COMPARATIVE STUDY BETWEEN DIFFERENT MANAGEMENT MODALITIES OF IATROGENIC ESOPHAGEAL PERFORATIONS

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ABSTRACT:

Background: *Iatrogenic esophageal perforation accounts 60% of esophageal perforations and associated with 19% of mortality. Endoscopic procedures & invasive surgical maneuvers are the common causes. Pain, dysphagia and subcutaneous emphysema are common manifestations. Water soluble contrast study, CT scan, and endoscopy provide a high sensitivity for diagnosis. Early aggressive management within the first 24 hours is crucial for excellent outcomes; majority of patients is suitable for non-operative management while surgical intervention and esophageal stenting are alternative treatment options.*

Aim of the work: *To compare efficacy of different management modalities in patients with iatrogenic esophageal perforations.*

Patient and Methods: *Papers provided data from March 2007 to June 2022 related to patients with iatrogenic esophageal perforation & comparing different management modalities are reviewed between January 2021 and June 2022. We made pairwise meta-analyses of our outcomes using Comprehensive Meta-Analysis software (CMA version 3.9). Event rate with the corresponding 95% confidence intervals (95%CI) was also being calculated for categorical data.*

Results: *In majority of patients non-operative management is the best option with successful rate of more than 90% and lowest mortality (6.3%). Surgical management is warranted in the patients who do not meet the criteria for conservative treatment with successful rate of more than 80%. Esophageal stent is an alternative treatment option with 50 to 83% of esophageal healing.*

Conclusions: *The treatment method still has to be chosen on an individual basis. We recommend conservative treatment when indicated. Extended perforations should be treated with a surgical approach and esophageal stenting have a satisfactory outcome in suitable patients.*

Keywords: *esophagus, iatrogenic, perforation, management, conservative, stent. Meta-analysis.*

INTRODUCTION:

Perforation of the esophagus is a relatively rare and complex clinical emergency that severely impacts the patient's condition, yet it is often diagnosed late. The mortality remains high, with a pooled mortality of 11.9% in patients treated actively from a recent review of published series[1].

Iatrogenic esophageal perforation accounts for 60% of esophageal perforations and associated with 19% of mortality, while spontaneous perforations are less common. Despite the fact that modern diagnostic methods have contributed significantly in many fields of modern clinical practice, diagnosis of esophageal perforations is challenging and may present difficulties that will finally result in significant delay of management, which in turn is associated with decreased survival rates even in high-volume centers [2].

Endoscopic procedures are the most common cause of iatrogenic esophageal perforation. Therapeutic endoscopic procedures increase the risk of esophageal perforation. The esophageal perforation rate is 1 to 5% in dilatation for achalasia, 1 to 6% for variceal sclerotherapy, 5% of endoscopic laser therapy, and 5 to 25% in esophageal stent placement. Other causes of esophageal perforation include placement of nasogastric tube, endotracheal tube, and bougie in bariatric surgery[3].

The patient symptoms depend on the site of esophageal peroration (cervical, thoracic and abdominal) and time of presentation. Pain is the most common presenting symptom, which is usually sudden onset after esophageal instrumentation. Cervical perforation results in neck pain, dysphonia, hoarseness, cervical dysphagia, and subcutaneous emphysema. Thoracic esophageal perforation presents with chest or back pain, dysphagia, hematemesis, and nausea/vomiting. Abdominal pain and peritonitis are the predominant symptoms for intra-abdominal perforation. Signs of progressing infection (fever, tachycardia, mediastinitis, thoracic empyema, sepsis, or multiple organ failure) usually occur in the case with delayed presentation (more than 24 hours after perforation)[4].

Water soluble contrast study, CT scan, and endoscopy provide a high sensitivity for diagnosis of iatrogenic perforation[5].

Nonoperative management is safe and effective treatment for early perforation (<24 hours) without clinical signs of sepsis. However, surgical management such as primary repair, esophageal exclusion, diversion, and esophagectomy is warranted in the patients who not meet the criteria for non-operative management[6] .

Endoscopic management (clip, esophageal stent) is an alternative treatment option with 80 to 90% of esophageal healing rate. Early recognition of suspicious symptoms within 24 hours, the use of the appropriate investigation, selection of the optimal treatment options, and multidisciplinary critical care are the best way to improve outcomes[7].

