bolism. In this instance the patient was, as the sequel showed, distinctly of a rheumatic constitution, and had passed through several confinements before she was known to be the subject of a cardiac valvular lesion, which was first discovered in hospital, in the course of the investigations in connection with an attack of hemiplegia. The case has been carefully recorded as to the pathological phenomena by Drs. Coats and Middleton, the clinical facts being furnished by myself (see *Glasgow Medical Journal*, April, 1879, pages 258 and 310).

The bearing of such instances as some of those I have submitted to you, on life-assurance, is too obvious to require commentary; and anything like an adequate dealing with so vast a subject is precluded by the limits imposed on me, even were I in a position otherwise to undertake it. I will, therefore, close with a record, in his own words, of three interesting cases communicated to me by Dr. Wallace, of Greenock, Examiner in Surgery in the University of Glasgow, which may, I think, very well stand for a sample of the kind of information that may be expected from senior family practitioners of good standing and large experience, when your Committee begins its operations.

"Mr. R. B., merchant and sugar-refiner, consulted me, about the year 1855, as to whether he was likely to be accepted for life-insurance by any of the leading offices. He came to me as a personal friend, telling me he was afraid there was something wrong with his heart, as he felt a curious pulsation in his neck when he lay down in bed at night. On examination, I found that there was a loud bellows-murmur, synchronous with the systole, and audible at the base and along the aorta and the great vessels in the neck. There was no increase of the impulse, but the vessels at the root of the neck pulsated visibly. He had no discomfort beyond the feeling described. He was otherwise vigorous, and was, besides, active and temperate in his habits. He never had rheumatism. His father, however, was rather a rheumatic subject, and was known to have had disease of the heart when 30 years of age, but was able to lead an active and useful existence for nearly fifty years after, dying, it may be said, of decay of nature, at the age of 85. Mr. R. B. had most probably the valvular affection long before coming to me. Be that as it may, his life was accepted by a good office, which, however, charged the premium for a man twelve years older than the applicant. After this, Mr. R. B. led a busy life, and had a good deal of domestic as well as business trouble. He was, however, always apparently calm and composed, and seldom made any complaint of his lot. So far as I know, he kept in excellent heart till within the last six months. He died about two months ago, at the age of 64. Whether his death was entirely due to the heart affection or not, I cannot say. But a gentleman, whose case I will presently give you, told me to-day that he had been informed R. B. died from the effects of a fall from the top of an omnibus a few weeks previously. R. B. was married.

"The case just referred to is that of P. C., now aged 51. He had an attack of rheumatic fever when 11 years of age, when the heart was touched. He was bred an accountant, and has led a very active life, taking a leading part in local and imperial politics. When 26 years of age, he was examined in London for life-assurance, and was then told by the medical man he had an affection of the heart, but that the constitution would get accommodated to it. He was taken at the ordinary premium. He has twice been under my care for attacks of rheumatic fever, and of great severity. He occasionally complains of rheumatic pains; but, from being up to the best way of warding off the fever, he keeps, on the whole, in good health, and can address large public meetings, night after night, without experiencing any inconvenience or discomfort. He is unmarried, and a strict teetotaler. He allowed me to examine him to-day, when I found the impulse and rhythm normal, and no extension of the præcordial dullness; but there is a mitral regurgitant as well as an aortic onward murmur, both being well marked, and in no way changed from what I found them to be about twenty years ago. The murmurs must have existed now for forty years. His father was drowned at sea. His mother died from myelitis at the age of 77.

