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Post-operative bed rest

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POST-OPERATIVE BED REST

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I. Introduction

Rest has been used as a therapeutic measure since the beginning of recorded history and before. Its value has appeared so obvious that its true worth has been oftentimes unquestioned.

It came about that rest became very popular in treatment of disease, and rest came to be interpreted as complete bed rest. The advantages of such treatment seemed so apparent that they were not thoroughly investigated, and bad effects were either not noticed or were blamed on other factors. However, as is the case with so many things in medicine, the pendulum began to swing in the other direction. The physiological disruptions caused by enforced inactivity were noticed and investigated. In time the dangers of apparently innocent bed rest began to show themselves and no longer was complete, prolonged bed rest prescribed without forboding because of the potential dangers it might bring with it.

It is my purpose in this paper to discuss the value of complete bed rest as a therapeutic measure following major operations, particularly following operations of the abdominal and of the pelvic organs.

Its advantages and disadvantages will be put forward, and an evaluation of present practices will be made.

II. HISTORY

The history of the proper evaluation of rest in bed is an interesting one and brings into view many opposing ideas and conflicting reports.

For many years no especial attention was given to rest. One of the first men to suspect that its therapeutic value might be in some respects overrated was Heberden (37) who, in his "Commentaries of History and Cure of Diseases" in 1802, mentioned that "sleep disposes the body to be invaded by all those diseases which are peculiarly attributed to the infirm or disordered state of the nerves and among them to apoplexies and palsies." In this same work, while discussing angina pectoris, he stated that although the customary treatment was "quiet, warmth, and spiritus liquors," he had seen one man with typical anginal attacks who was apparently cured by an active life which included chopping wood daily. This fact raised some doubts in his

mind as to the real value of rest.

However, bed rest remained popular and as surgery became more common, post-operative care came to consist in a large part of complete, prolonged, bed rest. Patients were kept in bed for two to three weeks before being allowed even to sit up after major operations. To have an operation in those times meant that, aside from the danger of the operation itself, the patient would spend many weeks in the hospital and in convalescence at home.

It was in 1899 that Ries (71) published his article, "Some Radical Changes in the After Care of Celiotomy Cases." And the changes he proposed were indeed radical. Instead of rest in bed for ten to twenty days after an operation, Ries recommended that patients be allowed up in twenty-four to forty-eight hours and be allowed to return home in four to six days in favorable cases. In defense of his methods he spoke of the excellent results he obtained. His patients were bothered with fewer of the usual post-operative troubles such as constipation, urine retention, and weight loss. They had a short hospital stay and were back to their regular activities in a much shorter time than usual. In addition they were allowed such food as they wished to eat, and, because of their activity and resultant hunger, ate a normal diet

early. Ries in his series of cases used a firm, layer closure of incisions without drainage and had no eventration or later incisional herniation in his series of cases.

This work by Ries brought forth much comment on post-operative rest. There was much severe criticism of his methods, but also a number of men were prompted to try his radical procedures in their own cases. And so, in the next few years, there was active and bitter discussion on early mobility of patients after an operation.

In 1906 Marshall and Quick reported one-hundred consecutive laparotomies with small incisions in which patients were put in a sitting position on the third to fourth day and were permitted to be up on the sixth day, usually leaving the hospital on the tenth day. Patients were allowed to move about in bed as much as they pleased after operations. The results obtained were good.

In 1907 Boldt (9) reported three hundred eighty-four cases of laparotomies in which the patients were allowed out of bed within twenty-four hours. He always used a tight abdominal binder and let the patients walk as soon as they felt able. He had one case of thrombosis in his series of cases and one case of eventration and death which he blamed on a poorly applied binder. Otherwise his

results were quite good.

Vance, (83) in 1907, recommended getting the patient out of bed as early as twelve hours after an operation in uncomplicated cases if proper supportive dressings were applied. However, Chase (14), in 1908, protested that patients were getting too little rest and did not let his patients do any active exercise for three weeks. Frederick (29) in the same year allowed no patient having an abdominal section to sit up before the sixteenth to the eighteenth day after operation.

Chase (14) in 1908 was strenuously opposed to short periods of bed rest after operation. He kept his own patients down for long periods of time. No active exercise was allowed until the patients got out of bed in about three weeks. He said that wounds healed poorly without adequate rest.

Miller (56) in 1912 was convinced that patients should be kept in bed till strong enough to get up whether it be two days or two months. He published no figures.

