

for the desired distance (usually about 1.5 cm.). To accomplish this no incision or dilatation with instruments was needed. The mucous membrane of the bladder was incised downward for a distance of about 1 cm. from the hole made by the artificial entrance of the ureter. The corresponding portion of the ureter within the bladder was next placed in the defect created by the incision of the mucous membrane which was then sutured over the ureter. This left about 1 cm. of the ureter lying between the muscle and the mucous membrane. Subsequently the ureter projecting into the bladder cavity was cut squarely across just proximal to the silk ligature, and usually the end was split into 2 equal parts, each of which was turned back and sutured to the mucosa of the bladder. In some instances, a portion of the end was incised in an oblique manner and the most distal point was sutured to the bladder mucosa. Cat-gut sutures were employed inside the bladder as non-absorbable sutures caused the collection of urinary salts.

The operated dogs were observed for varying periods of time. Urograms, autopsies, and histological studies were made.

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Postoperative Behavior of the Diaphragm and Ribs in Dogs.

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For a few days after upper abdominal operations in man the thoracic parietes are characteristically altered. Both the diaphragm and the ribs are markedly elevated, so that the space occupied by the lungs is shorter and broader; also, the diaphragmatic and costal movements are much reduced. The cause of this has been assigned to several factors: tight surgical dressings about the abdomen, reflex spasm of the abdominal and intercostal muscles, reflex inhibition of the diaphragm, gastro-intestinal distention, and pneumoperitoneum. Clinical studies^{1, 2, 3} have furnished very suggestive evidence, but opinions are still conflicting as to the chief cause. We felt that, if laboratory animals also present these postoperative changes, they would be better adapted than man to the study of the

¹ Muller, G., Overholt, R., and Pendergrass, E., *Arch. Surg.*, 1929, **19**, 1322.

² Potey, D., *Brit. J. Surg.*, 1930, **17**, 487.

³ Jung, T., and Van Allen, C., ready for publication.

causes and principles involved. Therefore, standard upper abdominal operations were performed on a series of dogs, with the essential surgical circumstances the same as those used in man (except, of course, the confinement in bed), and the diaphragm and ribs were examined. Other series of dogs were used as controls.

Five dogs (Group I) were employed as follows: All were fed as usual on the morning of the first day. Six hours later, morphine and atropine were given by hypodermic, and 1 hour after that a perfectly symmetrical anteroposterior roentgenogram of the chest was made, the x-rays being centered over a point 10 cm. cephalad to the xiphoid, by a specially devised method. The exposure was made at the expiratory phase of quiet breathing (as the most comparable phase in these animals whose respiration cannot always be regularized as to the depth of inspiration). Fluoroscopy was then done to determine the range of motion of the diaphragm and ribs with deepest breathing, produced by putting on a mask and cutting down the airway to a point barely compatible with the ability of the dog to maintain adequate pulmonary ventilation. One hour later the animal was etherized and operated upon with aseptic surgical technique. A long right rectus incision was made and one of 3 visceral operations was done: gastrotomy (2 dogs), partial gastrectomy (2 dogs), and cholecystectomy (1 dog). The incision was then sutured, *without* care to avoid leaving air in the peritoneal cavity, and a firm bandage was applied to the abdomen. Twenty-four hours after the operation a small dose of morphine was given, and 1 hour later the bandage was removed and the roentgenographic examination was repeated. Food was withheld until after that.

A second group of 5 dogs received exactly the same treatment except that the visceral trauma was omitted. The wound was as long, was traumatized as much, and was kept open as long, as in the first group. A third set received the same treatment, with the omission of the visceral trauma and the incision; and a fourth had the same treatment, with the omission of the visceral trauma, incision and etherization.

The pre- and postoperative x-ray films of each animal were compared as follows: A point was placed at the center of the upper margin of the body of the first thoracic vertebra, another in the mid-line on the profile of the diaphragm, and two more on the profile of the diaphragm on both sides of, and 4 cm. away from, the second point. The distance between the first point and each of the 3 others was measured, and the average was taken, to represent the position of the diaphragm in that roentgenogram. The value ob-

TABLE I.
Changes in position of the diaphragm and ribs after the various procedures.

