ACCIDENTS IN HERNIA OPERATIONS.*

WITH ESPECIAL REFERENCE TO THE VESSELS.

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In presenting this subject I have incorporated only those cases occurring in the practice of members of this Society; being impressed with the fact that the majority are teachers in medical schools, and that all members must be Visiting or Assistant Visiting Surgeons to some New York Hospital. This latter being the case, accidents of this nature by the members of such a society will have a marked relative value to the teaching surgeons, and also be of marked interest as a factor in impending or prospective suits.

Consideration of the dangers during an operation for the radical cure of hernia, especially by the Bassini method, should include those of the bladder, intestines, vas deferens and the vessels. Reference only is made to the subject of injury to the vas, as no further serious outcome can result from this injury than sterility of the side of trauma, and even this can be obviated by proper suture of the divided structures, if recognized at the time of the operation.

The bladder is a frequent enough content of hernia, and is made so, often enough, by dragging the sac farther down than necessary to meet with the proper technic relative to this step. Although several cases have been reported to me by the members, this subject has received sufficient attention in the literature of the day without my recording these cases. The point in question was well made in a paper recently written (but not yet published) by Dr. Roland E. Skeel of Cleveland, and read by him before the American Association of Obstetricians and Gynæcologists at Baltimore on September 24, 1908.

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He further called attention to the fact that the bladder-wall of the paraperitoneal variety of vesical hernia occasionally was so thin, and lacked the usual vascular and muscular appearance of bladder-tissue, as to be mistaken for the sac wall of a hernia, and incised before the true condition was evident; further stating that the urine escaping from these incisions in several cases was taken for serum of the usual peritoneal variety. He advocated the administration of methylene blue for several days before the operation in all cases where there was a suspicion of the possibilities of the bladder being in the hernial protrusion, so that the colored urine escaping from the injured bladder would be recognized as such. He further stated that some of the injuries, one a case of his own, were due to tying the ligature of the sac about a portion of the bladder that was evidently dragged into this region by pulling the neck of the hernial sac far out, thereby producing the vesical hernia rather than having it at the beginning of the operation. This production of a hernia of the bladder was demonstrated by me in doing a repair for a direct hernia three weeks ago. While dragging on the sac to place a suture ligature the bladder fundus was observed for a length of one and a quarter inches to the inner angle of my wound. Germane to this is the following,— a portion of the replies sent me by Dr. George D. Stewart:

"Another danger that I do not think is sufficiently emphasized is that of wounding the bladder. This is more frequently the case in femoral hernias, of course, but it is also to be seriously considered in inguinal hernia. In two instances, which I recall, inflammation had caused adhesions of the sac to the bladder. The latter was dragged out through the inguinal canal as a part of the hernial mass. In two instances I have seen the bladder wounded, and in one I have opened it myself."

Two cases of injury to the bowel are reported to me by members of this society, one in a large sliding or slipped hernia, where the sigmoid was opened and subsequently sutured without any following evil result. In the other the sigmoid was evidently grasped in one of the deep sutures, as

a fecal fistula or artificial anus developed in a few days and continued for several weeks, with an eventual repair without secondary operation.

Injuries to the femoral vessels in inguinal hernia are due to several important factors, among which are: (1) an anomalous distribution of the branches; (2) the needle; (3) the suture material as a contributing rather than as a primary cause; (4) the method of passing the needle from above or from below; and (5) exposure, etc., of the ligament. Injuries to the femoral vessels in femoral hernia so far reported to me by members of the Society were of the vein, explained very easily by the relationship of the vein to the saphenous opening. The branches of the femoral vessels likely to be involved in passing the needle would be any of the ones above the profunda, and they are, from above downward,—the superficial epigastric, the superficial circumflex iliac, and the superficial and deep external pudics. The involvement of any of the above branches, except the superficial epigastric, would in a normally placed set of branches imply reckless suturing, and suturing not of the kind as described by Bassini. Two cases of injuries to the deep epigastric, supposed at first to have been the femoral, are reported to me by two of the members of the Society.

In my case reported below, in passing the needle from above downwards I cut off the superficial epigastric flush with the wall of the femoral, and more than likely took off some extra portion of the wall, as the subsequent dissection of the vessel preparatory to ligation showed a perfectly round opening upon the ventral aspect of the femoral the size of an ordinary silver probe, or about 2 mm. in diameter (see Fig. 1).

The Needle.—All kinds of needles have been used, and I find upon collecting the returns from the answers to questions sent out by me to all the members, that the greater number use the ordinary Hagedorn. Some use a blunt needle, advocated some years ago as a preventative of the very class of danger under consideration in this paper. The needle in my case, without question, was the cause of my misfortune.

