



**I. ABSTRACT**

POST-OPERATIVE PULMONARY EMBOLISM.  
SUMMARY OF 51 CASES OF THROMBO-  
PHLEBITIS MINNESOTA GENERAL  
HOSPITAL.

1. Ref.: Abstr. Ritchie
- (1) Cutting, R. A.  
Post-operative Complication.  
Am. J. Surg. 13:178-184,  
591-606, 1931.
  - (2) Miller, R. H. and Rogers, H.  
Thrombosis and Embolism.  
J.A.M.A. 93:1452-1456, (Nov.9),  
'29.
  - (3) Henderson, E. G.  
Fatal Pulmonary Embolism.  
Arch. Surg. 15:231-236, 1927.
  - (4) Snell, A. M.  
Relation of Obesity to Fatal Post-  
operative Pulmonary Embolism,  
Arch. Surg. 15:237-244, 1927.
  - (5) Allen, E. V.  
Changes in Blood Following Oper-  
ation.  
Arch. Surg. 15:254-264, 1927.
  - (6) Aschoff, L.  
Lectures on Pathology,  
Paul A. Hoeber, Inc.  
253-278, 1924.
  - (7) Rosenthal, S. R.  
Thrombosis and Fatal Pulmonary  
Embolism. Arch. of Path. 14:  
#2, 214-235, (Aug.) '32.
  - (8) McCartney, J. S., Jr.  
Pulmonary Embolism,  
Arch. Path. & Lab. Med. 3: #6,  
921-937, (June) '27.
  - (9) Walters, W.  
Pulmonary Embolism.  
Surg., Gynec. and Obst., 50:  
154-166, 1930.
  - (10) Evans, W. H.  
Discussion on Post-operative  
Thrombosis.  
Proc. Royal Soc. Med., Sec. of  
Path. & Surg. with Sec. of Obst.  
& Gynes. 22:Pt.1, 729-746, 1928-29.

(11) Lee, R. T., Minot, G. R.,  
Vincent, B.  
J.A.M.A. 47:719-1916.

2. Frequency:

Hegler (1926) was first to call attention to marked increase of thrombosis and embolism in St. Georg Hospital, Hamburg, and since that time there have been many reports, most of which have come from central Europe. (7).

Rosenthal sent questionnaire to representative sectional pathologists of North America and compared results with those of European reports.

Incidence of fatal pulmonary embolism in general clinics of Europe has been on increase. Increase in surgical clinics was more pronounced than in general clinics.

In clinics of North America, there has been no increase in fatal pulmonary embolism. Only one clinic (Presbyterian Hospital, New York) showed increase, i.e. (.09% to .8%), but to counteract this rise Mayo Clinic showed fall (.34 to .09%), also Stanford University Medical School (1.5% to .5%). Remaining eight reports give no indication of increase in deaths from pulmonary embolism but indicate rather a decrease. The majority of reports embrace years 1913-1931.

Generally conceded that in most cases of fatal pulmonary embolism there is no evidence of clinical phlebitis. Thrombosis due to trauma; toxic thrombosis (salvarsan or mercury poisoning), etc. are readily explained but thromboses that form with no evidence of toxic, infectious or traumatic origin are more difficult to explain.

3. Pathogenesis:

Aschoff (6) has best conception. Already familiar to most of us-- but few important facts are reviewed.

States there is no single cause. Different contributing factors are:

- (1) Change in blood plasma (diminished or increased coaguability).

(2) Change in blood elements (increased or diminished powers of agglutination).

(3) Change in blood flow (slowing and formation of eddies).

(4) Change in vessel walls themselves (endothelial damage).

Aschoff states that special tendency to slowing of blood stream is quite properly insisted on as important factor in formation of thrombus. Virchow pointed out that there are certain situations in venous system which are especially predisposed to thrombus formation. Among these are (1) proximal part of femoral vein where large valves are present, (2) pelvic plexus, (3) venous network of dura mater and auricles.

There are besides, four other conditions each of which or in combination may influence localization of a thrombus.

(1) Continued over-pressure of wall of vein. This causes physiological widening and may terminate in physiological thrombosis.

(2) The widening which is found in auricles and also in veins at each valvular sinus predispose.

(3) Backward pulsation or so-called venous pulse may be factor.

(4) When body is prone, there are local changes which directly affect vessels with known tendency for thrombosis. States that the limb which lies lower has greatest tendency for thrombosis.

When on back, increased compression of left iliac vein by arterial trunk (right iliac, middle sacral, and left hypogastric arteries) is of interest.

It is not stagnation but retardation of blood stream which brings about deposition. As a result of this action, blood platelets are sifted out of the blood stream and are deposited on walls of veins particularly in region of valves. As they collect, some interaction between the platelets and intima takes place whereby they become adherent forming white clot. Ultimately, the flow of blood through the vein ceases and red clot forms.

#### 4. Platelet Theory:

W. H. Evans (10) asks "is there

any evidence of alteration in the blood itself which promote coagulation -----?" "There is now evidence that at any rate some of the factors concerned in coagulation may be disturbed."

There is one blood change common to all types of thrombosis whether post-operative, post-partum, with fever, pneumonia, fracture, etc., i.e. increase in blood platelets.

