febrile heat. In another variety of cases, the liberation of the oxygen is so persistent that remission of the fever is hardly perceptible; and in other exceedingly light cases, where the quantity of poison is very small, and is not reproduced, one sharp paroxysm of febrile phenomena may be all that is witnessed" (*loc. cit.*).

M. Gosselin, in 1874, stated, as the results of experimentation on animals and of careful clinical study: (1) "that absorption readily takes place from the marrow of bones and from the surface of wounds; and (2) that, in cases of injury of bone with exposure of the medullary canal, the marrow itself is apt to become putrid and poisonous where it is exposed to the air, and that wounds contain besides abundance of material, by whose absorption in the earliest stages traumatic fever is produced, whilst the absorption of other (and presumably different) gangrenous matters, at a latter stage, causes a graver febrile condition with the metastatic abscesses of pyæmia." (*British and Foreign Medico-Chirurgical Review*, April, 1874, p. 369.)

A brochure on *Intestinal Septicæmia* (*Septicæmie Intestinale*), published in 1873, by Dr. G. Humbert, deserves here a brief notice. The author of the pamphlet applies this name to a certain constitutional state, which he fully describes, and believes to be originated by the poisoning consequent on the passage into the blood of putrid substances into the canal. He considers that septicæmia may be caused, not only by agents which are developed outside the blood-vessels, and accordingly may be regarded as veritable foreign bodies, but may be induced by substances produced by the physiological processes of ordinary digestion and nutrition. In confirmation of this opinion, Dr. Humbert cites the division of septic substances into three classes given by M. Blum (*De la Septicæmie Chirurgicale Aiguë*, Thèse de Strasbourg, 1870, p. 1)—viz.: "a. Excremental substances abnormally retained in the organism, and occasioning the affections known under the name of uræmia, cholæmia, ammoniæmia, etc.; b. Septic substances formed at a spot resulting from certain alterations, still badly defined, of its anatomical elements (inflammations, suppurations, gangrene); c. Septic substances developed from without the patient, and absorbed by him (miasmata)." Humbert regards putrefaction as only an act of general disassimilation, the rapidity of which is favoured both by the surrounding medium and by the want of reparatory materials; and he considers the products of disassimilation and of putrefaction to be alike septic, and that they are similar in chemical composition. An essential quality of the septic substance developed by either process he regards to be, putridity. He sums up the conclusions he has arrived at thus. "1. Septicæmia is not a morbid entity, a malady so-called; this word expresses only the combination of the phenomena resulting from the introduction of septic materials into the blood. It is poisoning by septics, as narcotism is poisoning by narcotics. This is only the specific name; while the varieties are indicated by the terms surgical, puerperal, and typhoid septicæmia. 2. Septic substances are only the products of the more or less advanced combustion of organic matter. Putridity exists from the moment when this combustion exceeds the limits in which the matter is fit to form tissues. Putrid matters have one common origin and nature: their differences consist only in a variation in the proportion of their elements, or in the viruses with which they may be impregnated."

(To be continued.)

SCROTAL CALCULUS.—Dr. Lippmann reports, in the *Centralblatt für Chirurgie*, April 23rd, 1881, an unique case of this affection. The patient was a peasant aged 68, who stated that fifteen years previously, finding great difficulty in micturition, he consulted a medical man, who removed from the scrotum a calculus weighing 120 grammes (about 4½ ounces). From this there resulted an urethral fistula, which gave passage to the urine, first easily, then with increasing difficulty. The fistula was situated a little behind the point of the junction of the penis and the scrotum. All attempts at catheterism failed, that portion only of the canal situated in front of the fistula being permeable. The scrotum was distended to the size of the head of a foetus, and was of hard consistence. The testicles were retracted towards the external inguinal ring, and extremely atrophied. When a catheter was introduced into the fistula, a calculus stopped the way. The next day, an incision of the length of the scrotal raphe was made, and four calculi, weighing in all forty grammes (about an ounce and a half), were removed. They were rough, of a greyish-yellow colour, presented facets, and were made up of phosphates. When joined together, they were about the size of a goose's egg. The cavity was afterwards washed out with carbolic acid. The wound healed quickly, leaving a fistula, through which the patient passed his urine. Later on, he emptied his bladder by the help of a catheter of his own invention, which was simply a goose-quill.

