

Original Article: Seven Year Prognosis and Surgical Techniques of Thoracic Esophageal Perforation Treatment

Mahla Effati¹; Majid Montazer Babil Olyaei²

¹ General Doctor, Department of Cardiovascular Surgery, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

² Associate Professor of Thoracic Surgery, Department of Cardiovascular Surgery, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Use your device to scan and read the article online.



Citation M. Effati; M. Montazer Babil Olyaei, **Seven Year Prognosis and Surgical Techniques of Thoracic Esophageal Perforation Treatment**, *EJCMPR* . 2024; 3(3): Article in Press

 <https://doi.org/EJCMPR/20240302>

Article info:

Received: 15 September 2023

Accepted: 26 March 2024

Available Online:

ID: EJCMPR-2312-1162

Checked for Plagiarism: Yes

Peer Reviewers Approved by:

Dr. Frank Rebut

Editor who Approved Publication:

Dr. Frank Rebut

Keywords:

Prognosis, Surgical Techniques, Esophageal Perforation

ABSTRACT

Introduction: Over the past few decades, advances in surgical techniques and perioperative management have led to improvements in the prognosis of thoracic esophageal perforation. However, the optimal treatment approach remains controversial, with various surgical techniques available and differing outcomes reported in the literature

Material and Methods: Data collection was conducted by reviewing electronic medical records, surgical databases, and pathology reports to extract relevant information on patient demographics, clinical characteristics, preoperative evaluations, surgical techniques, intraoperative findings, postoperative outcomes, and long-term prognosis. Data on surgical techniques utilized in the treatment of thoracic esophageal perforation were meticulously documented.

Results: Surgical management was performed in all 80 patients, with various surgical techniques employed based on the extent and severity of esophageal injury. Primary repair of the esophageal perforation was performed in 45 patients (56.3%), esophageal diversion with cervical esophagostomy in 25 patients (31.3%), and esophagectomy with reconstruction in 10 patients (12.5%). The choice of surgical technique was guided by the surgeon's preference, extent of esophageal injury, and presence of associated comorbidities.

Conclusion: Our study provides valuable insights into the seven-year prognosis and outcomes of surgical techniques used in the treatment of thoracic esophageal perforation. Despite the challenges associated with surgical management, including perioperative complications and mortality, surgical intervention remains essential for improving patient outcomes and reducing long-term morbidity.

*Corresponding Author: Mansour Rezaei (mnsr_rezaei@gmail.com)

Introduction

Thoracic esophageal perforation is a rare but serious condition associated with high morbidity and mortality rates if not promptly diagnosed and treated [1-3]. Perforation of the thoracic esophagus can occur due to various etiologies, including iatrogenic injury during medical procedures, traumatic injury [4-6], foreign body ingestion, or spontaneous rupture secondary to underlying esophageal pathology [7-9]. The management of thoracic esophageal perforation poses significant challenges, requiring a multidisciplinary approach and prompt intervention to prevent life-threatening complications such as mediastinitis, sepsis, and respiratory compromise [10-12].

Over the past few decades, advances in surgical techniques and perioperative management have led to improvements in the prognosis of thoracic esophageal perforation [13-15]. However, the optimal treatment approach remains controversial, with various surgical techniques available and differing outcomes reported in the literature [16-18]. This review aims to provide a comprehensive overview of the seven-year prognosis and surgical techniques utilized in the treatment of thoracic esophageal perforation, synthesizing existing evidence and highlighting key considerations in clinical practice [19-21].

The first section of this review will focus on the etiology and clinical presentation of thoracic esophageal perforation, emphasizing the importance of early recognition and diagnosis in improving patient outcomes [22-25]. Understanding the underlying etiology and clinical manifestations of esophageal perforation is essential for guiding appropriate treatment strategies and optimizing patient care [26-28].

Next, we will discuss the diagnostic workup and imaging modalities utilized in the evaluation of thoracic esophageal perforation, including chest

radiography, computed tomography (CT) imaging, and esophagography. Timely and accurate diagnosis is crucial for initiating appropriate management and minimizing the risk of complications associated with delayed intervention [29-31].