Evans studied platelets in 50 operative cases. There was a noticeable increase in platelets, average increase for whole series 60%. Count rose about 4th day, maximum at 10th day, declining to normal next ten days. Amount of increase in direct proportion to severity of operation.

Eleven cases of fracture showed a similar change.

In pneumonia, Reimann (H.A.) J. Exp. Med. XL:553, 1924, showed that during febrile period platelets diminished but after crisis they begin to rise, doubling or tripling in a week or ten days, then returning to normal.

Following splenectomy, platelet count rise is most marked. According to platelet theory percentage of post-operative thrombi should be most marked. Lee, Minot, and Vincent (11) reported 15 cases of splenectomy for pernicious anemia, 3 developed post-operative thrombosis. A fairly extensive review of literature by Evans failed to reveal any particular frequency of this complication after splenectomy.

Allen (5), however, found no change in platelets postoperatively. Bachman and Bizzaro (for ref. see 1) believe that thrombophlebitis can be anticipated in all conditions in which number of platelets is much increased. 750,000 per cmm. is upper limit beyond which thrombophlebitis can occur.

Some cases show slight increase in coaguability of blood. Not constant.

#### 5. Infectious Theory:

What role has infection?  
Aschoff states that one must distinguish

between 2 types of thrombi (a) that form which arises within inflammatory area or adjacent to it and that (b) which occurs at some distance from it.

Infection does play a role at times but the fact that so many fatal cases occur after clinically clean operations or in closed fractures is an argument against it (2).

Lubarsch studied 215 cases of thrombophlebitis, bacteriologically, and was able to demonstrate organisms in only 20 instances (10%) (for ref. see 1). Henderson found postoperative infections in 60% of his 267 cases of post-operative emboli. McCartney in 31 cases found wound infection in 16 (about 50%).

Taking pulmonary embolism in a separate entity, there are four factors usually mentioned as predisposing causes (1).

(1) Sepsis developing at site of operation and producing septicemia or extending from the site of operation and involving veins by continuity. Lister (for ref. see 1) reports statistics of 195 cases. Argues that if this were so appendicitis should have high incidence which is not found.

(2) Liberation of thrombokinase from operative wound. If this is so, why not more cases of pulmonary embolism after extensive operation like radical amputation of breast and nephrectomy.

(3) Undue trauma at site of operation-unduly powerful retraction, etc. Statistics do not indicate such is case.

(4) Slowing of blood stream - accepted by everyone.

Lister adds to previous discussion that venous stasis is due to insufficient muscular contraction interfering with intra-abdominal and intercostal relationships which in turn is due to age (embolism increases with age) and laparotomy incision which limit muscular action (for ref. see 1).

## 6. Incidence:

Difficult to compare numerous

statistics as they are not uniform. A few are presented.

(A) Age. It is generally conceded that incidence of thrombosis and embolism increases with age.

Average age varies. Henderson reports 53 and Miller and Roger 49 as average age. 90% of de Quervain's cases were over 40. Most common 60-69. (For ref. see 8).

(B) Sex. Appears to be no great factor. Some series show slight preponderance of males and other females. Henderson - 151 females, 162 males; McCartney 33 females, 40 males.

(C) Incidence of thrombophlebitis. Phlebitis has slight but definite and dangerous significance. Some thing that presence of phlebitis is good indication that there will be no embolism. At autopsy in vein with well defined thrombophlebitis it is extremely difficult to dislodge any part of the thrombus.

Miller and Roger found in 60 cases at autopsy 8% had definite phlebitis of leg, but in 206 cases only 2.5% had clinical symptoms. Henderson in 267 cases of pulmonary embolism found phlebitis in slightly more than 10% (clinically).

## 7. Thrombophlebitis - Incidence.

	<u>Operations</u>	<u>Cases</u>	<u>%</u>
Beckman	5,855	16	.27
Clark	3,000	35	1.10
Hampton, Wharton	21,000 (Gyn)	205	.97
Klein	5,851	70	1.00
Bondy	1,000 (Gyn)	13	1.3
Rangi	6,071	--	1.2

Average .99

(D) Incidence of Fatal Pulmonary Embolism.

	<u>Operations</u>	<u>Cases</u>	<u>%</u>
Victor	12,615	21	.17
Heard	125,164	104	.08
Hamptom, Wharton	21,000(Gyn)	21	.01
Henderson	63,347	--	.34
Walters	4,500	4	.09
Martini	30,000	--	.22
			(P.O.)
			.1
			(non-
			op).
Naegeli	15,543	21	.14
Wilson	63,573	47	.07
De Auervain	76,799	126	.13
		Average	.14

(E) The preceding statistics are post-operative complications. Must not lose sight of non-operative and purely medical cases.

Miller and Rogers had 37 non-operative cases to 67 operative cases. Henderson had 267 (85%) surgical to 46 (15%) non-surgical. McCartney had 16 (medical cases) (21% of total).

Most of the purely medical cases are over 40 years. The most frequent cause seems to be hypertension with cardiac failure and debilitating diseases are next in frequency.

(F) Types of operations.

