sulphate of quinine. — 14th: Temperature 98·6°. Better. Pulse 85. Tongue cleaner. Bowels confined. — 15th: Temperature 98·8°. Bowels not open for three days. To take an ounce of castor oil; also a drachm of hydrocyanic acid mixture three times a day. Evening temperature 99°, 100·6° — 16th (noon): Still pain in epigastrium. Bowels well open. — 17th (noon): Better. — 18th (noon): Pain in epigastrium diminished. — 19th (noon): Bowels confined. Ordered a black draught. — 20th: Bowels well open. Patient has lost flesh a little. Appetite poor. Has been fed on soups, chicken, rice-pudding, and milk. — 25th: Still pain in epigastrium, but general condition improved; so he returned to duty.

This case was considered as one of constipation and dyspepsia, and treated as such. When he went to duty, he still complained of the pain at the epigastrium, and whilst at work he had on many occasions to apply for a purgative, as he always for years had suffered from constipation. He slept fairly well until March 27th, 1887, when he again presented himself to me for treatment.

March 27th: Temperature 101·6°; pulse 110. Skin moist. Complains of great pain in the abdomen. Breath very fetid. Bowels open once after taking a black draught. The following mixture ordered: dilute hydrocyanic acid, five minims; aromatic spirits of ammonia, ten minims; chloric ether, fifteen minims; water, one ounce: three doses. — 28th: Temperature 99·6°. Bowels not freely open. To take an ounce of castor oil. Breath still fetid. Low diet. Evening temperature 100°, 100·2°, 100·6°. Still pain in epigastrium, but better than yesterday. — 29th: Bowels open; scybala; very fetid. Pain at epigastrium. To apply a mustard plaster to abdomen. Temperature 100·2°. — 30th: Temperature 99·6°. On examining the abdomen, there is a hard swelling over the liver, which is circumscribed. No sign of fluctuation to the right of the mesial line of the abdomen below the ribs. Extent $\frac{1}{2}$ in. by 2 in. There is pain on pressure. The general health of the patient is good. He likes his food well. Can lie only on his back. Tongue very foul. Percussion over tumour is dull. Slight bulging of the ribs on right side. Pain on respiration. Short dry cough. Unable to sleep at night. Twenty-five minims of hydrochlorate of morphia to be taken at night. Temperature 100·2°. Bowels constipated. Podophyllin pill (quarter of a grain) given. Bowels open three times; motions very fetid; loose biliary matter, with lumps of hard faecal matter. — 31st: Temperature 99·2°. Swelling very distinct; very prominent when the patient stands up; conical in shape. Liver enlarged. Complains of great pain. Fomentations applied. To take an ounce of acid and gentian mixture three times a day, also to have four ounces of port wine. Restless at night. Repeat morphia. — April 1st: Temperature 99·4°. Swelling larger; hard; no fluctuation; distinct edge around it; pain on pressure; dimensions of whole circumscribed tumour $4\frac{1}{2}$ in. by $3\frac{3}{4}$ in. Abdomen distended; abdominal veins enlarged. Patient was sick once (bilious matter). Is losing flesh rapidly. Expression of face anxious. Weight of patient 140 lb. Tumour is adhering to abdominal wall, but very slightly. Can lie only on his back; much pain and dragging if he stands up. Bowels not open. Ordered a soap enema. Evening temperature 99·8°, 100·4°, 101°. Ordered low diet, with port wine; also to take acid and gentian as before. — 2nd: Temperature 99·6°. Passed a fair night after morphia. Pulse small and weak. Abdomen less distended, as the bowels were well open; had large evacuation of hard faeces, with biliary matter. No sign of fluctuation in tumour, which is getting more conical. Appetite fair. Evening temperature 100·8°. — 3rd: Temperature 99·8°. Swelling in abdomen increased in size downwards. Pulse quick, small. Skin hot. Tongue cleaner. Sleeps after morphia. Distension of abdomen smaller. Evening temperature 101°. Swelling inclined to point in abdominal wall. Skin slightly red. Frequent poultices have been applied to the swelling. Some sense of fluctuation. Ordered a turpentine enema. — 4th: Temperature 100°; pulse 104. A very large quantity of scybala, hard and black, evacuated. Swelling now extends to umbilicus; is larger, measuring 5 in. by 4 in. Distension of abdomen gone. Patient says he feels much easier. Urine acid, containing bile, but no albumen. To repeat poultice. Six ounces of wine to be given. Patient is getting very thin; face drawn; expression very anxious. — 5th: Temperature 99°. To repeat enema. A large quantity of scybala came away, with some mucus. Swelling more prominent in abdomen; soft; distinct fluctuation; extends upwards to xiphoid cartilage; feels soft