Dr. Gerster also claims the same cause in his case. The needle which was given me was a large, full-curved, so-called fistula needle, or a powerful triangular surgical needle, the edges being as sharp as a knife. Objection was raised to such a

FIG. 1.

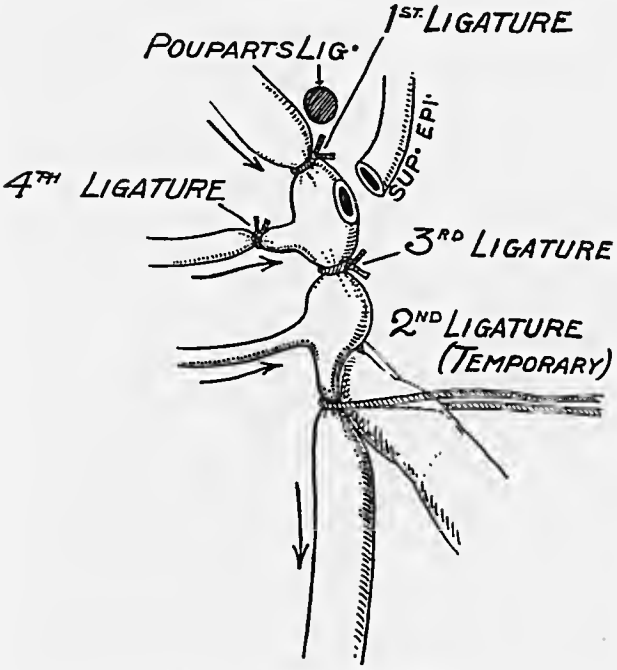


Diagram showing relations of wound in artery.

needle being given me, but I was told that no others were obtainable from the department at that time, and that the one I was given was the only one that would take the suture material, a cord-like one-and-a-half mm. kangaroo tendon. Although having misgivings, but taking extraordinary precautions, I used the needle, passing it from above downwards

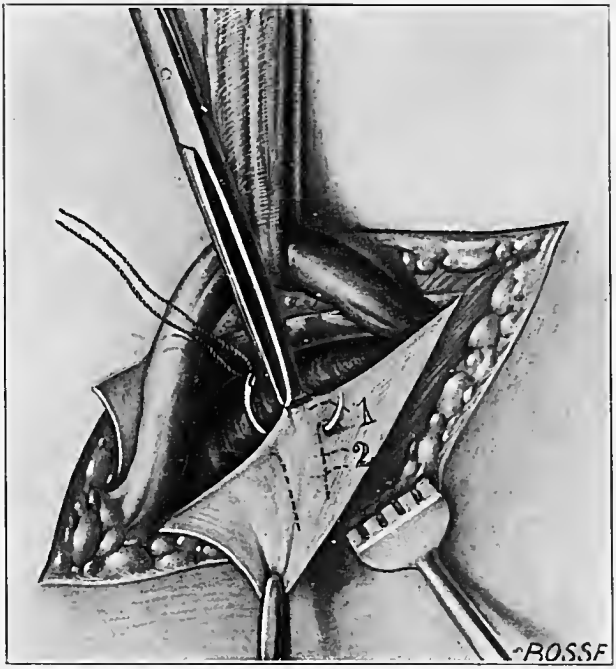
after having carefully palpated the pulsating femoral. The point passed readily and was grasped by the needle holder. A quick jerk to carry the large suture through was followed by a profuse flow of dark blood, which was suspected as coming from an injury to the femoral vein (see the history).

There is now no question in my mind that as the full curve and sharp edges passed through the aponeurosis the superficial epigastric was cut, say just below its base, from the femoral (see Fig. 2—the needle passing around the dotted line representing the superficial iliac artery). The suture material, dense, large, hard kangaroo tendon, such as I was forced to use on my case, is without question a dangerous suture material, as the necessary tugging, etc., to make it pass through the tissue in which a needle puncture may have accidentally been made in either vessel will not tend to any other result than that of enlargement of the puncture, while a soft or small suture material might act as a hæmostatic in filling the puncture, and also in closing the opening by the final knot application.

Passing of the Suture.—No particular light is obtained by the answers received from the members addressed. I can conceive only in an academic sense that the passing of the needle from above downward is less hazardous than in the reverse; that in passing the needle from below upwards one directs the point of the needle toward the wave pulsation of the vessel, while in the passing of the needle from above downwards one follows the stream, so to say, and the wave pulsation will cause the artery to strike the curve of the needle rather than the point, as in the method from below upwards. I fully believe that if the ligament is grasped and carried well upward it is not material how the needle is passed (see Fig. 2—forceps grasps the shelving border of the ligament and pulls it upwards).

