Improvised Transumbilical Glove Port: A Cost Effective Method for Single Port Laparoscopic Surgery

Elbert Khiangte · Iheule Newme · Partha Phukan ·
Santanu Medhi

Received: 9 August 2010 / Accepted: 29 October 2010 / Published online: 26 November 2010
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Abstract Innovations in technology has changed the traditional laparoscopy to be less invasive. Singleport transumbilical laparoscopy has emerged to enhance the cosmetic benefits and to decrease the morbidity of the minimally invasive surgery. It has further minimized the minimally invasive surgery. However, this technique requires a specialized multichannel port (for introducing laparoscope and instruments) which is very costly and in fact, is not affordable by the majority of the population in a developing country like India. We have improvised a single-port access system using readily available materials like surgical gloves, towel ring, inner flexible ring and conventional laparoscopic trocars with no added cost burden to the patient. We have performed 40 single port surgeries using this method without any complications.

Keywords Single-port laparoscopic surgery · Transumbilical E.K. Glove port · Single-port access surgery · Improvised glove port

Introduction

Laparoscopic surgery has gained popularity as an alternative to open surgery. The benefits credited to it is its excellent visualization, decreased blood loss, less post-operative pain, earlier convalescence, superior cosmesis and comparable oncologic outcomes [1]. In an effort to reduce the morbidity and improve the cosmesis of laparoscopic

surgery, surgeons have tried to reduce the size and number of ports. Transumbilical single-port surgery has recently emerged, where the surgery is done through a single port, typically the patient's navel. This improves the cosmesis, lessens post-operative pain and ensures virtually a 'scar less' surgery. It has further minimized the minimally invasive surgery. Many nomenclatures have evolved for single-port laparoscopic surgery, including Single-Incision Laparoscopic Surgery (SILS), Embryonic Natural Orifice Transluminal Endoscopic Surgery (E-NOTES), One-Port Umbilical Surgery (OPUS), Single-Port Access (SPA), Natural Orifice Transumbilical Surgery (NOTUS) etc.

Single-incision surgery can be performed with a skin incision followed by several different fascial punctures using the standard laparoscopic trocars or the low profile trocars. It can also be performed using one of the many commercially available multichannel single-port devices: R-port™ (Advanced surgical concepts, Dublin, Ireland), Uni-X™ (Pnavel system, Morganville, NJ, USA), and SILS port™ (Covidien). Several successful general surgical, urological and gynaecological procedures were also performed with a homemade transumbilical port using the Alexis wound retractor® and surgical gloves [1–3]. The commercially available multichannel single-port devices are very costly and Alexis wound retractor® is not available in this part of our country. Therefore, we have innovated a cheap transumbilical port using gloves, rings and conventional laparoscopic trocars.

Materials and Methods

To make the trans-umbilical glove port we require the following (Fig. 1):

1. A flexible ring- which is introduced in to the abdomen.

E. Khiangte (✉) · I. Newme · P. Phukan · S. Medhi
International Hospital,
Lotus Tower, G.S. Road, Christian Basti,
Guwahati, Assam 781005, India
e-mail: ekhiangte@yahoo.in

Fig. 1 Materials required for construction of transumbilical glove-port

2. A rigid larger ring (towel ring) placed outside the abdomen.
3. A pair of surgical gloves.
4. Standard laparoscopic trocars or low profile laparoscopic trocars.

Preparation of the Glove Port

The finger of one of the glove was cut into several thin rings, to be used as rubber bands (Fig. 2).

The fingers of the other glove were truncated with scissors and the trocars were fitted into it and fixed with the rubber bands made earlier (Fig. 3). We usually use two 5 mm and two 10 mm ports. 5 mm pots for hand instruments and 10 mm ports for the laparoscope and clip applicator for larger cystic duct clipping.

The open end of the glove was passed through the flexible ring (Fig. 4) and turned around it in the middle of the glove to form a double layer of glove with the flexible ring within it (Fig. 5).

