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A NOTE ON

THROMBOSIS IN THE VEINS OF THE PELVIS AND LOWER EXTREMITIES AFTER OPERATIONS.

BY K. G. LENNANDER, HON. F.R.C S. ENG.,
PROFESSOR OF SURGERY IN THE UNIVERSITY OF UPSALA.

(Translated from the Swedish by I. Walker Hall, M.B. Vict., Senior Demonstrator of Physiology, Owens College, Manchester.)

SOME remarks of mine upon this subject appeared in the Upsala *Lakare Förenings Förhandlingar* of January, 1899, and in the *Centralblatt für Chirurgie*, 1899. The results obtained during 18 months following July, 1897, led me to suggest that after every herniotomy or abdominal operation the patient's bed should be raised at its lower end some 10 to 50 centimetres (from 4 to 19 inches) in order mechanically to assist the venous blood flowing from the lower extremities towards the heart, and so preventing thrombosis. This could be best accomplished by placing square pieces of wood under the feet. By such means the change in the position of the body caused the blood to flow along a plane inclined towards the inferior vena cava, and if the shoulders were not raised equally so towards the right auricle. Such a raising of the bed must therefore also make the flow of the blood from the veins in the true pelvis and from the exterior genitals more rapid than in the horizontal position. When the blood-stream has reached the inferior vena cava it will certainly be impelled towards the heart by the negative pressure in the thorax at every inspiration. Since January, 1899, this procedure has been adopted up to date in my practice and no case of thrombosis in the pelvic or lower extremity veins has

occurred during three years. As a rule the foot of the bed is raised from 15 to 30 centimetres (from six to 12 inches) but during convalescence it can be lowered to from 10 to 15 centimetres (from four to six inches), and the latter height ought to be maintained in many cases even when the patient has returned home. In cases of cardiac lesions or cardiac debility and in those of local venous changes the elevation is even more important. The elevation should then be from 25 to 40 or 50 centimetres (from 10 to 15 or 19 inches) for the first few days. Cardiac tonics, digitalis, camphor, strychnine, and subcutaneous or intravenous saline injections should be administered before and after narcosis in all cases of cardiac debility. With famished and emaciated patients subcutaneous injections may be given of from 500 to 1000 cubic centimetres (from 17 to 35 ounces) of solution of grape sugar (strength from 5 to 10 per cent.) as well as injections of olive oil, from 50 to 200 cubic centimetres (from one and a half to seven ounces) in 24 hours with from 2 to 3 per cent. of alcohol. The injections can be given in such a way that from 5 to 10 per cent. dextrose and from 2 to 3 per cent. alcohol may be added to normal saline solutions, but 10 per cent. dextrose solution causes pain during and after injection and shows a little sugar in the urine. It is equally important to suit the narcosis as far as possible to the patient's condition (viz., morphia, $CHCl_3$, ether combined with local anæsthesia, &c.) in order to maintain the circulation and in this way prevent thrombosis.

According to Ziegler thrombosis is caused (1) by slowing of the blood-stream, and (2) by local vascular changes. In laparotomy and hernia patients there are several conditions leading to slowing of the blood-stream and more particularly in the veins of the lower extremities. Many have weak hearts from long illness and are feeble almost to starvation point. Hence after the anæsthetic one often fears fatty degeneration of the cardiac muscle. Furthermore the circulation in the calf of the leg in weak patients may be almost stagnant from the continued supine position, and if there are any varicose veins (especially saccular, where the sacs communicate with the main vessel by narrow orifices) the blood readily stagnates. Laparotomy patients are also frequently troubled by more or less "meteorism" and each increased tension of the bowels increases the intra-abdominal pressure, diminishes the extent of inspiration, lowers the negative intra-thoracic pressure, and so lessens all the forces

which promote the venous flow from the iliac veins to the right auricle.

Local vascular changes, phlebitis, fatty degeneration of the endothelium, &c., may be primarily local, or secondary to infective or autotoxic conditions. Primary vascular changes are always found in patients with varices and in those who have recently suffered from blood clotting. I believe that nothing predisposes more to thrombosis after operations than previous coagulation in the larger veins of the lower extremity or pelvis. Experimental and microscopical evidence points to the probability that a thrombus in circulating blood commences from deposits of the blood plates ("Blutplaettchen") on the vessel walls, between which a small or large number of leucocytes are found. This gathering together of small granules is called "conglutination" by Eberth. If the blood-stream is sufficiently slow coagulation may ensue from the fibrin ferment which is set free from the white blood corpuscles during the act of conglutination. As the result of this united conglutination and coagulation the vessel lumen is rapidly occluded. Distally the coagulation extends in the vessels to the nearest large branch, where the blood-stream is again free. Proximally the blood will also be clotted if the local circulation is sufficiently slow. Hence, we may find a thrombus extending very quickly from the foot all the way upwards through the crural to the iliac veins in a patient who at first only complains of pain in the calf.

In flowing blood fibrin ferment is very quickly destroyed, hence a rapid or normal circulation ensures such destruction. If we then wish to prevent the formation or spreading of a thrombus it is necessary to combat all causes of local stasis. For the pelvic and lower extremity veins the raising of the lower end of a patient's bed should be of considerable mechanical assistance in promoting the flow of blood towards the inferior vena cava and right auricle. The value of this aid may be increased and the patient made more comfortable by frequently altering his position in the bed, and lightly rubbing the feet and legs, provided that he has not already a thrombus. If any varices exist on the distal side of the operation wound in a lower extremity the part should be bandaged from the foot to such a point, the leg should be elevated, or, better, the bed should be raised. This procedure exerts a very much more noticeable influence upon the circulation. By its use I believe we may largely prevent thrombosis following surgical operations, parturition, and

those diseases which are accompanied by intense anæmia and auto-intoxication, in which a tendency towards the complication of thrombosis exists.

I consider myself also entitled to ask physicians to use this suggestion of "bed elevation" for preventing thrombosis. Anæmic patients often rest and sleep better after such an arrangement of the bed. Patients with medium-sized varices on their feet or legs if their limbs have not been bandaged during the day often feel restless and tired with aching in their legs at bedtime and are consequently unable to sleep for several hours. For such persons an elevation of from eight or 12 to 15 centimetres (from three or four and a half to six inches) should be employed at night. After a few nights' experience of the position in question these patients will sleep better and the unpleasant sensations in their limbs will entirely disappear.

Upsala.

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