APAROSCOPIC surgery has become a standard procedure in general surgery and gynecology, and its applications to a variety of surgical indications have increased during the past decade. Along with advancements in procedure, various kinds of devices and instruments have been developed and refined for each specific application. Among these devices, an endoscopic threaded imaging port (EndoTIP; Karl Storz Endoscopy, Tuttlingen, Germany) was designed to be used as an access device to enter the peritoneal cavity under endoscopic monitoring, thereby enhancing safety and ease of access. Using this device we developed a method for the insertion of a peritoneal shunt tube through a small skin incision. This method has proved to be safe and noninvasive.

Materials and Methods

The EndoTIP is a hollow, threaded, blunt-tipped cannula that accommodates an endoscope (Fig. 1). It is commercially available in two sizes (6 mm and 11 mm in diameter) and in several lengths, and can be obtained either with or without a sealing valve or insufflation stopcock. The 6-mm EndoTIP is used in combination with a 0°, 5-mm laparoscope, whereas the 11-mm EndoTIP requires a 0°, 10-mm laparoscope. The length of the cannula is selected depending on the patient’s habitus. The procedure described in this article is independent of the size or length of the cannula. An incision large enough for insertion of an EndoTIP is made in the upper paramedian abdomen. The subcutaneous tissue is separated laterally to expose the anterior rectus fascia. A laparoscope is mounted within the EndoTIP so that the terminal orifice of the cannula can be optimally viewed on a monitor. The EndoTIP combined with the laparoscope is then inserted through the incision and placed perpendicular to the anterior rectus fascia. Holding the laparoscope with the left hand, a clockwise rotation of the EndoTIP is initiated using the right hand without applying axial force (Fig. 2A). The blunt tip of the cannula is engaged in the anterior fascia and advanced through the different tissue layers—muscle, vessels, and posterior fascia—separating and transposing these structures onto the outer thread (Fig. 2B). Because these structures are lifted from the peritoneum by the thread, the peritoneal membrane is stretched onto the tip of the cannula (Fig. 2C). Through the thin, tented membrane, the liver, bowel, and omentum are easily visible, and inadvertent injury is avoided. Further rotation advances the cannula gradually into the peritoneum and finally into the peritoneal cavity (Fig. 2D). Throughout the process of entry, tissues along the cannula’s path are not transected and are clearly visible by using the endoscope.

After opening the peritoneum, both the laparoscope and the proximal sealing valve of the EndoTIP are removed. Through the lumen of the EndoTIP, a PVC tracheal tube (Blue Line; Portex, Kent, UK) with adequate diameter is
inserted into the peritoneal cavity in an appropriate direction by tilting the cannula (Fig. 3A). A longitudinal slit was made in the tube beforehand. The PVC tube is soft enough not to injure the viscera, yet strong enough to resist collapse. The access cannula is then removed using a counterclockwise rotation. With the peritoneal cavity secured by the PVC tube, the shunt tube is connected subcutaneously between the ventricle and the abdominal incision through a pressure control valve (Codman Hakim Programmable Valve; Medos S.A., Le Locle, Switzerland). After confirmation that cerebrospinal fluid is dribbling from the abdominal end of the shunt tube, that tube is introduced into the peritoneal cavity through the PVC tube (Fig. 3B). The shunt tube is further threaded through the slit in the PVC tube into the peritoneal cavity. By holding the shunt tube with larger forceps within the PVC tube at the level of the incision, and by extracting the PVC tube at the same time, the slit is separated automatically by the forceps tip as the PVC tube is removed and the shunt tube is left in the peritoneal cavity (Fig. 3C and D). Only one or two skin stitches are needed for wound closure, and no fascial or peritoneal sutures are required.

Clinical Application and Results

We have used this method for VP shunt placement surgery in eight patients suffering from hydrocephalus. In the first three patients, we used an 11-mm cannula; following the success achieved in those cases, we switched to a 6-mm cannula for the next five patients. The length of the skin incision varied from 13 to 15 mm when using the 11-mm cannula and from 8 to 10 mm when using the 6-mm cannula.

In each case, no difficulties in accessing the abdominal cavity occurred, and it took 5 minutes on average from the time of skin incision to the opening of the peritoneum. A PVC tracheal tube was easily passed through the lumen of the EndoTIP into the peritoneal cavity. The shunt tube was...
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also brought into the peritoneal cavity with ease through the slit in the PVC tube. A few stitches were placed on the wound for closure. The total time required for all parts of the procedure, beginning with skin incision, was approximately 5 minutes.

Postoperatively, in all cases radiological examination showed that the shunt tube had been placed correctly within the peritoneal cavity. Wound pain was minimal compared with that experienced after conventional laparotomy. No insufficiency in the shunt system or incisional herniation was seen during the follow-up period.

Discussion

During VP shunt placement surgery, in most cases a peritoneal shunt tube is put in place via a small laparotomy that includes an incision measuring approximately 4 cm. It generally takes approximately 20 minutes to open the peritoneum, insert the shunt tube, and close. In obese patients, however, a longer incision is needed, and more time is consumed.

One previously described method involves using a small trocar to insert the shunt tube. Although that method is quick and requires only a very small incision, it carries the risk of visceral injury due to blind penetration with the trocar. Therefore, it must be performed only in a safe area over the abdomen, where no vital organs lie beneath.

With our new method an EndoTIP combined with an endoscope is used to facilitate the insertion of the shunt tube. Using this method, the peritoneal cavity can be accessed quickly (approximately 3 minutes) through a small incision (<1 cm long for insertion of the 6-mm diameter EndoTIP). Each layer of the abdominal wall is separated radially without axial force as the cannula advances, and the process is clearly visible with the aid of the endoscope, thereby providing good safety for the procedure, especially in patients in whom postoperative peritoneal adhesion is expected.

Basically any location in the abdomen can be accessed using this method, and obesity is not an exclusionary condition for this minimally invasive procedure. These advantages have been verified for years in endoscopic abdominal surgery, for which the EndoTIP was developed and has been used as an endoscopic or instrument port in a vast number of cases.

Similar methods for abdominal tube insertion or revision under laparoscopic guidance have been reported. In these methods, pneumoperitoneum is created beforehand and the shunt tube is observed and manipulated through access ports. Two incisions are generally required and the potential adverse effects of pneumoperitoneum are of concern.

With our method, pneumoperitoneum is not necessary; however, if by chance the space under the tip of the cannula is not well secured, carbon dioxide insufflation can be induced through the stopcock, provided the stopcock type of EndoTIP is used, and the PVC tube can be inserted appropriately after the entire area has been observed using a laparoscope.

We have developed a simple and minimally invasive method for placement of an abdominal shunt tube by using the access device EndoTIP. This method has been useful in VP shunt placement operations, and is expected to be useful in lumboperitoneal shunt placement procedures as well.

References


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J. Neurosurg. / Volume 94 / April, 2001