treme urgency of the symptoms thus produced, has not infrequently led to ulceration of the urethra, and serious, if not fatal, extravasation of urine into the neighbouring tissues. In earlier days, when the catheter detected a stone was thus impacted, the practice was either to cut down and remove the calculus from the position it occupied in the urethra, or, if possible, to push it back into the bladder, and then to extract it by some form of lithotomy or cutting operation. Though either proceeding was usually successful, it entailed an operation which necessarily required a period of convalescence. Amongst some of my earliest lithotomies in male children were cases occurring under these circumstances. In illustration of the importance of this change in practice I may be permitted to mention, very briefly, the particulars of a recent case.

It was that of a boy, aged 4 years, whom I saw with urgent retention of urine due to the lodgment of a stone in the urethra just behind the scrotum. I pushed the stone back into the bladder and the retention was at once relieved. On the following morning I had the child placed under an anæsthetic and crushed the stone. As I found at the moment I had not an evacuating catheter sufficiently small to enter the bladder without more force than is desirable, I contented myself with more completely pulverising the calculus with the lithotrite than I should otherwise have thought necessary to do. The *débris* was discharged in the natural course of micturition, and the patient was practically well without any delay, as the urine was never even tinged with blood. Sir William Roberts was kind enough to examine the fragments of the calculus [which were exhibited], and reported that it consisted of uric acid with a coating of oxalates, and weighed a little over 5 gr.

A short time ago the patient would undoubtedly have been submitted to a more serious operation. I may incidentally mention that I reported¹⁴ a very similar case, where I practised lithotritry in a male child aged 11 years in 1881, and I have since from time to time successfully adopted this proceeding. I believe this was one of the first recorded examples in so young a subject, a circumstance I had forgotten until recently reminded of it by my friend Dr. Keegan. I have not met with an instance of recurrence of stone after litholapaxy in children.

THE APPLICATION OF THE ROENTGEN OR X RAYS.

To what extent this means may be utilised in matters which have occupied a considerable portion of this lecture has yet to be demonstrated. In its application to the diagnosis of calculus situated within any portion of the male or female urinary apparatus from the kidney downwards, I am not aware that it has been sufficiently successful in indicating either the form or position of the stone. From some experiments made chiefly outside the human body—I refer to such as those of M. D'Arsonval¹⁵ in Paris, and Mr. Henry Morris¹⁶ and others—it is quite possible by the shadows thus cast to distinguish various kinds of calculi. At present I do not think more than this can be said or has been sufficiently demonstrated. Though I have had several patients skiagraphed, I have not yet succeeded in obtaining results which were of help in making a diagnosis, independently of such means as we are in the habit of using.

In thus referring to this method of investigation it is with the hope that in its further development and application it will, amongst other aids, enable us to dispense with the use of the sound as a means of diagnosing stone in the bladder. I cannot recall an instance in the child, woman, or young adult, extending up to what I would call middle age, who was ever seriously damaged by the judicious use of this instrument; but in males of a more advanced age, in whom the prostate was large and access to the interior of the bladder, by means of a rigid instrument, by no means easy, we have seen, both where a stone had been discovered, as well as where one had not, serious and even fatal consequences ensue. A cystitis, for instance, has thus been aroused with considerable general disturbance which has sometimes taken a long time to overcome, not to say anything of being the means of postponing a necessary operation indefinitely by reason of the acute septic conditions under which it would have been undertaken.

Nor is this all. How few surgeons, in whatever degree they may be engaged in work of this kind, can feel that the skilful employment of the steel sound is an absolute guarantee against the possibility of a stone escaping their vigilance! When we look at the shape the diseased bladder and prostate

often assume, it is astonishing to me that this somewhat primitive mode of examination so rarely fails us. But it is in just this particular class of cases that we rely upon it most, and where our disappointment is the keenest, if it falls short of our expectation, whatever the explanation may be.

Under these circumstances I have for some time past been in the habit of including under one process, with great advantage, the administration of an anæsthetic, the use of the sound for the first exploration of the bladder, and the immediate removal of the stone, by crushing if practicable, if one is discovered. Just as in earlier years a preliminary paracentesis of an ovarian tumour was often found to be an unfavourable antecedent to an ovariectomy, so may the passing and use of a sound be a preface, which we would avoid, to the subsequent removal of the stone, however this may be effected. No more desirable object can be wished for in connection with the practical use of these rays than their adaptation in determining the presence, position, and constitution of the various stony concretions that have their habitat in the human urinary organs.

