

chance to study cast formation. Many single cells are seen free in the tubules evidently broken away from the lining epithelium. The whole section is cellular, especially the glomeruli, and the blood vessels are everywhere very distinct. One experiment is cited.

Rabbit No. 29. First day. 600 gm., rabbit caged. Second day. Urine: albumin, slightest possible trace. No casts. Given .001 gm. cantharidin.

Third day. Urine: albumin, slightest possible trace. No casts.

Fourth day. Urine: albumin, very slight trace. No casts. Given .001 gm. cantharidin.

Fifth day. Urine: albumin, trace. Considerably many casts, fine granular, sometimes with cells adherent, occasionally blood adherent.

Sixth day. Urine: albumin, large trace. Many casts, fine granular and hyaline with cells and blood adherent. Some highly refracting.

Seventh day. Urine: albumin, large trace. Only very rare granular cast. Animal killed.

Kidney: Microscopically, section appears very cellular, and many red blood corpuscles may be seen. The lesion of the convoluted tubules is apparently a desquamative one, for large numbers of cells are free in the tubule, but there is very little necrosis of the cells composing the tubule. Very few casts may be seen.

These experiments with trypan red, arsenic and cantharidin are valuable in this connection, not because they furnish material for study of cast formation, but because they furnish negative evidence in support of the described histogenesis of the process. These animals had albuminuria, but very few casts in the urine, and the kidney sections showed few casts in the tubules. The lesions only to a very slight extent involved the tubular epithelium, but were largely in the glomeruli and connective tissue. As far as it goes this is in support of the theory that it is from the necrosis and destruction of the tubules and not from albumin excreted through the glomeruli that casts arise. This theory of cast formation is positively supported by the histological evidence adduced in connection with the degenerative lesions of the tubular epithelium and by the results of urine analysis.⁴

CONCLUSIONS.

From these experiments it would seem that the following conclusions may be drawn:

1. It is possible by the injections of uranium nitrate and other irritants to produce in rabbits an albuminuria and cylindruria dependent upon lesions of the kidney simulating nephritis in man.

2. Granular casts are the first to appear in the urine when the kidney is attacked by an irritant.

3. Casts are more common in the urine when the kidney lesion is primarily a necrosis of the tubular epithelium.

4. Casts arise from the degeneration and necrosis of the cells of the tubular epithelium of the kidney. Entire necrotic cells may desquamate and at first remain distinct from one another, then become massed together, and finally formed into a definite plug, taking the shape of the tubule in which it is formed.

The same process takes place with cell fragments and granular material derived from disintegrated cells. The casts are all granular at first and later become hyaline as they pass down the tubule in the urinary stream.

DESCRIPTIONS OF PLATES.

Fig. 1. Shows swelling of cells of convoluted tubules, with a loss of cell boundaries and obscuring of lumen.

Fig. 2. Shows necrosis of cells of convoluted tubules and the necrotic mass breaking away.

Fig. 3. Shows necrotic material within tubules, broken or sectional in appearance; few nuclei evident in the mass.

Fig. 4. Casts within tubules, appearing as solid plugs, but showing origin from cells.

Fig. 5. Granular casts within tubules.

Fig. 6. Granular cast within tubule, cell adherent to cast.

Fig. 7. Hyaline casts within normal tubules.

Fig. 8. Apparently normal glomerulus and a normal tubule leading from it.

Fig. 9. Shows a glomerular tuft in a dilated glomerular space.

Fig. 10. Shows dilated tubules in a chronic case.

AGE IN ITS RELATION TO ARTERIOSCLEROSIS AND DEATH FROM ARTERIOSCLEROSIS.

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(From the Clinico-Pathological Laboratory of the Massachusetts General Hospital.)

Of the two thousand cases coming to autopsy at the Massachusetts General Hospital in the past ten years, 442, or 22.1%, showed more or less arteriosclerosis. Two facts must be considered in regard to this material; first, cases received at this hospital are chiefly acute cases or cases suffering from acute exacerbation. It is in no sense a hospital for chronic disease. Second, post-mortem examination of the head is limited chiefly to those cases with head symptoms. Were it possible to obtain permission for a complete examination of the head in all cases, the number showing arteriosclerosis of the cerebral vessels might be much greater. It may then be said that about one fifth of all cases coming to autopsy at the Massachusetts General Hospital, where acute cases are chiefly admitted and post-mortem examination is somewhat restricted, show more or less arteriosclerosis. In all of these 442 cases the arteriosclerosis was sufficient to warrant it being included in the anatomical diagnosis.¹

Male. Female. American. Foreign. Colored. ?

