clean and almost closed; there was no discharge, no cedema; he had darting pain in the left ear, and much thirst.

April 17th.—He had a severe rigor last night, which lasted for a considerable time, and was followed by profuse perspiration. Pulse 100, temperature 99.4°. The tongue was furred; the wound was discharging thin foetid pus. Enlarging the opening, I syringed the wound with carbolic lotion, and put the patient on sulphate of quinine, and tincture of the perchloride of iron.

April 19th.—He had had no rigor since the 17th; pulse 82, temperature 100°, respiration 26. On the evening of the 17th (tenth day after the accident), the patient noticed that the discharge from the wound began to increase, especially when he was swallowing his milk. The wound looked clean, but the dressings were soaked with discharge, and a creamy-looking fluid was coming away. I gave the patient a drink of milk, and found that pure milk came away from the wound. I then tried water, with the result that the discharge became clear. There could, therefore, no longer be a doubt as to the existence of an opening into the œsophagus. The patient had no pain in his shoulder unless when lying on his back. I determined to continue the dressings as before, but to change them more frequently.

April 22nd.—He had, unfortunately, got an attack of bronchitis, the cough being very hard and troublesome; pulse 84, temperature 100°. The discharge from the wound was considerable. There was much exuberant granulation around the orifice. I prescribed ammonia, squill, and bark.

April 26th.—He was feeling better. The cough was not so troublesome. His appetite was improving; bowels regular, tongue clean. He had copious perspirations. He slept well; had no pain unless when lying on the left side. The wound was clean, with little discharge, and this not increased by drinking. He had no difficulty in swallowing; pulse 84, temperature 99°. I prescribed dilute sulphuric acid with quinine.

April 30th.—He was much better; the copious perspirations had ceased, and there was no discharge from the wound. I touched the granulations with nitrate of silver. The patient could not yet swallow solids without experiencing pain. He had some pain in the dorsal region of the spinal column on the 27th, but this had now disappeared; pulse 100, temperature 98.6°. After this date, the patient walked on two occasions into the dispensary for examination, a distance of six miles. The granulations formed a kind of bag or cyst, two inches long: but, after being ligatured at its base, it dropped off, leaving the wound quite healed. I have seen the patient frequently since, and he is now pursuing his usual occupation of weaving, suffers no pain, and has not the slightest difficulty in swallowing solids or fluids.

REMARKS.—The points of interest in the case are many. I shall particularly refer to a few of them: for example: 1, the readiness with which the wound of the œsophagus healed, even under the disadvantageous circumstances in which the patient was placed; 2, the probable fate of the slug; 3, the comparative safety of such injuries, notwithstanding the rich supply of large blood-vessels in the part; and 4, the possibility of a subsequent stricture of the œsophagus.

1. That there was an opening into the œsophagus, I think there is every reason to believe; and, also, that this was caused by the direct entry of the slug, and not by any subsequent ulceration. There was hæmorrhage from the œsophageal wound, as indicated by the vomiting of blood immediately after the accident, and the subsequent discharge of blood by the bowel. The original opening was evidently a small one, as it was not until the tenth day after the accident that any food was noticed to escape by it; so it is probable that the original opening was in some way increased in extent, possibly from slight softening or ulceration. This opening closed up about the nineteenth day.

Longmore, in Holmes's *System of Surgery*, refers to similar cases, in which recovery occurred after five days in one, and twenty-six days in another. In such injuries, there is a liability to concussion of the vertebral column, and to injury of the deep-seated nerves, attended sometimes with loss of power in the arm; extensive paralysis even may set in after some time. But our patient fortunately escaped these risks, and I ascribe this to the comparative slightness of the shock caused by the slug—it being light, and of small size.

Care, however, should always be taken to allow the wound to heal from below. The advantages of this plan of treatment are obvious. It is the course to be followed in all penetrating gunshot-wounds, and much more is the same plan to be pursued in such a case as the present, where we have a hollow organ like the

œsophagus wounded, from which food, in its passage along that canal, is so liable to be extruded.

