Many surgeons have objected to any ligation of the saphenous vein short of its junction with the femoral vein. Some have even stressed the necessity for ligating the small tributaries (superficial epigastric, etc.) that flow into the vein at this level. In spite of these theoretical objections there is no doubt that ligation at a low level is effective. Is it permanent? Possibly not, but this slight procedure is so rapid and easy for both surgeon and patient that it is certainly worth doing, even though no lifetime guarantee is attached. In any case, we are living in times when it is probably wise to follow a short-term policy in such matters. If we can bring a man, and more especially a soldier, into a higher category for the duration of the war it is worth while.

Summary

A new and simple method is described for the complete subcutaneous ligation of varicose internal saphenous veins. It has the advantage that the operative treatment is complete at one sitting and that no incision is necessary. The treatment is ambulatory.

POST-OPERATIVE RESPIRATORY COMPLICATIONS IN SERVICE CASES

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Being struck by the high incidence of post-operative respiratory complications in Service cases as compared with those occurring in civilians, and noting that Kaye (1941) and Binning (1940) have described similar experiences, we decided to keep a record of a series of consecutive cases in an attempt to find some causative factor.

A record was kept of the age, operation, premedication, type and amount of anaesthetic, duration of anaesthesia, any unusual incident during anaesthesia, and any post-operative complications in a series of consecutive cases undergoing surgical procedures at an E.M.S. hospital. The patients were all members of H.M. Forces, the great majority of them anaesthetic-resistant subjects in the "pink" of physical condition. Many of them had that type of "dust and tobacco pharyngitis" described by Kaye (1941). The wards were remote from the operating theatre, necessitating a journey in the open air to and from the theatre.

Clinical

The cases developing post-operative respiratory complications all followed a very similar course. The temperature rose on the second, third, or fourth day to a point between 100° and 102° F., with cough and purulent sputum. All had moist sounds in the chest, which were usually most noticeable at the base on the side operated on. The signs were those of a simple bronchitis, and only three had signs of consolidation. If the temperature rose above 101° F. sulphapyridine was given; but the course did not seem to be materially altered by this, for in four days from the onset of symptoms most of them had settled down to normal, the sputum had become very scanty, and what there was of it was colourless and frothy.

All patients were operated on at the earliest opportunity, the majority on the day after admission, so that the risk of their getting any infection in the ward was reduced to a minimum. Most of them were smoking heavily up to the time of operation, and at one time, from February to April, all patients operated on for hernias and appendicitis were forbidden to smoke till after the fourth day. It was not found that stopping smoking after operation had any effect upon the incidence of complications, and non-smokers were affected as well as smokers.

It was soon apparent clinically that the power to cough and to breathe deeply were factors, and we began to institute measures to encourage free movements and deep breathing. For the 24 hours after operation all men operated on for abdominal conditions were given inhalations of carbogen for ten minutes every two hours when awake. This did not make any difference that we could detect. We then began to get

all these cases out of bed the day after operation; from the second day they stayed up longer, and were encouraged to walk if they wanted to. This procedure was continued even when the temperature rose, as the men soon found that they were able to cough much more easily when sitting in a chair than when propped up in bed. This routine was adopted after a personal communication from Lawrence Abel. On the first day the patients move out of bed rather unwillingly, on the second day they are quite willing to sit by the fire, and on the third or fourth they begin to walk about the ward and to go to the lavatory of their own free will. This has not lessened the incidence of complications, but it has diminished the time taken for recovery and has possibly been a factor in the avoidance of a real pneumonia. Before we started getting these cases up three men developed consolidation, but since that time we have had only one case, to be described later. When treated in this way the cough made no difference to the man's rate of recovery, for after four days he seemed none the worse, and was transferred to a convalescent home on the eighth day.

[The final end-results of the operations for hernia, which at present seem most satisfactory, will, it is hoped, be the subject of a later communication.—D. J. M.]

Throughout this series a critical attitude has been adopted as to what constitutes a chest complication. Any cough, even without rise of temperature or without sputum, has been recorded. As it was found that some house-surgeons were more critical in their attitude than others, the latter part of the investigation was entrusted to one person who made regular ward rounds, with the post-operative condition of patients as the sole object.

