in conjunction with the recently published evidence of the prevalence of trepanning among the ancient Peruvians and Mexicans. The striking parallelism between some of the phases of pre-Columbian civilisation in certain districts of America, and the earlier civilisations along the shores of the Mediterranean and Eastern Asia, has often given rise to the surmise that the inhabitants of the Old World were in possession of means of direct communication with the American continent long before its discovery by Columbus. It now looks as if the custom of trepanning would strengthen the evidence in support of this theory. But before this aspect of the problem can be profitably discussed, there are some preliminary points which have to be investigated. Of these, one of the most paramount is to determine if there be any analogy between the methods of operating on both sides of the Atlantic. I may explain that when *Prehistoric Problems* were published I was not aware of these later transatlantic discoveries, as it was only during a recent visit to the American continent that I had an opportunity of making myself acquainted with this important development of the subject. My object in noticing them now is, in some measure, to supplement what I have already written on the European side of the question.

On visiting Washington during the last week of July 1897, Professor M'Gee showed me at the Bureau of Ethnology not less than eighteen trepanned skulls from Peru; which had already been examined by many anthropologists throughout America. I learned also that an exhaustive report on their anatomical and surgical characteristics was in the press. Before leaving America I had the pleasure of receiving a copy of this monograph, which is now before me, and supplies more accurate details than my own hurried notes.

The principles and methods of primitive surgery, as disclosed by these remains, appeared to me so extremely interesting that I prevailed on Professor M'Gee to exhibit them at the meeting of the British Association held at Toronto during the month of August of last year. Members who were present at the Anthropological Section of that meeting and heard the Professor's lucid description of these skulls, will, I have no doubt, be anxious to peruse the full report. It is entitled "Primitive Trephining in Peru," by Manuel Antonio Muñiz and W. J. M'Gee. Being an extract from the *16th Annual Report of the Bureau of American Ethnology*, and therefore readily accessible to European anthropologists, it will be unnecessary here to give more than a short account of the circumstances under which these crania were discovered, and of the conclusions arrived at by the authors.

In a prefatory note Professor M'Gee writes as follows :—

"During several years prior to 1893, Dr Manuel Antonio Muñiz, some time Surgeon-General of the army of Peru, travelled extensively through the ancient land of the Incas, and made large collections from the huacals and scattered graves of the Andean valleys and the desiccated Piedmont zone inclining from the Cordillera toward the Pacific Ocean. Lowland Peru is arid, and even the rugged highlands fronting the Pacific receive but limited rainfall ; and by reason of a combination of conditions, the air and so the soil are dry nearly all the year, and in some places the ground is saline or nitrous. Accordingly, organic matter buried in the earth is preserved in a manner hardly conceivable to those accustomed to the conditions of humid lands ; and thus Dr Muñiz' explorations were remarkably fruitful.

"The material collected from the long-neglected tombs of Peru by Dr Muñiz comprised weapons of war and the chase, implements in wide variety, domestic utensils, costumery of skins and stuffs, and articles of adornment, all in considerable quantity ; though his tastes and training led him to devote especial attention to the somatic remains of the ancient people. His collection comprised something over a thousand crania : of these, nineteen were found to be trephined, several more than once.

"In 1893 Dr Muñiz attended the 'International Congress of Anthropology of the World's Congress Auxiliary of the World's Columbian Exposition' at Chicago, for the purpose of exhibiting and describing the trephined crania. His formal communication, translated into English, forms the accompanying 'summary statement.' Afterward he attended the Pan-American Medical Congress at Washington, and exhibited the collection informally ; and still later

he transferred its custody to the writer, on behalf of the Bureau of American Ethnology, for use in preparing the accompanying description of the remarkably interesting series of specimens of primitive surgery.

"On his return to Lima, toward the end of 1893, Dr Muñiz had the misfortune to encounter a political movement; before it ended, his house was sacked and



Fig. 2. Exterior aspect of Cranium 10 from Cuzco.

burned, his library and his rich collections were destroyed, and he was exiled. Of all the archaeological materials brought together during his years of labour, only the collection of trephined crania remains, and the energetic collector has ensured the safety of this remnant by transferring it to the Bureau of American

Ethnology for preservation in the United States National Museum, save for a single specimen (the triple-trephined cranium from Cuzco) which has been placed in the United States Army Medical Museum."

