



PERI-OPERATIVE AND CRITICAL CARE MÉDICINE JOURNAL

**SEVERE PATHOLOGIES IN CRITICAL CARE
MANAGEMENT AND THERAPEUTIC CHALLENGES**

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Editorial: A Glimpse into Key Topics in Perioperative and Critical Care Medicine

In this issue of the *Perioperative and Critical Care Medicine Journal*, we present five thought-provoking articles that cover a diverse range of critical issues in perioperative and critical care medicine. These articles reflect the breadth of expertise and challenges faced by medical professionals who are dedicated to providing the highest level of care for patients, both before and after surgical interventions.

The first article delves into the management of *severe scorpion envenomation*, an often overlooked but highly critical condition that requires prompt diagnosis and treatment. The article offers invaluable insights into the pathophysiology, clinical presentation, and the latest therapeutic strategies, which are essential in improving patient outcomes.

The second contribution focuses on *perioperative cardiac arrest*, a terrifying event that demands immediate attention and precise management. This review not only highlights the causes and risk factors but also emphasizes the importance of early recognition and effective resuscitation techniques, offering recommendations for better prevention and management of these life-threatening situations.

In the third article, we explore *Legionnaires' disease*, a severe form of pneumonia caused by *Legionella* bacteria. The review provides an overview of the epidemiology, clinical features, and the diagnostic approach, shedding light on the importance of early intervention and tailored treatment in critically ill patients. The fourth article addresses the complex subject of *pediatric renal transplantation*. As this procedure continues to evolve, the article highlights key advances, challenges, and multidisciplinary approaches involved in ensuring optimal graft survival and long-term outcomes for young patients undergoing kidney transplantation.

Finally, we conclude with a critical review on *severe herpes meningoencephalitis*, an aggressive infection that can have devastating consequences if not promptly treated. The article provides a comprehensive overview of the pathogenesis, diagnostic tools, and treatment strategies, underscoring the need for timely intervention to prevent irreversible neurological damage.

Together, these articles exemplify the variety and complexity of issues that clinicians face in the perioperative and critical care settings. As the field continues to evolve, it is crucial for practitioners to stay informed of the latest research and advancements in order to provide the best possible care for their patients.

We hope this issue of the *Perioperative and Critical Care Medicine Journal* sparks new insights, fosters discussions, and inspires further research into these critical areas of medicine. Our commitment to advancing knowledge and improving patient care remains at the core of what we do, and we are grateful for the continued contributions of the scientific and medical communities.

Happy reading.

Pr. Nadia GRAINAT.

Severe Scorpion Envenomation

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Summary: Scorpion envenomation (SE) is a major public health problem, particularly in tropical and subtropical regions, with more than 1.2 million cases and 3,250 annual deaths worldwide. In Algeria, between 45,000 and 50,000 cases are reported each year, with around 50 deaths, and an increased severity in children under 15 years old. Clinical signs range from mild to severe, with cardiovascular failure being the leading cause of mortality. A retrospective study conducted at Batna University Hospital analyzed 28 severe cases over 7 years.

The results show a male predominance, variable admission times (less than 24 hours in 36% of cases), and treatments including anti-scorpion serum, positive inotropes, analgesics, and rehydration. Hypotension and tachycardia are present in 82% of cases, and cardiac and metabolic abnormalities are observed. Children are the most vulnerable, and most cases occur in rural areas during hot months. Echocardiography, although useful, requires proper training to be performed correctly, and cardiac biomarkers such as troponin and pro-BNP, as well as ECG abnormalities, are essential diagnostic indicators. Rapid and adequate management in an intensive care unit is crucial for managing severe scorpion envenomation cases. Intensive care allows for continuous monitoring, optimized complication management, and the rapid administration of necessary treatments such as inotropes and mechanical ventilation. This specialized care significantly improves survival chances, especially for the most vulnerable patients, such as children.

Keywords: scorpion envenomation, Mortality, Children, Intensive Care, Cardiovascular failure, Emergency treatment

Introduction:

Scorpion envenomation (SE) is a major public health issue, particularly in tropical and subtropical regions, where the diversity of venomous scorpions is high. Every year, scorpion stings affect more than 1.2 million people worldwide, unfortunately causing over 3,250 deaths. This phenomenon is a significant health challenge, both in terms of its scope and its severe consequences, especially in rural and desert areas.

In Algeria, scorpion envenomation is a particular concern, with between 45,000 and 50,000 cases reported annually, resulting in about 50 deaths. This high prevalence places the country among the most affected regions by this issue. The severity of envenomations is particularly marked in children under 15, a vulnerable age group due to their low resistance to the venom's effects and the difficulty of accessing medical care in certain areas. The clinical signs of scorpion envenomation vary, ranging from mild local symptoms to severe systemic manifestations, sometimes fatal.

The main cause of mortality in these cases remains cardiovascular failure, which can occur rapidly due to the neurotoxic effects of the venom. This failure can lead to cardiogenic shock or arrhythmia, making rapid and effective medical treatment essential to reduce the risk of death. Therefore, managing scorpion envenomation requires urgent medical care, enhanced prevention, and ongoing awareness among exposed populations.

The objective of our study was to identify the factors contributing to the severity of scorpion envenomation and the various approaches to treatment.

Mechanisms of Cardiovascular Failure Associated with Severe Scorpion Envenomation:

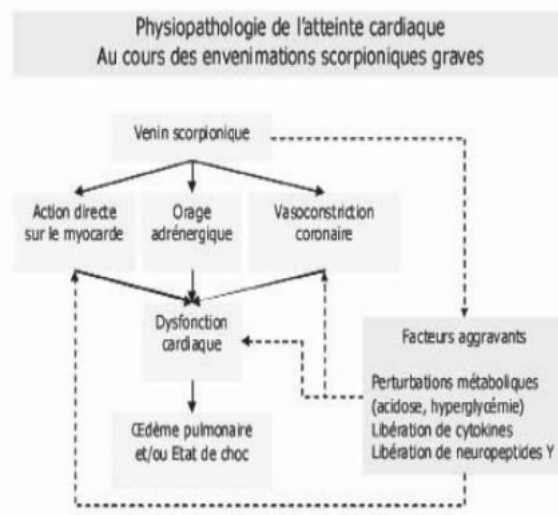


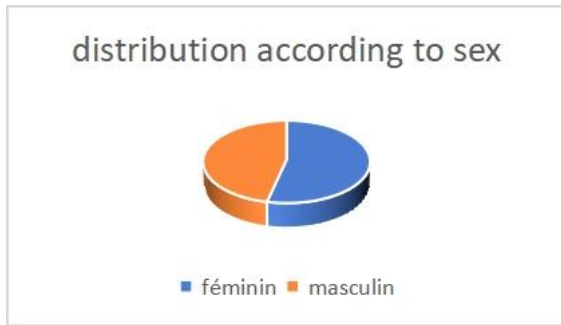
Fig. Mechanisms of Action of the Venom (5) (6) (7)

Materials and Methods:

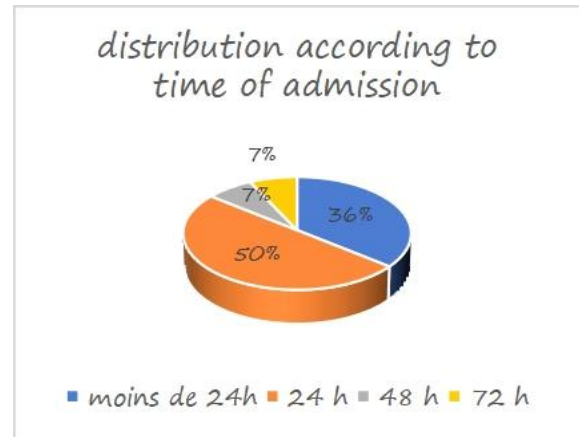
This is a monocentric retrospective study of all severe scorpion sting cases admitted to the general intensive care unit of Benflis Touhami University Hospital in Batna. Data were collected from medical records over a period of 7 years, from 2018 to 2024.

The parameters studied include sex, age, time of admission, clinical signs of severity, laboratory tests, chest X-ray, echocardiography, treatment, and outcomes.

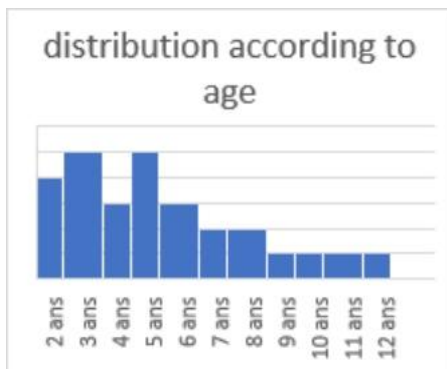
Results :



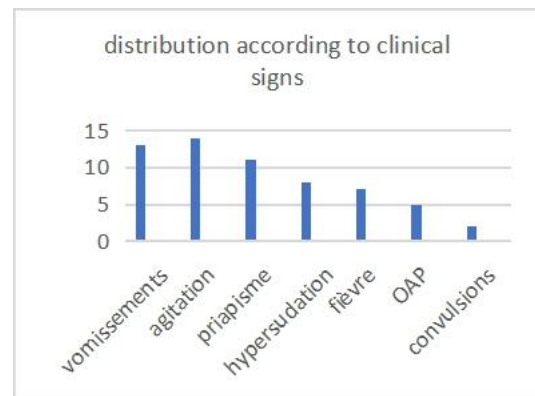
There is a slight male predominance, with a sex ratio of 0.85.



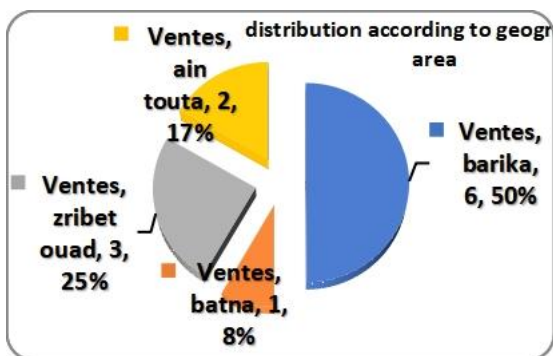
The time between the sting and admission is less than 24 hours in 36% of cases, 24 hours in 50% of cases, 48 hours in 7% of cases, and 72 hours in 7% of cases.



