EARLY POSTOPERATIVE RISING

A Statistical Study of Hospital Complications

JAMES B. BLODGETT, M.D., and EDWARD J. BEATTIE, M.D., Boston, Massachusetts

THERE has recently been a revival of interest in early postoperative rising and walking. In June 1942 a critical study of early postoperative ambulation was undertaken at the Peter Bent Brigham Hospital. The preliminary results of these studies are the basis for this communication.

Ries in 1899 was the first to report on the subject of early postoperative rising. He had noted that his gynecological patients who rose from bed shortly after operation were considerably stronger, that as a group they had a low incidence of postoperative complications, and that there were no demonstrable ill effects of early rising. The early rising technique was not then widely accepted in this country, but in continental Europe it has been extensively used from 1909 until the present time. The recent revival of American interest in this subject began in 1941 when Leithauser (4) reported a series of 436 cases. Newburger (5) has published an excellent review of the American and foreign literature on the subject and also experimental data of his own (6) from rats. Newburger's experiments showed increased strength in wounds of animals in the early postoperative period if they had been given postoperative exercise. Clinical papers have been published by Leithauser (3), Nelson, Nixon, Powers, D'Ingianni, and Schafer and Dragstedt. All these authors are impressed by the rapid return to full strength of their early rising postoperative patients and by the apparent early reduction of wound discomfort. Almost all of them note a low incidence of pulmonary complications and of deep phlebitis of the legs. The latter three reports are the only ones in which any comparisons are drawn between a series of early rising patients and a control series. The definition of what constitutes early rising has not been very strict as some authors include in this group patients who have risen as late as the 4th or 5th day after operation.

In order to arrive at an accurate appraisal of the results of early rising, cases must be compared under as similar circumstances as possible. Since the incidence of pulmonary and vascular complications appears to vary in different parts of the country, the results of an early rising series in one region cannot properly be compared with those of a control series from a different region. The two series are most accurately comparable if they are observed in the same clinic.

From the Surgical Clinic of the Peter Bent Brigham Hospital, Boston, Massachusetts.

METHOD

In order to emphasize any apparent changes in postoperative complications, this study is limited to the type of operative case in which the complications most commonly occur; that is, patients having major abdominal surgery. Only patients who rose from bed either on the first or second postoperative day are considered in the group of early risers. These are compared with patients who remained in bed at least 1 week after operation.

This study compares 238 consecutive cases in which early rising was practiced with 443 in which it was not. The factors considered as possibly bearing on the incidence of complications were: (1) age, (2) sex, (3) type of anesthesia, (4) type of incision (upper vertical, lower vertical and McBurney).

The operations performed through upper abdominal incisions were on the biliary tract, stomach, duodenum, and spleen. The operations through lower incisions were on the small and large bowel, female internal genitalia, and occasionally the appendix. The procedures through McBurney incisions were all appendicectomies. The suture technique was that of interrupted fine silk to all layers except the peritoneum where continuous chromic catgut was used.

The complications studied were: (1) pulmonary (atelectasis, pneumonia); (2) vascular (phlebitis, pulmonary infarct); (3) wound (disruption, infection).

Our technique of getting the patients up from bed is modeled after Leithauser (4). The patient is turned upon the side on which he has his incision. The hips and knees are flexed. Thus the knees and lower legs are brought to the edge of the bed. The patient is then raised sideways to a sitting position on the side of the bed. The advantage of sitting up in this manner is that as the patient assists in raising himself, he uses the flank muscles on the side opposite from his wound. As the patient sits on the side of the bed his shoes are

TABLE I.—ANALYSIS OF COMPLICATIONS IN EARLY AND NON-EARLY RISING PATIENTS

	First day rising		Second day rising		Non-early rising	
	No.	Per cent	No.	Per cent	No.	Per cent
Total patients	185		53		443	
Complications Pulmonary	9	4.9	4	7.5	35	7.9
Atelectasis	8	4.3	3	5.7	28	6.3
Phlebitis	6	3.2	1	1.8	8	1.8
Infarct	3	1.6	0	0	2	0.4
Fatal infarct	1	.54	0	0	1	0
Wound disruption	2	1.1	1	1.8	12	2.8
Wound infection	5	2.7	0	0	25	5.7
Pneumonia	1	.54	1	1.8	7	1.6
Died	1	.54	1	1.8	10	2.3
Postoperative day of discharge 7th–10th day	62	33.0	15	28.0	61	13.7
11th–13th day	57	31.0	16	30.0	56	12.6
14th–16th day	30	16.0	13	25.0	141	30.8
17th day plus	35	19.0	9	17.0	180	40.6

