layer of rubbish smouldering night and day till the whole process is completed and then cover it over with at least a foot of earth. The heat will destroy all eggs and maggots and also keep the flies off the mass.

As regards the methods of disposal of carcases, urine, kitchen and ablution sullage now in use no observations are offered as they are satisfactory.

THE DIAGNOSIS OF TRAUMATIC HÆMATURIA AND REPORTS OF CASES.

By Major H. S. SHUCKSMITH, F.R.C.S.,
Royal Army Medical Corps.

Traumatic hæmaturia can present difficult problems in clinical diagnosis. Textbook descriptions of damage to individual components of the urinary system give a multiplicity of signs and symptoms and often an involved classification of the types of damage which may occur, yet out of this wealth of detail it may be difficult to carry a clear picture in mind when confronted with a given case. It is essential to have as simple a classification of traumatic lesions as is consistent with an adequate guide to treatment and to remember the salient clinical features which allow the diagnosis to be established.

The hazards of war present patients with multiple injuries either in multiple bomb splinter wounds or in non-penetrating wounds due to falls of masonry. It cannot be repeated too often that all wounds of the abdomen, buttocks and thighs may involve the bladder and that this viscus is commonly injured in fractures of the pelvis but frequently in cases injured by falls of masonry, even when the pelvis is fractured, the hæmaturia may be the result not of a ruptured bladder but of damage to a kidney.

It is obvious that in operative procedures a well-founded diagnosis is essential when the incision may for example involve exploration from the loin or alternatively laparotomy, but a precise diagnosis is of practical importance also in cases which do not require operation. A ruptured kidney may in months or years become hydronephrotic and its diagnosis at the time of injury may be important for subsequent Medical Boards.

It is not intended to give a recapitulation of the classical descriptions of injuries to individual organs but to present the practical pathological and clinical features which are of paramount importance in diagnosis and treatment.

Ruptures of the Penile Urethra.

The classification for practical purposes into complete and incomplete is sufficient. In complete rupture there is blood running from the external urethral meatus, retention of urine, and the central perineal swelling may be relatively large; in incomplete ruptures there is only a spot of blood on the end of the meatus, the patient can pass urine and the perineal swelling is

absent or very small. Clifford Morson considers that much less damage is caused by asking the patient to void urine than by attempting to pass a catheter and this teaching should be followed.

The treatment may be succinctly outlined. The incomplete case should be left alone whilst, for the complete rupture, suprapubic cystotomy should be immediately performed and, if circumstances allow, the rupture repaired with or without the use of a catheter as an internal splint. If evacuation is necessary this repair can be done later.

Rupture of the Prostatic Urethra.

The precise diagnosis depends upon the development of a distended bladder displaced upwards towards the umbilicus. The vesical sphincter remains tonically contracted and after some hours when the secretion of urine is maintained the bladder distends. There is a pyriform central abdominal swelling, dull on percussion, and commonly dullness to the left iliac fossa, in a patient who cannot pass urine and from whom catheterization withdraws only pure blood.

Rupture of the Bladder.

The difficulty in forming a clear picture of the signs in rupture of this organ which may, of course, be extra- or intraperitoneal seems to revolve around the question of whether a ruptured bladder can hold any urine. It would seem most unlikely that more than 1 to 2 ounces of urine can be kept in a ruptured bladder if, indeed, as much as this, and a working rule can be applied that if a patient can hold more than this quantity of urine, blood stained or not, then the viscus is watertight.

Beyond the inability to hold urine, and the small quantity of blood-stained urine which catheterization may produce, there may be very few physical signs for some hours and the general condition of the patient may be well maintained. Later, however, in the case of the extraperitoneal rupture, there is diffuse suprapubic tenderness and swelling and, in the intraperitoneal rupture, generalized abdominal rigidity and other features of peritonism.

Rupture of the Kidney.

Blood-stained urine in quantity greater than 1 to 2 ounces voided by the patient or obtained on catheterization must mean a damaged kidney which may commonly be confirmed by local physical signs around the kidney. Complete rupture of the renal vessels presents the picture of internal hæmorrhage and the diagnosis of the site will depend on local physical signs. Clot retention may complicate the picture in severe ruptures of the kidney but the recognition of clot and the distensibility of the bladder will furnish a guide.

