

ESWEP score global application: a retrospective study

ESWEP score, aplicación global: un estudio retrospectivo

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SUMMARY

Introduction: In 2021, the ESWEP Score was developed, a tool that considers variables to decide between primary closure or ostomy in enteric perforation, the cut-off point was 11, no traumatic perforation was considered. Validating ESWEP Score, in all segments of the digestive tract, and patients with traumatic perforation, would allow providing optimal treatment. **Materials and methods:** Retrospective study, through anesthesiology service records, included 49 with traumatic and non-traumatic gastrointestinal perforation in whom primary closure was performed between years 2020-2022. Statistical analysis was performed in SPSS 28.0 .1. **Results:** 49 patients were included with a mean score of 9.06 SD 3.243, 41 cases (83.7%) with a score less than or equal to 11, only 8 cases with score >11, 65.3% were perforations of traumatic origin, only 10.2% of cases presented dehiscence with a mean score of 14.4 SD 2.8. Fisher's exact test rejected independence between ESWEP Score and dehiscence, with $p=0.001$, no association between other variables was confirmed. The association between the cut-off point established by Ammar & Cols. with primary closure dehiscence. **Conclusion:** ESWEP Score is a useful tool for surgical decision making in patients with traumatic and non-traumatic gastrointestinal perforation.

Key words: Perforation, Trauma, Dehiscence, Gastrointestinal Anastomosis

RESUMEN

Introducción: En 2021 fue desarrollado ESWEP Score, una herramienta que considera variables para decidir entre cierre primario u ostomía en perforación entérica, el punto de corte fue 11, no se contempló perforación traumática. Validar ESWEP Score, en todos los segmentos del tracto digestivo, y pacientes con perforación traumática, permitiría proveer tratamiento óptimo. **Materiales y métodos:** Estudio retrospectivo, a través de registros del servicio de anestesiología, se incluyeron 49 con perforación gastrointestinal traumática y no traumática en quienes se realizó cierre primario, entre 2020-2022. Se efectuó el análisis estadístico en SPSS 28.0.1. **Resultados:** Se incluyen 49 pacientes con media de puntaje 9,06 DE 3,243, 41 pacientes (83,7%) con puntaje menor o igual a 11, 8 de los casos (16,3%) con score >11, 65,3% fueron perforaciones

de origen traumático, sólo se presentó dehiscencia 10.2% de casos con media de puntaje fue 14,4 DE 2,8. La prueba exacta de Fisher rechazó independencia entre ESWEP Score y dehiscencia, con $p=0,001$, no se corroboró asociación entre otras variables. Se confirma la asociación entre el punto corte que establecieron Ammar & Cols. con la dehiscencia de cierre primario. **Conclusión:** ESWEP Score resulta una herramienta útil para la toma de decisiones quirúrgicas en pacientes con perforación gastrointestinal traumática y no traumática.

Palabras clave: Perforación, Traumatismo, Dehiscencia, Anastomosis Gastrointestinal

INTRODUCTION

Enteric perforation constitutes a surgical emergency with a high mortality rate, which has been documented to be as high as 30-50%.⁽¹⁾ Delayed diagnosis and treatment lead to a state of sepsis. The latter represents a public health issue, as it is estimated to affect millions of individuals annually, contributing to a mortality rate of 1:3 of those affected.⁽²⁾

Currently, there are patient-dependent variables that modify the prognosis in relation to the provided treatment, leading to an increased likelihood of primary closure technique dehiscence. Studies have identified individual pathologies that generate states of immunosuppression, delaying the healing process. When combined with other factors, attempts have been made to establish tools that can predict anastomotic leakage.⁽³⁾ Other research has focused on describing treatment outcomes, considering a single segment of the digestive tract, and in surgical procedures that are not performed as emergencies.⁽⁴⁾

In 2021, a tool called the ESWEP Score was validated. (*Figure 1*) Its acronym stands for East Surgical Ward Enteric Perforation Score. This scale assigns scores to various preoperative and intraoperative variables, with a total of 26 factors.