REMARKS

ON

THE TREATMENT OF GUNSHOT-WOUNDS OF THE ABDOMEN IN RELATION TO MODERN PERITONEAL SURGERY.

By J. MARION SIMS, M.D., LL.D., etc.

[Continued from page 973 of vol. ii for 1881.]

IN 1864, Sir Joseph Oliffe and myself assisted M. Nélaton in an ovariectomy. There was nothing unusual in the case. It was a multilobar tumour without adhesions; just such a case as would now be promptly and certainly cured.

Twenty-four hours after the operation, I saw that the patient must die, and told M. Nélaton she was dying from an effusion of a reddish serous fluid in the peritoneal cavity, and I suggested to him then to puncture the *cul-de-sac* of the vagina, to let it run out. It was not done; and she died forty hours after operation. I assisted M. Nélaton and Sir Joseph Oliffe at the *post mortem* examination, and we found precisely what I had predicted, viz., a large effusion of a sero-sanguinolent fluid—a quart or more—in the peritoneal cavity. She died of septicæmia, but we did not then understand it. However, from this time, the idea that septicæmia and not peritonitis was the usual cause of death after ovariectomy, took complete possession of my mind, and I was on the look-out for other *post mortem* reports.

Within a year from this date (1865), Mr. Spencer Wells published his standard work on ovariectomy (*Diseases of the Ovaries*, by T. Spencer Wells, F.R.C.S., etc., London, 1865), giving the necropsies of all his fatal cases. I ran hurriedly through it, and analysed its *post mortem* reports. These confirmed my previous views, and fully established the fact that the great majority of deaths following ovariectomy was the result, not of peritonitis, but of septicæmia; septicæmia caused by "bloody serous" or "ichorous serous" fluids in the pelvic cavity. Mr. Spencer Wells's necropsies established this great truth—one of the most important as yet developed in the progress of ovariectomy. He did it, not knowing what he had done, and not realising at the time the grand results that would follow. And when I published my views on this subject (1872), proving their correctness by analysis of Mr. Spencer Wells's thirty-nine fatal cases, and by my own subsequent personal experience, he, in common with the majority of ovariectomists, at first rejected my interpretation of his facts.

In New York, I was for a while alone in the advocacy of the universality of the doctrine of septicæmia in deaths from ovariectomy. Dr. Gaillard Thomas was, I believe, amongst the first to accept it; but it was not generally accepted till indorsements came from Europe, first from Professor Humphry of Cambridge, and then from Professor von Nussbaum of Munich. They were followed by others, mostly in Germany. The indorsement of German surgeons had much to do in influencing opinion amongst us. At last, Listerism (1876) was applied to ovariectomy, and this was the complete triumph of the doctrine of septicæmia in ovariectomy, as in other departments of surgery.

It would be an odd and unique freak in the laws of nature, if other wounds of the peritoneum should not follow the same course as those made by the surgeon's knife in ovariectomy. How easy, then, the transition of this law from ovariectomy to gunshot and other wounds of the peritoneal cavity. Nothing could be more natural; nothing more logical.

After the analysis of Mr. Spencer Wells's cases, I was convinced that we should find the same pathological appearances in shot and other wounds of the abdomen, that we found in fatal cases of ovariectomy; but my convictions remained only such, till the following case occurred to prove their truth.

In November 1869, Mr. Richardson was shot in the abdomen, in the *Tribune* office, New York. The poor fellow lived five days. The *post mortem* examination was made by Dr. J. Cushman, assisted by Drs. Finnell, Morton, Swan, and Clark, ten or twelve hours after death. They found "a gunshot-wound of the abdomen, five inches below the left nipple, and a half-inch to the left of the median line. The direction of the wound was inward, downward, and backward, and to the left of the spinal column, one inch above the crest of the ilium. The ball traversed the left lobe of the liver, two inches from its anterior border, passed through the stomach and

ileum, and then along the lower end of the kidney to the point at which it was extracted. The abdominal and pelvic cavities contained *about thirty-two ounces of bloody fluid*. Death, in our opinion, was caused by peritonitis'.

