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SCIENTIFIC ARTICLE - ORIGINAL ARTICLE

ANALYSIS OF VENTILATORY PARAMETERS AND HOSPITAL OUTCOMES IN MECHANICALLY VENTILATED PATIENTS

ERIKA LETÍCIA GOMES NUNES[1,2]; ISADORA OLIVEIRA FREITAS BARBOSA[1]; MARISTELA LÚCIA SOARES CAMPOS[1]; BRUNA KELLY FERREIRA[1]; GIULLIANO GARDENGHI[3,4]

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ABSTRACT

Introduction: Mechanical ventilation is essential for advanced life support, however, if conducted improperly, it can damage the lungs. Parameters such as driving pressure (DP) and mechanical power (MP) are important measurements that help to reduce ventilator-induced lung injuries (VILI).
Objective: To verify if the adjusted parameters in the intensive care units (ICU) in an emergency hospital, were within the recommended by the literature, and verify the patient's outcomes.
Methods: Cross-sectional study of individuals admitted to the ICUs of an emergency hospital. Data regarding hospitalization, vital signs and ventilatory parameters were collected.
Results: 99 individuals were studied, 71% male. Only 8.1% of the DP values were high (greater than 15 cmH2O). The MP, in 21.2% of the patients, was above 17J/min. The main outcome observed in the sample was the mortality rate of 63.8%. SpO2 values were above 95% in 64.6% of the evaluations.
Conclusion: In some situations, ventilatory parameters were adjusted in a non-protective way according to the scientific literature (8.1% increased DP and 21.2% increased MP). SpO2 values were frequently high, which is directly related to VILI. Such findings may be associated with the mortality in the studied population.

Keywords: Respiration Artificial; Ventilator-Induced Lung Injury; Intensive Care Units.

INTRODUCTION

Mechanical ventilation is an indispensable strategy for advanced life support; however, if conducted improperly, it can damage the lungs, leading to a process known as ventilator-induced lung injury (VILI). The physical mechanisms contributing to lung injury are increasingly well understood.[1]

These mechanisms include exposure to high transpulmonary inflation pressures, alveolar overdistension, and/or repetitive opening and closing of alveoli. In addition to direct lung damage, these mechanical forces can trigger a complex cascade of inflammatory mediators, resulting in local and systemic inflammatory responses (biotrauma), causing injuries to non-pulmonary organs[2]. This can lead to dysfunction of multiple organ systems and, potentially, patient mortality.[3]

The primary mechanical determinant of VILI is pulmonary overdistension due to high transpulmonary pressure, causing the lung to exceed its resting volume[3,4]. Lower tidal volumes, lower driving pressure (DP), lower plateau pressure (Pplat), and appropriate positive end-expiratory pressure (PEEP) are indicated to reduce mechanical stresses imposed on inflamed

lung tissues, contributing to an effective lung protective strategy.[5]

Based on basic thermodynamic principles, lung injury is attributed to a rate of energy transfer (mechanical power) from the ventilator to the patient. This energy dissipation within the lungs can lead to the production of heat, inflammation, and disruptive deformation of cells and the extracellular matrix.[5,6] The measurement of these mechanical stresses can be performed using the predictive equations for driving pressure (DP) and mechanical power (MP).[7]

Driving pressure (DP) can be routinely calculated in patients who are not making inspiratory efforts by subtracting PEEP from Pplat,[8] recommending values ≤15 cmH2O. The easy bedside application also makes it possible to calculate mechanical power (MP), in which the formula basically involves tidal volume (TV), peak pressure, DP, and respiratory rate (RR). The result of the equation is given in joules per minute. Studies suggest values below 17 J/min, but the idea is to use as little energy as possible, as higher values are also strongly related to mortality.[7,9]

The main factor motivating the study is to raise awareness that the primary mission of the professional's approach should be: not to cause and/or exacerbate harm to the patient, as the intubation procedure itself already makes them vulnerable. The approach to mechanical ventilation (MV) should provide life support while minimizing unwanted toxicity, preventing sentinel events during intervention, and ensuring patient safety.[10] Therefore, the objective of this study was to verify whether the parameters adjusted in the intensive care units (ICUs) of an emergency hospital in the state of Goiás were within the recommendations of the literature, as well as the hospital outcomes of the sample.

METHODS

This is a cross-sectional observational study. With CAAE registration: 53496621.5.0000.0033, it was approved by the Research Ethics Committee of Hospital de Urgências de Goiás, Dr. Valdemiro Cruz (HUGO), under opinion number 5.409.088, in accordance with resolution 466/12 of the National Council of Research Ethics involving human beings.

Patients aged 18 years or older, admitted to the ICUs, receiving invasive ventilatory support in controlled mode, and whose guardians agreed to sign the informed consent form (ICF) were included. Asynchronous patients and those in spontaneous mode were excluded from the study.

After the ICF was signed by the guardian, personal data, medical history, diagnostic hypothesis, vital signs, peripheral oxygen saturation, and length of hospital stay of the patients were collected. The ventilatory parameters collected included tidal volume (TV), inspiratory pressure, PEEP, inspiratory time, peak pressure, Fraction of Inspired Oxygen (FiO2), spontaneous and set respiratory rate (RR), static lung compliance (CStat), driving pressure (DP), and mechanical power (MP). All data were recorded on an evaluation form prepared by the authors.

The data were categorized and tabulated in a spreadsheet using Microsoft Excel 2010 and then analyzed using the statistical software Statistical Package for Social Science, version 26.0. For the analysis of categorical variables, absolute frequency and relative frequency were used, and for continuous variables, mean and standard deviation were used. Tidal volume (TV) values were compared to predicted values using Student's t-test. The significance level adopted was 5% ($p < 0.05$).

RESULTS

Ninety-nine patients were included in the studies, with the sample being predominantly male, consisting of 74 men and 25 women. Table 1 describes the characterization of the sample.

Table 1. Characterization of the sample regarding age, height, predicted weight, and vital signs.
DP (Standard Deviation); HR (Heart Rate); RR (Respiratory Rate); SpO2 (Peripheral Oxygen Saturation); MV (Mechanical Ventilation); Source: Prepared by the authors.

	Mean +/- Standard deviation	Minimum	Maximum
Age	55.7 ± 18.7	18.00	91.00
Height	1.7 ± 0.08	1.58	1.88
Predicted weight	17.2 ± 6.2	3.00	21.00
HR	10.8 ± 4.0	2.00	14.00
RR	13.8 ± 0.5	12.00	14.00
SpO2	20.9 ± 0.4	18.00	21.00
Length of hospital stay	17.9 ± 13.8	1.00	62.00
Duration of Mechanical Ventilation (MV)	15.6 ± 11.5	1.00	55.00

Considering the ventilatory prosthesis, 55% used endotracheal tubes and 45% used tracheostomy. Regarding the assessment of oxygen saturation, we recorded 64.6% above 95%, which is associated with hyperoxia, and 3.0% below 88%, which is associated with hypoxia. The SpO2 values were around 95±5%. Table 2 describes the main ventilatory parameters adjusted and measured during mechanical ventilation.

Table 2. Ventilatory parameters
Oxygen); VC (Tidal Volume); DP (Driving Pressure); MP (Mechanical Power); Source: Prepared by the authors.

	Mean ± Standard deviation	Minimum	Maximum
PEEP	7.5 ± 1.5	5.00	13.00
FIO_2	35.9 ± 20.8	21.00	100.00
VC	400.7 ± 83.7	197.0	573.0
DP	10.47 ± 3.2	5.00	25.00
MP	13.77 ± 5.3	5.00	34.00

The predominant ventilatory mode used was Pressure Control (79%), followed by Volume Control (21%). Regarding variables related to lung injury, only 8.1% of the DP values were high (above 15 cmH2O). The DP found was 10.4±3.2 cmH2O. In 21.2% of the patients, the MP was above 17 J/min, which is associated with LPIV

The static lung compliance (Cstat) was 19.4±5.3 ml/cmH2O, which is considered very low. The respiratory rate (RR) found during mechanical ventilation was 21.2±3.6 breaths per minute. The tidal volume (TV) values did not show a significant difference when compared to the predicted tidal volume of 6 ml/kg (observed TV: 400.7±83.7 ml vs. predicted TV: 397.2±51.3 ml, p: 0.68).

Table 3. Hospital Outcomes
Legend: ICU (Intensive Care Unit); TQT (Tracheostomy); Source: Prepared by the authors.

Outcome	%
Extubation and ICU Discharge	14,90%
Death	63,80%
TQT	21,30%

Table 3 shows the hospital outcomes of the sample. It is noted that 63.8% of the sample progressed to death, 21.3% of the sample required a tracheostomy instead of direct extubation, and only 14.9% were discharged from the ICU.

DISCUSSION

The majority of the sample in this study was composed of men, accounting for 74.7%, and most had been on mechanical ventilation for more than seven days. This result can be explained by the fact that the research was conducted in an emergency and trauma hospital where the male population constitutes the majority of the patients served. These findings are consistent with data present in the literature[11].

It is known that tidal volume (TV) and driving pressure (DP) can impact the development of lung parenchymal injury by ventilation (LPIV) in patients with acute respiratory distress syndrome (ARDS)[7,8]. Other studies have sought to identify the relationship between driving pressure (DP) and in-hospital mortality in populations without acute respiratory distress syndrome (ARDS)[11]. In the study by Silveira Júnior, Cardoso e Rieder[11] the values of driving pressure (DP) and mechanical power (MP) were not associated with mortality in trauma patients without ARDS.

Other ventilatory parameters, such as respiratory rate, can also contribute to tissue damage. Measurements of tidal volume (TV) and driving pressure (DP) do not account for the effect of respiratory rate on the development of lung parenchymal injury by ventilation (LPIV). By calculating mechanical power (MP), it is possible to account for flow and respiratory rate, in addition to tidal volume and DP, representing the energy applied to the respiratory system[12].