Deaths.—In this series there has been no death solely attributable to anaesthesia, but one case in which the patient died should be noted. He was admitted with a paralytic ileus, and an ileostomy was performed under nitrous-oxide-oxygen-ether anaesthesia. He had a continuous intravenous glucose-saline for eight days. No pulmonary symptoms developed. Twenty days later the ileostomy was resected under nitrous-oxide-oxygen-trilene-ether anaesthesia and the abdomen closed. After the second operation he was gravely ill, and among other symptoms developed a pneumonia which did not resolve, and he died 84 days later. Necropsy showed a number of small lung abscesses and a local peritonitis.

Complications after Various Operations

Out of 2,000 consecutive cases undergoing surgical procedures under anaesthesia, 101 had post-operative temperatures of over 100° F. with cough and sputum, and 46 developed post-operative cough with no rise in temperature. It soon became obvious that the type of operation and not the anaesthetic employed was the essential factor, and the following table shows the incidence of these complications after various types of operation.

TABLE I

Operation	No.	Fever and Cough	Cough	Total	%
Amputation digit	31	0	0	0	0
Amputation limb	10	0	0	0	0
Appendicectomy	98	26	9	35	36
Circumcision	41	0	0	0	0
Cystoscopy	38	0	0	0	0
Débridement	149	1	2	3	2
Haemorrhoidectomy, etc. ..	58	0	0	0	0
Hernial repair	192	61	26	87	45
Laparotomy	17	4	2	6	35
Menisectomy	57	0	2	2	4
Miscellaneous	194	3	1	4	2
Nephrectomy, etc.	3	1	0	1	33
Orchidectomy, etc.	51	2	2	4	8
Orthopaedic operations ..	114	0	0	0	0
Perforated peptic ulcer ..	6	2	1	3	50
Plaster	123	0	0	0	0
Tonsillectomy	113	1	0	1	1
Trendelenburg operation ..	128	0	1	1	1
Minor operations of less than 10 minutes' duration ..	577	0	0	0	0
Total	2,000	101	46	147	7.3

It is interesting to compare the figures for hernia repairs (average duration of anaesthesia, 27.34 minutes) with those for Trendelenburg operations (average duration of anaesthesia, 27.55 minutes). The types and amounts of anaesthetic employed were entirely comparable.

It may be argued that the extra depth of anaesthesia required to obtain the necessary relaxation for abdominal operations is a factor in the causation of respiratory complications. Against this the figures for haemorrhoidectomies should be noted. Twenty-three of the cases quoted were performed under lower-second-plane inhalation anaesthesia; the remainder were done under low spinal.

Intubation.—Out of 192 cases in which endotracheal tubes were passed 12 (6%) developed complications; 9 of them were abdominal operations. This percentage corresponds very closely with that obtained by Campbell and Gordon (1942) in a series of Canadian soldiers.

Complications after Hernia Operations

Incidence with Various Anaesthetics.—As hernia repairs are the largest group with a high "chest" incidence an analysis has been made below of the types of anaesthetic used.

TABLE II.—Service Cases

Anaesthetic	No.	Fever and Cough	Cough	Total	%
Pent.-N ₂ O-ether (plus) ..	29	13	4	17	59
Pent.-N ₂ O-ether (minus) ..	20	3	2	5	25
Pent.-N ₂ O-ether (plus) ..	15	3	1	4	27
Pent.-N ₂ O-ether (minus) ..	44	11	7	18	41
Pent.-N ₂ O-ether (plus) ..	10	3	1	4	40
Continuous pentothal ..	8	3	2	5	62
Cyclopropane ..	4	2	1	3	75
Spinal ..	15	8	1	9	60
N ₂ O-ether (plus) ..	13	2	1	3	43
N ₂ O-ether (minus) ..	1	0	1	1	100
N ₂ O-ether (plus) ..	13	4	2	6	46
N ₂ O-ether (minus) ..	3	1	1	2	67
Closed circuit ether ..	7	3	0	3	43
Oxford vaporizer-ether ..	10	2	1	3	30
Oxford vaporizer-trilene ..	4	2	0	2	50
Total ..	192	61	26	87	45

Ether (plus): More than one ounce of ether per half-hour of anaesthesia.
Ether (minus): Less than one ounce of ether per half-hour of anaesthesia.

These figures are admittedly much too small to show the real complication incidence of any of the types of anaesthetic, but they do tend to show that there is little real difference between them.

The incidence among hernia repairs on civilians during the same period was as follows.

