International Journal of Biomedicine 11(1) (2021) 29-31
http://dx.doi.org/10.21103/Article11(1)_OA5

ORIGINAL ARTICLE

Surgery

INTERNATIONAL JOURNAL OF BIOMEDICINE

Laparoscopic Repair of Perforated Gastric Ulcer by Forming a "Covered Perforation"

Alexei I. Khripun, PhD, ScD[1]; Ilya V. Sazhin, PhD[2]; Archil S. Tsulaya[2]; Sergey N. Shurygin, PhD, ScD[2]; Leonid V. Safonov, PhD[3]; Alexey G. Vaganov[4]; Sarkis A. Asratyan, PhD[2]; Aleksandr N. Alimov, PhD, ScD[1]

[1]Pirogov Russian National Research Medical University
[2]Budgetary Institution of Health «Clinical Hospital V.M. Buyanova»
[3]Federal Science Center of Physical Culture and Sport (VNIIFK)
[4]State Budgetary Institution of Healthcare of the City of Moscow «City Clinical Hospital No. 29»
Moscow, the Russian Federation

Abstract

Performing video endoscopic operations on patients with emergency surgical pathology in order to increase the efficiency and reduce the duration of surgical intervention, as well as to prevent postoperative complications, stimulates the continuous development and implementation of new minimally invasive technologies in emergency surgery. The aim of the study was to develop a new method for laparoscopic suturing of a perforated gastric ulcer (PGU) with the formation of a "covered perforation." The proposed method uses a fold-duplicator from the anterior wall of the stomach to close the perforation of the stomach wall, thus expanding the possibilities of using minimally invasive technologies for PGU.(**International Journal of Biomedicine. 2021;11(1):29-31.**)

Key Words: laparoscopy • perforated gastric ulcer • endoscopic techniques • abdominal cavity

For citation: Khripun AI, Sazhin IV, Tsulaya AS, Shurygin SN, Safonov LV, Vaganov AG, Asratyan SA, Alimov AN. Laparoscopic Repair of Perforated Gastric Ulcer by Forming a "Covered Perforation." International Journal of Biomedicine. 2021;11(1):29-31. doi:10.21103/Article11(1)_O5

Introduction

Currently, there are several options for the surgical treatment of perforated gastric ulcer (PGU), the most common of which is suturing the perforation through its edges with interrupted, Z-shaped or continuous sutures.[1,2] The other most common way to close the perforation of the ulcer is tamponade with a strand of the greater omentum (Graham patch).[1] With the widespread introduction of minimally invasive technologies into everyday surgical practice, suturing is often performed using laparoscopy.[2,3] In some cases, the surgeon is faced with complications that limit the use of a simple interrupted suture or other suturing options. Such complications include a large size of the perforation (more than 1 cm), pronounced infiltration of the edges of the defect, the eruption of sutures on the stomach wall when tying knots, and the inability to tamponade with the omentum or other nearby tissues.[2,4]

***Corresponding author**: Leonid V. Safonov, PhD. Federal Science Center of Physical Culture and Sport (VNIIFK), Moscow, Russia. E-mail: lsaf@mail.ru*

Method Description

In an experiment, we have developed a method of laparoscopic suturing of PGU with the formation of a "covered perforation." It assumes that the perforation is localized on the anterior wall (the pyloric or prepyloric parts) of the stomach. The anatomical basis of the method is the mobility and elasticity of the stomach wall.

The essence of the method is as follows: A 10 mm video laparoscopic trocar is inserted into the abdominal cavity through a 10 mm incision in the abdominal wall above the navel. In the right hypochondrium, a 5 mm trocar and an endoclamp are installed, and in the left mesogastrium – a 10 mm trocar and a needle holder (Fig.1).

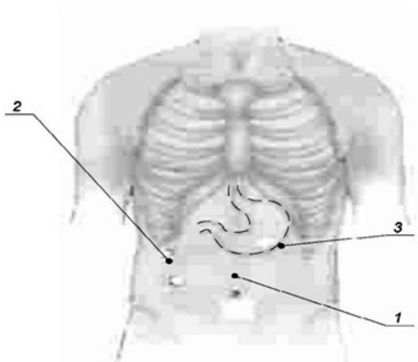

Fig. 1. Position of the trocars. 1) Umbilical 10 mm trocar for laparoscope. 2) A 5 mm trocar for endoclamping. 3) A 10 mm trocar for the needle holder.

After insufflation of carbon dioxide until the pressure in the abdominal cavity is 12 mmHg, we perform the revision and sanitation of the abdominal cavity, and visualize the perforation on the anterior wall of the stomach.

Using a needle holder inserted through a 10 mm trocar and a clamp inserted through a 5 mm trocar, two main lines of the serous-muscular suture are applied with a polyfilament absorbable suture with a nominal diameter of 2 0 on a 25-26 mm, one-half-circle stitching needle. One is located above and the other below the perforation. The distance is 20 mm above and below from the perforation. The sutures are applied so that the needle entry is 40 mm from the proximal edge of the perforation, and needle exit is 20 mm from its distal edge. After completing the seams, at both free ends of the threads, approximately 50 mm to 80 mm long, are left (Fig.2).