Amato[8] and his research group demonstrated that the indiscriminate use of pressures causes deleterious effects and results in increased mortality. They showed that in the group where PEEP was maintained and DP values were increased (exceeding protective limits), there was a marked increase in mortality. In the group where both PEEP and DP were simultaneously increased, as long as DP values were controlled, mortality did not increase. Finally, in the group where PEEP was increased but DP was maintained and/or decreased, mortality decreased as long as PEEP remained above a certain value.[8]

In the current study, 8.1% of patients had a driving pressure (DP) higher than recommended by the literature (above 15 cmH2O), and 21.2% showed a mechanical power (MP) exceeding 17 J/min. Additionally, the tidal volume (TV) was in accordance with the predicted weight of the patients. However, despite most parameters being aligned with literature recommendations, 63.8% of the sample had death as the hospital outcome.

Factors such as advanced age, tracheostomy,[13] care by the healthcare team, and the structure and number of patients admitted to the ICU may be associated with mortality.[14] Additionally, individuals undergoing invasive mechanical ventilation (IMV) are believed to have a worse prognosis, including higher mortality rates and longer ICU stays.[15] All patients in this study were on

IMV, which may partly explain the high mortality rate found in the sample. However, investigating the risk factors associated with mortality was not the focus of this research. Severe patients who require IMV, such as those with acute neurological conditions, can have mortality rates around 33%[16-18]. Our study revealed a mortality rate significantly higher than this, which should prompt the hospital service to investigate the reasons for such an outcome. We hope that this finding encourages reflection among healthcare professionals in this regard.

Another important finding was that 64.6% of the sample exhibited hyperoxia. Although oxygen is essential for cellular respiration, excessive amounts lead to the production of reactive oxygen species, causing cellular damage and death. On the other hand, hyperoxia is not easily detected by pulse oximetry, which can result in significant discrepancies between SpO2 and arterial oxygen pressure (PaO2). Therefore, caution is needed when determining the ideal oxygen dosage using SpO2 records, and it is important to confirm with arterial blood gas analysis.[21]

Observational studies indicate that both high and low PaO2 levels are associated with mortality in critically ill patients.[21-23] In the review by Damiani et al[24] an association was observed between arterial hyperoxia and increased hospital mortality in critically ill patients with diagnoses such as stroke, traumatic brain injury, and post-cardiac arrest, clinical profiles similar to those in the present study. However, the authors caution that these data should be interpreted carefully due to the heterogeneity of criteria used to define exposure to hyperoxia.

Despite the findings contributing to future studies, this research had some limitations. The heterogeneity of the sample, as well as its size, were notable limitations. Additionally, the study's objective was to verify whether the parameters were in accordance with the literature, providing a more descriptive rather than inferential analysis.

CONCLUSION

In some situations, the ventilatory parameters were adjusted in a non-protective manner according to the scientific literature (8.1% with increased DP and 21.2% with increased MP). Mortality was observed in 63.8% of the sample. SpO2 values were above 95% in 64.6% of the assessments, which is directly related to LPIV. These findings may be associated with higher mortality in the studied population.

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BILIARY TRACT INJURY IN BLUNT ABDOMINAL TRAUMA: CASE REPORT IN A YOUNG PATIENT

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ABSTRACT

The article in question describes a case of bile duct trauma, a rare condition with the potential for significant severity, requiring an agile and precise diagnostic and therapeutic approach due to the risk of serious complications. This case report describes the management of a young patient with traumatic bile duct injury, highlighting the diagnostic and therapeutic complexity involved. The objective of the case report is to provide a detailed description of a specific clinical case, demonstrating the initial clinical presentation, diagnosis, treatment and evolution of this condition. The Data Collection method was also used, where the patient's clinical data was found, including medical history, physical examinations, laboratory test results, diagnostic imaging images (such as computed tomography, etc.) and intraoperative findings. Finally, as final considerations, the results were detailed in light of the medical literature and planned in terms of differential diagnosis, therapeutic management and specific challenges encountered during the patient's treatment.

Keywords: Bile duct injury; Intraoperative; Surgery; Case report.

INTRODUCTION

Biliary tract trauma is a relatively rare condition but with potential for considerable severity, occurring in both blunt and penetrating abdominal traumas. Although it accounts for about 0.1% of all trauma admissions and 2-3% of closed abdominal traumas, these injuries require prompt and accurate diagnostic and therapeutic approaches due to the risk of severe complications such as peritonitis, sepsis, and multi-organ failure[1].

Among the segments of the extrahepatic biliary tract, the gallbladder is the most commonly affected. Biliary duct injuries present a significant challenge to medical practice due to their high morbidity, with treatment depending on various factors, including the extent of the injury, the timing of diagnosis, and the experience of the surgical team. Due to the rarity of these injuries, surgical correction is not only complex but also often a subject of controversy.

Biliary tract injuries are classified according to their location and severity, using systems such as the Bismuth Classification and the Strasberg Classification for iatrogenic injuries[2]. Diagnosing these injuries, especially in cases of closed trauma, can be challenging. Commonly used methods include abdominal ultrasound, computed tomography (CT), magnetic resonance cholangiography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP), the latter of which can be both diagnostic and therapeutic.

Complications associated with biliary injuries include biliary fistulas, hepatic abscesses, cholangitis, and biliary strictures. Treatment depends on the location and severity of the injury, as well as the patient's stability[3]. The main therapeutic strategies include conservative management, endoscopic intervention, and surgical treatment, which can range from primary

repair and biliary-enteric diversion to hepatic resection in cases of more extensive injuries[4].

This article presents a case report from the General and Trauma Surgery Service at the State Hospital of Aparecida de Goiânia Cairo Louzada – HEAPA, highlighting the complexity and challenges involved in managing these injuries.

OBJECTIVE

Present a case report of traumatic biliary tract injury in a young patient, detailing the clinical presentation, diagnostic results, adopted therapy, intraoperative findings, and discussing the considerations and challenges faced during the patient's follow-up.

METHOD

Patient F.G.M.M.S., a 15-year-old male, was selected for this study based on clinical findings, diagnostic results, and the therapeutic approach adopted for the traumatic biliary tract injury presented. Information was gathered from the patient's medical history, including reported symptoms, laboratory test results, imaging findings, and details of the surgical procedure.

The clinical case was thoroughly described, covering the patient's clinical history, physical examination findings, results of previous tests, and intraoperative observations. The collected data were analyzed in light of the relevant medical literature, allowing for a comprehensive discussion of the presented symptoms, diagnostic process, adopted therapeutic strategies, and outcomes achieved in the context of this specific case.

CASE REPORT

Patient F.G.M.M.S., a 15-year-old adolescent, was admitted to the General and Trauma Surgery Service at the State Hospital of Aparecida de Goiânia (HEAPA). According to the initial report provided by the guardian, he had sustained blunt abdominal trauma four days earlier after being struck by a horse during horseback riding. Initially, he sought medical attention at an Emergency Care Unit, where he was discharged with a diagnosis of right rib fractures. However, in addition to persistent pain localized in the right hemithorax and the upper right quadrant of the abdomen, the patient had begun experiencing symptoms of jaundice and dark urine two days before. Upon inquiry, he denied the presence of pale stools and itching.

On physical examination, the patient was in fair general condition, pale, hydrated, afebrile, and exhibited jaundice at grade ++/4+. No neurological or hemodynamic alterations were observed. The cardiovascular and respiratory examinations were normal. The abdomen was atypical, with present hydroaeric sounds, tenderness in the upper right quadrant, no signs of peritoneal irritation, and palpable hepatomegaly 4 cm below the right costal margin.

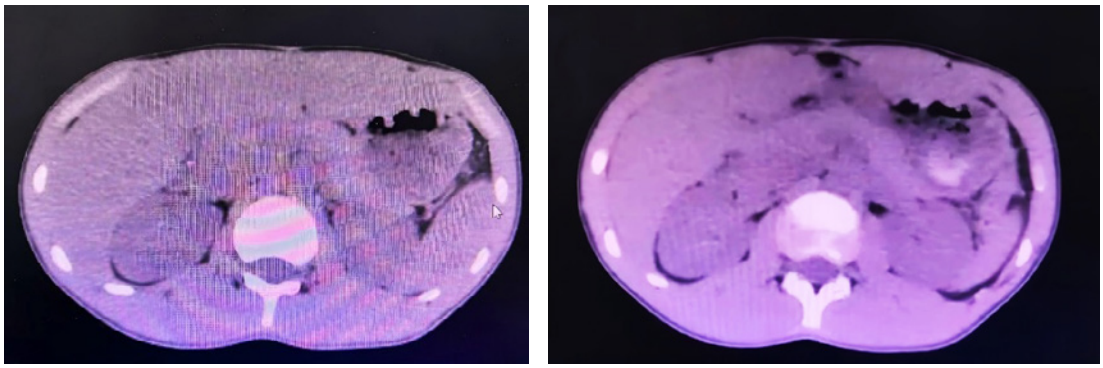
Given the clinical history and physical examination findings, the patient underwent further investigation. The CT scan revealed a hepatic injury with significant intra-parenchymal and subcapsular contusion and laceration, a deflated gallbladder, absence of dilation of intra- and extra-hepatic bile ducts, and free fluid in the peritoneal cavity. Laboratory tests showed a decrease in hemoglobin levels, an increase in direct bilirubin, as well as in canalicular and hepatic enzymes, as indicated in Table 01 below:

Table 01. Shows the values of the patient's admission laboratory tests. HT (Hematocrit), Total B. (Total Bilirubin), Direct B. (Direct Bilirubin), Indirect B. (Indirect Bilirubin), GGT (Gamma-Glutamyl Transferase), ALP (Alkaline Phosphatase), AST (Aspartate Aminotransferase), and ALT (Alanine Aminotransferase).

Hemoglobin	HT	Total B.	Direct B.	Indirect B.	GGT	ALP	AST	ALT
9.3 g/dL	27.8 %	6.53 mg/dl	5.78 mg/dl	0.75 mg/dl	281 U/L	1,484 U/L	281 U/L	279 U/L

Following the diagnostic investigation and considering the possibility of hepatic trauma with subsequent biliary tract injury, the patient underwent exploratory laparotomy. During the procedure, moderate hemoperitoneum, subcapsular hepatic laceration in segments V, VI, VII, and VIII, and signs of contusion were observed, as well as a probable millimetric injury to the common hepatic duct. Additionally, no injuries to other intra- or retroperitoneal structures were found. The surgical strategy included abdominal cavity drainage with the placement of a tubolaminar drain in the peri-hilar.