The Ligament; Exposure and Traction Upon It.—Unless the ligament be thoroughly cleared, and traction be made upon its shelving border, as shown in the illustration, the danger of injury to the vessels is intensified. Should these arguments

FIG. 2.



Shows forceps grasping the shelving border of Poupart's ligament, to retract the same as far as possible from the vessels; also shows the needle being passed from above downwards, and passing about the high-placed superficial epigastric (1). Normal site of the superficial epigastric (2).

be true, then as a prevention against these accidents it will be necessary to consider the needle, the method of passing the suture, the suture itself, and finally such precautions in regard to the ligament as will give us the best picture of the shelving border, and that which will give us the greatest room between the ligament and the vessel.

The Needle.—Although a goodly proportion of the Society use the Hagedorn needle, I cannot but feel that safety will be enhanced by the use of a round needle with a sufficiently large eye to take the suture material.

Passing the Suture.—In passing the suture one can follow down the artery with less danger of having the artery transfix itself upon the needle than by passing the suture from below upwards. The suture material should be soft and pliable, not stiff and wiry.

The Ligament.—Clearing away all areolar tissue, having the field perfectly dry from blood so as to be able to observe the glistening interior surface of the aponeurosis, and then grasping the shelving border in a pair of forceps (see Fig. 2), preferably applied over the site of the femoral vessels, which have been previously well defined by the palpating finger, and then passing the suture as advised above, will, I believe, minimize the danger of injuring either the vein or the artery in this operation.

TREATMENT OF THE INJURED VESSELS.

The Vein.—In this structure our ill-luck has a fortunate side to it. We can ligate laterally, and should the injury be too large for ligation suture can be done much more readily than in cases of arterial injury.

The Artery.—Lateral ligation is out of the question, and either suture of the vessel, or allied methods of arteriorrhaphy of Brewer and Halsted, or ligation distal and proximal to the injury must be done.

There were forty-one responses by the honorary and active members of this Society to fifty-two requests sent out.

Some of the members were out of town at the time the final statistics of the paper were made up. The following cases of injury in inguinal hernia are recorded:

CASE I.—Iliac artery; ligation after unsuccessful trial at suture; no untoward result.

CASE II.—Femoral artery in a male; ligature; gangrene; amputation; recovery.

CASE III.—Femoral artery (see history of my case).

CASE IV.—Femoral artery; ligature; gangrene; amputation; death.

By one member, three cases of the femoral vein. In two of these cases the bleeding was checked by tying the suture, while in the third a large hæmatoma developed in ten hours, requiring removal of the sutures down to the kangaroo tendon, and then firm packing being applied, was successful in checking the bleeding. None of these cases were seriously involved.

One member reports a case of injury to the deep epigastric artery, with ligature, and also one of injury to the deep epigastric vein with ligature. Another member reports two cases of injury to the deep epigastric vein, with ligation, supposed at first to have been of the femoral vein. He is not positive now, but thinks they were of the epigastric. Mass ligatures were used to check the hemorrhage.

Two other cases, authentic, of injury to the femoral vein, are reported to me as occuring in the practice of members from whom I have not heard. Both these cases are said to have resulted favorably.

In all these cases the injury was recorded as being due to the needle.

Femoral Hernia.—No injury of the artery has been reported to me. The following are the instances of the vein being punctured:

CASE I.—Femoral vein; ligature drawn checked the bleeding; no bad result.

CASE II.—Femoral vein; nothing done; result perfect.

A complete history of my case is reported below. No cases are recorded from the literature of this subject.

CASE I.—Dr. John F. Erdmann's service at Gouverneur Hospital, March 22, 1908. Mr. A. W., Norwegian, silver-

smith, thirty-nine years old, entered the service for a radical operation upon a large right-sided inguinal (direct) hernia. No medical events of note crop out in his history until he was of sufficient age to acquire a gonorrhœa. From the same period of his life he drank a bit more than might class him with the moderate alcoholic, but not with the pronounced *habitué*. He does not recall the period of onset of his hernia, but knows that he has had it for years, and has never used any appliances for its cure or to retard its increase in size. For two months previous to his admission he has used alcohol to excess, and then found the hernia was a source of considerable discomfort. For a week he has had pains of varying degrees of intensity in the tumor, which would extend occasionally to the lowermost portion of his scrotum, and as a result of this pain he entered for treatment.