Sex and Nationality	Male	Female	American	Foreign	Colored	?
	329	113	214	187	23	18

In this series of 442 cases arteriosclerosis was nearly three times as common in men as in women, and about equally frequent in Americans and foreigners.

Age.—A glance at Chart 1 will show that in this series the age in approximately one fifth of the cases was between forty and fifty years; in one third between fifty and sixty, and nearly one third between sixty and seventy.

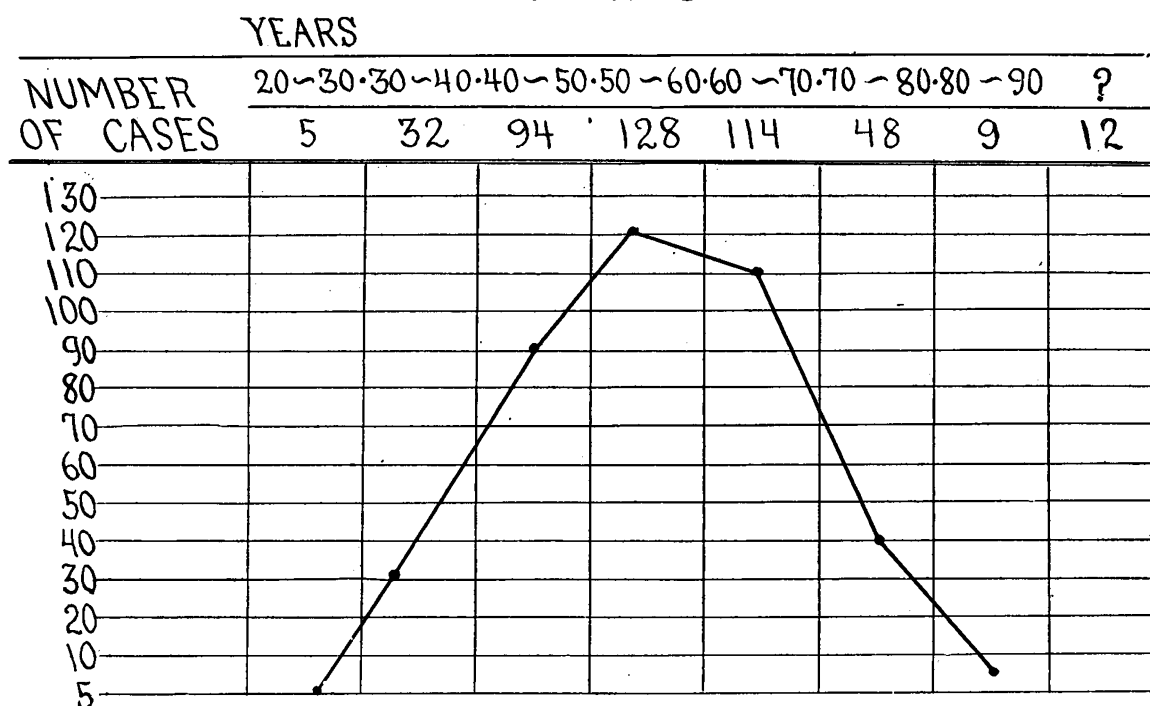
Fifty-nine of these cases gave history of father or mother dying late in life from apoplexy, cardiac or renal disease.

Habits.—There were 135 who used alcohol in

¹ The proportion of males to females admitted to the Massachusetts General Hospital in the last ten years is not quite 3 to 2.

⁴ I wish to express my thanks to Dr. Christian for his constant interest in the experiments, and also for his kind assistance in the preparation of this report.

CHART 1



moderation; 57 in excess. Nearly 50% of the 442 cases used alcohol to some extent. Syphilis was acknowledged or present in 44 cases, nearly 10%. In 10 cases lead as a predisposing factor had to be considered. In none was gout apparently an antecedent.