in the centre, but hard all round. Urine clearer; contains biliary matter. Repeat poultice. — 7th: Soap enema given; a small quantity only retained. Bowels open; motion consisting of small hard lumps of faecal matter, with a little mucus. 10.20 A.M.: Bowels open again; a large quantity of pus passed, mixed with blood, and having a fetid smell; this gave instant relief to the patient. Swelling soft at one point of abdomen; pits on pressure; slightly glazed; dull on percussion. Six ounces of brandy given. 1 P.M.: Bowels open; more pus and blood passed; at stool twenty minutes; two pints of contents; pan contains urine, a small amount of faecal matter, and a large quantity of pus and blood. Tumour smaller. Patient is very much relaxed. Temperature 98·6°; pulse 130. Anxious expression of face is gone. Patient much emaciated and very weak from frequent purgation, but is bright and more cheerful. To have six ounces of wine, also soup, milk, &c. Has lost much flesh during the last three days. Ordered half a grain of opium powder, a grain and a half of extract of belladonna, with a sufficient quantity of extract of gentian, every three hours. — 7th (noon): Still the same faint sign of fluctuation in swelling, which is much smaller. General condition of patient greatly improved. Takes food well. Not sick. During the last few days the skin has had a slight icteric tinge, also the conjunctivæ. To repeat opium and belladonna; and six ounces of wine to be given. Pulse 104; temperature 99·4°, 100·4°, 100°. — 8th (noon): Pulse 124; systolic murmur at apex, probably anæmic. Swelling much diminished; no fluctuation. Bowels open; faecal matter more normal; some pus and blood. — 9th (noon): Doing well. — 10th (noon): Better. Swelling very much smaller. — 11th (noon): No pain over swelling. Pulse 130. Bowels confined; an ounce of castor oil to be given. — 12th: Bowels well open; some pus, but very small amount. Patient better and more cheerful. — 13th (noon): Got up to-day for the first time. Diet to be chicken broth with wine. Tonic medicine ordered. — 14th (noon): Swelling disappearing. General health good. Bowels confined; castor oil to be taken. — 15th (noon): Bowels open. — 16th (noon): Swelling smaller and hard. Patient continued to improve in every way; gained flesh and appetite, and the swelling gradually disappeared. On May 1st he went to duty. On April 29th his weight was 146 lb., and on May 31st 155 lb., when there was no sign of the tumour, but merely a feeling of hardness over the part where the tumour had existed.

Patient's previous history.—Has never had any sickness before; no symptom of dysentery at any time. He is well developed. Has not been temperate in drink and has always eaten in large quantities. He has been thirteen years in the navy. He has served only in the Mediterranean, and is now serving at a China station.

Remarks.—The man left Alexandria for Singapore on March 17th and reached here on April 26th, so that he was ill during the whole voyage. Temperature in the sick bay was from 90° to over 100° F.; we had no ice or milk, and everything was against the patient's recovery. The patient came to me on June 6th suffering again from intense pain over the liver, which was evidently a return of his former trouble, and I invalided him home; but the hopes for his ultimate recovery are very small.

Singapore.

ON THE HÆMO-DYNAMICS AND TREATMENT OF CEREBRAL HÆMORRHAGE.

By LEONARD BRADDON, F.R.C.S.