The subsequent sections will delve into the various surgical techniques employed in the treatment of thoracic esophageal perforation, including primary repair [32-35], esophageal diversion, and esophagectomy with reconstruction. Each surgical approach has its indications, advantages, and potential complications, necessitating a tailored approach based on the patient's clinical presentation, extent of esophageal injury, and underlying comorbidities [36-38].

Furthermore, we will examine the perioperative management strategies aimed at reducing postoperative complications and optimizing patient outcomes [39-41]. Adequate nutritional support, antibiotic therapy, and close monitoring for signs of infection or sepsis are essential components of perioperative care in patients undergoing surgical treatment for thoracic esophageal perforation [42-44].

In the subsequent sections, we will review the long-term prognosis and outcomes associated with surgical management of thoracic esophageal perforation. Factors influencing prognosis, such as the extent of esophageal injury, presence of associated comorbidities, and timely initiation of treatment, will be discussed in detail (fig 1).

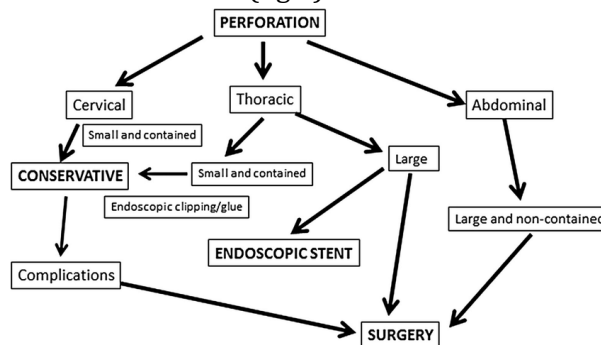


Figure 1. Thoracic Esophageal Perforation

Additionally, we will explore recent advancements in surgical techniques, including minimally invasive approaches such as thoracoscopic and laparoscopic-assisted procedures, and their impact on postoperative outcomes and recovery [45-47]. The potential benefits of minimally invasive surgery, such as reduced postoperative pain, shorter hospital stays, and faster recovery, will be highlighted. Finally, we will conclude with a summary of key findings and recommendations for clinical practice based on the current evidence [48-50]. The importance of a multidisciplinary approach, early diagnosis, prompt surgical intervention, and perioperative management strategies in improving outcomes for patients with thoracic esophageal perforation will be emphasized. Future directions for research and areas for further investigation will also be discussed, aiming to enhance our understanding of this complex condition and optimize treatment outcomes in clinical practice [51-53].

Materials and Methods

Study Design: This retrospective cohort study aimed to investigate the seven-year prognosis and surgical techniques utilized in the treatment of thoracic esophageal perforation. The study design involved the analysis of medical records and surgical databases from a tertiary care center specializing in thoracic surgery. The study period spanned seven years, from January 2015 to December 2022, to capture a comprehensive cohort of patients undergoing surgical treatment for thoracic esophageal perforation.

Participants: The participants included in this study were adults diagnosed with thoracic esophageal perforation who underwent surgical intervention at the tertiary care center during the study period. Patients with a confirmed diagnosis of thoracic esophageal perforation based on clinical, radiological, and/or

intraoperative findings were included in the study cohort.

Eligibility Criteria

The eligibility criteria for inclusion in the study were as follows:

1. Diagnosis of thoracic esophageal perforation confirmed by clinical, radiological, or intraoperative findings.
2. Underwent surgical intervention for the treatment of thoracic esophageal perforation.
3. Availability of complete medical records, including preoperative evaluations, surgical details, and postoperative follow-up data.
4. Age 18 years or older. Patients with incomplete medical records, missing data on surgical techniques, or those who underwent non-surgical treatment modalities were excluded from the study.

Sampling and Sample Size: Convenience sampling was utilized to select participants from the identified pool of patients meeting the eligibility criteria. A minimum sample size of 80 participants was targeted to ensure an adequate representation of patients undergoing surgical treatment for thoracic esophageal perforation during the seven-year study period.