Image 01. Axial slices from the admission abdominal CT scan show signs of hepatic contusion, associated with the presence of free fluid.



By the sixth postoperative day, the patient was showing clinical and laboratory improvement, but then began to exhibit increased canalicular enzyme levels and elevated bilirubin levels, as shown in Table 02. Additionally, there was a significant increase in drain output and a control CT scan showed findings consistent with a probable bilioma.

Table 02. Shows the values of the patient's follow-up laboratory tests. GGT (Gamma-Glutamyl Transferase) and ALP (Alkaline Phosphatase).

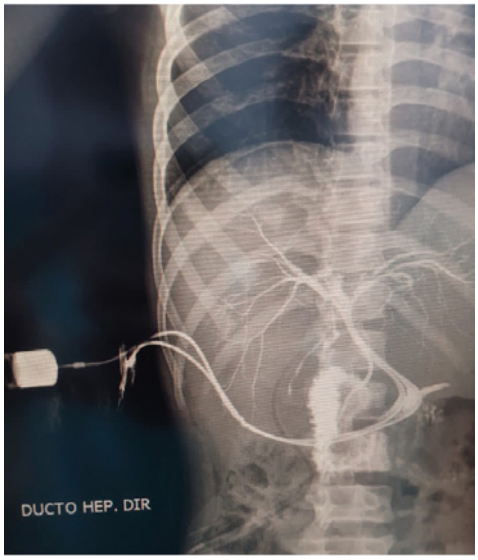
Total bilirubin	Direct bilirubin	Indirect bilirubin	GGT	ALP
7.23 mg/dl	7.21 mg/dl	0.02 mg/dl	705 U/L	3350 U/L

Given the observed changes, a new approach was opted for on the seventh day of hospitalization. During the procedure, a longitudinal lesion was identified on the medial-anterior wall of the common hepatic duct, extending to the confluence of the hepatic ducts, measuring approximately 2 cm in length, along with avulsion of 1 cm of the right hepatic duct and 1 cm of the left hepatic duct. Considering these findings, a cholecystectomy was performed, followed by identification of the lesion in the common hepatic duct[4]. A choledochotomy and catheterization of the right and left hepatic ducts were then carried out due to the absence of a Kher drain compatible with the patient's biliary tract caliber. Confirmed by intraoperative cholangiography, both catheters were externalized and fixed to the right flank. Additionally, the abdominal cavity was drained using a tubolaminar drain, with the proximal end positioned at the hilar plate and the distal end also in the right flank.

During follow-up, the patient showed significant clinical and laboratory improvement, being discharged for weekly outpatient follow-up. At the follow-up visits, the drain output was checked, along with laboratory evaluations and imaging exams, including cholangiography. On the third outpatient visit, cholangiography showed patency of the distal bile duct, contrast in

the duodenum, and no contrast leakage at the bifurcation, allowing the removal of the tubular drains from the right and left hepatic ducts while maintaining the sentinel drain. Later, this drain was also removed, based on confirmatory findings of bile duct integrity by magnetic resonance cholangiopancreatography.

Image 02. Postoperative follow-up cholangiography of the patient, showing patency of the distal bile duct, contrast in the duodenum, and no contrast leakage at the bifurcation.



The patient continues to be monitored by the General Surgery Service of the unit, as well as by the Hepatobiliary Surgery Service of the state of Goiás.

DISCUSSION

This case highlights the complexity and inherent challenges in managing traumatic bile duct injuries, especially in the context of blunt abdominal trauma involving a young patient.

The initial underdiagnosis of the injury, a common occurrence in hepatic trauma cases, especially when clinical symptoms evolve gradually and subtly, underscores the importance of a high index of suspicion, a diligent diagnostic approach, and appropriate surgical intervention to minimize complications and facilitate patient recovery.

In summary, this report reinforces the imperative need for continuous vigilance and rigorous follow-up in cases of hepatic trauma associated with bile duct injuries to ensure the prompt identification and correction of any complications, ultimately achieving the best possible outcome for the patient.

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CASE REPORT: INTRAOPERATIVE ENTEROSCOPY IN THE DIAGNOSIS OF A CASE OF GASTROINTESTINAL BLEEDING

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ABSTRACT
The article in question describes a clinical case of gastrointestinal bleeding originating from the small intestine, a condition that requires challenging diagnostic strategies, especially in patients within the public healthcare system. The case report details the patient's clinical presentation and the complementary diagnostic sequence involved in elucidating the condition, employing intraoperative enteroscopy to identify the probable site of bleeding for a definitive surgical approach. During the surgical procedure, the surgeons were able to perform an assessment that few emergency centers would allow, by mobilizing the digestive endoscopy and digestive surgery team for the intraoperative enteroscopy. The objective of the case report is to provide a detailed description of a specific clinical case, demonstrating the clinical presentation, diagnosis, treatment, and progression of this condition, with emphasis on the diagnostic challenge for adequate treatment. Finally, the final considerations, the results were analyzed in light of the medical literature and discussed in terms of diagnosis, therapeutic management, and specific challenges encountered during the patient's treatment.

Keywords: Intraoperative Enteroscopy; Intraoperative; Surgery; Case report.

INTRODUCTION

In patients with gastrointestinal bleeding, approximately 5-10% will not have an identified source with standard endoscopic and radiographic evaluation. In about 75% of these patients, the source is in the small intestine[1]. The most common initial step in evaluating suspected small intestine bleeding is capsule endoscopy, provided that the initial upper endoscopy and colonoscopy are complete and have good visualization. However, capsule endoscopy is not available in the SUS procedure table, making intraoperative enteroscopy an alternative for investigating these cases.

OBJECTIVE

The present work aims to share the experience of the General Surgery Department at the Hospital de Urgências de Goiás - HUGO.

METHOD

The patient J.L.S, a 73-year-old man, was selected based on clinical presentation and diagnosis. Data were collected from the patient's medical history, including reported symptoms, laboratory test results, imaging findings, and information about the surgical procedure.

The patient's previous exams were reviewed, and the clinical case was thoroughly described,

including the patient's medical history, physical findings, results of previous tests, and intraoperative findings. The collected data were analyzed in light of relevant medical literature, discussing the symptoms, diagnosis, treatment, and outcomes of the case in question.

CASE REPORT

A 73-year-old male patient was admitted to the emergency department due to gastrointestinal bleeding, with a reported history of episodes of melena and enterorrhagia. He was hemodynamically unstable, requiring vasoactive drugs and mechanical ventilation. A transfusion of 3 units of packed red blood cells (PRBC) and 2 units of fresh frozen plasma (FFP) was performed. An upper endoscopy (EGD) was conducted, revealing moderate enanthematous gastritis. A contrast-enhanced abdominal CT scan showed colonic diverticulosis, blurring and densification of mesenteric fat, and a small amount of fluid in the peritoneal cavity. A colonoscopy was not performed due to the patient's hemodynamic status.

He evolved with no further episodes of melena or enterorrhagia, and on the 3rd day of hospitalization, he presented with hypovolemic shock, requiring a massive transfusion protocol (4 units of PRBC, 4 units of FFP, and 4 units of platelets). A new upper endoscopy (EGD) was indicated in the operating room, along with exploratory laparotomy and intraoperative enteroscopy to investigate the source of bleeding. The preoperative endoscopy did not reveal any lesions that would explain the condition. During the cavity inventory, a change in the color pattern of the content, suggestive of hematin, was observed 2 meters from Treitz and 20 cm from the ileocecal valve upon transillumination. An enterotomy was performed in this segment for intraoperative enteroscopy, which revealed multiple diverticula in the distal ileum, with no active bleeding but with hematin present and a large amount of retained melena in the cecum. A right hemicolectomy, resection of 20 cm of ileum, and double-barrel ileotransversostomy were performed. The patient showed progressive hemodynamic improvement and was discharged after 12 days. Pathological analysis was negative for malignancy. He underwent intestinal reconstruction 8 months later and is under follow-up with no new episodes of gastrointestinal bleeding.

Figures 1 and 2: Preoperative endoscopy showing findings suggestive of hematin upon transillumination in the distal ileum (20 cm from the ileocecal valve).

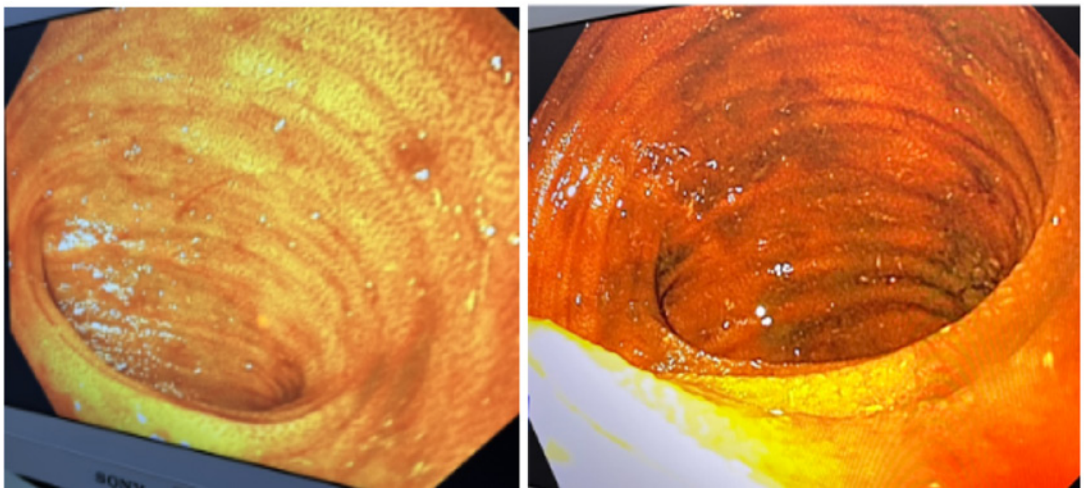
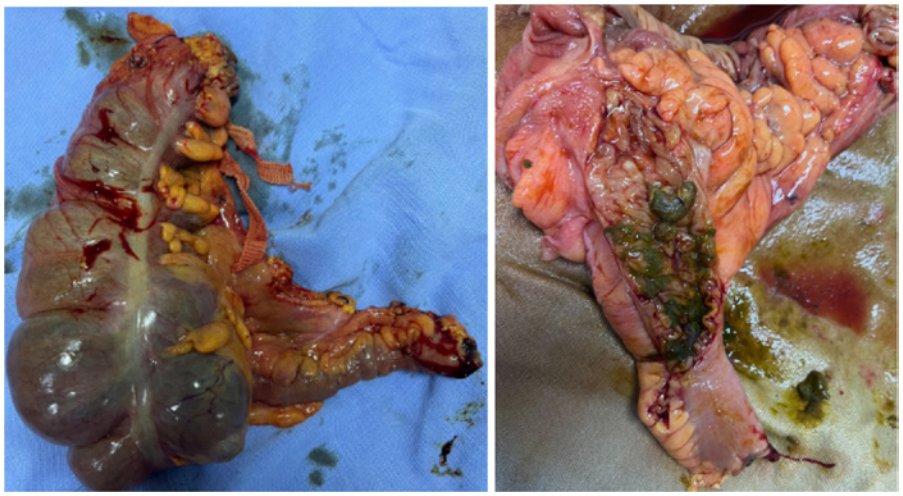


Figure 3: Intraoperative enteroscopy traversing the entire length of the small intestine.

