Surgical dilators having insufflating means

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Abstract
Surgical instruments for obstetrical use including a first device for dilating the cervical neck, and a second device for dilating the uterus. Each device includes a relatively rigid element surrounded by a pneumatically inflatable element, the rigid element projecting through the inflatable element to permit complete dilation and the performance of surgical procedures through a longitudinally extending bore in the rigid element. The invention may be incorporated into known endoscope constructions, and permits the controlled expansion of the cavity being expanded to the degree required. One embodiment of the invention is suitable for use in creating a pneumoperitoneum, and offers added safety by confining the inflating gas to the interior of the inflatable element.

5 Claims, 6 Drawing Figures
SURGICAL DILATORS HAVING INSUFFLATING MEANS

BACKGROUND OF THE INVENTION

This invention relates to surgical instruments, and more particularly to those for use in obstetrical procedures.

The examination of the cervix and uterus, as well as the performance of surgical procedures in these areas, has been greatly facilitated by the development of the endoscope, which permits not only the examination under illuminated conditions within these organs, but the performance of biopsy and cauterizing procedures as well. As a part of the obtaining of access to the uterus, it is normal to dilate the cervix by the serial insertion and withdrawal of a plurality of obturators, normally ranging in diameter from approximately 3mm. to 12mm. Once dilated, the cervix will remain in such condition sufficiently long to permit the introduction of the endoscope past the cervix and into the uterus. Dilation of the uterus is presently accomplished by the introduction of an inert gas past a seal effected at the cervical neck.

When the surgical procedure is accomplished by penetrating the abdomen, it is also known to inflate the abdominal cavity, again, employing an inert gas, this procedure being employed to gain access to the fallopian tubes to effect sterilization by electro-cauterization. Unfortunately, the introduction of a relatively inert gas under pressure into body cavities is not without substantial danger. In some cases, injury has resulted from excess dilatations as a result of excess gaseous pressure. More serious has been the formation of embolisms and resulting complications.

Another form of know surgical inflating device is the Foley catheter useful for draining the bladder, where the ducts have become blocked. This device is formed substantially of non-rigid material, and its use as a dilator is correspondingly limited.

BRIEF DESCRIPTION OF THE PRESENT INVENTION

Briefly stated, the invention contemplates the provision of a set of instruments in which dilatation is accomplished by the inflation of an expandable element, after insertion of the same into the body cavity, so that the inflating gas is confined within the element. The inflating element may be formed so as to permit inflation only to a predetermined degree, or expansion may be controlled solely by inflation pressure within the elastic limit of the element. The element is formed to surround a rigid shaft extending to the opposite ends of the inflatable element, so that the expansive pressure is maintained substantially uniform along the longitudinal axis of the shaft. Where the shaft is hollow, an endoscope may be positioned within a longitudinally extending bore, whereby biopsy, cauterization, and simple examination can be performed at the distal end of the cavity. When the inflatable element is employed in the uterus, it may be frustaconically shaped, with the base thereof at the distal end, to permit maximum exposure of the walls of the uterus, and the exposed ends of the fallopian tubes.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, to which reference will be made in the specification, similar reference characters have been employed to designate corresponding parts throughout the several views.

FIG. 1 is a perspective view of a first embodiment of the invention.

FIG. 2 is an enlarged fragmentary sectional view of the first embodiment showing the same in expanded condition.

FIG. 3 is a perspective view of a second embodiment of the invention.

FIG. 4 is a perspective view of a third embodiment of the invention, partly in section.

FIG. 5 is a view in elevation, partly in section showing a fourth embodiment of the invention.

FIG. 6 is an exploded view in elevation of the fourth embodiment.

DETAILED DESCRIPTION OF THE DISCLOSED EMBODIMENTS

Referring to FIGS. 1 and 2 in the drawings, the first embodiment, generally indicated by reference character 10, comprises broadly: a rigid shaft member 11 approximately 3mm. in diameter and bounded between first and second ends 12 and 13, respectively, by an outer surface 14. A proximal portion 15 forms a handle.

Surrounding a distal portion adjacent the first end 12 is an expandable membrane formed of rubber or synthetic resinsous materials such as polyurethane. The membrane is of elongated configuration, and is bonded at first and second marginal edges 17 and 18 to the surface 14, as best seen in FIG. 2. Communicating with the interior of the membrane is a supply tube 19 having a pressure gauge 20, a bleeder valve 21 and inflating means 22, which may be in the form of a manually engageable bulb. It will be understood that the inflating means 22 may be substituted by a source of pressurized gas (not shown) having suitable valving means.