Group	Procedure	Av. rise of diaphragm	Av. narrowing of chest
		mm.	mm.
I	Visceral operation	1	17
II	Incision	0	7
III	Anesthesia	-1	6
IV	Morphine	-1	1

tained from the postoperative film was subtracted from that obtained from the preoperative film, and this figure (plus or minus) was used to represent the amount of elevation of the diaphragm after operation. Finally, the greatest distance between the inner surfaces of the seventh ribs, as shown in the film, was measured; and the postoperative value was subtracted from the preoperative value, to obtain a figure which would represent the amount of narrowing of the lower part of the chest after operation.

In none of the dogs did the diaphragm show distinct or consistent alterations after the experimental procedures. It was a little depressed in some instances and a little elevated in others, so that the average for each group was extremely close to zero (Table I). However, the spread of the ribs was consistently and markedly reduced after the operation in the dogs of Group I, consistently (almost) and slightly reduced in those of Groups II and III, and without consistent or marked change in those of Group IV; so that the average of the first group was 1.7 cm., that for the second and third groups was 0.7 and 0.6 cm. respectively, and that for the fourth group was 0.1 cm. The fluoroscopic results could not be reduced to figures so precisely, but they showed no appreciable change in the ranges of motion of either the ribs or the diaphragm after operation. Since the diaphragm was unaltered as to either the expiratory position or the maximal range of motion, it was concluded that the inspiratory position also was unaltered.

Therefore, the dogs showed only one consistent respiratory abnormality after operation, *i. e.*, narrowing of the chest, which is apparently caused partly by the visceral trauma and partly by the anesthesia. The abdominal incision evidently played no part, since the third group showed just as much narrowing as the second. The removal of the abdominal bandage before making the postoperative examinations was not responsible for the negative results, for we have found from other experiments⁴ that the bandage has to be

⁴ Van Allen, C., and Jung, T., *J. Thoracic Surg.*, 1931, 1, 3.

applied very much more tightly than is done ordinarily to retain dressings, in order to affect the action or position of the diaphragm. Since the abnormality seen in these dogs is quite different from those in man, we shall not study its mechanism further.

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Serological Evidence on the European Type of Typhus Fever in China.

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Fletcher and Lesslar¹ described what they called tropical typhus from the Federated Malay States. By using several strains of *B. proteus* X for the Weil-Felix test they showed that, though clinically the same, urban cases gave a positive agglutination with the X₁₉ (Warsaw) strain while those from rural districts gave positive tests only with the Kingsbury strain. Spencer and Maxcy² using the variants of X₁₉, X₂, and X_K (Kingsbury) found that the sera of patients with endemic typhus invariably agglutinated to a high titre the X₁₉ strain, but possessed no appreciable group agglutinins for other strains. With Rocky Mountain spotted fever, however, X₁₉ organisms were agglutinated significantly only in a minority of cases and to a lower titre than in endemic typhus; moreover, agglutinins for X₂ and X_K were also found in a considerable proportion of these cases. Felix and Rhodes³ have recently studied more extensively the sera of patients with typhus and typhus-like diseases from various parts of the world and confirmed the above findings. There seems no doubt that some endemic diseases clinically simulating typhus give positive Weil-Felix reactions with the X_K strain to high or low titres, but not with the usual X₁₉ strain, while still others give negative tests with any known strain. Felix and Rhodes propose to consider the various forms of typhus and typhus-like diseases as serological types of typhus. According to them the typhus nature of those diseases which give negative Weil-Felix reactions

¹ Fletcher, W., and Lesslar, J. E., *Bull. Inst. Med. Res.*, Kuala Lumpur, F. M. S., 1925, 2; 1926, 1.

² Spencer, R. R., and Maxcy, K. F., *Pub. Health Rep., U. S. A.*, 1930, 45, 440.

³ Felix, A., and Rhodes, M., *J. Hyg.*, 1931, 31, 225.