TABLE III.—Civilian Cases

	No.	Fever and Cough	Cough	Total	%
Men ..	36	5	3	8	22
Women ..	18	2	1	3	17
Children ..	8	0	0	0	0
Total ..	62	7	4	11	18

Season.—The seasonal incidence of complications following hernia operations showed a peak of 60% in February, falling to 31% in April, rising to a fresh peak in June of 60% and then falling to 11% in September.

Graph showing seasonal incidence of complications after hernia operations.

Bacteriology.—No predominating organism was found in a small series that had their sputa examined. When more than one case from the same operating list developed coughs their sputa showed no evidence of a common infection.

Age.—An analysis of the various age groups showed nothing of interest: 18 to 25, incidence 39%; 25 to 30, incidence 54%; 30 to 35, incidence 46%; 35 to 40, incidence 55%.

Radiological

A small series of cases, mostly hernia repairs, were examined with x rays on the day after operation to observe movements of the diaphragm. They were examined lying, with the tube overhead centred over the diaphragm and the screen held below the bed. The movements could usually be seen clearly, but in some cases it was difficult to make out the movements on the left side owing to the heart shadow. It was found that there was a considerable variation in different patients. In some, very little movement of any sort could be detected with normal breathing; in others the movements were quite normal, and comparable to non-operated controls. In a small series of orthopaedic cases the movements were normal. In the majority of cases the movements were symmetrical, but in a few instances one side showed a slightly diminished excursion compared with the other, and this was not necessarily on the operated side. In two cases the right dome and in one the left dome of the diaphragm was raised but showed movements.

In re-examined cases in which there was diminished movement it was found in all instances to have returned to normal on the fourth day after operation. Table IV shows the results.

TABLE IV

Operation	Movements of Diaphragm		Chest Complications
	Right	Left	
Left ing. hernia ..	—	—	None
Left ing. hernia ..	×	×	None
Right ing. hernia ..	—	—	Cough, no fever
Bilat. ing. hernia ..	×	×	Cough and fever
Left ing. hernia ..	×	×	Cough, no fever
Right ing. hernia ..	—	×	Cough and fever
Appendectomy ..	—	—	None
Right ing. hernia ..	×	×	None
Left ing. hernia ..	×	×	"
Right ing. hernia ..	×	×	"
Left ing. hernia ..	×	×	"
Right ing. hernia ..	×	×	"
Left ing. hernia ..	×	×	Cough, no fever
Right ing. hernia ..	×	×	"
Left ing. hernia ..	—	—	Cough and fever
Bilat. ing. hernia ..	×	×	None

Movements are classified arbitrarily as:

- × × Full normal movement; 3/4 in. to 1 in. excursion with deep breathing.
- Decreased movement: fair excursion, about 1/2 in. with deep breathing.
- Little movement; some increase with deep breathing.
- Hardly perceptible movement; not much increased with deep breathing.

The series is admittedly too small, but of the nine cases which developed coughs seven showed definitely diminished movements of the diaphragm, while no coughs developed in four cases which were noted as having full normal excursion. Support is given to the view that diminished ventilation of the lungs is a factor of some importance in the development of chest complications.

Summary and Conclusions

The site of operation is the most important factor. Any operation involving the abdominal wall is more likely to be followed by a cough than one in any other part of the body.

The type of anaesthetic used has little bearing on the incidence of these complications.

Intubation, *per se*, is not a factor.

The incidence is higher in Service cases than in civilians.

There is an increased seasonal incidence in February, June, and July.

Diminished ventilation of the lung is a factor of importance. This is probably the result of pain on breathing. When the pain is past and the patient is able to ventilate his lung freely the complications subside rapidly.

The more serious chest complications can be minimized by starting active movements as early as possible.

We wish to express our thanks to the Regional Hospital Officer for permission to publish this report.

REFERENCES

- Binning, Rex (1940). *British Medical Journal*, 2, 794.
- Campbell, S. M., and Gordon, R. A. (1942). *Canad. med. Ass. J.*, 46, 347.
- Kaye, G. (1941). *Anesth. & Analges.*, 20, 238.

A certificate of disablement under the Workmen's Compensation Act may now be given by the Examining Surgeon for the district in which the workman lives or to which he has been removed for treatment. Hitherto this certificate could only be obtained from the Examining Surgeon for the district in which the man worked.