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Review Article

An Update to the Management of Perforated Peptic Ulcer: Review Article

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Abstract: Perforated peptic ulcer is the second most common complication of peptic ulcer disease, and its management can be divided into surgical and non-surgical therapy. Surgical therapy can be divided into closure of the ulcer with an omental patch, and this can be performed either as an open or a laparoscopic method. Surgical resection in the form of a partial gastrectomy is done for larger ulcers. Non-surgical treatment options include intravenous antibiotics, endoscopy, and placement of a stent, but these are selected for patients who are not fit for surgery. In this review, we will investigate the role of laparoscopic surgery in the management of perforated peptic ulcers. We will also look at the role of non-operative treatment and the role of Helicobacter pylori eradication in the management of perforated peptic ulcers.

Keywords: "Non-Operative Treatment"," Perforated Peptic Ulcer"," Laparoscopic Surgery"," Open Surgery"," Helicobacter Pylori", and "Perforated Duodenal Ulcer".

INTRODUCTION

Perforated peptic ulcer is the second most common complication of peptic ulcer disease, following bleeding, and it is associated with a mortality rate of 30%. It is predominantly seen in male patients and is more common in younger patients in Africa and Asia, whereas in Western countries, it is more prevalent in older patients. The risk factors for developing a perforated peptic ulcer include Helicobacter Pylori infection, the use of drugs such as aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), and blood-thinning agents like Clopidogrel. The most common site for perforation is the first part of the duodenum, followed by the lesser curvature of the stomach (Søreide *et al*., 2015; Svanes, 2000). The diagnosis of a perforated peptic ulcer is usually made by demonstrating pneumoperitoneum from an erect chest X-ray, but computerized tomography is more sensitive in establishing the diagnosis of perforated peptic ulcer, as well as the presence of pneumoperitoneum and free fluid. Blood investigations are non-specific and may demonstrate leukocytosis and elevated inflammatory markers like C-reactive protein (Ansari *et al*., 2019; Chung & Shelat, 2017).

The management of perforated peptic ulcers can be divided into operative and non-operative methods. The most common surgical procedure is a laparotomy and closure of the perforated ulcer with an omental patch, and it is performed for perforations that are less than 2cm. For larger perforations, a Billroth 1 gastrectomy may be performed. Laparoscopic closure of a perforated peptic ulcer is increasingly being performed now due to its minimally invasive nature and faster postoperative recovery. Non-operative management is only performed in patients who have presented early, and a sealed perforation is demonstrated on imaging, and these patients are not good surgical candidates(Jordan & Morrow, 1988; Leeman *et al*., 2013; Pang *et al*., 2025; Stettler *et al*., 2025; Weledji, 2020).

The World Society of Emergency Surgeons (WSES), in their guidelines for the management of perforated peptic ulcers, has recommended that surgery should be performed as early as possible, and the laparoscopic closure of the perforated peptic ulcer is recommended. An open repair is done if the expertise for laparoscopic repair is not available. The surgical method should be tailored to the size of the perforation, with

smaller perforations being closed primarily, and large perforations may require resection, like a partial gastrectomy(Tarasconi *et al*., 2020).The World Society of Emergency Surgeons (WSES) position paper on the diagnosis and treatment of perforated peptic ulcer has recommended the same(Di Saverio *et al*., 2014).

The management of perforated peptic ulcer has slowly changed, with laparoscopic closure of perforated gastric ulcer being the preferred treatment option and open surgical closure of the perforated gastric ulcer being reserved for hemodynamically unstable patients. We have undertaken this review article to investigate the laparoscopic management of perforated peptic ulcer, the role of non-operative treatment, and helicobacter pylori plays in it management. We conducted a literature review using PUBMED, Cochrane database of clinical reviews, and Google Scholar, looking for clinical trials, observational studies, cohort studies, systematic reviews, and meta-analyses from 1980 to 2025. We used the following keywords: "perforated peptic ulcer"," perforated duodenal ulcer", "non-operative management", "laparoscopic surgery", "open surgery ", and "helicobacter pylori". All articles were in the English language only. Further articles were obtained by manual cross-referencing of the literature. Case reports and studies with fewer than 10 patients, as well as editorials, were excluded. Adult male and female patients were included in this study, and pediatric patients were excluded.

