SUGGESTIONS FOR THE PREVENTION OF POST-OPERATIVE THROMBOSIS AND EMBOLISM.

BY

FREDERICK McCANN, M.D. EDIN., F.R.C.S. ENG.,
SURGEON TO THE SAMARITAN FREE HOSPITAL FOR WOMEN, LONDON.

THE spectre of death from embolism still haunts the path of the operating surgeon. These sudden surgical tragedies, although less numerous than in former times, still occur in the practice of surgeons—good, bad, and indifferent—in every country, after “clean and unclean cases,” after short operations and long operations, after easy operations or after those attended with complications, whether performed on the young or on the aged. The cause, closely linked as it is with that of thrombosis, is variously ascribed to the blood being infected with bacteria, to the recumbent posture, to the anatomical situation of the affected vein, and lastly, to the quality of the blood.

All these are no doubt contributory, or, in the language of the textbooks, “predisposing” causes. Is there not something more? Does the fault not lie in the technique employed? I believe it does, and that the chief fault is expressed by the one word “transfixion.”

There must be some common error in the practice of operative surgery to account for these fatalities, otherwise their number would ere now have been reduced to vanishing point. Some surgeons have had the courage to place them on record, others remain silent. Statistics have been furnished from the Mayo Clinic in Rochester, U.S.A., which give some idea of the frequency of post-operative thrombosis and embolism. Thus E. H. Beckman¹ writes that in 5,835 surgical operations the total number of cases of phlebitis was 16. He says:

Although we continually have a certain number of phlebitis cases following operation, we have not been able to determine any causative factor in this annoying complication. . . . We are often surprised to find a phlebitis develop in a patient who has otherwise had an ideal convalescence. In only one of the present series was there an infected wound.

Appendicectomy	...	...	1 left, 1 right
Appendicectomy, curettage and perineorrhaphy	...	...	1 left
Cholecystostomy, internal	Alexander	...	...
curettage	...	...	1 left
Drainage and pelvic abscess	...	...	1 left
Total abdominal hysterectomy	...	...	1 left, 1 right
Gastrectomy	...	...	1 left
Cholecystostomy and appendicectomy	...	...	1 left
Cholecystectomy	...	...	1 left
Kraske colostomy	...	...	1 left
Tube and ovary appendicectomy	...	...	1 left
Ovarian cyst	...	...	1 left
Mayo's operation for prolapse	...	...	1 left
Ventral hernia	...	...	1 right
Cholecystostomy	...	...	1 right
	12	4	

Three-fourths of these cases of phlebitis were in the left femoral or internal saphenous veins and one-fourth in the right. None were double. This is about the usual proportion in our clinic.

L. B. Wilson² gives a record of all the cases of fatal post-operative embolism occurring in the Mayo Clinic during the years 1899–1911 inclusive.

During this period 63,573 major operations were performed, with 47 cases of fatal post-operative embolism. Autopsies were made in 41 of the fatal cases.

The fatalities from embolism represent 5 per cent. of the total number of deaths from all causes (864)—that is, 0.07 per cent.

	Deaths.
After 2,372 operations on blood vessels	2
„ 3,266 operations on the thyroid	2
„ 2,281 operations on the mouth	1
„ 2,391 operations on the stomach and duodenum	3
„ 4,507 operations on the gall bladder	9
„ 389 operations on the small intestine	1
„ 9,908 operations on the appendix	4
„ 2,530 operations on the colon and rectum	5
„ 4,501 operations for hernia	5
„ 900 operations on the kidney	1
„ 601 operations on the prostate	4
„ 7,993 operations on the uterus, tubes, and ovaries	10

Of the 47 cases, 26 were males and 21 females the youngest 25 years and the oldest 72.

19 of the fatalities occurred within the first week; 21 occurred within the second week; 4 in the third week; and one each on the twenty-sixth, thirtieth, and sixty-fourth days.

In 36 cases the embolism was pulmonary, in 10 cerebral, and in 1 coronary.

In 28 of the 41 cases examined *post mortem* the primary thrombus was located in the field of operation or in the femoral veins; in 4 cases the emboli were probably cardiac; in 9 cases the seat of origin was not determined.

Such is the story to be elicited from a large series of operations. Gall bladder operations and operations on the female genitalia furnish the largest number of deaths—0.19 per cent. and 0.13 per cent. respectively. Disintegration of the blood corpuscles from toxic substances is held to explain the high percentage following operations on the gall bladder.

Although sepsis is a most important factor in causation, yet intravascular clotting apart from sepsis does occur.