After a minute description of the anatomical and surgical features of each skull, the details of which are greatly simplified and rendered easily intelligible by a series of beautiful illustrations, Professor M'Gee concludes with an elaborate discussion on the methods of operating, the kind of instruments used, and the motive or motives for which the operation had been performed.

The methods pursued by these Peruvian operators are readily seen to have been of two kinds. First, an oval or circular perforation was effected by scraping the bone with a rough-edged instrument (fig. 2). In this case the apertures show highly bevelled margins similar to those on many of the trepanned skulls found in the neolithic burials of Europe, as, for example, that from the grave in Bute, now deposited in the National Museum of Edinburgh, as well as in the Guanche cemeteries of the Canary Islands. The second method was by circumscribing an irregularly-shaped portion of the cranial surface by deep incisions, either straight or curved, and then removing it by means of an elevator. These incisions are V-shaped in section, shallowing and narrowing towards their extremities, and often project beyond the margin of the aperture. One cranium shows four straight incisions circumscribing a square portion of bone, and overlapping each other at the corners, precisely similar to those on the specimen figured by Mr Squier (*Incidents of Travel and Exploration in the Land of the Incas*, p. 457; also in *Prehistoric Problems*, fig. 86). Other crania have irregularly-shaped openings made by a combination of both straight and curved incisions. In one or two instances the bungling art of the operator is revealed by disconnected cuttings, apparently of an abortive character, on the adjacent cranial surface.

The following extracts from Professor M'Gee's general observations sufficiently bear out the correctness of these statements.

"The process of rasping is distinctly exemplified by several of the specimens. Perhaps the clearest evidence is that afforded by cranium 16, which displays a complete operation without trace of incision or elevation, apparently produced

wholly by rasping, scraping, or grinding. It is true that the outlying marks are for the most part indistinct, but this may be ascribed to increasing delicacy of manipulation as the process was brought to an end—a delicacy attested by the paper-like thinness of the remaining margin of the inner table; and a sufficient number of striæ are preserved to at least suggest the extension of the process over the entire area of this particular operation (p. 57).

“Several of the specimens are without traces of rasping or scraping. These fall into two groups, in one of which the operation was evidently incomplete, while in the second the more delicate (at least) of the marks of instrumentation have been obliterated by physiologic process. To the first group belong eight crania, all of which afford independent indications that the subjects died under the knife, either in consequence of the original lesion or from the effects of the operation. The second group comprises five crania, in which there is collateral evidence of long survival and extensive reparative process. In every case in which the operation was presumptively complete, and in which traces of instrumentation have not presumptively been obliterated by physiologic action, as well as in several others, rasping is exemplified (p. 57).

“The elevation of the button outlined and partially dissevered by the incisions is indicated clearly in one case, and with strong probability in at least six others, and is suggested in several additional cases. In cranium 4 one of the margins of the irregular aperture is crushed, splintered, and undercut in such manner as to record unmistakably the application of the elevator lever-fashion over this part as a fulcrum; while the broken edges of the inner table and the margins of the aperture generally were evidently produced by the forcible elevation and breaking outward of the button” (p. 56).

As to the instruments by which these operations had been performed, the author, after a critical review of the form of the aperture and the various markings on its margin—cuts, striations, etc.—thus formulates his opinions:—

“Summarily it appears that the instruments used in performing the operations exemplified in the Muñiz collection were chiefly or exclusively stone implements of the character found among nearly all primitive peoples, including the ancient Peruvians. There is nothing to indicate that the instruments were in any way specialised; but there is absolutely no indication of the employment of trephines, saws, or other multiple-point instruments, and only negative suggestions concerning the use of metal” (p. 60).

The evidence of motive for operative interference derived from the presence of antecedent traumatic lesions is indubitable only in a few cases. In the others such a connection is either negative or

of a subordinate character. On this phase of the subject the author thus expresses himself:—“The relations may perhaps best be summarised by the statements: (1) that most of the operations were independent of cranial wounds so far as can be ascertained; (2) that most of the cranial lesions were not followed by trephining; and (3) that only wounds of great severity were followed by cranial treatment.”