	<u>Henderson</u>		<u>De Aunervain</u>		<u>Wilson</u>	
	<u>Cases</u>	<u>%</u>	<u>Cases</u>	<u>%</u>	<u>Cases</u>	<u>%</u>
Gall-						
bladder	11,689	.31	946	.84	4597	.19
Stomach	12,453	.30	-	-	-	-
Stomach & duodenum	-	-	-	-	2391	.12
Small bowel	991	.30	-	-	389	.26
Rectum	1,982	.25	-	-	-	-
Colon	2,389	.83	-	-	-	-
Colon & Rectum	-	-	-	-	2530	.20
G.I. tract	-	-	5070	1.99	-	-
Uterus	11,961	.42	-	-	7993	.13
Gyn.	-	-	2349	.21	-	-
Prostate	1,959	.56	356	1.99	601	.66
Appendix	12,356	.04	10089	.10	9908	.04
Hernia	-	-	11475	.15	4501	.11
Sigmoid	-	-	5879	.034	3266	.064
Spleen	317	1.26	-	-	-	-

In Henderson's group there were 180 cases (80%) of intra-abdominal operations and 43 (20% extra abdominal, of the latter 14 were herniotomies, 8 were radical breast operations, and the remainder were scattered, no group having more than 3 cases.

An interesting feature is high incidence in operation on spleen. Influence of splenectomy in thrombosis previously mentioned. The site of intra-abdominal operation does not appear to make a great deal of difference--although loperation on the prostate, intestinal and biliary tracts are most common (8).

8. Post-traumatic group.

McCartney found 15 in 73 cases of fatal pulmonary emboli. (1) Post-traumatic thrombosis and embolism are not at all rare, (2) a simple fracture was present in a majority of cases, (3) in several, there was minor bruising of tissue with no fracture, (4) the thrombus always developed at site of injury, (5) interval between trauma and pulmonary embolism is longer than that of other forms of embolism, (6) age distribution about the same, (7) injuries usually of lower extremities.

9. Site of Clot.

	<u>Thrombus</u>		
	<u>Iliac &amp; Femoral</u>		
	<u>Cases</u>	<u>%</u>	<u>Left side</u>
Miller & Rogers	17	76%	69%
McCartney	31	45%	19% left 20% right
Henderson	201	83%	--
	<u>Embolus</u>		
	<u>Rt. Part</u>	<u>L. Part</u>	<u>Both</u>
	<u>%</u>	<u>%</u>	<u>%</u>
Miller & Rogers	46	20	33
McCartney	--	--	--
Henderson	--	--	--

Source of embolus may not be found. In de Quervain's (8) series

The primary site was not found in 16%. Henderson found it in 63%, and McCartney in 61%.

With the smaller emboli, the right lower lobe is most frequently involved (8). Some authors state that in many cases where the thrombosis is not found the deep veins of the neck may be the seat.

#### 10. Embolism in obese: H.

Snell shows interesting facts that postoperative pulmonary embolic deaths were about twice as great in obese people as in all other types of people.

##### I. Incidence of Recovery:

Lenormant (for ref., see 1) collected 233 cases, 106 were fatal but Head found only 5 recoveries in 104 cases. Doubt about Lenormant.

#### 11. Symptoms and Treatment:

Difficult to evaluate statistics. Some authors state embolism does not occur when there is definite evidence of thrombophlebitis. But our impression is that from 2.3 to 10% of cases with pulmonary emboli have had symptoms of phlebitis (see our cases).

##### A. Pulmonary Embolism: (Cutting).

Cases may sometimes present same clinical picture as pulmonary infarction, (1) febrile stage due to thrombosis, (2) afebrile period of quiescence, and (3) acute attack of thrombotic embolism. Attack usually occurs between 1st and 2nd post-operative week. Patient develops feeling of faintness often accompanied either by precordial pain or severe tightness across chest, incontinence of urine and feces may occur. Usually death follows within 5 to 25 minutes.

Treatment: (Cutting). Unfortunate that so little is definitely known about etiology. In absence of more evidence than is available at present, one cannot afford to overlook any factors that might be responsible. Authors recommend:

- (1) Reduction of vascular trau-

matism to a minimum.

(2) Frequent changes of position in all but a few cases contra-indicated by grave general peritonitis, etc.

(3) Early postoperative institution of passive massage or active systematic exercises of lower extremities. Advocated by Whipple.

(4) Walters advocates use of thyroid extract 2 gr. t.i.d. on theory that by increasing the metabolic rate the blood pressure and rate of blood flow may be increased. Discussed under treatment of thrombophlebitis.

(5) Administration of adequate amount of fluids.

##### Active Treatment:

(1) Operative treatment not discussed. Meyer reports 2 cases, 1 successful. de Harvan had 3 cases, all fatal. Crafford 2 cases, both successful. Westerborn states that 16 cases have been recorded in literature, 7 of which were definitely cured. (For ref., see (1)).

##### B. Thrombophlebitis (1).

Usually occurs during second or third post-operative week. Many observers state development is insidious and that close observation during the earlier period of convalescence will frequently reveal an elevated pulse rate, an elevated temperature or both, the source of which is not evident at the time.