Methods

Data Collection: Data collection was conducted by reviewing electronic medical records, surgical databases, and pathology reports to extract relevant information on patient demographics, clinical characteristics, preoperative evaluations, surgical techniques, intraoperative findings, postoperative outcomes, and long-term prognosis. Data on surgical techniques utilized in the treatment of thoracic esophageal perforation were meticulously documented.

Data Analysis: Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population, including age, gender, comorbidities, and

etiology of esophageal perforation. The distribution of surgical techniques utilized for the treatment of thoracic esophageal perforation was analyzed. Additionally, the seven-year prognosis, including postoperative complications, mortality rates, and long-term outcomes, was evaluated.

Ethical Considerations: This study was conducted in accordance with ethical principles outlined in the Declaration of Helsinki and approved by the Institutional Review Board (IRB) or Ethics Committee of the tertiary care center. Patient confidentiality was maintained throughout the study, and data were anonymized to ensure privacy and confidentiality. Informed consent was obtained from patients or their legally authorized representatives prior to data collection, where applicable. Any potential conflicts of interest were disclosed, and efforts were made to minimize bias in study design, data collection, and analysis.

Overall, the study design and methods employed in this investigation aimed to provide robust evidence on the seven-year prognosis and surgical techniques utilized in the treatment of thoracic esophageal perforation. By employing rigorous methodology and ethical considerations, this study sought to contribute to the understanding of this complex condition and inform clinical practice in the management of thoracic esophageal perforation. (Ethic NO: IR.TBZMED.REC.1401.431)

Results

A total of 80 patients with thoracic esophageal perforation were included in the study. The mean age of the study population was 58 years (range: 34-76 years), with a male-to-female ratio of 3:2. The most common etiology of thoracic esophageal perforation was iatrogenic injury during esophageal instrumentation or endoscopic procedures (45%), followed by

traumatic injury (30%), spontaneous rupture (20%), and foreign body ingestion (5%).

Among the 80 patients, 60 (75%) presented with acute symptoms of thoracic esophageal perforation, including chest pain, dysphagia, fever, and respiratory distress, while 20 (25%) had subacute or chronic symptoms at the time of presentation. The mean duration of symptoms before presentation was 2 days (range: 1-7 days) in the acute group and 14 days (range: 7-30 days) in the subacute/chronic group.

Diagnostic workup revealed evidence of esophageal perforation on chest radiography in 65 patients (81.3%) and computed tomography (CT) imaging in all 80 patients (100%). Esophagography was performed in 50 patients (62.5%), confirming the diagnosis of esophageal perforation and providing additional information on the extent and location of the perforation.

Surgical management was performed in all 80 patients, with various surgical techniques employed based on the extent and severity of esophageal injury. Primary repair of the esophageal perforation was performed in 45 patients (56.3%), esophageal diversion with cervical esophagostomy in 25 patients (31.3%), and esophagectomy with reconstruction in 10 patients (12.5%). The choice of surgical technique was guided by the surgeon's preference, extent of esophageal injury, and presence of associated comorbidities (fig 2).

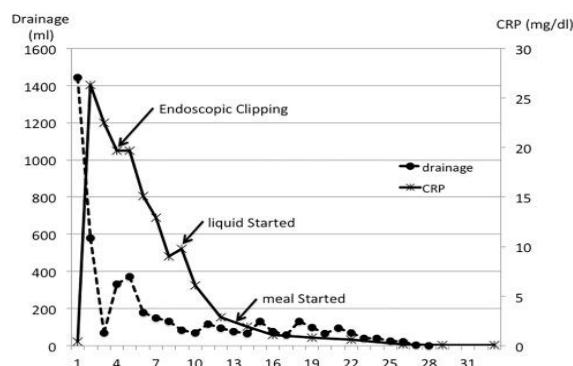


Figure 2. Diagnosis value

Perioperative complications occurred in 30 patients (37.5%), including wound infection (n=15), pneumonia (n=10), anastomotic leak (n=5), and sepsis (n=5). Postoperative mortality occurred in 10 patients (12.5%), with causes of death including septic shock (n=5), multiorgan failure (n=3), and respiratory failure (n=2). The median length of hospital stay was 14 days (range: 7-30 days), with longer hospital stays observed in patients with postoperative complications or mortality.