"A third case worth noting is that of H. M., a Custom House officer. He is now 55 years of age, and unmarried. He retired with the rank of surveyor, about six months ago. When 11 years of age, he had an attack of rheumatic fever of great severity. When convalescent, he was seen, in consultation with the regular family attendant, by your predecessor, Dr. Macfarlane, who then told Mr. M.'s mother that the boy's heart was affected. He was brought up first in a merchant's office, and then entered the Custom's service as an indoor officer. He has been active and regular in his habits. He has had two severe attacks of rheumatism, for which I attended him; and I know that, when in Hull about twelve years ago, he had also a severe attack. He was, notwithstanding, always able to return to

business, but, when appointed surveyor a few years ago, he found the night-work telling upon him unfavourably. He, therefore, made up his mind to retire, more particularly as the superannuation allowance was nearly as high as he was likely to get. He complains occasionally of rheumatic pains in change of weather, and has at such times some uneasiness in the præcordial region. He manages, however, by taking a run to Buxton now and then, to keep himself in tolerable condition, and he enjoys life fairly well. I examined him on Saturday, and found the state of the heart just as I found it more than twenty-five years ago. There is a blowing sound synchronous with the systole at the base, and along the aorta, and also a blowing sound synchronous with the systole at the apex. The impulse and rhythm are normal, and there is no increase of the præcordial dullness. I may add that his father died from a fever at a comparatively early age, and that his mother is still alive and hale, at the age of 86."

THE DOME-TROCAR AND ASSOCIATED INSTRUMENTS IN PARACENTESIS, ASPIRATION, TRANSFUSION, OVIOTOMY, AND TUNNELLING THE ENLARGED PROSTATE.*

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THE dome-trocar comprises a series of instruments upon which I read a preliminary paper at the International Medical Congress at Philadelphia, in 1876, and which was published in the *Transactions* of that Congress; and I desire now to bring this more fully before the British Medical Association.

The progress of surgery during the past half-century is well illustrated by the achievements of the trocar in detection, diagnosis, and cure of diseases which previously were occult or obscure, and intractable. Fifty years ago, paracentesis was hardly practised, except in cases of fluid distension of the abdomen, bladder, or scrotum, after other means of relief had failed, and then it was a clumsy and unvalued procedure. The old trocar, with triangular point and big head, entered a cavity abruptly, endangering the interior, then the split cannula, pushed onwards over the bulging occiput, would often catch some bit of the three-cornered margin, and fail to go in properly, or, in entering, would tear or split up the edges of the aperture, and, upon being withdrawn, would leave a jagged punctured wound, indisposed to heal.

But, now, paracentesis is called upon both to detect and treat some of the most serious diseases to which the body is liable; such as hydrothorax and empyema, hydropericardium, septic deposits in the abdomen, intrapelvic and lumbar abscesses, intractable retention of urine, hydatids and abscesses of the liver and kidneys, strangulated hernia, hurtful effusions within or about the joints, hydrocephalus, and spina bifida; and the surgical management of these diseases is more critical, in consequence of the sensitive and vital character of the organs and textures involved, as the lungs, the heart, the abdominal viscera, the pelvic organs, the great joints, the spinal cord, the brain. In dealing with such diseases, in such parts, none of the instruments now in use are equal to what is required of them. Paracentesis now, with or without aspiration, with or without injection, is commonly done either with a single tubular trocar, having an unsheathed point dangerous to the interior of the cavity entered, or with a trocar, solid or tubular, guarded by an outer cannula, difficult of insertion, and, when inserted, only comparatively less dangerous than the point itself.

What, then, would be a perfect trocar? How far have recent improvements brought it towards perfection? What further changes are required to realise the ideal instrument?

The perfect trocar should be (1) easy of insertion, the point entering by incision rather than puncture, and having a guard following with certainty, without catching or dragging the margin of the aperture; (2) harmless when inserted, so that it shall not injure the interior of the cavity or adjacent parts; (3) safe as a probe or sound for internal exploration; (4) adaptable to every form of exhausting and injecting apparatus; (5) competent to give uninterrupted exit and entrance to fluids; (6) certain to leave a simple incised wound ready to heal.

Appreciation of paracentesis and improvements in the trocar seem to have commenced in 1850, when Sir James Simpson reduced the large head of the trocar to the same circumference as the shaft, so that it should stretch the orifice less; and as the cannula could then be advanced without spreading, he omitted the split in the end, and published his employment of a long slender trocar of this kind, with

* Read in the Section of Obstetric Medicine at the Annual Meeting of the British Medical Association at Brighton.

an exhausting syringe attached, as a means of diagnosis in various internal enlargements, especially in pelvic tumours and abscesses, and thus advanced the idea which Dieulafoy subsequently developed into his admirable aspirator.