I had looked forward with the greatest interest for this *post mortem* report, and was not the least surprised when I heard that the peritoneal cavity was full of bloody fluid. The peritonitis was only of the agglutinative character; such alone as showed nature's efforts to protect vital organs by the exudation of plastic lymph.

This was a case that, with the lights now before us, might have been saved by timely operation. Richardson lived five days and a half, an unusual length of time after such wounds. The wound of the liver was not necessarily mortal. The perforation of the stomach and the ileum could have been safely sutured, and the peritoneal cavity cleared of the quart of bloody fluid, which caused death by septicæmia.

We all remember the death of Mr. James Fisk of New York, the great financier. He was shot in the abdomen (January 6th, 1872), as he was ascending the private stairway in the Grand Central Hotel. As soon as I heard of the shooting, I told some of the doctors in attendance that he could be saved only by abdominal section, clearing out the peritoneal cavity, and repairing the damage done by the bullet to intestines and blood-vessels; otherwise, he would die of septicæmia. He died in eighteen hours. *Post mortem* examination was made by Drs. Janeway and March eleven hours after death. Drs. Wood, Sayre, Phelps, Trepler, Fisher, Beach, and Shine were present. The ball "entered six inches above the umbilicus, and one inch and a half to the right of the middle line; passed downward and to the left through the omentum and mesentery, piercing two loops of the small intestine, and was found in the left inguinal region, about twenty-two inches below the point of entrance. There was little or no hæmorrhage." I was present at the necropsy. There were from four to six ounces of bloody serous fluid in the pelvic cavity. I was standing by the distinguished surgeon James R. Wood at the time, and called his attention to it. No importance was attached by those who made the necropsy to the presence of the reddish serum, as no allusion was made to it in their *post mortem* report.

Here there were two perforations of the ileum and a wound of the omentum and mesentery, all easily reached and remediable by the present resources of our art. This was only nine years ago; but at that day and time the old dread of opening the peritoneal cavity still hung like a pall over the medical mind. Peritonitis was then the bugbear that it had been for ages; but we have stripped it of its terrors; for, with the light of science and the confidence of experience, we now constantly explore the abdominal cavity with the utmost impunity.

It was said that Mr. Fisk died of shock. The term *shock* covers up a vast deal of ignorance. What would some of us do if it were not for the words *malaria*, *neuralgia*, and *cold*? So it is with shock. I do not pretend to say that men may not die of shock; but death from shock, uncomplicated with hæmorrhage or septic influences, is rare indeed. To say that a man like Mr. Fisk died of shock is begging the question. He was in the prime of life, and in robust health. I have never seen the *post mortem* examination of a man so absolutely perfect physically. Not a flaw was to be found in any of his organs. He had no weak, flabby, or fat heart, and no valvular trouble. His kidneys and all other organs were in a perfect state. About ten hours after the shooting, reaction was sufficiently established for him to dictate his will to a lawyer, and then to see his wife. In three or four hours more, his mind wandered a little; he became comatose, and died eighteen hours after the wound.

It is absurd to say that a great, strong, healthy man died of shock, when there was only a perforation of two superficial loops of small intestine to account for it; but it is quite reasonable to say he died of septicæmia, when there was sudden perforation of intestine, with extravasated flatus and fluids, especially when we find bloody serum or other foreign fluids in the peritoneal cavity, even in small quantities. In the case of Mr. Fisk, there were from four to six ounces of bloody serum in the pelvic cavity. It is not the quantity, but the quality, of the exudation, that kills. In some of Mr. Spencer Wells's earlier ovariectomies, he saw blood-poisoning produced by very small quantities of "ichorous fluid" in the peritoneal cavity; and in one case his own hands suffered from it.

We have yet to learn that the vital powers may be as suddenly overwhelmed by septic agents in a concentrated dose as by opium in a concentrated dose.