The fact that it is an uncommon problem and it produces symptoms that can mimic other serious thoracic conditions, such as myocardial infarction, contributes to the delay in diagnosis. Furthermore, patients at risk for iatrogenic perforations (esophageal malignancy) frequently have comorbidities that increase their perioperative morbidity and mortality[8].

The most common conditions associated with iatrogenic esophageal perforation include anatomical narrow portions **(cricopharyngeus, aortic arch, left bronchial imprint, gastroesophageal junction)** and pathological narrowing such as achalasia, benign stricture, and tumor. The appropriate treatment of iatrogenic esophageal perforation depends on time of presentation, site of injury, the extent of contamination, and the presence of underlying esophageal disorder[9].

The heterogeneity of causes resulting in esophageal perforation equals the heterogeneity of treatment modalities, with no evidence of superiority of any of them[10].

AIM OF THE WORK:

The aim of this study was to compare efficacy of different management modalities in patients with iatrogenic esophageal perforations.

PATIENTS AND METHODS:

The current review followed the guidelines of preferred reporting items for systematic reviews and meta-analysis statement 2009 (PRISMA) [11]**.** The detailed steps of methods were described elsewhere as well as PRISMA checklist [12]**.**

Eligibility criteria:

Selected papers for the present meta-analysis included those that provided data from March 2007 to June 2022 on factors related to patients of any age with iatrogenic esophageal perforation to discuss comparison between different management modalities of iatrogenic esophageal perforations. When institutions have published duplicate trials, only the most updated reports were included for qualitative appraisal. All publications were limited to human subjects and English language. Abstracts, case reports, conference presentations, editorials and expert opinions were excluded.

Information sources:

Databases: The study process was conducted following the accepted methodology recommendations of the PRISMA checklist for systematic review and meta-analysis, where registration of the protocol is not mandated. We conducted a systematic electronic database search for suitable studies covering three databases including EMBASE, PubMed, and Cochrane library.

Search strategy: The review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The search was conducted in accordance with the principles outlined in the Cochrane Handbook for Systematic Reviews of Interventions. Studies were identified through searching electronic databases and relevant websites. Highly sensitive electronic searches were conducted to identify published and ongoing studies. We used the following search term: "Iatrogenic Esophageal Perforation management". Missed relevant papers were collected via manual search trials in Google Scholar and references of the included papers.

Selection process and data collection process: The selected study design for included studies were Randomized Controlled Trials, Cohort, Case-control series, and reviews studies conducted between January 2021 and to June 2022. Patients of any age with iatrogenic esophageal perforation were included to discuss comparison between different management modalities of iatrogenic esophageal perforations. Papers were excluded if there were one of the following exclusion criteria: i) in vitro or animal studies; ii) data duplication, overlapping or unreliably extracted or incomplete data; iii) abstract only articles, reviews, thesis, books, conference papers, case report, case series, or articles without available full texts (conferences, editorials, author response, letters, and comments).

Three independent reviewers screened titles and abstracts for selecting eligible papers. Further full-text screening was performed to ensure the inclusion of relevant papers in our systematic review. Any disagreement was done by discussion and consulting a senior researcher when necessary.

Collected data: Extracted data included the sample size, patients' characteristics, the interventions used, follow-up duration, and outcomes.

Quality assessment: The quality of relevant studies was assessed using national

institute of health (NIH) quality assessment tool for observational cohort studies. ("Study Quality Assessment Tools |National Heart, Lung, and Blood Institute (NHLBI)," 2019) Regarding cohort studies, each study was given a score out of 14 based on answering each question (Yes= 1, No= 0, NA= 0). A score of 10-14 indicated a good quality article, 5-9 for fair, and 1-4 for poor quality article. Regarding case series studies, total evaluation score was 9, a score from 7-9 indicated good quality article, whereas score from 4-6 for fair, and 1-3 for poor quality article.

Statistical analysis:

We made pairwise meta-analyses of our outcomes using Comprehensive Meta-Analysis software (CMA version 3.9 **[13].** Event rate with the corresponding 95% confidence intervals (95%CI) was also be calculated for categorical data. Mean with the corresponding 95% confidence intervals (95%CI) was also being calculated for continuous data. A fixed-effects model was used when there was no heterogeneity. Heterogeneity was assessed with Q statistics and I^2-test considering it significant with I^2 value > 50% or P-value < 0.10.

