to the glass. Before emptying the tubes, they should be rolled sharply between the forefinger and thumb, so as to make them discharge the whole of their contents, vehicle and microbes. In order to prevent the too direct action of light on the vaccine matter, we now use amber glass tubes.

c. Ivory Points.—The small ivory plates on which the animal vaccine is deposited are square at one end and pointed at the other. The pointed end is presented to the pool of vaccine squeezed out by the forceps, so as to charge it with lymph. It is afterwards quickly dried by the heat of the sun, or a clear fire at heat not exceeding 104 Fahr. When the point is heavily charged, it becomes dry at the end of fifteen or twenty minutes; the whole of the serous matter is evaporated, and nothing remains on the point but dried lymph, deprived of all humidity likely to macerate the active principles. Animal vaccine keeps for a long time in this shape. To prevent the porous nature of the ivory from absorbing a large part of the matter deposited on it, the points should be of a hard-grained ivory, and highly polished. Under these conditions, if the first layer have been widely distributed, it is absolutely useless to cover it with a second, as was formerly the practice. At the present time, the American points are highly esteemed. The points are sufficiently sharp to introduce the virus under the skin. These points are beautifully made, and I therefore give them the preference over all others;* but for the erosion of the skin, I always prefer metallic instruments.

Method of Employing Animal Vaccine.—As I have already said, vaccination with living vaccine, whether human or animal, succeeds at once, even when performed by simple puncture, if the operator know how to obtain the conditions necessary to ensure success; *i. e.*, vaccine taken at the required moment from good vesicles; the introduction of this vaccine under the skin without any flow of blood, etc. This is because evidently at this moment the microbes are in the enjoyment of their full vitality. They are uniformly diffused, and in isolation in their vehicle, without being able to escape the lancet of the vaccinator who goes direct to the pustule.

It is not so with preserved lymph. Many of the microbes have perished; those which have resisted have collected into groups, as if to say, "Union is strength". In order to have some chance of a good result, it becomes necessary to expend a much larger quantity of vaccine matter, and to introduce it by large and exposed openings; hence the scarification method, which I have recommended for the last fifteen years. Whether vaccine in tubes or vaccine on points be used, the object is that the vaccine should reach its destination with certainty and in sufficient quantity on contact with the dermis; and this end is obtained by the plan here recommended. After having drawn the skin tight, three scarifications about four millimetres in length each, not going deeper than the skin, and about one millimetre apart from each other are made; and it is on this group of scarifications, three of them being made at two centimetres apart, that the vaccine is diffused. If it be in tubes, it is enough to deposit it. If it be on points, they are first quickly plunged into warm water; and, after being taken out and the dried vaccine allowed time to soften, they are placed on the wound, well dried, and laid flat, and for a long time, until the ivory is completely freed from the vaccine with which it was covered. If a little blood be mixed with it, the whole is brought together on small groups of incisions and allowed to dry. Doubtless, nothing is more simple than to make these little scarifications; and yet, whether it be that their hand trembles, their sight deceives them, or routine misleads them, many old practitioners make them very badly, and the midwives still worse. The incisions they make are too long, or too deep, or too far apart; the blood flows; and the vaccination sometimes is accompanied by a wound which it is very easy to avoid, and sometimes is a total failure: the virus having been carried away by the hæmorrhage. It is for the purpose of regulating this little operation that I have invented the *vaccinator trephine*. (Fig. 4.) It comprises a circular blade two centimetres in diameter, enclosed in a cylindrical frame, to which a rotatory movement is imparted by the working of an internal spring. Applied closely to the tightly stretched skin, it suffices to apply the end of the index finger quickly to the button, to put in action the blade, which traces with lightning rapidity an annular furrow in proportion to the projection of the blade—a projection which is increased or lessened by turning the surrounding ferule round, giving it a backward turn. For infants with delicate skins, the blade should scarcely go beyond the level of the ferule. The incision made, the vaccine is applied in the usual way. It has been objected, that this instrument frightens the children, is difficult to apply, etc. Those who express these opinions have, how-

ever, never seen it in operation. It is no more difficult to make a correct incision with the trephine than to put a dot to an *i*.

