MURDOCH (J.B.)

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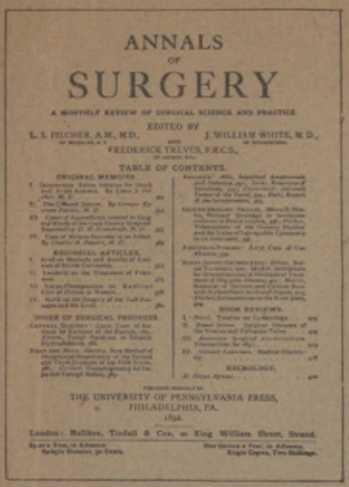

ANNALS
OF
SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY

L. S. FILCHER, A.M., M.D., and J. WILLIAM WHITE, M.D., and FREDERICK TREVES, F.R.C.S.,

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PUBLISHED MONTHLY BY
THE UNIVERSITY OF PENNSYLVANIA PRESS,
PHILADELPHIA, PA.
1892.

London: Baillière, Tindall & Cox, 20 King William Street, Strand.

JANUARY, 1893.

A Contribution to the Study of Amputation at the Hip-joint.

By J. B. MURDOCH, M. D.
Pittsburgh.

A CONTRIBUTION TO THE STUDY OF AMPUTATIONS AT THE HIP-JOINT.[1]

By J. B. MURDOCH, M. D.,

OF PITTSBURGH.

TO surgeons of our day, the cutting off of a limb, is one of the most simple operations in surgery. Requiring neither accurate anatomical knowledge nor much surgical skill, the operation can be taught to anyone having a little manual dexterity. Yet, notwithstanding its simplicity, it has required the patient labor of the most distinguished surgeons, all the way down the ages, to bring the operation to its present state of perfection. The simple matter of how to cut the flaps, how to arrest the hemorrhage, and how to dress the wound, ~~have~~ has received the attention and been the subjects of controversy of the best minds of our profession from the time of Hippocrates down to our own day, and still they are questions which have not been definitely answered.

To the railroad surgeon, the subject of amputation is especially interesting. It is the operation which he is most frequently called upon to perform, and this interest increases in proportion to the danger and difficulty of the amputation. It is for this reason that I have selected *amputation at the hip-joint*, as the subject of my present address.

I shall give you the histories of the cases of amputation at the hip-joint in which I have been interested, and the conclusions at which I have arrived.

The first case to which I direct your attention, is one of world-wide fame, and is given in detail in "The Report of Amputations at the Hip-Joint in Military Surgery," by George A. Otis, Assistant Surgeon, United States Army, in Circular No. 7, War

[1] Read before the New York State Association of Railway Surgeons, November 14th, 1892.

Department, Surgeon General's Office, July 1st, 1867. This case is known as "Shippen's Successful Amputation at the Hip-Joint."

It is chiefly for the purpose of continuing the history of this case that this contribution is made. The interest in this case arises from the fact, that, of the 72 cases of primary amputation for gun-shot injury mentioned in the report, this is the only one which is known to have been successful.

Says Dr. Otis: "Taking the 44 primary operations enumerated in the tables, and adding to these twenty-eight similar cases which are only reported numerically, we obtain a total of 72 primary amputations at the hip for gun-shot injury, of which 68 were fatal and one was successful, while the outcome in three cases was involved in uncertainty." [1]

This one case, therefore, is interesting to all surgeons, but especially interesting to the writer of this paper, because of the fact that, at the amputation, he was the operator's chief assistant. For the information of those surgeons who have not seen Dr. Otis' report, let me quote the history in full, from Circular No. 7, page 26.

Case 1.—Private James E. Kelly, Co. B, 56th Pennsylvania Volunteers, aged twenty-eight years, was wounded at about nine o'clock of the morning of April 29, 1863, in a skirmish of the First Division, First Corps, on the Rappahannock, nearly opposite Pratt's house, two miles below Fredericksburg. A conoidal musket ball, fired from a distance of about three hundred yards, entered the upper part of his left thigh in front, fractured the femur, and passed out at the posterior part of the thigh. The ball struck the femur four inches below the great trochanter and fractured it somewhat obliquely, but with less comminution than is usual. A long fissure extended, however, to the level of the trochanter minor. The important vessels and nerves were uninjured.