The different management modalities addressed in relevant meta-analysis were conservative, endoscopic (stent or clipping) and surgical management.

We compared the outcome of the three management modalities according to the following:

1) Mortality rate
2) Leak after initial repair
3) Failure rate
4) Dysphagia
5) Oral intake (mean days)
6) Total length of stay (mean days of stay)

RESULTS:

Literature search and study characteristics:

Electronic search yielded 47 articles from three databases (Figure 1). After duplicates removal, 35 articles were screened in title/abstract screening, while 26 articles were screened in full text screening for inclusion. Finally, 10 articles were included in qualitative and nine in quantitative meta-analysis (diagram1). The manual search resulted in no more studies. Detailed characteristics of the included studies are shown in (Table 1).

Table: Characteristics table for included studies

Reference ID	***Type of Study***	***Sample***		***Year of***	***Qualitative***
Freeman/2015/USA	Retrospective	60	Operative	2009-2012	Good
			Stent		
Kang/2019/South Korea	Retrospective	28	Operative	2008-2018	Good
			Conservative		
Loske/2015/Germany	Retrospective	10	Endoscopic	2007-2014	Poor
Ko/2012/USA	Retrospective	8	Operative	2010-2011	Fair
Law/2017/Hong Kong	Retrospective	43	Operative	1997-2013	Good
			Stent		
El-Asmar/2020/Egypt	Retrospective	24	Conservative	2009-2020	Good
VANUYTSEL/2012/Belgium	Retrospective	16	Conservative	1992-2010	Fair
Freeman/2006/USA	Retrospective	17	Stent	2006-2007	Good
Hauge/2019/Norway	Retrospective	21	Operative	2007-2014	Good
			Stent		
Waltersten/2021/Sweden	Retrospective	20	Operative	2000-2015	Fair
			Stent		

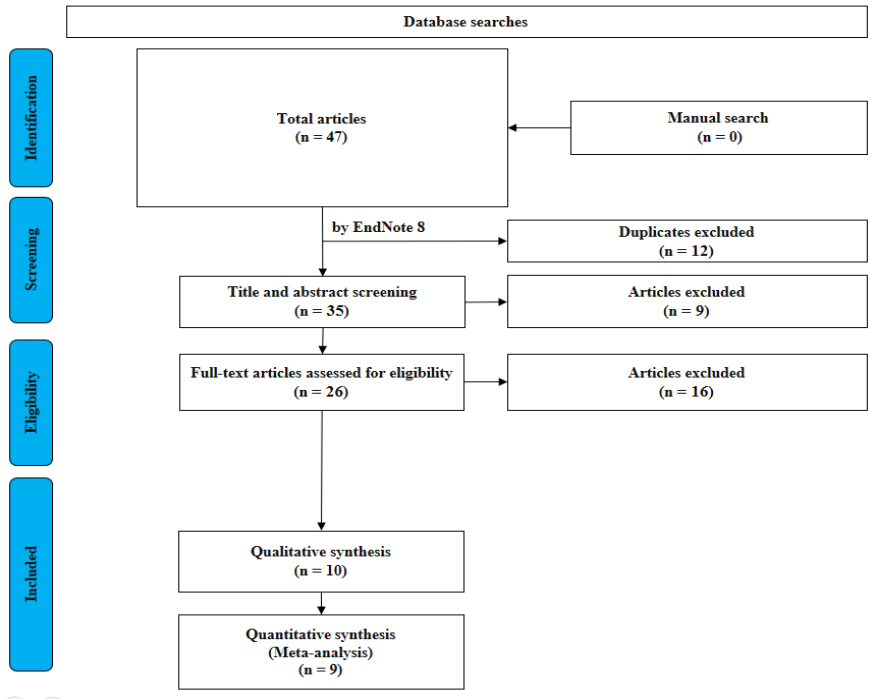

Diagram (1): PRISMA flow diagram of the search and review process

Risk of bias assessment:

With regard to quality assessment, from 10 studies, six were evaluated with good quality, three were fair, and one was poor.

Outcomes of the relevant studies:

I. Mortality rate:

Meta-analyses of relevant studies showed that patients treated with conservative measure had the least significant mortality rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.063, 95% CI (0.009–0.335), p-value=0.009] (Figure 2). Patients treated with stent repair measure had the most significant mortality rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.168, 95% CI (0.037–0.512), p-value=0.05] (Figure 2). While patients treated with operative repair measure had midway significant mortality rate in iatrogenic esophageal perforation treatment [Event rate = 0.089, 95% CI (0.042–0.180), p-value<0.001] (Figure 2).