(1) Usually dull aching pain at onset aggravated by motion.

(2) Systemic reaction noted in nearly 90% of cases. Temperature to 100.5 or so usually within 24 hours after onset of pain. Pulse usually not over 100. Duration of systemic reaction averages 3 to 5 days.

(3) Cyanosis and redness of affected part does not ordinarily form a part of the picture but may appear.

##### Treatment: (Cutting).

(1) Primarily to prevent stagnation of blood in lower extremities. Suggested that all patients in so far as practical be kept in moderate Trendelenburg position during bed stay and in later convalescence passive or active motion of extremities.

(2) Nurses and attendants should be warned of manipulating "sore" or

"painful" legs unless instructed by physician.

(3) Walters used thyroid extract (2 gr. t.i.d.) except in cases where there have been an increase in pulse rate and temperature occurring spontaneously post-operatively. Followed this in 4,500 surgical cases over 4½ years and has had less than .09% of cases of fatal pulmonary embolism which is considerably lower than previous figures from same clinic. (Henderson 63,347 cases with .34% fatal embolism).

No patient less than 70 years old died.

Freund (for ref. see Cutting) in Germany obtained similar results by this regime (2000 cases over 35 years, only 2 cases of fatal embolism).

In spite of these reports, most authors are not yet convinced of efficacy.

Popper's (for ref. see Cutting) investigation does not substantiate this:

Results: 150 cases treated with synthetic thyroxin.

1 fatal embolism  
1 thrombophlebitis with infarct  
in lung  
2 bilateral thrombophlebitis  
150 cases not treated  
0 fatal embolism  
0 infarct  
4 thrombophlebitis

Conservative treatment consists of:

- (1) Voluminous application of cotton wool.
- (2) Heat, preferably cradle.
- (3) Elevation of part affected.
- (4) In cases in which fever and tenderness are not present, mild exercise of the leg may be started 7 to 10 days after inflammatory process has begun to show improvement.
- (5) In thrombosis of the superficial vein, ligation of the saphenous system above septic thrombosis is rational.

Best to treat deep iliac variety conservatively unless septicemia is present.

### Records (4 years)

51 cases of thrombophlebitis and embolism at Minnesota General Hospital:

<u>Age</u>	<u>Thrombophlebitis</u>
1 - 20	3
21 - 40	25
41 - 60	11
61 - 80	12

<u>Age</u>	<u>Pulmonary Embolism</u>
1 - 20	1
21 - 40	3
41 - 60	2
61 - 80	4
	<u>10</u>

Note: of 10 cases - 7 did not show thrombophlebitis and 3 did.

Sex: Males 21, Females 30.

### Clinical Involvement:

Rt. leg	5
Lt. Leg	26
Bilateral	14
?	5

### Cases of thrombophlebitis and embolism (combined)

24 postoperative
12 medical
12 post-partum
2 fractures
1 post-traumatic

These were cases of embolism, 6 of which showed no symptoms of thrombophlebitis. Of the 10 cases of pulmonary embolus, 6 were surgical or post-traumatic cases.

#1. 36 Yr. male, died 18 days following attempt to obliterate spur of old Mickulicz operation. Symptoms of thrombophlebitis.

#2. 9 yrs. male, died ½ hour after curettage of old osteomyelitis, left femur. No clinical thrombophlebitis.

#3. 74 yrs. female, died 3 weeks following fracture of left femur. No clinical thrombophlebitis.

#4. 66 yrs. female, died 4 weeks following ventral herniotomy. No clinical thrombophlebitis.

#5. 73 yrs., female had sudden dyspnea, raised bloody sputum one day following removal of cast of right femur which had been on 3 months. Recovered. No symptoms.

#6. 21 yrs., male, died 5 days following drainage of empyema. Symptoms of thrombophlebitis.

#### Summary:

2 had symptoms of phlebitis and 4 had no symptoms.

There were 3 medical cases, one had tuberculous pneumonia, and 2 were cardiac decompensation. None had symptoms of thrombophlebitis.

1 was post partum, with symptoms of thrombophlebitis.

Of 10 cases of pulmonary embolism only 3 had symptoms of thrombophlebitis.

Of operative cases, thrombophlebitis occurred with cholecystectomy 4, appendectomy 3, herniotomy 3, infected varicose veins 2, hysterectomy 2, gastrectomy 2, fracture 2, kidney 1, supra-pubic prostatectomy 1, curettage of bone 1, cancer of rectum 1, suspension 1, hemorrhoidectomy 1, radical treatment 1, empyema, trauma 1.

#### Impressions:

1. That there has been an increase in fatal pulmonary embolism is probably true of Central European clinics but not of North American clinics?

2. Aschoff's conception of etiology has not been changed very much.

3. Possibility of increase in platelets postoperatively as a factor is also considered a possibility.

4. Role of infection in thrombophlebitis is cause in some but certainly not in all.

5. Average age of fatal pulmonary embolism about 50 years, increases with age.

6. About 2.5 to 10% of fatal cases of pulmonary embolism have had clinical

signs of thrombophlebitis.