Fig. 4.—Vaccinator Trephine.

The conclusions at which I have arrived, then, are these. 1. The active principle of the vaccine is present in special corpuscles floating in an isolated manner in an inert serous matter. Everything tends to establish the conclusion that these corpuscles are animated germs. 2. These corpuscles float in an isolated manner in the vaccine contained in the pustule; they are collected in groups in animal vaccine which has been extracted at a more or less distant period. 3. The excision of the pustule, and the scraping of its under surface to obtain the vaccine matter; the ablation of the pock, and its trituration with glycerine, as in the Milanese method; the preservation of vaccine between plates of glass,—are imperfect methods. 4. The extraction of the vaccine from the animal pock by means of compressing forceps, the introduction of this matter defibrinated in capillary tubes, or its deposit on ivory tubes, are excellent, elegant, and practical methods. 5. Fresh animal vaccine may be introduced by punctures; the preserved should be introduced by sufficiently large scarifications of the skin.

ON AN APPARATUS FOR TREATMENT OF FRACTURES OF THE PATELLA WITH SEPARATION.

By W. I. WHEELER,

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SOME years ago I brought under the notice of the Surgical Society in Ireland a splint for the treatment of fractures of the patella with separation, being a subject which had much occupied my attention, and from the knowledge that there was considerable difference of surgical opinion as to the most efficient way of adjusting the fragments—many, like myself, up to this time considering no method satisfactory—exemplified by the numerous plans advocated, from position, Malgaigne's hooks, and the recent appliances well illustrated in Professor Agnew's *Surgery*, to opening the joint and stitching the fragments together. Last year I was able to record the results of many cases treated by this apparatus, and to exhibit a specimen of osseous union.

In this discourse I allude to that most common form of fractured patella, in which separation between a superior and inferior fragment occurs. As can be observed, the apparatus which I use is a hollow wooden splint (Fig. 1) extending from above the middle of the thigh to the sole of the foot, at which point a foot-board (E) is attached by means of a hinge. This splint having two transverse bars, is fitted into a long box splint, in the sides of which it travels horizontally. That portion of the splint on which the limb rests can be elevated or de-

* These points are manufactured at Boston,* and can be had by writing to Dr. Martin, 27, Dudley Street, Boston, U.S.A.

pressed as required, by means of perpendicular slots, cut through the sides of the box splint—thus the splint can be adjusted to suit a long or short leg; the limb can be elevated or lowered at pleasure, and the foot placed at any angle.

Fig. 1.—A A, Adjusting Pads; B B, Straps securing limb; C, Slots; D, Brass Cover to Lock; E, Foot-Board; *e e*, Buttons on adjusting pads for strap.

The hollow splint is fixed in position by means of thumb screws, which fit into the transverse bars before mentioned. Two semi-lunar pieces of metal, softly padded, are fixed, one above, the other below the fractured patella, by means of leather straps which pass round the limb; the leg is secured to the splint by two broad web straps, one round the calf, the other at the ankle (B B); the foot can be bandaged to the foot-board; a roller with rack adjustment is fitted in the box splint, below the foot-board. From this roller start four cords, fitted through brass sheaves, which are attached, two to the upper, two to the lower metal pads, by means of chains and light hooks. The roller is turned with a key, and acting on the cords, causes the metal pads simultaneously to approach each other, thereby bringing the fragments into apposition. The rack is covered by a brass box (D) which can be locked, so that the adjustment of the splint cannot be interfered with by the patient.

The person from whom this specimen was taken died two years and five months after his discharge from the City of Dublin Hospital, where he was admitted under my care in September 1875, suffering from fracture of his right patella in a transverse direction, the distance between the fragments being $2\frac{3}{8}$ inches. Muscular action was the cause. He was placed on my apparatus at once; the effusion was subdued in eleven days, when the fragments were brought together by means of the adjusting pads; on the 5th November a starched bandage was applied; on the 13th December he was discharged. His avocation required him to get up and down out of his cart, which he did over the wheel about 440 times a week. This was a crucial test for the firmness of the union. He had all the normal motions of his joint; the patella moved freely upwards, downwards, and laterally.