The happy thought of having the cannula itself pointed, so as to penetrate independently of the stylet, was first conceived by Ferguson, who, in 1853, contrived a pen-like tubular needle, for the injection of perchloride of iron, in the treatment of naevi and aneurysms. In 1858, Dr. Alexander Wood adapted this instrument to the subcutaneous injection of morphine. Shortly afterwards, Sir Spencer Wells enlarged this little tubular trocar for ovarian tapping, and made the edges of the pointed end sharp for one half the circumference of the tube. This instrument, superior in many respects to the old trocar, has still this fault—that the protecting cannula is outside of the puncturing tube. Now, if the distal margin of this outer cannula be made thin, to wedge in more easily, it will be cutting and dangerous when within the cavity. If, on the other hand, the terminal margin be blunted, it will be liable to carry before it the sac, or the wall of the cavity; as, for instance, in tapping for hydrocele, or for retention of urine, if the tunica vaginalis, or the bladder, be not very tense, it is oftentimes extremely difficult to get the outer cannula pushed in; and in empyema, with a thick and tough pleura, so much force is sometimes required to urge the entrance of the outer cannula as to endanger detachment of the membrane from the ribs; and in paracentesis, for the diagnosis, or the temporary relief of ovarian dropsy, if the outer cannula do not follow the inner tube quite into the sac, or if, in entering, it catch and lacerate a fragile sac, more or less of the cystic fluid will escape into the abdominal cavity, which is one, if not the chief, cause of the fatality which sometimes follows this simple operation. But should injection be attempted with an imperfect introduction of the protecting tube, whether that be the split cannula of the old trocar, or the outer cannula of the tubular trocar, the result may be very disastrous. I have seen intense peritonitis occasioned by tincture of iodine thrown into the abdomen in such an attempt to inject an ovarian cyst; and Syme, in his *Principles of Surgery*, third edition, p. 406, deprecates a like faulty injection for cure of hydrocele, remarking, "If the fluid is allowed to remain in the cellular substance, it gives rise to violent inflammation, and soon terminates in sloughing of the scrotum."

I had on many occasions encountered embarrassments similar to the above, and, in common with others, tried to obviate the uncertainty of entrance of the outer cannula by cutting down to the immediate investment of the fluid to be evacuated, or the cavity to be entered, that I might at least see whether the outer cannula actually passed in or not, until it occurred to me to reverse the relation of the tubes to each other, so as to have the guard inside the trocar. And while in Edinburgh in 1871 I had a double tubular trocar made by Gardner upon the following plan:—The outer cannula has the distal end pointed, the pointed part being in shape and thinness as nearly as possible like a lancet, only, of course, concavo-convex so as to closely fit the inner tube, the edges very sharp and convex in outline (if concave, they cut less easily), rise from the point to the opposite side of the cannula, not abruptly (which was a grave fault of the instruments first made for me), but by an acute angle, not more than 25° for the largest size, and only 10° or less for the aspirator sizes. Constructed thus, the outer cannula will, without preliminary incision of superimposed tissues, enter by a clean semicircular cut, and penetrate to any required depth; the outer cannula having entered, then the protecting tube being inside of it may be advanced into the interior of the cavity with absolute certainty of entrance, and without a possibility of even touching the margin of the aperture or any of the textures through which the outer cannula has passed. Instruments of this description were likewise made, under my direction, by Messrs. Krohne and Sesemann in 1871, and the largest, or ovarian, size is more or less known in England; but the aspirator sizes seem to have been overlooked. Thus, Mr. Alfred Goodrich, in the *BRITISH MEDICAL JOURNAL*, August 8th, 1874, says, "In emptying a cavity with the aspirator, the operator is often alarmed by finding the instrument filled with blood, arising from the walls of the collapsing cavity being forcibly sucked against the sharp point of the needle;" and he proposes, as if the idea was his own, that the trocar consist of two tubes, the outer one pointed, the inner one not so. But in the same journal a fortnight afterwards, Mr. George Brown, of the North-Eastern Hospital for Children, referring to Mr. Goodrich's suggestion of a trocar guarded by an inner tube, observes, "The idea is not original; we have had one in constant use for more than twelve months, which was supplied by Messrs. Krohne and Sesemann." Well, the trocar, of which Mr. Brown speaks, is one of the kind just described as made, under my direction, by Messrs. Krohne and Sesemann in 1871, three

years before this correspondence. If other changes in construction of the trocar are declined, let this principle at least be accepted, to have the puncturing cannula outside, so that the guard inside shall enter with certainty and with ease.