I have some confidence in expressing the belief that the time is not far distant when, under the circumstances I have mentioned, these Roentgen rays will enable us to see the stone instead of feeling it, just as in a recorded case,¹⁷ where a Murphy's button, lost in a remote corner of the intestines, was thus found by my old friend and colleague, Mr. Mitchell Banks.

NOTES ON THE COMPOSITION OF THE BLOOD SERUM IN PERNICIOUS ANÆMIA.¹

BY
R. F. RUTTAN, B.A., M.D., & J. G. ADAMI, M.A., M.D.,
F.R.S.C., Professor of Pathology,
Professor of Practical Chemistry, McGill University, Montreal.
McGill University, Montreal.

As far as we can learn, the chemical analysis of any very large quantity of blood or blood serum from cases of pernicious anæmia has so far never been made, and, although we freely admit that objections may be taken to the following analysis on the ground that the blood was not obtained *intra vitam*, nevertheless, we think the following analysis of the blood serum obtained at the necropsy upon a typical case of the disease deserves to be placed upon record. This analysis was made from the serum obtained from an extremely distended right heart, removed five hours after death in the month of February. It may be noted that the mean temperature in Montreal in February is several degrees below freezing point, and that the body in this case had been placed immediately after death in a room the temperature of which was close upon freezing point; the room indeed was so cold as to make the performance of the necropsy somewhat of an ordeal. The body was found not completely cold.

HISTORY OF THE CASE.

Before giving the analysis it will be well to say a few words in reference to the history of the case.

The patient, a man of 53, began to feel weak in March, 1892; there was a numb sensation in the lower extremities as from "pins and needles," and he soon noticed that his knees were liable to give way under him. He had lived in England until the age of 42, when he came to Canada. For the greater part of his life he had been a carpenter; the last two years he had undertaken work as a shorthand reporter. His personal history was very good. About the only trouble he had suffered from previously was a right-sided rupture, brought about when he was 40 by lifting a heavy weight. His condition upon admission to the Montreal General Hospital, under Dr. George Ross, in August, 1892, was one of great pallor and slow mental condition, with no pain experienced in any region. The knee-jerks were much diminished. The appetite was good, the digestive system apparently in fair condition; there was no abdominal pain. The arteries exhibited a slight amount of arterio-sclerosis; the heart was definitely enlarged, with the apex at the fifth interspace, just outside the nipple line. Upon auscultation, there was noted a soft blowing systolic murmur at the apex. An examination of the blood immediately on admission gave the number of red corpuscles at 570,000, a proportion of white to red corpuscles at 1 in 200 (about), the amount of hæmoglobin at 25 per cent., and this confirmed the diagnosis of pernicious anæmia. The patient was placed upon increasing doses of liquor arsenicalis, and in less than a fortnight the number of red corpuscles had increased to 1,353,333, and the patient was feeling stronger and was of better colour. On September 7th the red corpuscles were 2,006,000, proportion of white to red 1 in 301, and

¹⁴ *Surgical Disorders of the Urinary Organs*, 4th edition.

¹⁵ *Bull. de l'Acad. de Méd.*, Paris, June 2nd, 1896.

Lancet, November 14th 1896.

¹⁷ *BRITISH MEDICAL JOURNAL*, October 24th, 1896.

¹ This paper was read before the Montreal Medical Society in 1893, and an abstract was published at that time.

on September 17th, the number still further rising to 2,363,333, the proportion of white to red was 1 in 351; hæmoglobin had increased to 36 per cent. The patient was discharged on this date. On February 8th, 1893, he returned to the hospital, and was under Dr. James Stewart. The number of the red corpuscles had sunk to 700,000. The percentage of hæmoglobin had not fallen to the same extent; indeed, comparing the hæmoglobin percentage with the number of corpuscles, there was an actual increase of 23 per cent. per corpuscle. The patient was very prostrate, and the progressive asthenia ended in death upon February 21st. There had never been any hæmorrhage or diarrhœa, and vomiting occurred but twice, and on both occasions after taking arsenic.

NECROPSY.

The necropsy, performed by one of us, fully confirmed the diagnosis made during life.