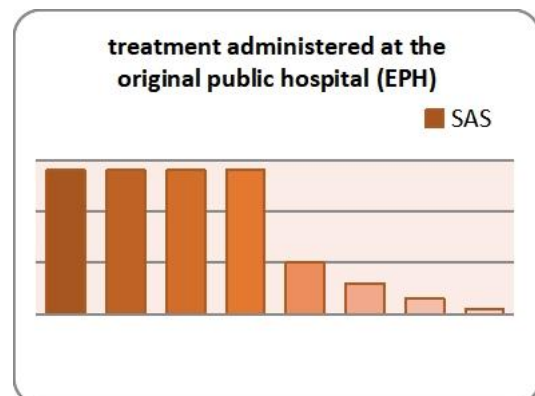
The most affected patients are children under 15 years old, with a higher number of cases in children under 8 years old.



The clinical signs found, in order, are agitation, vomiting, priapism in boys, excessive sweating, fever, pulmonary edema (OAP), and convulsions (8).

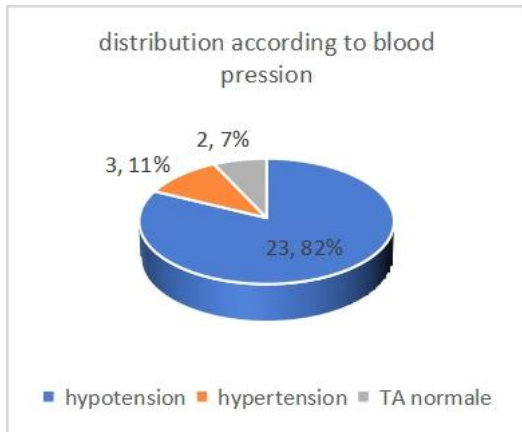


50% of the patients come from a town in Batna located 80 km further south, 25% are from the Wilaya of Biskra, followed by the town of Ain Touda with 17% of cases, and the town of Batna with 8% of cases.

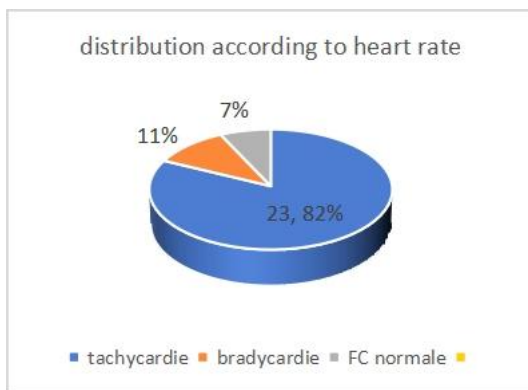


The treatments received at the originating public hospital included anti-scorpion serum within 12 hours in all cases, as well as oxygen, analgesics, and rehydration. Other treatments

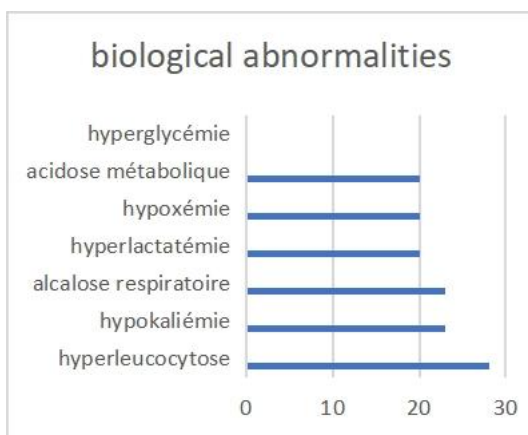
included corticosteroids, dobutamine for 3 patients, and one patient arrived intubated.



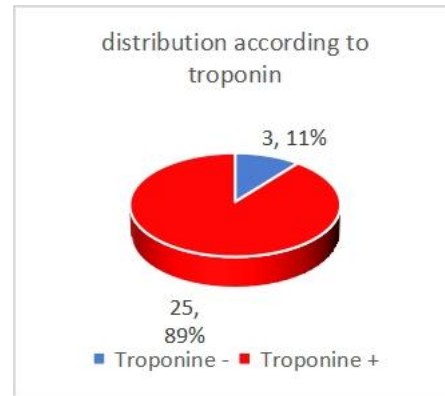
Hypotension is observed in 82% of cases.



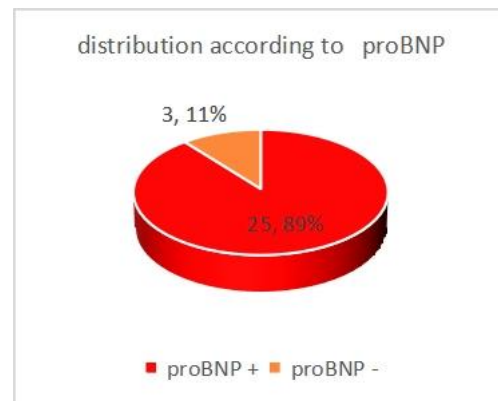
Tachycardia is observed in 82% of cases.



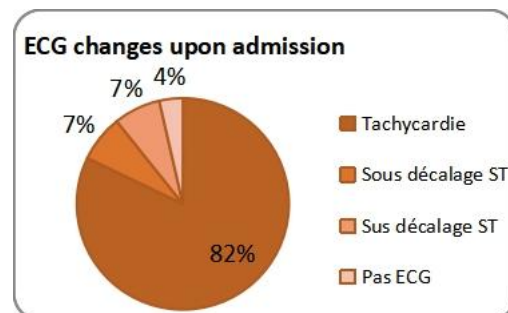
Leukocytosis is present in all patients. A majority of patients (23 out of 28) have hypokalemia and respiratory alkalosis. Hyperlactatemia, hypoxemia, and metabolic acidosis are found in 20 cases. No hyperglycemia is observed.



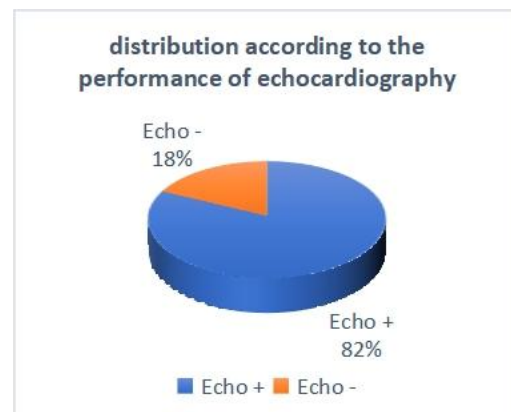
Troponin is positive in 89% of cases.



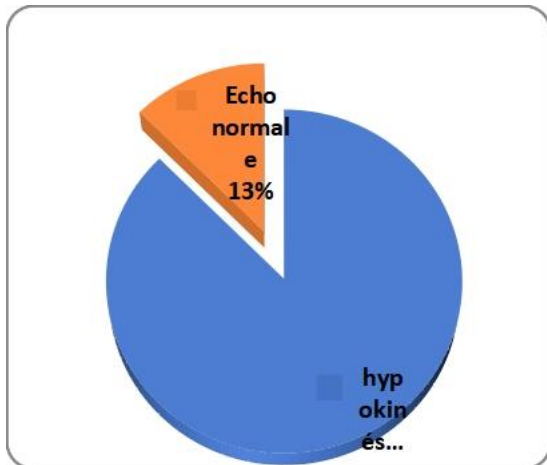
ProBNP is positive in 89% of cases.



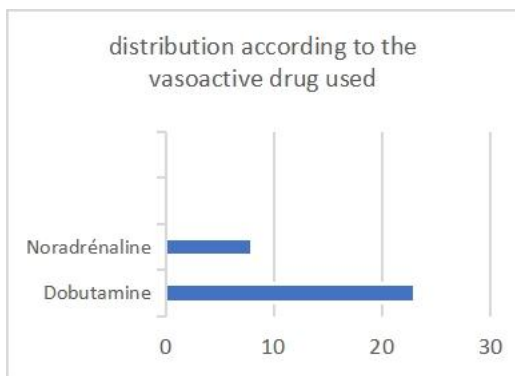
Sinus tachycardia is observed in 82% of cases, while other abnormalities affecting the ST segment are found in 14% of cases.



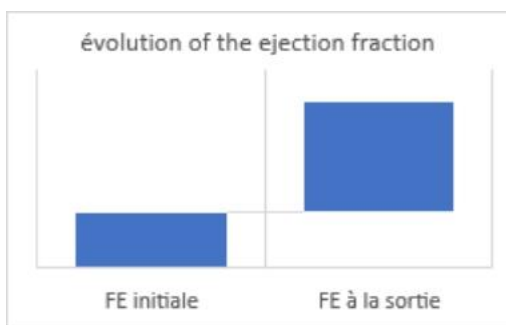
In 18% of cases, the patients did not undergo echocardiography.



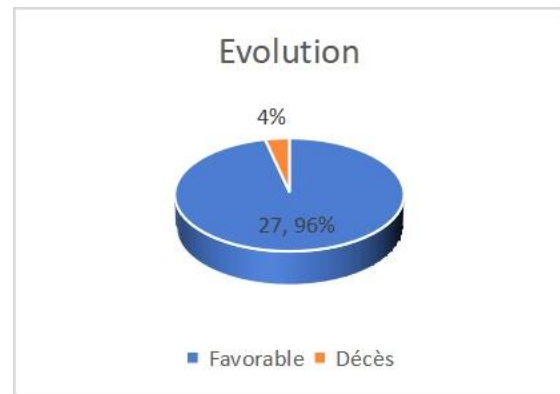
Hypokinesia is observed in 87% of cases.



The most commonly used vasoactive drug is dobutamine, and both drugs were used concurrently in three cases.



The treatment led to an improvement in the ejection fraction in all cases.



We regret the death of a child.