Fixed model was used due to absence of heterogeneity with I^2=45.159 and P-value=0.009.

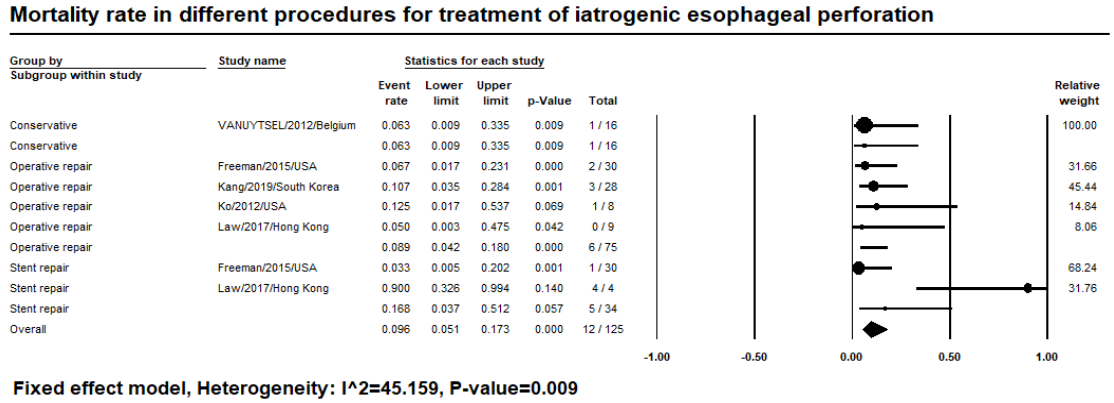

Diagram (2): Meta-analysis for mortality rate in treatment of iatrogenic esophageal perforation

II. Leakage rate:

Meta-analyses of relevant studies showed that patients treated with operative repair measure had the least significant leakage rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.164, 95% CI (0.076–0.319), p-value<0.001] (Figure 3). Patients treated with stent repair measure had the most insignificant leakage rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.328, 95% CI (0.064–0.778), p-value=0.476] (Figure 3).

Random model was used due to presence of heterogeneity with $I^{\wedge 2}$=67.856 and P-value=0.003.

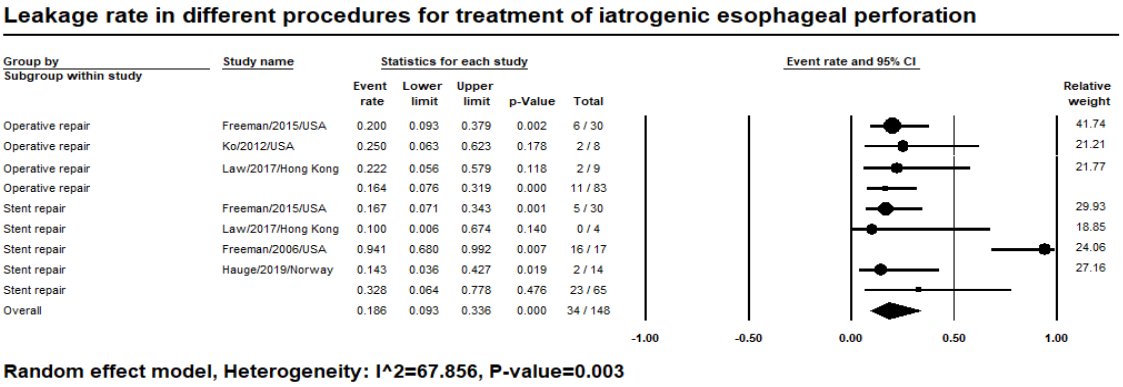

Diagram **(3):** Meta-analysis for leakage rate in treatment of iatrogenic esophageal perforation

III. Failure rate:

Meta-analyses of relevant studies showed that patients treated with conservative measure had the least insignificant failure rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.083, 95% CI (0.005–0.622), p-value=0.105] (Figure 4). Patients treated with stent repair measure had the most insignificant failure rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.500, 95% CI (0.123–0.877), p-value=1] (Figure 9). While patients treated with operative repair measure had midway significant failure rate in iatrogenic esophageal perforation treatment [Event rate = 0.099, 95% CI (0.028–0.290), p-value<0.001] (Figure 4).