His physical examination revealed a heart hypertrophied and tumultuous in character. No other physical lesions except the hernia are found. The hernia is found to be a complete (direct) one of considerable size, omental apparently, and reducible in part only.

Operation on March 23. Owing to his late alcoholic habits, and his heart, local anæsthesia was used in the beginning. Upon exposure of the sac contents numerous and extensive adhesions were found. As these were likely to prove troublesome, and the patient was becoming restless, general anæsthesia with ether was given. The separate stages of the operation were passed over smoothly until the placing of the kangaroo tendon. A large fistula needle, perfectly new, with its triangular edges as sharp as a knife, and measuring one and three-quarter inches from tip to eye, was given me, threaded with a strand of hard, wiry kangaroo tendon, such as is supplied by the Bellevue and allied hospitals. Ordinarily I raise no objection to any needle passed me, but this one appeared to me so absolutely an instrument of danger that I called the assistant's attention to it, and requested a different needle. It seems that just at this time we were suffering from a dearth of needles and an inability to obtain more. This was forcibly brought to my mind by the assistant's reply that no needle in the hospital but the one given me would carry a tendon for suture. Bearing in mind the dangerous type of needle, and also the anatomy of this region,

I was more than careful in palpating the site of the femoral. With a remark to the Staff that the femoral was under the finger I began to pass my suture from above (proximally) downwards. The point engaged below and emerged above without giving any evidence of blood, but upon drawing the needle through and giving a sudden jerk to pull the kangaroo through, there was a fearful gush of dark blood. I thought that the femoral vein was punctured, and so expressed myself. Tying or drawing the tendon did not diminish the current of blood. Finger pressure was made and Poupart's ligament cut over the course of the vessel, and an incision made down the thigh over the vessels for a distance of three and a half inches. A careful but rapid dissection was then made and a clamp applied in a pool of blood to the vessel. It was now noted that our artery was at fault, and incidentally the anæsthetist, as our black blood was due to his prodigality in administering the ether. A proximal ligature was applied, but before tying the knot traction was made with pressure on the ligature loop. This controlled the hemorrhage sufficient to allow orientation. The loop was slipped as near as practicable to the opening, and then tied. A distal loop was applied below the forceps and pressure made as in the former instance, and the clamp was then removed. It was now found that hemorrhage continued in a stream of several inches in height direct from the anterior surface of the femoral artery, demonstrating a good collateral supply at this point, at least, from the rear. Dissection showed a large branch, evidently anomalous, passing from the femoral directly behind the point of injury, and that the site of injury was without question that of the superficial epigastric, the opening being rather larger than usual, and I should say, higher placed than ordinary, being practically under the ligament rather than a few lines below. (See Fig. 1.) My distal ligature was then placed proximally a full one-sixth inch more, as another posterior branch was found between the former site of the ligature and the source of collateral circulation. The ligature was then tied and the temporary one removed, a ligature was tied about the posterior supply source, and the wound closed with as near typical repair of the hernia as possible. Considerable blanching of the extremity was observed, but we were sure that some circulation was evident throughout the entire extremity. All proper precautions for

warmth, etc., were observed. No complaint by the patient upon his recovery from the ether.

March 24, pulse felt by some of the Staff in the femoral; foot warm; circulation apparently perfect, but not up to normal. No complaints from the patient, except such as ordinary hernia patients make; wonders why his leg and foot are so carefully protected.

April 1, circulation good; absolutely no untoward evidences.

April 24, patient has been kept on his back longer than the usual hernia case by two weeks. The reasons are evident. Discharged to-day perfectly well.

Called for examination on October 4, hernia recurred to slight degree; no trouble.

Comments.—I feel quite satisfied that this injury was caused by the needle sweeping about or around a high placed superior epigastric artery, and as a result of using a large and sharp needle its inner edge cut this vessel from the artery, and in so doing cut it off at its funnel expansion of origin from the femoral; that had I had an ordinary round needle, or even a Hagedorn, the delivery of the needle from behind Poupart's ligament would not have been followed by injury further than that of including the epigastric in my ligature. That had it been in the artery or vein the pulling through of the ligature material would have very markedly enlarged the opening. That a suture of the artery was not practical here for more reasons than that of lack of proper needles for this work. That owing to anomalous branches posteriorly, which apparently corresponded to the anastomotic branches of the circumflex, etc., from the profunda, a better collateral circulation was present after the ligation, and saved in its entirety our patient's limb.