Surgeon Edward Shippen, U. S. Volunteers, Surgeon-in-Chief of the First Division, consulted the senior medical officers of the brigades attached to the division, and it was decided that in order to give the man a chance for his life amputation at the hip-joint should be performed. At four o'clock, seven hours after the reception of the injury, the patient was placed fully under the influence of chloroform,

[1] Circular No. 7, page 67.

and Surgeon Shippen commenced the operation, assisted by Surgeons G. W. New, A. W. Preston, Browne and Murdoch. The patient's nates were brought well over the edge of the operating table, and the femoral artery was compressed at the groin. A ten-inch catling was then introduced about midway between the trochanter major and the anterior superior spinous process of the ilium, the point at first directed slightly upwards in order to open the capsule of the joint; then the handle was raised and the point made to come out about an inch in advance of the tuberosity of the ischium. A large flap was then cut from the anterior and inner side of the thigh, about six inches in length; the hemorrhage being controlled by Surgeon James B. Murdoch, 24th New York Volunteers, who grasped the flap and compressed the femoral artery before it was cut. The heel of the knife was then placed where the point came out, and the points of entrance and exit were connected by an incision cutting to the bone. Part of the capsule being opened by the first incision, the remainder of it was divided, the round ligament cut, and the head of the femur removed from the acetabulum. The hemorrhage was then arrested, the femoral artery being tied last. The loss of blood was very slight, less even than in an ordinary amputation of the thigh. The stump having been dressed, the patient was placed in an hospital tent, and remained under Dr. Shippen's charge for three days. The operation was admirably borne, and the case was progressing most favorably on May 2d, when the patient was transferred to the Corps Hospital at the Fitzhugh House, under charge of Surgeon A. W. Whitney, 13th Massachusetts Volunteers, in consequence of the movement of the First Division to the battlefield of Chancellorsville. No unfavorable symptoms occurred. The patient improved daily, the stump granulating finely. He had an excellent appetite, and was quite content with the soldier's ration. But Dr. B. A. Clements, Assistant Medical Director, and Dr. Taylor, Medical Inspector, visited him and provided that he should be furnished with such delicacies as the resources of hospital could not supply. In the latter part of May, Surgeon Shippen having returned from Chancellorsville, saw the patient frequently and removed the ligatures until, on May 28th, the last had come away. The case continued to progress favorably until June 15th, when the greater portion of the Army of the Potomac having moved northward, the wounded and sick at the Fitzhugh House were captured by the rebels.

Kelly was taken to Fredericksburg in a wagon, and thence to Richmond by rail, and was incarcerated in Libby Prison. The extraordinary nature of his case appears not to have procured for him

any modification of the amenities of that place of confinement. According to his report, he lay upon the floor on his blanket, and received a diet of diluted tea and corn bread, and twice a week a bowl of soup. He was not subjected to any surgical attendance. After a week of the prison regimen, the wound became gangrenous and a troublesome diarrhœa supervened. On July 14th, the prisoner was exchanged. He was sent to Annapolis and entered the hospital there in an exhausted state. His normal weight before the removal of the limb was one hundred and fifty-five pounds; he now weighed sixty-three pounds. There was a sloughing sore extending from the upper outer angle of the wound downwards over a space larger than the hand. There was a profuse diarrhœa. He was ordered to take pills

FIG. 1. Shippen's successful Primary amputation at the Hip-joint.
(Copied from Circular No. 7.)

of opium and bismuth, with tincture of sesquichloride of iron, and beef essence and rice jelly for nourishment. Bromine was applied to the sloughing parts on three successive days, but without apparent benefit. A dilute lotion of chlorinated soda was then substituted. On July 24th, the slough separated, leaving a clean, healthy, granulating surface. On August 19th, Acting Assistant Surgeon Stovell, who had immediate charge of the case, reported that the patient had steadily improved since his admission and might be considered out of danger. On September 17th, Surgeon T. A. McParlin, U. S. A., reported that Kelly was rapidly improving; that the wound was healed, except at a point where there was a slight purulent discharge and over an ulcerated space as large as a walnut, which was granulating kindly. The patient had been removed to the tent colony or camp of convalescents. On