On reviewing the indications of motive generally, the Professor, though regarding the evidence as somewhat vague and illusive, comes to the following conclusions:—

“There are suggestions of therapeutic treatment in a few of the crania, yet, on the whole, stronger indications that even in these cases the operations were thaumaturgic, while in the great majority of the specimens the operations can only be interpreted as wholly thaumaturgic; and since there is nothing to indicate different culture-grades or differentiated methods, it seems necessary to conclude that all the operations belong to the earlier stage in the development of sophiology, and were essentially thaumaturgic. It is clear that most of the operations were ante-mortem, and there is nothing to indicate that any were post-mortem. At the same time, there is, in several cases, conclusive evidence that the motive for the treatment was connected—albeit in a thaumaturgic way—with the individual treated, while there is not the slightest indication that the operation was vicarious in any case. Accordingly, the motive must be subclassed as sortilegic.”

As regards the provenance of the skulls, Dr Muñiz informs us that five were found in the valley of Yucay near Cuzco, the metropolis of the ancient Inca empire, and twelve within a 60-miles' radius of Lima; one cranium was discovered in Tarma, and one in the ruins of Cañete. His opinion of their age is thus stated:—“All these skulls, some taken from caves, pertain to a period at least two hundred years anterior to the discovery of Columbus.”

In a summary statement Dr Muñiz gives the following deductions as the result of his investigations:—

“(1) Trephining, as a surgical operation, was employed in pre-Columbian Peru in various pueblos and at divers latitudes.

“(2) Different methods of operation were employed as the segments extracted were of different shapes—square, polygonal, circular, oval, etc.

"(3) There are found crania which show that the individual succumbed immediately, or a short time after the completion of the operation. Others are found which indisputably prove the survival of the person subjected to the operation.

"(4) It is almost impossible to accept for ancient Peru the idea of post-mortem trephining, the numerous other examples of cranial perforation being probably of pathologic origin."

In conclusion, it may be noted that, in addition to the nineteen trepanned skulls forming the Muñiz collection, illustrations of the "Inca skull," brought from that country by the late Mr Squier, and of eight others preserved in the Municipal Museum at Cuzco, are incorporated into this monograph for purposes of comparison, and to complete, as far as practicable, the account of the trepanned crania from Peru. Of the latter, three have their apertures nearly circular, and, from the marginal evidence, there is reason to believe that they had been performed by scraping; while the remaining five are more or less irregularly shaped, and the margins are incised.

"Trephining in Mexico" is the title of an article by Drs C. Lumholtz and A. Hrdlicka in the *American Anthropologist* of December 1897, describing two trepanned skulls found in burial-caves in North-Western Mexico. One of these is in the Natural History Museum of New York, and the other in the Museum of Science and Art, Philadelphia—both forming part of the Lumholtz collection. The chief points of interest in regard to the former are thus described:—

"The cave was found to be very small, and, contrary to the exaggerated reports of the Indians, it contained only three skeletons. According to the custom prevailing throughout most of the country of the Tarahumares, those remains had not been buried, but the skeletons were lying on their backs, their skulls turned toward the east. A few crudely-made clay vessels of the ordinary Tarahumare type accompanied the skeletons. On gathering the three skulls, I was at once struck by a circular hole in the right parietal bone of one of them (fig. 3). As they undoubtedly belonged to the Tarahumare, the question at once occurred to me—Could it be possible that this barbaric tribe, not particularly advanced in the arts, was capable of trephining? The remoteness of the place entirely negatives the suggestion that a civilised surgeon could have had anything to do with it.

"The skull, of which the lower jaw is missing, is that of a female over sixty

years of age. It is impossible to guess at the age of the specimen, on account of the circumstances in which it was preserved. However, the cranial walls still contained some animal matter, they are still somewhat fatty to touch, and retain some odour. A spindle (provided with a whorl made from a piece of pine bark) which was lying among the bones in this cave indicates that the body of this female had not been put there in recent times. This variety of whorl, so