Previous illness.—Of the acute infections, rheumatism was recorded in 64, influenza in 42, typhoid in 40, pneumonia in 31, diphtheria in 21, scarlet fever in 15; 73 had had gonorrhea. No definite deductions as to the part acute infections played in the production of arteriosclerosis were attempted. That rheumatism damaged the arteries as well as the heart valves was strongly suggested from the analysis of these cases in several instances. Arteriosclerosis and glomerulo-nephritis were associated frequently enough to suggest a common factor in their production.

Deductions.—From a study of these 442 cases, in which arteriosclerosis was present at autopsy, the following facts were ascertained: Arteriosclerosis was three times as common in men as in women, and about as frequent in Americans as foreigners. Two thirds of these cases occurred between fifty and seventy years of age. About the same number between the ages of fifty and sixty, and from sixty to seventy. It is a disease of the fifth decade, as well as of the sixth and seventh decades.

It occurred no earlier in the colored race than those of other nationalities in this series. An inherited, or syphilitic, background was present in 14, and 10% of the cases, while 50% used alcohol.

Fatal cases.—Inasmuch as only a small number of these patients died as a result of their arterio-

sclerosis, an analysis of the clinical² and autopsy records was made to determine how many of them died directly or indirectly from the disease. There were 182 cases. A group of prostatic cases, 22 in number, was omitted, owing to the impossibility of determining what part the arteriosclerosis played in causing death. These were cases of prostatic adenoma, or carcinoma with cystitis, ureteritis, pyelitis, pyelo-nephrosis, hydronephrosis, suppurative and chronic nephritis. In some of these prostatic cases death was due to cardiac or renal disease, in a smaller group to septicemia.

These 182 cases for the purpose of analysis will be considered under four groups:

1. Cardio-renal.
2. Cerebral.
3. Aneurysmal.
4. A, gangrene; B, gangrene with diabetes; C, diabetes alone.

Of the cardio-renal group, there were 124 cases; of the cerebral, 26; of the aneurysmal, 19; of the gangrene, 13.

Careful analysis of the clinical and autopsy records was made in assigning cases to the various groups.

Group 1, Cardio-Renal Group 124 cases.

	Male.	Female.	American.	Foreign.	Colored.	?
A,	67	30	47	4	7	3
B,	25	2	15	10	2	—
	92	32	62	50	9	3

Just as in the whole series of 442 cases, three times as many men as women had arteriosclerosis,

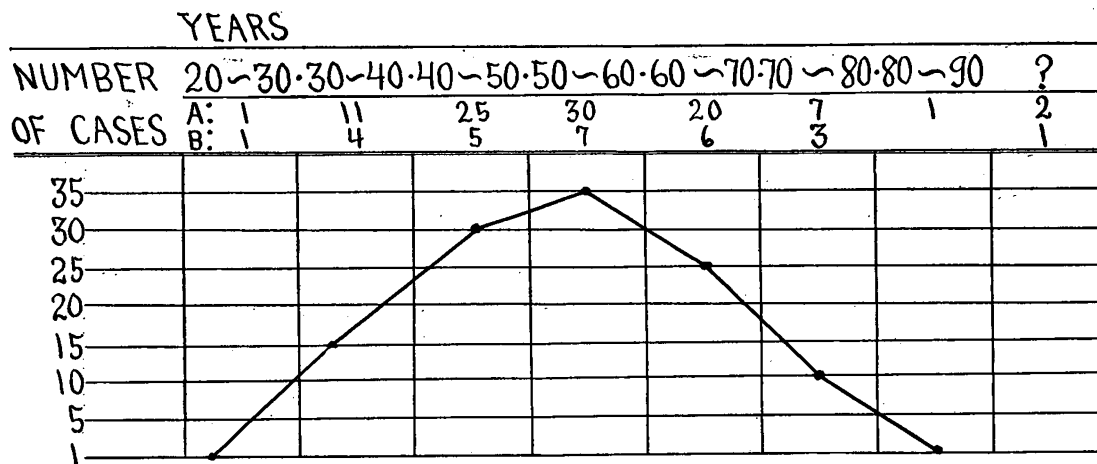
² I wish to thank Dr. C. L. Overlander for his abstracts of the clinical records.

so in the fatal cases this proportion holds. There was no marked difference between those foreign and American.

Age.—The age chart in this cardio-renal group is of interest.

occurred in the fifth and sixth decades. Whereas the cardio-renal group reached its maximum fatality in the fourth and fifth decades, the cerebral hemorrhage fatality was greatest in the fifth and sixth.