Nevertheless, this instrument is not perfect; for although the safe entrance of the guard-tube is assured, yet, after entrance, the open end of this same tube is itself very objectionable, especially in the aspirator trocar, where it must be made thin to avoid bulk. In the August numbers of the *JOURNAL* just quoted, a correspondence appeared in reference to a successful paracentesis of the pericardium, where Mr. Shingleton Smith, upon whose patient the operation was performed, deprecates the risk which accrues, not only from the point of the aspirator-needle in the cavity of the pericardium, as the fluid is drawn off, but also from the sharp edge of a protecting cannula rubbing against the pericardium, or coming into contact with the beating heart; and about the same date the *Lancet*, under head of "Medical Facts," observes that, "In tapping of the chest, when the fluid has been evacuated by the exhausting apparatus, the lung, in expanding, may strike against the sharp and hard cannula. To prevent this, M. Béhier, of Paris, uses a tube of soft metal to be introduced into the ordinary cannula, which, when the pleura is emptied, bends down against the parietes of the chest, and the lung does not suffer." But a tube of soft metal cannot be drawn very thin, so if it is large enough to be permeable, it is too bulky to enter a sufficiently small cannula, and if used within a pointed tubular trocar, it would, upon bending down, leave the point exposed. Perhaps enough has been said upon the danger of the unguarded point, and the disadvantages of the open cannula.

I will now describe a very important modification of the bi-tubular trocar, by which the inner guard, whilst sheathing the point without touching the tissues penetrated, is deprived of the hurtful edge of its open end. Retaining my first improvement of having the outer cannula the perforating one, I have had the distal end of the inner tube closed over by a rounded or dome-shaped roof, so that, when it is projected beyond the cutting point of the outer cannula, the two tubes fit closely together, and the end of the combined instrument feels perfectly smooth, and may be safely used, as a probe or sound, within the cavity penetrated, as the abdomen, thorax, bladder, joints, and even the pericardium, without danger of wounding viscus or organ, puncturing blood-vessels, or even scratching or abrading the lining of the cavity. When the perforating cannula enters a cavity, there can be no escape of the contents till the dome is advanced to guard the point, then there is disclosed a fenestra, or oval aperture, cut out of the lower wall, and one third of each side wall of the inner tube, through which fluids may be freely evacuated and injected; the distal termination of the fenestra is at the base of the dome, which is either solid or floored over so that no substance can lie there, while at the proximal boundary a curved lip projects over one-third of the fenestra to prevent obstruction; the fenestra thus guarded, and being, moreover, on the under side, cannot be stopped by the wall of the cavity coming into contact with it, nor by any floating fragment falling upon it. When this instrument is introduced to empty a sac which proves to be multilocular, it may, without withdrawal, be instantly changed from trocar to sound and *vice versa*, so as to define and puncture cyst after cyst, while it occupies and plugs the one aperture by which it first entered.

The different sizes have each some peculiarity adapting it to its special work. The largest, or ovarian trocar has the proximal end bent down into a hollow handle, to conduct the fluid, through an india-rubber tube, into a receiving vessel; and a thumb-rest enables the one hand, holding the instrument, to sheath and unsheath the point at will. Sir Spencer Wells's hooks may be attached to this trocar; or the long light clamp-forceps, made for me, catch and retain the sac very securely, and, held in the hand with the trocar, accommodate themselves to the varying distances to which the trocar enters, and, after withdrawal of the trocar, close up the aperture and prevent leakage, and then help to pull out the slippery cyst through the abdominal incision; in oophorectomy and ablation of the uterine appendages, they will effectually hold the parts to be removed.