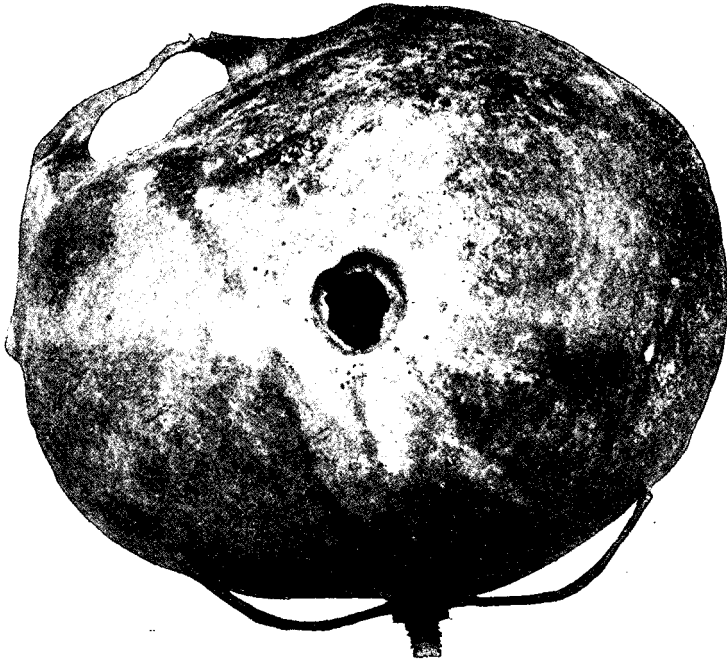


Fig. 3. Trepanned Skull from Mexico.

far as we can ascertain, has not been observed among the Tarahumares of the present day. It is indeed possible that this skeleton may be pre-Columbian.

“The skull does not present any deformities or fractures, nor is there anything pathological about it. There are no traces of any injury on either of the skull tables. It shows, however, evidences of a superficial injury of the bone at about the middle of the junction of the right parietal with the occipital.

“The singular aperture is situated in the anterior and superior part of the

right parietal bone, 1.3 cm. back of the coronal, and 2.3 cm. below the sagittal suture. It is almost exactly round, measuring 2 cm. in diameter, and the regularity of the hole indicates, without a doubt, that it is artificial. The outer edge of the hole is smooth and somewhat sunken, the parietes ascending from it; the inner edge is partly obliterated by a lamella of thin bone, which proceeds from all parts of the inner edge to the centre, and whose free edge is very sharp and irregular. Viewed from the inside of the skull, this lamella appears smooth and directly continuous with the inner skull surface. It is very probable that part, at least, of this lamella remained after the wound had been made.

"The walls of the opening are quite smooth, and are covered with a compact bony tissue. This fact, in connection with the smooth and slightly sunken external edge, shows that the wound was made a long time—several years—before the death of the person.

"One would expect that trephining among the Tarahumares would have been done in the most primitive way, by scraping; but the almost circular form of the opening, and its perpendicular walls, which show no signs of bevelling, do not admit of this conclusion. The senior author has never found among the Tarahumares any implement which afforded a suggestion that it had been used for such an operation. At present they do not use any stone implements except plowshares, and the art of trephining has apparently become obsolete."

The other trephined skull was taken by Dr Lumholtz from a burial cave near the pueblo of Nararachic, State of Chihuahua, but the trephining was only subsequently observed, when it passed for examination into the hands of Dr Hrdlicka. The aperture in this case, as in the former, is situated in the fore part of the right parietal (fig. 4).

"The opening itself," to quote the words of the authors, "however, is not round, as in the first case, but oval or almond-shape, with the blunt point forward; and the edges, which are very regular and uniform, are distinctly bevelled.

"The opening in its present state is almost filled with new bone, which indicates a long survival of the subject after the operation. Its size, as shown by the somewhat different colour of the new bone, was about 2.2 cm. by 1.6 cm. The anterior part of the wound is much more filled than the posterior, this latter presenting a depression of the size of about one-third of the whole original opening, partly filled with cancellous bone. In the lower part of this depression there is still preserved a slit-like communication with the interior of the skull.

"The parietal bone in which the opening is situated shows absolutely no sign

of injury. The edges of the opening, as already stated, are regular, without any nodules, and there is no trace of any healed depression or fracture. The inner table of the skull at the place of the opening shows a number of little radiations, which diverge from the slit mentioned, indicating that otherwise this inner table is smooth, and shows no injury nor anything pathological.

“That the trephining was done many years before the death of the subject, and probably in youth, is further indicated by a slight alteration of the whole