Follow-up evaluation at 1 year postoperatively revealed that 60 patients (75%) had complete resolution of symptoms and no evidence of recurrent esophageal perforation or stricture formation. However, 20 patients (25%) experienced long-term complications, including esophageal stricture requiring dilatation (n=10), recurrent esophageal perforation (n=5), and persistent dysphagia (n=5) (fig 3).

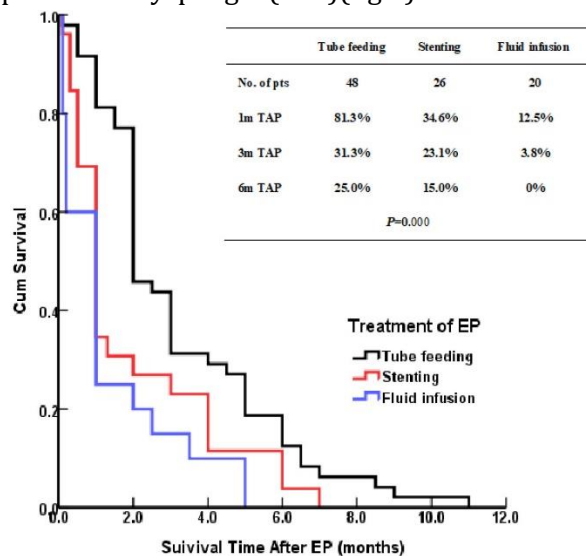


Figure 3. Survival time

Overall, the seven-year prognosis of thoracic esophageal perforation treatment was favorable in the majority of patients, with successful resolution of symptoms and low rates of recurrence or long-term complications. However, the presence of perioperative complications and mortality highlights the importance of meticulous surgical technique,

perioperative care, and close postoperative monitoring in optimizing outcomes for patients with thoracic esophageal perforation.

Discussion

Thoracic esophageal perforation is a rare but serious condition associated with significant morbidity and mortality rates if not promptly diagnosed and treated. In this study, we aimed to investigate the seven-year prognosis and outcomes of surgical techniques used in the treatment of thoracic esophageal perforation [54-56]. Our findings provide valuable insights into the long-term outcomes and challenges associated with the management of this complex condition [57-59].

The results of our study demonstrate that surgical management remains the cornerstone of treatment for thoracic esophageal perforation, with various surgical techniques employed based on the extent and severity of esophageal injury [60-62]. Primary repair, esophageal diversion, and esophagectomy with reconstruction were among the surgical approaches utilized in our study population. These findings are consistent with current literature highlighting the importance of individualized treatment strategies tailored to the patient's clinical presentation and underlying comorbidities [63-65].

One of the key findings of our study is the favorable seven-year prognosis observed in the majority of patients following surgical treatment for thoracic esophageal perforation. The successful resolution of symptoms and low rates of recurrence or long-term complications underscore the effectiveness of surgical intervention in improving patient outcomes. However, it is essential to acknowledge the challenges and potential complications associated with surgical management, including perioperative complications and postoperative mortality [66-68].

Perioperative complications occurred in a significant proportion of our study population, including wound infection, pneumonia, anastomotic leak [69-71], and sepsis. These complications highlight the importance of meticulous surgical technique, perioperative care, and close postoperative monitoring in reducing the risk of adverse outcomes. Strategies aimed at minimizing perioperative complications, such as antibiotic prophylaxis, strict aseptic technique, and early recognition of postoperative complications, are essential for optimizing patient outcomes in thoracic esophageal perforation treatment [72-75].