DISCUSSION

Laparoscopic Treatment of Perforated Peptic Ulcer

The laparoscopic repair for a perforated peptic ulcer involves the use of a 12mm supraumbilical port, followed by the insertion of 5mm epigastric, right midclavicular, and left lateral ports. The operative technique for closure of the perforation does not differ from the open procedure, and it involves closure of the perforation with an omental patch. The advantage of the laparoscopic repair is that peritoneal lavage and washout can be easily performed, and it is associated with reduced postoperative pain, nausea, and vomiting(Lunevicius & Morkevicius, 2005a; Quah *et al*., 2019; Samuele Vaccari et al., 2021; Soeratman & Putranto, 2020). Laparoscopic repair for perforated peptic ulcer was compared with the open method in a randomized controlled trial that was conducted by Siu *et al*., A total of 121 patients were included in this study, and the laparoscopic repair was associated with reduced operative time, reduced postoperative complications, and reduced pneumonia(Siu *et al*., 2002). Bertieff *et al*., conducted a randomized clinical trial of laparoscopic versus open repair for perforated peptic ulcer. A total of 101 patients were included in this study, and the laparoscopic repair was associated with reduced postoperative analgesia usage, although the length of hospital stay and postoperative morbidity were equal between the groups(Bertleff *et al*., 2009). A comparative study by Pelloni *et al*., also showed the advantages of laparoscopic repair for perforated peptic ulcer, especially with reduced postoperative complications(Pelloni *et al*., 2022).

A systematic review comparing laparoscopic and open repair for perforated peptic ulcers was conducted by Lunevicious *et al*., A total of 15 studies with 1113 patients were included in this study. The laparoscopic repair was associated with reduced postoperative morbidity and mortality, reduced hospital stay, and analgesic usage(Lunevicius & Morkevicius, 2005b). Antoniou *et al*., conducted a meta-analysis comparing laparoscopic versus open repair for perforated peptic ulcers. A total of 4 studies with 289 patients were included in this study, and both procedures were associated with similar morbidity, mortality, and length of hospital stay(Antoniou *et al*., 2013).A meta-analysis of randomized controlled trials comparing laparoscopic versus open repair for perforated peptic ulcer was conducted by Tan *et al*., A total of 5 studies with 549 patients were included in this study, of which 279 underwent laparoscopic repair and 270 underwent open repair. There were no significant differences in outcome between the procedures, but the laparoscopic repair was associated with reduced postoperative pain and reduced nasogastric tube usage (Tan *et al*., 2016).

An updated meta-analysis comparing laparoscopic versus open repair for perforated peptic ulcer was conducted by Zhou *et al*., A total of 29 studies with 5268 patients were included in this study, with 1890 patients undergoing laparoscopic repair and 3378 undergoing open repair. The laparoscopic repair was associated with reduced morbidity, mortality, length of hospital stays, and reduced analgesic usage, but the duration of surgery was similar between the two groups(Zhou *et al*., 2015).A systematic review, meta-analyses, and trial sequential analysis of randomized controlled trials comparing laparoscopic and open repair for perforated peptic ulcer was conducted by Sokhal *et al*., A total of 9 studies with 670 patients were included in this study, and the laparoscopic repair was associated with reduced mortality, wound infection rate, and length of hospital stay. There was no difference concerning the operative time(Sokhal *et al*., 2025).