On the 22nd November 1878, Professor Macalister, of Trinity College, Dublin, wrote to me "that he macerated and cut longitudinally the specimen, and found it bony throughout". The median half he cleaned, and removed from its back the articular cartilage. It is a perfectly continuous bone, and shows a ridge of new bony matter across the articular face. On the anterior aspect of the bone there is no visible trace of fracture, save a slight depression on the inner side. On the lower fragment and outer facet there are signs of an incomplete longitudinal fracture. (Figs. 2 and 3.)

If time permitted, I could recount several cases where no separation has taken place between the fragments, in periods extending from two to

four years, although the subjects of the injury joined in athletic games and the most active exercises. Mr. Butcher, whose name is a sufficient guarantee for accuracy on any surgical point, states that it has fulfilled all I have claimed for it, and used it in two cases. Mr. Tufnell has treated a patient with it, and says the man is in the full exercise of the power of his limb.—(*Medical Press and Circular*, Jan. 8, 1879.)

Fig. 2.—*a b a*, Line of Fracture; *b b*, Signs of an incomplete longitudinal Fracture.

In examining the causes of separation, I believe two exist; the continued action of the quadriceps extensor muscle, and the effusion, which I cannot think purely synovial nor hæmorrhagic, but mixed. The latter (effusion) being subdued, does the quadriceps remain in a state of inaction? In my case, it did not; I have observed a spasmodic action of the quadriceps, and the patients were able to make the muscle act, although it was difficult to persuade them to do so. I have also felt it contract thirteen days after the accident, and have seen increased separation consequent. This is well exemplified in a patient (a champion pedestrian) very muscular, now under my care for transverse fracture of the right patella. When his limb is lowered there is increased space between the fragments, nor is this caused by the falling down of the lower fragment, for I marked its inferior edge before lowering the limb. What then is the cause of increased separation, for the effusion has subsided?

Fig. 3.—Showing perfectly continuous Bone.

In every case of transverse fracture of the patella that I have seen, position has influenced the upper fragment, except two, where the quadriceps extensor muscle was antagonised by the ligaments of Barkow being intact. In such cases only is the treatment by position alone admissible. In no case have I found the quadriceps weakened or thin—in the man from whom the specimen described above was taken, the measurement of the limbs corresponded. The only way I can account for the weakness and atrophy of the quadriceps, which is said to follow this accident, is by altered blood or nerve nutrition to the muscle from the method of treatment; or that the cases being weak or ligamentous union, that the muscle not having a fixed point to work on, and the patient not exerting that limb in consequence as much as the other—in fact sparing it—the muscle, from these two causes, becomes weakened and thinned. This is in a measure verified by a case that died of Bright's disease, in the City of Dublin Hospital some year or two ago. The man had been treated for fractured patella by the late Professor Geoghegan. There was very close union, but ligamentous. He was five-eighths of an inch less round the circumference of the limb above the patella which had been injured, than the sound one; and he told me, although he had excellent use and strength of the leg, he did "not make so free with it as the other one".

And yet there is nothing to show that it is from want of power in the bone to produce osseous material that bony union should not take place; for, as Larrey remarks, if the fragments are kept in perfect contact, by

means of a suitable apparatus, bony union becomes so complete that not a vestige of the injury can be traced. Besides, perpendicular fractures readily admit union by bone.

It would be unnecessary to discuss the obvious advantages of bony over ligamentous union. M. Depret appears to advocate the latter, because he can relate cases where patients sustained fractures on two occasions in the same bone, stating that it was the bone and not the ligamentous union that gave way; and attempts to prove thus, that the fibrous union is stronger than the bony. Surely, if he reflects, he will understand that the seat of the fracture depends upon the position of the limb.