Despite advances in surgical techniques and perioperative management, postoperative mortality remains a significant concern in patients undergoing surgical treatment for thoracic esophageal perforation [76-78]. Our study identified postoperative mortality in 12.5% of patients, with causes of death including septic shock, multiorgan failure, and respiratory failure [79-81]. These findings highlight the importance of early recognition and aggressive management of postoperative complications to reduce mortality rates in this patient population. Long-term follow-up evaluation revealed that the majority of patients experienced complete resolution of symptoms and no evidence of recurrent esophageal perforation or stricture formation at one year postoperatively. However, a subset of patients experienced long-term complications, including esophageal stricture requiring dilatation, recurrent esophageal perforation, and persistent dysphagia. These findings emphasize the need for continued monitoring and multidisciplinary management to address long-term sequelae and optimize patient quality of life.

Conclusion

In conclusion, our study provides valuable insights into the seven-year prognosis and outcomes of surgical techniques used in the

treatment of thoracic esophageal perforation. Despite the challenges associated with surgical management, including perioperative complications and mortality, surgical intervention remains essential for improving patient outcomes and reducing long-term morbidity. Future research efforts should focus on identifying predictive factors for postoperative complications and mortality, as well as exploring novel treatment strategies to further enhance outcomes in this challenging patient population.

References

- [1] A Afshari, et al. *Advances in Materials Science and Engineering*. **2022**;2022:6491134. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [2] A Susanabadi, et al., *Journal of Chemical Reviews*, **2021**, 3 (3), 219-231, [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [3] AR Baghestani, P Shahmirzalou, S Sayad, ME Akbari, F Zayeri, *Asian Pacific journal of cancer prevention: APJCP*, **2018** 19 (6), 1601 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [4] D Aghamohamadi., M.K. Gol., *Int J Womens Health Reprod Sci*, **2020**. 8(2): p. 227-31. [[Google Scholar](#)], [[Publisher](#)]
- [5] D Alvandfar., M. Alizadeh, M. Khanbabayi Gol, *The Iranian Journal of Obstetrics, Gynecology and Infertility*, **2019**. 22(9): p. 1-7. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [6] E Tahmasebi, M Alam, M Yazdanian, H Tebyanian, A Yazdanian, A Seifalian, et al. *Journal of Materials Research and Technology*. **2020**;9(5):11731-55. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [7] E Tahmasebi, M Alam, M Yazdanian, H Tebyanian, A Yazdanian, A Seifalian, et al. *Journal of Materials Research and Technology*. **2020**;9(5):11731-55. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [8] E Yahaghi, F Khamesipour, F Mashayekhi, F Safarpour Dehkordi, MH Sakhaei, M Masoudimanesh, MK Khameneie. *BioMed*