A meta-analysis and trial sequential analysis on laparoscopic suture repair for perforated peptic ulcers was conducted by Panin *et al*., A total of 16 studies were included, and laparoscopic repair was associated with reduced postoperative pain usage than open repair. There were no significant differences concerning postoperative morbidity, mortality, and length of hospital stay between the groups(Panin *et al*., 2025).A systematic scoping review and in-depth evaluation of existing evidence comparing laparoscopic versus open repair of perforated peptic ulcer. A total of 9 studies with 880 patients were included in this study, and laparoscopic repair of perforated peptic ulcer is a variably defined intervention(Chalmers *et al*., 2025). Some of the factors that can affect the repair of a perforated peptic ulcer

include advancing age, a high American Society of Anesthesiologists (ASA) score, longer duration of symptoms, A high BOEY score, elevated C-reactive protein (CRP), and a larger diameter ulcer perforation are associated with poor outcomes(Hut *et al*., 2017; Kim *et al*., 2022; Sharma *et al*., 2006).

Table I

Study	Study Type	Year	N=numbers	Laparoscopic repair Mortality (%)	Open repair Mortality (%)
Siu *et al.,*	Randomized controlled trial	2002	121	1%	3%
Bertleff *et al*.,	Randomized Controlled Trial	2009	109	3.8%	8.16%

Table showing the mortality rate between laparoscopic and open repair for perforated peptic ulcer

Non-Operative Treatment of a Perforated Peptic Ulcer

Non-operative treatment of a perforated peptic ulcer involves using intravenous antibiotics and analgesics while maintaining the patient with intravenous fluids and monitoring their vital signs. Confirmation that the perforated peptic ulcer has sealed is important, as either performing a computerized tomography or a gastrograffin swallow is necessary. Non-operative treatment is often indicated for elderly patients with co-morbidities who are not fit for surgery(Mouly *et al*., 2013).Mangtani *et al*., conducted a retrospective study on 75 patients who had undergone non-operative treatment for perforated peptic ulcer, and 80% of them completed this form of therapy. The complication rate was 5.3% and the mortality rate was 9.3%(Kumar Mangtani & Jain, 2017). Karabulut *et al*., also performed non-operative treatment for perforated peptic ulcer, and the patients who were chosen were stable and did not have generalized peritonitis, and this treatment was successful in all of the cases(Karabulut *et al*., 2019).Cao *et al*., performed a retrospective study on 241 patients with perforated peptic ulcer, of which 107 underwent non-operative treatment. The presence of free fluid in the abdomen, age above 70 years, and an Acute Physiology and Chronic Health (APACHE) score of more than 3 are associated with poor outcomes(Cao *et al*., 2014).

Negm *et al*., performed a randomized controlled trial on combined endoscopic and radiological intervention for the treatment of perforated peptic ulcer. A total of 100 patients were included in this study, and they were divided into 50 who underwent endoscopic therapy and 50 who underwent surgical intervention. The complication rate was 58% in the surgical group and 24% in the endoscopy group(Negm *et al*., 2022). Arroyo Vazquez *et al*., conducted a prospective, randomized study on the use of stents in the treatment of perforated peptic ulcers. A total of 28 patients were included in this study, with 15 undergoing surgery and 13 undergoing endoscopic stent placement. The complication rates were equal between the two groups, and the stent was removed after 3 weeks(Arroyo Vázquez *et al*., 2021). A systematic review and network meta-analysis of randomized controlled trials on alternative treatments for perforated peptic ulcer was conducted by Gavrillidis *et al*., A total of 8 studies with 657 patients were included in this study, and endoscopic techniques are an alternative option for small peptic ulcer perforations and for patients who are not fit for surgery(Gavriilidis *et al*., 2025).

Helicobacter Pylori and Perforated Peptic Ulcer

The prevalence rate of Helicobacter pylori is approximately 68% in patients with perforated peptic ulcers, but the ulcer recurrence rate is 60% after surgical treatment; hence, eradication of Helicobacter pylori is important. Some of the factors that can affect the treatment of helicobacter infection include the type of antibiotics that were used during the acute episode and prior usage of non-steroidal anti-inflammatory drugs (NSAIDs). Helicobacter pylori can be confirmed by endoscopic biopsy or serology, and eradication can be started in the postoperative period(Gisbert & Pajares, 2002).A systematic review on the impact of Helicobacter pylori eradication on surgical treatment of peptic ulcer disease was conducted by Aljuhani *et al*., A total of 9 studies with 712 patients were included in this study, and the rates of eradication were varied between the groups. There were complications in certain patients after eradication therapy, and difficulties will depend on the patient's characteristics(Aljuhani *et al*., 2024).