Fig. 2 Rubber bands made from the finger of glove

Fig. 3 Trocar fixed to the finger of the glove with rubber bands

Technique

Under general anaesthesia a 2 to 2.5 cm umbilical skin incision was made down to the peritoneum. The inner flexible ring, fitted with the glove was then introduced into the abdomen assisted by a retractor (Fig. 6). The open end of the glove was then wrapped around the outer larger ring (Fig. 7). Pneumoperitoneum was introduced by carbon dioxide gas insufflations (Fig. 8). We used one conventional and one articulating laparoscopic instruments to perform the surgeries. After the operation the inner ring along with the specimen was pulled out and the fascia was closed with 1-0 PDS and the umbilicus was approximated using 3-0 vicryl rapide sutures.

Result

We started our study using this technique since September 2009 and performed 40 single-port surgeries till June 2010, of which 27 were single-port cholecystectomies, 11 appendectomies and 02 ovarian cystectomies. There were 24 females and 16 male patients. Age ranged from 12 to 54 years.

All the surgeries were completed without any intra-operative or post-operative complications. In 2 out of 27 single-port laparoscopic cholecystectomies an additional 5 mm port was placed in the epigastrium due to technical difficulties. In most of the cholecystectomies, in our series, we used an 18 Gauge spinal needle through the right hypochondrium which served to aspirate the content of the gall bladder and then it was curved with a needle holder to hook the gall bladder and retract it. If one is gentle enough to hook only the serosa of the gall bladder then inadvertent bile leakage could be avoided. It was found that the short gall bladders with thick walls could be better retracted by this procedure. We did not use any additional ports, sutures

Fig. 4 Open end of glove passed through the flexible ring

Fig. 7 Open end of glove being wrapped around the towel ring

Fig. 5 Glove port ready for insertion

Fig. 8 The transumbilical E.K. glove port

Fig. 6 Inner ring introduced through the umbilical incision

Fig. 9 Postoperative photograph showing umbilical incision after single-port cholecystectomy

or needles to perform appendectomies and ovarian cystectomies by this procedure.

The time required to assemble the transumbilical glove port was 4–5 mins. The operating time ranged from 20–100 mins for cholecystectomies with an average of 40 mins. The appendectomy and ovarian cystectomy took an average of 30 mins. No drains were used. The incisions were strictly intraumbilical and the cosmetic results were excellent (Fig. 9). Most of the patients were discharged on the 2nd post-operative day. There was no wound infection, skin maceration, mortality or ventral hernia reported in our study. The scars receded into the umbilicus and were hardly visible, resulting in excellent cosmesis.

Discussion

The gynaecologists were the first to introduce single port surgery who used this approach to perform tubal ligation in the 1960s [4].

Single incision surgery can be performed through the several fascial punctures using the conventional trocars. Piskun and Rajpal used the multiple puncture method to perform laparoscopic cholecystectomy [5]. However, multiple fascial puncture may lead to skin maceration and fascial tear, and further complicate wound healing [1].

The commercially available single-port access system like the R-port™, Uni-X™, and SILS™ etc. are designed specifically for single port surgery. Various operations like cholecystectomy, nephrectomy, orchidopexy and ureterolithotomy have been reported using this single port access system [6, 7].

Homemade transumbilical port using Alexis wound Retractor®, glove and conventional laparoscopic trocars have been in use to perform various operations like varicocele, transumbilical pre-peritoneal (TAPP) inguinal hernia repair, hemicolectomy and laparoscopic total hysterectomy [1–3].

Our improvised transumbilical glove port is very cheap in comparison to the commercially available single port

access system and is more cost effective than the home made transumbilical port where an Alexis wound retractor® is required. A variety of instruments (3 to 12 mm) can be used to facilitate the procedure. In addition, the glove acts as a wound protector and avoids port site contamination or metastasis while retrieving infected or malignant specimens. No gas leakage was noted during the procedure.

Conclusion

Our improvised transumbilical E.K. glove-port is simple, reusable, cost-effective and a reliable gadget for single-port surgery. It may be an alternative to the costly, commercially available single-port system, especially in a developing country like India. Wider use of this technique will definitely help the surgeons to take single port access surgery to the masses.

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