the mass have found a hard pylorus embedded in adhesions. Dismayed by such experiences, they have considered the condition to be cancerous, and closed the incision. A man, aged 38, was admitted into the Cancer Charity with the diagnosis of gastric cancer, and he had, in the epigastric region, a scar left by an exploratory incision; the surgeon who made this incision believed that this patient had an inoperable pyloric cancer. I watched the patient for many weeks, and doubting the accuracy of the diagnosis, advised him to submit to gastro-jejunostomy. In the course of the operation I found the pyloric half of the stomach completely fibrosed; its walls resembled scar tissue in colour and consistence. The gastro-jejunostomy was successful; the man left the Cancer Charity, and returned to his occupation. This operation was performed in January, 1912. In November, 1913, the man reported himself in good health, and was earning his living by hard work such as hop-picking, pulling turnips, and digging. We examined the condition of the stomach by means of the x rays and a bismuth meal; the new stoma could be seen discharging its functions very efficiently. It is of the utmost service to us that the improvements which follow the establishment of a new stoma in the stomach are capable of visual demonstration.

Reports on the results of gastro-jejunostomy often contain accounts of patients who have been submitted to operation in the belief that a localized lump in the wall of the stomach was cancerous; the surgeon has been surprised, on examining the patient two years afterwards, to find that the suspected cancerous lump has disappeared. So many of these cases have been observed and reported that surgeons willingly admit the difficulty of deciding between a stomach converted into the semblance of a leather bottle by cancer, or by inflammation. Such changes are not confined to examples in which the stomach is uniformly affected, for the change may be limited to a relatively small area of the stomach, but it shows clearly the advantage, in doubtful cases, of giving the patient the benefit of the doubt as well as the benefit which gastro-jejunostomy will bring him if the lump in his stomach is of inflammatory origin. All surgeons who have had much experience of gastro-jejunostomy for tumours of the stomach will admit that patients often make excellent and permanent recoveries after an operation, in spite of a dismal prognosis.

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TWO YEARS' OPERATING TO THE CLOCK.

BY

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In a very interesting leading article in the *BRITISH MEDICAL JOURNAL* last year, my attention was attracted by an appeal to surgeons, not to forget that quick operating meant less exposure of parts, with consequent less liability to shock and supervention of sepsis. For years past I happen to have acted according to the idea that the success of a serious surgical operation on the unknown quantity, the human body, is in direct ratio to its rapidity.

Speaking recently to Mr. Maclaren, the famous cricketer, I was much interested by hearing him state "there are more matches lost by not playing to the clock than many people imagine." Might I venture to apply this remark to our "game," and say there are many more lives saved by a smart operation than probably many of us realize?

At the same time I emphasize the fact that I should not be credited with the opinion that quick operating is of value *per se* unless combined with conscientious and thorough workmanship, and unless compatible with the removal of the *fons et origo mali*, whether this be an infected appendix, Fallopian tube, or gall bladder, or other cause. Also in many septic cases deliberate care must be taken to isolate the operating area by sponge packing, so as to avoid further visceral or parietal infection, and a

most determined attempt must be always made to clear the "field of battle" of all dead material and to leave it as dry as possible. If these latter conditions cannot be, for one reason or another, complied with, then I unhesitatingly recommend free drainage every time. Furthermore, the size of the incision must be of such dimension as to afford every facility to the operator to carry out intelligently such measures as the exigency of the condition demands, and it should constantly be borne in mind that the peritoneal cavity in particular is not the place for the game of "blind man's buff."

Before recording the results obtained by me in working to the clock it will be well to describe briefly the general system on which the patients have been treated.

After a detailed organic examination has been made the patient has two days' preparation in hospital, consisting of light diet, calomel, magnesia, *mistura calcei lactatis*, and if debilitated, hypodermic injections of liquor strychninae. On the morning of operation a soap and water enema is administered, and the patient's skin is painted with tincture of iodine (1 in 50). If the condition is serious, a nutrient enema (strong coffee 3ij, brandy 3j, glucose 3j, peptonized milk 5v) is given half an hour before operation, also a hypodermic injection of morphine, gr. $\frac{1}{4}$ with atropine $\frac{1}{10}$, and fifteen minutes later a brandy and soda. Ether by the open method is the routine, unless there are contraindicating lesions.

My operating staff consists of an anaesthetist, my resident medical officer, my specially trained assistant nurse, the charge nurse of the operation theatres, her assistant, and the operation room porter. No headgear is indulged in, and gloves are worn only in very septic cases, for self protection. Our hands and arms are treated liberally to hot water, soap, and nailbrush, hot formalin solution (1 in 200), alcoholic mercuric solution (1 in 1,000), and aqueous acid mercuric solution (1 in 1,000) respectively.

During operation the sterilized instruments are kept in a basin of carbolic lotion (1 in 40); our sponges are all dry sterilized, except the Turkey sponges, which are kept in acid mercurial solution and thoroughly wrung out in warm carbolic lotion before being used. No lotions are used in wounds, and only in cases of abdominal pus collections are Turkey sponges employed, and then merely to form a more effective walling-off of the danger zone.

Sterilized silk is used for all intraperitoneal work except when pus is present; then Lister's catgut is exclusively employed. Wounds above the umbilicus are closed by interrupted through-and-through strong silk sutures; below the umbilicus we always employ tier sutures, except in septic cases with drainage. I never bury silk in any parietal wound, hernial or otherwise. All bleeding points are ligated, and if "dead" spaces cannot be avoided they are left open to drain themselves. No flushing of the abdominal cavity or of wounds is practised, except in curetting a womb and arthrotomy of infected joints. Dry sterilized gauze dressing is applied to all clean wounds. Collapse and shock are treated by saline infusion, hot saline and brandy enemata, temporary elevation of foot of bed, and hypodermic injections of aseptic ergot, camphorated oil, and strychnine.