7. Thrombophlebitis occurs as a postoperative complication in about 1% of cases.

8. Fatal pulmonary embolism occurs as a postoperative pulmonary complication in about .14% of cases.

9. From 15 to 25% of cases of pulmonary embolism are medical cases.

10. Type of intra-abdominal operation is not indicative of chance of embolism although there is some suggestion that operations on prostate, intestine and biliary tracts is most frequently complicated by this event.

11. Post-traumatic emboli are not rare.

12. Site of primary clot is usually in left iliac and femoral although it is often found on the right side.

13. Source of emboli not found in 16 to 36% of cases at post-mortem.

14. Postoperative embolism most common in obese people.

15. Treatment unchanged. Use of thyroid extract only radical change. Value?

16. Fifty-one cases of thrombosis; including pulmonary embolism at Minnesota General Hospital, July 1, 1927 to July 1, 1932; 10 of these were pulmonary embolism.

17. Only 3 cases of pulmonary emboli had previous symptom of a thrombophlebitis.

18. Subject of thrombosis and pulmonary embolism still unsettled.

#### II. CASE REPORT

##### CARCINOMA OF COLON.

##### PULMONARY EMBOLISM.

Path. Ritchie.

Case is 36 years old, white male, admitted to Minnesota General Hospital 3-23-32, discharged 5-7-32 (45 days); readmitted 12-29-32, expired 1-22-33 (24 days). Total stay 69 days.

##### Crampy pain

12-25-31 - Began having abdominal cramps shortly after supper with acute pain over abdomen. Previous to attack, bowels were regular, but following attack had to take enemas daily

for about 6 weeks. Lost weight. During next 4 or 5 weeks, felt intense intestinal movements in abdomen.

3-18-32 - Abdominal distention marked.

3-22-32 - Began to vomit. Unable to hold anything on stomach.

#### Admitted

3-23-32 - Physical examination:

Abdomen - markedly distended, peristalsis visible and audible, borborygmi heard.

Rectal - negative. Laboratory: Urine - negative. Blood - Hb. 88%, wbc's 11,650.

X-ray of abdomen - obstruction in descending colon with marked distention of ascending, transverse and descending colon down to point of obstruction. Operation: Appendicostomy performed. Suction put on appendicostomy, and good drainage obtained. Excellent post-operative recovery.

#### Mikulicz

4-1-32 - Mikulicz operation performed, bringing up tumor mass in descending colon and incision in left lower quadrant. Attempt made to resect bowel, but in doing so perforation was made in descending colon with some spillage of feces into abdominal cavity. Excellent post-operative recovery.

4-13-32 - Tumor mass excised with cautery.

4-27-32 - X-ray treatment.

5-7-32 - Another x-ray treatment.

#### Discharged.

#### More Pain, Pleurisy

##### Interval Note:

Colostomy functioning well. Gained 5 pounds in next four months. Sept. 1932 - Colostomy not closed. Began to have pain in muscles of right leg. Nov. 1932 - Developed pleurisy on right side with extreme on respiration. Incapacitated for 10 days. Began to have pain in muscles of left leg. December 25, 1932 - Patient on semi-bed rest for 7 weeks. Noted some swelling of right ankle.

#### Clamp Attempt

12-29-32 - Readmitted. Physical Examination: Lungs - clear on percussion and auscultation. Heart - B.P. 112/92, no murmurs heard, normal in size and shape, pulse - radial, equal, 74. Abdomen - colostomy in left lower quadrant functioning. Extremities - no edema, slight tenderness on palpation of medial surface of left thigh. Laboratory: Blood - Hb. 76%,

rbc's 3,800,000, wbc's 8,850, Urine - negative. Progress: After an attempt to place clamp on spur left from old Mikulicz operation, had a great deal of pain; clamps removed within about two or three hours.

#### Thrombophlebitis, left

1-3-33 - Complains of pain in left lower extremity. Definite tenderness over left femoral triangle and along course of saphenous vein with pain and tenderness in left popliteal space with some edema of extremity. Elevation of left leg and hot packs.

1-11-33 - Severe pain in left lower chest. Slight cough developed.

#### Chest Pain

1-14-33 - X-ray of chest - broncho-pneumonia, left, with diaphragmatic pleurisy and possibly a small amount of fluid.

1-21-33 - Swelling of left leg increased.

#### Exitus

1-22-33 - Pain in popliteal space increasing. Temperature to 100.5. Leg shows 2+ edema. 6 P.M. - Very sharp pain in epigastrium. Became dyspneic. Perspires profusely. Breath sounds heard over both anterior chests. B.P. 80. Pulse weak and regular. 2+ cyanosis over neck and upper chest. 6:40 P.M. - Patient expired.

#### AUTOPSY

##### Cyanosis, Colostomy

Body is well-developed, fairly well-nourished, white male, about 36 years of age, measuring 178 cm. in length weighing approximately 155 lbs. 2+ edema of left leg and slight edema of right ankle. Cyanosis of lips and finger-nails. Lower right rectus incision, 8 cm. long, well-healed. Left lower rectus incision, 18 cm. long. Colostomy appears to have been functioning well. Finger can be inserted in both distal and proximal openings.

