Observations on the Activity of Surgical Patients

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Brit. med. J., 1964, **1**, 669-670

The effect of early ambulation on post-operative complications has been a topic of discussion and disagreement between surgeons for many years. Recently I spent three months in a surgical ward studying the effect of surgery upon muscle blood-flow. I was in the wards continually from 9 a.m. to 6 p.m. every day, taking measurements from many patients, and during this period I observed and recorded their activity. I was surprised by the results of the latter observations and felt it worth while to extend and present them as a short paper.

Time Spent in Bed each Day

The activity of surgical patients can be divided into that occurring when up and that occurring when in bed. The first objective of this study was to discover how many hours the patient spent in each of these two states.

Seventy patients were asked to keep an exact record of the time that they spent in and out of bed during their stay in hospital and of the nature of their activity when up. Fifty did this adequately. The normal ward routine was as follows :

6.30 a.m.	Awakened ; cup of tea	12.15 p.m.	Lunch
7.00 a.m.	Up for washing	2.00 p.m.	Back to bed for afternoon rest
8.00 a.m.	Breakfast	3.30 p.m.	Up for tea
9.00 a.m.	Back to bed for morning rest and ward rounds.	6.00 p.m.	Supper
11.00 a.m.	Up. Free activity	8.00 p.m.	Bed for the night

All the patients followed this routine. It meant that the fit man awaiting operation spent 15 of every 24 hours in bed. The nine hours out of bed were spent sitting reading, eating, or talking—and only a small proportion of this time was occupied in active exercise. Even visits to special departments consisted mainly in sitting in a waiting-room.

Fifteen hours in bed each day (63%) contrasts markedly with life out of hospital, where the average daily period of bed rest is eight hours (33%).

All 50 patients had an operation, and they all kept their daily activity record through the post-operative period. The results are shown in Table I. They are presented as the average number of hours spent in bed each day.

Although early ambulation was encouraged it can be seen that the period spent out of bed on the first two days after operation was very small. The normal routine was re-established by the sixth day. The individual figures, not detailed here, from which Table I is obtained can be presented in two ways.

TABLE I.—*Time Spent in Bed, Before and After Operation*

	Pre-operation	Operation	After Operation (Days)					
			1	2	3	4	5	6
Hours spent in bed each 24 hours	15	24	23¼	21¾	20¼	20¼	17	15

One can consider the number of days that each patient was completely confined to bed after operation. This gives a good impression, for 26 patients had only *one* day of complete rest, 11 had two days, four had three days, five had four days, three had five days, and only one of the 50 had not got out of bed by the sixth day.

If the figures are considered in the opposite manner, stating the time up and the activity while up, a completely different picture appears.

First day: ¾ hour up. Nearly all the patients spent this period sitting in a chair. A few brave souls walked a few yards.
Second day: 2¼ hours up. About a quarter of this period was spent walking about.
Third day: 3¾ hours up. Frequent short walks between periods of sitting.
Fourth day: 3¼ hours up. Frequent short walks between periods of sitting.
Fifth day: 7 hours up. At least two-thirds spent sitting.
Sixth day: 9 hours up. Return to normal pre-operative activity.

The number of hours spent in bed on each of these days was 23¼, 21¾, 20¼, 20¼, 17, and 15 hours respectively. When considered as percentages of the whole 24 hours these figures reveal that an operation only changes the amount of bed rest per day from 63% to a mean value in the first three post-operative days of 90%. ***A much smaller change than that occurring when the patient enters hospital.***

These studies show that one has a false impression about early ambulation and demonstrate that patients in hospital spend most of their time in bed—something we are apt to forget. When we talk to a patient immediately after operation and he says, "Oh yes, I've been up," we must beware of thinking that this means that he has been indulging in any worth-while activity.

It followed from these observations that it was important to know how active patients were when in bed and the effect of an operation on this activity.

Activity of the Calf During Bed Rest

The most accurate method of measuring muscle activity is to record its electrical activity with the electromyograph. This is a very sensitive instrument, too sensitive for the crude quantitative purpose that I required. I therefore measured the activity of the calf muscles by recording the changes of calf circumference produced by the muscle contractions. This was done with a strain gauge made of rubber tubing filled with colloid graphite (Hesse, 1959). The strain gauge was tied round the calf and balanced so that any movement of the