Is there any situation more hopelessly depressing than the attitude of the physician by the bedside of a severe case of cerebral hæmorrhage? So certain of the diagnosis that he seems able to view the fatal clot through the very skull, perfectly acquainted with the antecedent pathology and the actual mode of operation of the silent force that, as it leaks, destroys, he yet stands helplessly by, the author only of trivial directions, utterances apathetically oracular. From the days of darkness until now no vigorous attempt seems to have been made to deal rationally with an accident that sweeps away thousands of active lives, and the routine of treatment invariably adopted might be designated insignificant, if it were not probably actually injurious. "*Post sanguinis missionem, si non redit motus et mens,*" Celsus wrote,

"*nihil spei superest.*" This treatment has, after long ages, been discarded; the three last words, however, seem to be impressed upon the profession with all the indelibility of despair. In this short article I am neither about to attempt to add to the already clear pathology of the question, nor to recapitulate cases and symptoms; but I wish to draw the attention of the profession to certain aspects of the lesion, which, if they have been before studied, have been since neglected, and which afford, as I believe, grounds for the adoption of strong and, there is every hope, successful methods of treatment.

At the post-mortem table the most striking feature in a fatal apoplexy is the comparatively enormous amount of blood poured out and the force which has been liberated. The grey and white matter is ploughed up in all directions, commissures are burst through, and often smaller vessels torn across. Dr. Wilks says the weight of the clot is commonly $3\frac{1}{2}$ oz.,¹ and from these considerations infers that the vessel must be of great magnitude in such cases. But apart from the fact that the miliary aneurysms of Charcot and Bouchard, the most frequent sources of hæmorrhages, are formed on, usually, the smaller twigs, none of the vessels entering the brain substance are of any magnitude; those from which bleeding has been shown to have occurred have been secondary branches of these; and, inasmuch as it is hardly possible for an artery to be torn completely across, in all cases the seat of leakage must be a hole of very inconsiderable diameter. How, then, is such tremendous force exerted that the extravasation can overcome the resistance of the brain substance, which in a fresh brain exposed to a stream of water is evidently considerable, and in a situation where it is uniformly supported by unyielding walls on all sides must be much more?

When a trephine hole is made in the calvaria and the dura is cut, the brain always bulges slightly into the aperture; at any rate, it never shrinks downward on exposure. This shows, and tracings from the fontanelle and from accidentally exposed brains support the view, that the pressure within the skull is certainly not negative; it is probably a good many millimetres positive, although I know of no exact data on the subject. The extravasation then occurs from an arteriole where the pressure cannot be more than, say, ten millimetres, into tissue confined at certainly an atmospheric pressure; and into this tissue it is extruded to the extent of some ounces, an amount which must considerably add to the condensation of the brain substance and the total intracalvarian tension. Some estimate of the force exerted may be gained from the flattened aspect which, in severe cases, the convolutions frequently present. By artificially effecting such flattening on a fresh healthy brain it might be possible to reduce such an idea to figures, but I have had no opportunity of doing so. However, the pressure happens and has to be accounted for. It is, in fact, a problem in hydro-dynamics. The first drop, outside the first small rupture, represents, in fact, a miniature but perfectly complete hydraulic press—a "hæmostatic" paradox. Surrounded on all sides by solid, communicating with a small tube, in which the heart-beat works like a piston, every impulse in the arteriole increases the extravasation (perhaps widens the inlet); the total pressure in the arteriole at the seat of rupture is multiplied in increasing dimensions by the area of the extravasation, the force of which is exerted in all directions equally. Thus each heart beat, like the force-pump, increases the quantity of fluid in the hydraulic chamber and the destroying force of the extravasation—only the safety valve is a long way down, at the aortic valves. [One would thus *a priori* assert it to be impossible for cerebral hæmorrhage to occur in a case of aortic regurgitation, so perfect is the analogy.] When the pressure in the bleeding leak is multiplied by the superficial area of even a moderate hæmorrhage, it is easily seen that the force exerted by the latter is very great. Supposing a hæmorrhage of 10 mm. in diameter, and a tension in the arteriole of 10 mm., the total extravasating force would be $(10 \times \pi r^2 =) 3750$ mm., or about five atmospheres. These figures may be exaggerated, but they are not probably far wrong. Of course it would not take five atmospheres to tear apart brain tissue *outside*, but within the calvaria the resistance to rupture must be considerably greater. In any event, it is evident (1) that the destructive effect of an intra-cerebral hæmorrhage is due to the hydraulic