put on, and then he stands up on a foot stool[1]. While standing on the foot stool, he is encouraged to breathe deeply and to cough several times after deep inspiration. This procedure is less painful than when the patient coughs in bed and is often effective in raising mucous plugs from the bronchi. He is now encouraged to walk 8 or 10 feet before sitting in a chair. On the first rising the patient remains in the chair about 10 minutes, and then returns to bed in the same manner as he rose. Our patients were gotten up twice each day. Usually by the third or fourth day they needed little or no assistance and could rise at will. All the patients were encouraged to move freely about in bed and to breathe deeply several times each hour.

RESULTS

The most striking effect observed in early rising patients is the rapidity with which they regain their strength. In point of fact, they do not seem to *lose* strength. They are more active in bed, and their wounds are less disabling. On the fourth postoperative day most of the early rising patients had very little wound discomfort and got up unassisted. At this time they became ambulatory patients and required very little nursing care. As a result of this early strength and freedom from pain, most of the patients requested that they go home earlier than the non-early rising patients. We did not feel justified in sending our patients home before the seventh to ninth postoperative day because not until then could we consider that the time for appearance of wound infection or disruption had passed. In spite of this, 64 per cent of the early rising patients were discharged before the 13th postoperative day while only 26 per cent of the control group were discharged by this time. At the time of discharge, those of the early rising group were strong and able to do a great deal for themselves in contrast to the group who had remained in bed for 10 to 14 days and were usually discharged 1 or 2 days after getting out of bed.

[1]We have considered it important to put on the patient's shoes, or slippers with heels, before he bears weight as a prophylaxis against deep phlebitis of the leg veins. If the patient is one with short heel cords, he might injure his posterior calf muscles by standing, stepping down from the foot stool, or walking, and a pathological sequence could be initiated that might result in deep phlebitis.

INCIDENCE OF COMPLICATIONS

Table I lists the overall incidence of complications. The complications in the patients who rose on the second day are separated from those who rose on the first day so that a more accurate picture will be given. As this study was begun, we were concerned lest there be a marked increase in the incidence of wound disruption among the early rising group. It is seen that instead of increased incidence of wound disruption, the early rising group had a slightly lower incidence of wound disruption. Likewise the incidence of pulmonary complications was reduced. The incidence of vascular complications, however, was somewhat increased. None of these increments are, as yet, significantly greater than the standard error of their difference, but they point the trend. The trend

TABLE II.—ANALYSIS OF PULMONARY COMPLICATIONS

	First day rising							Non-early rising						
	Number	Pneumonia		Atelectasis		Total		Number	Pneumonia		Atelectasis		Total	
		No.	Per cent	No.	Per cent	No.	Per cent		No.	Per cent	No.	Per cent	No.	Per cent
Incisions (abdominal)														
Upper	84	1	1.2	8	9.5	9	11	198	5	2.5	20	10	25	13
Lower	45	0	0	0	0	0	0	154	0	0	7	4.5	7	4.5
McBurney	56	0	0	0	0	0	0	91	2	2.2	1	1.1	3	3.3
Sex														
Female	118	1	.8	6	5.1	7	5.9	301	2	.7	13	4.3	15	5
Male	67	0	0	2	3	2	3	142	5	3.5	15	11	20	14.2
Anesthesia														
Ether	133	1	.7	6	4.5	7	5.3	408	6	1.5	26	6.4	32	7.8
Spinal	39	0	0	2	5.1	2	5.1	19	0	0	1	5.3	1	5.3
Local	10	0	0	0	0	0	0	14	1	7	0	0	1	7
Age														
12–30 yrs.	63	0	0	0	0	0	0	125	4	3.2	7	5.6	11	8.8
31–60 yrs.	88	1	1.1	5	5.7	6	6.8	232	1	2.3	12	5.2	13	5.6
60 yrs. plus	34	0	0	3	8.3	3	8.3	86	2	2.3	9	10	11	12.8

toward earlier discharge from the hospital is seen in the greater percentage of the test group who were discharged early. This reduction in hospital days required and the fact that the patients who have risen early need less care represents a definite reduction in work for the ward personnel.