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Figure 1. ESWEP Score, validated by Ammar & Colaboradores, 2021.⁵

PRE-OPERATIVE SCORE		
Parametes	Value	Score
1.-Age	More than 50 years	1
2.-Pre-operative vitals	Pulse >100 beats/minute	1
	MAP <80mmHg	1
	RR >30/minute	1
	Respiratory alkalosis/acidosis	1
3.-Laboratory investigations	Hb <8 g/dl	1
	TLC >12 x 10 ⁹ / L	1
	Serum albumin < 3g/dL	1
	Serum creatinine >1mg/dL	1
4.-Urine output	>0.5ml/kg/hour	1
5.-Immunocompromised status	Diabetic	1
	HIV/Hepatitis B/Hepatitis C	1
	Cardiac disease	1
6.-Duration of symptoms	More than 48 hours	1
PER-OPERATIVE SCORE		
Parametes	Value	Score
1.-Perforation size	>1 cm	1
2.-No of perforations	>1	1
3.-Peritoneal spillage 500-1000cc >1000cc	<500cc	1
	2	
	3	
4.-Anesthesia duration	<1 hour	1
	>1 hour	1
5.-Por.operative vitals	Pulse >100beats/min	1
	MAP <80mmHg	1
6.-Per-operative urine output	<0.5ml/kg/hour	1
7.-Condition of small gut	Inflamed/diseased	1
8.-Length of segmented involved	More than half feet	1

Obs.: Total pre-operative score: 14. Total per-operative score: 12. Total ESWEP Score: 26
 MAP: mean arterial pressure, RR: respiratory rate, Hb: hemoglobin, TLC: total leukocyte count, HIV: human immunodeficiency virus.

A higher score is associated with more unfavorable factors for successful primary closure. The cutoff point indicated in this study for the decision between primary closure techniques or the creation of a stoma was 11. One of the circumstances noted in the study is that the surgeon's experience still determines the surgical decision.⁽⁵⁾ This score was developed in a population with non-traumatic enteric perforation. Therefore, this study aims to evaluate the use of this tool in a more diverse population, considering each segment of the digestive tract and including patients whose perforation is due to trauma.

Individuals with enteric perforation require emergency surgical treatment. While the initial goal is to control contamination to prevent progression to sepsis, once the site is identified, definitive management is necessary. Therapeutic options include primary closure techniques without resection and anastomosis, primary closures involving resection and anastomosis, as well as stomas.⁽⁶⁾ Although intestinal diversion eliminates the possibility of primary closure dehiscence, it is not a complication-free treatment and negatively impacts the patient's quality of life.⁽⁷⁾ Considering the above, some authors suggest that primary clo-

sure techniques can be performed in up to 90% of perforations resulting from abdominal trauma.⁽⁸⁾

It is necessary to provide the treatment that results in the lowest number of short and long-term complications, reduces the risk of surgical reintervention. Decision-making to achieve these objectives must be multifactorial and individualized, considering factors associated with etiology, duration of symptoms, patient's clinical condition, laboratory parameters, resource availability. All these variables are considered in the ESWEP Score, except for the last one, which is also a subject of study when evaluating the association between primary closure dehiscence and the use of suture materials. The ESWEP Score seems to be a comprehensive tool that can meet the need for a resource to define appropriate treatment for gastrointestinal perforations.

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted using a retrospective sample of patients from the General Hospital of the State of Sonora over a two-year period between 2020 and 2022.

Data were collected from surgical procedure records in the anesthesiology department. Inclusion criteria consisted of patients with gastrointestinal perforation who underwent primary closure techniques and had available clinical and laboratory parameter records to establish the ESWEP Score. Exclusion criteria involved patients with insufficient information to determine the score and those for whom the evaluation of surgical treatment outcomes was not possible due to various reasons, including death, voluntary discharge, or transfer.

Data were collected on the variables ESWEP Score (considering a cutoff point of 11), type of perforation (traumatic and non-traumatic), primary closure dehiscence, complications, re-intervention, and suture material used. Once included in the database, IBM SPSS 28.0 software was utilized, employing the Fisher's exact test to determine the association between ESWEP Score (above or below 11) and primary closure dehiscence, with a p-value of <0.05 considered statistically significant.