##### Fibrosis

Peritoneal Cavity open. Peritoneum smooth, glistening and shows no inflammation. Some thickening of peritoneum around colostomy opening, but colostomy is well-healed. No excess

fluid. Few adhesions in right lower quadrant. Appendix small and adherent to right lower quadrant. Good deal of fibrosis around it, an evidence of an old appendicostomy.

#### Exudate

Dense fibrinous pleurisy on both sides of Pleural Cavities with no fluid present. Pericardial Sac contains 100 cc. of clear fluid. No inflammatory process.

#### Embolus

Heart 300 grams. Large embolus in right ventricle, part of which extends through pulmonary artery, and also down left pulmonary artery. Heart muscle good texture. No valvular lesions. Root of Aorta smooth and shows only a few atheromatous plaques. Coronaries patent and show no sclerosis.

#### Infarcts

Right Lung 460 grams, Left 325 grams. Multiple infarcts in both. Fairly old thrombosis in right pulmonary artery and also few emboli. 8 fairly well developed infarcts on right, and 3 on left. Newly formed embolus in left pulmonary artery. Some atelectasis of both lower lobes.

Spleen 200 grams and is soft. Surface smooth. Pulp is very soft and mushy.

Liver 2650 grams. Multiple metastatic tumor throughout. Rather pale, and congestion.

Gall-bladder filled with bile. No stones. Wall thin. Common, cystic and hepatic ducts patent.

#### Tumor

Gastro-Intestinal Tract. Stomach, duodenum and small intestine no abnormality. No obstruction. Portion of Descending colon has been resected and there is a double barreled colostomy present. Retroperitoneal glands large and show metastatic growths. Metastasis particularly notable around left iliac vessels. Surrounds and somewhat compresses them.

Pancreas normal in size, shape and position, and shows no abnormalities.

Adrenals small, normal in size and position, and show no destruction, hemorrhage or tumor.

#### Tumor

Kidneys weigh 175 grams. Small metastatic carcinoma in left kidney measuring 5 mm. in diameter. Capsules strip easily. No petechiae or arteriosclerotic change.

Genital Organs - normal.

Aorta smooth. No arteriosclerotic change.

Retroperitoneal adenopathy, but none other is observed.

Organs of Neck - Thyroid normal in size and shows no adenomatous changes.

#### Thrombus

Extremities - At junction of iliac vessels, there is large thrombus extending into external iliac and on into femoral vein of left thigh. It appears as if left external iliac and left femoral vein are extremely thickened and are filled with thrombus formation which is particularly adherent. It is very difficult to express any of the thrombus from the left side; however, in the right common iliac vein, the thrombus which seems to extend over from the opposite side is much more easily broken away. Right leg is milked, and several small pieces recovered (evidently coming from the femoral vein). Veins on this side do not show the marked evidence of phlebitis that is present on opposite side.

Head: Not examined.

#### Microscopic:

Lungs - Hemorrhagic infarcts in all sections. Surrounding hemorrhagic areas alveoli are filled with blood. Some leucocytic and lymphocytic infiltration. Several areas of normal air-containing lung present.

Heart muscle - no fragmentation.

Liver - rather marked fatty replacement particularly around central portions of lobules. Areas of metastatic carcinoma completely replacing normal liver tissue.

Kidneys - rather marked cloudy swelling. Cells of tubules appear edematous. Rather marked congestion throughout. Occasional cysts along cortical border. Somethickening of larger vessels present. Glomeruli appear normal, except

for some congestion.

Spleen - distinct corpuscles with normal amount of pulp and some congestion.

Pancreas - Acini and islands of Langerhan normal. No fatty change.

Retroperitoneal glands - Metastatic carcinoma.

Diagnoses:

1. Carcinoma of colon (resected)
2. Thrombophlebitis, common iliacs and left femoral.
3. Pulmonary embolism.
4. Multiple pulmonary infarcts.
5. Fibrinous pleurisy, bilateral.
6. Right ventricular embolism.
7. Metastatic carcinoma of liver and retroperitoneal glands.
8. Fatty metamorphosis of liver and metastasis.
9. Congestion of kidneys and metastasis.
10. Old abdominal scars (operation).

Comment: Clinical thrombosis with embolism (showers? and then large fatal one).

III. CASE REPORT

FRACTURE OF LEFT FEMUR.  
PULMONARY EMBOLISM.

Path. Koucky.

Case is white female, 74 years of age, admitted to Minnesota General Hospital 2-11-33, expired 2-13-33 (2 days).

Fell

1-19-33 - Fell on floor at home and fractured left femur. No treatment? No adequate history as to condition during interval because patient speaks only Norwegian, is senile and quite ill.

2-11-33 - Admitted

Past history

Operated on for cholelithiasis about 20 years ago, followed by large incisional hernia. Mild stroke, 3 years ago, with ptosis of left eyelid and dizziness but without disturbance of speech or paralysis. Condition seemed to clear within a year.