Discussion:

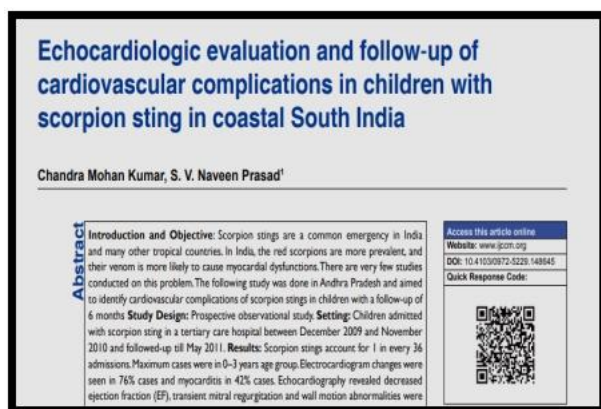
Children represent the majority of patients with severe scorpion envenomation, with symptoms primarily characterized by cardiovascular disturbances (9). Scorpion stings occur predominantly in rural areas, mainly during the hottest months of the year, when about 80% of cases are recorded. This trend can be explained by the increased activity of cold-blooded arthropods during the warmer periods, which coincide with their reproductive phase.

These findings are consistent with data reported in several studies, both national and international (10) (11) (12) (13) (14). However, clinical examination alone cannot confirm or rule out cardiac dysfunction, highlighting the technical limitations of echocardiography in these situations. On the other hand, elevated cardiac biomarkers such as troponin and pro-BNP, electrical abnormalities on the ECG, signs of acute pulmonary edema (OAP) on chest radiography, and gasometric abnormalities (hypoxemia, elevated lactate levels) appear to provide diagnostic and therapeutic alternatives. Nevertheless, these tests remain less sensitive than echocardiography for guiding the diagnosis.

In cases of severe scorpion envenomation, admission to intensive care is imperative. Symptomatic treatment, which must be

tailored to clinical manifestations, remains the cornerstone of management. Non-invasive approaches such as CPAP and non-invasive ventilation (NIV) can be used initially, while mechanical ventilation should be considered if these measures fail, particularly in the presence of respiratory distress. Furthermore, the administration of norepinephrine, with or without dobutamine, is necessary to stabilize hemodynamics as soon as signs of severity appear (15).

Echocardiography (16) plays a crucial role in the early diagnosis of cardiac dysfunction in patients showing signs of severity. It allows for a detailed assessment of cardiac contractility and an estimation of the ejection fraction, providing essential information to guide therapeutic management.



Echocardiography, combined with a biological assessment including elevated cardiac biomarkers (troponin and pro-BNP), electrical changes on the ECG, signs of acute pulmonary edema (OAP) on chest radiography, and gasometric abnormalities (hypoxemia, lactate levels), confirms the presence of significant cardiac and metabolic involvement, often linked to acute cardiovascular failure.

More specifically:

- *Echocardiography:* Can reveal abnormalities such as reduced ejection

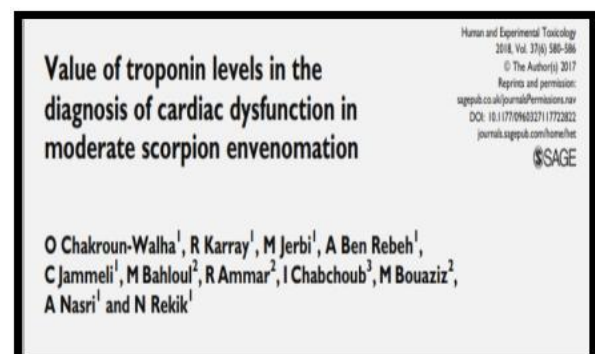
fraction, cardiac hypokinesia, and signs of ventricular dysfunction, suggesting heart failure due to the neurotoxic effects of the venom.

- *Troponin and pro-BNP:* Elevated levels of these cardiac biomarkers indicate myocardial injury and cardiac stress. An increase in troponin is particularly associated with myocardial damage, while pro-BNP is a marker of cardiac stress and ventricular failure.

- *Electrical changes on the ECG:* Abnormalities such as sinus tachycardia, ST segment changes, and arrhythmias are commonly observed in severe scorpion envenomation, reflecting the impact of the venom on the electrocardiac system.

- *Signs of OAP on chest radiography:* Acute pulmonary edema (OAP) may appear as a consequence of acute heart failure induced by envenomation, marking severe respiratory distress.

- *Gasometric abnormalities (hypoxemia, lactate levels):* Hypoxemia indicates poor blood oxygenation, often due to respiratory failure or impaired cardiac function. Elevated lactate levels suggest anaerobic metabolism due to circulatory failure and alterations in organ perfusion.





- l'immunothérapie, seul traitement spécifique, à mettre en œuvre impérativement devant toute piqûre potentiellement grave chez tout sujet jeune de moins de 16 ans, lorsque le scorpion responsable est identifié comme dangereux ou dans l'ignorance de l'espèce ayant piqué, par le sérum antiscorpionique SAS. Le SAS se présente sous forme de F(ab') équin purifié liquide. La précocité de la sérothérapie est importante : il s'agit d'intercepter les toxines circulantes avant qu'elles atteignent les récepteurs membranaires des cellules des tissus excitable auxquels elles se lient avec une haute affinité.

L'anti venin est administré par voie veineuse, soit en perfusion (dilué à 10 %, en 30 minutes pour 100 mL), soit en intraveineuse directe lente (3 minutes pour 10 mL). La posologie est directement liée à l'évaluation de la gravité de l'envenimation.

La voie veineuse permet la neutralisation immédiate et définitive des toxines. Les accidents de type anaphylactique sont rares. Plus fréquentes sont les réactions locales habituellement mineures. Des accidents tardifs (maladie sérique) peuvent survenir dans un petit nombre de cas.

To date, early immunotherapy with Anti-Scorpion Serum still holds its place as the only specific treatment. However, no study has proven its effectiveness either in treating or preventing progression to severe forms.

Limitations of the study: One of the main limitations of our study lies in its retrospective nature, with the absence of certain data, particularly due to incomplete information collection. Moreover, clinical signs were not systematically assessed by the same physician, and the lack of a standardized protocol led to sometimes incomplete documentation of signs and treatments administered. Finally, this study focuses solely on patients who presented with stage III scorpion envenomation, which constitutes a relatively small sample. Nevertheless, it could provide a solid

foundation for future research aimed at exploring the early diagnosis of cardiac dysfunction in scorpion envenomation-related emergencies.

Conclusion: Acute heart failure is the leading cause of mortality in severe scorpion envenomation cases, and significant impairment of cardiac contractility may be present, though it may not clinically manifest as acute pulmonary edema (OAP). The availability of echocardiography as a first-line tool, along with the use of complementary tests such as ECG, troponin, pro-BNP, and gasometry, has greatly facilitated diagnosis and contributed to improving the quality of care.

In our study, we observed that children are particularly affected (17), being the most vulnerable to severe forms of scorpion envenomation due to their low resistance to venom and the difficulty of accessing medical care in certain areas. Algeria, in particular, stands out as one of the regions most affected by scorpion envenomation (18), with a high prevalence of severe cases, largely due to the extent of rural areas and climatic conditions that favor scorpion proliferation.

To address this major public health issue, a program has been developed in Algeria, based on an epidemiological surveillance system coordinated by the Ministry of Health and the National Institute of Public Health (19). This program aims to better understand the extent of the phenomenon, improve prevention, and ensure more effective medical care in the most affected regions. In addition, prevention caravans against scorpion envenomation are organized (20), targeting rural areas and regions most at risk. These caravans aim to raise awareness among local populations about preventive measures, such as managing scorpion habitats, using antivenom serums, and actions to take in case of a sting, thus helping to reduce the

incidence of envenomations and improve the response to this health issue.

The treatment of severe scorpion envenomation remains mainly symptomatic, and quick and appropriate care in an intensive care unit remains essential to improve survival chances, especially in children and in the most affected regions.

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Incidence and Risk Factors of Cardiac Arrest in Urological Surgery

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Abstract:

Cardiac arrest (CA) in the operating room is a rare but serious event. The aim of this study is to analyze the risk factors and incidence of CA during urological surgeries. This is a retrospective and analytical study conducted over a five-year period, focusing on patients who underwent surgery in the urology departments of the CHU of Batna and Annaba. All CA cases included in the study involved patients undergoing urological procedures. The studied parameters included patient-related factors, surgical factors, and anesthesia-related factors.

Out of 3912 surgical interventions, eight cases of CA occurred, resulting in an incidence of 0.20%. The average age of the patients was 62 years, with a male predominance. The analysis identified several risk factors, including: a surgical duration of ≥ 3 hours, general anesthesia (used in 100% of cases), emergency surgery (60%), advanced age (over 60 years, in 80% of cases), and hemorrhagic surgeries.

In conclusion, although CA is a rare event, its incidence remains significant. Identifying the risk factors allows for the implementation of preventive measures aimed at reducing the occurrence of this event in the operating room.

Keywords: Incidence, risk factors, cardiac arrest, operating room, urology, CHU Batna, CHU Annaba.

Introduction:

Cardiac arrest (CA) in the operating room is a rare but serious event that can be detected early through peri-anesthetic monitoring [1]. The most recent data from a U.S. administrative database report an estimated incidence of 5.6 per 10,000 procedures [2]. Its prognosis is more favorable compared to out-of-hospital cardiac arrest [5,6]. Perioperative cardiac arrest is a severe complication, with a significant impact on morbidity and mortality. The survival rate at hospital discharge is on average 31%, although it varies depending on the etiology of the CA and the cardiac rhythm observed during resuscitation [3].

When managing a CA, the diagnostic approach to identifying the underlying cause is conducted alongside therapeutic measures, particularly cardiopulmonary resuscitation (CPR). Identifying a specific cause that can benefit from targeted treatment is a crucial step in the initial protocol. In most cases, CA has a multifactorial origin, related to the patient's preoperative clinical status, the emergency context, inadequate risk assessment, monitoring failures, insufficient preoperative evaluation, or human errors [4]. Identifying these risk factors has helped reduce the incidence of CA and improve its prognosis.

However, in Algeria, there are no specific data on the incidence of cardiac arrest (CA) or its risk factors. The aim of this study is to identify the frequency and risk factors associated with CA in the operating room among patients undergoing urological surgery at the Batna University Hospital and Annaba University Hospital.