RESULTS

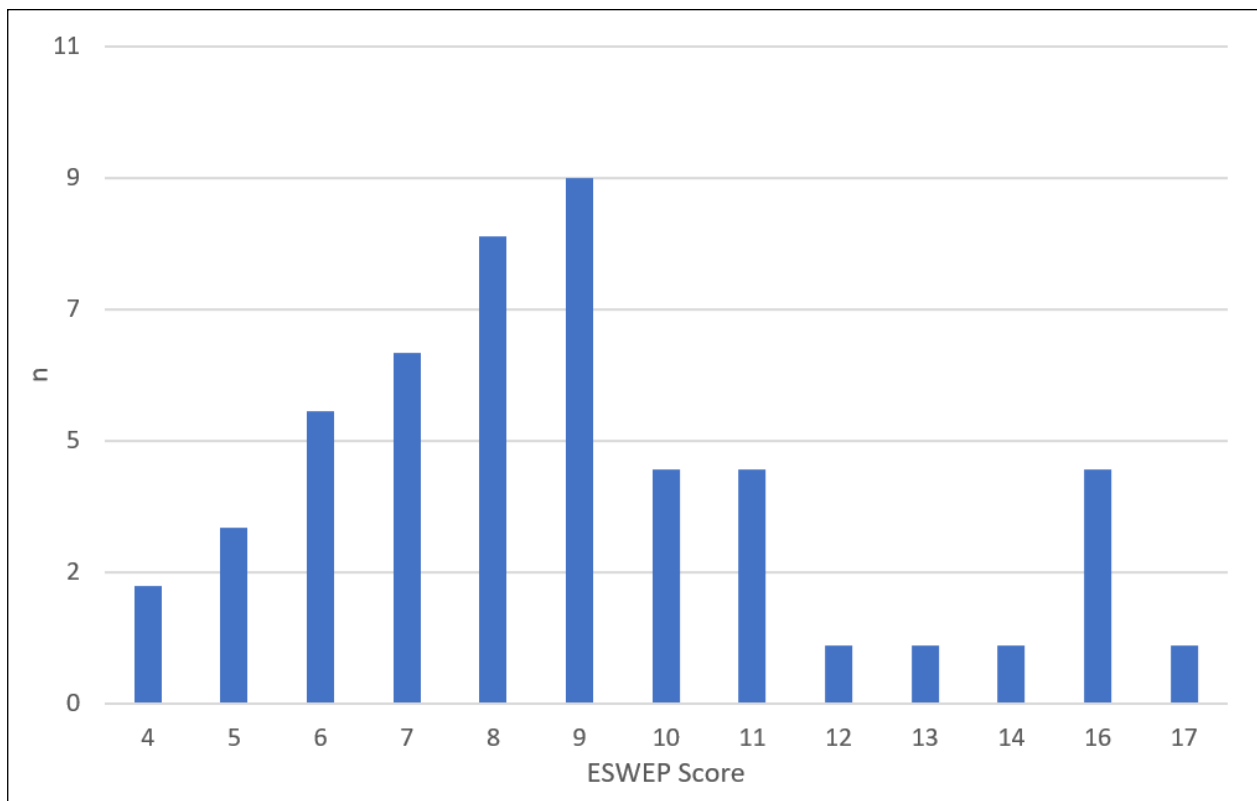
The surgical procedure logs from the anesthesiology department of the General Hospital of the State of Sonora were reviewed for the period 2020-2022. Among them, 49 patients with gastrointestinal perforation who underwent primary closure techniques were identified. Both physical and electronic medical records contained information necessary to establish the ESWEP Score for all patients, except for albumin. Twenty-eight patients had recorded serum albumin levels, representing 57%, while 21 patients had no albumin record (43%). Serum albumin is not considered a supplementary study for trauma patients. Therefore, we decided not to exclude these patients and chose to compare the results between the entire group and those with available albumin levels.

Once the scores were established, the minimum score observed was 4, and the maximum was 17. The most frequently observed score was 9, recorded in 9 different patients, representing 18.4% of the total cases (**Figure 1**). Considering the cutoff point defined by Ammar & Colleagues for the ESWEP Score, the sample was divided into two groups. A total of 41 patients had a score equal to or less than 11 (83.7%), while only 8 patients had an ESWEP Score greater than 11 (16.3%).

The mean ESWEP Score obtained was 9.06, with a standard deviation (SD) of 3.243, estimated from the population of 49 patients. In the group of 28 patients with available albumin levels, the mean was 9.93 with an SD of 3.506. For patients without albumin data, the calculated mean was 7.9 with an SD of 2.4.