I have seen nausea, vomiting, exhaustion, incoherent talking, dizziness verging into coma, instantly relieved by washing out two or three teaspoonfuls of turbid sero-purulent matter from a septic pus-pouch behind the body of the uterus; and then, in two or three hours more, all those symptoms of prostration and blood-poisoning

would be reproduced, and then relieved in the same way, again and again, till a counteropening was made in the bottom of the sac, which permitted continuous drainage through the vaginal *cul-de-sac*; this saved the life of the patient. One must see such things, to realise the rapidity of blood-poisoning by concentrated septic material. Let me repeat that there is no more reason why the system should not be suddenly overwhelmed by the rapid absorption of concentrated septic fluids, than by the rapid absorption of an overdose of morphia. Opium in sufficient quantities may kill in from eight to twelve hours. Septicæmia may do the same thing often in less time.

When I went to Sedan, as Surgeon-in-chief of the Anglo-American Ambulance, in August 1870, I went hoping that I might be able to do something to elucidate the subject of the treatment of gunshot wounds of the abdomen; but, unfortunately, the cases that came under my observation were moribund, and therefore beyond all hope of relief. But I learned this great truth—that they all died of septicæmia, the *post mortem* examinations showing large quantities of bloody serum in the peritoneal cavity in every case, evidently the source of blood-poisoning; while there was not the slightest trace of peritonitis. There was not a single exception to this. From what we saw there, I felt more convinced than ever that all cases of shot-wounds of the abdomen, that did not speedily die of hæmorrhage, always died from septicæmia, the result of large quantities of bloody serum in the peritoneal cavity, and not from peritonitis.

In ovariectomy, we see patients dying of septicæmia when bloody serous fluid is retained in the peritoneal cavity; and we see them recovering if we prevent the exudation of this fluid, and recovering with equal certainty if we drain it off after or as it is formed. This is an important lesson in peritoneal surgery. The principle established by it is applicable to all other wounds of the peritoneum, whether made by accident or by the surgeon's knife, by puncture, or by bullet. In other words, wounds of the peritoneum, however made, have a common course to run, and are all amenable to the same general laws. Here, then, is the similitude between deaths from ovariectomy, from perforation, and from gunshot wounds of the peritoneum. In all these, patients may, and do, die of peritonitis; but this is not the rule. It is not the universal law; it is rather the exception. And, even if peritonitis should complicate a septicæmic case, there is no reason why we should not proceed precisely as if such complication did not exist. Indeed, I am convinced that the time will soon come when peritonitis, properly so called, will be treated by abdominal section and clearing out morbid products from the peritoneal cavity. Nature cures peritonitis in its early stages by uniting contiguous inflamed surfaces by intervention of plastic lymph. But, if the inflammatory process go further than plastic exudation; if it terminate in pouches of pus in folds of the intestines, or in purulent effusion in the peritoneal cavity, as seen in puerperal peritonitis—then death follows from the absorption of these puriform collections, which produce blood-poisoning, whether called septicæmia or pyæmia. In this stage, why should we not open the abdomen before it is too late; liberate adhesions; remove matter, whether imprisoned in pouches or free in the pelvic cavity; clear out deadly foreign products, and thus get rid of septic agents, just as we do with bloody serum after ovariectomy? In the one case, the source of poison is generally locked up in little pouches; in the other, it is free in the peritoneal cavity, and usually in the pelvic portion of it. In searching out and removing the products of peritonitis, it would be necessary to examine every inch of intestine and every portion of omentum involved in adhesions. This can be done, and it will be done; for it is but the imitation of nature's clumsy efforts in this direction; and, when we follow the laws of nature, we are sure of going in the right course.

Bristowe says: "In a large number of cases, and especially in such as result from the perforation of some viscus or sac, and the escape of irritating matters, general peritonitis of the ordinary adhesive character is at once excited, and the effused matters consequently become confined to some limited district or districts. In many cases, a circumscribed abscess is thus produced, which may possibly undergo cure by the discharge of its contents, either externally or into the bowel." It would be better to do this work promptly by surgical interference, than to wait for the slow and uncertain efforts of nature.

