

4. As a result of the shape we have another advantage: It is dust-proof. The lenses are consequently more easily kept clean.

5. As a further result of the shape we have the advantage of greater durability. The hinges of the ordinary case are soon worn out.

6. It is never necessary to remove the handle from the instrument.

7. The ophthalmoscope can be kept in the case at all times except when in actual use. During office hours it takes too much time to be continually taking the instrument from the case with a lid. By removing the lid the ophthalmoscope can be placed in the case and taken from it more easily than from the vest pocket. The weight of the ophthalmoscope will prevent its falling out of the pocket in stooping.

I use the Knapp ophthalmoscope. The instrument with a tilting mirror would require a thicker case. There is no place in this case for an accessory lens. I find it more convenient to carry this in an eye-glass case in my vest pocket.

THE TORSION OF ARTERIES FOR THE ARREST OF HÆMORRHAGE.

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There is no subject of greater interest to the practical surgeon than the arrest of hæmorrhage. This remark is equally true whether the hæmorrhage comes from a wound accidentally inflicted, or one made intentionally, by the surgeon's knife.

Without the means of stopping the flow of blood from bleeding vessels, the surgeon's art would be greatly crippled, and surgical operations, where blood-vessels must be divided, would be impossible.

There is no sight so appalling as a formidable hæmorrhage. When a large artery is opened, the blood gushes out in an angry stream, the face becomes pale, the color leaves the lips, the respiration becomes sighing, the heart fails to beat, and death closes the scene. Without any knowledge of the circulation or nature of the blood, or of the means by which its flow from a wound could be arrested, what a terrible and mysterious sight it must have been to the early races of men to see one of their number perish from hæmorrhage. What, for instance, must have been the sensation of our first parent Adam, as he looked upon the wounds of his dead son Abel, with the stain of his blood upon the ground. Surgeons from the earliest ages have shared this dread of hæmorrhage, and have ever been striving for the best means of its control.

Upon no subject has our profession been more conservative than upon this one—the arrest of

arterial hæmorrhage. Since the time of Celsus, notwithstanding the numerous methods which have been proposed for this purpose, but two, viz.: the actual cautery and the ligature, have received the endorsement of the profession. But, if the profession has been slow to endorse new methods, its confidence once gained has been most unwillingly surrendered.

From the time of Archigenes, who practiced in Rome shortly after the time of Celsus, up to the time of Richard Wiseman, Sergeant-Surgeon to King Charles II, the red-hot iron was the sole method employed. Thus this method of checking hæmorrhage after amputation not two centuries ago, was the same as that used for fifteen hundred years previous. The pertinacity with which surgeons adhered to the use of the actual cautery after Paré's great discovery of the ligature, well illustrates the fear in which surgeons stood of hæmorrhage. They had used, and had seen their fathers use, the red-hot iron, and, notwithstanding the pain it caused and the interference with primary union, they were unwilling to discard the agent which long usage had taught them was successful.

In 1564, Ambrose Paré published his new discovery, which, to use his own language, "was taught him by the special favor of the sacred Deity." In this publication, as is well known, Paré demonstrated the value of the ligature as a hæmostatic. But, owing to the extreme fear of hæmorrhage, and the criminal neglect of surgeons, it was two hundred years before it was adopted by the profession, and then it came into favor through the influence of Sharpe, one of the surgeons of Guy's Hospital, London, who boldly championed the claims of the ligature to popular confidence.

Since this time nothing has dislodged the position which the ligature has held as a hæmostatic in the opinion of the profession.

The efforts made by Sir James Y. Simpson, of Edinburgh, to substitute acupressure, and the still more recent endeavor of Dr. S. F. Spier, of Brooklyn, to substitute constriction for ligation have most signally failed. The same statement may be made also in regard to torsion as a means of arresting arterial hæmorrhage. It has not received the support of the profession to any great extent, but unlike the other rivals of the ligature, it has had champions for hundreds of years, and still holds a place as a valuable means of arresting hæmorrhage. This subject has received but little attention by modern surgeons. The twisting of an artery to arrest bleeding is of ancient origin. It is spoken of by Celsus. A fact often observed that an arm or leg may be torn from the body with the loss of only a few drops of blood, no doubt suggested the method. It has been advocated by such surgeons as Amussat, Dieffenbach, Schroeder and Syme. But the credit of

bringing it prominently before the profession and establishing its efficiency is due to Mr. Bryant, the present distinguished surgeon of Guy's Hospital, London. At this hospital the ligature is seldom used, torsion being chiefly relied upon. Mr. Bryant tells us in the last edition of his "Surgery," that in two hundred consecutive amputations of the thigh, leg, arm and forearm, all of the arteries were twisted, one hundred and ten of them being the femoral artery, and that in no case was there secondary hæmorrhage.