Rupture of the Ureter.

This can only be diagnosed at operation and on the development of fistula.

Diagnosis.

The history of the injury, position of the patient, site and direction of the violence and of wounds are of obvious significance. Penetrating or perforating wounds of any part of the abdomen, back, buttocks or thigh demand investigation of the urinary track. The presence of bruising over the loin, symphysis, or in the central or lateral clefts of the perineum, and blood at the end of the external urinary meatus, will be checked. Signs of a fractured pelvis may be elicited and particularly helpful in this connexion is tenderness along the inferior ischio-pubic ramus.

The patient may be unable to pass urine not only on account of mechanical reasons but also from the presence of shock or spasm from local painful wounds. Catheterization is therefore carried out in all cases which cannot micturate except where blood is streaming from the urethra.

The essential features in the differential diagnosis may be outlined as follows:—

(1) Profuse urethral bleeding: complete rupture of the urethra which is confirmed by retention of urine and central perineal swelling and tenderness. Catheterization is not tried as it is detrimental to the local lesion.

(2) Patient can void urine: (*a*) incomplete rupture of the urethra is established by the presence of a spot of blood on the external urethral meatus; (*b*) blood-stained urine in quantities greater than 1 to 2 ounces means a ruptured kidney.

(3) Retention of urine, no urethral bleeding, and catheterization reveals blood only: (*a*) ruptured prostatic urethra is shown by a pyriform suprapubic swelling which is dull on percussion and the dullness may extend to the left iliac fossa; (*b*) intraperitoneal rupture of the bladder results in abdominal rigidity after the establishment of peritonism which on occasions takes some hours to develop; (*c*) extraperitoneal rupture of the bladder shows suprapubic tenderness and swelling after some hours; the general condition is good.

Case Reports.

(1) *Simple Rupture of the Kidney: Fractured Pelvis.*

A Lieutenant-Colonel aged 44 was pinioned in a doorway by falling masonry for four hours. He was admitted showing little measurable indices of shock, the pulse being 95 and the systolic blood-pressure 135 mm. of mercury. There was tenderness over the left inferior ischio-pubic ramus due to a fracture of the lower margin of the obturator foramen revealed on radiography. He passed 10 ounces of blood-stained urine which was considered to have arisen from a partial rupture of the right kidney as there was a large abrasion over this region caused by a block of stone. The urine was free of blood in thirty-six hours.

This diagnosis of ruptured kidney may well be of importance later should hydronephrosis develop in this kidney. It was not considered that the information to be gained on intravenous pyelography justified the use of materials to assess the degree of damage to the kidney.

(2) *Simple Rupture of the Kidney: Fractured Pelvis.*

A Javanese Merchant Seaman aged 30 suffered extensive bruising over the left flank and hip when his ship was torpedoed. He had hæmaturia which lasted for four days and a fracture of the ischio-pubic component of the left obturator foramen. There was evidence of a left perinephric hæmatoma. His convalescence was uninterrupted after aspiration of a large subcutaneous hæmatoma in the left flank.

(3) *Bomb Splinter Wound Kidney. Penetrating Wound of Chest.*

A Bombadier R.M.A. aged 19 sustained a B.S.W. over the right upper part of the loin. His general condition was good, pulse 100, systolic B.P. 125 mm. of mercury. There was a small entrance wound over the lower ribs 4 inches from the spine. The abdomen was slightly resistant and the urine contained blood. The apex beat was displaced 1 inch to the left of the middle line, there was no dullness on percussion of the chest and air entry was good. An X-ray showed a metallic foreign body in the region of the 10th right dorsal transverse process.

Transfusion was started, the entrance wound excised and the right kidney explored: extensive bleeding from the upper pole could not be controlled by sutures over fascia so nephrectomy was done, the peritoneum was opened and the abdominal cavity explored with negative findings. The track of the wound was through the diaphragm into the chest. The hole in the diaphragm was closed by a couple of sutures around the adjacent rib. The wound was closed with rubber drainage. A thoracotomy was performed by resection of 3 inches of the 7th rib in the mid-axillary line and a little blood mopped out. The chest wall was closed with valve drainage.