Tovey (82) in 1918, in reviewing his fifteen hundred abdominal and pelvic operations, treated with early mobilization, highly recommended that patients be allowed to move at will as soon as they regain consciousness and to go home of the eighth to tenth day. He mentions an

advantages: less nausea, vomiting, and distension; earliest spontaneous action of the bowels; less liability to circulatory changes; less weakening of muscles; better assimilation of food; early return to work; and lessened expense. He noted no disadvantages except "The patient does not think much of an operation has been done."

Pool (65) devised a rather complicated series of exercises that could be used by patients in bed as prophylaxis against post-operative complications.

In 1922, Claremont (15) recommended the methods of short post-operative convalescence then in use in Germany be adopted to a greater extent in England. In the same year Rowland (74) suggested that need for rest after operations was greatly exaggerated and suggested that patients be allowed to move as much as they liked in bed from the first, and have freedom of the room after ten days. He stated advantages as being: lessened pulmonary embolism; less hypostatic pneumonia; no muscle wastings; no undue adhesions; less constipation; no delay in wound healing; less expense for the patient. He thought, however, that all cases should be studied individually.

As the movement toward shortening of post-operative rest progressed there was considerable work being done at the same time on thrombosis, pulmonary embolism, post-operative

pneumonias, and other specific troublesome and dangerous occurrences which so often followed operations. As early as 1898 Welch (86) had mentioned stasis of blood as one of the most important etiological factors causing thrombosis. In 1904, Richardson (70) said that he "sometimes thought that venous thrombosis was the result of enforced quiet" and required his patients "to keep their legs moving freely, and at no time to keep them perfectly still."

Wilson (87) in a summary of thirty-six cases of pulmonary and eleven of cerebral embolism mentioned venous stasis as an important factor and advised movement as soon as possible after operation as a phylactic measure.

Lister (48) after a study of one-hundred and ninety-five cases of pulmonary embolism following surgery thought that age and an anterior incision were predisposing factors and recommended muscle exercise and active respiration as prophylactic measures.

Lockhart-Mummery (49, 50) in 1921 stated his belief that mere rest in bed did not lead to thrombosis. In 1924, however, he stated that he thought the most important etiological factor of post-operative embolism was venous stasis.

Gamble (32) in 1935 devised a series of bicycle exercises to be used by patients after the first post-

operative day. Homans (39) recommended elevating the foot of the bed to prevent venous thrombosis. Frykholm (31) recommended raising the head of the bed if the patient could not be up after a few days post-operatively for the same reason.

Leithauser and Bergo (46) in 1941 recommended early rising and ambulatory activity after operation after reviewing nearly five-hundred consecutive cases treated in this manner.

Considerable work has been done also on vital capacity and pulmonary complications following surgery. Powers (68), Patey (64), Corryllos (18), Khromov (43), and McMichael and McGibbon (52) made important contributions in this field.

Other complications following surgery and their relation to bed rest have been investigated to a greater or lesser extent and will be discussed more in detail.

Various post-operative complications whose relation to recumbency have been fairly well established will now be discussed separately.

III. POST-OPERATIVE COMPLICATIONS

1. Hypostatic Pneumonia and Other Lung Complications

Post-operative pneumonia has been, and still is, one of the more dangerous of the post-operative complications. For instance, Pasteur (63) found that there were lung complications in 5.6% of three thousand five hundred ~~fifty~~-nine abdominal operations. Sise (76) found that post-operative lung complications occurred in from 2 to 3% of operations. The incidence was dependent to a large part on the site of the operation. Keeney (42) found that the percentage was about thirty-five of all abdominal operations. The cause of such lung disorders was for a long time a topic of dispute. It is now known that several factors are at work. First, aspiration of infected material into the bronchi at the time of operation is of importance. Secondly, there may be blood borne infective agents carried to the lung. Of major importance also are factors which are produced by recumbency.

If normal individuals are kept in bed flat on their backs, there is an average reduction of about 340 cc. in the total volume of air in the lungs, and the total volume

of blood in the pulmonary vessels is materially increased according to McMichael and McGibbon (52) based their figures on work done at the Royal Infirmary, Edinburg. Other workers have made significant observations on vital capacity and lung expansion after operation. Powers (67) in 1928 observed that, while operations on the extremities and the rectum had no effect on vital capacity, there was marked reduction in vital capacity after abdominal operations, particularly after upper abdominal operations.