The following summary includes, without any attempt at selection, all important operations performed by me in the British Hospital, Buenos Aires, during the two years May, 1910, to May, 1912. This period is chosen principally because Dr. K. McFarlane Walker and Dr. K. D. Pringle, who have been my assistants and who are responsible for all entries in the operation register, are still resident, a fact which considerably facilitates reference.

SUMMARY.

Hernia, Inguinal: Radical Cure (Halsted).—Number of operations, 50; total time occupied, 733 minutes; average to each, 14.6 minutes; maximum time 27 minutes, minimum 8. Result: Local sepsis in 1 case, the rest healing normally.

Some twelve years ago I abandoned Halsted's method on account of the frequency of testicular complications; a few years ago I was tempted to try it again, now it is my operation of choice; with improved technique, I find orchitis with subsequent atrophy is eliminated. In this operation I thoroughly expose lower shelf of Poupart, and pass the two lower sutures through Gimbernat's ligament and conjoined tendon; this, in my opinion, is the principal part in the piece.

Hernia, Inguinal: Radical Cure (Bassini).—Number of operations, 21; total time occupied, 332 minutes; average to each,

15.8 minutes; maximum 25, minimum 9. Result: Local sepsis in 1 case, rest normal union.

My only objection to this operation is, that the placing of cord between oblique muscles creates an intermuscular space, which must obviously detract from the solidity of the barrier, as compared with Halsted's method.

Hernia, Inguinal: Radical Cure (Buchannon).—Number of operations, 66; total time occupied, 99 minutes; average to each, 16.5; maximum 21, minimum 10 minutes. Result: Normal union in all cases.

I find this is a useful operation in young children, whose cord structures are thin, and consequently do not occupy much space.

Hernia, Inguinal, Strangulated.—One case; 5 minutes; no attempt at radical cure, gangrenous bowel returned, and gauze drain inserted. Result: Aseptic cure.

Hernia, Femoral: Radical Cure (Bassini).—Number of operations, 2; 22 and 12 minutes respectively. Normal union.

Hernia, Inguinal, and Hydrocele.—One case treated by Halsted's method and excision of the hydrocele sac; time occupied, 19 minutes. Result: Normal union.

Hernia Umbilical, Radical Cure.—One case; 15 minutes. Normal union.

Hernia, Ventral: Radical Cure.—Number of cases, 6; time occupied, 98 minutes; average to each, 16.3; maximum 25 minutes, minimum 6 minutes. Result: Normal union in all cases.

In these operations the sac and all cicatricial tissues were excised, anatomical structures thoroughly differentiated and revived before suture.

Hydrocele: Radical Cure.—Number of cases, 11; time occupied, 88 minutes; average to each, 8; maximum 13 minutes, minimum 5 minutes. Result: Normal union in all cases.

Treated by excision of free portion of the sac, with doubling back of remainder by suture.

Variocoele (Bennett's Operation).—Four cases; 9, 5, 9, and 7 minutes respectively. Result: Normal union in all cases.

Appendicectomy, Non-suppurative.—Number of cases, 39; time occupied, 458 minutes; average to each, 11.7; maximum 18 minutes, minimum 7 minutes. Result: One gangrenous case died from streptococcus poisoning; in the rest normal union occurred.

In each instance the abdomen was opened by vertical incision in semilunar line, and stump of appendix interred in caecal wall by suture.

Appendicectomy, Suppurative, with and without Peritonitis.—Number of cases, 23; time occupied, 410 minutes; average to each, 17.8; maximum 26, minimum 9 minutes. Result: One death, the rest being cured.

Whenever possible, stump was buried in caecal wall; in others, the appendix was cut off flush, and caecal wound closed in ordinary way. Drainage was employed in each case; a few minutes spent in thorough drying of pus cavities is well rewarded by results. In all except one (moribund) the appendix was removed. I operate in every case of appendicitis as soon as I can make the necessary technical arrangements.

Cholecystectomy.—Number of cases, 11; time occupied, 173 minutes. Average to each, 15.7; maximum 28½, minimum 3½ minutes. Result: In the 4 gangrenous and suppurative cases drainage was provided for forty-eight hours; seven healed aseptically, and all were discharged cured by the thirtieth day.

The method which I usually adopt is to thoroughly isolate "field" with sponges and bibules; then the gall bladder is aspirated, incised, mopped dry, edges seized with forceps; these are grasped in palm of left hand, while left index finger is inserted into gall bladder right down to opening of cystic duct. With this guide and grip the cysto-hepatic adhesion is most easily separated, and the tip of index finger at duct opening points the site for application of ligature by my assistant; occasionally an omental graft is utilized for stump. The above use of my left hand considerably facilitates examination of cystic and common ducts for calculi, which is always done before ligature is applied. My only regret in twenty years' operating on the gall bladder is that I have not removed it much more often instead of trusting to cholecystotomy with drainage—a method which, as far as permanent cure is concerned, has proved very ineffective in my hands.

Cholecystotomy (after Enteric Fever).—Number of cases, 1; time occupied, 16 minutes. Result: Convalescing.

Hydatid Tumours (Liver).—Number of operations, 13; time occupied, 171 minutes; average to each, 13; maximum 26, minimum 6 minutes. Result: All cured.