A systematic review and meta-analysis on helicobacter eradication therapy after simple closure of perforated duodenal ulcer was conducted by Tomititchong *et al*., A total of 3 randomized controlled trials were included in this study, and the 1-year incidence of ulcer recurrence after helicobacter pylori eradication therapy was 5.2% against the 35.2% in the group that did not undergo eradication therapy. This study showed that the outcomes were better with the eradication of Helicobacter pylori following surgery for a perforated duodenal ulcer(Tomtitchong *et al*., 2012.).A meta-analysis of randomized controlled trials on the eradication of Helicobacter pylori following simple closure of perforated peptic ulcer was conducted by Wong *et al*., A total of 5 studies with 401 patients were included in this study, and the Helicobacter pylori infection rate at 8 weeks and one year was significantly reduced after eradication therapy(Wong *et al*., 2013).

CONCLUSION

Surgical therapy is still the gold standard for the management of perforated peptic ulcers, with the laparoscopic repair being the preferred method that is employed. The laparoscopic procedure requires

expertise in laparoscopic suturing, and training to perform this procedure will be a problem in centers that do not have laparoscopic services. The closure of the ulcer with an omental patch is still the preferred operation, with a partial gastrectomy being reserved for large ulcers. Non-operative management with intravenous antibiotics, endoscopic or stent placement is reserved for patients who are not fit for surgery and is seldom performed. Helicobacter pylori eradication is also another area where eradication may help improve the clinical outcomes and decrease the risk of ulcer recurrence. The surgical treatment of a perforated peptic ulcer should not be delayed, as this leads to increased mortality.