Patients and Methods:

This is a retrospective analytical study conducted over a five-year period, from January 2020 to December 2024. The study population included patients who underwent surgery in the urology department at Batna University Hospital and Annaba University Hospital. Cases of cardiac arrest in the operating room were included based on one of

the following criteria: a diagnosis of cardiac arrest (CA) documented in the anesthesia form or the patient's medical record, accompanied by the initiation of cardiopulmonary resuscitation (CPR). Patient characteristics (age, sex, ASA score), as well as factors related to anesthesia (general or locoregional anesthesia), the nature of the procedure (elective or emergency), and the type of surgery (endoscopic or traditional) were analyzed.

Results:

We included 8 cases of cardiac arrest occurring among 2108 surgical interventions, corresponding to an overall incidence of 0.38%. The average age of patients who experienced cardiac arrest was 62 years, with a male predominance, a sex ratio of 3:1 (Figure 1). The average duration of the procedures ranged from 3 to 6 hours. ASA classification: 75% of the patients were ASA 3 and 4, while only 25% were ASA 2.



Fig. 1 Distribution by Sex

The average duration of the procedures ranged from 3 to 6 hours. In terms of ASA classification, 75% of patients were classified as ASA 3 and 4, while only 25% were classified as ASA 2 (Figure 2).

Results:

The average duration of the procedures was between 3 and 6 hours. In terms of ASA classification, 75% of patients were classified as ASA 3 and 4, while only 25% were classified as ASA 2. Among the cardiac arrest (CA) cases, 50% occurred during traditional

surgeries, while 25% occurred in the endoscopy room (Figure 3). Additionally, 60% of CAs occurred in an emergency setting, while 40% took place during scheduled surgeries. All patients who experienced CA were under general anesthesia (100%), with either endotracheal intubation or the use of a laryngeal mask.

The analysis identified the following risk factors: advanced age, ASA 3 and 4 classification (Figure 2), the urgent nature of the procedure, general anesthesia, and a surgical duration of ≥ 3 hours, particularly in cases of hemorrhagic surgery.

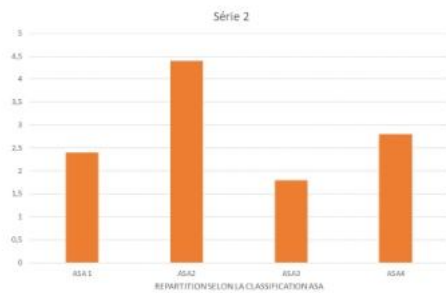


Fig. 2 Distribution by ASA Classification

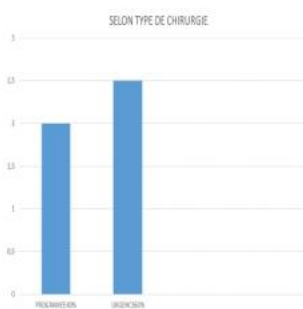


Fig. 3 Distribution by Type of Surgery

The multivariate analysis of age groups (Figure 4) and the type of surgery (emergency or elective) confirmed that advanced age was a significant risk factor, and that the emergency setting

significantly increased the risk, particularly for older patients.

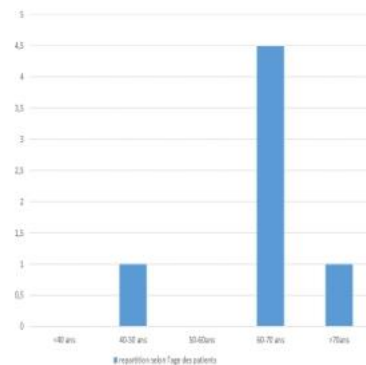


Fig. 4 Distribution by age

Among the 8 cases of cardiac arrest, two patients (25%) survived and were transferred alive to the intensive care unit, while six patients (75%) died on the operating table. Regarding the survivors, one was discharged without neurological sequelae, while the other died in the surgical intensive care unit on day 19 due to a nosocomial infection.

Discussion:

Cardiac arrest in the operating room is a rare event at Batna University Hospital and Annaba University Hospital, with 8 cases out of 3912 anesthetics. In our study, 50% of the cardiac arrests occurred in the endoscopy room, and 50% during traditional surgeries. In urological endoscopy, the most commonly managed urgent conditions are macroscopic hematuria and obstructive renal failure, both of which carry a high perioperative mortality rate. In traditional surgery, the most common conditions are renal tumors, adrenal tumors, and pelvic surgeries, which are major procedures, often hemorrhagic, and can jeopardize the patient's vital prognosis.

Studies conducted by SFAR-INSERM have shown a correlation between the frequency of perioperative cardiac incidents and an age over 60 years [14]. Regarding anesthesia-related cardiac arrests, although advanced age is often

associated with a higher ASA score, which is also a risk factor for cardiac arrest, the relationship between age and cardiac arrest remains complex. Keenan [12] does not consider advanced age as a risk factor, but demonstrated that the risk is three times higher in children under 6 years old. Some studies report that emergency situations increase the risk of cardiac arrest by 3 to 6 times [14, 15], while others do not confirm this correlation [16]. In our study, advanced age was identified as a risk factor for cardiac arrest. The lack of adequate assessment of the health status of elderly patients undergoing emergency surgery likely contributed to masking preoperative organ failures. Emergency surgery, in particular, constitutes an independent risk factor compared to elective surgery. Indeed, emergency anesthesia increases the risk of cardiac arrest by 8 times compared to elective surgery [13]. In elective surgery, the risks associated with general anesthesia (GA) are better assessed and prevented to ensure patient safety [14]. The insufficient preoperative evaluation and preparation of patients undergoing emergency surgery is a major source of this risk [15, 17]. Additionally, general anesthesia carries a risk of cardiac arrest six times higher than locoregional anesthesia, and the emergency context increases this risk eightfold, particularly in developing countries where regional anesthesia is not always safer than general anesthesia [19].

The mortality rate in our series is high (75%), while a study conducted by Runciman et al. in Australia reports a 19% death rate among 129 cases of cardiac arrest [23]. This difference may be explained by the smaller size of our study, conducted in two operating rooms at Batna and Annaba University Hospitals, compared to the larger data sets of other studies. However, the immediate survival rate in the operating room in our series is 25%, with two patients being transferred alive to the surgical intensive care unit, which allowed for an immediate improvement in the vital prognosis [4, 5, 16, 21]. In terms of hospital survival, 25% of patients who experienced cardiac arrest survived beyond the first 72 postoperative hours. Unlike other series, no

neurological sequelae were observed in the survivors in our study, whereas Runciman et al. report a morbidity rate of 2% due to neurological sequelae [23].

Conclusion:

Cardiac arrest in the operating room is a rare event in the urological surgery departments of Batna and Annaba University Hospitals. The identified risk factors are related to patient characteristics, the type of anesthesia, and the nature of the surgery. The risk of cardiac arrest is particularly high during emergency procedures, especially in elderly patients with a high ASA score and hemorrhagic surgeries. Preventing this complication requires thorough preoperative evaluation and rigorous perioperative monitoring to ensure patient safety.

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Pulmonary legionellosis : from respiratory distress to recovery, the difficult journey of a patient in intensive care

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Summary :

Legionellosis is a potentially fatal bacterial infectious disease caused by bacteria of the genus *Legionella*, discovered in 1977. It manifests itself in two distinct clinical forms: a mild, flu-like form known as Pontiac fever, and a more severe form characterised by a severe pulmonary infection that can lead to respiratory distress and requires intensive care.

Despite the seriousness of certain forms of the disease, very few studies have focused specifically on patients admitted to intensive care. The rapid administration of appropriate antibiotic treatment plays a crucial role in the prognosis of severe pulmonary legionellosis. The recent increase in cases of legionellosis can be partly explained by the bacterium's adaptation to modern water supply systems. Diagnosis of this infection is based primarily on the detection of antigens in patients' urine.

Antibiotic treatment is based on three classes of drugs with intracellular activity: macrolides, fluoroquinolones and rifampin. Given this situation, it is essential to introduce effective empirical treatment (type, dose, duration) against *Legionella pneumophila* as soon as severe pneumonia is suspected, in order to improve management and optimise patients' chances of survival. The main aim of this study is therefore to propose a systematic approach including empirical treatment for *L. pneumophila* in the management of severe pneumonia. *Legionella* are bacteria naturally present in aquatic environments, which makes their total eradication impossible. The only effective method of reducing the risk of contamination is to install terminal filtration at all points of water use.

Key words : diagnosis of pulmonary legionellosis, respiratory distress, antigenuria, early and effective antibiotic therapy, resuscitation, mortality.

Introduction :

Pneumonia in intensive care units is common

It manifests itself in several clinical forms : Legionnaires' disease, characterised by pneumonia which can be serious, more exceptionally extra-pulmonary forms with various localisations (neurological, cardiac, muscular, articular, etc.) and Pontiac fever [1] [2]. Diagnosis is made by positive antigenuria.

If left untreated, pulmonary disease generally worsens within the first week. It can progress to irreversible respiratory failure and acute renal failure [3], which are often fatal.

Historical background :

Legionellosis owes its name to an epidemic that occurred in 1976 at an American Legion congress in Philadelphia [4]: 29 of the 182 patients died. It was later discovered that a previously unknown bacterium, *Legionella pneumophila*, had spread via the air conditioning system in their hotel.



Hotel Bellevue-Stratford

A phyladelphia (USA) 1976



58th Legionnaires' Congress



CDC investigation



Legionella is a bacterium

Discovered in 1977

Fraser DW and al. N. Engl. J.Med. 297:1189-1197, 1977.

Mc Dade J.E and al. N. Engl. J.Med. 297:1197-1203, 1977.

Epidemiology :

The incidence of *Legionella pneumophila* in community-acquired pneumonia varies considerably depending on the context. It is 0.4% in the general population, 3.6% among hospitalised patients, and as high as 17.8% in cases of severe pneumonia requiring intensive care [5].

In 2001, the incidence of legionellosis in metropolitan France was 1.35 cases per 100,000 inhabitants [6]. In comparison, the average incidence in Europe that same year was 0.6 cases per 100,000 inhabitants, with significant variations, reaching up to 2.6 cases per 100,000 inhabitants in other European countries. In Algeria, legionellosis is the second most common cause of severe pneumonia after *S. pneumoniae*, with a high

case-fatality rate of 10%, which can rise to 27% if targeted anti-legionella antibiotic treatment is not administered in time [7].