There was the characteristic lemon-yellow tint of pernicious anæmia, and the subcutaneous fat was found in fair amount; the brain was large and anæmic; the lungs also pale, but crepitant throughout; the stomach was large, with distinctly thin and pale walls, presenting two small papillomatous overgrowths close to the pylorus (?gastritis polyposa). The lower part of the ileum presented also walls greatly thinned. The liver was large (2,000 grammes), brown in colour, varying to orange yellow, and friable. Sections showed the characteristic Quincke's siderosis both by the ammonium sulphide and by the hydrochloric acid and potassium ferrocyanide tests, with some fatty degeneration. The bile duct was pervious, and a greenish-yellow bile stained all the intestinal contents. The kidneys showed a large cortex, and were pale, fatty, and friable. The bladder was distended with more than 500 c.cm. of dark amber-coloured urine: prostate not enlarged. The spleen was of fair size, firm on section, but it yielded upon being scraped a considerable amount of purplish bloody pulp. The sternal bone marrow was increased in amount, and of a purplish-red colour. There was a right inguinal hernia, the pouch being filled with a large adherent mass of great omental tissue.

Turning now to the circulatory system, there were found slight atheromatous changes in the aorta. The heart was large (370 grammes), the right side being especially distended, indeed relatively enormous, auricle and ventricle being filled with pale very dilute blood, in which floated some soft reddish clot. The left side was smaller, the left ventricle dilated, with slight hypertrophy. The tricuspid valves were distinctly thickened along their free margins, and only admitted three fingers with difficulty. The mitral valves were still more fibroid. The aortic and pulmonary valves were competent and normal.

Of the blood distending the right heart, 300 c.cm. were immediately removed, placed in a clean bottle, and sent up to the Chemical Laboratory of McGill Medical College.

The analysis of the blood serum, made by one of us, gave the following results:

The clear, almost colourless, serum had a specific gravity of 1026.1. This is below the figure usually given as being that of the specific gravity of serum, namely 1027 to 1030. It contained only 5.2 per cent. of proteids (by weight). These proteids consisted of 2.3 per cent. of globulins precipitated by saturation with magnesium sulphate, and 2.9 per cent. of serum albumen proper. There was 0.875 per cent. of ash. It will thus be seen that not only were the total proteids reduced about 40 per cent. below the average normal quantity, but also that the normal ratio of the globulins to the serum albumen was considerably altered, the ash also was about 12½ per cent. above the normal.

The total quantity of iron found in the liver was 0.2433 per cent. by weight calculated to the fresh undried tissue. This is equivalent to about 0.72 per cent. in the dried tissue. The estimation accords fully with the observations of previous observers, as showing the very great increase in the iron contained in the liver in this disease, to which, among English workers on the subject, Dr. W. Hunter has especially called attention.

OBSERVATIONS UPON THE RELATION BETWEEN LEUKÆMIA AND PSEUDO-LEUKÆMIA.

BY

C. F. MARTIN, B.A., and G. H. MATHEWSON,
M.D., Lecturer on Pathology, and B.A., M.D.,
McGill University: Assistant Physician to the Royal Victoria
Hospital, Montreal.

[From the Medical Clinic of the Royal Victoria Hospital, Montreal.]
(Concluded from page 1636.)

Of all the forms of leukæmia, that which is most akin to Hodgkin's disease is, of course, the lymphatic form, and as exemplifying this the following case is appended, having come to our notice during the past year. The clinical history of our case is briefly as follows, and we are indebted for our abstract from the notes to Dr. Robertson, the resident physician of the hospital.

A French Canadian, aged 18 years, entered Professor James Stewart's wards, November 24th, 1895, complaining of cough and headache, "lumps" over his body, and painful swelling of the left arm. He had been ill for only five weeks, excepting for a temporary swelling of the lip, resulting, he supposed, from using a borrowed flageolet. This had resulted in painful intermittent swellings of the lips for a few days previously, but had quite subsided a day or two before his general illness. The earliest manifestations of disease were glandular enlargements beneath the chin and the angle of the jaw, which in two or three days had so progressed as to involve also the glands beneath the auricle, and those in the posterior triangles of the neck. Before the end of the first week another lump was seen on the forehead, small in size and beneath the skin. Likewise the glands in the groin became involved, and there was pain over the region of the anterior crural nerves of both sides. There was otherwise no distress at the time, but early in the second week of his illness there had ensued great pallor with weakness and dyspnoea, and the patient's symptoms became alarming. He was confined to bed but slept poorly, suffering for the most part from orthopnoea. Epistaxis commenced about the same time and has frequently since recurred. Deafness seemed to have occurred simultaneously, while, on the night before admission, painful swelling of the left arm ensued. Dr. Vipond, who kindly asked one of us to see the case with him, permitted his removal to the hospital, where he was admitted on the following morning.