Figure 4: Surgical specimen - right hemicolectomy and enterectomy.



DISCUSSION

Most cases previously referred to as obscure bleeding are more accurately categorized as suspected small bowel bleeding. The evaluation of suspected small bowel bleeding involves a thorough search for the cause of the bleeding, guided by the clinical history, physical findings, and results of any previous evaluations. Additional tests that may be indicated include wireless video capsule endoscopy, deep small bowel enteroscopy, radiographic imaging (CT enterography, CT angiography [CTA], or MR enterography), and intraoperative enteroscopy[2].

The frequency of missed lesions during upper gastrointestinal endoscopy or colonoscopy was examined in a study of 317 patients who underwent capsule endoscopy due to suspected small bowel bleeding. A bleeding source outside the small intestine was found in 11 patients (4%). The bleeding origin was found in the upper gastrointestinal tract in four patients, with lesions including gastric cancer (one patient) and angioectasia of the stomach or duodenum (three patients, including one case of GAVE). In seven patients, the source of bleeding was identified in the colon. Lesions found in the colon included colon cancer (three patients), angioectasias (two patients), diverticulum (one patient with evident bleeding), and Crohn's disease colitis (one patient)[3].

In patients with negative capsule endoscopy and CT enterography results and ongoing bleeding, the next step in evaluation is usually deep small bowel enteroscopy, if available. Intraoperative enteroscopy is an option if deep small bowel enteroscopy or push enteroscopy does not reveal a source of bleeding, if there is massive bleeding with hemodynamic instability, or if there are contraindications to deep small bowel enteroscopy, such as dense abdominal adhesions[4].

Intraoperative enteroscopy involves inserting an endoscope through an enterotomy site, either via oral or rectal approach during surgery. The surgeon telescopes the intestine over the endoscope, allowing inspection of the entire length of the small intestine in over 90% of patients. Although generally avoided, intraoperative enteroscopy may be the only option in patients with significant and ongoing bleeding where no bleeding source has been identified through less invasive methods[5]. The diagnostic yield ranges from 60% to 88%, with rates of recurrent bleeding ranging from 13% to 60%[6].

In a study that used intraoperative enteroscopy in patients with bleeding or anemia, the diagnostic yield was 69%. Segmental resection was performed in 90% of these patients, with a symptom recurrence rate of 20%. No severe complications were reported. It should be understood that the safe insertion of an enteroscope through an enterotomy is limited by the endoscope's curvature radius and the length of the mesentery. It is much safer, if a complete examination of the small intestine is needed, to perform one or more enterotomies rather than stretching and tearing the mesentery and its vessels[7].

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ANORECTAL TRAUMA AFTER BLUNT PELVIC TRAUMA: CASE REPORT AND LITERATURE REVIEW

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ABSTRACT

INTRODUCTION: Anorretal trauma is a complex pathology with multiple causes, such as penetrating injuries, blunt trauma and iatrogenic causes. Although conducted in the secondary assessment of the polytraumatized victim, it is of great importance due to the potential for progression to serious complications. Perineal lesions can affect the anorretal sphincter apparatus and the coloproctological system, due to anatomical and functional alterations, such as fecal incontinence. Case report: Male patient, 33 years old, admitted to the emergency unit due to multiple trauma due to a collision. During the evaluation, direct quadril dislocation was evidenced, associated with an extensive direct perineal laceration, with extension to the middle gluteal region, with anocutaneous detachment in 70% of the circumference and exposure of the internal anal sphincter. Opted for debridement and local cleaning, followed by separate composite suturing in two planes. A satisfactory evolution has been achieved, with infectious control and without the need for early reintervention. From a functional point of view, there is no definition of the sphincter sequelae due to the neurological quadro installed. Discuss: Dor pelvica, obstipação, tenesmo and bleeding remnants são queixas recounted in emergencies in their most diverse presentations. The patient must be submitted to primary assessment for hemodynamic stabilization and diagnosis of lesions that demand immediate addressing, and subsequently, anorhetal trauma may be better addressed. Regarding the management of extraperitoneal retinal trauma, primary raffia and diversion of intestinal transit can be attempted in cases of impossibility of access or in cases of rock raffia. Small perineal lesions can be addressed with primary repair, but extensive lesions generally require delayed sphincter reconstruction.

Keywords: Anorectal trauma; Fecal incontinence; Perineal injury; Colostomy; Pelvic trauma

INTRODUCTION

Anorectal and perineal traumatic injuries are complex pathologies that require constant attention in emergency services due to the frequent and severe complications that can result from improper treatment. These injuries can occur due to various causes, including penetrating wounds (56%), primarily from firearms or sharp objects, or blunt traumas (44%), most commonly from traffic accidents (42%), falls from great heights (16%), and foreign objects (1%), such as impalement. They can also be of iatrogenic origin, caused by obstetric procedures or during anorectal procedures. These injuries may also be associated with other injuries of varying degrees, such as orthopedic, genitourinary, and intra-abdominal organ traumas. They have an incidence of 1 to 3% in trauma centers, predominantly affecting males between the ages of 20 and 40.[1]

These injuries are typically identified and addressed, in the vast majority of cases, during the secondary evaluation of a polytrauma patient. They are of great importance due to their variable presentations and potential to evolve into severe complications.[2] During the clinical assessment of anorectal injuries, the etiology of the trauma, the time elapsed since the injury,

associated injuries, symptoms, and clinical presentation must all be considered. Depending on the patient's hemodynamic stability, the appropriate complementary method will be chosen, with computed tomography being the most commonly used due to its utility in evaluating polytrauma patients and its wide availability in emergency services.[3]

The clinical spectrum of these injuries is diverse, depending on their location, which may predominantly involve the perineum, causing damage to soft tissues and pelvic support, or primarily affect the rectum, with or without concomitant intraperitoneal involvement.[4] Perineal injuries can impact the anorectal sphincter complex, subsequently compromising the entire coloproctological system due to significant anatomical and functional alterations, such as fecal incontinence.[5]

CASE REPORT

A 33-year-old male patient was admitted to the emergency unit following a polytrauma incident caused by being struck by a car. He was admitted under orotracheal intubation due to a decreased level of consciousness at the rescue site, with severe traumatic brain injury and suspected significant musculoskeletal trauma, evidenced by visible internal rotation of the right lower limb, accompanied by signs of reversible ischemia in the limb. During the institutional protocol evaluation, a posterior dislocation of the right hip was identified, associated with an extensive ipsilateral perineal laceration, without active bleeding or other alarm signs. After a closed reduction of the limb in a sterile environment in the resuscitation room, adequate limb perfusion was restored. Once brain and abdominal injuries requiring emergency surgical intervention were ruled out, the patient was taken to the operating room for urgent drainage of a moderate pneumothorax on the right side and further assessment of perineal injuries.

During the exploration of the wounds, an extensive perineal injury on the right side was found, extending to the right mid-gluteal region and up to the scrotal raphe, with 70% of the anorectal circumference detached, along with muscular exposure of the right internal anal sphincter, including a 4 cm deep muscular laceration. A digital rectal examination and anoscopy were performed without evidence of lower rectal injuries. The medical team opted for debridement and local cleaning, followed by suturing with separate stitches using 3-0 Chromic Catgut absorbable suture in two layers—the first layer for approximation of the skin, subcutaneous tissue, and musculature, and the second between the skin and rectal mucosa, with partial edge approximation and coaptation, leaving areas for spontaneous local drainage.

The patient's postoperative course was managed in an intensive care unit due to neurological conditions. In subsequent surgical evaluations, he showed satisfactory progress from an infectious standpoint, without developing complications such as an ischiorectal anorectal abscess, which could have been treated by reopening sutures to facilitate drainage. Functionally, the patient began to have spontaneous bowel movements 8 days after surgery, concurrent with improvements in hemodynamic and neurological status. He experienced alternating liquid and pasty stools in 3 to 5 moderate episodes daily, with progressive improvement until discharge on the 20th postoperative day, at which point he had 2 to 3 pasty stool episodes daily. Due to the established neurological condition, the patient continues to experience motor, sensory, and cognitive deficits, with a lack of sphincter control, both fecal and urinary. This makes it challenging to assess the degree of incontinence associated with the complex perineal injury; however, a therapeutic approach involving pelvic physiotherapy is indicated.

Figures 1 and 2 – Record of the 7th postoperative day.