Pathophysiology :

Legionella is a facultative intracellular [8] environmental bacterium that is capable of multiplying in protozoa [9], particularly amoebae, until lysis occurs. Legionella is an opportunistic pathogen that accidentally infects humans by multiplying in alveolar macrophages and pulmonary epithelial cells following inhalation of contaminated water microdroplets [10]. Vesicular trafficking in the host cell and endosomal maturation pathways are modulated (in particular, fusion of the phagosome and lysosomal vacuoles is inhibited), allowing the creation of a replication niche, intracellular multiplication of the bacteria and cell lysis. The bacteria then end up in the extracellular environment, where they are free to infect neighbouring cells and carry out a new replication cycle. This species comprises 16 different serogroups. Legionella pneumophila serogroup 1 (Lp1) is the most frequently found in human pathology (around 90% of cases) [11] [12].

The diagnosis of legionellosis, often made in cases of pneumopathy, is based on risk factors (nosocomial context, travel, exposure to aerosolised water) and a suggestive clinical picture (severe pneumonia, digestive and neurological symptoms). It is confirmed by the detection of antigens in urine, PCR on lung samples, culture or serology.

There is no vaccine against legionellosis, and the bacteria are resistant to penicillins. Antibiotic treatment varies according to severity, lasting from 14 to 21 days, and the use of mains water is prohibited in hospitals.

Mortality from legionellosis in intensive care units can be as high as 20-30%, influenced by host factors and initial severity. However, two studies have

highlighted the importance of the time taken to administer antibiotics

Materials and methods:

Patient B.S.A, aged 34, presented with a history of chronic psychosis on nozinan and olanzapine. On admission, he was evacuated from an institution on suspicion of neuroleptic malignant syndrome with fever, muscular rigidity of the upper and lower limbs, and hypersialorrhoea. On arrival, he was conscious, with a Glasgow score of 15/15 and a fever of 40°C. His vital signs were as follows: blood pressure 120/85 mm Hg, heart rate 130 beats per minute, respiratory rate 18 cycles per minute, and SpO2 96% on 5 litres of oxygen. The biological work-up showed a normal blood count with mild thrombocytopenia (67,000 platelets) and ionogram abnormalities, including hyponatremia at 124 mmol/L and elevated CPK at 2484 U/L. The toxicology work-up was negative, and the renal work-up was fine.

Radiological findings :

A chest X-ray showed a left lung opacity, localised in the upper half of the lung field, indicating extensive lung involvement. Three days after admission, a chest CT scan revealed condensation in the left lung, ground-glass foci in the left lung and right upper lobe, and a medium-sized liquid pleural effusion draining into the right trachea. Antibiotic therapy with ciprofloxacin, gentamycin, ceftriaxone and azithromycin was initiated. Laboratory tests showed creatinine levels of 15 mg/L, thrombocytopenia with 30,000 platelets, anaemia with haemoglobin at 10 g/dl, CRP elevated to 328 mg/L, and procalcitonin at 9.85 ng/mL. The antigenuria for Legionella pneumophila was positive at 8.14. Gasometry showed respiratory alkalosis (pH 7.53, PCO2 30 mmHg).

Intensive care admission score:

Several scores are used to assess the severity and mortality of pneumonia, such as the PSI and CURB-65, but the modified ATS score is the most reliable for determining the need for intensive care admission. This score has a sensitivity of 95% and a specificity of 73%. Major criteria include septic shock and the need for mechanical ventilation, while minor criteria include low systolic blood pressure, multilobar pneumonia, and a PaO₂/FiO₂ ratio ≤ 250 . Although the patient had no major criteria, he was admitted to intensive care due to his worsening clinical condition: biological disturbance, severe pulmonary extension and positive antigenuria results.

Treatment and outcome:

The patient was transferred to the medical intensive care unit on day 4, with therapeutic adjustment including Tienam, vancomycin, levofloxacin and candidase. Anemia, thrombocytopenia and a smear showing bicytopenia were noted. On day 13, the patient received dexamethasone 40 mg for 4 days. On day 14, respiratory distress appeared with signs of struggle and desaturation, accompanied by an abundant pleural effusion on the left. An evacuating pleural puncture was performed, and an iatrogenic pneumothorax occurred, requiring drainage with radiological and clinical monitoring. The follow-up X-ray showed partial improvement with reduction of the effusion, but severe parenchymal damage persisted. On day 15, respiratory distress worsened, with cyanosis and desaturation at 50%, with gasometric abnormalities (pH 7.32, PCO₂ 61 mmHg). The patient was intubated and placed on controlled mechanical ventilation. On day 18, after radiological and gasometric improvement, he was extubated and placed on NIV for 24 hours, then on oxygen. On day 20, there was a clear clinical, radiological and biological improvement. Blood gas levels were stable, with pH 7.49, PCO₂ 37 mmHg and

PaO₂/FiO₂ 388. The patient was conscious, cooperative and haemodynamically and respiratory stable on day 22. Biological tests showed significant improvement. The patient was transferred to the respiratory department on day 23 for further treatment.

Discussion :

The clinical case of patient B.S.A. illustrates a severe form of legionellosis, with an acute presentation and a complex clinical course requiring intensive care. This case provides an opportunity to discuss several aspects of legionellosis, including its clinical manifestations, treatment and risk factors.

Legionella pneumophila is responsible for a variable proportion of community-acquired pneumonia. Depending on the context, it is implicated in 0.4% of cases in the community, 3.6% in hospitals, and up to 17.8% in severe forms requiring intensive care [13]. The BSA patient, with severe pneumonia associated with pleural effusion and strong clinical suspicion, corresponds to this high-risk group.

The patient's clinical signs, including high fever, confusion, myalgia and acute renal failure, are characteristic of the extra-respiratory manifestations of legionellosis [14]. Indeed, Legionella pneumophila is frequently associated with extrapulmonary symptoms, affecting up to 40-50% of patients [15]. Confusion, in particular, is a major neurological symptom, although its pathophysiology is poorly understood, but it is much more frequent in legionellosis than in other community-acquired pneumonia [16]. This observation echoes the importance of suspecting legionellosis when a patient presents with neurological signs associated with severe pneumonia.

Radiological findings, including pulmonary opacity and pleural effusion, complete the clinical picture of severe legionellosis. The patient's chest CT scan,

with ground-glass foci and pulmonary condensation, is typical of severe forms of legionellosis. These radiological abnormalities, combined with worrying laboratory findings (such as elevated CRP, elevated procalcitonin and hyponatremia), reinforce the diagnosis. Rapid diagnosis based on specific diagnostic tests such as antigenuria for Legionella has enabled targeted and appropriate antibiotic therapy to be initiated.

With regard to antibiotic treatment, several studies have shown that dual therapy (generally combining macrolides or fluoroquinolones) is frequently used in severe forms of legionellosis. However, a retrospective study has suggested that the early use of fluoroquinolones as monotherapy may be an effective option that is less prone to adverse effects than dual therapy [17]. The patient's initial antibiotic treatment with a combination of ciprofloxacin, gentamycin, ceftriaxone and azithromycin was therefore justified, although therapeutic reassessment in intensive care made it possible to adapt the management, in particular by adding Tienam, vancomycin and levofloxacin because of the clinical course.

Assessing the need for admission to intensive care is another key point. The modified ATS score, used to assess the severity of community-acquired pneumonia, is based on severity criteria such as septic shock or the need for mechanical ventilation. Although the patient did not meet any major criteria, the worsening of his clinical condition (biological disturbance, deterioration in respiratory function) justified his transfer to intensive care. This rapid management was crucial in improving the patient's chances of survival.

The patient showed progressive improvement after several days in intensive care, demonstrating the importance of early management and

dynamic adaptation of treatment. Intubation and mechanical ventilation were necessary due to worsening respiratory distress, but rapid improvement after extubation and the introduction of non-invasive ventilation (NIV) enabled the respiratory burden to be reduced. This development highlights the importance of continuous monitoring in intensive care and of adapting treatment according to clinical response.

Finally, the contributing factors in this case include several high-risk comorbidities for severe Legionella infections, such as male gender and the patient's relatively young age. However, other factors, such as the use of antipsychotic drugs, particularly the combination of nozinan and olanzapine, may also influence the course of legionellosis by disrupting the immune system or increasing the risk of malignant neuroleptic-type reactions, as in this case.

In conclusion, this case highlights the importance of rapid diagnostic and therapeutic management of legionellosis, especially in severe forms. Fluoroquinolone monotherapy could be an effective and safe alternative in these contexts, but it is essential to adapt to the patient's clinical course. The favourable outcome observed in this case is the result of rapid and appropriate management, but it remains crucial to pursue research to better understand the pathophysiology of this infection and improve therapeutic strategies.

Conclusion :

Legionellosis, when it develops into severe forms requiring intensive care, remains a serious pathology, associated with a significant mortality rate. Because of the diversity and non-specificity of the clinical, biological and radiological symptoms, early diagnosis can be particularly complex. However, prompt initiation of specific antibiotic treatment is undoubtedly one of

the most important factors in improving clinical outcome.

Appropriate management, including antibiotics such as fluoroquinolones or new-generation macrolides, is crucial. These compounds have been shown to be more effective than erythromycin, particularly in the management of severe *Legionella pneumophila* infections. Recent studies also suggest that a combination of these treatments could improve therapeutic results and reduce mortality. In addition, further research is needed to better understand the virulence mechanisms of *L. pneumophila* and to identify more targeted and effective therapeutic strategies.

A reduction in mortality observed in recent years could also be the result of optimising early management, intensified clinical monitoring in intensive care units, and the use of individualised treatment protocols that take comorbidity factors into account. Ultimately, the management of severe legionellosis relies on constant diagnostic vigilance, rapid initiation of antibiotic therapy, and ongoing adaptation of treatment to the patient's clinical progress.

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Pediatric Kidney Transplantation: The Anesthesiologist-Resuscitator at the Heart of the Surgical and Postoperative Process

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Abstract:

Pediatric kidney transplantation is a complex procedure that requires collaboration across multiple medical and surgical specialties, including pediatrics, nephrology, anesthesia-resuscitation, and urology. This study aims to describe the anesthesia protocols and immediate postoperative management of pediatric kidney transplantation in our unit, focusing on the outcomes and factors influencing graft recovery.