Random model was used due to presence of heterogeneity with $I^{\wedge 2}$=72.467 and P-value=0.006.

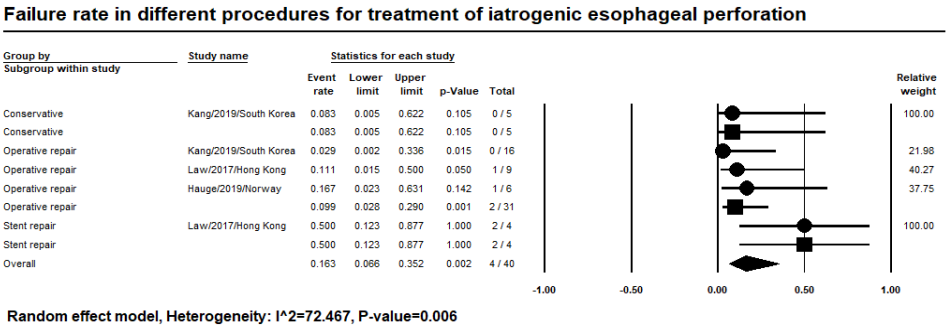

Diagram (4): Meta-analysis for failure rate in treatment of iatrogenic esophageal perforation

IV. Dysphagia rate:

Meta-analyses of relevant studies showed that patients treated with stent repair measure had the least insignificant dysphagia rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.152, 95% CI (0.022–0.594), p-value=0.109] (Figure 5). Patients treated with operative repair measure had the most

insignificant dysphagia rate in iatrogenic esophageal perforation treatment than others [Event rate = 0.686, 95% CI (0.040–0.991), p-value=0.699] (Figure 5). While patients treated with conservative measure had midway insignificant dysphagia rate in iatrogenic esophageal perforation treatment [Event rate = 0.625, 95% CI (0.422–0.792), p-value=0.226] (Figure 5).

Random model was used due to presence of heterogeneity with $I^{\wedge 2}$=80.523 and P-value<0.001.

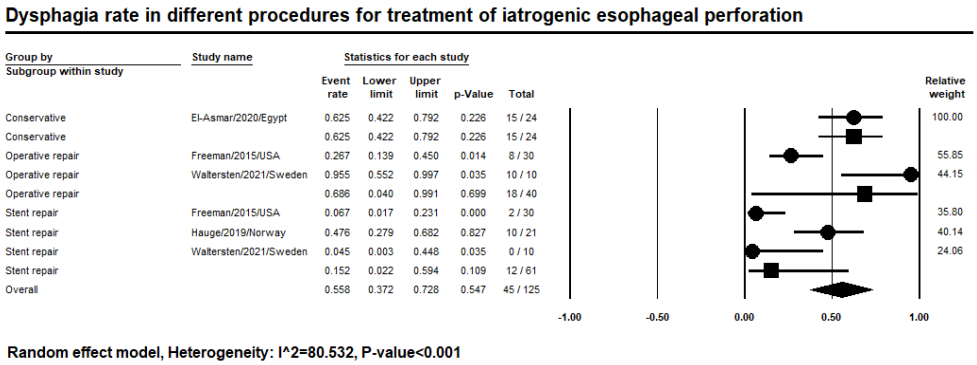

Diagram **(5):** Meta-analysis for dysphagia rate in treatment of iatrogenic esophageal perforation

V. Oral intake:

Meta-analyses of relevant studies showed that patients treated with conservative measure had the highest and the best significant mean oral intake in iatrogenic esophageal perforation treatment than others [Mean = 14, 95% CI (13.020–14.980), p-value<0.001] (Figure 6). Patients treated with stent repair measure had the least and the worst significant mean oral intake in iatrogenic esophageal perforation treatment than others [Mean = 3, 95% CI (2.310–3.690), p-value<0.001] (Figure 6). While patients treated with operative repair measure had midway significant mean oral intake in iatrogenic esophageal perforation treatment [Mean = 8, 95% CI (5.495–10.505), p-value<0.001] (Figure 6).

Random model was used due to presence of heterogeneity with $I^{\wedge 2}$=99.076 and P-value<0.001.