Still, it is the improvement in surgical technique, especially in the direction of combating sepsis, which has helped to reduce the number of cases of post-operative thrombosis and embolism. Who can be sure that complete asepsis has been attained during an operation or the subsequent convalescence? It is assumed when all goes well, but it is not proven. Indeed, it is much more difficult to exclude the septic element in any consideration of this subject than many writers would have us believe. In spite of elaborate precautions post-operative thrombosis and embolism still remain.

Ten years ago a woman who had undergone vaginal hysterectomy for uterine cancer, when sitting up in bed twelve days after the operation suddenly fell back dead. Her death was due to pulmonary embolism. This was an operation done by the old method of transfixion and ligation of the broad ligaments, healing, as all these operations healed, with varying degrees of sepsis, typical conditions for the development of post-operative thrombosis and embolism.

Further, statistics favoured the view that thrombosis and embolism more frequently followed operation on the female genitalia than in other situations. This preponderance was explained by the nature of the tissue involved, but I came to the conclusion that the operative technique must also be at fault.

I therefore determined to give up transfixion and to operate anatomically, picking up vessels cleanly and ligaturing them without encompassing masses of tissue. The result has been that I have never had another case of post-operative embolism or thrombosis either in my private or hospital practice.

Dangers of Transfixion.

Let me now draw attention to the application of the method in abdominal and pelvic surgery.

“Never transfix a vascular area” should become a surgical axiom. By transfixion vessels are liable to be punctured and bleed either externally or into the tissues; the transfixing ligature is tied to arrest the bleeding, and the result may be that the ligature remains in the lumen of the vessel.

Now, if this ligature is of doubtful asepticity or becomes subsequently infected, the natural process of clotting in the vessel may be arrested, the clot liquefying and becoming detached in portions or in its entirety. I use the word “may,” for it is really remarkable that thrombosis and embolism are not more frequent. Although the diminution of sepsis has been a great factor in improving results, yet it is worthy of note that it is not the severe infections that are followed by these troublesome complications, but rather those of a milder type. If a vessel has been punctured the ligature should be withdrawn and the vessel clamped and tied after removal of the blood clot. Again, in the tying of blood vessels, even those of small size, it is surprising to witness the amount of “muscle” some surgeons put into this part of an operation. The object of a ligature is to approximate the coats of a vessel and to keep them in apposition, not to cut them. As the success of the modern abdominal surgeon depends so much on his capacity to tie and stitch properly, it is necessary for him to cultivate a delicacy of touch so that ligatures and sutures are nicely and accurately adjusted without undue constriction. He must further acquire the art of using thin material without breaking it, for the fault more frequently lies with the surgeon than with the material.

Pedicle needles have served their purpose and should be given up. The large sharp curved needle is a dangerous weapon. Round-bodied needles should alone be used within the abdominal cavity, and in order that they may be held easily I have had them made with the posterior half flat. The employment of the round-bodied needle constitutes a distinct advance in surgical technique. Its advantages are evidenced, for example, in stitching the uterus, where little or no bleeding results from the passage of the needle. Death from embolism has followed such a simple operation as utero-suspension. Was a cutting needle used?

There are certain situations in the abdomen where transfixion is frequently employed—namely, the broad ligaments, the omentum, and the mesentery.

The Broad Ligaments.—Transfixion of the broad ligaments is a most dangerous proceeding. These ligaments contain between their layers a venous plexus specially well developed in the presence of uterine new growths and liable to be injured by the transfixing needle. In this situation it is easy to operate anatomically, to open up the broad ligaments, and to tie the vessels separately with thin material. "Chunks" of tissue should not be left ligatured with thick material liable to cause post-operative pain and maybe thrombosis.

The Omentum.—I believe the method of ligaturing the omentum by transfixion and interlocking sutures, as generally taught and practised, to be dangerous and a cause of post-operative thrombosis and embolism. It may be argued that the needle can be passed through an avascular spot. Do all operators take this trouble? Vessels in the omentum should be caught with forceps and tied, the same technique being employed when a portion is excised.

The Mesentery.—Here, again, transfixion is dangerous, and it is easy where a portion of mesentery is excised to catch the bleeding points, and to tie them and to approximate the two edges by tying over forceps instead of stitching. Transfixing the mesentery of the appendix with a needle and puncturing vessels may easily lead to thrombosis and embolism. Deaths from this cause after a simple appendix operation are by no means so rare. The "patches of pneumonia" and localized pleurisy seen after this and other operations are most probably embolic in origin. Puncturing veins in the wall of the caecum may be another cause of thrombosis. The use of a small curved round-bodied needle, avoiding blood vessels, should prevent such an accident when covering the appendix stump.

Stomach and Intestine.—It is important also to avoid puncturing vessels in the walls of the stomach and intestine during gastric and intestinal operations. The extravasated blood in the bowel wall may easily become infected and break down.