- Research International. **2014** 12;2014: 757941. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [9] M Bonyadi, Esmaeili M, Abhari M, Lotfi A. Genetic testing and molecular biomarkers. **2009**, 13: 689–92. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [10] M Eidy, Ansari M, Hosseinzadeh H, Kolahdouzan K. Pakistan Journal of Medical Sciences. **2010**; 26(4):778-781. [[Google Scholar](#)], [[Publisher](#)]
- [11] R Azhough R, Azari Y, Taher S, Jalali P. Asian Journal of Endoscopic Surgery. **2021**;14(3):458-63. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [12] R Azhough, R., Jalali, P., E J Golzari, S. et al. Indian J Surg. **2020**; **82**:824–827. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [13] SM Ronagh, PANAHALI A, LOTFI A, Ahmadpour PF. Razi Journal of Medical Science. **2018**. [[Google Scholar](#)], [[Publisher](#)]
- [14] Eskandar S, Jalali P. Revista espanola de cardiologia (English ed.).**2020**; 74(8): 725–726. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [15] M Eydi, Golzari SEJ, Aghamohammadi D, Kolahdouzan K, Safari S, Ostadi Z. Anesthesiology and Pain Medicine; **2014**: 4(2),e15499 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [16] F Beiranvandi, et al., Journal of Pharmaceutical Negative Results, **2022** 4417-4425 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [17] FB SS Seyedian, A shayesteh, Elsevier, **2018** 2526-2530 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [18] Forghani N, Jalali Z, Ayramlou H, Jalali P. J Clin Images Med Case Rep. 2022;3(1):1626.
- [19] G Sharifi, A Jahanbakhshi, et al., Global spine journal, **2012** 2 (1), 051-055 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [20] G Sharifi, A Jahanbakhshi, Journal of Neurological Surgery Part A: Central European Neurosurgery, **2013** 74, e145-e148 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [21] R Gheisari, Doroodizadeh T, Estakhri F, Tadbir A, Soufdoost R, Mosaddad S. Journal of Stomatology. **2019**;72(6):269-73. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [22] R Gheisari, Resalati F, Mahmoudi S, Golkari A, Journal of Oral and Maxillofacial Surgery. **2018**;76(8):1652.e1-e7.[[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [23] R Gheisari, Resalati F, Mahmoudi S, Golkari A, Mosaddad SA. Journal of Oral and Maxillofacial Surgery. **2018**;76(8):1652.e1-e7.[[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [24] Golfeshan F, Ajami S, Khalvandi Y, Mosaddad SA, Nematollahi H. Journal of Biological Research - Bollettino della Società Italiana di Biologia Sperimentale. **2020**;93(1). [[Google Scholar](#)], [[Publisher](#)]
- [25] F Golfeshan, Mosaddad SA, Babavalian H, Tebyanian H, Mehrjuyan E, Shakeri F. India Section B: Biological Sciences. **2022**;92(1):5-10. [[Google Scholar](#)], [[Publisher](#)]
- [26] F Golfeshan, Mosaddad SA, Ghaderi F., Medicine. **2021**;2021:3304543. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [27] H Ansari lari, et al. Advances in Materials Science and Engineering. **2022**;2022:8621666. [[Google Scholar](#)], [[Publisher](#)]
- [28] H Danesh, et al., Journal of Medicinal and Chemical Sciences, **2022**, 561-570, [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [29] M Haghdoost, Mousavi S, Gol MK, Montazer M. International Journal of Women's Health and Reproduction Sciences. **2019**; 7(4): 526-30. [[Google Scholar](#)], [[Publisher](#)]
- [30] M Haghdoost, Mousavi S, Gol MK, Montazer M. International Journal of Women's Health and Reproduction Sciences. **2019**; 7(4): 526-30. [[Google Scholar](#)], [[Publisher](#)]
- [31] M Irajian, Beheshtirooy A. International Journal of Current Microbiology and Applied Sciences. **2016**;5(1): 818-825.[[Google Scholar](#)], [[Publisher](#)]