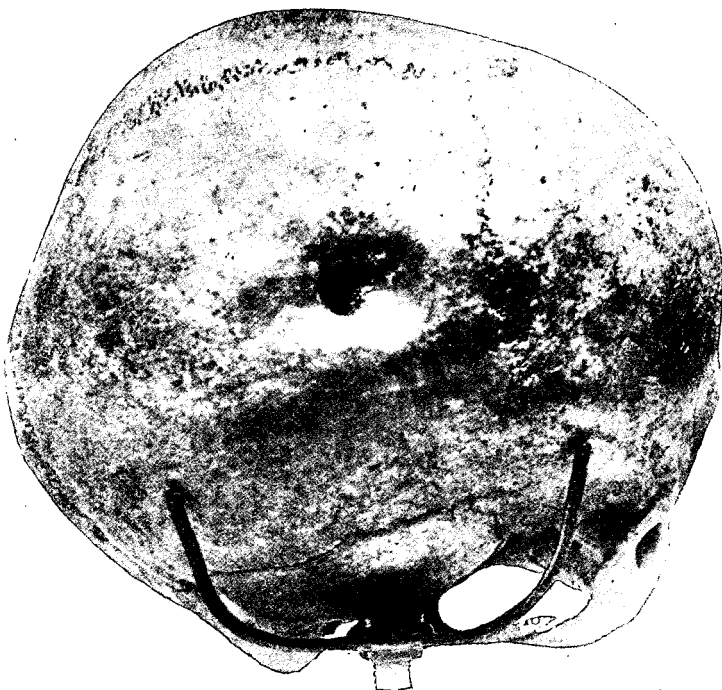


Fig. 4. Trepanned Skull from Mexico.

right side of the head posterior to the wound. (The right side is somewhat larger than the left, and seems slightly lower.)

“That the wound was made by trephining, a minute and thorough examination shows beyond doubt. The method of opening the skull in this case differed, however, from that employed in the first one. The shape of the wound and the bevelled edges, for which natural absorption alone could not sufficiently account, prove that in this instance the trephining was accomplished by scraping.”

The first of these Mexican specimens has a special significance in the fact that it strongly suggests that the opening was effected by means of some rotating instrument. Its circular shape, perpendicular edge, smooth surface, and, above all, the thin osseous lamella which projects into the orifice from the inner margin, are all indications in favour of this view. It reminded me of certain perforations in stone implements, such as could be made by the friction of a revolving round stick and sand. That the Indians were acquainted with the art of boring holes and sawing stone in this manner is abundantly proved by the ordinary archaeological remains collected throughout the country. I handled in the Toronto Museum a partially-bored stone implement having the central core still remaining—precisely like several specimens to be seen amongst Neolithic remains in Europe. Mr Hill Tout showed me, in his private collection at Vancouver, several fragments of sawn jade found among ancient remains in the valley of the Fraser river, one of which he kindly presented to me.

It would appear so far from these American researches that the curious psychological cult, founded on the European custom of cutting post-mortem amulets from the crania of those who had survived the operation of trepanning, with the idea that they were effective charms against malignant diseases and evil spirits, had no place among the religious obsequies of the pre-Columbian races of the New World. The only cranial relics to which I can refer as having been possibly used as amulets were in the Toronto Museum, but even these might have nothing to do with trepanning. These were four or five portions of human skulls of a more or less circular shape, and sharply defined at the edges. They were mostly perforated with small holes, as many as seven being in one large piece which measured nearly 8 inches in diameter. Mr David Boyle, the curator, pointed out that the specimen had been bored from the inside. (See *Annual Report of the Canadian Institute for 1888*, p. 53.) Another, 4 inches in diameter and highly polished on the convex surface, had three holes about an inch apart, as if placed in the apices of an equilateral triangle. Other two were plain discs. Some of these relics were found in a grave at Aurora, about 20 miles north of Toronto. I may mention that a plain cranial disc was found

on the site of the lake village of Glastonbury ; but whether such objects are to be regarded as amulets or ornaments, I cannot say.

In the Redpath Museum of McGill University, Montreal, I observed a Guanche skull having a large irregular opening at the junction of the frontal with the left parietal bone, which appeared to me to have been the result of trepanning during life. Subsequently I learned it had been so regarded by Sir William Dawson, F.R.S., in a paper (p. 9) on "The Physical Characters and Affinities of the Guanches or Extinct People of the Canary Islands." In this paper the author discusses the relationship of these people to the Neolithic inhabitants of Western Europe and Africa, and their possible connection with the colonisation of Eastern America. His conclusions on these questions are thus stated :—

(1) "The Guanches present the characters of a primitive and little mixed race, and their rudimentary civilisation corresponds with this, and assimilates them to such peoples as those of the early Swiss Lake habitations and the early Iberian races of Western Europe and the earliest colonists of Egypt and other parts of North Africa.

(2) "There are sufficient resemblances between them and native American races of the eastern part of that continent to render it not improbable that there was early intercourse between the two sides of the Atlantic, in which the Guanches or peoples allied to them may have borne a part."