DISCUSSION

Traumas affecting the anus and lower rectum are rare due to the anatomical position of these organs. However, they present a challenge due to their high morbidity and mortality rates, ranging from 3 to 10%, and possible postoperative complications of up to 21%. Anatomically, the anorectal region is protected by the thighs, the pelvic bone structure, and the roots of the lower limbs, which can complicate diagnosis. Therefore, a high level of suspicion is required.[1] Although the use of a rectal examination is considered for determining possible associated injuries during the primary and secondary assessments of polytrauma patients, approximately 77% of these injuries go unnoticed. [6]

Abdominal or pelvic pain, constipation, tenesmus, and rectal bleeding are complaints often reported in the emergency room in various presentations. The diagnostic approach includes digital rectal examination, anoscopy under anesthesia, sigmoidoscopy, and triple-contrast abdominal and pelvic tomography, with the latter being the standard method as long as the patient is hemodynamically stable.[1]

The patient should first undergo primary assessment for hemodynamic stabilization and diagnosis of injuries requiring immediate intervention, following the ABCDE protocol of ATLS (Advanced Trauma Life Support). Subsequently, during the secondary assessment, the anorectal trauma can be more thoroughly addressed. Injuries can be classified using the American Association for the Surgery of Trauma (AAST) scale to determine severity and guide management decisions.[7]

Table 1 - Classification of the American Association for the Surgery of Trauma (AAST)

Rectum Injury Scale

Grade*	Type of Injury	Description of Injury	CID-9	AIS-90
I	Hematoma	Contusion or hematoma without devascularization	863.45	2
	Laceration	Partial thickness laceration	863.45	2
II	Laceration	Laceration < 50% of the circumference	863.55	3
III	Laceration	Laceration > 50% of the circumference	863.55	4
IV	Laceration	Full thickness laceration with extension to the perineum	863.55	5
V	Vascular	Devitalized segment	863.55	5

Grade III lacerations with multiple lesions should be advanced to Grade III
[5]; with permission

Treatment recommendations are categorized into three groups based on the type of rectal trauma: intraperitoneal, extraperitoneal, and rectal and/or anal.[8] Intraperitoneal injuries are managed similarly to colon injuries. If intestinal diversion is needed, it should be performed near the injury, preferably with a loop stoma, with intraoperative maturation. For rectal trauma, debridement of the wound is recommended, along with repair of the rectal injury via the transanal approach for lower rectum injuries and the transabdominal approach for upper rectum injuries. Intestinal diversion may be necessary in cases where the injury cannot be primarily repaired, there is gross contamination, hemodynamic instability, late injury, or other factors compromising the safety of primary repair.[9] In some cases, presacral drainage and/or distal rectal lavage may be required. These maneuvers, which are no longer routinely indicated, should be used as needed.[10]

In anal trauma with sphincter involvement, it is important to initially determine whether there is an associated concomitant rectal injury and, consequently, perform primary or delayed repair, with or without fecal diversion. There is a lack of current information regarding traumatic damage to the anal sphincter and its reconstruction, making it difficult to establish clear recommendations. Anal sphincter injuries should be evaluated within the patient's clinical and hemodynamic context. In patients with hemodynamic instability requiring evaluation and management of vital organ damage, the assessment of sphincter apparatus damage should be evaluated later.[6] Extensive perineal soft tissue injuries should be treated with a diverting colostomy, and primary reconstruction of the compromised sphincter and perineal tissues should be attempted when there is no infection or necrosis. Perineal injuries may be associated with genitourinary injuries, which should be actively investigated and included in the therapeutic plan when present.[3]

The most common complications following surgical correction of anal sphincter injuries are suture dehiscence, fistulas, strictures, and erratic healing with delayed closure. For extensive perineal defects, various methods such as healing by secondary intention, negative pressure therapy, and skin grafts are used. However, reconstruction with tissue flaps is preferred, which may include regional flaps or pedicled flaps from the thigh, gluteal region, or abdomen.[11]

In patients who cannot regain continence through non-surgical methods, advanced techniques such as graciloplasty, dynamic graciloplasty, artificial sphincters, or magnetic anal sphincters, among others, are employed.[11]

CONCLUSION

Accidental anorectal trauma is rare and often associated with severe injuries. It requires early therapeutic planning to avoid future complications. Surgical management, including debridement of devitalized tissue, repair of the anorectal mucosa, and primary closure of sphincter defects, is recommended by the limited existing literature when feasible.

The primary objectives of treatment are to control potentially fatal injuries, minimize infections, and preserve anal sphincter function.

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BILATERAL NEUROFIBROMATOSIS IN MALE NIPPLE: CASE REPORT

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ABSTRACT
Neurofibromatosis type 1 (NF1) is a genetic disorder often diagnosed in childhood due to its early clinical manifestations, which include skin, eye, tumor, bone, and neurological changes. Also known as Von Recklinghausen's disease, it is an autosomal dominant genetic disorder that affects approximately 1 in every 3,000 individuals worldwide. This report discusses a typical case of neurofibromatosis type 1 with multiple café-au-lait spots distributed over the body, mainly concentrated on the trunk, abdomen, and back, and particularly on the patient's nipples. Surgical treatment was performed, with the excision of the nipple lesions showing good clinical progress.

Keywords: Neurofibromatosis type 1, Von Recklinghausen's disease, Neurofibromas, Skin nodules.

INTRODUCTION

Neurofibromatosis type 1 (NF1), also known as Von Recklinghausen's disease, is an autosomal dominant genetic disorder that affects approximately 1 in every 3,000 individuals worldwide. This condition is caused by mutations in the NF1 gene located on chromosome 17, responsible for encoding the protein neurofibromin, which acts as a tumor suppressor. The functional deficiency of this protein leads to the formation of multiple tumors along the nerves, known as neurofibromas, in addition to other diverse clinical manifestations.[1]

The signs and symptoms of NF1 vary widely among patients but typically include café-au-lait spots on the skin, axillary and inguinal freckling, optic gliomas, Lisch nodules (pigmented hamartomas of the iris), and a predisposition to developing both benign and malignant tumors. The complications associated with NF1 can be severe, involving the central nervous, cardiovascular, and skeletal systems, significantly impacting the quality of life of affected individuals. Cutaneous neurofibromas are one of the most visible manifestations of NF1. They can be classified as cutaneous, subcutaneous, and plexiform, each with distinct clinical characteristics. Cutaneous neurofibromas are the most common, presenting as soft nodules that can appear anywhere on the body. However, the location of neurofibromas can vary, and in rare cases, they can affect unusual anatomical regions such as the nipples.[2]

The presence of neurofibromas in specific areas can cause not only physical and aesthetic discomfort but also additional complications, depending on their location and growth.[1,2] Neurofibromatosis with breast involvement is particularly rare, and there are few reports in the medical literature about neurofibromas involving the nipples, especially bilaterally in male patients. This case report describes a rare presentation of neurofibromatosis type 1 with bilateral neurofibromas on the nipples in a male patient, highlighting the importance of recognizing this atypical manifestation and its implications for clinical and therapeutic management.

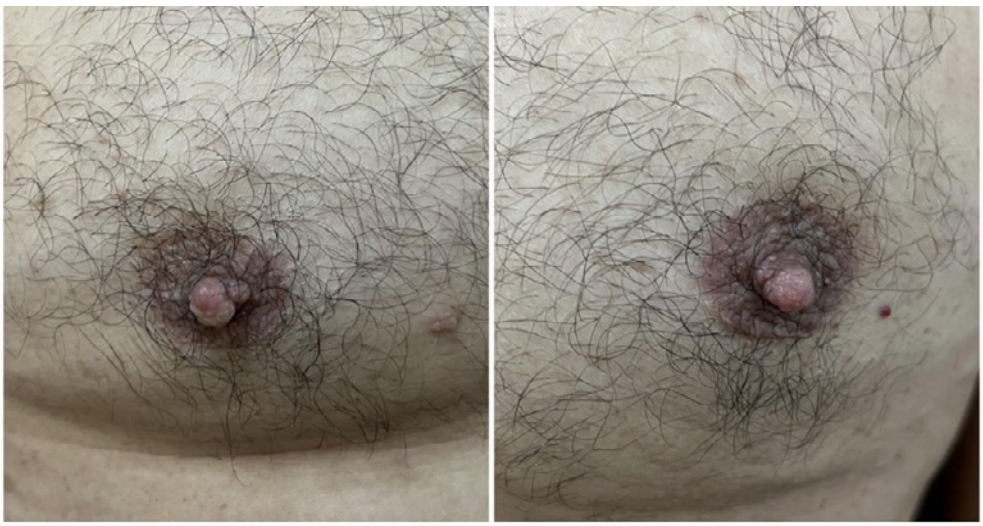
CASE REPORT

A 43-year-old male patient, P.M.C, from Brasília-DF, sought medical attention due to the presence of cutaneous nodules, including on the nipples. On physical examination, the patient presented with skin lesions clinically corresponding to neurofibromatosis type 1, with multiple café-au-lait spots distributed over the body, mainly concentrated on the trunk, abdomen, and back, as shown in (Figure 1).

Figure 1 - Images taken during the initial consultation showing café-au-lait spots distributed on the abdomen, trunk, and back.

Also observed were the presence of globular nodular lesions bilaterally on the nipples, with a fibrous consistency. The nodule on the right side was larger, suggesting neurofibromas (Figure 2).

Figure 2 - Images of nodular lesions on the nipples. A- Right nipple; B- Left nipple.



The conventional surgical excision technique was chosen for the removal of the lesions from each nipple, with the excised material from the right side sent for histopathological analysis. Both the histopathological and immunohistochemical analyses were compatible with nipple fibromas, consistent with neurofibromas.

DISCUSSION

Neurofibromatosis type 1 (NF1) is a genetic disorder often diagnosed in childhood due to its early clinical manifestations, which include skin, eye, tumor, bone, and neurological changes. The most notable skin features are café-au-lait spots and freckles. Café-au-lait spots, present in 95% of patients, are hyperpigmented, appear in the first year of life, and stabilize in adulthood. Freckles predominantly appear in intertriginous regions, such as the axillae and groin, between the ages of 3 and 53.

Patients with NF1 have a predisposition to developing various benign and malignant tumors due to the compromised function of the NF1 tumor suppressor gene. The most common benign tumors are neurofibromas, which can be plexiform, cutaneous, or nodular. Plexiform neurofibromas can be superficial or deep and are associated with hypertrophy of the skin and soft tissues. Cutaneous neurofibromas are soft, pruritic, and mobile to palpation, while nodular neurofibromas are firm masses under the skin that can cause pain and compress surrounding structures[3].