On opening the abdomen the whole operative field is packed round and isolated with sponges, the assistant places his left hand flat below inferior angle of wound, and makes constant firm pressure on the abdominal wall. The cyst is then incised, edges rapidly seized with forceps, cyst pulled outwards, and contents evacuated. When the part is clean and dry the assistant removes his hand, the packing is then removed, and the edges of incised cyst wall sutured to upper angle of parietal wound, a large drainage tube inserted into cyst, and remainder of wound closed by interrupted through-and-through sutures.

When the cyst is situated deeply in substance of liver, the following tactics are adopted. An exploratory needle is introduced *in situ*; when fluid is struck the syringe is detached from needle, the latter remaining as a guide; packing having been performed as before mentioned, the blade of a long scalpel is introduced along needle into cyst, needle then withdrawn. An index finger is at once inserted along knifeblade, and knife

withdrawn. The cyst with intervening portion of liver is then drawn forwards by finger. Two sharp hooks are now introduced alongside of finger, and made to firmly grasp each side of incised cyst wall. With a full curved needle interrupted through-and-through sutures are introduced on each side. These embrace parietal wall, intervening liver substance, and cyst wall. A large drainage tube is inserted, and lower segment of wound closed. Haemorrhage is generally momentarily brisk in these cases, but if a resolute attitude is taken on plan indicated above, it is of no consequence, and always ceases the moment index finger gets control inside cyst. Paradoxical though it may seem, experience has taught me that no instrument causes less haemorrhage in liver or lung than a good sharp knife. All these cases recovered after protracted convalescence; suppuration seems to be an essential natural factor in removal of fibrous capsules. I make it a rule to get these cases out of bed by the tenth day, and insist on their spending their time in the garden.

Hydatid Liver: Rupture into Lung: Transthoracic Hepatotomy.—Number of cases, 1; time occupied, 7 minutes. Result: Cured.

Before the admission of the patient, a young man, the cyst had been discharging itself via the bronchus, large quantities of purulent offensive bilious material being coughed up. Owing to the occurrence of marked septicaemia, with rapid loss of strength, I had to intervene. I endeavoured to locate cyst with long exploring needle (eight punctures), but failed; concluding that the cyst had collapsed, and was obviously situated near superior border of liver, I adopted a plan of campaign which I had devised on a former occasion and found efficacious. Some 3 in. of seventh and eighth ribs were excised in axillary line; edges of pleural incision were rapidly sewn to diaphragm. The latter having been incised, I worked my right index finger along superior border of liver until I came to a dense adhesion between latter and diaphragm. An exploring needle was then inserted into liver substance at this point, and pus withdrawn. Thanks to the harmonious action of needle, knife, and index finger, daylight was promptly admitted into a small suppurating fetid cavity, containing a gangrenous cyst. This was extracted; a large drainage tube was introduced. Within ten days cough and bronchial discharge had ceased; two months later he left hospital cured. Owing to the patient's very exhausted toxic condition rapidity was essential; luckily I seemed to have the wind at my back from start to finish.

Hepatic Abscess: Transthoracic Hepatotomy.—Number of operations, 3; time occupied, 35, 15, and 8 minutes respectively. Two were cured; the other died of septic pneumonia.

Hydatid Lung.—One case; 9 minutes. Cured.

I cannot lay too much stress on the absolute necessity of accurately locating cyst by exploratory punctures before excising rib; the latter must be effected at site where the cyst seems to be most superficial. By attention to this all-important detail life, pleuritis, and operating time can be saved. On excising rib the presenting portion of lung is instantly seized with vulsellum forceps and dragged into wound, which it is made to cork, so that no blood or fluid may subsequently enter pleural cavity. The exploring needle is again inserted into exposed portion of lung, when fluid is withdrawn, syringe is detached, knife passed along needle, needle withdrawn, index finger passed along blade of knife, knife withdrawn, two sharp hooks passed alongside of finger, placed in position, and finger withdrawn. Through-and-through interrupted sutures are then inserted; exposed portion of lung is now allowed to recede to inner level of parietal wound and sutures tied. A short, thick drainage tube is then introduced just into cavity of cyst. In interstitial pulmonary and hepatic hydatids rapidity and resolution are the cardinal factors, to which might be added, so as to avoid drowning (pulmonary cases), never move the patient from the dorsal position during operation; if necessary, sit down and work from below upwards.

Hydatid Omentum (size of Orange): Enucleation.—One case, lasting 8 minutes. Result: Normal union.

Hydatid, Mesentery (two "Hen Egg" Cysts).—One case; enucleation in 12 minutes. Result: Normal union.

Hydatid, Pleura: Excision Rib, Marsupialization.—One case, lasting 9 minutes. Result: Cure.

Hydatid, Gluteus Maximus (Drainage).—One case, lasting 10 minutes. Result: Cure.

Hydatid, Pelvic (Drainage).—One case, lasting 46 minutes. Result: Cure.

The patient had had previous operations elsewhere during the past eight years. On exposing the cyst I found it densely adherent to adjacent coils of bowel. The left broad ligament was also adherent and spread out on its anterior surface. The mass seemed to be welded into and to occupy whole pelvic basin. Considering the antecedent history of recurrence, I went for enucleation, but I had not gone far until I found that I had denuded some 4 in. of ileum of its peritoneum, and as I had gained little or no ground, I abandoned the enucleation theory and excised the denuded portion of ileum, uniting gut by end-to-end anastomosis, opened cyst, cleaned out myriads of daughter cysts; some anatomy seemed now to be coming into sight! Seeing what we took to be an independent small-sized cyst near middle line I incised it; it turned out to be a uterus containing a normal ovum (about one month). I completed this unasked-for Caesarean section, fixed the edges of cyst to lower angle of parietal wound, inserted a large drainage tube. The lady was out of bed on the twenty-first day, the wound being healed and all functions normal.