Pulmonary complications. The diagnosis of atelectasis was made in our patients on a clinical basis, if there was a postoperative rise in temperature associated with râles and elevated respiratory rate in the absence of other demonstrable cause for fever. The diagnosis was also made if there was x-ray evidence of atelectasis. The incidence in the first day rising group was 4.3 per cent, 6.3 per cent in the late rising group.

Table II is a comparative chart of the pulmonary complications analyzed for their various etiological factors. The familiar greater incidence of atelectasis in upper abdominal vertical wounds is seen in both groups when the cases are divided with respect to the location of the abdominal wound. It is significant that no case of atelectasis occurred in the cases with low abdominal wounds who rose on the first day.

Analysis for the sex factor shows that although the incidence of atelectasis in men who remained in bed was high, it was unusually low in those who rose on the first day after operation. The incidence of atelectasis among the females of the two groups is essentially the same.

The analysis for the type of anesthesia shows no significant variation in the incidence of atelectasis in either group whether ether or spinal anesthesia was used.

The influence of the age factor repeats the familiar pattern of increasing incidence of atelectasis with advancing age in both groups.

Pneumonia was such an infrequent complication that it does not permit comparative analysis.

Vascular complications. The term phlebitis is used in this discussion to include both silent thrombosis (phlebothrombosis) and deep phlebitis of the legs. The diagnosis of deep leg vein phlebitis was made on the basis of tenderness in the calf muscles, associated usually with one or more other signs i.e. a positive dorsiflexion (Homans') sign, edema of the lower leg, or a rise in pulse rate, temperature, or white count. Also if a patient had pulmonary infarct or embolism in the absence of heart disease, a presumptive diagnosis of phlebitis was made. The overall incidence of deep vein phlebitis among the early rising patients is seen to be *greater* than among those who did not rise early (3.2 per cent vs. 1.8 per cent). See Table III.

Analysis of the incidence of phlebitis with respect to the placement of wounds shows that there was no phlebitis recorded in any of the McBurney incisions whether they rose early or not. The females had a higher incidence of phlebitis than the males in the first day rising group. The highest incidence of phlebitis in the non-rising group was in the patients of 60 years or more, but in the early rising patients, the highest incidence was in the group between 30 and 60 years.

TABLE III.—ANALYSIS OF VASCULAR COMPLICATIONS

	First day rising					Non-early rising				
	Number	Phlebitis		Infarct		Number	Phlebitis		Infarct	
		No.	Per cent	No.	Per cent		No.	Per cent	No.	Per cent
Incisions (abdominal)										
Upper	84	4	4.8	2	2.4	198	5	2.5	1	0.5
Lower	45	2	4.4	1	2.2	154	3	1.9	1	0.6
McBurney	56	0	0	0	0	91	0	0	0	0
Sex										
Female	118	6	5.1	3	2.5	301	4	1.3	1	0.3
Male	67	0	0	0	0	142	4	2.8	1	0.7
Anesthesia										
Ether	133	5	3.8	3	2.3	408	8	2	2	0.5
Spinal	39	1	2.6	0	0	19	0	0	0	0
Local	10	0	0	0	0	14	0	0	0	0
Age										
12–30 yrs.	63	1	1.6	1	1.6	125	0	0	0	0
31–60 yrs.	88	5	5.7	2	2.3	232	1	0.4	0	0
61 yrs. plus	34	0	0	0	0	86	7	8.1	2	2.3

This observed increase in the incidence of postoperative deep phlebitis of the legs is not great enough to be of irrefutable statistical significance. But it is significant that our data do not agree with many of the previously published clinical impressions that early rising produces a reduction in the incidence of phlebitis. Early rising is apparently not the answer to the problem of postoperative venous thrombosis.

WOUND COMPLICATIONS

Considerable interest was attached to the possibility of increase in wound disruption which might occur from the increased stress put upon the wound in rising from the bed and walking about. Wound disruption is here defined as any wound in which the fascia is shown to have separated whether or not the peritoneum remained intact. Our data (Table IV) show an actual *reduction* in