Wounds of the œsophagus from within, such as rupture and the like, without any communication with the exterior, are often very dangerous, sometimes even fatal in their consequences. But, on the other hand, wounds from without belong to a different class entirely. Our object, therefore, must be to prevent a case of the second class from being converted into one of the first; that is, the orifice into the œsophagus must be closed before the rest of the wound is allowed to heal by granulation.

2. One of two things must have occurred to the slug: it may either have penetrated into the œsophagus, and then have been discharged through the intestine; or it may still be lodged somewhere deep in the tissues of the neck. We know that it is possible for foreign bodies to become so invested by organised lymph as to give rise to little or no irritation in the living tissues in the neighbourhood, and so cause no inconvenience. At any rate, the slug was never discovered, nor have there been any indications hitherto pointing to its lodgment.

3. Longmore points out that, during the Crimean War, the mortality of wounds of the neck among the English soldiers only amounted to 4.08 per cent., while among the French it amounted to 26 per cent. In the American War, it was 14 per cent. Even 26 per cent, is not such a high mortality if we take into consideration the important organs and vessels that are so superficially placed in the neck, and accordingly so exposed to injury. As Longmore, however, remarks: "In no region are so many examples offered of large vessels meeting, but escaping from balls in their passage, as in this, because the cause which operates elsewhere—ready mobility among long and yielding structures—exists in a greater degree in the neck than in any other part."

4. I cannot find any records as to the occurrence of stricture after gunshot-wounds of the œsophagus; but, so far, my patient has made no complaint of any kind pointing in this direction, and it is now over twelve months since the accident happened. The possibility, however, of such an occurrence, I should say, would greatly depend on the extent of the injury. Where the wound is extensive, I should be disposed to regard stricture as a likely occurrence; but where the extent of the injury appears to be slight, as in the case in question, I should be inclined to regard its appearance as very unlikely.

NOTES OF CASES OF DILATED STOMACH: WITH REMARKS.

By T. SANCTUARY, M.D., Hayle, Cornwall.

CASE I.—The patient was a spirit merchant, aged 40, who, according to his own account, had enjoyed good health up to August 1879. He consulted me in February 1880, for "wind in the stomach and sickness after eating." The general and family histories were good. He had been a full liver, and a regular and moderate drinker of stimulants, taking his glass of toddy at night and a couple of wineglasses of sherry for dinner. He had a pale, flabby tongue, indented at the edges, and a good deal furred at the back part; his teeth were much decayed, his expression careworn, and his complexion withered and sallow; his bowels were constipated, the nervous system greatly depressed, and general nutrition poor. He told me that he noticed his appetite fail him first about the end of July 1879, and he then began to feel "a fulness" at the pit of the stomach. Of late his appetite had become very capricious: sometimes he felt a craving for food, at others the thought of it produced a feeling of nausea; but invariably, an hour or so after eating, he was seized with a violent attack of vomiting, and pain in the stomach, and all he had eaten was rejected, together with more or less sticky phlegm. The vomiting was not altogether dependent on the ingestion of food, as it sometimes occurred when no food had been taken previously. He had lived for the last six months chiefly on raw eggs, milk, and cream, with some iced water or claret to allay the excessive thirst from which he suffered. His height was 5 ft. 11 in.; weight 130 lbs. He said that he weighed 170 lbs. in June 1879, and he was now feeling the diminution a good deal, and was fully conscious of his emaciated appearance.

From his appearance and symptoms, malignant disease of the pylorus at once suggested itself to me. I examined him carefully, and fancied I could feel a hard lump in the epigastrium; there was a diffused tenderness in the stomach and adjacent parts, but no specially painful spot anywhere. On percussion and auscultation, I discovered that the stomach presented a very curious phenomenon. The patient

was eructating quantities of gas every few minutes, and immediately after each eructation I could perceive a sensible diminution in size of the distended stomach; whilst, at the termination of the interval, that organ reached to within half an inch of the navel. On shaking him gently from side to side, I could plainly hear a splashing sound, such as water makes when shaken in a churn. I therefore added, to my previous diagnosis, that of dilated stomach. I suggested the use of the siphon-tube to wash out his stomach, but he declined, and wished to try what medicine would do to relieve him. I therefore put him on milk-diet, as he would not hear of enemata, and recommended him not to take more than two or three ounces at a time; and ordered him a mixture containing bismuth, hydrocyanic acid, and creasote, with three-minim doses of tincture of opium, *B.P.*, and advised him to keep a supply of ice constantly by him to check the vomiting.*