In this retrospective study conducted at the Batna University Hospital, 65 children who underwent kidney transplantation were included. The immediate results were excellent, with 100% of the children demonstrating functional graft recovery within the days following the procedure. All patients showed an improvement in their quality of life after transplantation, with no major complications related to graft rejection or vascular thrombosis.

However, we regret the death of one child, which occurred six months after the procedure due to a digestive lymphoma, highlighting the long-term risks these patients may face. Despite this tragic event, the overall results were highly positive, with the vast majority of children benefiting from improved renal function and significantly better quality of life after transplantation.

This study emphasizes the importance of a multidisciplinary and personalized approach to managing pediatric kidney transplant recipients to ensure optimal outcomes and graft survival (1), particularly in this fragile pediatric population.

Keywords: Pediatric kidney transplantation, Cohort, Anesthesia-resuscitation, Renal graft, Functional recovery, Quality of life

Introduction:

Pediatric kidney transplantation is a complex procedure that presents unique challenges in terms of anesthesia and resuscitation, especially in low-birth-weight children. This surgical procedure, which is a priority in our university hospital, requires the collaboration of multiple medical and surgical specialties: pediatrics, nephrology, anesthesia-resuscitation, and urology. All participants share the common goal of ensuring the immediate function of the graft to ensure its survival. The management of these patients demands a rigorous and tailored approach, particularly to ensure optimal perfusion of the graft and to prevent serious complications such as thrombosis of the vascular anastomoses.

The pediatric population with chronic kidney failure is particularly fragile, with many children affected by growth retardation. The surgical challenges associated with pediatric kidney transplantation are also significant, particularly due to the need to transplant an adult-sized kidney into a child (2). This large graft size requires substantial volume loading to avoid hypoperfusion of the graft during vascular unclamping (3), with a high risk of volume overload. Furthermore, it is crucial to minimize both warm and cold ischemia times, as prolonged durations can compromise the graft's survival (4).

In this context, anesthesia for pediatric kidney transplantation presents specific difficulties, notably in managing fluid balance, electrolytes, and blood pressure, which must be adapted to the child's size and weight. Low-birth-weight children require particular attention, as their physiological capabilities make anesthesia management even more delicate. A thorough understanding of the

pharmacokinetics and pharmacodynamics of anesthetic drugs, as well as their interactions with immunosuppressants, is also essential to avoid postoperative complications.

This study, conducted as part of a retrospective work at the University Hospital of Batna, aims to describe the anesthesia and immediate peri- and postoperative resuscitation practices for pediatric kidney transplantation in our unit. It also seeks to assess the recovery time of renal function and identify factors that may impact graft recovery in transplanted children. The work highlights the importance of multidisciplinary and personalized care, continuous monitoring in the intensive care unit, and preventive strategies to optimize graft survival and patient safety.

Materials and Methods:

1. Study Type :

This is a retrospective observational study involving a cohort of 65 children who received a kidney transplant between 2015 and 2022, representing all transplanted patients during this period at the University Hospital of Batna. This analysis is based on clinical data extracted from the patients' medical records. A number of parameters were assessed for each case, with follow-up extending from the time of transplantation until the inclusion date in the study. The obtained results were compared with data available in the scientific literature. Parameter analyses were performed using Excel 360 software.

2. Inclusion and Exclusion Criteria :

We included recipients aged 15 years or younger over an 8-year period, from February 2015 to December 2022, at the University Hospital of Batna. Patients older than 15 years were excluded from the study.

3. Data Collection

Data were collected from the donor-recipient pre-kidney transplant records available in the

nephrology department archives. The information gathered includes the patients' medical and surgical history, as well as the anesthesia record, prescriptions, monitoring chart, operative report, and post-operative follow-up documents. A data collection form was created to centralize all necessary information for our analysis. This form includes general and demographic data, as well as medical, surgical, and infectious history, along with other specific background information.

Information related to the renal pathology that led to end-stage renal failure and its management was also collected (5). Additionally, immunological data, as well as long-term immunosuppressive treatments, were documented. Complementary tests include standard and specialized assessments.

The perioperative period was divided into several phases:

Pre-anesthesia consultation, which defined the anesthetic management plan;

Operative phase, during which the technical aspects and different stages of the procedure were addressed, including critical moments such as vascular unclamping. The technical difficulties encountered, along with perioperative maneuvers and incidents or accidents, were detailed;

Graft management, followed by the post-transplant immunosuppression protocol.

Statistical analysis of the data was performed using Excel 360 software. We studied factors that may influence the "non-immediate" resumption of diuresis at the time of vascular unclamping. Through correlation analysis, we evaluated the impact of perioperative volume expansion on diuresis at surgical closure, as well as in the first 72 postoperative hours and on graft function. Simple linear regression was used to determine the predictive value of diuresis on postoperative days 0, 1, and 2 for graft function on postoperative days 1, 2, and 3.

Results: Sixty-five patients were included in the study, based on kidney transplantation activity in children between 2015 and 2022

(Figure No. 1), with a sex ratio of 1.5 for recipients. The average age of these patients is 10.80 ± 3.73 (Table I).

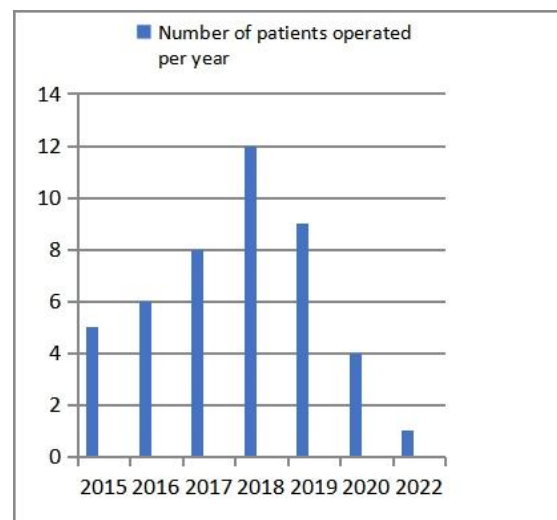


Fig. 1: Number of patients operated per year.

		Sex Ratio	
Pediatric recipient. PR		1,5	
Living donors. LD		0,58	
Moyenne		Minimum	Maximum
Age PR	10,80 +/-7	3	15
Weight PR	32,88 +/-11 12,72		47
Height PR	1,36 +/-0,21	0,94	1,69
BMI PR	17,15 +/-2,38	13,95	23,74
BSA PR	1,09 +/-0,28	0,78	1,75
Age LD	40,60 +/-8,75	21	60
Weight LD	70,71 +/-9,04	54	90
Height LD	1,63 +/-0,67	1,53	1,79
BMI LD	26,54 +/-3,85	18,31	34,34
BSA LD	1,79 +/-0,12	1,55	2,04

Table 1: Demographic and Anthropometric

Characteristics of Recipients and Donors

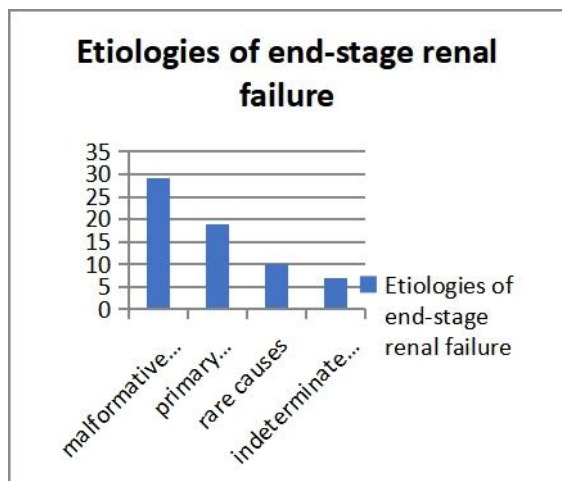


Fig. 2 Renal pathologies leading to end-stage renal failure

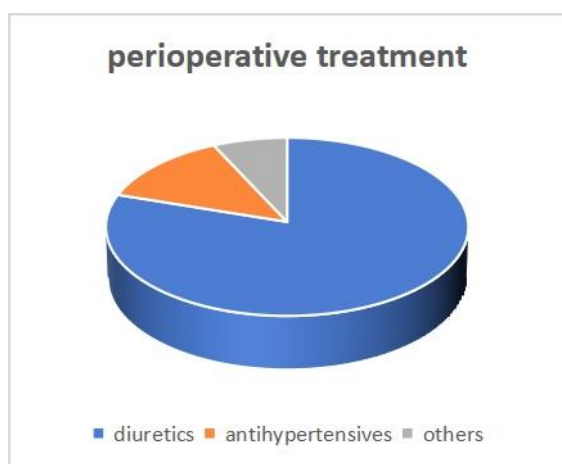


Fig. 3 Medications administered perioperatively

The primary cause of end-stage renal failure in our cohort is dominated by obstructive uropathies (6), responsible for 45% of cases. This is followed by primary nephropathies, accounting for 30% of cases, and then by other rarer conditions, often of hereditary origin, which represent 15% of cases. Finally, in 10% of cases, the causes remain undetermined.

The average duration of dialysis prior to transplant was 8 months, with a range from 0 to 12 months in 90% of cases. All transplants were performed using living donors, and in 99% of cases, the donors were family members of the child. The average age of living donors was 40.60 ± 8.75 years.

The anesthetic technique used was primarily intravenous, based on narcotics, with a

preference for propofol administered in 63 cases, and etomidate in 2 cases. The main analgesic was sufentanil for all patients, while cisatracurium was used as the muscle relaxant of choice. Anesthesia maintenance was achieved with a halogenated gas, sevoflurane, although Continuous Intravenous Anesthesia with Target Concentration (CIVAT) was sometimes used.

Postoperative analgesia was administered via continuous morphine infusion through an electric syringe ($20 \mu\text{g}/\text{kg}/\text{min}$) for 48 hours, with repeated pain assessments. These assessments were done using self-assessment via the Visual Analog Scale (VAS), or for children too young to communicate, through hetero-assessment using the FLACC scale (Face, Legs, Activity, Cry, Consolability) (7).

The average duration of anesthesia was 5 hours (with extremes ranging from 5.8 to 6 hours). Extubation occurred at the end of the procedure in 64 cases, while in 1 case, it was done in the Post-Intervention Care Room. The surgical technique involved an anastomosis on the common iliac artery in 64 cases, and on the aorta in 1 case, due to the iliac artery being too low for an adequate anastomosis. The average warm ischemia time was 1 minute and 30 seconds, while the total cold ischemia time (including 58 minutes of warm ischemia and 2 minutes of cold ischemia) was 1 hour.