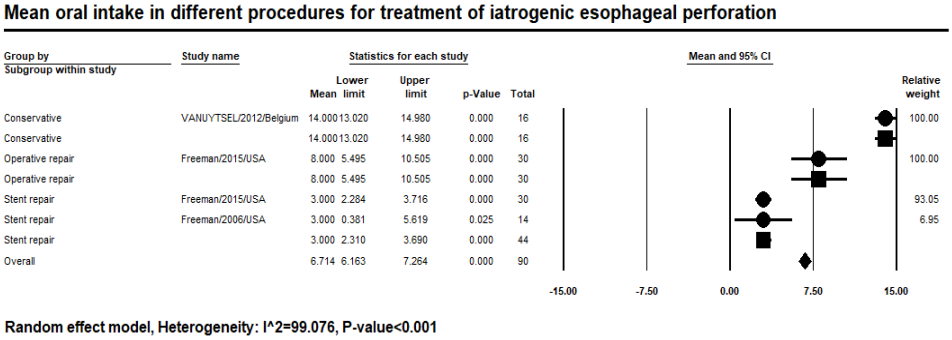

Diagram **(6):** Meta-analysis for mean oral intake in treatment of iatrogenic esophageal perforation

Hospital stays:

Meta-analyses of relevant studies showed that patients treated with operative repair measure had the highest and the worst insignificant mean hospital stay in iatrogenic esophageal perforation treatment than others [Mean = 42.472, 95% CI (-24.886–109.830), p-value=0.217] (Figure 7). Patients treated with stent repair measure had the least and the best significant mean hospital stay in iatrogenic esophageal perforation treatment

than others [Mean = 9.989, 95% CI (5.679–14.300), p-value<0.001] (Figure 7). While patients treated with conservative measure had midway significant mean hospital stay in iatrogenic esophageal perforation treatment [Mean = 11.434, 95% CI (10.332–12.536), p-value<0.001] (Figure 7).

Random model was used due to presence of heterogeneity with $I^{\wedge 2}$=83.530 and P-value<0.001.

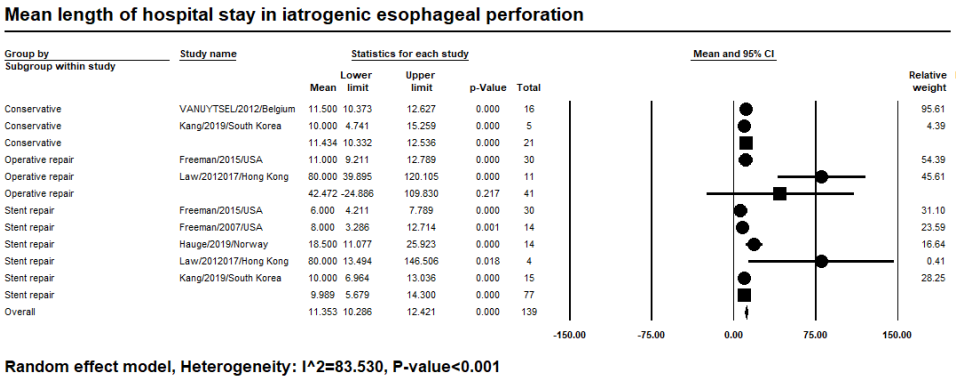

Diagram (7): Meta-analysis for mean hospital stay in treatment of iatrogenic esophageal perforation

DISCUSSION:

Esophageal perforation (EP) covers a large range of conditions characterized by the transmural disruption of the esophagus. The large majority (60%) of esophageal perforations are iatrogenic and occur during diagnostic and therapeutic (esophageal dilation, varices ligation, sclerotherapy and endoscopic procedures. Other rare causes include operative and external trauma, malignancy, foreign bodies, and caustic ingestion ***(Chirica et al., 2019)*** [2]**.**

Despite advances in the surgical and medical management of esophageal perforations, the disease continues to represent a clinical challenge associated with significant morbidity and mortality**.** The diagnosis of esophageal perforation may be difficult, especially when the perforation occurs spontaneously because unspecific symptoms often mimic those of other diseases such as myocardial infarction, ulcer perforation, pneumonia, and spontaneous pneumothorax. The clinical signs depend on cause, location, the extent of perforation, the degree of mediastinum contamination, and the interval from perforation to presentation. The most common clinical symptoms are severe chest or epigastric pain, dysphagia, and dyspnea ***(Brinster et al., 2004)***[14] **.**