TABLE IV.—ANALYSIS OF WOUND COMPLICATIONS

	First day rising					Non-early rising				
	Number	Wound infection		Wound disruption		Number	Wound infection		Wound disruption	
		No.	Per cent	No.	Per cent		No.	Per cent	No.	Per cent
Incisions (abdominal)										
Upper	84	4	4.8	2	2.4	198	11	5.6	8	4
Lower	45	0	0	0	0	154	4	2.6	2	1.3
McBurney	56	1	1.8	0	0	91	10	11	2	2.2
Sex										
Female	118	4	3.4	1	0.8	301	14	4.6	3	1
Male	67	1	1.5	1	1.5	142	11	7.8	9	6.3
Anesthesia										
Ether	113	4	3	1	7	408	25	6.1	12	2.9
Spinal	39	1	2.6	1	2.6	19	0	0	0	0
Local	10	0	0	0	0	14	0	0	0	0
Age										
12–30 yrs.	63	0	0	0	0	125	10	8	3	2.4
31–60 yrs.	88	4	4.5	1	1.1	232	13	5.6	7	3.0
61 yrs. plus	34	1	2.9	1	2.9	86	2	2.3	2	2.3

wound disruption in the test group. Among early rising patients there was 1.1 per cent of wound disruption whereas in the non-rising patients, there was 2.8 per cent incidence of wound disruption. The known higher incidence of wound disruption in upper abdominal incisions was demonstrated in both series. The two McBurney incisions that had wound disruption were those in which drains had been used.

The incidence of wound infection among the early rising patients was 2.7 per cent as compared with 5.7 per cent in the patients who rose late. This group includes all types of infection including stitch abscesses.

It is interesting to note that all of the wound infections in both series appeared in patients with potentially contaminated wounds. Of the 5 patients who had infected wounds in the early rising group, there were 4 patients who had cholecystectomies and 1 patient who had an appendicectomy for acute appendicitis. Of the 25 patients who had infected wounds in the non-early rising group, 11 had appendicectomies, 10 cholecystectomies, 1 a perforated ulcer and 3 a resection of the large bowel.

EVALUATION

We have now observed the technique of early postoperative rising for 3 years. Data on a control series of intra-abdominal operations are presented herewith. The most remarkable observation is that postoperative activity tends to maintain the patient's strength and endurance whereas prolonged rest leads to increasing weakness and muscle atrophy. It also appears that muscle activity in the region of the wound has the tendency to reduce the period of wound tenderness but it does not increase the incidence of wound disruption.

Early rising appears to reduce the incidence of postoperative atelectasis. This may be due to increased respiration and more effective coughing, especially when the patient is standing when his diaphragm can descend to lower levels (3). Since atelectasis most frequently appears during the first 48 hours after operation, the patient should be gotten up as soon as possible within that period if rising is to have a significant effect on preventing atelectasis.

In our experience[1], the incidence of phlebitis or phlebothrombosis of the deep veins in the legs is not reduced by early postoperative walking. Our data agree with the published impression of D'Ingianni who observed early rising patients in New Orleans. There may be certain precautions which can be observed to minimize calf muscle trauma when patients rise from bed. These are, however, equally important at any time in the postoperative period.

There was no greater incidence of wound disruption and infection in our patients who rose early.

SUMMARY

A controlled, preliminary study of early postoperative rising and walking is made on patients having major intra-abdominal surgery. A total of 681 cases were analyzed for postoperative complications and their causative factors. Early rising is defined as rising and walking on the first or second postoperative day.

The patients who rose early were considerably stronger and had less pain in their wounds. They were able to care for themselves on about the fourth postoperative day and were ready for discharge considerably earlier than the control group.

The incidence of wound disruption and wound infection was reduced in the early rising group.

The incidence of pulmonary complications was somewhat lower in the early rising group.

The incidence of deep leg vein thrombophlebitis was observed to be somewhat greater in the early rising group.

[1]It might be postulated that some of the late rising group developed signs of phlebitis of the leg veins at home several days after discharge. If so, it has not been apparent in the follow-up visits which are made 10 days to 2 weeks after discharge.

REFERENCES

1. Allen, A. W., Linton, R. R., and Donaldson, G. A. J. Am. M. Ass., 1945, 128: 397.
2. D'Ingianni, V. Arch. Surg., 1945, 50: 214.
3. Leithauser, D. J. Arch. Surg., 1943, 47: 516.
4. Leithauser, D. J., and Bergo, H. L. Arch. Surg., 1941, 42: 1086.
5. Newburger, B. Surgery, 1943, 13: 692.
6. Ibid., 1943, 14: 142.
7. Nelson, H. Arch. Surg., 1944, 49: 1.
8. Nixon, J. W. South. M. J., 1944, 37: 682.
9. Powers, J. H. J. Am. M. Ass., 1944, 125: 1079.
10. Ries, E. J. Am. M. Ass., 1899, 33: 454.
11. Schafer, P., and Dragstedt, L. R. Surg. Gyn. Obst., 1945, 81: 93.