The post-operative course was extremely severe. The respirations were 50 per minute for several days.

X-ray examination revealed extensive collapse of the left lower lobe of the lung and patchy pneumonia of the whole of the right lobes which were fully expanded. The drainage tube was removed. Oxygen through a B.L.B. mask gave remarkable benefit to the patient.

Looking back on this case the thoracotomy was rank interference and nothing else.

He gradually recovered although after two months the collapsed lobe had not fully expanded. It was debated whether he should be boarded for discharge from the Army but somehow he managed to settle that himself. Instead of appearing for re-examination inquiries elicited that he had returned to his gun.

(4) *G.S.W. Thigh: Penetrating Wound of Bladder.*

A Dutch boy aged 15 had been machine gunned from the air thirty-six hours previous to admission to hospital. His general condition was good, there was an entrance wound in the right Scarpa's triangle, he could not pass urine and showed suprapubic tenderness and slight swelling. Suprapubic cystotomy was performed, pieces of metal removed from the bladder and the entrance wound in the thigh enlarged. He had to be evacuated to a local hospital a few hours after the operation.

(5) *Rupture of the Prostatic Urethra: Extra- and Intraperitoneal Rupture of the Bladder, Fracture Dislocation of the Pelvis.*

R.A.F. Corporal aged 21 was buried by falling masonry. He was admitted within the hour, his general condition was good, the pulse being

80 and systolic B.P. 135 mm. of mercury. The abdomen was rigid, lateral pressure on the pelvis elicited free movement and catheterization revealed pure blood. 1,000 c.c. of Stored Group IV blood were given and laparotomy performed. The intestines were undamaged, there was an intraperitoneal rupture of the fundus of the bladder which was sutured from the peritoneal aspect and the peritoneum closed; an extraperitoneal rupture near the left ureteric orifice was sutured with non-chromic catgut from inside the bladder and the dislocated prostatic urethra was rail-roaded on a catheter and the surfaces of the ruptured urethra apposed. The lateral vesical space was drained and a large tube left in the bladder and the catheter splint was anchored to the suprapubic wound.

The urethral catheter was left in site for ten days and then removed. He passed urine on the fourteenth day and the bladder healed within a month. The treatment of the fracture dislocation of the pelvis necessitated eight weeks' recumbency, basal pneumonia complicated convalescence and the urine was heavily infected with *B. coli* and contained pus. Constant efforts to maintain an adequate fluid intake, to produce an acid urine and to sterilize the urine, failed. Multiple recumbency calculi developed which had to be removed at two operations. A right pyelolithotomy and suprapubic lithotomy were withstood and fourteen days later left pyelolithotomy was performed. A further stone was present in the left side at the region of the pelvic brim and as the kidney showed some evidence of hydronephrosis a nephrostomy was performed. This wound soon healed and he was well enough to be repatriated.

SUMMARY.

The diagnosis of traumatic hæmaturia is discussed in an attempt to present a simple system for diagnosis.

Cases of rupture of the kidney, simple and compound, ruptures of the bladder and prostatic urethra are described.

My thanks are due to Colonel F. Whalley, *D.S.O.*, *T.D.*, K.H.P., who commanded the hospital in which the patients were treated, and to Colonel A. S. Heale, *M.C.*, D.D.M.S. of the Command abroad, for permission to submit this article for publication.

ADAPTING THE FIELD BOYLE'S ANÆSTHETIC APPARATUS FOR CARBON DIOXIDE ABSORPTION.

BY MAJOR REX BINNING,

Royal Army Medical Corps.

THERE are many advantages that may be claimed for the principle of carbon dioxide absorption during anæsthesia, such as economy of anæsthetic gases, prevention of heat and water vapour loss from the patient and quiet respirations during anæsthesia. In wartime, when the value of shipping space has to be measured, not in terms of money but of men's lives and available tonnage, the question of economy is pre-eminent.

If the apparatus, Boyle, Field Service pattern, be used with the normal