Mr. Bryant says: "The physiological arguments in favor of torsion are very great, and the practical advantages seem to be no less. After seven years' experience in its practice, applied to vessels of all sizes, the femoral being the largest, I have had no mishap. I have observed that wounds have united more rapidly and kindly, primary union being the rule. There has been less constitutional disturbance after operation, and consequently, less liability to traumatic fever, pyæmia, and other complications such as we are all too familiar with in the practice of surgery. I have had stumps heal in a week, and the patient up in two weeks; without one single drawback, rapid and uninterrupted convalescence following the operation."

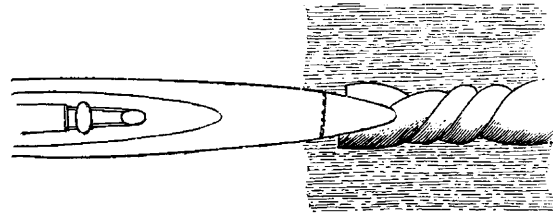
Having given this experience of Mr. Bryant, I desire now to give my own as observed at the Western Pennsylvania Hospital of Pittsburgh. At this hospital, torsion is almost exclusively relied upon to check the hæmorrhage from wounded arteries or veins, whether the wound be produced by the surgeon's knife or otherwise. My experience with torsion as a hæmostatic, dates back to the year 1872, when I became a member of the hospital staff. My colleagues had, previous to my connection with the hospital staff, been twisting arteries as large as the radial and ulnar. The facility with which this was done and the fact that the wounds healed kindly and without secondary hæmorrhage, induced me to follow their example, at first timidly, but with success came confidence. Having been successful in the amputation of a forearm with no untoward result, I ventured next to twist the brachial artery after the amputation of an arm; soon after this the axillary, and then the popliteal, and finally the femoral. And now, for the past eighteen years, torsion, for the arrest of hæmorrhage after all surgical operations, has been the recognized, and almost the only method resorted to at this hospital. It is to be regretted that records have not been kept of the number of larger arteries which have been twisted to arrest hæmorrhage.

The following is a table showing the number of arteries divided in cases of amputation where torsion has been resorted to for the arrest of hæmorrhage at the Western Pennsylvania Hospital:

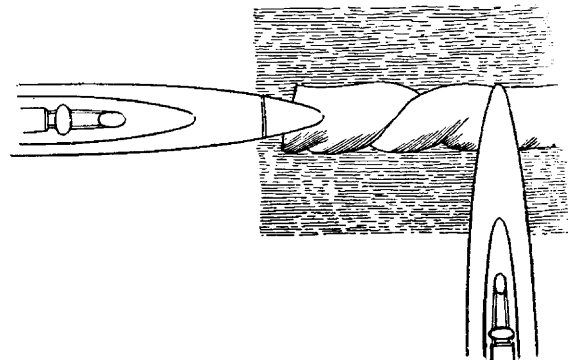
Femoral	116 times.
Popliteal	18 "

Axillary	18 times.
Anterior tibial	317 "
Posterior	317 "
Brachial	81 "
Radial	45 "
Ulnar	45 "

There are two methods by which the torsion may be applied, as is illustrated by the following cuts:



FREE TORSION.



LIMITED TORSION.

- 1st. Limited torsion; and
- 2nd. Free torsion.

In the first method, two pairs of forceps are required. The first pair grasps the vessel at its cut extremity, and pulls it from the sheath. It is then seized by the second pair at a point from one-half an inch to an inch above the cut extremity of the artery; this second pair being held at right angles to the long axis of the vessel. The first pair is then given three or four sharp turns.

By the second method (free torsion), only one pair of forceps is required. It is the one recommended by Mr. Bryant as not being so likely to injure the external coat of the artery. And this is the method which was adopted in the cases which I have given.