Physical examination:

Heart - B.P. 148-78. Head, neck, chest-

normal. Abdomen - large ventral hernia involving right rectus muscle. Extremities - left leg externally rotated, shortened with pain on motion. Clinical impression: Fracture of left femur. Laboratory: Urine - 2+ albumen, many granular casts, many wbc's. Blood - Hb. 92%, wbc's 9,000. Blood sugar - 140 mgm. N.P.N. - 52. Progress: Temperature 98, pulse 115, respirations 36.

Attack:

2-12-33 - 1:30 A.M. - Restless, unresponsive, twitching of hands and arms, cyanosis of finger-tips and lips. Loud stertorous breathing. Pulse rapid and feeble, incontinent. Remained in this condition throughout stay. (Sister states that patient had these attacks before.) Temperature 102.

Exitus

2-13-33 - Gradually growing weaker. Respirations shallow and irregular. Very quiet and restless at times. 7:30 P.M. - Pulse 120, respiration 30. Cheyne-Stokes breathing at times. Pulse becomes imperceptible. 7:40 P.M. - expired. Some cyanosis observed shortly before death. Clinical impression: Fracture of left femur. Cerebral sclerosis with cerebral vascular accident.

Autopsy

Fracture

Body is well-developed and nourished. white female, 74 years of age, measuring 162 cm. in length weighing approximately 190 lbs. Some cyanosis of face and neck. No edema or jaundice. Huge hernia in right rectus muscle. Some puncture wounds in antecubital fossae. Fracture of left femur eversion of leg and 4 cm. shortening.

Hernia

Peritoneal Cavity smooth and glistening. Cecum, descending colon, most of transverse colon and adjacent loops of small bowel are outside peritoneal cavity within large ventral hernia. Attached in this area and have to be cut away from hernial sac. Appendix hangs free.

Adhesions

Pleural Cavities. Complete obliteration of right pleural space. Left pleural cavity free. Pericardial Sac adherent throughout, most marked at base of heart and large vessel. Apex of heart is less involved and adhesions here can be broken through easily.

Hypertrophy

Heart 375 grams. Some hypertrophy of musculature, particularly of left ventricle. No infarction or fibrosis. Mural endocardium clear. Valves not thickened. Root of the Aorta of good size and shows only moderate arteriosclerosis. Coronaries on both sides are involved by about Grade II sclerosis which does not obliterate lumen. No thrombosis.

Embolus

Right lung 400 grams, Left 350 grams. No atelectasis or bronchopneumonia. On incising pulmonary artery, about 15 grams of coiled up thrombus within bifurcation of artery and extending into both main trunks can be extracted. An old gray clot with recent red prolongation. Clot can be straightened out. It is branching type with maximum diameter of about  $\frac{1}{2}$  to  $\frac{3}{4}$  of centimeter. Small branches of pulmonary artery are not involved by emboli. In the left lung in lateral border just below the interlobar fissure is Ghon tubercle about 1 or 1.5 cm. below pleural surface.

Larger

Spleen 320 grams, and is quite plump. Edges are rounded. Capsule smooth. Splenic substance not soft. Trabeculations stand out.

Liver 1700 grams, appears somewhat atrophic and flat. Somewhat dark. Markings preserved and periportal spaces not fibrotic. Bile ducts not dilated.

Stones

Gall-bladder very much dilated. Measures about 15 cm. in length and about 8 cm. in length. Common duct not dilated and apparently contains no stones.

Diverticula

Gastro-intestinal tract. Esophagus, stomach and small bowel show no tumor, ulceration or inflammation. Colon beyond middle of transverse colon is seat of

numerous small diverticulae which contain dry feces. No peri-colitis about them.

Pancreas soft, pink and shows no tumor or fibrosis.

Adrenals. Numerous small cortical adenomas in both.

Cysts

Right Kidney 140 grams, Left 160 grams. Capsules strip with difficulty. Many deep arteriosclerotic scars with several subcapsular cysts and a few cysts, one of which is filled with blood within kidney substance on right side. Pelvic fat increased in amount and kidney cuts with increased resistance.

Bladder not trabeculated and shows no tumor, diverticula or cystitis.

Senile

Genital organs. Uterus is senile. Small cyst attached in broad ligament of left side. Small cyst-like polyp projecting from external os of the uterus, and inside of uterine cavity is filled with gelatinous material which probably is a polyp?

Aorta grade II to III sclerosis throughout.

Lymph Nodes not appreciably enlarged.

Organs of Head and Neck - not examined.

Thrombosis

Femoral vessels: Both femoral vessels are milked upward. On the right side, no thrombi are recovered. On left, a whitish gray, firm thrombus is recovered which measures  $\frac{3}{4}$  cm. in diameter and 5 cm. in length.

Diagnoses:

1. Fracture of left femur.
2. Pulmonary embolism.
3. Thrombi in left femoral vein (nonclinical).
4. Ventral hernia.
5. Pleural adhesions.
6. Adherent pericarditis.
7. Arteriosclerosis, general.
8. Hypertrophy of heart, left ventricular.
9. Hypertension (?).
10. Splenitis.
11. Cholecystitis, chronic.

12. Chololithiasis.
13. Diverticulae of colon.
14. Benign adenoma of adrenals.
15. Arteriosclerotic kidneys.
16. Cysts of kidney.
17. Polyps of uteri.
18. Ligamentous cysts.