Regarding the diagnosis, a total of 14 diagnoses were reported. (**Table 1**) The most frequently reported diagnosis overall was traumatic small intestine perforation, occurring 18 times, which accounts for 36.7% of cases. Among the non-traumatic causes of perforation, peptic ulcer perforation was reported most frequently, occurring 10 times, representing 20.4% of the total. Seventeen cases of non-traumatic origin perforation were identified (34.7%), while 32 cases were of traumatic origin (65.3%).

Out of the 49 evaluated cases, only 5 patients (10.2%) experienced primary closure dehiscence. Regarding complications that occurred and required re-intervention, in addition to the 5 patients with documented primary closure dehiscence, there was one case of abdominal wall closure dehiscence and one case of intra-abdominal infection, totaling 7 patients who underwent re-intervention due to complications (14.3%). Characterizing the patients with complications and establishing risk factors for them is limited as they only accounted for 4% of the cases. In terms of the techniques employed, we documented simple primary closure and resection with anastomosis. Simple primary



Graph 1. Histogram of ESWEP Score scores.

Table 1. Frequency of diagnoses included in the study.

Diagnosis	n	%
Strangulated inguinal hernia with small bowel perforation	1	2,0%
Strangulated ventral hernia complicated by small bowel perforation	2	4,1%
Meckel's diverticulum perforation	1	2,0%
Peptic ulcer perforation	10	20,4%
Traumatic cecal perforation	1	2,0%
Traumatic colon perforation	5	10,2%
Traumatic stomach perforation	2	4,1%
Traumatic stomach and small bowel perforation	1	2,0%
Traumatic stomach and colon perforation	1	2,0%
Traumatic small bowel perforation	18	36,7%
Traumatic small bowel and colon perforation	3	6,1%
Unspecified small bowel perforation	1	2,0%
Intestinal tuberculosis	2	4,1%
Sigmoid volvulus	1	2,0%

closure was performed in 31 patients (63.3%), while resection and anastomosis were done in 18 patients (37.7%).

Six different types of suture materials were used. (**Table 2**) The most frequently used suture material was 3-0 Vicryl, employed in 28 cases (57.1%), while the least used material was 2-0 Silk, which was only used once (2%).

The same statistical analysis was conducted exclusively in the group of patients for whom preoperative serum albumin levels were documented. (**Table 4 and Figure 3**) Using the Fisher's exact test, independence between the variables was rejected with a statistical significance of $p=0.008$. Other statistical tests were employed to determine the strength of association (Phi and Kramer V), and consistent data were reported, yielding a value of 0.008.

Table 2. Frequency of primary closure materials used.

Material de sutura	n	%
Monocryl 3-0	10	20,4%
PDS 3-0	5	10,2%
Prolene 3-0	2	4,1%
Silk 2-0	1	2,0%
Vicryl 2-0	3	6,1%
Vicryl 3-0	28	57,1%

Table 3. Contingency table; dehiscence with respect to ESWEP Score cutoff, in the total cases studied.