He returned to me in three days' time, saying he felt worse; that he could retain very little milk, and that the pain was increasing. I again advised the siphon-tube and nourishing enemata, and, rather reluctantly, he consented. I introduced the tube (for full directions as to the mode of using this instrument, *vide* Appendix, note 1), with the usual result of producing severe coughing and vomiting of stringy mucus, but no blood, and washed out the stomach with a weak solution of Condyl's fluid (two drachms to one pint of water) distinctly feeling the point of the tube through the abdominal wall about the region of the navel.

He felt relieved, after the operation, though much exhausted, on account of the violent vomiting. I repeated the process next morning, and afterwards twice daily for a month, keeping him alive, in the meantime, principally by enemata of beef-tea, but allowing him also small quantities of milk, and Brand's essence of meat, by the mouth. The pain, by this time, was much lessened, and he had gained two pounds in weight; but there was still some vomiting at times, which was always increased by a larger meal than usual, and there did not appear to be any real gain in strength. The disease seemed at a standstill, and the stomach presented more nearly its normal dimensions.

As he was particularly anxious to discontinue the enemata, I ordered him, in addition to his former mixture (which he was still taking at intervals), twenty grains of sulphate of magnesia in one and a half ounces of water every three hours, and recommended unfmented bread, with milk-diet, and charcoal biscuits. I saw nothing more of him till July, when he sent for me, saying he thought he should not live long. I found him in bed, terribly emaciated, his countenance presenting the peculiar cachectic hue and expression characteristic of the cancerous diathesis; and he told me that his weight in the previous week was only 116 lbs., that he felt much weaker, and that the pain and vomiting were worse, and that he could get but little sleep. I did not, at this juncture, advise the siphon-tube again, as it was evident that the end was not far off. I could now, on careful palpation, make out a hard tumour, about the size of a bantam's egg, an inch and a half above, and rather to the right of the navel. From this time his downward course was very rapid, and treatment was almost exclusively confined to ice, opium, and nutrient enemata. Finally, he sank, and died on August 3rd.

I was fortunate enough to obtain a *post mortem* examination, and the appearances fully confirmed the diagnosis. At the necropsy, I found the stomach enlarged to about twice its natural size, and containing a considerable amount of yeasty fluid. The pyloric portion was hard and enlarged, and felt gristly and elastic when squeezed; the serous coat was milky and clouded, as if with a sub-acute peritonitis; the tube of the pylorus was so contracted, that I could only just pass the small end of a tobacco-pipe stem through it; the mucous membrane was not eroded, but appeared as if it had been entirely absorbed, and replaced by a nodular ring of greyish white cartilage. The colon was much displaced; it was partially overlaid by the stomach, and occupied the lower hypogastric region. I could not find any secondary deposits in the pancreas, liver, transverse colon, or omentum, and the malignant disease seemed to have confined itself exclusively to the pyloric orifice, which, on microscopic examination, showed the usual characteristics of scirrhus. The mucous membrane of the rest of the stomach was attenuated; and, with a quarter-inch object glass, I could find comparatively few gastric tubes remaining, these few being interwoven with fibrous bands, and appearing to be full of a fatty *débris*. It was evident that the dilatation was secondary to the

scirrhus; also, that the washing out of the organ with Condyl's Fluid materially relieved the fermentation so long as it was persevered in, and would, I believe have completely cured it, had no malignant complication been present. Moreover, I see no reason why removal of the tumour might not have been attended with a reasonable probability of recovery, as there was no erosion or secondary infiltration, and the cancer was distinctly localised.

