each fall and spring during life to maintain them in continuous relief, although as already stated, a great many in this grade do pass one or two, or more, years without requiring a treatment. If the great pathologic changes that have been taking place during many years are kept in mind, I am sure no complaint would be expressed at the incompleteness of the cure, especially so when the patient is experiencing relief all the time that he is taking the supplementary courses, and really feels, not only entirely free from disagreeable symptoms, but would coincide with his physician, were the latter to assert that the complaint was completely cured.

THE TORSION OF ARTERIES FOR THE ARREST OF HEMORRHAGE.

Read in the Section on Railway Surgery, at the First Pan-American Medical Congress, Washington, D. C., Sept. 6, 1893.

BY J. B. MURDOCH, M.D.

PITTSBURG, PA.

To the members of the National Association of Railway Surgeons who were present at the meeting held at St. Louis in May, 1889, this paper will contain little that is new. The interest taken in the subject at that time was so great, and the discussion which it elicited so animated, that I am encouraged to bring it before this larger audience of the Pan-American Congress. The subject is, in my opinion, so important that every surgeon should be familiar with it. Since the reading of the paper referred to, I have continued to practice and to teach this method of controlling the hemorrhage from wounded arteries and veins, and increased experience only confirms me in the value of this method as a hemostatic. What I shall now say is a reiteration of what I have already said, with the addition of a later and larger experience.

There is no subject of greater interest to the practical surgeon than the arrest of hemorrhage. This remark is equally true, whether the hemorrhage comes from a wound accidentally inflicted or 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 hemorrhage. 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 soon closes the scene. Surgeons from the earliest ages have shared with the people this dread of hemorrhage, and have ever been striving for the best means for its control. Upon no subject has our profession been more conservative than upon this one, the arrest of arterial hemorrhage.

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 indorsement of the profession. But if the profession has been slow to indorse 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 hemorrhage 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 hemorrhage. 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 hemostatic. But, owing to the extreme fear of hemorrhage, 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 hemostatic 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 also be made in regard to torsion as a means of arresting arterial hemorrhage. 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 hemorrhage. The subject has received but little attention from 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 late 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 the arteries were twisted, one hundred and ten of them being the femoral artery, and that in no case was there secondary hemorrhage.

Mr. Bryant says: "The physiologic 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, pyemia, 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.

That Mr. Bryant never lost his faith in the efficacy of torsion as a hemostatic, is evident, from the following letter received from him shortly after my first paper upon this subject had been published:

65 GROSVENOR ST., GROSVENOR SQUARE, LONDON, {
January 11, 1887. }

Dear Dr. Murdoch:—I have to thank you for your *Pittsburg Medical Review* and your article on "Torsion." It is very gratifying to me to find my teaching has had such a happy influence in your country, and I trust I may not lead you into wrong ways. I adopt torsion as generally as ever, and so do most of my colleagues. The carbolic catgut ligature is only a second best. How wonderfully our art is advancing, and how we reciprocally learn from one another across the Atlantic, and thus forge permanent links of friendship and good feeling. Ever yours truly,

THOMAS BRYANT.

Having given this experience of Mr. Bryant, I desire now to give my own as observed at the Western Pennsylvania Hospital at Pittsburg. At this Hospital, torsion is almost exclusively relied upon to check the hemorrhage from wounded arteries or veins, whether the wound be produced by the surgeon's knife or otherwise. My experience with torsion as a hemostatic, 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, 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 hemorrhage, 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 after the amputation of an arm; soon after this, the axillary, and then the popliteal, and finally the femoral. And now, for the past twenty-one years, torsion for the arrest of hemorrhage 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 large arteries which have been twisted to arrest the hemorrhage.

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 hemorrhage at the Western Pennsylvania Hospital, Pittsburg:

Femoral	160 times
Popliteal	24 "
Axillary	24 "
Anterior tibial	405 "
Posterior tibial	405 "
Brachial	115 "
Radial	59 "
Ulnar	59 "

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

1, Limited torsion, and 2, 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, which 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 until 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, free torsion of the arteries and veins was the method resorted to, to control hemorrhage.

FIG. 1. LIMITED TORSION.

In addition to these cases, of which we have a record, torsion has been the method resorted to in all other surgical operations performed during this period, such as amputation 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 hemorrhage which could fairly be attributed to the method of controlling the hemorrhage, not only at the Western Pennsylvania Hospital, but in all of the hospitals in Pittsburg and the surrounding towns. Torsion is the method most frequently resorted to for the arrest of hemorrhage. Our surgeons, as a rule, have more confidence in it than in the ligature.

FIG. 2. FREE TORSION.