Peroperative fluid management was guided by central venous pressure (CVP), with an average intake of $12.6 \text{ mL}/\text{kg}/\text{h}$ of saline and albumin. Two patients received red blood cell transfusions.

Medications administered perioperatively:

The medications administered perioperatively included diuretics (70%) and antihypertensives (10%).

Antibioprophylaxis consisted of administering a second-generation cephalosporin in 61 cases, and it was adjusted based on germ carriage in 4 cases. No patient required thromboprophylaxis with low molecular weight heparin (LMWH). Regarding

the normalization of renal function postoperatively, this was observed from the first day (D1) in 99% of patients, and on the third day (D3) in 1% of cases. After this period, all patients showed satisfactory recovery of renal function.

Recovery Time for Renal Function Postoperatively:

The recovery time for renal function was rapid in 99% of cases, assessed by diuresis (1 to 3 mL/kg/h) and blood creatinine levels. The observed postoperative complications were as follows: viral pneumonia (1 case), hyperglycemia (2 cases), peritoneal drainage fluid infection (1 case), hypertension (4 cases), and oliguria with favorable evolution (1 case). The average duration of stay in the intensive care unit was 2 days (with extremes ranging from 1 to 7 days), while the average duration in the nephrology unit was 10 days (with extremes ranging from 6 to 13 days). No deaths were recorded.

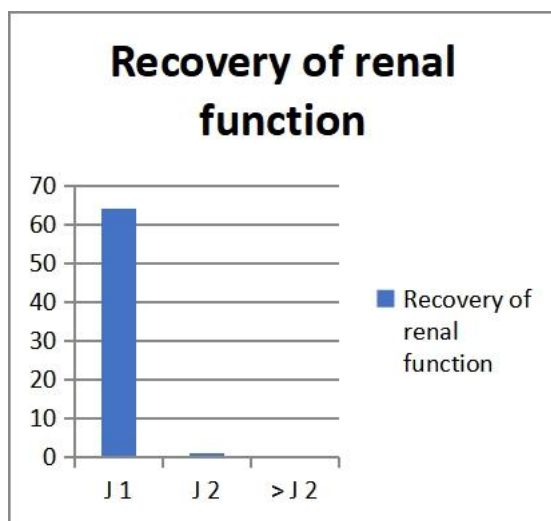


Fig. 4: Time to recovery of renal function

Discussion:

Pediatric kidney transplantation is a complex procedure that requires rigorous management. The protocol followed in our department is based on the latest recommendations. In our series, the most frequently observed etiologies are obstructive uropathies, in contrast to the study by Graf C. (8), which primarily identifies nephronophthisis (chronic tubulointerstitial nephropathies). Early recovery of renal

function largely depends on optimized preoperative preparation.

The perioperative period is a crucial stage to ensure the success of the transplant. The duration of anesthesia does not exceed 6 hours in all cases, which is similar to the study by Mabrouk K. et al. (2014), where the average anesthesia duration was 6.64 hours. The experience accumulated by the donor and recipient teams over the past eight years has allowed us to identify the key factors necessary to achieve the main objective of the study: rapid recovery of renal function. Among the factors that may delay this recovery (9) (10), ischemia time played an important role in our practice, where warm ischemia was under 2 minutes and cold ischemia was also less than 2 minutes, with warm ischemia time ranging from 55 to 58 minutes. It is crucial to prevent acute tubular necrosis (ATN), as the transplantation of an adult kidney can have a protective effect, provided that ATN is avoided (11). These results contrast with those of Hmamouchi B.'s study (12), where cold ischemia time was longer.

Another key factor is volume expansion (13), which must begin during the warm ischemia phase, at the time of venous clamping. These practices have contributed to improving renal function recovery in the majority of cases. Preoperative preparation of the recipient, strict hemodynamic management, and the appropriate use of perioperative medications are essential for a good prognosis.

Intravenous general anesthesia is systematically used in our department, excluding renal-eliminated or nephrotoxic agents. No patient in our series required thromboprophylaxis. Postoperative bacterial infections are rare in our study, highlighting the effectiveness of our care protocol. Regarding the choice of analgesia and anesthesia protocol, it remains an area of ongoing research.

Kidney transplantation in children should be performed as early as possible to avoid long periods of dialysis and their complications (14), as well as to improve graft survival. We

adopted a "preemptive" transplantation approach (4), implemented in 30% of cases. Our cohort of 65 patients (Table II) received high-quality care, and the kidney transplant in children was generally successful. The lowest recorded weight in our series was 11 kg in a 3-year-old child, who is doing well to this day. It would be desirable to reduce the time between the diagnosis of end-stage renal failure (ESRF) and transplantation.

However, we regret the death of one patient 6 months after the procedure, due to a digestive lymphoma. A malignant lymphoma was reported as a complication in the article by Cachat et al., which was the cause of a death (15). The postoperative protocol included an induction treatment with anti-lymphocyte antibodies (ATG) for three days, combined with corticosteroids, followed by calcineurin inhibitors, such as tacrolimus orally, for maintenance, along with non-specific myelosuppression agents (NSM). This protocol contributed to the improvement of graft survival.

	Cohort 1971- 1987 n=14	Cohort 1988- 1998 n=13	Cohort 2003- 2013 n=24	Cohort 2015- 2020 n=64
boy/girl ratio	0,75	0,62	1,41	1,75
number of children transplanted per year	0;875	1	2,4	8
second transplant	5	0	2	8
living donor/cadaveric donor ratio	0,16	0,85	1	100%
minimum age at the time of ESRD diagnosis	7,9	1	1,9	0,1
minimum age at the time of transplantation	8,3	2,3	2,3	3
duration between ESRD diagnosis/transplantatio n	2,4	1,8	0,92	0,80
survival rate in %	78	100	96	99
graft survival rate in %.	71,4	92	79,16	99

Table II: Evolution of kidney transplants and comparison of current data with results published by Cachat et al. (15) and the results of Graf C. (8).

Conclusion

Although pediatric kidney transplantation remains relatively limited in our country, significant progress has been made since 2015, allowing the survival and rehabilitation of children who were once doomed. Improving the organization of kidney transplantation, as well as promoting organ donation from deceased donors, are essential levers to increase the number of children receiving transplants in our country.

This progress has required many sacrifices and unwavering collaboration from all the teams involved. I would like to express my gratitude to all the contributors, whose list is long and varied. Today, we are reaping the benefits of these collective efforts, much to the delight of the children who, thanks to these advances, can now continue their education and lead a normal life.

Future perspectives include the evaluation of long-term graft survival, a work that has already been initiated and will be presented in the next issue of the journal. These analyses will help deepen our understanding of the long-term outcomes of pediatric kidney transplantation and further improve the care of transplanted children.

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Prognostic factors of severe herpes meningoencephalitis in intensive care.

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Abstract:

Introduction: Meningoencephalitis (ME) refers to inflammation of the brain, typically of infectious origin, although immune-related disorders can sometimes be the cause. It is primarily caused by neurotropic herpes viruses. Although the frequency of the disease has slightly increased in recent years, severe herpes meningoencephalitis due to HSV-1 remains rare, with an estimated incidence of one case per 100,000 people per year. Despite intravenous acyclovir administration and supportive care, approximately two-thirds of patients with severe herpes encephalitis requiring intensive care have a poor prognosis. Some studies (1-2-3) have gathered data on the prognosis of severe forms, assessed using the modified Rankin scale (values 4-6). The objective of this study is to identify the prognostic factors of severe HSV-1 ME in our intensive care unit.

Materials and Methods: This is a retrospective study involving 19 patients admitted to the intensive care unit for severe herpes meningoencephalitis, over a period of three years, from January 2022 to December 2024. The parameters studied included age, sex, severity indicators, time to admission to intensive care, and outcome.

Results: The 19 patients included in the study comprised 12 women, with a sex ratio of 0.58, and a mean age of 47.88 years. The main reasons for admission to the intensive care unit were altered consciousness in 84.21% of cases, with 42.10% presenting a Glasgow score < 9, seizures in 31.57% of cases, and behavioral disturbances in 15.78% of cases. The identified predictive factors for a poor prognosis were a Glasgow score < 8, age > 45 years, presence of comorbidities, delay in acyclovir administration (more than 48 hours), time to admission to intensive care, prolonged stay in intensive care, and occurrence of respiratory or cardiac complications.

Conclusion: HSV-1 herpes meningoencephalitis is a diagnostic and therapeutic emergency. The unfavorable outcome of patients in intensive care is closely related to modifiable prognostic factors, including delayed antiviral treatment, coma depth, duration of stay in intensive care, and the presence of respiratory or cardiac complications at admission.

Keywords: Meningoencephalitis (ME) – HSV-1 – Acyclovir – Intensive Care – Prognosis – Prognostic Factors

Introduction:

Severe herpes meningoencephalitis (HME) is a severe acute neurological syndrome characterized by inflammation of the meninges accompanied by damage to the brain parenchyma, primarily caused by the herpes simplex virus (HSV-1, HSV-2) [1]. Although rare, HME is the leading cause of clear fluid meningoencephalitis, accounting for about 25% of cases. This condition, which is notably severe, requires rapid diagnosis, as it represents both a diagnostic and therapeutic emergency. The etiological diagnosis is often disappointing, as the responsible agent is identified in less than 30% of cases [2-3]. For patients hospitalized in intensive care, severe HME often necessitates mechanical ventilation assistance [4] [5]. A Glasgow score lower than 9 is the main criterion for intubation, according to good practice guidelines. Despite the effectiveness of antiviral treatment, HME remains associated with high morbidity and mortality [6]. The objective of this study is to clarify the clinical data justifying admission to intensive care and to determine the prognostic factors in patients with herpes meningoencephalitis requiring intensive care, while identifying areas for improvement in the management of this condition [7].

Pathophysiology:

Herpes encephalitis, usually caused by the Herpes Simplex Virus type 1 (HSV-1), follows a specific pathophysiological mechanism. The main steps are as follows:

Initial infection: HSV-1 typically enters the body through the oral or nasal mucosa, sometimes after contact with herpes lesions. It then infects sensitive neurons, often in the trigeminal ganglia or sensory nerve ganglia.