December 23d, 1863, the wound had entirely healed, and Kelly visited Washington and obtained his discharge from service and a pension of one hundred and eighty dollars a year. He then went to his home at Blairsville, near Black Lick Post Office, Indiana County, Pennsylvania. His general health was then good and his weight had increased to one hundred and twenty-four pounds. In the autumn of 1863, before the wound had completely cicatrized, an excellent picture of Kelly, in water color, was made by Mr. Stauch, under the direction of Surgeon J. H. Brinton, Curator of the Army Medical Museum. In December, 1864, Lieutenant Colonel G. K. Johnson, Medical Inspector U. S. A., procured a very satisfactory photograph of Kelly's stump. From these two pictures the plate which accompanies this history was prepared. Kelly still resides at Blairsville, and his general health continues good."

This is the history of this remarkable case, as taken from the records in the Surgeon General's Office, U. S. A.

The subsequent history is as follows:

Kelly is still in good health. In reply to a letter addressed to the postmaster at Black Lick Station, Pa., three years ago, I received the following:

BLACK LICK STATION, PA., Oct. 8, 1889.

DR. J. B. MURDOCH.

DEAR SIR:—In answer to your inquiry, I would say that I am personally acquainted with James E. Kelly; I saw him only a few days since; he is living and in good health, is an active, energetic man. I never knew him to be sick or in ill health. The loss of his leg does not seem to impair his health in any way. He is as active a man on crutches as I ever saw. I have seen him turn somersaults in the street on his crutches. You can reach him if you write to Blairsville, Indiana Co., Pa.

Respectfully,

A. K. PIERCE, P. M.

At my invitation, I received a visit from Kelly in April last He came to my office in Pittsburgh. I found him to be a hale, hearty man, fifty-eight years old; walked miles about the city, tiring out a youthful companion who was his escort. He has suffered no ill health, except an occasional attack of colic, since the amputation. He is a farmer, does the work of a farmer, has built a farmhouse for himself, including the putting on and shingling of the roof, with his own hands; walking all over the roof upon his crutches for this purpose.

He has a large family of grown up sons and daughters, and many grandchildren.

Kelly is not a teetotaller. He especially enjoys a drink of old Monongahela whiskey, and prefers to take it straight, like a soldier, out of a tin canteen.

The lessons to be drawn from this case are:

First.—That, notwithstanding the fearful mortality following primary amputation at the hip-joint, it is not absolutely hopeless, under the most adverse circumstances.

Second.—That the loss of a limb does not necessarily shorten life.

It has been asserted that life could not be prolonged for more than a few years after amputation at the hip-joint. We also know that application for life insurance is usually refused, when made by those who are maimed. The fact that this man has lived for more than twenty-nine years after the removal of his entire lower extremity and is now in excellent health, at the age of fifty-eight, should have weight in judging such matters.

It is to be regretted, as has been suggested by Dr. J. S. Billings, that the records in the pension office, as to the longevity of those who have been maimed, has not been collected and tabulated, in order to make them practically available and useful. It is sincerely to be hoped that the effort which is now being made before Congress, will be successful, in order that the medical profession and the public may be better informed.

My subsequent experience in amputation at the hip-joint is as follows:

At the Western Pennsylvania Hospital, Pittsburgh, I have amputated at the hip-joint, within the past three years, four times, for sarcoma, involving the femur.

My first operation was done February 16, 1889. The patient was a young farmer, aged thirty. In this case, in deference to the opinion of others, the arteries were ligated with stout catgut. Secondary hemorrhage occurred on the ninth of the following month, which proved immediately fatal; the patient having lived three weeks after the operation.

Case 2.—August 28, 1889. Female, aged 18. Recovery was complete, and patient discharged in twelve weeks after the operation.

I have since learned that this patient died two years after the operation from typhoid fever.