But, to return to our subject; let us look at blood-poisoning from a peritoneal point of view. Septicæmia and pyæmia are caused by the absorption of putrid fluids. The septicæmic putrid fluid is bloody serum in the peritoneal cavity. Pathologists will give us its peculiar characteristics. The pyæmic putrid fluid is vitiated pus, generally in peritoneal pouches, the result of peritonitis. Septicæmia often kills rapidly; peritonitis always more slowly. Death may result in a few hours from the one, while it takes days for the other. Peritonitis poisons more slowly, and is really less dangerous. The reason of this

is very simple; but I do not know that pathologists have explained it. It is this. In septicæmia following ovariectomy, the septic bloody fluid is exposed to an immense absorbing surface—the peritoneum—which takes it up as rapidly as does the cellular tissue a hypodermic dose of morphia. In peritonitis, the septic purulent deposits are segregated and in small quantities, and exposed to small absorbing surfaces. The difference, then, is in the large amount of poisonous material and the large free absorbing surface in the one case, and the smaller amount of septic material and the smaller area of absorbing surface in the other. Besides this, sepsis by bloody serum is a more concentrated poison than sepsis by pus or puriform collections.

Pyæmia from peritonitis kills more rapidly than pyæmia from purulent collections in other parts of the body. Perhaps the reason is to be found in the fact that the pus-pouches, bounded all round by convolutions of intestine, may be thus exposed to osmotic influences of intestinal gases and germs. The distinctions here drawn are not in accordance with the doctrines of the day; but they are not based on theory; they are the result of clinical observation and *post mortem* examinations. True, I have seen but few fatal cases of peritonitis following ovariectomy. According to my experience, they are about as one in ten, compared with septicæmia.

(To be continued.)

EXTRACT FROM A LECTURE ON TUBERCLE,

*In the Course of Pathological Anatomy at the Middlesex
Hospital Medical School, January 1882.*

By SIDNEY COUPLAND, M.D., F.R.C.P.,

Physician to and Lecturer on Pathological Anatomy at the Middlesex Hospital.

GENTLEMEN,—Having, in my last lecture, given you as explicit an account of the general pathology of tubercle as far as I understand it, I propose to-day, before leaving this subject, to recapitulate to you these facts in the form of a concise summary. In doing so, you must allow me to adopt a somewhat aphoristic and dogmatic method; for I feel that upon this subject, of all in pathology, it is necessary for us to have clear and definite ideas. There is hardly any pathological question that has been so swayed by every wind of doctrine as this of tubercle; not even the subject of inflammation has been viewed from so many standpoints, and received so many and varied explanations. The conclusions I am about to give you do not claim to be anything else than the formulated expression of ideas gathered from time to time from various sources. They embody simply the essential points I have learned from others, confirmed, so far as opportunities have been given me, by my own *post mortem* experience. Therefore, they are in no way original or novel. I hope they may be nearer the truth in consequence; as near, that is, as our present knowledge allows us to go. My sole aim is to teach you the facts which are established, and the inferences that appear to flow from them, in the simplest and plainest manner.

1. Tuberculosis is an infective disease to which man and the higher animals are liable.
2. It is characterised anatomically by the formation of minute nodules or "granulations", composed of elements like those met with in granulation-tissue, the result of simple reparative inflammation.
3. These nodules, or elementary or primary "tubercles", may occur in an isolated manner, or, by their confluence, may form larger or smaller conglomerate masses.
4. The typical structure of each fully formed primary nodule consists in (a) a collection of lymphoid round cells, enclosed in a delicate fibrillar meshwork or stroma; (b) in an internal zone, more or less evident, of larger nucleated epithelioid cells; and (c) a central multi-nucleated or giant cell.
5. These "tubercles" arise apparently in connection with the lymphatic tissue that pervades the body. No region is exempt from them. They may occur in the substance of organs, in the bones and muscles, in serous membranes, as the pia-arachnoid, pleura, pericardium, and peritoneum; in synovial membranes; in mucous membranes (arising in the submucous stratum), as in the mouth, pharynx, larynx, trachea, bronchi, intestines, and genito-urinary tract.