CASE II.—This patient was a dressmaker, aged 48. She suffered from heartburn, vomiting, and violent pain in the stomach; this latter being most severe in the right of the epigastric region. She told me these symptoms had been coming on for about six months, and growing worse every week. She was quite prostrate with the attack when I saw her first, in June 1879; she had twice vomited blood, and had been losing flesh for four months; she suffered pain if she fasted, and it was increased by taking food, and only relieved by vomiting. The vomiting generally came on immediately after a meal, but had occasionally been delayed some hours; together with her food, she vomited large quantities of a greenish sour liquid, with a good deal of gas; the bowels were obstinately constipated, and the urine scanty. Her chest was healthy, tongue moist and slightly furred, the abdomen soft and contracted, the skin dry; and the peristaltic movements of the stomach were easily observed through the wasted abdominal wall, the stomach-note being recognisable down to the navel. I ordered her a scruple of bicarbonate of magnesia, with fifteen grains of trisnitrate of bismuth in half an ounce of aqua calcis three times a day, and a soapenema; also five-grain doses of Morson's pepsin-powder, with two ounces of milk every hour, for she steadily refused to allow me to use the siphon-tube or nutrient enemata. The treatment seemed to have no effect in stopping the vomiting, though she thought the pain was less severe. The sulphites, hyposulphites, sulphurous acid, opium, and binocide of manganese were tried, but with no benefit. The microscope showed quantities of sarcinous fungi in the vomited matters. I urged her again to let me try the siphon-tube, and succeeded in persuading her, and treated her in this manner for eighteen days, giving her no medicine, and feeding her meanwhile by enemata of beef-tea and chicken-broth. She experienced a good deal of pain at first in the stomach, when the tube was introduced, but gradually became able to bear it without much inconvenience. The vomiting was completely checked, and, by degrees, I got her back to a liquid stomach-diet alone. Nevertheless, she gained no strength, but rather emaciated; the vomiting returned again, and continued very severe; she became increasingly prostrate, hiccough supervened, and coffee-ground vomiting, and she gradually sank four months after she consulted me.

I performed a *post mortem* examination twelve hours after death. The body was much emaciated; the lungs and heart were quite healthy; the omentum was puckered. The characteristic changes were in the stomach, which was double its ordinary size, and its walls were thin and atrophied. Near the pylorus, was a contraction of semi-cartilaginous hardness. On opening the stomach, an ovoid ulcer, two inches and a half by one inch, was seen to surround the constriction; its edges were round and elevated, and its base smooth. On section, the mucous membrane appeared to be continuous with the upper layer of the ulcer; its deeper layers were very firm, white, and fibrous. Around the ulcer and its contraction was a portion of healthy mucous membrane, which extended to a perfectly healthy pylorus; so that the obstruction of the onward passage of food lay not in the pylorus, but in the irritability of the ulcer, which caused the food to be rejected before it got into the pyloric grasp. In the omentum were several hard tumours, and the omentum itself formed a firm contracted mass about the size of two fingers. On section, these tumours were tough, containing a milky juice, and, when magnified two hundred diameters, showed large cells with distinct nuclei, evidently cancerous. All the stomach-follicles had disappeared over the smooth surface of the ulcer; in the deeper structures of which no cancer-cells were observable, but only bands of fibrous tissue. The intestines, liver, spleen, and kidneys were healthy.

There was no doubt that this patient had suffered from ulcer of the stomach for a long time, and that the malignant disease was probably secondary. There was not any trace of cancerous deposit at the ulcer itself, but the omental cancer may have been set up by the chronic irritation induced in the adjoining glands and structures.

With regard to the treatment, in the present state of our knowledge of malignant disease, nothing but temporary improvement was possible; and this did follow, not, however, on the use of the antiseptic drugs, but on the more direct and heroic method of washing out the stomach with the long siphon-tube.