Case 3.—May, 1890. Male, aged 25. Patient died in seventy-two hours after amputation, from shock.

Case 4.—February 20, 1892. Male, aged 17. Died from shock twenty-two hours after operation.

In addition to these four cases, I have been present as an assistant in four other cases, and have done the operation many times upon the cadaver.

A few words in regard to the dangers connected with the operation, and the best methods of guarding against them.

The dangers are, 1st, hemorrhage; 2nd, shock, and 3rd, sepsis.

First.—In regard to the hemorrhage.

The means which have been suggested for its control during the operation, are various.

1. Ligature of the femoral artery, previous to the amputation, first put in practice by Baron Larrey in 1793, and adopted by Valentine Mott, of New York, October 7th, 1824, when he did the first amputation at the hip, performed in America.

2. By making pressure upon the femoral artery as it passes over the body of the pubis. This procedure was first resorted to by the celebrated English surgeon Abernethy.

3. Compression of the abdominal aorta by the fingers of an assistant, introduced into the rectum, or by an abdominal tourniquet.

4. The figure-of-eight elastic bandage of Esmarch, carried above the crest of the ilium, and around the abdomen, as recommended by Mr. Jordan Lloyd.

5. By the use of a rod, introduced into the rectum by means of which pressure is made upon the external or common iliac artery, as recommended by Mr. Davy.

6. By the use of a steel rod, passed under the femoral artery, and around the ends which protude, an elastic tube or band is wound in the form of a figure eight, (8). This is the method known as Trendelenburg's. Dr. Varick, of Jersey City, N. J., who first employed the rod in this country, did not disarticulate

until he had transfixed a second time behind the neck of the femur, and thus compressed the vessels posterior to the bone.

7. At a late meeting of the railroad surgeons of the Pennsylvania lines west of Pittsburgh, it was suggested by Dr. J. J. Buchanan, company surgeon of the Pittsburgh & Fort Wayne Railroad, located at Pittsburgh, that, in amputations at the hip, the abdominal aorta could be compressed most safely and most effectually by the hand of an assistant passed into the abdominal cavity; a previous abdominal section having been made for that purpose. A few months after this suggestion, it was put into practice by Dr. Neal Hardy, a company surgeon of the same road, at Upper Sandusky. The case was successful, and is fully reported in *The University Medical Magazine*, Philadelphia.

8. The method of M. Pean, the distinguished French surgeon at the Saint Louis Hospital, Paris, of controlling hemorrhage in all operations, including amputations, deserves mention. He neither makes use of a tourniquet nor of ligatures, but performs all amputations, including amputation at the hip, with a common scalpel, grasping the arteries with hæmostatic forceps, as he proceeds, either before or after dividing them. In the case of the larger arteries, it is his custom to leave the hæmostatic forceps, which grasp the vessels, hanging in the wound for two or three days; for the smaller vessels, after stopping the bleeding by forcipressure, he relies upon the pressure of the dressings to control the hemorrhage.

It was my privilege, in July, 1891, to witness the results of some of the cases operated upon in this manner at the Saint Louis Hospital; one of which was an amputation at the hip-joint, performed three weeks previous, upon a man in middle life. The man was in good spirits at the time I saw him, not at all anæmic, and bid fair to make a good recovery.

9. The last method which I will mention, is that of Prof. John A. Wyeth, of New York. Let me describe it in his own words:

"Two steel mattress needles, three-sixteenths of an inch in diameter and a foot long, are used. The point of one is inserted an inch and a half below the anterior superior spine of the ilium, and slightly to the inner side of its prominence, and is made to traverse the muscles and deep fascia, passing about half-way between the great tro-

chanter and the iliac spine, external to the neck of the femur, and through the substance of the tensor vagina femoris, coming out just back of the trochanter. About four inches of the needle should be concealed by the tissues.

The point of the second needle is entered an inch below the level of the crotch, internal to the saphenous opening, and passing through the adductors, comes out about an inch and a half in front of the tuber ischii. A piece of strong, white rubber tubing, half an inch in diameter, and long enough to go five or six times around the thigh, is now wound very tightly around and above the fixed needles, and tied."