	ESWEP Score	Dehiscence		Total
		No	Yes	
	≤ 11	40	1	41
	> 11	4	4	8
Total		44	5	49

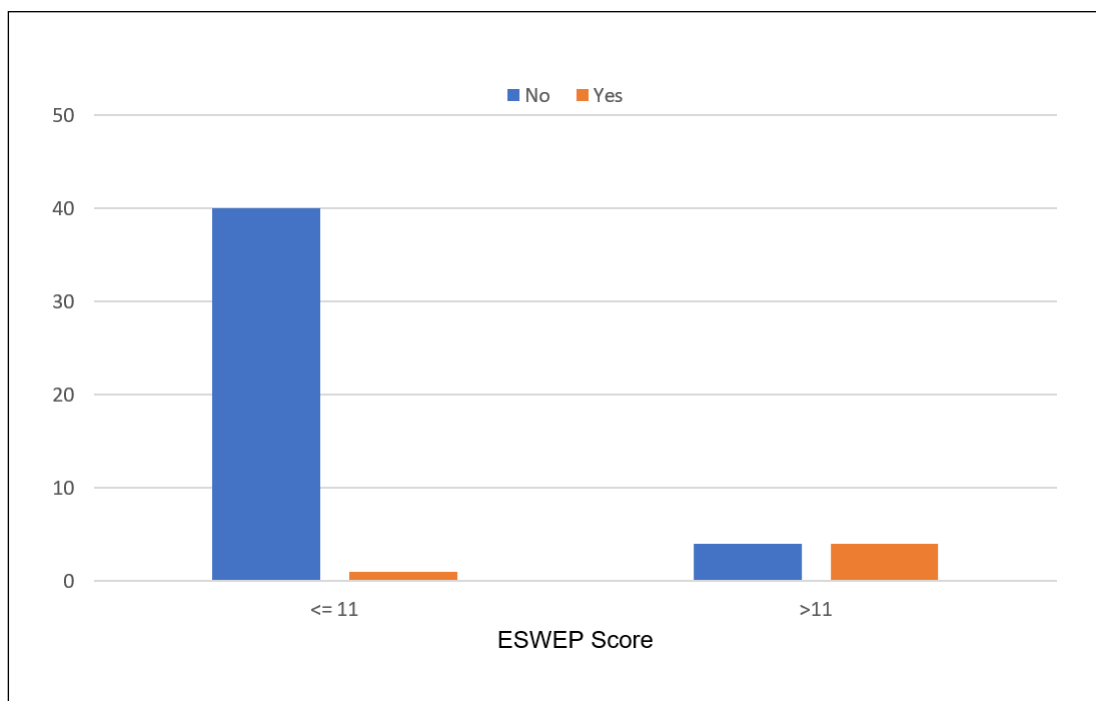
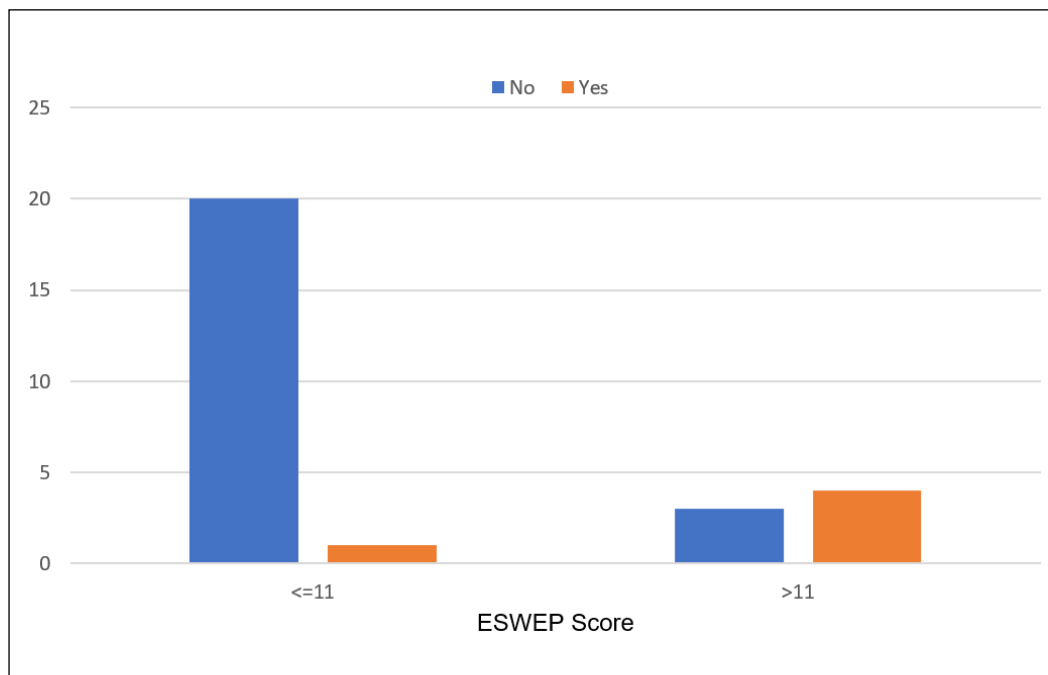
**Graph 2.** Cases of dehiscence by ESWEP Score cutoff in the total cases studied.

