INTRODUCTION

Recently developed single-port laparoscopic surgery (SPLS) obtains better cosmesis. However, it entails a large (up to 3.5 cm) umbilical fascial incision for accommodating the operating-port. This may lead to significant wound-related morbidity and remarkably high incisional hernia rate (5.8%). Moreover, it adds to the surgical expenses and needs expert handling. In this context, we describe a simple technique of umbilical access/porting in an attempt to improve the existing technology. The authors call it the Single-site Multi-port Laparoscopic Endo-surgery (SIMPLE) technique.

TECHNIQUE

Under general anaesthesia, the patient is positioned supine. For right-sided pathologies, the surgeon stands on the left of the patient (and vice versa). The camera-assistant stands on the left of the surgeon. The monitor is placed opposite the surgeon. Pneumoperitoneum is created by inserting the Veress needle at the umbilical ring (Figure 1A). The intra-abdominal pressure is set at 12 - 16 mmHg. As against the SPLS, this technique defers large umbilical incision and subsequent umbilical-flap elevation. Instead, three trocars (one 10 mm and two 5 mm) are secured directly at the umbilical mound via corresponding three small curvilinear skin-incisions (Figure 1B). The trocars are directed in peculiar paths. Once in the subcutaneous space, their tips are deviated outwards and forwards (by about a centimetre at 45° angle to the skin) to puncture the fascia and the peritoneum. Thus, these “lazy S” path-pattern help in distancing the trocars right from their skin-entries till the tips of the inserted instruments. This arrangement is better conceptualized in the form of three isosceles triangles placed one-in-another—the inner-most formed by the skin-entries, the middle-one formed by the fascial-entries and the outer-most formed by the tips of the laparoscopic instruments (Figure 2). Moreover, the pneumoperitoneum stretches the umbilicus to augment this triangular arrangement. With the triangulation maintained, the trocar-location can be rotated as per the site/quadrant of the “target-organ”.

The tight surgeon-cameraman interface can be considerably eased as follows: Horizontal “dissociation”: The camera-trocar is kept maximally withdrawn and the working-trocars are advanced further by 8 - 10 mm. The camera-assistant introduces his/her right hand from underneath the surgeon’s left hand for holding the camera (Figure 3). With this, the camera-assistant’s left hand manoeuvres the camera-cable comfortably. Vertical “dissociation”: The surgeon stands on a 0.5 feet high wooden stool during the entire procedure.

The valves of the 5 mm trocars are kept facing away from each other; one may be used for the CO₂-inflow and the other for the surgical-smoke venting.

REFERENCES

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Furthermore, the occasional problem of sub-optimal extra-hepatic exposure during cholecystectomy is solved by grasping the fundus of the enlarged gallbladder by catgut-loop that, in turn, is held retracted by the standard port-closure needle inserted via per-abdominal 2 mm stab-incision. When required, 10 mm clip-applier may be used after interchanging the 10 mm laparoscope by the 5 mm. Endobag is routinely used for the specimen-extraction through the 10 mm port. We do not connect the mini-incisions for this purpose.

All three fascial punctures are meticulously closed under direct vision using 3/0 polyglactin acid. The skin-incisions are closed by subcuticular sutures using 3/0 mono-filament material to achieve excellent cosmetic results (Figure 4).

DISCUSSION

Navarra has been credited for performing the first SPLS cholecystectomy in the year 1997. Since then, as the cosmetic advantage of single incision was better appreciated, many authors have reported their experience in varied pathologies across the globe. Despite array of port-systems available in the market, the SPLS is fraught with a rather sceptical acceptance. Apart from the expenses, this seems to be due to its two innate problem-interfaces:

1. The surgeon-port interface: Triangular porting-ergonomics, the basis of any laparoscopic surgery, is deficient. The specially-designed SPLS instruments require expertise for handling. They cause a chop-stick effect (simulating the surgeon’s crossed-hands in an open surgery), are scarcely available and expensive. Moreover, smoke-venting system is lacking in the basic design of these ports.

2. Surgeon-camera man interface: Any un-obstructed hand-movement of either of them becomes rather difficult without frequent clashing. It also limits the camera-person’s ability to smoothly manoeuvre the 30° camera-cable. Consequently, even the simple surgical tasks turn difficult.

Thus, wider dissemination of the single-site surgery is far from possible unless these shortcomings are tackled. However, the SIMPLE technique addresses many of these issues:

Apart from offering favourable ergonomics, the inner-triangle of the skin mini-incisions helps the future scars...
to recede in the umbilicus (thus, achieving good umbilical aesthetics) and the outer triangle formed by the fascial entry-points helps in trocar-spacing. Bypassing the umbilical flap-raising potentially reduces the seroma formation. The often-frustrating problem of surgical smoke-venting is curbed in this technique. Peri-port gas-leak is reduced by precisely tailored skin-incisions and using threaded trocars to seal-off the leaky gaps. Usage of the day-to-day laparoscopic instruments is likely to shorten the learning curve and reduce the surgical cost. Our learning curve cholecystectomy by this technique was 15 cases and for appendectomy were 10 cases. The port-closure needle mirrors the “dynamic” retraction as in the conventional laparoscopy. By enhancing the exposure, it can reduce the rising bile-duct injury rate (0.72%) for the SPLS. In contrast to SPLS, our all-small-incisions method that tends to minimize the access-trauma, the oblique port-paths and the prompt fascial-closure of all the ports are likely to diminish the port-site hernia formation. Using this technique, we have successfully performed cholecystectomy (>300 cases), appendectomy (>300 cases), peritoneal dialysis catheter fixation (>50 cases), combined laparoscopic surgery like appendectomy with cholecystectomy (12 cases), ovarian cystectomy (18 cases) and diagnostic laparoscopy (>200 cases) over last 4 years. From this experience, we have observed that, apart from acceptable cosmetic results, postoperative incision-site pain was remarkably less than the conventional laparoscopy. Moreover, nobody has developed port-site hernias till now.

However, this technique has certain limitations. There is a very bleak margin-of-error for strategic trocar-placement designed to avoid the trocar-clashing. Narrow slit-like umbilicus is challenging to access. Large specimen-extraction becomes unfeasible without connecting the mini-incisions.

In conclusion, the SIMPLE technique complies the basic principles of laparoscopic triangulation and may be considered as a valuable method of trans-umbilical surgery.

REFERENCES