CONCLUSIONS.—In considering the relative value of these different methods for the temporary arrest of the hemorrhage, it may be observed that the two first are objectionable, owing to the fact that the securing of the femoral vessels does not prevent hemorrhage from the branches of the internal iliac artery.

The third and fifth methods are objectionable because of injury which may be done to the solar plexus, or to the abdominal viscera.

The method recommended by Lloyd is difficult of application, and cannot always be depended upon. My experience with it is similar to that of Keen of Philadelphia, who says: "I have tested this method, and confess that it has not given me any satisfaction; I have had great difficulty in controlling the artery."

The method of Trendelenburg is open to the same objection as the first, viz., that it does not control hemorrhage from the branches of the internal iliac artery; but, as modified by Varick, while it must control the hemorrhage, is so much more complex than the method of Wyeth, as to be rejected in favor of the latter.

Buchanan's suggestion of, first, making an abdominal section for the purpose of getting at the abdominal aorta so as to compress it, may have charms for the gynecologist, who sees no danger in opening the abdominal cavity; but, to the general surgeon, it seems an additional and serious operation.

The method of M. Pean, of controlling the hemorrhage with hæmostatic forceps and pressure, as he proceeds in the operation, I am inclined to look upon with favor, but have had no personal experience in its application.

It was reserved for our distinguished countryman, Prof. John A. Wyeth, of New York, to devise what he has well named the bloodless method. I believe this method to be the best, and the one destined to supersede all other methods for the temporary arrest of the hemorrhage.

There are cases in which it is difficult to pass the needles as directed by Wyeth. My second case was one of this character; a large sarcoma involved the upper end of the femur, bulging up over Poupart's ligament. In this case, the hemorrhage was controlled by manual pressure over the abdominal aorta, and torsion of the vessels as they were reached.

METHODS OF OPERATING. These are exceedingly numerous. If each operation were to be named after the surgeon designing it, it would be necessary to describe some forty methods of disarticulation at the hip. Many of them have long since been abandoned, and many differ from one another in very trifling particulars.

The following are the modes now generally adopted:

1. Disarticulation by antero-posterior flaps (transfixion). This is the operation which has already been described when relating the history of Shippen's case. It is frequently spoken of as Liston's operation. The great feature of the operation consists in the rapidity with which it can be performed. Ferguson states that the procedure can be completed (as far as the use of the knife is concerned) in from twelve to twenty seconds. This was a matter of no little moment before the use of anæsthetics. No tourniquet of any kind was employed; the main vessels being secured in the flap itself by the fingers of an assistant, who compresses them, while the flap is being cut. This method is not looked upon with favor by modern surgeons, the loss of blood being necessarily very great.

2. Disarticulation through an anterior-racket incision. It is a feature of this operation that the vessels are secured as they are exposed; the surgeon dealing with the hemorrhage according to the method adopted during the removal of a large tumor. This is the mode adopted by M. Pean, of the Saint Louis Hospital, Paris, to which reference has already been made.

3. Esmarch's: This method is thus prescribed by Mr. Barker in his "Manual of Surgical Operations:" "By a strong muscular sweep of the knife, five inches below the tip of the trochanter, all the soft parts of the thigh are divided completely to the bone, and the latter is at once sawn across. The vessels are then ligatured. The bone is now seized and steadied while a second incision is made, commencing two inches above the tip of the trochanter, and carried down along the latter to terminate in the first circular cut." The fragment of the femur is then dissected out. This is very similar (as we shall presently see) to the manner in which Wyeth recommends the operation to be performed.

4. The method of Furneaux Jordan is one which is now very generally adopted by modern surgeons, and, in cases to which it can be applied, is, in my opinion, the best, as being less liable to be followed by shock.

It is not necessary to describe this operation in detail, as it is given in all of our modern text-books of operative surgery. Suffice it is to say that the amputation is made as low down upon the thigh as the condition of the disease or injury will permit (at the junction of the middle and lower third, if possible), by a circular incision. An incision is then made from the top of the trochanter major, downward along the femur, which runs into the circular incision; the soft parts are dissected from the bone, disarticulation being accomplished after dividing the muscles and ligaments by strongly abducting the femur.