Corryllos (18) in 1930 was so impressed with pulmonary deficiencies after operation that he recommended breathing carbon dioxide (5-10%) immediately after operation and every two hours thereafter. At the same time he stated that the patient's position should be changed no matter how severe the operation.

Patey (64) in 1930 showed experimentally that in practically all abdominal operations there was a certain deficiency of expansion of the lung bases and a certain amount of venous stasis post-operatively.

Khromov (43) in 1936 stated that he had found that patients who were confined to bed for four to six days after appendectomies had a temporary reduction in vital capacity of from 36-48%.

It is obvious that conditions such as congestion and atelectasis of lung areas favor the development of post-operative lung complications, and so it is important to combat these conditions in the best way possible. Carbon dioxide breathing is valuable, but also of importance in not allowing the patient to lie quietly in bed without moving. If the patient sits or stands there will be an increase in lung expansion due, in a large part, to the increased exertion, and there will be a clearing of the bronchi due to the upright position of the body. In regards to pulmonary diseases post-operatively, the customary confinement to bed for long periods of time is contraindicated.

2. Thrombosis and Embolism

Venous thrombosis, although not common, is one of the complications seen post-operatively from time to time. Pulmonary embolism, while of rare occurrence, is also seen occasionally after operation, and, because of its sudden, violent, and often unexpected appearance in patients whose convalescence is most often progressing

normally, is to be feared by the surgeons

In 1921, Farrar (28) found that in five thousand seven-hundred ten operations by ten different operators the incidence of pulmonary embolism was 0.19%-5.3%. Henderson (38) found that the incidence of fatal pulmonary embolism in surgical cases coming to necropsy at the Mayo Clinic from 1917-1926 was 6%. In 1939 Rosenthal (73) found the percentage of pulmonary embolism from 1917-1930 was 0.09%-6% in a cross section of the clinics throughout the United States.

In 1940, Culp (19) in an analysis of eight thousand one-hundred sixty-three urological operations found that eighty cases post-operative pulmonary embolism had occurred.

Portis and Roth (66) found the incidence of post-operative thrombosis to be 1-4% in most larger hospitals.

Statistical studies show that thrombosis and pulmonary embolism occur most frequently between the eighth to fourteenth day after operation. Hampton and Wharton (35), Lindsay (47), Barker, Nygaard, Walters, and Priestly. (3)

But what part, if any, does rest play in the occurrence of thrombosis and embolism after operation?

Welch (86) in 1898 in his "System of Medicine" stated

that the three possible etiological factors of thrombosis were 1. intimal lesions, 2. increased coagulability of the blood, 3. and blood stasis.

Richardson (70) in 1904 mentioned that he had "sometimes thought the venous thrombosis was the result of enforced rest" and for that reason required his patients "to keep their legs moving freely, and at no time to keep them still."

Wilson (87) mentioned venous stasis as a factor in fatal post-operative embolism. In a summary of thirty-six cases of pulmonary and eleven cases of cerebral embolism he advised movement as soon as possible after operation as a prophylactic measure.

In 1913, Pool (65) devised a complicated system of exercises to combat venous stasis which he believed was an important factor in post-operative thrombosis and embolism.

Lockhart-Mummery (49, 50) in 1921 contended that mere rest in bed did not lead to thrombosis but in 1924 stated his belief that venous stasis was the most important etiological factor in venous thrombosis after operation.

Mason (54) on the basis of animal experiments, concluded that the principles concerned in thrombus formation are the same as those concerned in normal blood coagulation.

Victor (84) in 1925 mentioned post-operative exercises as being of value in the prevention of thrombosis and embolism.

Lister (48) in a discussion of the causation of pulmonary embolism following operation, reviewed one-hundred and ninety-five cases of pulmonary embolism following surgery and decided that age and an anterior incision were predisposing factors. He recommended as early prophylactic measures muscle exercise and active respiration.

Brooks and Carroll (10) found that rest per se does not materially alter the normal blood pressure. Ellis (27) showed that moderate exercise increased venous pressure.

Dawbarn and Earlam (22), in an excellent bit of experimental work, added another factor to the causative factors of thrombosis. They worked with blood platelets and found that platelets showed a general tendency to increase after surgical operation, and, at the same time the coagulation time shortened slightly. The rise began about the sixth day, reached a maximum (average 150%) in ten days, persisted for a few days, and a normal figure was reached in about three weeks. The degree of platelet rise seemed to be related to the severity of the

operation (tissue damage). Age and confinement in bed per se did not cause a rise in the platelet count. Thus another factor is added to the etiology of venous stasis after operation.