Neurofibromatosis in breast tissue is rare. Generally, breast lesions manifest as painless nodules of varying sizes, with colors ranging from pink to blue, and a consistency that can be gelatinous or fibrous. There is a tendency for tumors to be concentrated in the nipple-areolar complex. Malignant breast tumors have been observed in association with neurofibromatosis as well as mutations in the BRCA1 and NF1 genes, located on chromosome 17. In such cases, neurofibromatosis in the nipple-areolar complex can be treated by lesion resection, resulting in a good aesthetic outcome and a low risk of recurrence. Additionally, the surgeon should be aware of the risk of associated neoplasms in the breast parenchyma. Patients with neurofibromatosis require regular multidisciplinary clinical follow-up due to the variety of disease manifestations[4].

Lisch nodules, hyperpigmented spots on the iris, are a specific ocular manifestation of NF1, present in 90% of adults and 10% of children. Although they generally do not affect vision, an ophthalmological evaluation may be necessary[4]. Another benign tumor that can develop is an optic pathway glioma, with signs such as decreased visual acuity, proptosis, and optic nerve atrophy, typically arising in childhood. Neurofibrosarcomas, malignant tumors, often originate from plexiform or nodular neurofibromas and exhibit characteristics such as persistent pain, hardened consistency, and accelerated growth[3].

Patients with NF1 may also present with bone abnormalities, such as pseudarthrosis, bone dysplasia, increased fracture risk, short stature, scoliosis, and osteoporosis. Neurological alterations include cognitive deficits, learning difficulties, headaches, epilepsy, macrocephaly, and peripheral neuropathy[3].

The diagnosis of NF1 is clinical, based on the National Institutes of Health (NIH) criteria, which include the presence of six or more café-au-lait spots, two or more neurofibromas, axillary or inguinal freckles, optic glioma, two or more Lisch nodules, distinctive bone lesion, and a family history of NF1. Genetic testing for the NF1 gene mutation can be useful in doubtful cases[3, 5].

Clinical follow-up for NF1 complications includes evaluation for fractures and osteoporosis, early breast cancer screening starting at age 30, dermatological evaluation, and monitoring

for hypertension. Imaging exams should be requested based on clinical presentation, such as MRI in suspected cases of optic nerve glioma or neurofibrosarcoma[5,6].

The management of symptoms is adjusted according to the complications developed over time. Neurofibromas are generally treated conservatively, with surgical intervention only in cases of pain, bleeding, or aesthetic impairment. Optic pathway gliomas can be monitored radiologically or treated with chemotherapy. Neurofibrosarcomas are treated with surgical resection followed by radiotherapy[5,6].

The life expectancy of individuals with NF1 is reduced, with an average age of death around 54.4 years and a median age of 59 years, significantly lower than the general population. Quality of life and functionality can be significantly improved with early diagnosis and multidisciplinary follow-up. Although there is no specific treatment for neurofibromas, therapies such as the selective MEK inhibitor Selumetinib have shown promising results[6].

CONCLUSION

This report describes a typical case of neurofibromatosis type 1, with multiple café-au-lait spots distributed over the body, primarily concentrated on the trunk, abdomen, and back, and especially on the patient's nipples. Surgical treatment was performed with the excision of the mammary lesions, resulting in good clinical evolution.

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THORACIC SUBARACHNOID EXTRAPARENCHYMAL NEUROCYSTICERCOSIS: A CASE REPORT OF A RARE PRESENTATION OF A PERSISTENT PUBLIC HEALTH CHALLENGE

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ABSTRACT

INTRODUCTION: Neurocysticercosis is the most common parasitic infection of central nervous system. Spinal form incidence is estimated in 0.7 to 3.0% of individuals with neurocysticercosis. Spinal chord form in its intradural variant is the rarest. It consists of a public health problem mainly in developing countries, Brazil being one of the endemic regions.

CASE REPORT: Patient of 59 years old reporting back pain for 2 months, escalating to complete paraplegia with pyramidal signs, with no clear sensory level. Magnetic resonance imaging of thoracic spine consistent with cystic lesion at the level of T4-T5. After multidisciplinary discussion, systemic therapy was initiated and surgical approach proposed. Intraoperative microscopy revealed multiple loculated lesions with apparent scolex in its interior. Histopathological examination confirmed neurocysticercosis.

DISCUSSION: Human cysticercosis occurs by the ingestion of stool released eggs which pass to external environment (fecal-oral route). Neurological impairment severity depends on affected region and degree of inflammation. Diagnosis basis consists on neuro-imaging studies and detection of antigens and antibodies. Treatment includes surgery, symptomatic therapy and anti-parasitic drugs.

CONCLUSION: Sanitary conditions share close relationship with neurocysticercosis and fight against the disease is a World Health Organization (WHO) priority, being one of the seven neglected zoonosis. Cases as exposed are rare and reinforce importance of differential diagnosis and early treatment in order to reduce complications and achievement of better long-term results.

Keywords: Neurocysticercosis, Spinal Cord Compression, Spinal Canal, Central Nervous System Cysts, Public Health Surveillance.

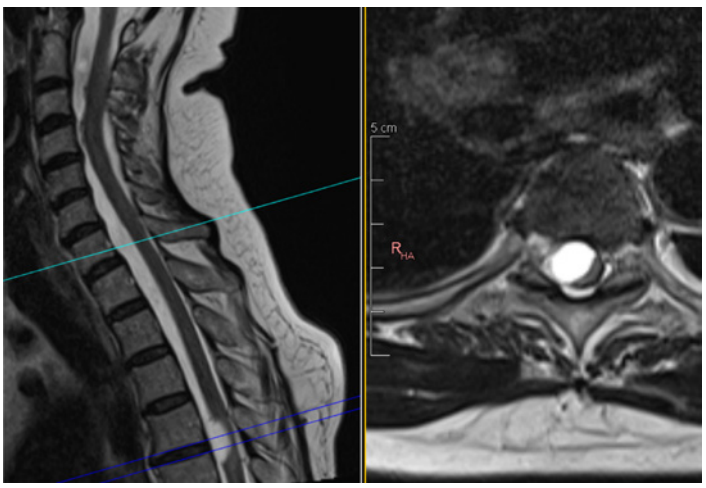
INTRODUCTION

Neurocysticercosis is the most common parasitic infection of the central nervous system. First described by Rockitansky [1], the disease is acquired through the oral ingestion of contaminated food containing mature and viable eggs of Taenia solium. The incidence of the spinal form of neurocysticercosis is estimated to be between 0.7% and 3.0% of individuals with neurocysticercosis [1–5]. Its prevalence and mortality are likely underestimated due to underdiagnosis in endemic areas where neuroimaging is not available [3]. Most cases of neurocysticercosis manifest in the parenchymal form (91%), with ventricular cysts and subarachnoid/spinal cysts being less common (6% and 0.2%, respectively) [6]. From an anatomical standpoint, the spinal form in its intradural variant is the rarest [4]. Neurocysticercosis is a public health issue, particularly in developing countries, including Latin America, Asia, and Africa, with Brazil being one of the endemic regions [1–5].

CASE REPORT

Patient LFC, a 59-year-old female housewife from the interior of Goiás, presented with a history of stabbing dorsalgia at rest, which began two months prior to hospital admission, progressing to paresthesia in the lower limbs. One month before, she developed paraparesis, predominantly on the right side, requiring support to walk and experiencing urinary strain. Two weeks before, she progressed to complete paraplegia and urinary retention. Additionally, she had deep vein thrombosis and pulmonary thromboembolism, for which she was being treated during hospitalization. Neurological physical examination revealed complete paraplegia, pyramidal release signs, and no apparent sensory level (sensation preserved). Magnetic resonance imaging (MRI) of the cervical spine showed poorly defined areas of signal alteration within the dural sac, with findings suggestive of adhesive arachnoiditis. Thoracic spine MRI showed a loculated cystic component anterolaterally on the right at the T4-T5 level, compressing and displacing the thoracic cord (Figure 1). Cerebrospinal fluid analysis demonstrated hyperproteinorrachia of 321 mg/dL and a cell count of 10/mm ^{3} with lymphocytic predominance. The test for IgG class antibodies against cysticerci in the cerebrospinal fluid was positive. After a multidisciplinary discussion, systemic therapy with dexamethasone and albendazole was initiated, and surgical intervention was recommended for the thoracic spinal lesion. The patient underwent a right hemilaminectomy at the T4-T5 level, followed by a longitudinal paramedian durotomy on the right. Microscopy revealed multiloculated cystic lesions with an apparent scolex inside (Figure 2). The lesions also exhibited a valve mechanism for clear content extrusion, resembling a "papo-de-anjo" or pouch-like structure (Figure 3), along with associated adhesive arachnoiditis (Figure 4). The pathological study confirmed the diagnosis of extraparenchymal neurocysticercosis. The patient showed partial improvement in motor deficit and was discharged with grade 2 strength in the lower limbs.

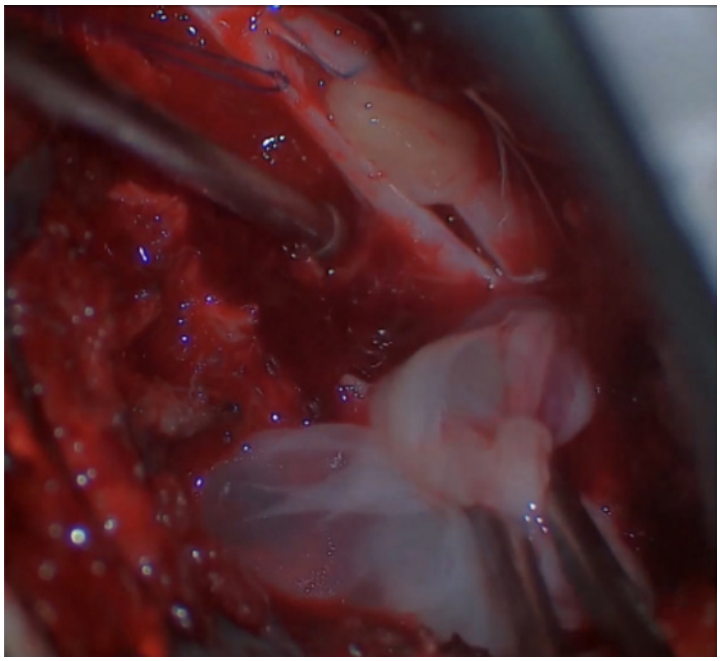
Figure 1 – Magnetic resonance imaging (MRI) of the thoracic spine with T2-weighted sequence in sagittal (left) and axial (right) sections, showing an intradural cystic lesion in the thoracic spine at the T4-T5 level.