The clinical examination often shows signs of subcutaneous emphysema and pneumothorax. To avoid a treatment delay, a high index of suspicion is necessary, especially when these clinical signs appear after endoscopic instrumentation. To establish the diagnosis of perforation, esophagography with water-soluble contrast agent is the gold standard. In case of a negative esophagogram, thoracoabdominal computed tomography is recommended when the clinical status remains highly suspicious for perforation, when critical patients are unable to undergo esophagography, or when perforations are difficult to locate ***(Wu et al., 2007)***[15]**.**

In recent years, the use of flexible endoscopy has been suggested because this examination not only has a high diagnostic value with a sensitivity of 100% and a specificity of 92% but offers also a treatment approach with the possibility of stent implantation. The outcome for patients with esophageal perforation depends on the cause, location, and degree of the lesion; the presence

of an underlying malignant disease; and the interval from perforation to diagnosis. Additionally, age and overall health status of the patient must be considered. The treatment options include conservative endoscopic interventional and operative management. The objective of either treatment includes elimination of the septic focus and maintenance of adequate nutrition. This can be achieved by adequate chest drainage, systemic broadspectrum antibiotic therapy, a nasogastric suctioning tube, and either total parenteral or enteral nutrition via feeding enterostomy ***(Schmidt et al., 2010)*** [16]**.**

The principles of management in esophageal perforation, be it surgical or non-surgical, are to eliminate the focus of infection and inflammation, prevent further contamination of the mediastinum with adequate drainage and antibiotics, restore alimentary tract continuity and establish nutritional support. The mechanism, severity and location of the perforation in addition to the time interval between perforation and treatment are critical in determining the appropriate management strategy. Additionally, the overall clinical status of the patient, damage to surrounding tissues, extent of associated injuries and any concomitant esophageal pathology must be considered prior to intervention. While both non operative and operative strategies have their place in the management of esophageal perforation, all cases require urgent surgical consultation because of the potential for rapid deterioration ***(Mavroudis et al., 2014)*** [17]**.**

The management of esophageal perforations continues to be a challenge and still is associated with a high mortality rate ranging from 15% to 50%. Although evidence in the literature suggests aggressive early surgical treatment recent data have shown that non operative treatment options such as adequate drainage of pleural fluid collections and sepsis treatment also seem to be safe alternative approaches to this disease. A more recent study has suggested an alternative approach that uses self-expandable metallic stents to cover the esophageal leak ***(Schmidt et al., 2010)*** [16]**.**

In our review we concluded that the best management modality of iatrogenic esophageal perforation is determined by the patient's criteria, location and time interval between perforation and diagnosis for the sake of that best management modality cannot be generalized in all patients and different circumstances.

Vanuytsel and his colleagues concluded that patient treated conservatively with broad-spectrum antibiotics and nothing by mouth the clinical course was further complicated by a pleural effusion, which required a drain in 38% and 6% died. In another review, the mortality rate after conservative therapy was reported to range between 0% and 33%. Non operative treatment requires very close observation of the patient, including frequent radiologic examinations and immediate placement of percutaneous pleural or mediastinal drainage under radiologic guidance when necessary (**Vanuytsel 2012)** [18].

Surgical management is warranted in the patients who not meet the criteria for non-operative management and present within 24 hours after perforation with successful rate of more than 80% but high dysphagia rate (68%) and prolonged hospital stay (42.5 days) become unavoidable. Surgical management includes operative drainage, T-tube drainage, primary repair, esophageal resection, and exclusion. The method of repair is dependent on the location and status of the patients. In one series, repair after 24 h resulted in a mortality rate of 22.2% compared with 13.3% for early repair and 11.1% for immediate repair ***(Schmidt et al., 2010)***[16]**.**

Endoscopic management (esophageal stent) is an alternative treatment option, this procedure is suitable for iatrogenic esophageal perforation after endoscopic mucosal resection (EMR) or endoscopic submucosal dissection

(ESD), early perforation (less than 24 hours), small size of the defect (less than 1 cm), none or minimal passage of esophageal content into mediastinum, lack of comorbidity, and absence of clinical instability with 50 to 83% of esophageal healing and remarkable rates of mortality (16.8%), leak (32.8%) and failure (50%) but with lowest dysphagia rate (22%), shortest mean oral intake (3days) and hospital length of stay (9.989 days). Related one study of this issue reported leak rate of 50% and 80% associated with Initial surgical treatment and stenting respectively ***(Hauge et al., 2019)***[19]**.**