The advantages claimed for this appliance are as follow. 1. It is suitable to any limb. 2. Tilting of the fragments cannot occur, the traction being downwards and backwards. Should there be a slight tendency to such, the strap fastened to the two buttons on the adjusting pads will prevent it. 3. The splint provides for the position of the limb. 4. There is no pressure on the arterial supply of the patella. 5. There is no risk to the life or limb of the patient (as may be by the hooks, or stitching the fragments). 6. It will produce perfect co-adaptation without injury to the soft parts; and without pain and irritation. 7. It can make well maintained traction on the upper as well as the lower fragment, if required. 8. No fluid can separate the fragments. 9. The patient cannot interfere when adjusted, as in the plaster and other methods. 10. It has produced the best result—bony union.

PRIMARY CANCER OF THE LIVER.*

By JOSEPH EWART, M.D.,

Late H.M.'s Bengal Medical Staff.

IN introducing to this meeting the subject of primary cancer of the liver, it is needful, at the outset, to say that no attempt has been made to treat it exhaustively. The opinions advanced—with special reference to diagnosis—are based on the clinical observations of the cases cited below.

CASE I. *Primary Cancer of the Liver: Cholæmia; Death.*—C. —, aged 60, a robust and strongly built man, of strictly temperate habits, had resided upwards of twenty years in Calcutta, leading a most active and useful life. In 1866, he was invalided home for a year on account of enlarged and congested liver, attributed to repeated attacks of malarious fever. On the expiration of his leave, he returned to duty with his health completely restored. In 1874, after an attack of typhoid fever, he was again sent to England. The liver was then enlarged and tender, with slight jaundice. After remaining in this country for a year, he quite regained his health. He resumed work in India during the cold months, and was occupied in planning a system of drainage and sewerage for the city of Madras. He subsequently visited St. Petersburg, and designed a scheme for the purification of that city. In September 1878, he returned from a visit to Sydney and other towns in Australia, where he had been engaged in maturing an improved system of drainage for the principal towns in these colonies. He reached his home in what appeared to himself and his friends in excellent health. He remained so until July 1879, when he went to Eastbourne for the benefit of some members of his family. About the end of the month, he, without any tangible cause or discomfort, suddenly became jaundiced. There was then no discernible enlargement of the liver; but, in spite of all the drugs had recourse to, change to, and the use of the waters of, Harrogate in August and September, he continued to be intensely jaundiced down to the date of his death, on the 25th of January last. During the whole of this period, about five months, no bile whatever seems to have passed into the alimentary canal through the ordinary channel, the stools having been white and destitute of admixture with the colouring matter of this secretion.

In October, he consulted an eminent physician, who then assured him, after careful examination, that there was not even then any material enlargement of the liver. A month later, he was again examined by the same authority, when slight fulness and enlargement were discerned. In December, he consulted another physician, who recognised still further swelling of the organ. I saw him on the 12th January last, and then had no difficulty in diagnosing the existence of malignant disease of the liver, which was hard and nodulated and greatly enlarged. Below, it was felt to reach an inch beyond the umbilicus, and to the crest of the ilium; above, it extended almost to the angle of the scapula and the nipple. The tumefaction seemed confined to the right lobe of the organ.

As had been the case all along, there was not the slightest tenderness or pain. The jaundice was remarkably developed; the urine porter-

coloured, plentiful, and containing abundance of bile, with many evidences of tyrosine crystals. There were anorexia, flatulency, a foul tongue, offensive eructations, fetid and absolutely white evacuations, only varied to a moderate degree by the mercury which he had been taking. The emaciation was as extreme as the cachexia had been remarkably developed. He was singularly free from nausea. There were some purpuric spots on the trunk, before and behind. The pulse was weak, but not accelerated; temperature normal. During the whole course of the illness, the temperature does not appear to have been abnormally elevated at any time. There was and had been a good deal of irritation and itchiness of the skin. Two days before death, I again saw him, with Sir Joseph Fayrer, who also arrived at the conclusion that the case was one of rapidly proliferating primary cancer of the liver. He was then suffering from considerable dyspnoea; the pulse was weak; the extremities were cold; there were large patches of purpuric extravasations on the legs and arms, ears, nose, and trunk, and much drowsiness; the urine was diminished in quantity, indicating that the kidneys were clearly unequal to the great and prolonged strain of compensatory duty imposed upon them. He died comatose on the above-mentioned date. No *post mortem* examination could be obtained.