A good pair of forceps is required which will hold the end of the artery firmly, and that has no lateral motion, and with serrations blunt enough to obviate any laceration or cutting of the parts seized by the blades. The vessel should then be drawn out as in the application of the ligature, and three or four sharp rotations of the forceps made. In large arteries, such as the femoral, the rotation should be repeated till the sense of resistance has ceased. The ends should not be twisted off. In small arteries the number

of rotations is of no importance, and their ends may be twisted off or not, as may be preferred. In all of the cases mentioned in the above table torsion of the arteries and veins was the method resorted to to control hæmorrhage.

In addition to these cases, of which we have a record, the method of torsion has been the one resorted to in all other surgical operations performed during this period, such as amputations of the female breast, the removal of tumors, the excision of joints, etc. It is within bounds to say that torsion has been resorted to at this hospital in thousands of cases without any mishap. We have had no case of secondary hæmorrhage which could fairly be attributed to the method of controlling the hæmorrhage.

The advantages of torsion as compared with ligation are:

1. The greater facility with which it can be applied.

I am fully aware that this proposition is disputed, but to those who are familiar with both methods, there can be no doubt that torsion is the easier of the two. For the ligation of an artery, an assistant is required to seize the vessel and draw it out while the ligature is applied. For torsion, the surgeon requires no assistant. The vessel must be seized by the forceps in either case. In torsion it only requires three or four turns of the forceps to complete the process, which can be accomplished in as many seconds. When a ligature is applied, let the operator be ever so skilful, the thread may break or slip off the vessel, but if neither of these accidents occur, the process cannot be accomplished in anything like the same time.

2. Torsion is a safer method, being less liable to be followed by secondary hæmorrhage.

This proposition has been absolutely proven by the experience in the use of torsion at Guy's Hospital, London, and I have now given additional proof by the experience given in this paper.

3. Healing is facilitated because the wound is free from any irritating or foreign body.

This proposition is so plain that it should not require an argument. It was true before the antiseptic treatment of wounds had come into such general use, but it is doubly so now. The catgut ligature is no doubt a safer ligature than the silk, for it does not require an ulcerative process for its discharge, and when this ligature has been made thoroughly antiseptic, it is no doubt the best. But a ligature rendered thoroughly antiseptic is not always at hand, and those surgeons who have had most experience with the antiseptic treatment of wounds, will, I think, be the first to admit that, in spite of their most careful attention, septic germs are often introduced into the wounds by means of the ligature. Even after every precaution in preparation and preser-

vation, the handling of a ligature in its application is a frequent source of infection.

But there are other objections to its use. The catgut ligature may dissolve before the artery has become closed by the natural hæmostatic process, or it may unbind. Both of these accidents have been the frequent cause of secondary hæmorrhage.

On a recent visit to some of the principal hospitals in New York City, where the operators and assistants possessed the greatest skill, I was not surprised to see that in many instances a ligature broke, or in other cases slipped off the vessels before they were secured. This was to me exceedingly annoying to witness, when I knew that the vessels could have been so easily twisted while they were in the grasp of the forceps. When the question was asked one of these operators, a distinguished surgeon, "Why don't you resort to torsion?" the reply was, "We are afraid to trust it." This answer might have been given with equal force by Richard Wiseman in the seventeenth century, when asked why he did not resort to the ligature instead of the red-hot iron.

In a matter so important as the arrest of arterial hæmorrhage, it is proper that surgeons should be conservative, but there is such a thing as pushing conservatism too far. In the torsion of arteries, I claim we have an improvement upon ligation; its claims for recognition rest upon physiological arguments, which cannot be shaken, and its reliability as a hæmostatic has been proven by abundant experience.

MEDICAL PROGRESS.

BIOLOGICAL EXAMINATION OF DRINKING-WATER.—MIGULA (*Centralblatt für Bakteriologie und Parasitenkunde*) has come to the conclusion that the number of colonies that are developed in plate cultures, is not an index of the potability of waters examined by this method. He finds, however, that there is a relation in the number of species found in water and its purity. If a large number of varieties are present it speaks generally for the unhealthfulness of the water. We must refer the reader for fuller particulars to the original and the tables which accompany it, representing as they do, over 400 examinations.

He closes with the following conclusions: first, that the number of colonies developed by 1 ccm. furnishes no ground for concluding as to the potability of such waters; second, the bacteria of decomposition are absent from running water; third, the bacteria of decomposition are most numerous in water containing 1,000 to 10,000 germs in each cubic centimeter, though they may be present when the number is as low as fifty, and