The first embodiment is used for dilating the cervix, and in unflated condition has a diameter approximating 3mm. It is inserted in normal manner into the cervical neck, following which the membrane 16 is inflated under pressure to exert a substantial force against the inner surface of the cervix sufficient to dilate it to approximately 12mm. The amount of internal pressure required to accomplish this will vary from patient to patient, and a suitable range of inflation pressures is established empirically. The dilatation of the cervix is preferably accomplished gradually, so as not to impart any undue stresses to the patient, and normally dilation can be accomplished by gradually building pressure up to 15 to 20 lbs. per square inch. Once dilation has been obtained to a range of about 12mm. to 14mm., the bleeder valve 21 may be opened, and the device 10 easily withdrawn.

The second embodiment, generally indicated by reference character 30, is employed after the cervix has reached a dilated condition, and is projected into the uterus prior to expansion. It includes a hollow tube 31 having an outer diameter of approximately 12mm., the tube having a continuous longitudinally extending bore communicating with proximal and distal ends 33 and 34, respectively. The outer surface 35 is provided with finger engaging means 36 to permit convenient insertion and withdrawal.

The expandable member 37 is preferably a molded type, including an inner cylindrical wall 38, a planar end wall 39 and a conical wall 40 joining the end wall
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39 in a curvilinear edge 41. Sealed areas 42 and 43 interconnected the member 37 with the outer surface 35 of the tube 31. An inflating tube 44 includes a pressure gauge 45 communicating with inflating means 46. Because of the larger volume of the member 37, inflation is preferably done from a source of compressed inert gas rather than a hand operated bulb.

When inflated, the frustoconical shape of the member 37 exposes a wide area of the uterine wall to examination and surgical procedure performed by the insertion of an endoscope through the bore 32, and relative movement of the barrel of the endoscope permits examination and the performance of surgical procedures at the distal end of the tube 31.

FIG. 4 illustrates a third embodiment of the invention, generally indicated by reference character 50 which incorporates a conventional endoscope 51 secured in fixed relation therewith. The inflating means 52 is similar to that of the second embodiment, and may be secured to the outer surface 53 of the barrel. Where the interconnection is permanent, a degree of flexibility is lost in that the distal end of the endoscope cannot be shifted relative to the distal end of the tube, but this disadvantage may be offset by convenience in insertion during certain surgical procedures.

Turning now to the fourth embodiment of the invention, as illustrated in FIGS. 5 and 6 in the drawings, this structure is useful where access through the cervix is not desirable. The fourth embodiment, generally indicated by reference character 60, includes a tubular member 61 having a hollow bore 62 extending between first and second ends 63 and 64, respectively. Hand engaging means 65 is mounted on the outer surface of the tubular member, as in the second embodiment.

The expandable membrane 66 is of generally spherical configuration, and includes a supply tube 67, gauge 68, bleeder valve 69 and an inflation source 70. Selectively penetrating the bore 62 is a stylet 71 which permits the puncturing of the abdomen for insertion of the tubular member 61, and an obturator 72, having a rounded distal end which permits the spreading of the cavity prior to inflation. Once inflation has been accomplished, the obturator is removed to be replaced by an endoscope.

Use of the fourth embodiment forms a pneumoperitoneum, as known in the art, but the inflating gas is confined within the expandable membrane 66, and not permitted to contact tissue.

It may thus be seen that I have invented novel and highly useful improvements in surgical instruments affording the insufflation of body cavities with a facility that has theretofore been impossible. In the case of dilation of the cervix, the entire dilation can be accomplished using a single instrument, which employs pneumatic pressure rather than the insertion of a series of dilators. Examination of the uterus, and the performance of surgical procedures therein is accomplished in a somewhat similar manner, the inflating gases being confined within an inflatable member, and not permitted to contact tissue being treated. In the case of the fourth embodiment, the treatment may be accomplished by penetrating the abdomen, and inflating the abdominal cavity, again with complete insulation of the inflating gas from the tissue of the patient.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modifications will occur to those skilled in the art to which the invention pertains.

I claim:

1. A combination surgical dilating and endoscopic device comprising: a rigid shaft element having proximal and distal ends bordering an outer surface, an expandable element surrounding said shaft element and secured to said outer surface, means supplying an inflating medium to said expandable element communicating therewith, and means for determining the degree of inflation of said inflatable element, said shaft element penetrating said inflatable element and defining a longitudinal bore extending substantially the length thereof; and an endoscopic element having an elongated barrel within the bore of said rigid shaft element and capable of longitudinal movement relative thereto; whereby said device may be inserted into a body opening to a position in which said inflatable element is positioned within a body cavity, following which said expandable element is expanded to correspondingly expand said body cavity, and said endoscope is manipulated relative to said rigid shaft element to perform a required surgical function.

2. Structure in accordance with claim 1 in which said expandable element is of generally cylindrical configuration.

3. Structure in accordance with claim 1 in which said expandable element is of frusto-conical configuration with the wider portion thereof located at the distal end of said rigid shaft element.

4. Structure in accordance with claim 1 in which said expandable element is of spherical configuration.

5. Structure in accordance with claim 1, in which said means for determining the degree of inflation of said expandable element includes a pressure gauge.

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