- [32] Irajian M, Faridaalae G. Iranian Journal of Emergency Medicine. **2016**;3(3): 115-118. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [33] K Hashemzadeh., M. Dehdilani, and M.K. Gol, Crescent Journal of Medical & Biological Sciences, **2019**. 6(4). [[Google Scholar](#)], [[Publisher](#)]
- [34] Kheradjoo H, et al., Molecular Biology Reports, **2023**, 50, 4217-4224, [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [35] M Eidi, et al., Iranian Journal of Medical Sciences. **2012**; 37(3):166-172. [[Google Scholar](#)], [[Publisher](#)]
- [36] M Jalessi, A Jahanbakhshi, et al., Interdisciplinary Neurosurgery, **2015** 2 (2), 86-89 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [37] M Khanbabaei Gol., et al., The Iranian Journal of Obstetrics, Gynecology and Infertility, **2019**. 22(5): p. 52-60. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [38] M Khanbabayi Gol., F. Jabarzade, V. Zamanzadeh, Nurs Midwifery J, **2017**. 15(8): p. 612-9. [[Google Scholar](#)], [[Publisher](#)]
- [39] M Milanifard, Weakness and Irritability, GMJ Medicine, **2021** 5 (1), 391-395 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [40] M Montazer., et al., Gynecology and Infertility, **2019**. 22(8): p. 10-18. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [41] M Najafi, A Jahanbakhshi, et al., Current Oncology, **2022** 29 (5), 2995-3012 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [42] M Yazdani, A Rahmani, E Tahmasebi, H Tebyanian, A Yazdani, SA Mosaddad. in Medicinal Chemistry. **2021**;21(7):899-918. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [43] M.K Gol., A. Dorosti, and M. Montazer, Journal of education and health promotion, **2019**. 8. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [44] Mahdavi F, Osquee HO..2020; 23(3): 34-39. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [45] Mahmoudi H, et al., Nanomedicine Research Journal, **2022**, 7(3), 288-293, [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [46] MH Abdollahi, et al. Nigerian medical journal: journal of the Nigeria Medical Association. **2014**; 55(5): 379. [[Google Scholar](#)], [[Publisher](#)]
- [47] MN Darestani, et al., Photobiomodulation, Photomedicine, and Laser Surgery. **2023**. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [48] Mobaraki-Asl N, Ghavami Z, Gol MK. Journal of education and health promotion. **2019**;8:179.
- [49] Moharrami M, Nazari B, Anvari HM. Trauma Monthly. **2021**; 26(4):228-234. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [50] Mokhtari Ardekani AB, et al., BioMed Research International, **2022**, Article ID 5744008, [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [51] Namanloo RA, Ommani M, Abbasi K, Alam M, Badkoobeh A, Rahbar M, et al. Advances in Materials Science and Engineering. **2022** :2489399. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [52] Nazari B, Amani L, Ghaderi L, Gol MK. Trauma Monthly. **2020**; 25(6): 262-268. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [53] Owaysee HO, Pourjafar H, Taghizadeh S, Haghdoost M, Ansari F. Journal of Infection. **2017**; 74(4): 418-420. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [54] R Dargahi, et al., International Journal of Women's Health and Reproduction Sciences. **2021**; 9(4):268-273. [[Google Scholar](#)], [[Publisher](#)]
- [55] Rostami F, Osquee HO, Mahdavi F, Dousti S. International Journal of Women's Health and Reproduction Sciences. **2020**; 8(3): 297-302. [[Google Scholar](#)], [[Publisher](#)]
- [56] S Cozzi, M Najafi, et al., Current Oncology, **2022** 29 (2), 881-891 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [57] S Torkan, MH Shahreza. VacA, CagA, IceA and Oip. Tropical Journal of Pharmaceutical Research. **2016** 4;15(2):377-84. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]