Latency and reactivation: After the initial infection, the virus can remain latent in ganglionic neurons. It may be reactivated by

various factors such as stress, immunosuppression, or other infections.

Propagation to the central nervous system (CNS): Upon reactivation, the virus travels along the axons of the neurons (via the neuronal pathway) to the CNS, primarily to the temporal lobe of the brain, where it induces inflammation [8].

Infection of brain tissue: HSV-1 directly infects brain cells, including neurons, by using specific receptors on the surface of cells. This infection triggers a local inflammatory response, with the release of cytokines and chemical mediators that can damage brain tissue.

Brain lesions: Inflammation and viral replication cause neuronal damage and cerebral edema. Lesions are particularly pronounced in the temporal regions and sometimes frontal regions, and can lead to severe neurological symptoms such as seizures, memory disturbances, and cognitive deficits.

Complications: If the infection is not treated promptly, herpes encephalitis can lead to permanent neurological sequelae or be fatal.

Materials and Methods:

This is a retrospective, descriptive, and analytical study conducted at a single center, which included 19 patients diagnosed with severe herpes meningoencephalitis, admitted to the Intensive Care Unit at the Batna University Hospital Center, over a period of three years, from January 2022 to December 2024. The analyzed parameters include age, sex, severity criteria, time to admission to intensive care, and the clinical evolution of

the patients. Data were collected from the patients' medical records. Statistical analysis was performed using Excel software. This study adheres to the ethical principles applicable to clinical research.

Results:

Over the past three years, 19 patients meeting the inclusion criteria were admitted to intensive care. All of these patients underwent lumbar puncture and brain imaging, which facilitated the diagnosis. The demographic and clinical characteristics of the patients upon admission are presented in Table 1.

Variables	Number	%
Sex H/F	07/12	
Age		
Medical history	7/19	36,84%
Glasgow admission score		84,21%
Convulsions (9)	6/19	31,57

Table 1: Demographic and Clinical Characteristics at Admission

Distribution of patients by age

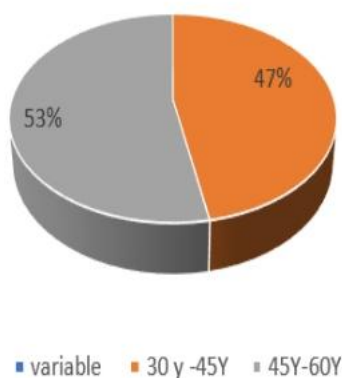


Fig. 1: Distribution by Age

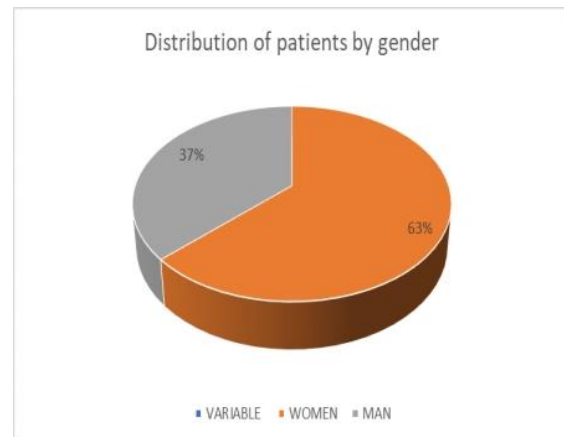


Fig.2 distribution by gender

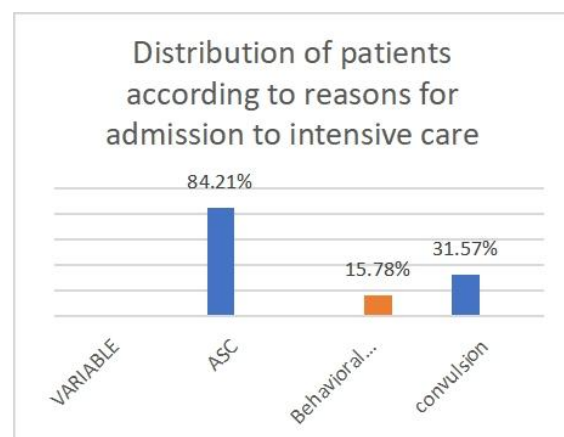


Fig.3 distribution by reasons for admission

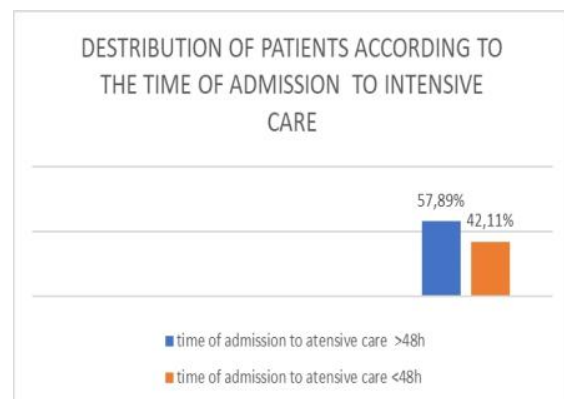


Fig. 4: Distribution by Admission Delay

The mean age of the patients was 47.88 years (Fig. 1), with a female predominance; the sex ratio was 0.58 (Fig. 2).

The reasons for admission to the intensive care unit were as follows (Fig. 3): Seizures

(31.57%), behavioral disturbances (15.78%), and altered consciousness (84.21%), with 21.05% having a Glasgow score of less than 8.

The predictive factors for a poor prognosis were represented by the severity of consciousness impairment with a Glasgow score <8, age > 45 years, the presence of respiratory complications at admission in 21.05%, antiviral treatment initiation > 48 hours in 52.62%, and admission to intensive care > 48 hours in 57.89% (Fig. 4). Associated comorbidities such as hypertension and diabetes in 36.84% were also important factors to consider.

The treatment was based on symptomatic care, including appropriate nursing care, mechanical ventilation management, correction of glycemic imbalances, and the administration of fluid and nutritional support. Antiviral treatment with acyclovir was administered, along with preventive measures against venous thromboembolic disease. Surviving patients were transferred to the infectious diseases department for continued management.

The average length of stay in intensive care was 16.36 days. We recorded a mortality rate of 20% (Fig. 5) among patients with a neurological score of 8 or higher.



Fig. 5: Distribution by Mortality

Discussion:

At Batna University Hospital, the rate of admission to intensive care for patients with severe herpes meningoencephalitis (HME) is increasing. This trend may be attributed to several factors, including aging, immunosuppression, and delays in antiviral treatment. It is also relevant to note, as highlighted by Michael Thy et al. in their study published in March 2023 in [Médecine Intensive et Réanimation](#) [12], that among immunocompromised patients, encephalitis, including HME, has significantly increased. In our study, women were the most frequently affected. The main general prognostic factors identified were the Glasgow score (84.21%), seizures (31.57%), behavioral disturbances, and oxygen desaturation. These are often responsible for the call to the intensivist and the initiation of mechanical ventilation, which, while necessary, is associated with high mortality.

When comparing our results with those of F. Hammami's study, published in February 2021 in [Revue de Neurologie](#) [13], we observe both similarities and notable differences. According to Hammami et al., the main poor prognostic factors include age over 30 years, a Glasgow score below 6, and a delay in antiviral treatment. In our study, we found that age over 45 years, a Glasgow score below 8, delays in intensive care admission, and late administration of acyclovir were poor prognostic factors. Although our age criteria differ slightly (45 years vs. 30 years), these findings support the idea that older age and a low Glasgow score are critical indicators of disease severity. Furthermore, the delay in antiviral treatment remains a key factor, as emphasized in both our study and Hammami's, reinforcing the importance of early management to improve prognosis.

Moreover, as emphasized by A. Khalfalli et al. in their study published in March 2017 in [The Journal of Neuroradiology](#) [14], all experts agree that herpes

meningoencephalitis is a diagnostic and therapeutic emergency. This urgency is reflected in the fact that the speed of diagnosis and treatment is directly linked to a reduction in the risk of severe complications and mortality. We share this conviction and emphasize the importance of rapid management, particularly regarding early administration of acyclovir and close monitoring of respiratory and neurological complications. Quick and appropriate intervention could significantly improve the prognosis for patients with this potentially fatal condition.

The results we obtained are similar to those of researchers from the CHRU Hospital in Tours, France, presented in their study dated May 29, 2024, published in an article titled [“Incidence and Outcomes of Severe Herpes Meningoencephalitis Hospitalized in France”](#) by A. Sauvage, E. Laurent, C. Gaborit, A. Guillon, [Médecine Intensive Réanimation CHRU de Tours, France](#). In their study, the mortality rate was 17.9%, while in ours it was 20%. The factors considered in their study included advanced age, comorbidities, and the presence of seizures. In contrast, the factors considered in our study were as follows: a Glasgow score below 8, age over 45 years, presence of comorbidities, delays in intensive care admission, the presence of respiratory or cardiac complications at admission, and the delay in acyclovir administration. These prognostic factors are crucial for assessing the severity of HME and guiding therapeutic decisions, with the goal of better managing prognosis and reducing mortality.

The objective of our study is to demonstrate the validity of the predictive factors for a good prognosis that we identified and show that considering these factors can help reduce mortality. Thus, a Glasgow score above 9, age under 45 years, the absence of respiratory complications at admission to intensive care, a delay in

acyclovir administration of less than 48 hours, and a short time to admission to intensive care are considered as predictive factors for a good prognosis. We observed that patients with these factors showed a favorable prognosis.

Conclusion:

The prognosis for patients with severe herpes meningoencephalitis (HME) in intensive care remains particularly bleak, underscoring the crucial importance of early diagnosis. Identifying prognostic factors that significantly influence disease progression is essential to optimize management. Indeed, the speed of intervention, combined with early and appropriate management, is closely correlated with patient morbidity and mortality. Among the determining factors, rapid diagnosis, early antiviral treatment, and rigorous monitoring of respiratory and cardiac complications play a key role in improving prognosis. Therefore, targeted management based on the assessment of prognostic factors could help reduce mortality and improve clinical outcomes. These findings highlight the need for heightened vigilance and rapid action to address this severe condition.

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