By this method of dividing the soft parts low down, shock is, no doubt, much diminished. With regard to the long boneless stump left, Mr. Jordan says: "If the thigh were to remain a soft pendulous mass, it would be a small price to pay for greater safety; but it is a remarkable circumstance that, as a rule, the muscles do not rest until the longest stump has become a short one."

5. The last method which I will describe, is that of Prof. Wyeth, who gives these directions for its performance: "Five inches below the tourniquet, a circular incision is made, and a cuff, which includes the subcutaneous tissues down to the deep fascia, is dissected off to the level of the lesser trochanter, at which level the muscles and vessels are divided squarely, and the

bone sawn through. All vessels, including the veins, are tied with catgut, and the smaller bleeding points can be discovered by slightly loosening the tourniquet. The remaining portion of the femur is now easily removed by dividing the attached muscles close to the bone, and opening the capsule as soon as it is reached. On lifting the end of the bone in the direction of the patient's navel, and dividing the cotyloid ligament posteriorly, the air enters the cavity of the acetabulum, and greatly facilitates the division of the ligamentum teres."

In comparing these different methods of operating, it may be said of the operation by antero-posterior flaps (cut by transfixion), that it has the advantage of great rapidity of execution. Before the days of chloroform, this was an advantage of the greatest value, and, even yet, I am not prepared to admit that the length of time a patient is kept under the influence of an anæsthetic, is a matter of no consideration. Nor do we know how much shock is increased by a prolonged operation. So that even now, in cases requiring amputation for injury, such as the railroad surgeon may be called upon to perform, rapidity of execution is of very considerable importance. This method, also, has a place in military surgery, but can scarcely be applicable to disarticulation for disease.

When the operation is done for disease, the racket method is a great favorite with many distinguished surgeons. Mr. Frederick Treves says of it, in his recent "Manual of Operative Surgery:" "The racket method may be considered to be the best. That which employs the anterior incision may be considered to be the most useful."

The method advocated by Esmarch and Wyeth, of doing the circular operation, and immediately sawing off the bone, has the advantage of easy access to the vessels, and securing them at an early stage of the operation; but, in the experience which I have had, is not so easy of execution as I had been led to believe; the chief difficulty being in disarticulating the head of the femur from the cavity of the acetabulum. When the femur is sawn at the level of the lesser trochanter, the fragment is so short as not to be easily handled, and gives no leverage for dislocating the head of the femur. This difficulty was so great, in my last operation, as to require more time than all the

rest of the operation. I was not unmindful of the directions given by Prof. Wyeth to lift the end of the bone in the direction of the patient's naval, and, dividing the cotyloid ligament posteriorly; but, in spite of this, I almost despaired of ever getting the head of the bone out. Perhaps a good deal of my difficulty was owing to a want of skill, but I was consoled by the remembrance of witnessing Prof. Wyeth, himself, one year previous, at

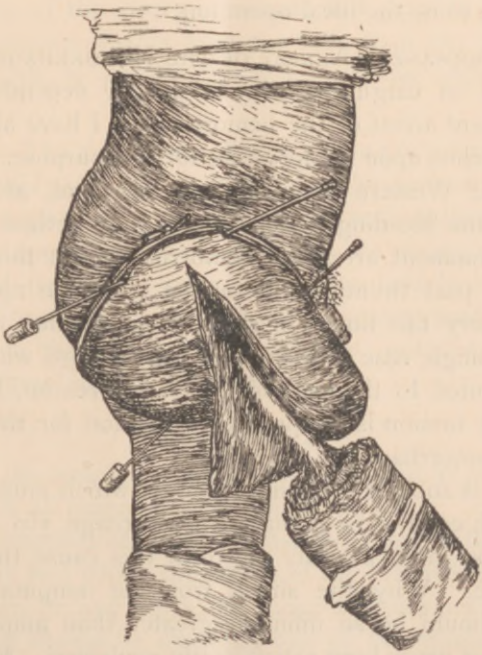

FIG. 2. Ideal method of Amputation at the Hip-joint.