force of the leakage; (2) that as the disruptive power increases in hydrostatic ratio, every second of time is of paramount importance in treatment; (3) lastly, that there is a hopeful method of treatment.

If the views suggested above are correct, every hæmorrhage into the brain unchecked ought to be, it may be said, inevitably fatal. I believe it to be only an accident, contingent on the manner merely of rupture, that every hæmorrhage into the brain from an arteriole little smaller than one of the perforating arteries is not invariably fatal. But one can imagine that (1) the sources of the smaller hæmorrhages are capillary vessels; (2) that in the case of miliary aneurysms, the redundancy of tissue, and in other ruptures fragments of tissue, or clot, may act in a valve-like manner to prevent further leakage; (3) the tendency to early clotting dependent on general (and perhaps unknown local) conditions is, in cerebral as in any other hæmorrhages, the greatest check and natural safeguard against further bleeding.

Assuming, then, the truth of the theory as to the production of the spreading force of the hæmorrhage, the problems of treatment are how to check a commencing, and how to relieve the symptoms due to a large established, extravasation. Inasmuch as every heart beat is a hydrodynamic force fraught with danger, every pulse restrained is treatment for success. Since blood pressure means blood extravasation, every remedy that will lower it will increase the chances of recovery. On these grounds, it seems that text-books and physicians have all for generations erred alike. The patient is generally directed to be laid low; to be kept cool, or even cold externally; to be fed on little, and nothing warm. Drugs, save purgatives, are decried; narcotics are especially condemned. Now, the horizontal posture, if it lower the frequency of the heart beat, increases the blood pressure within the cranium, the outflow from which gravity, best brought to bear in an upright attitude, especially assists. Cold externally means congestion inside. Starvation and cold food mean foregoing the immense advantage of attracting as much blood as possible to the portal system, and so lowering the supply elsewhere. Narcotics producing sleep, during which the brain is anæmic, could not be certainly injurious; and although of doubtful utility in the presence of better drugs, in their absence opium ought not to be despised; it lowers the blood pressure and relieves the brain. As regards purgatives, they are an open question. Trousseau, in his graphic lectures, alone, so far as I know, has adopted such a plan. He makes his patients sit up, take food, and, if possible, exercise. More important than all in medical treatment should be drugs which lower the blood tension. In nitrite of amyl, nitrites generally, pilocarpine, and other tension-decreasing remedies, we have powerful means of treatment. Warmth to the hypogastrium and the hot bath act similarly. But the simplest, the most potent, the most readily applicable, and yet most ignored remedy of all lies in surgical resource. The lesion consists in hæmorrhage from a distant and unreachably source; the remedy, therefore, is to cut off the blood supply by applying pressure to the nearest main trunk. If the seat of the hæmorrhage is diagnosed, the carotid ought to be immediately compressed upon that side, and the pressure should be kept up for several hours in order to give the ruptured artery time to become obstructed by the formation of a clot. In any case, upon the first symptom of hæmorrhage, this operation should be had recourse to instantaneously. That, if this were done in all cases at the first onset, many grave and fatal hæmorrhages would be checked, I have no manner of doubt. From time to time the pressure might, after the first three hours of continuous application, be omitted, and observation be made whether the symptoms of bleeding continued. If it is impossible to diagnose the side of the lesion, both carotids might, in grave cases, be compressed. If continued pressure cannot be applied efficiently, the carotid ought to be tied. This procedure can of course only completely arrest the bleeding where it proceeds from a branch of the external carotid—i.e., is extra-meningeal. But, in spite of the circle of Willis, it must obviously greatly diminish the force of blood-flow from intra-cerebral vessels, of which there is indeed abundant clinical evidence.

