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**ANALYSIS
OF THE USE ROUTINE
SUPPORT HOSIERY
IN THE THROMBUS EMBOLIC
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INTRODUCTION

The reported incidence of venous thrombosis is increasing in unexpected and troubling way. This is due in part to the improved and more refined system of diagnosis (Doppler speed-meter, phlebography, Scintigraphy by Marked Fibrin), but also to the more frequent cases of venous thrombosis as a perioperational complication.

In the U.S.A, almost 90,000 deaths every year are caused by thromboembolism of the lungs after surgical operations; 21.000 cases per year are registered in the U.K.

According to some reports, the development of venous thrombosis after surgery occurs in 30% to 60% of people over 40 years of age, depending on the type and duration of the surgical procedure.

In 50% cases, venous thrombosis is asymptomatic. In the same percentage appears up during the intervention, with 40% of cases occurring immediately after surgery. In 95% of case gets to the pulmonary embolism or the post-phlebotic syndrome.

EPIDEMIOLOGY

Clinical researches and anatomic pathological investigations carried out during the last ten years have identified two main categories at risk:

- The first category is at generic risk and includes all those patients who underwent abdominal, gynaecological, or orthopaedic operations;
- The second category is at high risk, and includes all those patients over 40 years who had a positive history for venous thrombosis or embolism, myocardic infarct, serious heart diseases, neoplasia, obesity, use of oral contraceptives, lower limb fractures, varices.

The foregoing should convince all medical operators to adopt an homogeneous prophylactic attitude and to use during the post-operational course all possible instrumental researches in order to identify the problem at an early stage, when and appropriate medical therapy can still be applied.

PROPHYLAXIS

The prophylactic measures that can prevent the venous thrombosis can be divided into two main groups:

- a) Mechanical measures apt to avoid the venous stasis in the lower limbs;
- b) Use of drugs that help to maintain the normal blood fluidity.

Since it is not our aim to examine the pharmacologic aspect, we shall analyse only the problem regarding the removal of the venous stasis.

We already spoke of the high percentage of venous thrombosis arising during surgery or in the immediate post-operational stage. We know that the horizontal decubitus on the operating table during surgery, in total relaxation, leads to an important decrease of the venous reflux speed with accumulation of blood in the lower limbs, still worsened by the flexion of the legs on the thighs and of the thighs on the pelvis.

This stasis can be emphasized by any stretching and compression manoeuvres on the blood vessels, or in case of hypotension during surgery.

The physical prophylactic means to be used are:

1. Use of support stockings;
2. Early mobility of the patient;
3. Muscular active exercises of the legs.

Other methods, such as the electric stimulation of the leg muscles during surgery, the rythmical foot compression using a pneumatic ankle-boot, or the back flexion of the foot during surgery using mechanical pedals, have been used and then discontinued for logistic reasons.

Active muscular exercises and early mobility of any post-operational patient are common practise anywhere.

On the contrary, the use of the elastic compression therapy still meet with quite a different an attitude. As a matter of fact this therapy still usually confined to particular cases, and practised through the use of bandages.

On the basis of what previously said, and emphasising the high number of asymptomatic thrombus-embolism, it is hard to understand why this prophylaxis is not standard practice when it should be advisable to make it of compulsory use, taking into consideration the cost to advantages ratio, favourable at length to the last ones.

There are no substantial physiological or hermodynamical differences with regard to the use of the support methodology in respect to the other one; in favour of the support stocking is the easier use.

The bandage has always to be applied by a doctor that must ensure the correct graduated compression, while the stocking can be applied directly by the patient, helped just in case by the hospital attendants.