Decourcy (23) in 1929, stated his belief that venous stasis was the most important etiological factor and recommended Fowler's position after operation to facilitate venous return.

Gamble (32) devised a complicated series of bicycle exercises beginning first day post-operatively and got the patients out of bed early.

Barnes (4) in 1937 in a study of pulmonary embolism found cardiac disease was the most outstanding predisposing factor and impaired venous return of much importance.

Barker and Counseller (2) emphasized minimal tissue trauma during operation, care in transfusing, early exercise of extremities, and administration of thyroid.

Ochsner and DeBakey (61) demonstrated that vasospasm is present in cases of thrombophlebitis.

Homans (39) recommended elevating the foot of the bed to prevent venous stasis and in 1940 Frykholm (31) recommended that patients be allowed up in a few days post-operatively, or if this was not possible to lower the foot of the bed so the patient would use the lower

leg muscles to maintain position in bed and thus increase venous return.

Smith and Allen and Craig (77, 78, 79) did some excellent work on venous circulation time in the normal and post-operative case. The sodium-cyanide method used for determining circulation time and results showed a low margin of error. In a normal person a twenty to forty per cent decrease in foot to carotid sinus circulation time was seen following moderate active exercise of the extremities. Elevation of the extremities decreased the circulation time to some extent. Warming the skin also decreased circulation time some what. After operation the arm to carotid sinus circulation time was only slightly affected. However, the foot to carotid sinus circulation time was at first decreased for a few hours, became greater than normal on the second day, and was about fifty per cent greater than average on the tenth day. Administration of dessicated thyroid maintained a normal rate of venous flow post-operatively. These experiments showed conclusively that venous stasis did occur post-operatively and showed also that exercise of the extremities was of much value in maintaining a more nearly normal venous return.

Ochsner and DeBakey (62) in an authorative article

written in 1941 state that immobility after operation is definitely undesirable as far as thrombophlebitis and phlebe-thrombosis are concerned. Immobility decreases cardiovascular activity and leads to venous stasis,

Hunter, Robertson, and Snyder (41) in a study of three hundred fifty-one autopsies found a high percentage of thrombosis of deep veins of the leg and recommended active movement of legs immediately after the patient was returned to bed.

Walters (85) stated that he had given desiccated thyroid and exercises in four thousand five-hundred surgical cases and had but four cases of pulmonary embolism.

So it would seem that a large number of observers are agreed that venous stasis is a more or less important factor in thrombosis and pulmonary embolism. Almost all men favor early post-operative movement of the legs as a prophylactic measure against thrombosis and many are of the opinion that early rising and walking after operation is of even more value, which seems entirely logical. Thus it appears that long periods of bed rest are contraindicated also because of the greater possibilities of venous thrombosis and pulmonary embolism.

3. Bowel Habit Disruption

Bowel habits and constipation are subjects of which the layman knows little and discusses much. A man's bowel habits are often poor, and of women it has been said with some truth the "they are constipated bipeds with back-aches." Even in the favorable environment of their own bathrooms many persons have difficulty with their daily evacuations. But put these people flat on their backs on a hard hospital bed, in noisy, unfamiliar surroundings with privacy at a minimum, and almost without exception there will be a resultant constipation. Add the factors of illness and a surgical operation to this bed confinement and they will even more surely have bowel troubles. Various enemas and laxatives will be necessary to promote "normal bowel function."

However, if the patient following surgery is allowed up early the situation is often markedly improved. A number of factors are involved. First the patient will not have to use that device called the bed pan by some and often called other things by those who must use it. Because of the unnatural position one must assume to use this thing, defecation is often made difficult. Also there is the matter of lack of privacy which is often a

psychic detriment here. When one is in bed in a hospital his complete daily schedule is rearranged to fit the hospital and often that is of great importance in bowel disfunction as habits formed through the years are forcibly changed.

Of primary importance is the fact that after operation the patient's diet is unnatural for a variable length of time. Soft, non-residue foods are eaten which naturally take some time to fill an already empty colon. If the ordinarily is stimulated by the activity and as a consequence a more normal diet is taken earlier than if the patient were to remain flat on his back for a longer period of time.

Many men have commented on the lessened amount of bowel disfunction when patients are allowed to return to normal activity early. A few among them are the following: Ries (71), Rowland (74), Tovey (82), Leithauser and Bergo (46), Nelson and Collins (57) and Dock (24, 25), all of whom based their convictions on clinical observations.