Two or three years ago, when dresser to Mr. Howse, in a case of extra-meningeal hæmorrhage for which he trephined, and in which, after turning out the clot, the bleeding could not be checked, I suggested compression of the carotid with the direct intention of checking it by this means, and

¹ Wilks and Moxon, Path. Anat., p. 222.

Mr. Howse approved of the suggestion. In that case I kept up, with his approval, constant pressure for three hours, with the result of arresting the bleeding; and this did not recur. The artery ruptured in this case was evidently of large size, judging from the stream sent out through the trephine aperture. Mr. Howse afterwards reported the case at, I think, the Clinical Society: and subsequently Mr. Charters Symonds, in a paper on the Treatment of Extra-meningeal Hæmorrhage, referred to this case, and advocated compression or ligature for arresting uncontrollable bleeding. But I do not know to whom they credited the original suggestion. It is possible, of course, although not recommended in text-books or known generally, that the plan is by no means novel. However, it is a valuable, the only valuable, resource in cases of beginning intra-cerebral hæmorrhage.

The greater problem remains: Is there any treatment worthy of the name for those more severe and so frequently fatal cases to which one is called, to find a comatose patient breathing stertorously and slow, with dilated pupils and a burdened pulse, with distorted features and turgid veins, with rigid or relaxed or convulsive and twitching limbs, and absent reflexes—with, in fact, any or all of the symptoms which indicate a severe and progressing extravasation within the brain? If the side can be diagnosed, the carotid can still be compressed and the hæmorrhage arrested; but what then? With three or four ounces of blood distending the brain substance, and drowning vitality by mechanical pressure, what is to be done? In many cases, without treatment a speedy fatal issue is obvious, and in such any plan which offers a ray of hope is justifiable. Trousseau, in defending his rejection of the bleeding plan in such cases, compares the clot to a foreign body, which cannot be affected by such measures. His analogy is good; but the general implication is not correct. It is not because extravasated blood is a foreign body that cerebral hæmorrhage kills. In the extra-meningeal case of Mr. Howse already referred to (and which I may be allowed to quote since he has published it), upon removing the bone the symptoms were immediately alleviated, the pulse falling, the dilated pupils contracting, the respiration quickening, the convulsions and rigidity (on opposite sides) ceasing. In a similar case reported in THE LANCET (August 20th) the same thing is noted. Immediate relief follows the removal of the bone, and consequent diminution of pressure. It is, in the graver cases, not only the shock, the diffuse effect of the local lesion, but still more the mechanical pressure of the hæmorrhage, that kills. The nerve centres essential to life are not directly bruised, but the great intra-cranial pressure evidently crushes out their vitality by direct vital interference. Tumours, hydrocephalus, abscesses, act similarly; their pressure destroys. Now, if there be any, ever so small, an opening in the hydraulic press, the hydrostatic paradox is destroyed; and if an opening were made into these cerebral hæmorrhages, at least one avenue to death, that by mechanical pressure, would be barred. There is plenty of evidence in apoplectic cysts, chalky abscesses, cured hydrocephalus, and pachymeningitis to show that extravasations which have not killed by pressure may be absorbed in the brain as elsewhere. And in these days of cleanly surgery meningitis need not be feared. Hence it is no heroic surgery to propose that in a case of bleeding, very grave or tending clearly to a fatal issue, the calvaria should be trephined, and a trocar or bistoury or probe plunged into the brain substance to reach the outpoured mass of blood. A way thus opened for its escape, it is probable that some of it would be gradually extruded; at any rate the intra-cranial pressure would be thus relieved; and with the application of a sitting posture, the use of nitrites, compression of the carotid, and the other measures advocated for checking further bleeding, one may hope for a successful issue to the treatment of this, one of the most fatal and hitherto the most hopeless of all the assaults by which death essays to vanquish the human stronghold.