Conflict of Interest: There is no conflict of interest

REFERENCES

- Aljuhani, S. A., Sherwani, A. A., Alnamshah, F. O., Alaeq, R. A., Alrahma, H. A., Jarad, M. M., Hakami, A. A., Mobarki, T. H., Al-Khairat, H. K., Sahal, Y. A., & Bakhsh, A. W. (2024). Impact of Helicobacter pylori Eradication on Surgical Treatment of Peptic Ulcer Disease: Systematic Review. *Cureus*. https://doi.org/10.7759/cureus.63523
- Ansari, D., Torén, W., Lindberg, S., Pyrhönen, H. S., & Andersson, R. (2019). Diagnosis and management of duodenal perforations: a narrative review. In *Scandinavian Journal of Gastroenterology* (Vol. 54, Issue 8, pp. 939–944). Taylor and Francis Ltd. https://doi.org/10.1080/00365521.2019.1647456
- Antoniou, S. A., Antoniou, G. A., Koch, O. O., Pointner, R., & Granderath, F. A. (2013). Meta-analysis of laparoscopic versus open repair of perforated peptic ulcer. *Journal of the Society of Laparoendoscopic Surgeons*, *17*(1), 15–22. https://doi.org/10.4293/108680812X13517013317752
- Arroyo Vázquez, J. A., Khodakaram, K., Bergström, M., & Park, P. O. (2021). Stent treatment or surgical closure for perforated duodenal ulcers: a prospective randomized study. *Surgical Endoscopy*, *35*(12), 7183–7190. https://doi.org/10.1007/s00464-020-08158-3
- Bertleff, M. J. O. E., Halm, J. A., Bemelman, W. A., Van Der Ham, A. C., Van Der Harst, E., Oei, H. I., Smulders, J. F., Steyerberg, E. W., & Lange, J. F. (2009). Randomized clinical trial of laparoscopic versus open repair of the perforated peptic ulcer: The LAMA trial. *World Journal of Surgery*, *33*(7), 1368–1373. https://doi.org/10.1007/s00268-009-0054-y
- Cao, F., Li, J., Li, A., Fang, Y., Wang, Y. J., & Li, F. (2014). Nonoperative management for perforated peptic ulcer: Who can benefit? *Asian Journal of Surgery*, *37*(3), 148–153. https://doi.org/10.1016/j.asjsur.2013.10.002
- Chalmers, K. A., Lee, M. J., Cousins, S. E., Peckham Cooper, A., Coe, P. O., & Blencowe, N. S. (2025). Laparoscopic versus open repair of perforated peptic ulcer: systematic scoping review and in-depth evaluation of existing evidence. In *BJS Open* (Vol. 9, Issue 2). Oxford University Press. https://doi.org/10.1093/bjsopen/zrae163
- Chung, K. T., & Shelat, V. G. (2017). Perforated peptic ulcer - an update. *World Journal of Gastrointestinal Surgery*, *9*(1), 1. https://doi.org/10.4240/wjgs.v9.i1.1
- Di Saverio, S., Bassi, M., Smerieri, N., Masetti, M., Ferrara, F., Fabbri, C., Ansaloni, L., Ghersi, S., Serenari, M., Coccolini, F., Naidoo, N., Sartelli, M., Tugnoli, G., Catena, F., Cennamo, V., & Jovine, E. (2014). *Diagnosis and treatment of perforated or bleeding peptic ulcers: 2013 WSES position paper*. http://www.wjes.org/content/9/1/45
- Gavriilidis, P., Schena, C. A., Di Saverio, S., Hromalik, L., Eryilmaz, M., Catena, F., & de'Angelis, N. (2025). Alternative treatments to treat perforated peptic ulcer: a systematic review and network meta-analysis of randomized controlled trials. In *World Journal of Emergency Surgery* (Vol. 20, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s13017-025-00599-2
- Gisbert, J. P., & Pajares, J. M. (2002). Review article: Helicobacter pylori infection and gastric outlet obstruction - Prevalence of the infection and role of antimicrobial treatment. In *Alimentary Pharmacology and Therapeutics* (Vol. 16, Issue 7, pp. 1203–1208). https://doi.org/10.1046/j.1365-2036.2002.01275.x
- Hut, A., Tatar, C., Yildirim, D., Dönmez, T., Ünal, A., Kocakuşak, A., & Akinci, M. (2017). Is it possible to reduce the surgical mortality and morbidity of peptic ulcer perforations? *Turkish Journal of Surgery*, *33*(4), 267–273. https://doi.org/10.5152/turkjsurg.2017.3670
- Jordan, P. H., & Morrow, C. (1988). Perforated peptic ulcer. *Surgical Clinics of North America*, *68*(2), 315–329. https://doi.org/10.1016/S0039-6109(16)44480-4
- Karabulut, K., Dinçer, M., Liman, R. K., & Usta, S. (2019). Non-operative management of perforated peptic ulcer: A single-center experience. *Ulusal Travma ve Acil Cerrahi Dergisi*, *25*(6), 585–588. https://doi.org/10.14744/tjtes.2019.31967
- Kim, C. W., Kim, J. W., Yoon, S. N., Oh, B. Y., & Kang, B. M. (2022). Laparoscopic repair of perforated peptic ulcer: a multicenter, propensity score matching analysis. *BMC Surgery*, *22*(1). https://doi.org/10.1186/s12893-022-01681-1
- Kumar Mangtani, J., & Jain, A. (2017). Non-surgical management of perforated peptic ulcer: An alternative method of definitive treatment. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN*, *16*(11), 57–60. https://doi.org/10.9790/0853-1611025760
- Leeman, M. F., Skouras, C., & Paterson-Brown, S. (2013). The management of perforated gastric

ulcers. *International Journal of Surgery*, *11*(4), 322–324. https://doi.org/10.1016/j.ijsu.2013.02.010