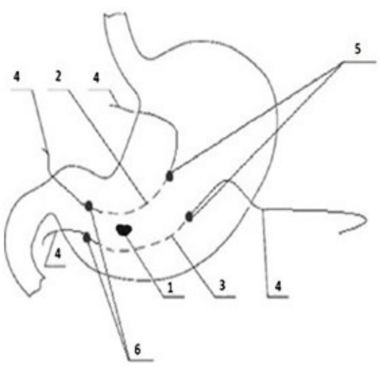

Fig 2. The imposition of the main serous-muscular sutures. 1 - Perforation hole; 2 - The upper line of the serous-muscular suture; 3 - The lower line of the serous-muscular suture; 4 - Free ends of the threads; 5 - Needle entry; 6 - Needle exit.

The ends of the threads are tied in knots in pairs. When these nodes are tightened, the part of the stomach proximal to the perforation hole is superimposed on this hole and covers it with itself, thereby forming a fold-duplicator from the anterior wall of the stomach.

Next, two more surgical sutures, each approximately 150 mm long, are inserted into the abdominal cavity with a needle holder. In order to strengthen the previously applied sutures and create tightness between the first sutures, two additional interrupted serous-muscular sutures are equidistantly superimposed. With these sutures, the outer edge of the fold-duplicator is additionally sutured to the stomach wall (Fig. 3,4).

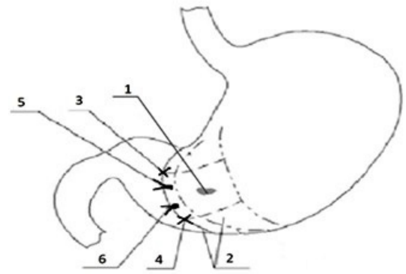

Fig.3. Strengthening the fold-duplicator of the stomach with additional interrupted sutures. 1 - Perforation hole; 2 – The formed fold-duplicator from the anterior wall of the stomach; 3, 4 - Tied knots of the main lines of the serous-muscular suture; 5, 6 - additional interrupted serous-muscular sutures to strengthen the duplicate fold.

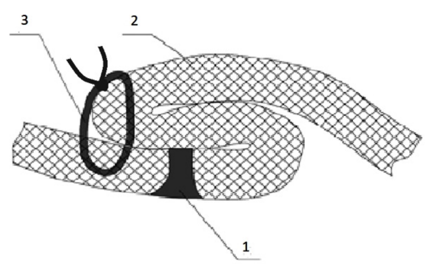

Fig.4. A schematic sectional view of the suture zone of gastric perforation. 1 - Perforation hole; 2 – A fold-duplicator from the anterior wall of the stomach; 3 - Nodal serous-muscular suture.

We developed this method in an experiment on full-size silicone models of the human stomach from SurgiReal. The laparoscopic suturing was modeled using the LapBox Suture Pad simulator, in which we placed a silicone model of the stomach with a perforation formed on the anterior wall measuring 10x10 mm. Laparoscopic suturing was performed according to the method described above, using laparoscopic instrumentation and an endovideosurgical complex from Karl Storz. We compared the proposed method with the traditional version of PGU suturing with a two-row interrupted suture. The result was assessed using a video endoscopic complex (Olympus Exera).

Discussion

When comparing the two laparoscopic suturing techniques for PGU, there was no clear technical advantage of either. Studying the deformation of silicone dummies, as well as their tightness in the operation area, using endoscopic equipment and hydraulic loads, no clear differences were noted between the two methods of suturing.

The analysis of the simulation results allows us to estimate the safety of the described method of suturing. One of the key indicators of its safe use is tightness. Another important criterion is functionality. The absence of narrowing of the lumen of the stomach after applying the proposed option indicates that the normal functioning of the stomach was preserved and that there was no violation of its evacuation function.

Our proposed method of laparoscopic repair of PGU does not require special instruments, special skills of the operating surgeon, and specific equipment in the operating room. It is a simple and affordable option for suturing PGU. This makes it possible to predict its widespread use in clinical practice.

This method is not proposed to replace other widely used methods of suturing a perforated ulcer, but as an additional option for choosing an algorithm of actions for a surgeon who has encountered certain technical difficulties in closing a perforation hole. Our proposed option allows for a wider application of minimally invasive technologies for PGU, even in the case of the above complications. After the experimental part of the research, a patent application (RU, No. 2020132221) was filed.

Competing Interests

The authors declare that they have no competing interests.

References

1. Zatevakhina II, Kirienko AI, Sazhina AV. Emergency Abdominal Surgery: A Methodological Guide for the Practitioner. M.: LLC "Medical Information Agency"; 2018. [In Russian].
2. Sazhin VP, Bronstein PG, Zaitsev OV, Kondrus IV, Krivtsov GA, Lobankov VM et al. National clinical guidelines "Perforated ulcer." Rostov-on-Don; 2015. [In Russian].
3. Shabunin AV, Bedin VV, Grekov DN, Yakomaskin VN, Eminov MZ, Shikov DV. Justification of the choice of surgical approach in perforated peptic ulcer. Moscow Surgical Journal. 2020;(1):7-12. doi: 10.17238/issn2072-3180.2020.1.7-12. [Article in Russian].
4. Schein M, Rogers P, Assalia A. "Common sense in an emergency abdominal surgery, 3rd edition. Russian Surzhinet, 2015. [In Russian].