Another published literature concluded that Perforation in the thoracic and distal esophagus failure rate was 35.7% and 64.3% in patients treated surgically, while Perforation in the thoracic and distal esophagus failure rate was 46.7% and 53.3% in a large-diameter self-expandable stent placement respectively ($p < 0.001$) ***(Dziedzic et al., 2016)*** [20]**.**

In regarding to the other complications our finding was comparable to other studies that reported mean oral intake of 8 days and 3 days and mean hospital stay of 11days and 6 days in operative and stent repair respectively ***(Freeman et al., 2015)*** [21]**.**

Conclusion:

Iatrogenic perforation, the most common cause of esophageal perforation continues to be a serious disorder with significant morbidity and mortality. Our data show that both non operative treatment, performed predominantly with stent implantation, and surgical treatment have a satisfactory outcome. The treatment method still has to be chosen on an individual basis. We recommend conservative treatment when the perforation is localized and does not cause severe general subsequent disorders. Extended perforations with spread of air and fluids to the mediastinum and subsequent development of systemic life-threatening disorders should be treated with a surgical approach. The best results can be obtained when the esophagus perforation was diagnosed and treated early.

Conflicts of Interest: The authors state that the publishing of this paper is free of any conflicts of interest.

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دراسة مقارنة بين طرق العلاج المختلفة لانثقاب المريء الناتج عن التدخلات الطبية

حسن عمر سياد نور، محمد محفوظ محمد عمر ، عمرو محمد محمود الحفنى ، محمد عبدالمجيد السيد حام ، ايمن حسام الدين عبدالله على.

كلية الطب - قسم الجراحة العامة - جامعة عين شمس.

المقدمة: يمثل ثقب المريء علاجي المنشأ ٦٠٪ من ثقوب المريء ويترافق مع ١٩٪ من الوفيات. الإجراءات التنظيرية والمناورات الجراحية الغازية هي الأسباب الشائعة. الألم وعسر البلع وانتفاخ تحت الجلد من المظاهر الشائعة. توفر دراسة التباين القابلة للذوبان في الماء والأشعة المقطعية والتنظير حساسية عالية للتشخيص. تعتبر العلاجات المبكرة خلال الـ ٢٤ ساعة الأولى أمرًا حاسمًا لتحقيق نتائج ممتازة ؛ غالبية المرضى مناسبون للعلاجات غير الجراحية بينما يعتبر التدخل الجراحي والدعامات المريئية من الخيارات العلاجية البديلة.

الهدف من الدراسة: مقارنة فعالية طرق العلاج المختلفة في المرضى الذين يعانون من انثقاب المريء علاجي المنشأ.

المرضى والطرق: قمنا بدراسة الأوراق العلمية التي قدمت بيانات من مارس ٢٠٠٧ إلى يونيو ٢٠٢٢ تتعلق بالمرضى الذين يعانون من انثقاب المريء علاجي المنشأ ، وتمت مراجعة طرق العلاج المختلفة بين يناير ٢٠٢١ ويونيو ٢٠٢٢. لقد أجرينا تحليلات تلوية زوجية لنتائجنا باستخدام برنامج التحليل التلوي الشامل (إصدار **CMA 3.9**). تم أيضًا حساب معدل الأحداث مع فواصل الثقة المقابلة ٩٥ ٪ (٩٥ ٪ **CI**) للبيانات الفئوية.

النتائج: في غالبية المرضى ، تعتبر العلاجات غير الجراحية هي الخيار الأفضل بمعدل نجاح يزيد عن ٩٠٪ وأدنى معدل وفيات (٦.٣٪). التدخلات الجراحية لها ما يبررها للمرضى الذين لا يستوفون معايير العلاج المحافظ بنسبة نجاح تزيد عن ٨٠٪. دعامة المريء هي خيار علاجي بديل بنسبة ٥٠ إلى ٨٣٪ من شفاء المريء.

الاستنتاجات: لا يزال يتعين اختيار طريقة العلاج على أساس فردي. نوصي بالعلاج التحفظي عند الحاجة. يجب معالجة الثقوب الممتدة من خلال نهج جراحي ، ويكون للدعامات المريئية نتائج مرضية في المرضى المناسبين.