Partial Obstruction, Ascending Colon, Band, Mesenteric Adenitis: Appendicectomy.—One case, lasting 26 minutes. Result: Normal union.

At site of a large calcareous gland the bowel was found partially occluded by a narrow band of what looked like an old detached strip of omentum. This along with adjacent dense adhesions was removed, the gland enucleated, and appendix extirpated for insurance reasons.

Salpingo-oöphorectomy, Hysteropexy, Appendicectomy.—Number of cases, 10; time occupied, 177 minutes; average to each, 17.7; maximum 34, minimum 11 minutes. Result: Normal union in all cases.

In this series only one tube and ovary were removed in each case; all were non-suppurative. Hysteropexy is employed in these cases to elevate the parts so as to prevent the formation of adhesions with stump in depth of pelvis, and which I have known to cause subsequent fixed retroversion of uterus. *Re appendicectomy:* Some years ago, after a simple salpingo-oöphorectomy on right side, the patient developed symptoms of complete intestinal obstruction on the eleventh day after operation. On opening the abdomen I found the tip of appendix glued to stump, forming a tight band constricting an underlying coil of ileum. Since that lesson the appendix has ceased from troubling.

Bilateral Salpingo-oöphorectomy, Pyosalpinx, Hysteropexy, and Appendicectomy.—Number of cases, 7; time occupied, 185 minutes; average to each 27; maximum 41, minimum 16 minutes. Result: All healed within a month.

Drainage was employed in each instance for at least seven days, and Lister's catgut was exclusively used for ligatures and sutures. Since adopting catgut in these cases of pyosalpinx I find that healing is considerably accelerated. I have had my share of bitter experience awaiting the discharge of what must be infected masses of silk. All the above were healed within a month. In the primary walling off of the peritoneal cavity before these collections are attacked I find nothing so useful as three or four large-sized Turkey sponges, supplemented with bibules to edges of parietal incision. By this means the chances of serious infection are reduced to a minimum; needless to say, the hands must be frequently rinsed in mercurial lotion during the performance.

Combined Operations.—Mrs. D., aged 35, a thin but wiry Irish lady, entered hospital with the following conditions: Endometritis, laceration of cervix, retroversion of womb, with slight prolapse, cystic ovary (right), and a very movable right kidney. I commenced by dilatation (Hegar) and curetting endometrium, excised the hypertrophied lacerated cervix, and performed posterior colporrhaphy. Time occupied, 13 minutes. Then I opened the abdomen, removed the right cystic ovary and appendix, ventrified the uterus, and closed wound. Time occupied, 12 minutes. Next a lumbar incision was made, and the kidney fixed by Lane's method. Time occupied, 8 minutes. Total time absorbed in the three operations, 33 minutes. Total time, including removal and application of bandages and dressings, 42 minutes. No shock followed. Temperature and pulse remained at normal, and the patient left hospital aseptically cured on the thirty-second day.

Ovariectomy and Appendicectomy.—Number of cases, 9, including one of primary ovarian gestation. Time occupied, 138 minutes; average 15.3; maximum 17, minimum 8 minutes. Result: Normal union in all cases.

In over 3,000 abdominal operations I have only met with this one case of undoubted primary ovarian gestation. In this instance the sac (about the size of a walnut), grew from free border of left ovary; the ovary with sac was absolutely non-adherent. The tube appeared perfectly free and normal. On opening sac, a perfect ovum, about one month, with some four teaspoonfuls of clear liquid, was found. Normal union took place, and she left hospital on the twentieth day. Ten months previously I had had to operate urgently on this lady for a ruptured extrauterine gestation of right tube.

Bilateral Ovariectomy and Appendicectomy.—One case, lasting 12 minutes. Result: Normal union.

I follow tradition in employing the term "ovariectomy," as meaning removal of developed cysts, as apart from cystic disease of the ovary.

Hysteropexy.—Number of cases, 9. Time occupied, 134 minutes; maximum 25, minimum 7 minutes. Result: Normal union in all cases.

The method I usually employ is as follows (for cases of prolapse after menopause): A transverse incision is made along line of attachment of vesical peritoneum to uterus (as in hysterectomy); the cervical tissue is exposed by blunt dissector, edges of peritoneum held out of the way by forceps, three catgut (medium size) sutures are passed through resistant cervix, about one-third inch apart, the ends of which are drawn out on each side respectively by Childe's forceps through recti muscles, and then tied; thus the exposed cervical tissue is brought into direct apposition with muscular fibres. The first loop of continuous peritoneal closure suture catches up a fold of uterine peritoneum, in order that no raw surface may be left for intestinal adhesion. The suture is then continued in the ordinary way, and wound closed in layers. The results are excellent.

Myomectomy and Hysteropexy.—Two cases, occupying 24 and 49 minutes respectively, and followed by normal union.

Dilatation and Curetting Uterus, Abdominal Hysteropexy, and Lumbar Nephropexy.—One case, occupying 42 minutes, resulting in normal union.