Turning now to the Old World, I have a few words to say on trepanning as practised by an indigenous tribe of Berbers in the Aurès (Algeria). Through French military surgeons who happened to have been located in that part of Africa we have had a good deal of information regarding the habits of these people, and especially about the singular custom of trepanning which has prevailed among them from time immemorial. Those who desire to go more deeply into the subject may consult the works of Drs Amedée, Paris (*Mémoire sur la trépanation céphalique pratiquée par les médecins indigènes de l'Aouress*, 1865), L. Th. Martin (*Trépanation du crâne telle qu'elle est pratiquée par les Kabyles de l'Aouress*, 1867), and A. Védrenes ("De la trépanation du crâne chez les indigènes de l'Aurès," *Revue de Chirurgie*, Paris, 1885). According to these authors there are special operators called *thebibs*, who practise trepanning, having previously qualified themselves for the

purpose at one or other of two schools—one at Teberdèjà and the other at Chebla—where the art is taught. In a recent communication to *l'Anthropologie* (vol. viii. pp. 1 and 174) Drs Malbot and Verneau give an interesting account of these trepanners and their method of operating, together with illustrations of the instruments used and of the skull of a man who had been operated on in 1883, and died a couple of months after.

The chief instruments are a borer (*brima*) and a small curved saw (*menchar*), both made of tempered iron. The former consists of a slender stem, generally about 4 inches in length, terminating at one end in three small teeth—the centre one projecting a little beyond the others—and at the other in a tang for insertion into a round wooden handle. The handle is divided into two portions—the front portion having a projecting round stem which fits into a corresponding hole in the butt-end so as to allow the instrument to be rotated while the latter remains fixed. The saw terminates at one end in a tang for insertion into a wooden handle, and at the other in a short serrated blade turned at right angles to the stem. There are generally two saws, one with coarse teeth and the other with fine teeth. The former is used at the commencement of the operation, and the latter towards the finish, when the sawing is approaching the surface of the brain, where, of course, greater care in manipulation becomes necessary. The operator, after having made the preparatory clearance of the scalp, proceeds by first making a number of holes in the skull with the borer along the perimeter of the portion to be removed. He then saws through the intervening spaces and removes the portion of bone thus circumscribed by means of an elevator. For further illustrations of the instruments used by these primitive trepanners I refer you to the work of MM. Terrier and Péraire (*L'Operation du Trépan*, Paris, 1895). The cranium figured by Drs Malbot and Verneau clearly illustrates the various steps of the operation. The cuts and cut-shaped markings seen in the vicinity of the aperture were probably made for exploratory purposes, as there is evidence that necrosis of the bones had been going on for a considerable time. This remarkable pathological specimen was procured by Dr Malbot from a native trepanner at Taberdega, and fortu-

nately the history of its natural owner is known. When a young man he received a severe blow on the head during a scuffle, from which, however, he recovered without having undergone any operation. Some twenty years later he began to suffer from violent headaches, and the cause having been ascribed to the seat of the old injury, trepanning was resorted to as the most feasible remedy. The operation had been performed, not in one sitting, but after some dozen *séances*, and the result was reported to have been so far successful; but, unfortunately, a couple of months afterwards, when the patient seemed to be out of all danger, he died of an attack of small-pox.

The outcome of this cursory survey of primitive methods of trepanning, whether for surgical or other purposes, may be thus categorically stated. (1) The process of scraping a hole in the cranial wall was common to the whole of the geographical area in which evidence of trepanning has hitherto been found. During the prehistoric period in the Old World this process was most commonly adopted, though not exclusively, as is proved by the skull found at Lizières in France, which had an aperture of the form of a parallelogram (*Prehistoric Problems*, p. 210), and that from Casa da Moura in Portugal, which had an elongated space defined by two curved incisions—the operation in this case not having been completed (*Ibid.*, p. 214, fig. 85).

(2) So far as the operation has been geographically defined, there is nothing antagonistic to the hypothesis that the scraping method had first originated among the Neolithic folk of Europe, and thence spread to Africa, the Canary Islands, and America. On the contrary, the facts so far seem to support the hypothesis, as all the deviations in the method and manner of operating are of minor importance, or of such a nature as we might expect to be evolved in the course of progressive local experience. The custom of trepanning among the present descendants of the Berbers has, in all probability, derived its parentage from the Algerian Dolmen builders, who have left us a few trepanned skulls; and could we follow all the steps of its genetic descent, the only change of continuity encountered would be that effected through the substitution of metal for flint in the manufacture of the instruments.