Table 4. Contingency table; dehiscence cases with respect to ESWEP Score cutoff in patients with serum albumin measurement

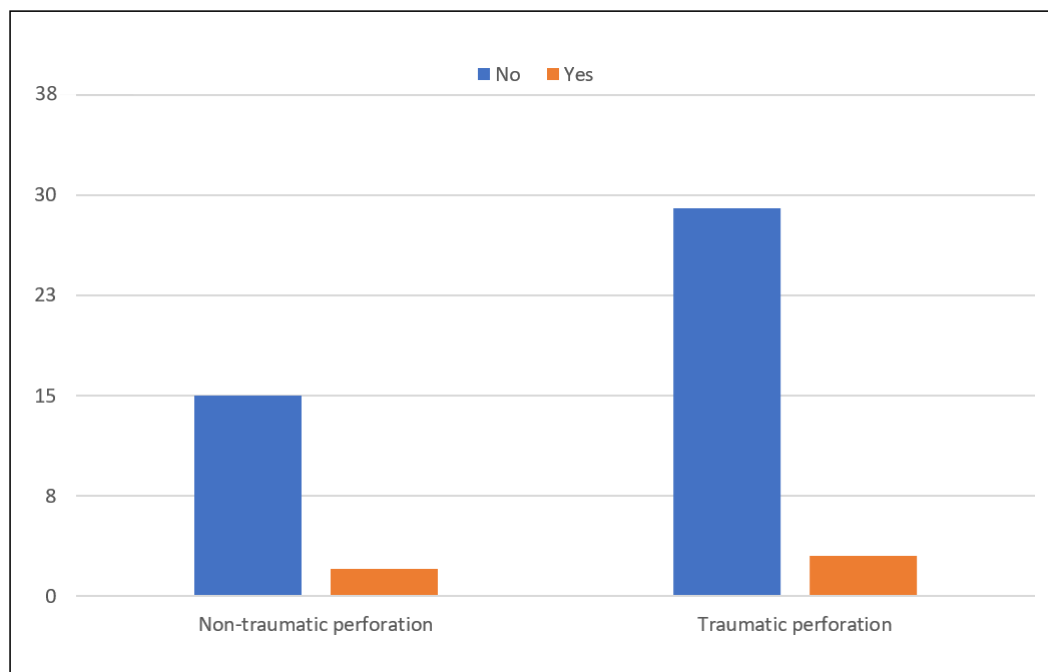
	ESWEP Score	Dehiscence		Total
		No	Yes	
	<= 11	20	1	21
	> 11	3	4	7
Total		23	5	28

Table 5. Cases of dehiscence according to the cause of perforation.

	Causa	Dehiscence		Total
		No	Yes	
	Non-traumatic perforation	15	2	17
	Traumatic perforation	29	3	32
Total		44	5	49



Graph 3. Cases of dehiscence by ESWEP Score cutoff in patients with serum albumin measurement.



Graph 4. Cases of dehiscence by cause of perforation.

An association between primary closure dehiscence and the cause of perforation was analyzed. (*Table 5 and Figure 4*) The results obtained indicate that both variables are independent from each other with a p-value of 0.57 obtained using the Fisher's exact test. Based on this result, we can infer that the ESWEF Score, initially evaluated only in patients with non-traumatic perforation, is applicable to both groups of patients (non-traumatic perforation/traumatic perforation).

We assessed the relationship between primary closure dehiscence and the suture material used for it. Through the Fisher-Freeman-Halton exact test, it was evident that the analyzed variables are independent from each other with a p-value of 0.729.

DISCUSSION

Although we chose to apply the tool in a broader range of scenarios compared to the study in which the ESWEF Score was validated by Ammar & Colleagues, our sample size was smaller. Only one case was approached with minimally invasive surgery, while the rest were treated through laparotomy. There is evidence of lower morbidity for procedures performed through minimally invasive approaches.⁽¹⁰⁾

Based on the established cutoff point, only 83.7% of patients were candidates for primary closure techniques. However, for the studied scenarios, tools have not yet been validated. We observed a decrease in the mean ESWEF Score when compared to the global mean. This reduction can be attributed to the exclusion of a parameter that contributes to the score. In the metabolic response to major trauma during the Cuthbertson phases, the Ebb phase, which occurs 12-24 hours after trauma, does not involve protein catabolism. Thus, measuring serum albumin levels in the early stages of these patients may not be essential.⁽¹¹⁾