Upton-on-Severn, Worcestershire.

A CURE FOR MALINGERING.—Some members of a Dresden workmen's benefit society, having gone on the sick list on account of pains of a character that could not be diagnosed by the surgeon, and of alleged inability to use the arm as required for their work, were ordered by the club to attend at the factory where they were employed, to sit on a bench during the whole of the working hours, and to look at the men at work. Scarcely any of them held out for more than a week.

SOME REMARKS

ON THE

KIND OF SPLINT MOST AVAILABLE FOR GUNSHOT FRACTURE OF THE LOWER LIMBS

ON THE FIELD IN CONNEXION WITH TRANSPORTATION.¹

By R. F. TOBIN, F.R.C.S.I.,

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My remarks have reference chiefly to gunshot fractures of the hip and the upper third of the femur; and as whoever has had practical experience of the difficulty of giving to such injuries during transport and subsequent treatment that essential condition to recovery—rest—will gladly welcome any suggestion on this subject that may even in a slight degree be helpful, I shall make no apology for occupying attention during a very brief period.

An appliance that will give rest to a fracture in the locality indicated must fix not only the injured limb, but also its fellow and the trunk as far as the thorax. For it is plain that, if the sound leg is left free, the patient will try from time to time to ease his position by means of it, and so tilt the pelvis and disturb the fractured parts; and that even a still greater amount of disturbance will occur if action of the psoas and iliacus muscles is permitted by the movements of the pelvis and lower half of the spine being left unrestrained. It also seems to me desirable that the appliance selected should fix the injured part by being placed behind it, rather than in front or at one side. A Liston's or a Bryant's splint gives immobility as long as it is supplemented by the patient's bed, but, as far as my experience goes, no splint on which the limb does not rest by its own weight, gives satisfactory support when for any purpose the patient has to be lifted. The foregoing conditions are fulfilled by the splint to which Mr. Thomas of Liverpool has given his name, and by that of Mr. Fagan of Belfast, which was brought to the notice of this Section during the Congress of 1881. To the general employment of these on the field, the difficulty of fitting the one and the costliness of the other are obstacles—obstacles not insurmountable, and which, as the instruments are most useful ones, will, I hope, be overcome. In the meantime, let me bring to notice the following appliance, which affords rest and support in a somewhat similar manner, but by means of materials more available on active service. The patient having arrived at the dressing station, where, by whatever name it may be known in different countries, the wounded first undergo a thorough examination, and it having been decided to make an attempt to save a limb fractured as described, I would proceed as follows: Having treated and dressed the wound after the fashion in vogue for wounds in general, the canvas of a stretcher with removable poles is spread upon the ground, and is cut transversely into two about its centre. The following materials are also made ready: (1) Two pairs of trowsers—viz., that of the wounded man and any other obtainable of about the same size; (2) a few strips of blanketing or a few large towels or other material, of a size to go as a binder round the waist and hips in three or four layers; (3) one stone and a half of plaster-of-Paris; (4) three gallons of water; (5) a bucket or other receptacle in which to mix the plaster and water; (6) three yards of calico torn into three many-tailed bandages; and (7) a roll of cotton wadding. The plaster is mixed with about an equal quantity by measure of water, and into the creamy fluid so formed the two pairs of trowsers and the material that is to go round the waist and hips as a binder are immersed. When these have been thoroughly imbued with the fluid, the trowsers are spread out one over the other on the canvas of the stretcher, the forks of the combined trowsers being made to lie a few inches away from and above the division in the canvas, and a many-tailed bandage placed, ready to be tied, under each leg. The material which is to form the abdominal binder is spread, with a many-tailed

¹ Read in the Military and Naval Section of the International Medical Congress held at Washington. Dr. Marston, in the absence of the author, read the above paper, enlarged upon the method of application, and expressed his opinion that it was an eminently practical and original suggestion. A short debate followed, in which several American surgeons took part and made some practical and pertinent observations.