It seems that the more general opinion is that prolonged rest is an important factor in bowel disfunction after operation.

4. Urinary Excretion

Another bodily function that frequently fails to maintain normal activity is urinary excretion. Of the various urinopathies occasionally found post-operatively the one found most often is urinary retention. The frequency of urinary retention after operation is quite variable and depends to a large extent upon the nature of the operation and the age of the patient. However, its frequency is such that it is a troublesome detail for the surgeon and an uncomfortable one for the patient.

Almost all surgeons hesitate to use the catheter unless other methods fail. But what other methods are available? First there is the old trick of letting the patient listen to running water which is seldom effective. Then there are the hot stupes applied to the suprapubic region which might work occasionally. Drugs are often of value but many hesitate to use them. But what about the fact that the patient is lying flat on his back in bed? Many persons who normally completely empty their bladder with no difficulty will have a greater or lesser amount of residual urine if made to urinate while lying flat on the backs. Many cases of post-operative urinary retention may be handled by merely allowing the patient

to be up on his feet for a short while. Bartlett (6) recommended standing by the edge of the bed in stubborn cases or urinary retention. Bickham (7) recommended the same procedure as did Selinger (75) who, however, firmly opposed early post-operative activity.

Rives (72) said "nothing else has half the value of letting the patient sit up or stand and leaving him to his own devices" in urinary retention, but was worried about the risk of eventration. Bancroft (1), Nelson and Collins (57), and Dock (24, 25) all believed that recumbency was an important factor in the retention and noted clinically that activity was of much value.

So it seems that prolonged rest is an important factor in post-operative urinary retention.

5. Post-Operative Distension

Post-operative distention is one of the dreaded occurrences which is seen occasionally after operation. The factors involved in the production of the distension are poorly understood and probably many in number. The part that bed rest plays directly causing a distension is probably a minor one, but it indirectly is of some

importance through the media of gut immotility, poor food intake, and decreased bodily activity. Although no statistics are available on the relation of bed rest to distension after operation is less common in cases that are allowed to return quickly to more normal activity. Tovey (82) noted a lessened incidence of distension in his fifteen hundred surgical cases who were mobilized early after operation. Dock (24, 25) in discussing bed rest thought that it definitely helped lead to distension in some cases. In no instance has there been the opinion put forward that bed rest tends to reduce the incidence of distension or that early activity tends to increase the incidence of it.

So it seems that rest probably is one of the factors, although a minor one, concerned in the production of post-operative abdominal gaseous distention.

6. Backache

Probably no one ever died of a backache, but many patients have had their post-operative convalescence made uncomfortable because of back pain. Such backache may be divided into two types. The first type occurs

immediately after operation, lasts only a day or so, and is due most usually to the fact that the patient during the operation had lain on the flat, unyielding surface of the operation table for some length of time. This causes muscle and ligamentous strain and quite often will cause backache.

However, in many cases the pain will not appear for several days after operation and will then continue throughout the convalescent period. In a good number of cases this pain is due to the prolonged period that the patient has to lie on his back. This is an unnatural position and it is no wonder that many times will cause back strain and pain, particularly in older patients. If however the post-operative period of bed rest is short the back pain almost always will disappear as activity is resumed.

Several factors are also of importance in the back pain. They are muscle atrophy, which accompanies bed rest, and a functional factor, which tends to cause the patient to emphasize any minor annoyances.

Prolonged bed rest, particularly in older individuals, will almost always be associated with backache to some degree.

7. Decubiti

Decubitis ulcer, or bed sore, is a lesion which may be attributed directly to a prolonged bed rest with little change in position. It will occur most often in older people who are inclined to be less active and whose circulation is poor. It is seen more often in hospitals where the nursing staff are either not cognizent of its dangers or are lax in their duties. A bed sore may develop very rapidly on one of the bony prominences and, once present, is very difficult to cure. Blood supply to the lesion is poor, the patient's general health is poor or he would not be lying in bed for such long periods of time, and the areas involved are difficult to keep from later pressure.

The best treatment for bed sore is always prevention. Prevention is accomplished most effectively merely by allowing the patient unrestricted movement in bed, in fact, by insisting upon it, and then getting the patient up and out of bed as early as possible. If this is done, there will be a very low incidence of decubiti during post-operative periods.

8. Mental Trauma

What is the relation of post-operative bed rest to the patient's psyche? Some men are of the opinion that a long, protracted period of rest in bed is of value because of the mental rest which is supposed to accompany it.