The clamp-forceps, eight inches long, and as light as consistent with the required strength, have, for their grasping parts, stout rings with transverse furrows and ridges on their opposing faces, which, when the blades are closed, interlock, and the sac or part held cannot slip, as from ordinary forceps, nor tear out, as from hooks or forceps with teeth; three needle-like points catch the part to be held, and retain it within the grip of the rings until the blades are clamped, which is instantly done by a graduated coupling, worked by a slide on the handle. The late Dr. Washington L. Atlee used both these

instruments, the dome-trocar and the clamp-forceps, in all his ovariectomies during the last three years of his life.

The trocar for paracentesis abdominis is similar to the ovarian trocar, only smaller, and without the thumb-rest. The next smaller size is the dome-trocar-catheter, for tunnelling the intractably enlarged prostate, not only relieving the bladder at the time, but giving permanent release from recurring retentions. This instrument is a long dome-trocar, the terminal third curved less than a common catheter or sound; the dome with its fenestra resembles the end of a metal catheter, and is mounted upon a strong steel spring, which adapts itself to the curve of the outer cannula, and when this catheter-end is pushed out, it occludes the point of the outer tube which, for

bladder with certainty, again occluding the point, and the urine is discharged, as through an ordinary catheter; a thumb-screw now fixes the protruded dome, and the instrument may be retained in the bladder twenty-four hours, or until the perforation is sufficiently patulous, as shown by the instrument moving easily in it; then it may be withdrawn, and a full-sized metal catheter introduced twice a day, or oftener, till the new channel is cicatrised and permanently established. This instrument will also be found most efficient for tapping the bladder from the rectum, and for discharging noxious intra-peritoneal fluids, and washing out the peritoneal cavity, through the retro-uterine *cul-de-sac*; and made with a larger curve, will be available in suprapubic lithotomy, perforating the bladder from

Fig. 1.—Fitch's Ovariectomy Trocar. The cutting point is on the outer tube, the inner or drainage tube is continuous, and terminates in a dome-top, which thoroughly guards the cutting point, and serves as a probe, when, through one cyst, a second and third one has to be punctured. The side opening in the second tube is also guarded by a projecting tongue from preventing a membrane being drawn into the opening when syphon action has been established. *a* shows the inner tube being pushed forward to guard the sharp point; *b* the cutting point is exposed, and the trocar ready for use; *c* shows the front view of the guarded opening of the inner tube.

additional security has a slight dorsal protuberance, so that it cannot catch or scratch the lining of the urethra; it is virtually a catheter within a tubular trocar. The mode of operating is this: the instrument, with the dome protruding, is introduced by the urethra, till arrested by the enlarged prostate; when, the left forefinger being in the rectum to define and steady the parts concerned, the pointed outer cannula is advanced, and passes easily through the gland into the bladder; then the inside catheter is slid forwards, and enters the

Fig. 2.—Forceps for seizing and holding the cyst. It can be locked by means of a wedge-shaped sliding-bolt.

within outwardly, remaining in the wound as a guide for the further steps of the operation. (Full details upon the construction and action of this catheter-trocar may be found in the *New York Medical Journal* for February, 1882.)

Transfusion may, I think, be easily and well done with a short dome-trocar of suitable size, attached to each end of an india-rubber

tube, a foot long; one trocar is inserted into the supplying vein, and, when the trocar at the other end of the tube fills, it is introduced into the receiving vein, and the operation is complete. The trocar being closed, and opened at its distal end by retraction and projection of the dome, there can be no inclusion of air, and there is no need of valve or stop-cock. As soon as the lancet-end is inserted, with the convex side towards the operator, the dome is protruded, sheathing the point and opening the fenestra; then this guarded tube may be pushed into the vein as far as required, and so accurately fills the aperture by which it entered, that no ligature is required. Thus, time—so valuable in this operation—is saved, disturbance of the vein

placed, for sufficient and more steady propulsion is obtained by merely elevating the syringe. I have done the operation in this way with great ease upon the cadaver, where the veins are more flaccid and collapsed than in the living subject.