The characteristics of patients with traumatic perforation included in the study correlate with global literature regarding the segments of the digestive tract most affected in this condition. This is evident in the predominance of small intestine perforations in cases of abdominal trauma.⁽¹²⁾ Peptic ulcer constitutes the leading cause of gastroduodenal perforation, including traumatic perforation which ranks second.⁽¹³⁾ Other causes include malignancy, with less frequent cases of mesenteric infarction or volvulus. Approximately 5-20% of peptic ulcer patients experience perforation, with factors contributing to perforation including NSAID consumption, aspirin, corticosteroids, stress, alcohol abuse, and tobacco use.⁽¹⁴⁾

There is a contrast in the percentage of patients undergoing simple primary closure versus those undergoing resection with anastomosis. This may be explained by the fact that the first therapeutic option for gastrointestinal perforation is simple primary closure. Up to 90% of penetrating intestinal injuries can be treated with primary closures or deferred primary anastomosis if damage control surgery is required.^(8,15) For perforated peptic ulcers, various surgical techniques are used. Omental patch closure remains the gold standard for peptic ulcer perforation.⁽¹⁶⁾ Gastrectomy is reserved for extensive ulcers.

All patients with a score above 11 experienced dehiscence. It is important to note that the limitation of our findings is the small population in which the statistical analysis was performed. However, since there are no other globally recognized scales guiding surgical decisions between primary closure and stomas in cases of traumatic perforation, our results suggest that performing primary closure techniques in patients with an ESWEF Score below 11 is safe.

Recognizing the potential usefulness of the ESWEF Score

for surgical decision-making encourages us to include serum albumin measurement in the laboratory evaluation of patients with gastrointestinal perforation. This would ensure adherence to a previously validated scale. While the statistical significance remained for both the total patients included and the group of 28 patients with available albumin levels, the value of full adherence is evident.

There is little difference between absorbable and non-absorbable sutures in terms of their use in primary closures and anastomoses.⁽¹⁷⁾ Our results indicated independence between primary closure dehiscence and suture material. It's worth noting that none of the cases evaluated used mechanical closure devices. However, the variety of suture materials in a small population limits the generalizability of this result. Suture material is not considered within the ESWEF Score.

Currently, approaches for patients with gastrointestinal perforation include laparoscopic and open surgery.¹⁸ In the cases included in this study, only one was performed laparoscopically, despite current literature documenting superior outcomes in terms of morbidity and mortality for laparoscopic procedures in gastrointestinal perforation.⁽⁹⁾ However, the factors influencing the choice of surgical approach were not described. Identifying this situation, supported by existing information, presents an opportunity for service quality improvement.

CONCLUSION

The validated ESWEF Score tool, originally developed for patients with infectious etiology of enteric perforation, could also be useful in cases of traumatic enteric perforation as well as in perforations occurring in other segments of the digestive tract such as the stomach and colon.

Validating the cutoff point established by Ammar & Colleagues across various scenarios presented in this study is impactful. Through this cutoff, we can determine who is suitable for primary closure techniques in future cases requiring surgical treatment. It's worth noting that the study's demonstration of the independence between the origin of perforation (traumatic/non-traumatic) and primary closure dehiscence strengthens the argument that this scale is applicable in diverse scenarios.

It would be relevant to explore factors related to complications other than primary closure dehiscence. However, in our study, since these complications occurred in only 4% of total patients, the evaluation of such characteristics was limited. This could be a subject for future research in larger populations.

Currently, approaches for patients with gastrointestinal perforation include laparoscopic and open surgery.¹⁸ In the cases included in this study, only one was performed laparoscopically, despite current literature documenting superior outcomes in terms of morbidity and mortality for laparoscopic procedures in gastrointestinal perforation.⁹ However, the factors influencing the choice of surgical approach were not described. Identifying this situation, supported by existing information, presents an opportunity for service quality improvement.

Having established the association between the ESWEF Score and primary closure dehiscence across various circumstances allows us to standardize criteria for therapeutic decision-making. This ensures that treatment choices are solely evidence-based, potentially leading to a reduction in complications and improvements in service quality indicators. The opportunity to replicate the study in a larger population remains, and it can contribute to further enhancing the evidence-based approach to surgical decision-making.

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Author Contributions: All authors contributed equally to the completion of the article.

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Ethical Considerations: Data were treated with confidentiality, equity, and justice, respecting the principles of Helsinki.

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