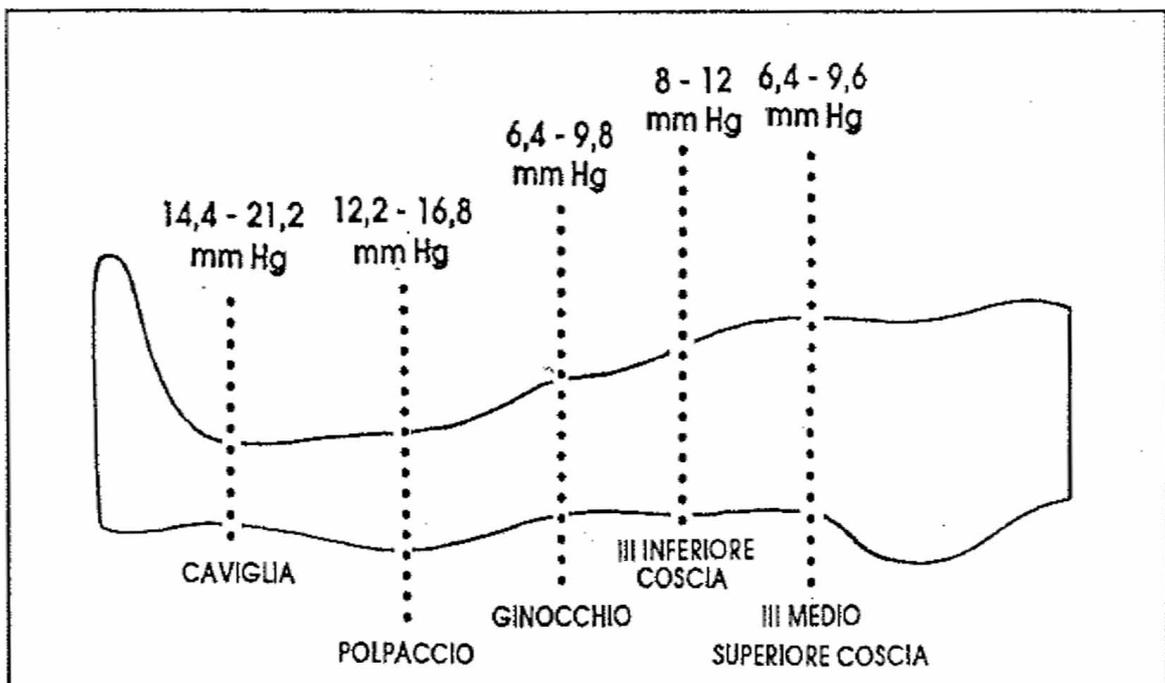
The contra-indications to the use of the support therapy might be either general or local. To the first group belong the oedema or pre-oedema of the lungs caused by cardio-congenital insufficiency and arteriosclerosis with serious peripheral ischemic risk; to the local ones belong the lower limbs dermatitis, the wet or dry suppurative courses, the dermo-epidermic graft recently made, the deformity of the lower limbs and the massive oedema.

CHOICE OF THE MATERIAL

Therefore, independently from the above mentioned pathologies, each single patient, a candidate for an surgical operation, should submit oneself to prophylaxis requested by each single case.

Today there are various companies producing support hosiery that meet the clinical requirements of Siegel (pioneer of the thrombus embolic prophylaxis studies). He has mentioned the requirements in his numerous thesis:

a wide range of sizes and models - to be able to answer all different anthropometrical needs, and above all, the real compressive values, decreasing and gradual from ankle to thigh, considered efficacious if between the values indicated on the below table:



These parameters enable, in a lying patient in narcosis, a sufficient speed of blood pressure gradient to avoid the stasis of superficial and deep veins, and to not create the decrease of arterial flow, as demonstrated in the following works of Siegel, Kakkar and Arnoldi.

The producers naturally has adapted the construction methods of the compression hosiery in way to obtain the compression values as mentioned

above to guarantee the efficacy of the products. Also, the application of the right size and model for every patient.

The producer can obtain with the proper compression hosiery the optimal result only by offering a wide range of sizes and models to satisfy the numerous anthropometrical variants of lower limbs, and by producing models that answer in every segment to the Laplace law, where the exercised pressure on a cylinder radius (R) is equal to the tension (T) of the texture, divided with R , that means that the pressure that the compression hosiery has to exercise, is in function of the proper limb where the hosiery is applied on.