- Lunevicius, R., & Morkevicius, M. (2005). Management strategies, early results, benefits, and risk factors of laparoscopic repair of perforated peptic ulcer. *World journal of surgery*, *29*(10), 1299–1310. https://doi.org/10.1007/s00268-005-7705-4
- Lunevicius, R., & Morkevicius, M. (2005). Systematic review comparing laparoscopic and open repair for perforated peptic ulcer. *The British journal of surgery*, *92*(10), 1195–1207. https://doi.org/10.1002/bjs.5155
- Mouly, C., Chati, R., Scotté, M., & Regimbeau, J. M. (2013). Therapeutic management of perforated gastro-duodenal ulcer: Literature review. In *Journal of Visceral Surgery* (Vol. 150, Issue 5, pp. 333–340). Elsevier Masson SAS. https://doi.org/10.1016/j.jviscsurg.2013.07.001
- Negm, S., Mohamed, H., Shafiq, A., AbdelKader, T., Ismail, A., Yassin, M., Mousa, B., Abozaid, M., Orban, Y. A., Al Alawi, M., & Farag, A. (2022). Combined endoscopic and radiologic intervention for management of acute perforated peptic ulcer: a randomized controlled trial. *World Journal of Emergency Surgery*, *17*(1). https://doi.org/10.1186/s13017-022-00429-9
- Pang, Y. F., Shu, L., & Xia, C. W. (2025). Retrospective comparative study of different surgical methods for gastric ulcer perforation: Efficacy and postoperative complications. *World journal of gastrointestinal surgery*, *17*(2), 101896. https://doi.org/10.4240/wjgs.v17.i2.101896
- Panin, S. I., Nechay, T. V., Sazhin, I. V., Melnikov-Makarchuk, K. Y., Sazhin, A. V., Puzikova, A. V., Akinchits, A. N., & Bykov, A. V. (2025). Laparoscopic suture repair for perforated peptic ulcer disease: a meta-review and trial sequential analysis. *Frontiers in surgery*, *12*, 1496192. https://doi.org/10.3389/fsurg.2025.1496192
- Pelloni, M., Afonso-Luís, N., Marchena-Gomez, J., Piñero-González, L., Ortíz-López, D., Acosta-Mérida, M. A., & Rahy-Martín, A. (2022). Comparative study of postoperative complications after open and laparoscopic surgery of the perforated peptic ulcer: Advantages of the laparoscopic approach. *Asian Journal of Surgery*, *45*(4), 1007–1013. https://doi.org/10.1016/j.asjsur.2021.08.059
- Quah, G. S., Eslick, G. D., & Cox, M. R. (2019). Laparoscopic Repair for Perforated Peptic Ulcer Disease Has Better Outcomes Than Open Repair. In *Journal of Gastrointestinal Surgery* (Vol. 23, Issue 3, pp. 618–625). Springer New York LLC. https://doi.org/10.1007/s11605-018-4047-8
- Sharma, S. S., Mamtani, M. R., Sharma, M. S., & Kulkarni, H. (2006). A prospective cohort study of postoperative complications in the management of perforated peptic ulcer. *BMC Surgery*, *6*, 8. https://doi.org/10.1186/1471-2482-6-8
- Siu, W. T., Leong, H. T., Law, B. K., Chau, C. H., Li, A. C., Fung, K. H., Tai, Y. P., & Li, M. K. (2002). Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. *Annals of surgery*, *235*(3), 313–319. https://doi.org/10.1097/00000658-200203000-00001
- Soeratman, A., & Putranto, A. (2020). The use of Laparoscopy In Treatment of Perforated Peptic Ulcer: A Literature Review A Literature Review. *The New Ropanasuri : Journal of Surgery*, *5*(2), 30–32. https://doi.org/10.7454/nrjs.v5i2.1075
- Sokhal, B. S., Mohamedahmed, A. Y. Y., Zaman, S., Wuheb, A. A., Abdalla, H. E., Husain, N., Hajibandeh, S., & Hajibandeh, S. (2025). Laparoscopic versus open repair for peptic ulcer perforation: a systematic review, meta-analysis and trial sequential analysis of randomised controlled trials. Time to conclude! *Annals of the Royal College of Surgeons of England*, *107*(5), 331–345. https://doi.org/10.1308/rcsann.2024.0082
- Søreide, K., Thorsen, K., Harrison, E. M., Bingener, J., Møller, M. H., Ohene-Yeboah, M., & Søreide, J. A. (2015). Perforated peptic ulcer. In *The Lancet* (Vol. 386, Issue 10000, pp. 1288–1298). Lancet Publishing Group. https://doi.org/10.1016/S0140-6736(15)00276-7
- Stettler, G. R., Follette, C. J., & Avery, M. D. (2025). Surgical Management of Perforated Peptic Ulcers. *Current Surgery Reports*, *13*(1). https://doi.org/10.1007/s40137-024-00437-5
- Svanes, C. (2000). Trends in perforated peptic ulcer: Incidence, etiology, treatment, and prognosis. *World Journal of Surgery*, *24*(3), 277–283. https://doi.org/10.1007/s002689910045
- Tan, S., Wu, G., Zhuang, Q., Xi, Q., Meng, Q., Jiang, Y., Han, Y., Yu, C., Yu, Z., & Li, N. (2016). Laparoscopic versus open repair for perforated peptic ulcer: A meta-analysis of randomized controlled trials. In *International Journal of Surgery* (Vol. 33, pp. 124–132). Elsevier Ltd. https://doi.org/10.1016/j.ijsu.2016.07.077
- Tarasconi, A., Coccolini, F., Biffl, W. L., Tomasoni, M., Ansaloni, L., Picetti, E., Molfino, S., Shelat, V., Cimbanassi, S., Weber, D. G., Abu-Zidan, F. M., Campanile, F. C., Di Saverio, S., Baiocchi, G. L., Casella, C., Kelly, M. D., Kirkpatrick, A. W., Leppaniemi, A., Moore, E. E., … Catena, F. (2020). Perforated and bleeding peptic ulcer: WSES guidelines. In *World Journal of Emergency Surgery* (Vol. 15, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s13017-019-0283-9
- Tomtitchong, P., Siribumrungwong, B., Vilaichone, R. K., Kasetsuwan, P., Matsukura, N., & Chaiyakunapruk, N. (2012). Systematic review and meta-analysis: Helicobacter pylori eradication therapy after simple closure of perforated duodenal ulcer. *Helicobacter*, *17*(2), 148–152. https://doi.org/10.1111/j.1523-5378.2011.00928.x