CASE III.—A messenger, aged 43, single, consulted me in November 1879, for pain in the stomach, and vomiting after food. Sh

* At my request, he sent me some of the vomited mucus, which, on examination, I found to be intensely acid, containing large quantities of sarcine and some yeast-fungus also.

was a pale, unhealthy-looking woman, with decayed and inefficient teeth, and a flabby, indented tongue. She menstruated profusely every three weeks, her bowels were obstinately constipated, and she passed less urine than before this illness came upon her. She could only get her meals at long intervals, as her occupation kept her walking for five or six hours at a time. When she did get them she was accustomed to eat heartily, her favourite food being hot heavy cake, pastry, and weak tea. She owned to drinking nine or ten cups of this beverage daily. Her family history was unimportant. After careful examination, I could find nothing amiss except in the stomach, where the gastric resonance extended from the fourth intercostal space to an inch below the level of the navel in the left nipple line, *i.e.*, about seven and a half inches, and the stomach caused a visible prominence in the abdominal wall. At intervals she would eructate offensive gas, and be greatly relieved by this proceeding; and after each eructation the abdominal swelling would grow less, until the gas had collected again. The pain was not limited to a small spot, but extended over the epigastric and umbilical regions, and was also felt in the interscapular space. Consequent on the vomiting, she suffered from severe headache; and complained of great weakness in the legs. When her abdomen was shaken, and auscultated at the same time, the splashing in the stomach were plainly audible. I attributed her symptoms to impaired digestion, caused by large and unwholesome meals, resulting in enlargement of the stomach cavity, and weakening of its walls; the pain being caused probably by stretching of the gastric nerves from over distension of the stomach by the gas which was formed in greater abundance after food had been taken, and also by the muscular soreness a result of the incessant vomiting. I ordered her a milk-diet, and an aromatic mixture, containing bismuth, strychnia, and hydrocyanic acid, three times a day, and a drachm and a half of Carlsbad salt every morning. A week after (November 24th) she came again, and reported herself no better, but suffering from an attack of diarrhoea as well. I prescribed some astringent powders, and a mixture with nitro-hydrochloric acid and quassia, and Morson's pepsin-powder. The diarrhoea continued till the 26th, when it stopped, leaving her much weaker, and her stomach still unable to take more than small quantities of milk. I advised her to rest in bed for an indefinite time, and to continue the mixture. On December 3rd the diarrhoea returned, but was soon checked by chlorodyne. She went on pretty well till January 8th, resting in bed, and limiting herself strictly to a diet of milk, varied at times with barley-water and a raw egg. On January 8th she complained that the pain in her stomach was worse, and she was ordered opium and belladonna liniment, which gave great relief. At her urgent request, I permitted her to get up on January 29th; but this experiment was followed by a sharp attack of vomiting and diarrhoea, with menorrhagia, which sent her to bed again, and the pain and sickness, which had been partially in abeyance, returned as severely as ever. I had suggested a trial of the siphon-tube previously on two occasions; but she had been dissuaded, by the solicitations of anxious friends, and also by a medical man of many years' standing, who assured her it would be "the death of her," and averred that such a mode of proceeding was altogether preposterous and unprecedented. At last, on February 5th, 1880, I got the better of her fears, and introduced the tube, with the usual consequences of nausea, retching, and vomiting of tough, gluey mucus, but no blood. I used a pint of a weak solution of Cond's fluid; and after the operation, in spite of the violent straining and vomiting, she said she felt better. I continued this on the 6th and 7th, when she felt so much relieved that she thought she would try to do without the washing out for the next day. I therefore ordered her to take fifteen-grain doses of hyposulphite of soda every four hours, and to adhere, as before, to her simple diet. I may say here that I had prohibited the use of tea, coffee, and alcohol, from the commencement. On the 8th the medicine seemed to exert no salutary effect whatever; therefore, at her urgent request, I resumed the tube on the 9th, and discontinued the medicine.