His personal history is of interest mainly in that when aged 4 years he suffered from some disease whereby his eyesight was almost permanently lost, leaving his vision up to the present day greatly impaired. The history of this illness is unsatisfactory. His habits were good, his occupation light, and he had otherwise been well up to his present illness. There was no venereal history.

The family history manifested no evidence of tuberculosis nor other hereditary taint.

Condition on Admission.—The patient is a young man, markedly anæmic, unable to lie down on account of cough and dyspnoea. He is somewhat deaf and apathetic, but intelligence seems good; he is rather somnolent, though on account of the dyspnoea he does not sleep well; he has headache, pain in the left elbow and arm. Temperature 101½°; pulse 136; respirations 32.

Lymphatic System.—The lymphatic glands all over the body, so far as can be determined, are enlarged and firm. They are all more or less movable, quite painless, and not tender. There is no evidence of suppuration nor even of acute inflammation or involvement of the skin. This applies to the glands beneath the jaw, in the triangles of the neck, in both axillæ and the inguinal regions, the epitrochlear glands, the occipital glands, and those behind the episternal notch; there is distinct dullness over the manubrium sterni, evidently from involvement of the retrosternal glands.

Locomotor System.—The muscles are fairly well developed; the left arm from wrist to shoulder is much swollen and oedematous. There is universal anasarca, and the skin generally has a rather oily look. There are numerous purpuric spots about the right elbow, and a few upon the back. On the forehead there is a subcutaneous nodule 2 inches in diameter, which is slightly tender and moderately firm. There is slight tenderness on percussion over the long bones and the sternum.

Circulatory System.—The pulse is rapid, fairly full and regular. The apex of the heart beats in the fifth space in the nipple line, to which point the left transverse dullness extends; vertically the dullness begins at the third space above. There is a fairly loud systolic murmur at the apex, transmitted into the axilla and to the back. There is no accentuation of either basal second sound.

Respiratory System.—There is dyspnoea with rapid shallow respirations, frequent cough, and some slight mucoid expectoration occasionally tinged with blood. An examination of the chest reveals a few dry râles, but otherwise no abnormality beyond the dullness over the sternum previously mentioned.

Digestive System.—The lips are dry, the tongue very pale and thinly coated. The teeth are very irregular and covered with sordes. Both tonsils are distinctly swollen, very pale, and on the right side there are a few submucous hæmorrhages. The appetite is fair and the bowels regular. The abdomen is not distended nor tender. The liver dullness extends in the right mammary line from the fifth space downward 4 inches. The organ is not palpable. Splenic dullness extends from the eighth to the eleventh space, but the viscus cannot be felt. There is no ascites.

Genito-Urinary System.—There is no priapism. The testicles appear normal. The urine is straw-coloured, clear, with a creamy, yellowish-white sediment and a few grains of uric acid. The urine is acid, specific gravity 1020, free from albumen and sugar; microscopically a large abundance of urates and uric acid crystals. No casts can be detected.

The Blood.—There is a tendency to hæmorrhage both from the nose and in the expectoration. The blood which flows from the finger on puncture is very pale, and the bleeding is stopped with great difficulty; the red cells 1,310,000, white cells 24,000, hæmoglobin 21 per cent. Stained slides show a very marked lymphocytosis, with an abundance of transitional forms. There is likewise a large number of polynuclear neutrophiles, many of which show undoubted evidence of mitosis. There is some irregularity in the size and shape of the red cells, and many of them are nucleated, in some cases their nuclei showing a breaking up into two, three, or more parts.

The Nervous System.—Apparently normal; special senses. Eyes: So far as can be ascertained the patient seems quite blind to any test: the pupils are widely dilated; there is a constant, rather coarse lateral nystagmus. Dr. Buller, on examination of the fundus, reported a double refinitis pigmentosa of unusual type, the pigment not showing the usual stellate arrangement following the vessels. The discs show indistinct borders, somewhat red, and with a few recent changes due to the present disease, and probably a few hæmorrhages.

Diary of Case.—The treatment adopted consisted in the first place of hypodermic injections of liquor sodii arsenitis, 5 minims daily, progressively increasing the doses by 1 minim every alternate day. Restricted diet was further advised, and some alcoholic stimulants recommended; apart from this the various symptoms were treated as they arose. A few days after admission severe and prolonged epistaxis ensued,