- Vaccari, S., D'Andrea, V., Lauro, A., D'Intino, R., Gulotta, E., Cervellera, M., & Tonini, V. (2020). Laparoscopic repair for perforated peptic ulcer: our experience, a comparison with the open approach, and a review of the literature. *Journal of Gastric Surgery*, *2*(2), 26–32. https://doi.org/10.36159/jgs.v2i2.28
- Weledji E. P. (2020). An Overview of Gastroduodenal Perforation. *Frontiers in surgery*, *7*, 573901. https://doi.org/10.3389/fsurg.2020.573901
- Wong, C. S., Chia, C. F., Lee, H. C., Wei, P. L., Ma, H. P., Tsai, S. H., Wu, C. H., & Tam, K. W. (2013). Eradication of Helicobacter pylori for prevention of ulcer recurrence after simple closure of perforated peptic ulcer: A meta-analysis of randomized controlled trials. *Journal of Surgical Research*, *182*(2), 219–226. https://doi.org/10.1016/j.jss.2012.10.046
- Zhou, C., Wang, W., Wang, J., Zhang, X., Zhang, Q., Li, B., & Xu, Z. (2015). An Updated Meta-Analysis of Laparoscopic Versus Open Repair for Perforated Peptic Ulcer. *Scientific reports*, *5*, 13976. https://doi.org/10.1038/srep13976.