Louisville, Ky., having a good deal of the same difficulty, when he gave a demonstration of the operation upon the cadaver before the Mississippi Valley Medical Association.

In the operation done by Keen, of Philadelphia, in February last, at which Prof. Wyeth was present, the operation required fifty minutes for its performance; how much of the time was consumed in enucleating the head of the bone is not stated. It is reported, however, that Prof. Wyeth suggested a low amputation of the bone. This is an excellent suggestion, as it leaves a

longer lever for manipulating the fragment. But let me ask, why saw through the bone at all? Why not go right on and disarticulate? With the whole limb to act as a lever this is easily accomplished, and, if Wyeth's tourniquet has been properly applied, it can be trusted to control the hemorrhage until the vessels are secured.

Wyeth's method of controlling the hemorrhage during the operation, combined with Furneaux Jordan's amputation, would seem to me to be the ideal operation.

THE PERMANENT ARREST OF THE HEMORRHAGE.—The ligature, either of catgut or silk, is usually depended upon for the permanent arrest of the hemorrhage. I have already stated that Pean relies upon forcipressure for this purpose.

At the Western Pennsylvania Hospital, at Pittsburgh, torsion of the bleeding vessels is the only method relied upon for the permanent arrest of hemorrhage. At this institution, during the past twenty years, torsion has been applied to the femoral artery 146 times, in cases of amputation of the thigh, without a single case of secondary hemorrhage, which could be fairly attributed to the method. For this reason, I cannot but believe that torsion is the preferable method for the permanent arrest of hemorrhage.[1]

There is another element of danger which must be guarded against with equal care as that of hemorrhage, viz., *shock*.

Perhaps more patients die from this cause than from the hemorrhage. Why the shock from an amputation at the hip-joint should be so infinitely greater than amputation near the joint, has never been satisfactorily explained. Many patients die within two or three hours after the amputation, when the loss of blood has not been greater than after an ordinary amputation of the thigh. Indeed, in my last case, as already related, the patient was a boy, 17 years old, and not a very feeble boy; not more than four ounces of blood were lost during the operation, and yet he never rallied from the shock, dying in twenty-two hours after its performance. I have observed the same rapid sinking in other cases, where the loss of blood has not been excessive. For this reason, the greatest care must be

[1] See my article on torsion of arteries. *Medical and Surgical Reporter*, Philadelphia, November 15, 1890.

exercised to maintain the vital forces by the moderate use of stimulants before the operation, and the protection of the surface of the body from cold and exposure during its performance. When this operation is done by any of the usual methods, it must be remembered that nearly one-fifth of the body is removed; and we all know that the nearer to the trunk we go, in an amputation, the greater the shock. In the Furneaux Jordan operation, the muscles are divided as near the knee as the condition of the injury or disease will permit; thus removing the amputation further from the body than any of the other methods. This, to my mind, is a very strong argument in its favor.

SEPSIS.—The time at my disposal does not permit me to say more upon this point than to urge that the strictest precautions to guard against this should be observed both during and subsequent to the operation; the dressings of the wound are so liable to be soiled by the discharges from the bowels and bladder. When the Furneaux Jordan operation is performed, the wound is farther from these sources of infection, and, for that reason, more easily kept clean.

SUMMARY.

1. For the temporary arrest of hemorrhage, Wyeth's method is the best, in all cases where it can be applied.

2. The method of operating known as that of the Furneaux Jordan is the best where the nature of the case will permit.

3. When, for any cause, the above methods are inapplicable the operation should be made by one of the Racket incisions, and the vessels secured as they are exposed in the course of the operation.

4. In military or railroad surgery, cases may occur where it is necessary to do the operation with great rapidity. In such cases the antero-posterior flap method, as used in the Shippen case, is the best.

5. For the permanent arrest of the hemorrhage, torsion of the bleeding vessels is recommended as being less liable to be followed by secondary hemorrhage; more easily applied, and leaving no foreign substance in the wound, less liable to convey infection.