Abdominal Wall.—Care exercised in making the incisions in the proper positions and respect for the anatomical arrangement of the structures will prevent accidents in this situation. The deep epigastric vessels may be injured unless sought for and avoided when making lateral incisions in the abdominal wall. If the injury is not discovered a troublesome haematoma may result. Moreover, in using through-and-through sutures it is better to employ a figure of 8 suture whose track can be seen and followed rather than to thrust a needle blindly into the abdominal wall, and puncture a vessel or vessels. Accurate haemostasis in the abdominal walls, as in all other situations, is most essential, so that no clots are left which may subsequently become infected.

Summary.

- (a) Do not transfix or puncture blood vessels.
- (b) Do not tie or stitch too tightly and cut into blood vessels.
- (c) Obtain accurate haemostasis, leaving no blood clots.

If by attention to improvements in technique these post-operative fatalities can be still further reduced, "tis a consummation devoutly to be wished." For this purpose neat, clean workmanship, founded on sound anatomical knowledge, is required. There is still scope for the surgical artist.

REFERENCES.

- ¹ *Annals of Surgery*, i, May, 1913. ² *Ibid.*, December, 1912.

MYOMECTOMY OR HYSTERECTOMY.

BY

VICTOR BONNEY, M.S., M.D., B.Sc.LOND.,
F.R.C.S.ENG.,

ASSISTANT GYNAECOLOGICAL SURGEON, MIDDLESEX HOSPITAL, ETC.

In the treatment of uterine fibroids myomectomy has had a very limited application as compared with hysterectomy. The positive indications for the former as against the latter operation have been a single tumour in a patient under 40 years of age either pedunculated, or at least not deeply embedded in the uterus, and not giving rise to excessive menstrual bleeding. It is now, however, in most cases possible, and I hold in many cases proper, to carry out the conservative operation though all these criteria are traversed.

The drawbacks that have been urged against removing the tumour or tumours and leaving the uterus are, first, that where the leading symptom is menorrhagia the haemorrhage may continue after the operation; secondly, that other tumours may arise either *de novo* or from overlooked seedlings; thirdly, that the likelihood of pregnancy in the conserved uterus is small, and that in the event of its happening the uterine scar may give way; and, fourthly, that the operation is frequently more difficult than hysterectomy while its risk is at least as great and often greater.

There are, of course, certain cases in which the propriety of removing the uterus is in no doubt: elderly women with large and multiple tumours; cases in which the anaemia is so extreme that any further loss of blood, even the amount of a normal menstrual period, is undesirable; inflamed or degenerate tumours, or large tumours growing in the supravaginal cervix. But besides these there is a considerable class of relatively young patients who, having fibroids in the womb, seek advice on account of menorrhagia, dysmenorrhoea, or abdomino-pelvic pain. It is in this type of case that myomectomy is artistry and hysterectomy crudity.

Let us examine the drawbacks that have been alleged against myomectomy and see if they are as cogent to-day.

CONTINUANCE OF MENORRHAGIA.

If excessive menstrual loss continues after myomectomy, it is due either (a) to a small submucous fibroid missed at the operation; (b) to endometrial thickening; (c) to the fact that the uterus has remained much hypertrophied although all the tumours have been removed; or (d) to a degenerate condition of the uterine wall.

(a) *A Missed Submucous Fibroid.*—It is easily possible to miss a small submucous fibroid, say the size of a pea, if the uterine cavity is not opened and inspected in the course of the operation, for so diminutive a tumour is with difficulty felt through the uterine wall. Hence the surgeon should as a routine open the cavity in most cases, and should make it an invariable rule to do so in every one where menorrhagia is complained of. I have frequently detected and removed in this way a little nodule which, if overlooked, would have defeated the whole object of the operation. The opening of the cavity in an uninfected case (and in none other should myomectomy be attempted) adds no risk to the operation.

(b) *Endometrial Thickening.*—In certain cases of fibroids diffuse thickening of the endometrium is present, whilst in others a local overgrowth in the form of a mucous polypus exists. Both abnormalities, if not dealt with, will maintain haemorrhage after the operation. An opening into the uterine cavity discloses them. Curettage is far more efficiently performed by this route than *via* the cervix, and a sharp scoop is the best instrument to use. A mucous polypus should be similarly ablated, special attention being paid to the cornua. On several occasions I have found and removed a polypus situated in one of these recesses.

(c) *Hypertrophy of the Uterus.*—With all interstitial and submucous fibroids of any size hypertrophy of the uterus enclosing them necessarily coexists. The condition is, indeed, in this particular exactly analogous to pregnancy. Involution takes place after myomectomy just as it does after labour, but is more apt to be incomplete, and such subinvolution will cause menorrhagia to persist. It is necessary, therefore, in these cases not merely to remove the tumours but to trim down the uterus to a reasonable