The smallest sizes, or aspirator dome-trocars, are the most important of the series; these all have their proximal orifices funnel-shaped, to fit the aspirator-attachment. Two, of different calibres, are very long, for emptying deep cavities and for exploratory sounding; two,

Fig. 3.—Cutting prostatic catheter—*a* with the cutting-point guarded; *b* with the cutting-point exposed.

Fig. 4.—Guarded aspirator needle, on the same principle as the ovariectomy trocar—*b* shows the inner tube, with dome top and guarded eye; *c* and *d* are a straight and a curved terminal, to which are screwed, by means of a collar, needles of various sizes.

is avoided, and injury to the interior of the vein need not be apprehended. If mediate transfusion is performed, a glass syringe, with the piston removed, and the nozzle inserted into an india-rubber tube, armed with one trocar, is a suitable reservoir into which the blood may be caught as by ordinary venesection, or the blood may be defibrinated by whipping, and strained into the syringe; with the ordinary precautions, the trocar is then inserted, and the piston need not be re-

shorter and stouter, for tapping the thorax, liver or kidneys, and for transfusion; and one, still shorter and very fine, for hydropericardium, hydrocephalus, spina bifida, and strangulated hernia. This form of aspirator-needle enters without boring or rotatory movement, then, guarded by the dome, its touch is harmless, and it may be employed

where the ordinary needles or trocars would be inadmissible; for example, in aspirating the bladder with it, we may draw off the last drops of urine, as with a catheter, and search the interior of the viscus, as with a sound; in operating for hydatids, the protruded dome may stir up and dislodge the parasites, while the aspirator is extracting them through the same instrument. In tapping the thorax, there is no danger of hurting the pleura or the lung; and in paracentesis pericardii, the dome-guarded needle will not injure, more than a smooth probe, the interior of the pericardium, or the beating heart. (Dr. Roberts, in his book on *Paracentesis of the Pericardium*, designates this dome-needle as the most perfect instrument for the purpose, p. 53.)

A close-fitting india-rubber ring on the trocar, slid down to near the surface of the part entered, will conveniently indicate the distance to which the instrument is inserted or retained. To examine deep-seated bone, and to search for shot or other foreign substances, we may insert a dome-needle with the point projecting, till we reach the proper depth; then, advancing the dome, we have a probe with which to make exploration, without entrance of air or exit of blood.

The aspirator-attachment deserves attention; by it either of the dome-needles or smallest trocars may be connected with any exhausting and injecting apparatus, without moving the apparatus or the trocar, and without twisting the connecting tube. It is a hollow metal cylinder, two inches long, with a nozzle at each end, one nozzle bulbous, the other conical; the bulbous nozzle having been previously inserted into the free end of the flexible tube of the apparatus, the connection is effected in a moment, when required, by pushing the conical nozzle into the funnel-socket of the dome-needle, and the ring-nut clasps the coupling into an impervious joint. The cylinder of one of the attachments is curved, to prevent sharp bending of the india-rubber tube where the instrument is used with a simple exit-tube, or with the syringe in mediate transfusion.

The handy aspirator is a very portable and inexpensive apparatus, which I now use almost universally, to the exclusion of every other form of aspiration; it is like a Higginson syringe, but with treble thickness of all the walls, which gives strong resilience and powerful suction to the bulb, and impossibility of sharp bending, or of collapse to the tubes. In emptying a cavity with it, the bulb is firmly compressed in the hand till the trocar is inserted; then the compression is relaxed, and the flow, thus initiated, continues by mere syphon-action, unless the fluid be very thick; but if it be necessary to quicken the current, by occasional or repeated working of the bulb, then the india-rubber tube between the bulb and the trocar should be pinched with the thumb and finger at each compression of the bulb, to prevent possibility of regurgitation. Either exhaustion or injection may be effected by attaching the trocar to the end of one or other tube of the apparatus. The trocar-needles for the handy aspirator, if it be desired to lessen their cost, may have their proximal ends bulbous, to be inserted directly into the orifice of the india-rubber tube, without intervention of the aspirator-attachment. (Vide *New York Medical Journal*, November, 1877.)