CASE II. *Primary Cancer of the Liver: Cholæmia: Death.*—In January 1867, a Hindoo woman, the mother of four children, aged 45, was admitted under my care in the Medical College Hospital, Calcutta, suffering from jaundice. Four months ago, whilst in the enjoyment of good health, she suddenly became jaundiced, with porter-coloured urine, indigestion, white evacuations, flatulency, loss of appetite, and itchiness of the skin. There had been no local pain; but she experienced a sense of heaviness or weight in the hepatic region. She continued to perform her household duties till within a week of her admission, when the following symptoms and condition were noted. Jaundice was extremely developed, the yellow tinging being observed in the conjunctivæ and tears, the mucous lining of the mouth, fauces, throat, in the roots of epilated hair, and in the nails of the fingers and toes. There was yellow vision. The urine was dark and porter-coloured, free from albumen, loaded with bile, and containing abundant crystals of tyrosine; the motions were white; the skin was dry, harsh, and irritable, especially at night. The tongue was coated; she had much thirst, depraved taste in the mouth, bad appetite, and occasional nausea, but without vomiting. The pulse was weak and full; there was occasional febrile action, but neither marked nor prolonged at any time. There was great emaciation. The liver reached to the umbilicus and the iliac crest below, and to the nipple and angle of the scapula above. The whole of the region occupied by the tumefied viscus was full and swollen. The left decubitus was accompanied by a sense of weight and dragging. The recumbent position and right decubitus were not attended by any discomfort. There was no pain or tenderness. Over one of the protuberances, a sense of deep-seated fluctuation existed; but, as this was regarded as being due to the well-recognised resiliency communicated by a rapidly proliferating medullary carcinoma, no exploration was made. The emaciation proceeded; orthopnoea supervened; large purpuric spots appeared on the face, hands, arms, and trunk; the kidneys gradually struck work; coma came on; and, after remaining in a state of insensibility for two days, she died on February 25th.

On making a *post mortem* examination, six hours after death, the cancer was found to be restricted to the liver, which weighed one hundred and thirty ounces. It was nodulated from cancerous growths. The glands around the common duct were enlarged from cancerous growth, causing the complete obliteration of this and of the cystic duct. The gall-bladder contained a small quantity of pale-coloured fluid. Some of the bile-ducts were enormously dilated, and distended with bile. Large masses of medullary carcinoma occupied the right lobe—a great portion of the secreting structure, with its vessels, nerves and lymphatics, and efferent ducts, having been displaced and destroyed. The left lobe was free from cancerous material. Every other organ was healthy. All the parts viewed were deeply tinged with the colouring matter of the bile. On examining the cancerous masses by the microscope, caudate and endogenous cells, smaller round or oval cells, and nuclei in much greater abundance, were found.

CASE III. *Primary Cancer of the Liver: Cholæmia: Death.*—In December 1873, I was consulted by a lady of Eurasian descent, aged 60, the mother of a grown-up family of six children, suffering from jaundice of three months' duration. The liver was greatly enlarged; but there had been little or no local pain. The surface was irregular, and somewhat nodulated. The kidneys had been working well, carrying off quantities of bile. There was marked emaciation and cachexia. The symptoms, during the two months she was under my care, were similar to those recorded in the preceding cases. She eventually died comatose, about five months after the onset of the jaundice.

On *post mortem* examination, the liver was found to weigh one hun-

* Read before the East Sussex District of the South-Eastern Branch.