The disturbance on the introduction of the tube gradually lessened, and, by the 15th, she was able to walk half a mile to my house, to have the operation performed there. On February 22nd, she seemed much better, and could take food with little pain and no vomiting, and the formation of gas was now reduced to a minimum; therefore, on February 23rd, I did not use the tube. It had, however, to be resumed on the 24th, no disturbance being now caused by its use, and was continued once daily until March 3rd, when I intensified the treatment by siphoning the stomach morning and evening, instead of in the morning only as heretofore; and at each sitting I used two solutions: the first being always either a weak solution of sulphurous acid, *B. P.* (half a fluid-ounce to a pint of water), or of salicylic acid

(two drachms to a pint of water); and the second pure spring water. She also took a mixture containing Carlsbad salt every morning before breakfast. She gradually improved in health and appearance, and by April 7th had gained five pounds in weight. She weighed 125 lbs. on November 17th, 1879, and 130 lbs. on April 7th, 1880. I now discontinued the evening washing, and, on April 16th, provided her with a tube to use herself, and altered the lotion to the original one of Cond's fluid. She persevered in this treatment until May 22nd, then used the tube only every other day, and finally discontinued it entirely on June 2nd, being now free from pain, flatulence, and vomiting, and able to eat a plain simple meal without annoyance to herself or her friends. On June 24th, 1881, she was enjoying capital health, walking on an average ten miles a day, weighing 137 lbs., and stating that she had not felt so well for twenty years. No nutrient enemata were used in this case.

[To be continued.]

ON PICRIC ACID AS A MEANS OF DISTINGUISHING ALBUMEN FROM PEPTONE.

By GEORGE JOHNSON, M.D., F.R.S.,

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AMONGST the few objections which have been raised to the use of picric acid as a test for albumen in the urine, is the statement that it forms a precipitate or coagulum with peptone, which is indistinguishable from that which it gives with albumen. If this statement were in accordance with facts, and if peptone be ever found in the urine, the use of picric acid as a test might be a source of confusion. The attention of my son and myself having been directed to this subject, we find that nothing can well be easier than to distinguish the precipitate which picric acid forms with albumen from that which it gives with peptone. We have experimented in the usual way, both on peptonised white of egg and on fibre of meat. The white of egg and meat fibre respectively were digested for some hours at a temperature of from 90° to 100° Fahr. in water acidulated with hydrochloric acid, and mixed with Bullock's pepsina porci. The liquid was filtered, and freed from the small amount of albumen which it was found to contain by boiling and a second filtration. We thus obtained a clear liquid peptone, which was coagulable neither by heat nor by nitric acid. On the addition of a saturated solution of picric acid there was an abundant gelatinous precipitate of peptone, *but this precipitate was immediately and completely redissolved by heat below the boiling point, and reformed on cooling.* Further, we found that the peptone, precipitated by picric acid, was completely dissolved by the addition of a few drops of nitric acid. Here, then, we have two simple and certain tests, by means of which albumen may be distinguished from peptone. The coagulated albumen, which is thrown down by picric acid, is always rendered more opaque and coherent by heat, and is insoluble in nitric acid; on the contrary, peptone, which is thus coagulated, is readily dissolved, both by heat and by nitric acid. The use of picric acid as a test, therefore, so far from tending to the confusion of albumen with peptone, will be found to be the simplest and most effectual means of distinguishing these two compounds, and even of separating them from each other when they co-exist in the same liquid. If the mixed precipitates, formed with picric acid, are heated, and then placed on a warm filter, the dissolved peptone will pass through, while the coagulated albumen remains on the filter.

Another means of separating dissolved albumen from peptone is that before referred to—*viz.*, coagulating the albumen by heat, and then separating it by filtration.

It has been asserted that peptones occur in the urine. This may be a fact, but with our present knowledge of this subject I feel some doubt as to the truth of the statement. My conviction is that if it ever occurs it must be a rare and exceptional phenomenon. Within the last two years, during which, at the suggestion of my son, I have used picric acid as a test for albumen, I have tested with it some hundreds of specimens of albuminous urine, and although I have not always applied heat to the urine after adding the picric acid solution, I have done so in a large proportion of cases, and in not one single instance have I found that the precipitate formed by picric acid has been either wholly or partially redissolved by the application of heat, but, on the contrary, it has invariably been rendered more dense and opaque. In almost every instance, when I have not heated the specimen after coagulation by picric acid, I have added nitric acid to another portion of the same urine, and have thus shown the presence