Hysterectomy, Abdominal (Subtotal Fibroids).—Number of cases, 12; time occupied, 373 minutes; average to each 31 minutes; maximum 60, minimum 15 minutes. Result: All discharged cured by twenty-eighth day.

In each instance the broad ligaments were ligated in two or

three sections (plus a final occlusive ligature) by means of that most handy of instruments, Childe's ligature forceps. In order to keep the game well in hand I suture (continuous) the divided cervical tissue *pari passu* with transverse sectional strokes of the knife; thus by the time the division of fundus from cervix is completed the cervical flaps are practically sutured together. This I find a great help, as it eliminates the tail-wagging dog business of subsequent groping for cervical flaps in the depths of a bloody pelvis. One provided an excellent specimen of "red degeneration." In nine of these cases the appendix was also removed.

Rupture of Ectopic Gestation.—Four cases, which occupied 8, 11, 11, and 13 minutes respectively. Result: All recovered, 3 aseptically.

The condition of the first was so desperate that I had not a moment to make a final inspection to see if all clots were removed. She reacted from the shock, and fourteen days later I had to reopen abdomen and clean out a purulent sanguineous collection from pelvis drainage. She recovered, but died of confluent small-pox nine months later.

In this desperate affection time is everything. I make it a practice, the instant the abdomen is open, irrespective of a "lake of blood," to dash my left hand into pelvis and firmly grip the ruptured tube, which is at once drawn to the surface and removed. Then, if time admits of it, I evacuate blood and clots. In the hurry I confess I forgot drainage in the above case in the first instance. The moral is obvious. Don't forget; when in doubt, drain.

Curetting the Uterus with (Hegar's) Dilatation.—Number of cases, 21; time occupied, 232 minutes; average to each, 11 minutes. One died, a case of hyperemesis, from excessive blood loss at operation. The rest were relieved. I rarely apply chemicals to the endometrium. I always dilate thoroughly and flush out interior with warm oxygen solution.

Faecal Fistula, following Gangrenous Appendicitis and Diffuse Peritonitis.—One case, treated by enterectomy and end-to-end anastomosis; time occupied, 53 minutes. Result: Normal union.

Coeliotomy, Exploratory.—Number of cases, 11; time occupied, 80 minutes; average, 7.3 minutes; maximum 15, minimum 2 minutes. Result: One died (duodenal ulcer, perforation, with advance, diffuse peritonitis); 7 proved inoperable cases of cancer, and 1 afforded an exquisite example of a perfectly symmetrical bicornuate uterus, which was left alone.

Gastro-jejunostomy, Posterior.—Number of cases, 12; time occupied, 379 minutes; average, 31.5; maximum 43, minimum 23. Result: Ten aseptic recoveries, 2 deaths, 1 from previous starvation, the other from cancer.

I rely altogether on the needle and thread for approximation purposes, making liberal use of silk stay sutures as guides and tractors before inserting the outer and inner circular sutures (silk and catgut respectively). I always make a 3 to 4 inch incision in stomach and jejunum, and then purposely halt in order to ligature all spurting vessels. Although I ~~have~~ succeeded (1900) in completing this operation in 18 minutes, a few cases of post-operative haematemesis have slackened the pace, and now I cannot reckon on getting all my sewing in and concluding the job to my satisfaction under 30 minutes.

Nephropexy.—Number of cases, 12; time occupied, 156 minutes; average to each 13; maximum 18, minimum 8 minutes. Result: Eleven healed aseptically; in the remaining case there was some local but unimportant sepsis.

Since 1902, when Mr. Arbuthnot Lane kindly showed me his method, I have used none other.

Nephro-lithotomy.—Two cases, occupying 26 and 9 minutes respectively. Both resulted in cures.

Nephrectomy.—Two cases, occupying 20 and 14 minutes respectively, and both resulting in cures.

Nephrotomy, Exploratory.—Two cases, occupying 11 and 6 minutes respectively. Normal union followed in both cases.

Vesical Calculus.—One case, treated by dilatation; time occupied, 5 minutes. Result: Cure. The patient was a woman.

Urethrotomy, External, and Vesical Drainage.—Number of cases, 5; time occupied, 32 minutes; maximum 12, minimum 3 minutes. Result: Two died from ante-operative uraemia; the other 3 were relieved.

Perineorrhaphy (Lawson Tait).—Two cases, occupying 12 and 11 minutes respectively, and ending in normal union.

Prostatic Abscess: Prostatotomy.—Number of cases, 5; average time occupied, 7 minutes. Result: All cured. Vesical drainage was employed.

Prostatectomy, Suprapubic.—Number of cases, 6; time occupied, 40 minutes; average to each, 6 minutes; maximum 12 (2 cases), minimum 2 (2 cases). Result: All cured.

One of the cases which took two minutes occurred in June, 1912, that is, a few weeks after the date mentioned at the beginning of this paper, but is included as of special interest. The patient was aged 67, and the growth the size of an orange. There was very little haemorrhage and no shock.

Prostatectomy, Perineal.—One case; 17 minutes. The patient had two previous operations in England for subacute abscess. I removed the affected lobe by crescentic incision. He was cured.

Haemorrhoids (Whitehead Modified).—Number of cases, 47; time occupied, 358 minutes; average to each, 7.6; maximum (1 case) 15 minutes, minimum (6 cases) 5 minutes. Result: All were discharged cured by twelfth day.

Pruritus Ani (Ball).—Two cases, occupying 8 and 9 minutes respectively, and resulting in distinct relief.

Empyema (Excision of Rib and Drainage).—Number of cases, 6; time occupied, 44 minutes; maximum 9, minimum 5. Result: One died; the rest recovered.