This may be true in certain selected cases, but for the average surgical patient bed rest is not conducive to mental rest. In most cases after operation the patient will soon become bored with his whole environment and, because of the long periods of physical inactivity, will find too much time at his disposal for thinking and worrying. In many cases the patient will begin to magnify his prognosis. Other times the patient may begin to worry about financial difficulties, and his continuing convalescence will do nothing to remedy this. It is doubtful that any beneficial mental inactivity is usually present in cases of lengthy post-operative physical inactivity. On the other hand, if the patient is allowed to be up early, he will find his mind occupied with more physical activities and will find less time for brooding. He will be aware of his steady return to normal life and will in turn find little to fear about his prognosis.

Financial worries will be lessened because of the knowledge that he will be returning to work at an early date. He is treated in a manner befitting the severity of his illness.

In some cases, particularly with old prostate patients, there is a real chance of serious psychiatric disturbances after operation. The excitement of the operation and the unfamiliar hospital surroundings are often quite a mental problem for some patients. Various types of psychoses may develop, most of which are temporary, but a few of which are permanent. (Eastman and Kilman (26), Brown (11)). These personality disintegrations may seriously interfere with convalescence by causing the patient to refuse to cooperate. In some cases it may be necessary to allow patients to return to their home surroundings very early.

So it has been found that post-operative rest may, if prolonged, cause mental upheavals and in some cases help precipitate serious and even permanent psychoses.

9. Muscle and Bone Atrophy

Another effect of prolonged bed rest is atrophy of musculature and the bony structure of the body. The

process of decalcification may be demonstrated most readily by observing X-rays of a patient who is confined to bed because of some major fracture. In time the bone will take on a lighter, thinner appearance showing that decalcification is taking place. In most cases after operation this causes little clinical disturbance and is not of importance.

However, muscle atrophy is of much greater importance. Atrophy and atony of muscles occurs when they are inactive. In prolonged, complete, bed rest there is little use made of many muscles and as a consequence atrophy occurs. The patient is aware of this and when it is time to return to normal activity the return must often be quite slow in order to allow weakened muscles to return to normal strength. Old people and obese persons are more frequently affected and the weakening may be quite severe. One of the more common happenings is post-operative flat foot which is seen after patients begin to walk after being on their backs for a long period of time. This flat foot quite often causes a severe backache and makes walking painful for the patient. Oftimes the patient's shoes must have the inner portion of the instep reinforced to maintain the normal weight bearing lines according to Bartlett (5). Muscle weakness may prolong hospital stay and convalescence

and cause the patient great concern.

Short periods of bed rest after operation completely remedy the situation.

10. Wound Healing

The chief argumentative factor against early post-operative eventration and evisceration occur only rarely. Totten (81) in his study of forty-seven cases of post-operative eventration found the incidence to be 0.24% in nineteen thousand four hundred seventy-three consecutive abdominal operations. Southam (80) quoted statistics showing that .2% of abd. ops. are for ventral (post-operative) hernia. For many years opponents of early activity after operation gave the lack of immobilization of the incision as a major cause of eventration. They were of the opinion that any movement of the wound surfaces would slow down the healing process and cause inadequate wound healing. At the present time there is much evidence both clinical and experimental to dispute this contention.

As early as 1898 Bloodgood (8) used a plaster spica after herniorrhaphy to immobilize the wound and promote better healing. This is probably the most extreme attempt

made to immobilize surgical wounds. Since then many workers have stated the necessity of lack of motion. Among these are: Masson (55), Glasser (34), Reid (69).

Proponents of early rising after operation have long contended that wound motility was not an important factor in wound healing failure. Mention was made of improper closure of the incision as a factor by Clute (16), but the fact that very few improperly closed wounds failed to heal helped minimize its importance. They also cited many cases of excessive strain which failed to cause eventration. (continuous vomiting after operation; accidentally falling out of two story window after operation; without causing wound rupture, etc. Freeman (30) thought that a tongue of omentum getting into the incision was very important. He did some experimental work on dogs to support this theory. Various experimental studies were made to determine just how wound healing proceeds after operation. Cutting (21) tested the strength of standard incisions in dogs. He found that immediately after operation the percentage strength was about 36% of normal. This dropped to a low of about 20% at two and one half days, remained at that level till four days and then steadily began to rise reaching 90% strength on the tenth day post-operatively. This showed the normal course of wound healing but cases of eventration were not normal Harvey and Howes (36) studied the effect of high

protein diet to wound healing on incisions of the stomach in rats. They found that the later period preceding the initiation of growth in the healing wound was not affected by a high protein diet, but that once growth started the maximum strength was reached some two days earlier than with a standard diet. Cathcart (13) showed experimentally that "muscular work increased protein metabolism and also led to laying down of protein i.e. to the stimulation of the anabolic process in the broadest sense of the term." Cooperman (12) showed that resting or sleeping for 5-7 hours caused a decrease in the serum protein of 6.3% on the average.