6. Being ill supplied with blood-vessels, they can only attain a certain size, and then perish. The central cells degenerate first, because they are the farthest removed from the nutrient blood-stream, and mutual pressure due to their increasing growth hampers their vital activity. They become fattily degenerated, soft, opaque, caseous, forming "yellow" tubercles, which, when isolated, are larger and manifestly of older formation than the miliary translucent grey granules. Where such tubercles are confluent, larger and more irregular caseous masses are formed. Caseation may pass into cretification. On the other hand, there is no doubt that occasionally the tubercular nodules take on a fibroid change, passing from the stage of "granulation-tissue" to one resembling "cicatrical tissue".

7. Almost invariably there occurs, in the vicinity of the tubercular formation, some reactive inflammation. This may be protective by ultimately leading to encapsulation by fibrous tissue of the caseated tubercular focus; or, as more frequently happens, it aids in the disintegration of the surrounding tissues, and leads, with the necrosis of the tubercles themselves, to destructive ulceration.

8. Individuals who are prone to the development of tubercle are called "tubercular". The disposition may be inherited. Probably what we recognise as "struma" or "scrofula" is only one form of this: a tendency to tuberculosis of lymphatic glands especially; just as in phthisical subjects we have a tendency to pulmonary tuberculosis.

9. The tubercular manifestation is, in the majority of cases, at first local, *i.e.*, limited to one organ or tissue. It may remain so limited throughout life—may not even endanger life—or may lead to death by the local destruction to which it gives rise. On the other hand, it may be more or less widely diffused throughout the body of the same individual. This diffusion may be due sometimes to the simultaneous development of tuberculosis in many parts. More frequently, it is due to secondary dissemination, by a process of infection.

10. This dissemination takes place, as in cancer, in two ways: *viz.*, by direct extension, or infection of neighbouring tissues by contiguity; and by general distribution of the tubercular virus through the medium of the blood-system (including lymphatics).

11. The tubercular virus seems to be most potent, or, at any rate, to retain its potency, *i.e.*, its infective property, in the caseous state.

12. Examples of the local extension of tubercle, or of propagation by contiguous infection are seen: (1) in the development of peritoneal tubercle from intestinal*; (2) in the spreading of tubercle from one part of an organ (*e.g.*, lung) to another part; (3) in extension from lung to pleura*; (4) in bronchial, laryngeal, and intestinal ulceration excited by the passage over their mucous membrane of material expectorated from a phthisical lung; (5) in tuberculosis of bladder and vesiculae seminales following upon renal or testicular tubercle, etc. The mode of its local extension approximates tubercle to the neoplasms, *viz.*, by its elements exciting in the tissue they infect changes leading to the formation of cell-masses resembling the primary focus.

13. The generalisation of tubercle is shown in the disease known as acute miliary tuberculosis, which is characterised by an eruption of miliary granulations in diverse organs and tissues. Its mode of occurrence may be (as above) compared to the general dissemination of secondary cancer, or, perhaps with equal truth, to the metastatic supuration of pyæmia. With few exceptions, it appears to necessitate a primary tubercular focus to give rise to it. It is believed that the infective virus, whatever it be, enters the blood-stream at this local focus, and is thence widely disseminated, the resulting growths being for the most part miliary, grey, and translucent; life not, as a rule, being prolonged for a sufficient length of time after the occurrence of the generalisation to permit of the growths becoming confluent or caseous. As the membranes of the brain are generally involved in this widespread infection, death occurs early.

14. Lastly, tuberculosis is inoculable. In this respect, it resembles pyæmia, and differs from the cancers; for there is reason to think that it may be and is communicated from one human being to another, *e.g.*, from husband to wife, and *vice versa*; and that it can be inoculated in animals from man (artificial tubercle). There is, further, a possibility, based on certain peculiar morphological resemblances of the formations, that bovine tuberculosis is communicable to man.

15. If the foregoing data be true, it follows that tuberculosis is an infective disease, probably due to the presence of a virus, which gives rise to the development of peculiar tissue-formations, capable of localised or general propagation in the body, and characterised mainly by their tendency to early disintegration.

16. Until the nature of the virus is known, it is impossible to formulate data concerning the conditions under which the disease arises in subjects free from inherited taint.

* In these cases, probably by extension along lymphatic channels.