Cerebrospinal fluid examination showed hyperproteinemia of 321 mg/dL and cellularity of 10/mm ^{3} with a predominance of lymphocytes. The test for IgG antibodies against cysticercus was positive in the cerebrospinal fluid. After multidisciplinary discussion, systemic therapy with dexamethasone and albendazole was initiated and surgical approach to the thoracic spinal cord injury was indicated. The patient underwent right hemilaminectomy at the T4-T5

level followed by right paramedian longitudinal durotomy. Multiloculated cystic lesions with apparent scolex inside were observed on microscopy (figure 2).

Figure 2 – Intraoperative microscopy showing visualization of the cysticercus and scolex.



The lesions also presented a valvular mechanism of extravasation of clear content with an "angel-shaped" appearance (figure 3) and associated adhesive arachnoiditis (figure 4).

Figure 3 – Intraoperative microscopy showing a lesion with a "papo-de-anjo" or pouch-like structure appearance.

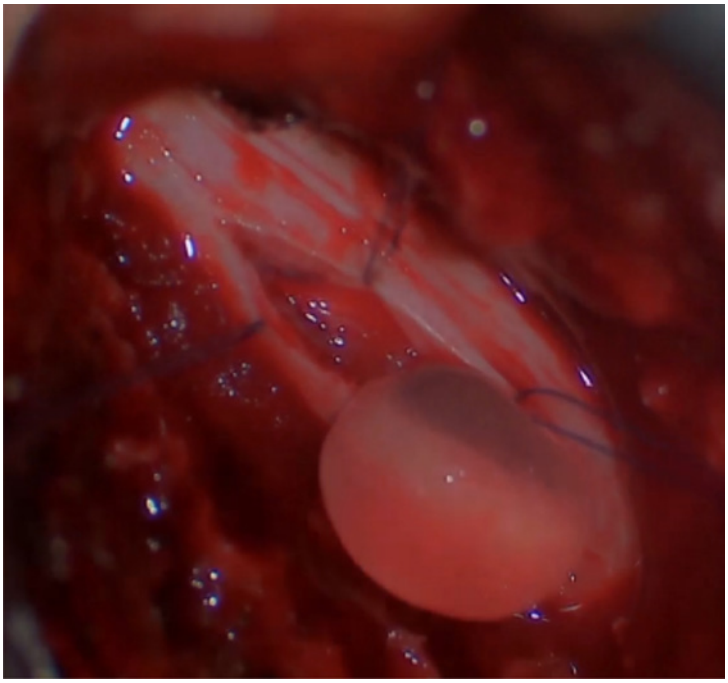
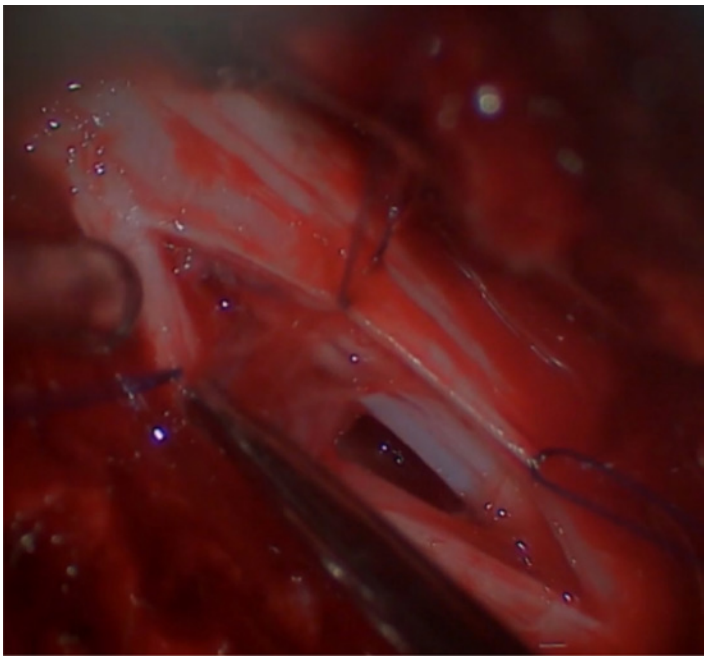


Figure 4 – Intraoperative microscopy highlighting an area of adhesive arachnoiditis.



The anatomopathological study confirmed the diagnosis of extraparenchymal neurocysticercosis. The patient evolved with partial improvement of the motor deficit and was discharged with grade 2 strength in the lower limbs.

DISCUSSION

Cysticercosis is caused by the larval stage of the Taenia solium worm. The disease is endemic in regions of Central America, South America, sub-Saharan Africa, India, and Asia. The clinical syndromes related to this parasite include neurocysticercosis and extra-neural cysticercosis, with the former being divided into intraparenchymal and extraparenchymal forms. Pigs serve as the intermediate host. The ingested eggs invade the intestinal mucosa of the pigs, enter the bloodstream, and then reach various organs and tissues, where they develop into cysticerci. The consumption of pork can lead to taeniasis. Human cysticercosis occurs through the ingestion of eggs released in feces that contaminate the external environment (fecal-oral route) [5–7].

The severity of neurological involvement depends on the affected region (cervical, thoracic, and/or lumbar), the degree of inflammation/arachnoiditis, and the involvement of nerve fibers. The diagnostic basis includes neuroimaging studies and the detection of antigens and antibodies in serum and cerebrospinal fluid. The gold standard is magnetic resonance imaging (MRI) or computed tomography (CT) [3,8].

The main imaging finding in parenchymal neurocysticercosis is a cystic lesion with ring enhancement and peri-lesional edema, which can also be seen in other conditions such as tuberculosis, pyogenic abscess, fungal granuloma, primary or metastatic tumor. Cystic lesions can also occur in echinococcosis and cenuriosis [6].

Diagnostic criteria are divided into absolute, imaging, and clinical-epidemiological criteria. The absolute criterion is direct visualization of the cysticercus in histopathological examination or demonstration of the scolex within a cystic lesion on imaging studies. Imaging criteria include cystic lesions, lesions with contrast enhancement, or intraparenchymal brain calcifications.

Clinical-epidemiological criteria include antigen tests, evidence of cysticercosis outside the central nervous system, close contact with an infected individual, and signs/symptoms [6].

The treatment of neurocysticercosis includes surgery, symptomatic therapy, and antiparasitic medications. Surgical treatment consists of cerebrospinal fluid shunts for hydrocephalus, cyst resections, and, more recently, endoscopic approaches. Symptomatic therapy is generally more critical in neurocysticercosis than in other infectious diseases, as it involves adjusting medications for controlling seizures and administering high doses of corticosteroids to manage inflammatory responses, focal neurological deficits, and intracranial hypertension. The main antiparasitic drugs are albendazole and praziquantel [3]. Although treatment regimens are not universally standardized, the use of albendazole at 15 mg/kg/day combined with dexamethasone at 0.2 mg/kg/day is recommended for patients with signs of spinal cord dysfunction, as in the case presented [1,4].

CONCLUSION

In the early 20th century, infections with T. solium were virtually eliminated from Europe through economic, educational, and sanitary changes, as well as improvements in the quality of medical, veterinary, and meat inspection services. Public health measures and community interventions that can contribute to disease control include promoting hand hygiene, food safety, safe handling of pigs, meat inspection, and treatment of human taeniasis [3,9].

Considering the risks, adverse effects, and failures of antiparasitic drugs, the importance of public health measures for the prevention and control of the disease becomes evident once again [3]. Sanitary conditions are closely related to neurocysticercosis, and combating this disease is a priority for the World Health Organization (WHO), being one of the seven neglected endemic zoonoses on their list [5].

Cases like the one presented are rare and highlight the importance of differential diagnosis of the lesion and early treatment to reduce the risk of complications and achieve a better final outcome, especially in endemic areas. Surgical intervention in cases of motor deficit without sensory level, even with ongoing anticoagulant therapy for venous thromboembolism, proved beneficial for the patient, considering the partial recovery in the immediate postoperative period and better long-term prognosis [4].

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BREAST CANCER IN MEN: PREVALENCE AND ITS MAIN CHARACTERISTICS - A REVIEW OF CURRENT LITERATURE

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ABSTRACT

Breast cancer is widely recognized as a major public health concern worldwide, predominantly affecting women. However, although it is relatively rare, breast cancer can also occur in men, accounting for a significant portion of cases diagnosed annually. Although less common, male breast cancer presents unique challenges in diagnosis, treatment, and clinical management, requiring a specific and personalized approach to ensure optimal patient outcomes. Understanding the prevalence and characteristics of breast cancer in men is critical to guide effective public health policies, prevention strategies, and clinical interventions. The general objective of this study is to discuss the prevalence and clinical, histopathological and therapeutic characteristics of breast cancer in men, in order to consolidate existing knowledge and identify gaps that can guide future research. The methodology of this work is the Literature Review. It is concluded that studies on breast cancer in men have provided a comprehensive view of this condition, from its prevalence to its main clinical characteristics and challenges associated with diagnosis and treatment.

Keywords: Male Breast Cancer. Breast Neoplasm in Men. Diagnosis of Breast Cancer in Men.

INTRODUCTION

Male breast cancer is a rare condition, accounting for less than 1% of all breast cancer cases diagnosed worldwide[1]. Despite its low incidence compared to female breast cancer, male breast cancer presents unique particularities and challenges that deserve attention. Between 2004 and 2014, 19,795 cases were diagnosed in the United States, with an increase in the incidence rate from 7.2% to 10.3%[1].

The mortality associated with male breast cancer significantly decreased during the same period, from 11% to 3.8%[1]. Several factors contribute to this mortality rate, including income, type of health insurance, tumor characteristics, and comorbidities, as measured by the Charlson-Deyo Score[2]. Additionally, age, tumor size, hormone receptor expression, and the stage of cancer at diagnosis directly influence mortality. Hazard ratios (HR) vary significantly according to cancer stage, with higher HRs associated with more advanced stages of the disease[2].