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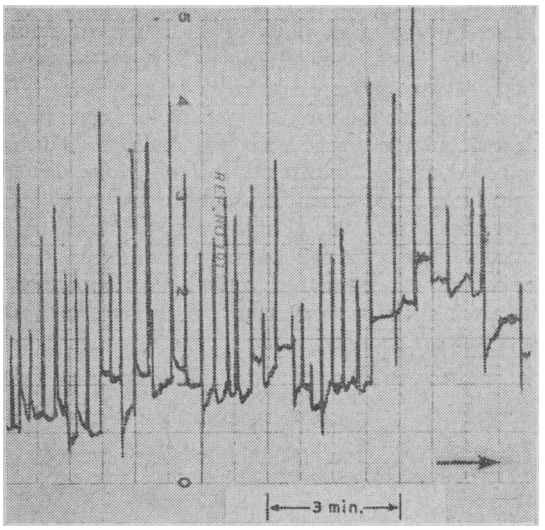
TABLE II.—*Frequency of Calf Contractions When in Bed Before and After Operation (All Subjects Had Recovered from the Anaesthetic and Were Awake)*

		Pre-operation	Hours after Operation								
			2	3	4	5	6	12	24	48	72
No. of contractions per hour	Range	150–240	20–99	40–96	25–96	35–91	39–94	29–100	140–220	162–250	144–250
	Mean	194	52	69	57	65	72	63	179	200	198

foot involving a calf-muscle contraction, producing an increase in circumference of 0.2 cm. or more, caused a shift on a pen writer of approximately 2 cm.

The strain gauge was left around the calf with long leads and the patient told to ignore it. He was purposely not told what it was measuring. At the end of an hour the recording was studied and the number of kicks greater than 2 cm. counted. This was assumed to be the approximate number of calf contractions per hour. The Chart below is a typical tracing.



Tracing showing the frequency of calf-muscle contractions in a fit man before operation (185 contractions/hour).

Ten patients were studied before operation; five of these were studied after operation for the first six hours and then each day for three days. An extra five were examined on the first post-operative day to confirm the findings in the original five. The operations on these subjects included major upper- and lower-abdominal procedures, thyroidectomy, mastectomy, and herniorrhaphies. The results are given in Table II.

The remarkable thing about these figures is the early return to a normal level of activity. As expected, calf movement was greatly depressed immediately after operation, but it rapidly returned to normal. At 12 hours it was on the increase, and was normal in 24 hours.

Discussion

There is no surgeon who will fail to enter an argument on the merits of early ambulation, for every one has his own firmly held views, usually backed up by his clinical impressions. Two things invalidate many of the arguments. First, terms are rarely defined and they have very different meanings to different people. Secondly, "clinical impressions" invariably hide ignorance of the facts. The facts that I have presented show that a surgical operation has much less of an effect on a patient's mobility than expected, for his amount of bed rest only increases by less than half (63 up to 90%) and his calf-muscle activity when in bed is only diminished for the first 12 to 24 hours.

I do not deny that patients undergoing operations are very inactive. The mistake everyone makes is to put the blame on the operation. This is wrong. It is the admission to hospital that is to blame, for at this time bed rest per day increases by 100%, the corresponding period of activity is halved, and this activity is much less vigorous. The correct statement is: patients *in hospital* are inactive.

A number of workers have shown that early ambulation after operation does not alter the incidence of deep-vein thrombosis (Blodgett and Beattie, 1946). This is not surprising if operations do not cause any gross increase in the period of immobilization. Hospitalization does increase the incidence of deep-vein thrombosis, for we rarely see it in an out-patient with normal leg veins, yet it often occurs in all types of in-patient—medical, surgical, and obstetric (I know of no published statistics to support this belief). I would guess that the abolition of hospitalization—that is to say of any form of rest in bed—would reduce the incidence of thrombosis and embolism. This is, of course, neither possible nor desirable, but I make a plea as a result of these studies that the long-standing conception of a direct causal relationship between post-operative bed rest and thrombosis be abandoned, and ask that the two factors, bed rest and the operation, be considered separately in their own right.

Operations may cause deep-vein thrombosis, but there is no evidence to confirm the widely held view that it is due to the associated immobilization.

Summary

The activity of surgical patients before and after operation has been examined by recording the time they spent in bed each day and by measuring the activity of the calf muscles while in bed. It is shown that the greatest reduction in activity occurs on admission to hospital, not at the time of operation, and that the activity of the calf muscles while in bed is reduced only for the 12 to 24 hours immediately after operation.

As the changes in activity imposed by operation are surprisingly small it is suggested that they are unlikely to be responsible for post-operative deep-vein thrombosis.

I thank Professor R. Milnes Walker and Mr. J. H. Peacock for permission to study their patients. This work is part of a thesis submitted for the degree of M.D. Bristol.

References

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