Breast Cancer (Halssted).—Number of operations, 6; time occupied, 200 minutes; average 33 minutes; maximum 43, minimum 24. Result: Normal union in all cases.

Breast Amputation (Chronic Interstitial Mastitis).—Three cases, occupying 12, 13, and 14 minutes respectively, and all resulting in normal union.

Adenitis, Tuberculous Cervical.—Two cases, occupying 24 and 26 minutes respectively, and each resulting in normal union.

In each the incision extended from mastoid to clavicle, with extensive dissection from and exposure of carotid artery and internal jugular vein.

Thyroid Cyst: Excision.—Three cases, occupying 15, 24, and 7 minutes respectively, and all resulting in normal union.

Otitis Media (Stacke).—One case, lasting 14 minutes. Relieved.

Laminectomy (for Fractured Spine).—One case, lasting 41 minutes. Normal union followed, but the patient was unrelieved, and died three weeks later.

Epiploexy, Talma-Morison (Cirrhosis Liver).—One case, occupying 16 minutes. The patient was not relieved.

Peritonitis, Tuberculous (Incision).—One case, occupying 10 minutes, and ending in cure.

Varicose Veins.—Number of cases, 9; total time occupied, 212 minutes; average 23. Result: Seven healed normally; in 2 some infection occurred in the eczematous zones.

I commence with a Trendelenburg, and when feasible remove affected vein or veins by one long incision.

Elephantiasis, Scalp.—One case of excision lasting 52 minutes.

This was the most hideous deformity I have ever seen on the human skull—a huge, overhanging, brawny, scaly mass, which had at its base an area extending from occiput along superior longitudinal line to and involving right eyelid (complete closure of lids), passing down to zygoma along upper margin of ear back to occiput. The patient (26 years of age) stated that he had had "a lump on his head ever since he could remember," and that it had gradually increased in size. Before coming to the Argentine he consulted surgeons in Manchester, who declined to operate. As the repugnant aspect of this weird kind of "dewlap" prevented his getting work, he begged me to operate. Having explained to him the danger of the procedure, at his request, I went for it; my lines of incision more or less corresponded to above area; the whole intervening scalp with mass was excised. At times the haemorrhage was terrific, but, ably backed by my assistant Dr. Walker, we stemmed the torrent, got him off the table alive, and treated him liberally to saline infusion, etc. A month later I had to do a plastic operation to restore normal position of right eyelid, and afterwards Dr. Walker grafted the granulating scalp with success. He is now, with the help of a wig, a very contented and presentable person. Not a trace of recurrence in twelve months. At page 799 in *Anomalies and Curiosities of Medicine*, by Gould and Pyle, is a figure similar to above case. The latter, however, was more extensive in that it involved right forehead and closed eye.

Branchial Sinus (Atheromatous Cyst, Third Cleft).—One case, occupied 20 minutes, in a girl 14 years of age. A hard, thickened, cord-like mass 2 to 3 in. in length, passing upwards and inwards from anterior border of sterno-mastoid to level of hyoid bone, where it formed a kind of bulb about the size of a grape. The parents' attention was drawn to the trouble by a line of inflammation of skin, which had recently gradually increased in intensity. A corresponding incision was made; a hard calcareous-like tube was exposed. At first its dissection appeared comparatively easy, but on reaching the terminal "cystic" portion I experienced a very bad ten minutes. The mass appeared firmly wedged to the internal jugular vein, carotid artery, and structures about greater corner of hyoid. However I succeeded in extirpating it in mass, escaping with one slight puncture of jugular vein, which, by the way, was anything but easy to repair. Normal union followed. She was discharged on the sixteenth day. Fig. 165 in Keen's *System of Surgery*, vol. iii, page 285, is a facsimile of the tube removed in this case, except in my case there was a cystic kind of bulb at its inner termination.

Fracture, Patella.—Suture, strong catgut; open method; 2 cases, occupying 30 and 12 minutes respectively, and each ending in aseptic cure.

Fracture, Ununited, Femur (Sutured by Wire).—Two cases, occupying 34 and 57 minutes respectively. One united aseptically, the other became septic, and failed to unite.

It should be mentioned that this case had three months' previous treatment with splint and extension; at operation there was not a trace of callus to be seen. Later on, when parts became aseptic, two more attempts were made, free drainage was provided, and, in spite of there being no further infection, callus was conspicuous by its absence; eventually (three months later) amputation was performed at the patient's request; normal union.

Fracture, Humerus, Compound.—Suture, strong catgut. One case, occupying 8 minutes, and resulting in normal union.

Fracture, Inferior Maxilla (Suture around Teeth).—One case, occupying 16 minutes, and ending in cure.

Fracture, Tibia (Ununited).—Number of cases, 5; time occupied, 120 minutes; average, 24 minutes. Result: Normal union.

In all strong catgut sutures were employed.

Fracture, Clavicle, Ununited (Suture Strong Catgut).—One case, occupying 16 minutes, and resulting in normal union.

Dislocation, Anterior Head of Radius (Three Weeks' Duration).—Impossible to reduce, even when parts were exposed by

incision. The head was excised. Time occupied, 30 minutes. Normal union followed, and the result is hopeful. The case underwent operation only recently.

Dislocation, Elbow, Backwards (Six Weeks' Duration).—One case; open reduction, occupying 57 minutes. An extremely difficult procedure, ending in normal union. The movements three months later were almost normal.