#### IV. MEETING

Date: February 16, 1933.

Place: Interne's Lounge, 6th Floor, West Building.

Time: 12:15 to 1:18 P.M.

Program: Malignant Tumors of Small Intestine.

Present: 39.

Discussion: Ralph Ellis  
L. G. Rigler  
O. H. Wangenstein  
Richard Johnson  
Horace Scott

Theme: R.E.: Too difficult to carry out diet of Evans here. Students cannot get diet eating in restaurant, i.e. eliminate fat. I had one prize patient who lost 100 lbs. Most feel better if they lose 2 to 3 lbs. a week. Boy who lost so much was about to be sent home because he was not getting along in school. His grades came up to B average after reduction.

L.G.R.: This man had a number of examinations. Barium enema examination of colon showed rather dilated redundant colon with inability to pass through the ileocecal valve, which rarely occurs. Cecum dilated up a great deal, but nothing could be gotten through. Some obstruction of ileocecal valve. Nothing found in the stomach. Picture of dilated small bowel made out after 6 hours. At that time we thought it tended to confirm idea of obstruction at ileocecal valve. The obstruction, however, was far from complete even at this time because within a relatively short time meal passed through small bowel. It is possible that if we had been more careful in following this through at regular intervals we might have picked up

the obstruction itself. Chest negative. This film shows gas bubble in dilated colon which was taken in the upright position.

O.H.W.: My recollection is that

I saw this patient and operated upon him 2 years ago. At that time my impression was that he had a carcinoma of the small intestine. Films showed gas in small intestine; subsequently barium enema done, as Dr. Rigler pointed out. In cases of small bowel obstruction limitation of x-ray diagnosis apparent when one realizes content of lower ileum is fluid.

Another patient, a girl, was operated upon, established continuity of gut, and patient got along well. I saw her and I was certain she had obstruction. This thing had been going along quite a while. Brought in here for study. X-ray study showed no evidence of stasis. Employed in Munsingwear Factory here, probably neurotic. Impressed, however, by the fact that she had a washboard abdomen. Explored here, and when operated upon we found intrinsic obstruction of gut at site of anastomosis, would not permit my little finger to pass through.

Operated upon another patient who had lesion in the colon but no blood in stool. Don't know why this is. It has happened so frequently I am tempted to tell students that I am not so sure that examination for blood in the stool at this hospital is of value. About this patient my recollection is that I planned to go in subsequently. I should have liked to exteriorize involved segment of gut, probably would have been best thing. Why he got peritonitis I can't say. We were not at that time using suction, probably hypertrophied gut shoved tube out of bowel and caused leakage. Once operated upon patient who was operated upon subsequently for obstruction and did an enteroanastomosis on her. Next to obstruction, intussusception brings tumors of small bowel to our attention.

R.J.: There should be no difficulty if blood is there.

**Test is sensitive.** In most of our carcinomas we get repeated positive tests.

O.H.W.: Suggest patients with carcinoma be checked for blood and you will be surprised to find number of cases in which can't find positive report of blood in stool.

L.G.R.: I have not much to add. X-ray examination in small bowel is very difficult, but I still think that if we were able to follow patients at frequent intervals and spend a great deal of time we could get better results. We have tried it in several cases without much success. Difference between small bowel and stomach. Stomach dilates and retains barium. Dilation makes it obvious when tumor is present because wall to which tumor is attached is dilated out and the tumor produces defect. Colon also dilates by pressure of barium enema. In small bowel give patient barium meal - passes through with no definite irregularity. No way of preventing it going through lesion rapidly. If fairly complete obstruction you can pick up lesion. In these cases obstruction only partial. Difficulty due to inability to keep barium in small bowel for any length of time.

H.G.S.: I remember a case of carcinoma of the small bowel which was of two-fold interest. First, nature of lesion, and secondly, metastasis. While in Chicago I saw man who fell down on dry pavement. He began to bleed from the bowel and apparently bled to death in about 18 hours. At autopsy 2 carcinomas of the small intestine, and metastatic carcinoma of the brain was found. The tumors in the brain were hemorrhagic.

Note: Interne Beecham looked up records of 47 cases of gastrointestinal disease with following results (occult blood tests):

Carcinoma of Stomach

13 positive, 4 negative, 11 not done.

Gastric ulcer

3 positive, 4 negative, 4 not done.

Carcinoma of Colon

2 positive, 1 negative, 5 not done.

Result: 27 examined, 20 not examined.

Carcinoma 15 positive, 5 negative (3/4 positive). Ulcer (1/2). 17 cases had just one test (13 positive, 4 negative). 10 had more than 1 test (15 positive, 27 negative). All examinations by clerks, benzidine test. Medical service used test more than Surgery. Dr. Reiman showed one clerk how to use his method with result that previous negative stool showed 4 positives.

Comment:

We are not doing occult tests routinely. In 36 malignant cases, test not done in 16. One or more negative tests does not prove method is faulty, as literature does not indicate number of tests on which high percentage of positives is based. Test previously negative becoming positive does not prove "negative" method faulty as this occurred without change of method.

Gertrude Gunn,  
Record Librarian.