Howes (40) noted that wounds sutured with silk lose strength till the third day. Newberger (58, 59) studied the influence of exercise on wound healing in rats. His findings based on rather conclusive experimental evidence showed that "exercise rather than immobilization was found to hasten the increase in tensile strength of the experimental abdominal incision."

Other recent work has indicated that deficiency of ascorbic acid is of utmost importance in slow or imperfect wound healing. Lanman and Ingalls (44), basing their conclusions on experimental and clinical evidence, concluded that the tensile strength of healing wounds was to a large extent dependent upon the ascorbic acid levels in the post-operative period.

Lund and Crandon (51) in a study of twelve cases of abdominal wound disruption thought that in 20-30% of the cases a low vitamin C level was a major factor in poor wound healing. They also found that patients with a low intake or plasma level of vitamin C had higher percentages of post-operative hernia than those with better intakes and levels. Nixon (60) mentions vitamin C as an important factor in wound healing.

Bartlett, Jones and Ryan (6) conclusively showed that the tensile strength of wounds showing a high ascorbic acid content was much greater than that of those with low ascorbic acid values. In human experiments they found that a decrease in the strength of healing wounds of human skin and fascia would occur when the plasma ascorbic acid level was below 0.20 mg. %. They found that if the ascorbic acid level was low at the time of operation wound healing would proceed satisfactorily if adequate ascorbic acid therapy was continued throughout the post-operative period.

Totten (81) studied forty-seven cases of post-operative eventration quite thoroughly. 40% of his cases occurred on the sixth to the seventh day. 72% occurred from the sixth to the tenth day. This is at a time when the strength of an incision normally is fast regaining a normal tensile strength. He stated that in only two cases was undue activity thought to be of an etiological importance.

When one considers the marked intra-abdominal strains that occur so frequently in patients even while lying in bed, such as coughing with the glottis partially closed, takes into consideration the infrequency of eventration in cases that are mobilized early, notes that eventration occurs after normal wounds are beginning to regain normal strength, and studies experimental evidence, it seems unlikely that early post-operative activity is of any danger as far as breaking down of the wound is concerned. Break-down of wounds seems to be due almost entirely to some metabolic disturbance in nearly all cases.

11. Convalescent Period

The convalescence period is of great importance to the patient and the surgeon. Short, non-complicated post-operative courses tend to show that the surgeon is capable and does not get into difficulty with his cases. To the patient a short convalescent period is important because in most cases time lost due to illness is also a loss in income and usefulness.

Long periods of bed rest, if proven to be necessary, should of course be used. However, facts tend to show

that long recumbency is often of no value and often offers added dangers to the patient. If this is the case, it is definitely unfair to the patient to make him remain in bed for long periods which actually hinders his return to normal productive activity. If it is possible to shorten a patient's hospital stay and shorten his total convalescent period without taking any chance of added morbidity or mortality it should certainly be done.

12. Expense

It almost goes without saying that a patient will welcome any lessened expense if unnecessary services are dispensed with. By allowing a patient early mobilization after operation his hospital stay will be greatly shortened. This saving of money for the patient will certainly be welcomed by him and in many cases will be vitally important to him. Of course, expense should not be placed before adequate medical attention, but, if such attention is not necessary or advisable, the lessened expense will certainly be appreciated.

IV, PRESENT DAY PRACTICES

At the present time opinion is still divided between long and short post-operative rest periods, but opinion seems to be definitely toward shortening the time spent in bed and in the hospital after operation. In general the older surgeons are disposed to keep their patients in bed for longer periods than the younger men.

Actual statistics of series of patients who were given shorter hospital convalescences are not common. Most of the published material is based on clinical opinion rather than actual statistical evidence. Very little has been said in defense of longer post-operative convalescence and what has been said is based even more on simple opinion only. For instance, Cutting (20), in 1932, recommended keeping patients in bed until the union of wound edges was secure but was indefinite as to how long this would be.

The actual practices of some who favor early ambulatory activity are of interest.