Ankylosis, Hip (Gonorrhoeal Arthritis; Faulty Position of Limb).—Osteotomy through neck of femur; one case, occupying 32 minutes. Aseptic healing in good position.

Amputation at Hip-joint.—Two cases, occupying 15 and 18 minutes respectively, and resulting in normal union.

Excision, Hip.—Tuberculous disease. One case, occupying 25 minutes. Probable cure.

Excision, Wrist.—Tuberculous disease. One case, occupying 22 minutes. Result: Very hopeful.

Excision, Superior Maxilla.—Necrosis, profound septicaemia before operation. One case, occupying 10 minutes. Died.

Excision, Ankle-joint.—Two cases, one tuberculous and one necrosis (traumatic), both recent. Each occupied 16 minutes. Result: One looks most hopeful, the other doubtful.

Bullet in Head of Humerus.—One case, 22 minutes, helped by an excellent x-ray photograph by my colleague Dr. Pennington. I made a long vertical incision through deltoid muscle, opened joint, dislocated head forwards and outwards, extracted bullet from its apparently comfortable bed in cancellous tissue of head, reduced dislocation; interrupted sutures, leaving room for free drainage. Aseptic healing ensued. He left hospital with fair movement. A few months later my friend Dr. Taylor of Dublin broke down some adhesions under CHCl₃; movement is now normal.

Acute Epiphysitis, Left Tibia (Lower); Pyaemia.—One case, in a boy aged 13, and ending in cure.

This was indeed a desperate affair. I chiselled open the greater portion of tibia and cleared out a medulla full of purulent material. As the left shoulder was distended, I performed arthrotomy, removing some 6 oz. of pus. Four days later the left ankle-joint became suddenly swollen; immediate arthrotomy and drainage. A fortnight later, shoulder again became distended; arthrotomy, removal of pus and some necrosed bone. A month later the left hip-joint became similarly involved; immediate incision and evacuation of some 12 oz. of pus. Recovery ensued. Immediately after first operation he was placed permanently in an open, sunny corridor. A pint of "Pol Roger" was daily administered for weeks with the greatest benefit. When the tibial wound had cicatrized he was sent to the seaside for a month. Cured.

Semilunar Cartilage, Right Knee: Excision.—One case, occupying 25 minutes, and giving a normal result.

Arthrotomy, Knee-joint: Haemarthrosis (Gonorrhoeal and Infective Arthritis).—Number of cases, 20; time occupied 102 minutes; average to each, 5 minutes. Result: All healed aseptically and were discharged cured by thirtieth day.

In each instance drainage was provided for at least forty-eight hours. I always make an incision through each side of distended capsule, insert a large through-and-through drainage tube, and flush out joint twice daily with warm oxygen lotion. Arthrotomy without drainage in infective cases is, to my mind, senseless.

Multiple Arthrotomy.—Total time occupied, 14 minutes. The patient, a man aged 38, was admitted to hospital suffering from what was apparently rheumatic fever. Temperature varying from 100° to 102°; tongue coated, both knees and ankles swollen and painful, and metacarpo-phalangeal (middle finger) also swollen and tender. He was treated as usual with 30-grain doses of sodium salicylate, guarded with drachm doses of sodium bicarbonate every three hours. As no improvement took place with seven days' treatment, on April 9th I opened both knees and ankles by bilateral incisions, evacuated a large quantity of turbid flaky serum from the knees, and a small quantity of same from each ankle. I inserted through-and-through tubes in the four joints, and washed out twice daily for three days with oxygen lotion. I should have stated I also incised metacarpo-phalangeal joint at same time as others. The drainage tubes were removed on the fourth morning. Normal healing ensued. Temperature gradually became normal; no more pains followed. He was allowed out of bed on April 20th (eleventh day), and he walked out of hospital cured on April 29th. I have operated on many such cases, but I have never before met with such a rapid convalescence.

The system employed in timing operations is as follows: The charge theatre nurse writes down the time by the clock the moment knife enters skin, and when final skin suture is tied calls out the time occupied. This is immediately written down by her on the operation slate, under the supervision of the resident medical officer, who later on in the day fills in all details in the operation register.

In conclusion, we have found that the employment of ether by the open method has so materially diminished the percentage of cases of shock that it is no exaggeration to state that I do not have one such case a month.

In serious cases of ante-operative toxæmia we have found the placing of the patients permanently out of doors, immediately after operation, to be of immense service, and during the early convalescent stage in such cases we have experimented purposely, and have proved over and over again that there is no drug, or anything else, equal to the

daily administration of a pint of the best dry champagne for a week. In connexion with this matter, it is only just to state that the committee of the hospital have never once questioned such expenditure.

I should be sorry to conclude this paper without recognizing the services of my staff. We all formed a machine, each part of which was indispensable to the whole. I often wish I could have the chance of similarly burying my individuality when operating in houses and homes. And in order to show the confidence I have had in my assistants, Drs. Walker and Pringle, I need only state that accident and emergency operations are their perquisite.

THE PRODUCTION OF GENERAL SYMPTOMS IN HAEMOGLOBINAEMIA.

BY

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AND

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IN the course of a previous investigation upon the effect of intravenous injection of laked red cells,¹ the conclusion was reached that the effective agent in causing an alteration of the general condition of the animal injected was represented by the red cell stromata, and not by the haemoglobin given up by the red cells when laked. As these observations appeared likely to throw some light upon the origin and nature of the general symptoms attending haemoglobinaemia due to the destruction of red blood cells, such as occurs naturally in paroxysmal haemoglobinuria and in blackwater fever, it was determined to repeat on a more extended scale some of the observations already made.