CHART 2



By this chart it will be seen that 37 of the 124 cases died between the ages of fifty and sixty; thirty of the 124 cases died between forty and fifty. In other words, 50% of the cases dying of cardio-renal manifestation were in the fourth and fifth decades, nearly as many in the fourth decade as in the fifth.

Group 2, Cerebral Group.

Male.	Female.	American.	Foreign.	Colored.	?
20	6	13	9	3	1

Of these 26 cases, 24 had cerebral hemorrhage, two thrombosis. In this group males were three times more affected than females.

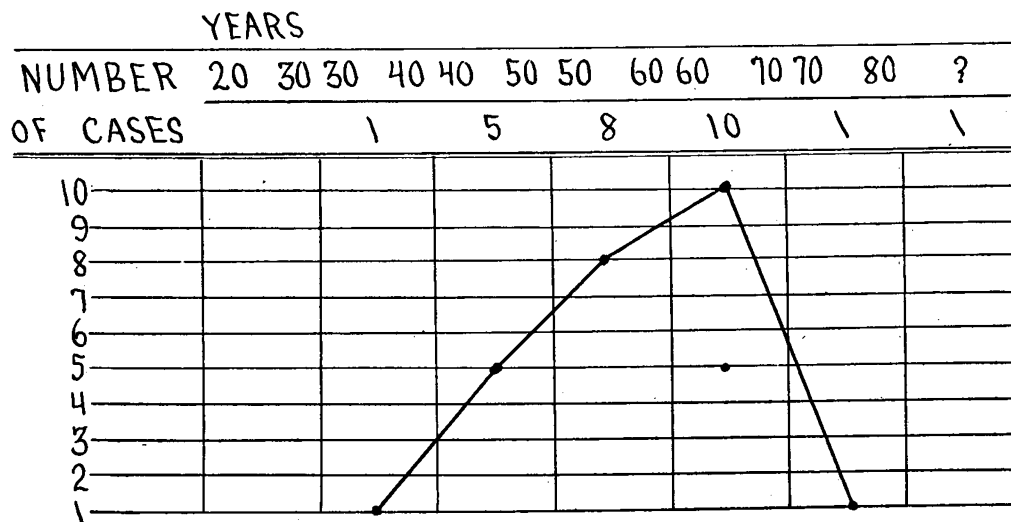
It is interesting in connection with this group to note that in 6 of these cases there was a previous history suggestive of cerebral hemorrhage from three years to six months before the final attack, while in 5 of the cardiac cases in which the brain was examined there was evidence of previous cerebral hemorrhage. In one case in the renal group an apoplectic cyst was found.

Group 3, Aneurysmal Group.

Male.	Female.	American.	Foreign.	Colored.
19	0	7	11	1

Of these 19 cases, all were males.

CHART 3.