The following letter from Dr. J. J. Buchanan, the accomplished surgeon at Mercy Hospital, the second largest hospital in Pittsburg, bears out the truth of this statement:

August 30, 1893.

Dear Doctor Murdoch:—In reply to your query concerning my experience with torsion as a means of controlling hemorrhage, permit me to say that I have used it constantly, though not exclusively, for twelve years for arteries of all sizes up to, and including the femoral, and have never known a hemorrhage to follow its employment. My colleague, Dr. R. W. Stewart, and myself, make frequent use of it in the surgical service of Mercy Hospital, both for arteries and the larger veins, and feel no anxiety concerning hemorrhage in our cases. Yours very truly,

J. J. BUCHANAN.

So, also, listen to what Dr. W. T. Huston of the Altoona General Hospital, says:

We find that torsion is just as safe as ligation, and gives nature a better chance for repair, for she has no foreign body to contend with as in ligation. At this Hospital I can safely say that there has not been one-half dozen ligatures in amputations during the last eighteen months, and we are having excellent results from the torsion of vessels. Dur-

ing the above-mentioned time there have been over fifty major amputations performed in which torsion was used for the control of hemorrhage. In all of these cases the patients never lost any blood from twisted arteries—not even from the femoral artery. We can, therefore, safely recommend torsion as an excellent means of controlling hemorrhage, and now we resort to torsion altogether, as it has given the most gratifying results in the control of hemorrhage.

Commendations like the above could be secured from every hospital in Western Pennsylvania.

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 skillful, the thread may break or slip off the vessel; but if neither of these accidents occur, the process can not be accomplished in anything like the same time.

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

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 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 the 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 preservation, 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 hemostatic process, or it may unbind. Both of these accidents have been the frequent cause of secondary hemorrhage.

Being a frequent visitor at the principal metropolitan hospitals, both in our own country and in Europe, I am familiar with the practice of our most skillful surgeons. It is exceedingly annoying for me to witness a thread break or slip off an artery, which often happens in the effort to tie it, when I know that the vessel could be so easily twisted while it was in the grasp of the forceps. When I have asked many of our distinguished surgeons why they do not resort to the torsion, the reply is always the same: *we are afraid to trust it.*

This answer might have been given with equal force by Richard Wiseman in the seventeenth century, had he been asked why he did not resort to the ligature instead of the hot iron.

In a matter so important as the arrest of arterial hemorrhage, 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 physiologic arguments which can not be shaken, and its reliability as a hemostatic has been proven by abundant experience.

CLINICAL NOTES.

A CASE OF GENERAL PERITONITIS CAUSED BY AN ENTEROLITH.

WITH A NECROPSY.

BY E. GRISWOLD, M.D.

SHARON, PA.

J. W., a strong, well built man weighing about one hundred and eighty pounds and 35 years old, had la grippe in the winter of 1891. He had been troubled for several years before with piles, but was seldom disabled entirely by them. By occupation he was a heater in a rolling mill. He never seemed to recover fully from the influenza; was troubled with frequent attacks of griping pains in the abdomen, and seldom had a good appetite. Later, these attacks sometimes became so severe, while at his work, that he was obliged to leave his furnace and lie down for a while. From this time onward he was obliged to employ a helper who could attend to his furnace during these attacks. Not long afterward he began to suffer severe griping and tenesmus at his stools. These distressing symptoms increased until they became so severe that he was afraid to be alone at stools, and was in the habit of having his wife or some one else with him. His stools were not abnormally frequent; nor did the pains connected with them seem to be modified by the condition of his piles. The pains centered, and radiated from, a point just below the umbilicus, and often affected the bladder. Notwithstanding the severity of his sufferings, at these times he would take a few minutes for reaction and rest, and then go to his work. He continued to do this until the conflagration which ended his life came.

On Monday morning, Aug. 6, 1893, about four o'clock, I saw him with his attending physician, Dr. J. H. Reed, and learned that he had been attacked with chills and violent abdominal pains about 7 A.M. on the day before. Dr. Reed did not see him until 3 P.M., when he found his suffering was intense, the pain centering largely near and below the umbilicus, followed toward the next morning, at the time of my visit, with pains down the right spermatic cord and retraction of the testicle, suggesting the possible presence of renal calculi. The temperature was 102 degrees; pulse 120; anorexia and nausea. The bowels had been loose the day before the attack. A careful examination led to the conclusion that there was general peritonitis. There was tumescence, tympanites, tenderness and partial rigidity of the abdominal muscles, with dorsal decubitus. The history of the case did not point to appendicitis, typhlitis or cecitis. Treatment, alterative doses of calomel, with