To this end the series of experiments recorded in Table I was made. These experiments fall into three groups. In the experiments of the first group the red cells of rabbit's blood, after twice washing with 0.85 per cent. sodium chloride solution, were laked by the addition of an equal volume of distilled water, solid sodium chloride being added at the end of five to ten minutes in amount equal to 0.85 per cent. of the distilled water employed. A portion of the liquid so obtained was injected intravenously into rabbits. The rest of the liquid was centrifugalized, and thereby separated into a clear supernatant fluid, ruby red in colour, containing haemoglobin, and a viscid jelly-like sediment of stromata. The supernatant fluid was pipetted off and used for intravenous injection of a second group of rabbits; the sediment was mixed with an equal volume of 0.85 per cent. solution of sodium chloride, and the stromata were then distributed uniformly in the liquid by stirring with a glass rod, the liquid so obtained being employed for intravenous injection of a third group of rabbits. In all experiments the injection was made slowly, 3 c.cm. of fluid a minute being delivered into the vein of the ear.

It will thus be seen that three liquids were used for injection. The first contained dissolved haemoglobin together with suspended red cell stromata; the second contained dissolved haemoglobin in approximately the same concentration as the first but was free from stromata; the third contained both stromata and dissolved haemoglobin, the amount of the former being the same as in an equal volume of the first liquid, while the concentration of dissolved haemoglobin was approximately half that present in the first liquid. In the tables the haemoglobin and stromata respectively are expressed in terms of the volume of red cells required to furnish the amounts injected, and, for convenience of comparison of the experiments one with another, these quantities are given per kilogram of body weight of the animal used for injection.

Comparing the three groups in Table I, it is seen that in those experiments in which red cell stromata were injected (the first and the third groups) death or severe symptoms usually followed injection, the amount of stromata employed per kilogram of body weight of the rabbits being represented by amounts of red cells ranging from 4 c.cm. to 20 c.cm. In experiments 4 and 21, in which the amounts of stromata per kilogram of body weight were represented by 12 c.cm. and 5 c.cm. respectively, no ill effect followed injection. The amount injected

TABLE I.—*Intravenous Injection of Laked Red Blood Cells, Dissolved Haemoglobin, and Red Cell Stromata. First Series.*

No. of Experiment.	Weight of Rabbit in Grams.	Haemoglobin injected per Kilogram of Body Weight (in Terms of Red Cells).	Stromata injected per Kilogram of Body Weight (in Terms of Red Cells).	Result.
1	370	20 c.cm.	20 c.cm.	Died six minutes after injection.
2	746	15 "	15 "	Died three and a half hours after injection.
3	373	15 "	15 "	Convulsive attack one and a half hours after injection, followed by recovery.
4	485	12 "	12 "	No marked ill effect followed injection.
5	340	4 "	4 "	Died at end of injection.
6	240	30 c.cm.	Removed by centrifugalization	Not markedly affected by injection.
7	400	30 "	"	Slight lassitude after injection.
8	342	24 "	"	No marked ill effect followed injection.
9	455	20 "	"	Collapse after injection followed by recovery and subsequent relapse. Killed four hours after injection.
10	260	20 "	"	Died at end of injection.
11	400	12.5 "	"	No marked ill effect after injection.
12	300	12.5 "	"	No marked ill effect after injection.
13	260	9.0 "	"	Collapse after injection followed by recovery.
14	370	7 c.cm.	14 c.cm.	Died one minute after injection.
15	556	5 "	10 "	Died one and three-quarter hours after injection.
16	612	5 "	10 "	Died five and a half hours after injection.
17	712	5 "	10 "	Died two and a half hours after injection.
18	330	3.5 "	7 "	Died three hours after injection.
19	520	2.5 "	5 "	Paresis of hind legs after injection followed by recovery.
20	550	2.5 "	5 "	Died one and three-quarter hours after injection.
21	580	2.5 "	5 "	No marked ill effect followed injection.

NOTE.—In experiments 1 to 5 the material injected was laked blood cells; in experiments 6 to 13 haemoglobin solution; and in experiments 14 to 21 red cell stromata (sediment after centrifugalization).

in the latter experiment is in the neighbourhood of the lethal dose, but in the former experiment there is encountered an individual variation in susceptibility to injection which is from time to time met with in rabbits, and is further illustrated in the second group in the same table (Experiments 6 to 13), and also in Table II.

When the solution of haemoglobin free from stromata, prepared as described above, was injected in amount represented by 30 c.cm. to 9 c.cm. of red cells per kilogram of body weight, it was observed that in most experiments no obvious ill effect followed injection. Two animals, however, became collapsed after injection (20 c.cm. and 9 c.cm. respectively per kilogram of body weight), and one died at the end of injection (20 c.cm. per kilogram of body weight). These experiments, which indicate the different degrees of susceptibility exhibited by individual rabbits, illustrate, when taken in conjunction with the preceding and succeeding series, the relatively slight ill effect ordinarily following injection of even large quantities of haemoglobin compared with the lethal character of small amounts of stromata. The experiments further suggest that when symptoms make their appearance after injection of large quantities of solution of haemoglobin, freed as far as possible from stromata by long continued centrifugalization, the ultimate source of the symptoms is perhaps to be found not in the haemoglobin, but in some stromata still remaining in the fluid injected.

A second series of experiments of the same type are recorded in Table II. It will be seen that although some variations are met with in individual experiments (for example, Experiments 3 and 11), nevertheless, on the