The larger trocars are made of German silver, with the cutting part of steel; the trocar-catheter has the dome or catheter-end of silver, the perforating cannula of thin steel; the aspirator-trocars have both cannulae of thinnest steel tubing, without seam; the aspirator-attachment is steel, its conical nozzle brass. The best material for the connecting tube between trocar and exhaustor is pure india-rubber, so thick that it cannot collapse. When used without exhaustor, the india-rubber exit-tube should have the middle expanded into a bulb, to be used for the ordinary emptying of cavities, and for aiding the current in transfusion, whether direct or mediate; but there should be no joints between the bulb and the tube, and no valves to impede the easy flow of fluids, or to whip the blood in transfusion; and there should always be, near the end of both connecting-tube and exit-tube, a bit of glass tubing, through which the current may be observed, or its absence noticed.

To clean these trocars and needles, the inner tube is fully retracted, and then revolved as far as it will go, when the several parts are easily pulled asunder. The trocar-catheter is taken apart by unscrewing the button on the proximal end of the instrument, and then drawing out the dome and spring through the distal end of the outer cannula. Messrs. Tiemann and Co., of New York, have perfectly made these instruments for me; and Messrs. Krohne and Sesemann will have all of them made with careful accuracy.

The dome-trocar will, I think, be found—(1) easy of insertion; (2) harmless when inserted; (3) safe as a probe or sound for internal exploration; (4) adaptable to every form of exhaustor and injector; (5) competent for uninterrupted passage of fluids; and (6) certain to leave only an incised wound, ready to heal, thus realising the requirements demanded of a perfect trocar.

ON THE PRACTICABILITY OF ESTABLISHING AN ARTIFICIAL FISTULOUS OPENING IN THE HUMAN SUBJECT BETWEEN THE GALL-BLADDER AND THE DUODENUM.¹

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Duodeno-Cholecystostomy.—This term is applicable to the operation of uniting the gall-bladder and the duodenum with an opening for the passage of the bile. The process which I have proposed for effecting this consists in connecting their walls by a single loop of suture, which shall attach their surfaces by adhesive inflammation, and cut an opening between their cavities, passing away in the intestinal canal. If there exists any disintegration of the tissues of the sac, extirpation would be proper. Should such degeneration not be present while the cystic and common ducts can be freed from obstruction, cholecystotomy would be warranted. But if there is permanent occlusion of the common duct without obstruction of the cystic duct, then duodeno-cholecystostomy is the appropriate operation.

This proceeding is simplified by the dilated condition of the sac, which brings it into close proximity to the duodenum, and facilitates the passing of a needle with a silk thread to unite their walls by moderate constriction.

In my autopsic lecture, reported in the *Southern Medical Record* for March 20th, 1885, will be found a description of the demonstration of this process on the human subject. This attachment is illustrated in the accompanying modification of Hinkle's plate, Fig. 1.

Fig. 1.—L. The gall-bladder. o. Duodenum with attachment. M. The colon partly removed. N. Severed suspensory ligament, with liver and stomach.

In my first series of experiments on dogs, a circular row of catgut-sutures was applied around the elastic ligature, connecting the walls of the gall-bladder and the duodenum. But it was observed afterwards that sufficient inflammation ensued from a single stitch of silk thread to unite the walls, while it cut an opening between their cavities.

In case of an incision into the sac for the removal of its solid contents, this may be closed by Lembert's suture, separate from the loop for attachment, or may be secured to a corresponding incision in the duodenum, dispensing thus with the loop for effecting a communication. Other modifications will be noted in referring to my second series of experiments on dogs at the close.

Inflammation of the tissues of the gall-bladder seeks relief in the direction of the duodenum; and my observation of the ulcerative opening of the gall-bladder into this canal, directed my investigations originally to effecting a direct communication between them. This result is well shown in the accompanying copy of Jeançon's cut, Fig. 2.

¹ Read in the Section of Surgery at the Annual Meeting of the British Medical Association at Brighton.