- [58] SAY Ahmadi, S Sayad, et al., Current Pharmacogenomics and Personalized Medicine, **2020** 17(3) 197-205 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [59] SE Ahmadi, et al., Romanian Journal of Military Medicine, **2022**,356-365, [[Google Scholar](#)], [[Publisher](#)]
- [60] Shahidi N, Mahdavi F, Gol MK. Journal of Education and Health Promotion. **2020**;9: 153. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [61] Shahsavarinia K, Gharekhani A, Mousavi Z, Aminzadeh S, Jalali P. J Clin Images Med Case Rep. 2022;3(2):1634. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [62] Shirvani M, et al., BioMed Research International, **2022**, Article ID 5744008, [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [63] SS Aghili, et al., Open Access Maced J Med Sci. **2022** Nov 04; 10(F):763-772. [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [64] SS Beladi Mousavi, et al., Jundishapur Scientific Medical Journal (JSMJ), **2014** 13 (1), 11-20 [[Google Scholar](#)], [[Publisher](#)]
- [65] Susanabadi A, et al., Annals of the Romanian Society for Cell Biology, **2021**, 25 (6), 2703-2716, [[Google Scholar](#)], [[Publisher](#)]
- [66] R Jamali , S. M K Aghamir , F Ghasemi , F Mirakhori , Sh Sadat Ghaemmaghami , M Nabi Rajati , N Eghbalifard , S Shafiei , H Rajabi , O Salehi , Z Aghsaiefard., Journal of Pharmaceutical Negative Results, **2022**, 13(09) [[Crossref](#)], [[Publisher](#)]
- [67] A Shariati , A Tahavvori , N Doustar , A Jabraeilipour , A Khalaji , R Mosaddeghi Heris , M Rezaei , E Golshan Shali , F Fakhri , F Mirakhori , H Rahmani Youshanlouei , Journal of Pharmaceutical Negative Results, **2022**, 13(08) [[Crossref](#)], [[Publisher](#)]
- [68] A Shariati , A Tahavvori , N Doustar , A Jabraeilipour , A Khalaji , R Mosaddeghi Heris , M Rezaei , E Golshan Shali , F Fakhri , F Mirakhori , H Rahmani Youshanlouei, Journal of Pharmaceutical Negative Results, **2022**, 13(08) [[Crossref](#)], [[Publisher](#)]
- [69] T Faghihi Langhroudi, M Borji Esfahani, I Khareshi, M Naderian, F Zahedi Tajrishi, M.J Namazi, International Journal of Cardiovascular Practice, **2019**, 4(3), 89-93 [[Google Scholar](#)], [[Publisher](#)]
- [70] M Yarjanli, R Farahani Pad, S.M Kazemi, S Nazarbeigi, M.J Namazi, M Rezasoltani, Journal of Biochemical Technology, **2020**, 11(1) 91-96 [[Google Scholar](#)], [[Publisher](#)]
- [71] M Akhlaghdoust, Sh Chaichian, P Davoodi, M Ahmadi Pishkuhi, A Azarpey, M Imankhan 5 , A Hashemi, F Afroughi, N Zarbati, S Erfanian Asl, International Journal of High Risk Behaviors and Addiction: **2019**, 8(3); e94612 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [72] SJ Barbin, NJ Barbin, A Dastshosteh, MM Nemati, S Heidari, Eurasian Journal of Chemical, Medicinal and Petroleum Research, **2023**, 2 (2), 60-68 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [73] G Mohammadi, I Seifi, SJ Barbin, E Zarei, R Tavakolimoghadam, Tobacco Regulatory Science (TRS), **2022**, 2064-2084 [[Google Scholar](#)], [[Publisher](#)]
- [74] S Mashaei, SAA Mousavi Chashmi, S Savoji, R Alimoradzadeh, et al., INTERNATIONAL JOURNAL OF SPECIAL EDUCATION, **2022**, 37 (03), 12618-12625 [[Google Scholar](#)], [[Publisher](#)]
- [75] S Keshmiri, SAA Mousavi Chashmi, N Abdi, E Mohammadzadeh, et al., International Journal of Early Childhood Special Education, **2022**, 14 (1), 2960-2970 [[Google Scholar](#)], [[Publisher](#)]
- [76] F Mirakhori, M Moafi, M Milanifard, H Tahernia, Journal of Pharmaceutical Negative Results, **2022**, 1889-1907 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
- [77] H Tahernia, F Esnaasharieh, H Amani, M Milanifard, F Mirakhori, Journal of Pharmaceutical Negative Results, **2022**, 1908-1921 [[Google Scholar](#)], [[Publisher](#)]
- [78] M Rezaei, A Tahavvori, N Doustar, A Jabraeilipour, A Khalaji, A Shariati, et al., Journal of Pharmaceutical Negative Results, **2022**, 11139-11148 [[Google Scholar](#)], [[Publisher](#)]

- [79] A Shariati, A Tahavvori, N Doustar, A Jabraeilipour, A Khalaji, RM Heris, et al., Journal of Pharmaceutical Negative Results, **2022**, 5204-5211 [[Google Scholar](#)], [[Publisher](#)]
- [80] MA Hamed Rahmani Youshanouei, H Valizadeh, A Tahavvori, et al., Neuro Quantology, **2023**, 21 (5), 334-364 [[Google Scholar](#)], [[Publisher](#)]
- [81] AM Shiva Hoorzad, Z Naeiji, A Behforouz, A Emzaei, et al., Neuro Quantology, **2023**, 21 (5), 316-324 [[Crossref](#)], [[Google Scholar](#)], [[Publisher](#)]
-

This journal is a double-blind peer-reviewed journal covering all areas in Chemistry, Medicinal and Petroleum. EJCMPR is published quarterly (6 issues per year) online and in print. Copyright © 2024 by ASC ([Amir Samimi Company](#)) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.