Leithauser and Bergo, (46) in 1941, used the following regime in three hundred seventy consecutive cases of appendicitis (not ruptured). For the first twenty-four hours the patients were turned frequently, told to be active, and took breathing exercises. On the first post-operative day, if condition was satisfactory, patients

were assisted to sit on the edge of the bed, then in standing by the bed for deep breathing exercises. In each position they took deep breaths and coughed. After this they were allowed to walk around the room and sit in a chair for a few moments and then put back in bed. They left the hospital by car and routinely presented themselves at the office on the sixth day for the first dressing. Most patients were allowed to do light work on the eighth days and heavy work on the fourteenth. The average confinement to bed was one and a half days and the average period of hospitalization after operation was two and three tenths days. In sixty-six other cases of assorted major surgery the average time in bed after operation was one and nine tenths days, and the time in the hospital was eight and nine tenths days. No pulmonary or vascular complications of any kind were seen in this series of cases except one hemorrhage from a peptic ulcer which was uncontrollable. The authors stated that the regime could not be used if there was undue rigidity, distention, shock, or an insecure wound present. The patients who were up earliest had the best clinical course.

Nelson and Collins (57), in 1942, presented a series of sixty consecutive cases of major abdominal and gynecological operations in which the patients were allowed to be up very early. In fact the patients were given bathroom

privileges within twenty-four hours post-operatively.

The author noted less post-operative weakness, quicker return of bowel and bladder function, more rapid convalescence and a lessened morbidity in general. No post-operative complications were noted in this series of cases.

In 1943 Leithauser (45) cited his experience with early rising of nine hundred cases of all types of abdominal and pelvic surgery. He recommended confinement to bed for only twenty-four hours, after operation. He found healing was promoted, convalescence shortened, and no serious complications were seen. A few of his figures are:

OPERATION	DAYS IN BED	DAYS IN HOSP.	TOTAL CASES
acute appendectomy	1.2	2.3	487
cholecystect- omy	1.3	7.8	43
indirect ing. hernia	1.1	6.8	41
pelvic operations	1.4	7.4	49

In 1944 Powers published figures on his experiment of treating one hundred alternate cases with the usual ten to fifteen day period of bed rest. The one hundred cases that were allowed up early were allowed to sit in a chair and walk on the first post-operative day. Fewer complications were noted with early rising (17 compared with forty-six with late rising--all types of complications

were included.) His figures are as follows:

	EARLY RISING	LATE RISING	CASES
Hernioplasty			
In hosp.	9.1 da.	15.2 da.	39
Convales.	5.6 wk.	10.0 wk.	39
Appendectomy			
In hosp.	8.5 da.	13.7 da.	22
Convales.	4.8 wk.	8.7 wk.	22
Cholecystectomy			
In hosp.	13.4 da.	20.8 da.	14
Convales.	5.9 wk.	11.6 wk.	14
Abdomino-pelvic			
In hosp.	11.7 da.	16.7 da.	25
Convales.	6.7 wk.	11.6 wk.	25

This work was rather well controlled and is of some significance.

Campeanu (1^o), in 1939, allowed very early activity after operation. In cases done under local anesthesia he had patients get off the table and move around immediately after operation. In one thousand three hundred cases he noted quicker recovery with shortened convalescent periods and noted no complications.

Some other excellent articles on the general abuse of bed rest have appeared in the recent literature. Ghormley (33), in 1944, pointed out the fact that the dangers of bed rest are being recognized to greater and greater extent by orthopedic surgeons.

Dock (24, 25), also in 1944, in an excellent article lists the various evil sequelae of complete bed rest.

The supporters of the longer periods of post-operative inactivity have published very little recently to support their beliefs. Much of their material is clinical opinion only and is not based on really accurate observation. Their part is merely a passive one and they try to show not that long post-operative inactivity is beneficial but that short inactivity is hazardous. It seems that their case is the weaker one.

V. CONCLUSIONS

Post-operative bed rest and problems related there to have been discussed and the literature reviewed. Present day trends and practices as related to post-operative rest have been presented.

From the evidence presented it seems that:

- 1) Post-operative bed rest has been generally over-emphasized in the past.
- 2) Prolonged bed rest is of doubtful beneficial value after operation.
- 3) Many dangers and inconveniences are related to lengthy post-operative bed rest.

- 4) At the present time the general trend is toward shortened post-operative inactivity.
- 5) The dangers that are often prescribed to early post-operative activity are in many cases not attributable to it.
- 6) Advantages of shortened periods of inactivity after operation are many.

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