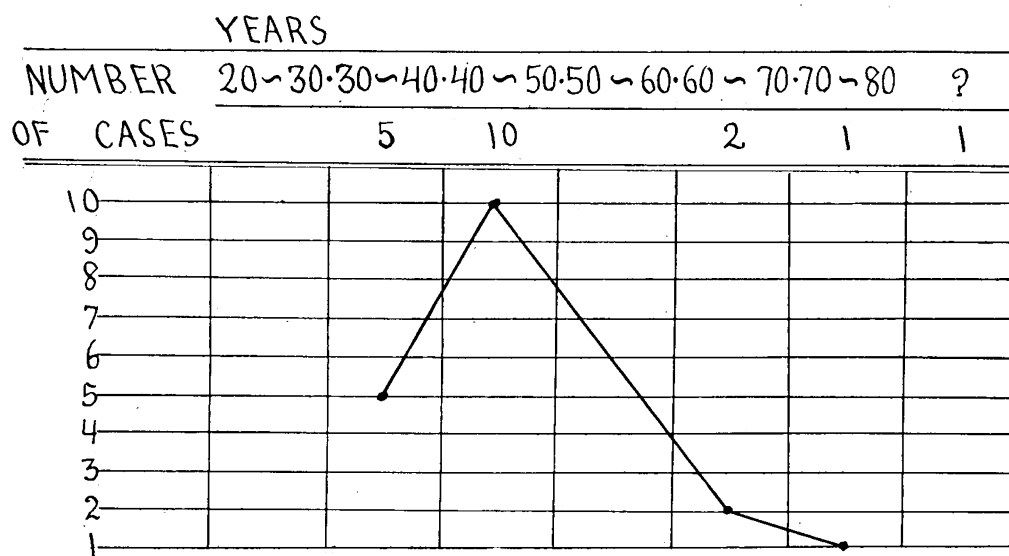


The maximum number of deaths occurred between sixty and seventy years in the cerebral group. Nearly as many between fifty and sixty. Nearly one half of the cerebral hemorrhages

The deaths, as may be seen from Chart 4, were greatest in the third and fourth decades; 15 of the 19 cases died before the age of fifty.

Syphilis was acknowledged in 5 of this group;

CHART 4.



5 denying syphilis acknowledged gonorrhea. There were 3 sailors, 3 painters, in this series of 19 cases. In possibly three others their occupation subjected them to prolonged strain. There were 22 aneurysms in this group of 19; 10 of the arch, 5 of the thoracic aorta, 3 of the abdominal aorta, 1 of the innominate, 2 of the right iliac and 1 of the right femoral.

In 14 cases death resulted from rupture of the aneurysm; thrice into the trachea, thrice into

Group 4, Gangrene Group.

This group is made up of

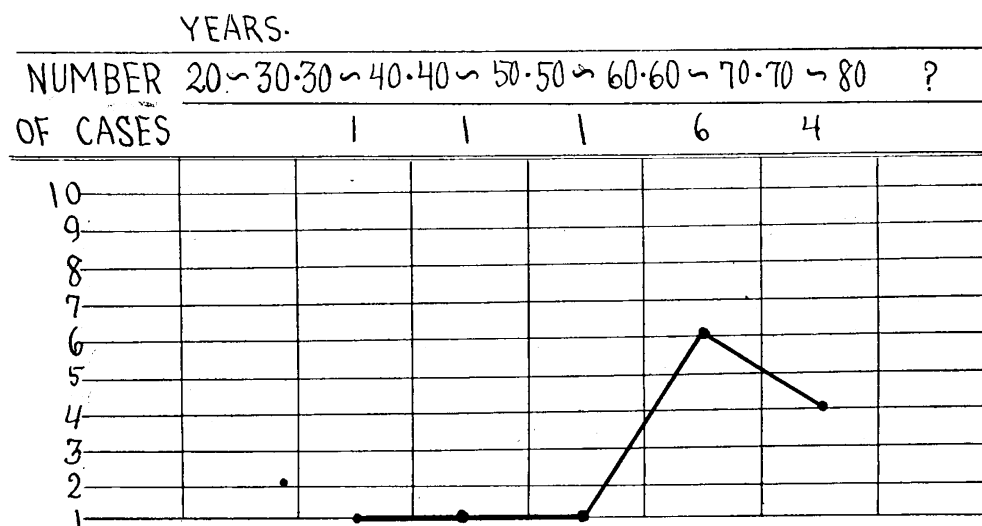
A. Gangrene.

B. Gangrene with diabetes.

C. Diabetes.

	Male.	Female.	American.	Foreign.	Colored.	?
A,	5	1	3	2	0	1
B,	1	4	3	1	1	
C,	1	1	2	0	0	
	7	6	8	3	1	1

CHART 5.



the mediastinum, twice each into the left bronchus, pulmonary artery and pericardium, and once each into the retroperitoneal tissues and into the tissue of the thigh. In 7 cases of the cardio-renal group, there was some dilatation of the arch, but not sufficient to be classed as aneurysmal.

Ten of the 13 cases included in this group died between the ages of sixty and eighty.

Gangrene alone, singly or in combination with diabetes in this arteriosclerosis series, caused death late in life. It occupies the sixth and seventh decades.

The distribution of the gangrene in Group A

was in the right foot in 3 cases, in the left in 2, in both feet in 1; 5 of the 6 cases required amputation. In 1, with thrombosis of the left popliteal artery, death resulted from coronary thrombosis. In 4 of the 5 operative cases, death was directly due to the arteriosclerotic condition. In the fifth there was a terminal bronchopneumonia, with pneumococcus septicemia.