Regarding the length of the product to be used, there are different vision discrepancies of different authors, some like Porteous sustain that the stocking and knee-high have the same efficacy, and some others sustain that the femoral flow is accelerated if used the pantyhose.

The last, but not less important parameter to be considered is the resistance to washing. Thomas has analysed, in a recent work on efficacy of compression hosiery, an elevate number of available products in UK, after being washed 10 times, and obtained more than discreet results.

ANALYSIS OF A NEW PRODUCT

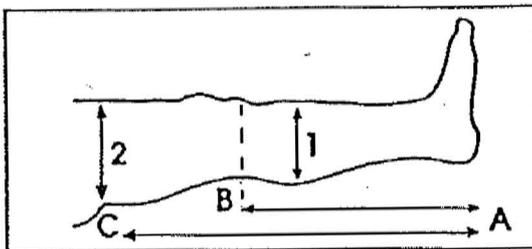
We have been commissioned by IBICI S.p.A to make a preliminary study of “anti-embolus” hosiery of recent production.

The study includes:

- one regular length knee sock and one long knee sock
- one regular stocking and one long stocking
- one regular pantyhose and one long pantyhose

Each of these 6 models have been produced in three sizes: Small, Medium and Large.

The following table shows how to choose correctly the right garment size.



AB - lunghezza della distanza dalla pianta del piede al poplite
 AC - distanza dalla linea glutea alla pianta del piede
 1 - circonferenza massima del polpaccio
 2 - circonferenza del III superiore della coscia

COLLANT		CIRCONFERENZA ALLA COSCIA	CIRCONFERENZA AL POLPACCIO	LUNGHEZZA A-C	
				REGOLARE	LUNGA
	PICCOLA	MENO DI 60 cm.	MENO DI 32 cm.	FINO A 71 cm.	DA 71 cm. IN SU
	MEDIA	MENO DI 60 cm.	DA 32 A 39 cm.	FINO A 73 cm.	DA 73 cm. IN SU
	GRANDE	DA 60 A 80 cm.	DA 39 cm. IN SU	FINO A 73 cm.	DA 73 cm. IN SU

CALZA		CIRCONFERENZA AL POLPACCIO	CIRCONFERENZA COSCIA	LUNGHEZZA A-C	
				REGOLARE	LUNGA
	PICCOLA	FINO A 32 cm.	FINO A 60 cm.	A-C SINO A 83 cm.	OLTRE 83 cm.
	MEDIA	DA 32 A 39 cm.	FINO A 60 cm.	A-C SINO A 83 cm.	OLTRE 83 cm.
	GRANDE	OLTRE 39 cm.	DA 60 A 80 cm.	A-C SINO A 83 cm.	OLTRE 83 cm.

GAMBALETTO		CIRCONFERENZA AL POLPACCIO	LUNGHEZZA A-B	
			REGOLARE	LUNGO
	PICCOLA	FINO A 32 cm.	MENO DI 40 cm.	DA 40 A 44 cm.
	MEDIA	DA 32 A 39 cm.	DA 40 A 45 cm.	DA 45 A 49 cm.
	GRANDE	DA 39 A 49 cm.	DA 45 A 47 cm.	DA 49 cm. IN SU

The pressure values of each product have been analysed in live with pressure-meter type Borgnis, and the results are corresponding with those required by the study of Siegel, as reported on the table on page 6.

We've noted oscillations between different models:

- between 16,1 and 18,5 mmHg on ankle
- 12 and 13,5 mmHg on calf
- 8,5 and 9 mmHg on knee
- 10 and 10,5 mmHg on 3rd superior.

Based on this experimental data and on the notions on the global literature since 1952 until today, we've started to use the IBICI anti-embolus hosiery by posing again a wider clinical study in the nearest future, by committing on all patients of abdominal surgery the compression hosiery associated to the calciparine prophylaxis on the risk patients, as well as by controlling in serial way the immediate post-operation until the 4th day after operation with Doppler sonography the veins of lower limbs.

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