The distribution of gangrene with diabetes in Group B was as follows: right foot in 3 cases, left foot in 1, left hand in 1. Four of these cases died in coma; one post-operative.

The condition of the pancreas was as follows: in one case it was normal, in one there was post-mortem change with no evidence of hyaline degeneration of the islands of Langerhans. In two, these islands showed hyaline degeneration; in one there was also chronic interstitial pancreatitis.

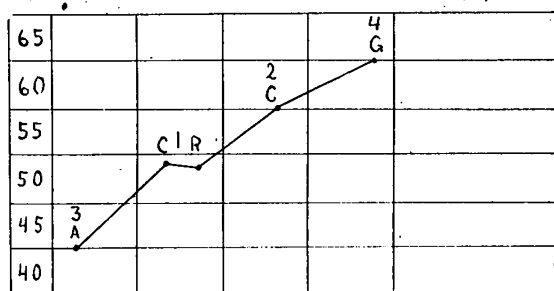
Group C: Diabetes Group.

Both patients died in coma; one had in addition terminal streptococcus septicemia.

The pancreas in both of these cases showed some change; in one hypoplasia, with slight chronic interstitial pancreatitis; in the other, slight fatty infiltration with chronic interstitial pancreatitis.

The average age of the patients in these four groups may be seen in the following chart:

CHART 6
AVERAGE AGE OF DEATH IN GROUPS 1, 2, 3 & 4.



1. Cardio-renal. 2. Cerebral. 3. Aneurysmal. 4. Gangrene.

CONCLUSIONS.

In this series of 2,000 autopsies, 442 cases, or 22.1%, showed more or less arteriosclerosis.

Arteriosclerosis was three times as common in the male as in the female. It occurred no earlier in the colored race in this series. The average age of the cardio-renal group was nearly fifty-five. The average age of the cerebral group was nearly sixty. Fifty per cent of the cases of cerebral hemorrhage occurred in the fifth and sixth decades and was three times as common in the male as in the female. All the cases of aneurysm were in males. The average age of death was nearly forty-five. Death from gangrene and diabetes was incident to the last decades,—the

sixth and seventh; the average age nearly sixty-five.

I wish to thank the visiting physicians of the Massachusetts General Hospital for permission to use their records, and Dr. James H. Wright for the privilege of access to the autopsy records.

TUBERCULOUS PERITONITIS.

A STUDY OF 122 CASES TREATED AT THE MASSACHUSETTS GENERAL HOSPITAL BETWEEN 1900 AND 1907.

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TUBERCULOUS peritonitis is a subject about which cluster many unsolved problems, although much has been written since König's second paper in 1892. The swing of the pendulum of opinion has been extreme. First there was the general feeling of hopelessness in regard to the outcome of cases diagnosed as tuberculous peritonitis, and then followed a period of extreme hope for all such as were seen in time to have a surgical operation. Many cases were found to recover. But as more and more operations were done, and men with large clinics were able to follow their results, it was found that all cases were not cured, so that by 1901 Borchgrevink, a Swedish surgeon, took extreme ground against operation, saying that operations were not curative but were harmful and delayed healing. Other foreign writers, surgeons for the most part, have since 1900 taken a decidedly conservative ground. Animal experiments have been introduced to show that early operations were of more than doubtful value. In the United States, Murphy and Mayo and Douglas have urged "aggressive surgery" on the ground that it materially influences the prognosis favorably.

Not only is there division among the writers in regard to operations as a therapeutic procedure but also there are wide differences of opinion as to how the infection is introduced to the peritoneum; whether it comes from the blood, from the passage of the bacilli through the intestinal wall, or from the Fallopian tubes to the peritoneum. The Gynecological Congress at Rome, in 1902, discussed but did not settle these questions.

The operators who believe that surgical interference is an actively remedial therapeutic measure are hopelessly divided as to the reason why a simple incision through the abdominal wall should bring about the destruction of the bacilli of tuberculosis in the tubercles covering the peritoneum. Neither is there any universality in the technic employed by the surgeons to accomplish their results. For the most part such methods, as attempting to disinfect the peritoneal cavity with antiseptics, have been given up as well as that of having the operation take place in the direct sunlight. Most operators advise against trying to separate adhesions of any density. Mayo, however, advocates careful search for the primary focus, in spite of adhesions.