Studies indicate that men are generally diagnosed at more advanced stages than women, which may be attributed to a lack of awareness and lower rates of preventive screening. As a result, survival rates for men with breast cancer tend to be lower than those for women, highlighting the importance of early diagnosis and appropriate treatment strategies.

The treatment for male breast cancer is similar to that used for women, involving surgery, radiotherapy, chemotherapy, and hormone therapy. However, there is a growing need for treatment protocols specifically for men, due to biological and clinical differences between the

sexes. Clinical trials that include men are essential for developing more effective and personalized therapeutic approaches.

In conclusion, male breast cancer, although rare, represents a significant area of concern in public health. A detailed understanding of its incidence, risk factors, clinical characteristics, and response to treatment is crucial for the development of clinical strategies and public health policies aimed at reducing mortality and improving the quality of life of patients.

METHODS

The present study is characterized as a bibliographic literature review of a descriptive nature. The type of study adopted aims to synthesize and critically analyze pre-existing scientific literature to identify, evaluate, and interpret all relevant research available on the topic under study, namely, male breast cancer. This review was conducted globally, without geographical restrictions, considering the universality of the phenomenon investigated.

The population of interest for the review includes male individuals diagnosed with breast cancer, with no delimitations by age, ethnicity, or socioeconomic conditions, as the goal is to encompass the broadest spectrum of available scientific evidence. The sampling process for this bibliographic review was intentional and non-probabilistic, selecting relevant scientific articles on the topic, available in the PubMed, Medline, and Lilacs databases.

The initial search in the PubMed database returned 7,239 articles without applying filters. After applying the temporal filter considering the last ten years and the language filter for English and Portuguese, the number was reduced to 3,284 articles. With the requirement of full-text availability, the total decreased to 2,072 articles. Finally, by applying the methodology type filter, 368 articles remained.

Similarly, in the Medline database, the initial search generated 6,806 articles. The application of the language filter reduced the set to 6,208 articles. With the inclusion of the ten-year temporal criterion and the requirement of full-text availability, the number was reduced to 1,551 articles. Selecting the methodology type, 206 articles remained.

In the Lilacs database, 252 articles were initially found. With the application of the language filter, the total became 134 articles. After the methodology, time, and full-text availability filters were applied, 40 articles remained.

The inclusion criteria for the final selection of articles encompassed documents in English and Portuguese, published in the last ten years, and fully available in open-access databases. The search terms used included keywords pertinent to the topic, such as "male breast cancer," "male breast neoplasia," "diagnosis of male breast cancer," among others, in English and Portuguese.

The methodology employed in the articles was qualitative, aiming to include only review articles and clinical studies. Articles that did not meet these criteria were excluded. Regarding ethical aspects, the literature review does not involve direct risks to participants as there is no primary data collection.

The data analysis was conducted through a qualitative approach to identify patterns, themes, similarities, and differences in the results of the selected studies. After applying all the mentioned inclusion and exclusion criteria, the research resulted in a final sample of 19 articles for detailed analysis.

RESULTS

Prevalence of Breast Cancer in Men:

Male breast cancer is a rare disease, accounting for approximately 1% of all breast cancer cases worldwide. Epidemiological studies indicate that prevalence varies geographically, with

higher rates observed in regions with higher overall cancer incidences. In the United States, the annual prevalence is estimated at about 2.5 cases per 100,000 men, while in European countries such as France, the prevalence ranges from 0.5 to 1 case per 100,000 men. This pattern of low prevalence is consistent globally, reflecting a continuous need for awareness and deeper scientific investigation [1].

Temporal Trends in the Incidence of Male Breast Cancer:

Analysis of temporal trends reveals a gradual increase in the incidence of male breast cancer over the past decades. Data from the National Cancer Institute of the United States show that the incidence rate increased from 0.86 per 100,000 men in 1975 to 1.44 per 100,000 men in 2015[1]. This increase can be partially attributed to improvements in diagnostic methods and greater awareness of the disease. However, factors such as population aging and changes in risk factors also contribute to this upward trend. Understanding these trends is crucial for developing more effective prevention and treatment strategies[3].

Geographic Distribution of Male Breast Cancer:

The geographic distribution of male breast cancer varies considerably between different regions of the world. In North America and Europe, incidence rates are relatively higher, while in Asian and African countries, rates tend to be lower. This geographic variation can be influenced by genetic, environmental, and socioeconomic factors. For example, in the United States, the incidence is higher among white men compared to African American and Asian men. Studies suggest that differences in exposure to risk factors, such as diet and hormone levels, may explain some of these disparities[4].

Risk Factors Associated with Male Breast Cancer:

Several risk factors have been associated with the development of breast cancer in men. Among the main ones are advanced age, family history of breast cancer, genetic mutations (such as BRCA1 and BRCA2), and exposure to estrogens. Other factors include obesity, chronic liver diseases, and Klinefelter syndrome. Epidemiological studies show that men with BRCA2 gene mutations have up to an 80 times higher risk of developing breast cancer compared to the general population. In addition, prolonged exposure to female hormones, whether through medical therapies or endocrine conditions, also significantly increases the risk[2].

Histopathological Characteristics of Male Breast Cancer:

Male breast cancer shares many histopathological characteristics with female breast cancer, although there are some notable differences. Most tumors in men are invasive ductal carcinomas, with a small proportion of ductal carcinoma in situ and other histological types. Studies show that tumors in men tend to be diagnosed at more advanced stages, often due to lack of awareness and screening. In terms of molecular characteristics, the expression of hormone receptors (estrogen and progesterone) is common, and about 10-15% of tumors are HER2-positive. These characteristics directly influence treatment options and patient prognosis[5].

Surgery in the Treatment of Male Breast Cancer:

Surgery is one of the main treatment options for male breast cancer, with mastectomy being the most common procedure. Clinical data indicate that modified radical mastectomy, which involves the removal of breast tissue and axillary lymph nodes, is frequently performed due to the late presentation of the disease6. In addition to surgery, adjuvant treatment, including

radiotherapy, chemotherapy, and hormonal therapy, is often used to improve clinical outcomes. Studies show that surgery combined with adjuvant therapies can significantly increase the five-year survival rate, especially in early stages of the disease[7].

Radiotherapy as a Therapy for Male Breast Cancer:

One of the main benefits of radiotherapy is its ability to provide localized treatment, concentrating the radiation on the specific area where the tumor was located. This minimizes the impact on surrounding healthy tissues, thus reducing the risk of adverse side effects. However, precision in delivering radiation is crucial to ensure that only cancer cells are affected while preserving the integrity of normal tissues[4]. It has been shown to be an effective therapeutic modality that can be used both as adjuvant treatment and as an integral part of managing advanced-stage cancer[8]. The decision to use radiotherapy as part of the treatment plan for male breast cancer is based on several factors, including: tumor size and location, disease stage, presence of metastases, and patient preferences[9]. In most cases, radiotherapy can be combined with other treatments, such as surgery and chemotherapy, to achieve the best possible outcomes[8].

Chemotherapy and Hormonal Therapy in the Treatment of Male Breast Cancer:

Chemotherapy is a systemic approach that uses cytotoxic drugs to destroy cancer cells, either by preventing their cell division or damaging their DNA. It can be administered before surgery (neoadjuvant) to reduce the tumor size and facilitate surgical removal, or after surgery (adjuvant) to eliminate remaining cancer cells and reduce the risk of recurrence. Additionally, chemotherapy may be indicated to control metastases in advanced stages of the disease[10].

Chemotherapy and hormonal therapy play fundamental roles in the treatment of male breast cancer, although the incidence of this disease is considerably lower compared to women. These therapeutic modalities aim to reduce tumor size, control its spread, and prevent recurrences, contributing to improved clinical outcomes and quality of life for affected patients[10].

Chemotherapy regimens for male breast cancer are generally based on protocols similar to those used for female breast cancer, taking into account the tumor's sensitivity to different chemotherapeutic agents, disease stage, and the patient's individual characteristics. The most common drugs include anthracyclines, taxanes, antimetabolites, and alkylating agents. The choice and combination of these agents are determined by the oncologist based on a comprehensive evaluation of the clinical case.

However, it is important to note that chemotherapy is associated with significant side effects, such as nausea, vomiting, fatigue, hair loss, bone marrow suppression, and increased risk of infections. These adverse effects can negatively impact the patients' quality of Hormonal therapy aims to block the effects of hormones that stimulate tumor growth or reduce their production in the body. Aromatase inhibitors, such as letrozole, anastrozole, and exemestane, are frequently used in hormonal therapy for male breast cancer, especially in men with estrogen receptor-positive tumors. These drugs work by inhibiting the aromatase enzyme, responsible for converting androgens into estrogen, thus reducing estrogen levels in the body and inhibiting tumor growth[11]. Another option for hormonal therapy is tamoxifen, a selective estrogen receptor modulator (SERM), which blocks estrogen receptors in cancer cells, preventing their stimulation by the hormone. Tamoxifen can also be an option for men with estrogen receptor-positive breast cancer, especially in cases of advanced or metastatic tumors. Like chemotherapy, hormonal therapy may be associated with side effects, including hot flashes, changes in libido, erectile dysfunction, weight gain, and increased risk of blood clots. However, these adverse effects tend to be less severe compared to chemotherapy and can be managed with additional medications

or dose adjustments.[12]

Careful monitoring of the treatment response is essential to evaluate the effectiveness of therapeutic interventions and make adjustments when necessary. Regular imaging exams, such as mammograms and MRIs, along with clinical evaluations and laboratory tests, are important for early detection of any signs of recurrence or disease progression. [2]

DISCUSSION

Over the past few decades, there has been increasing awareness about breast cancer, particularly among women. However, many are unaware that this disease can also affect men, although to a much lesser extent. Discussing male breast cancer, its prevalence, and distinctive characteristics is crucial for a comprehensive understanding of this condition[13].

Male breast cancer is a rare condition, representing less than 1% of all breast cancer cases diagnosed. Although the incidence is low, its significance cannot be underestimated, as it can have significant implications for the health of affected men. The prevalence of breast cancer in men varies by geographic region and demographic factors, but studies indicate that the incidence rate is gradually increasing worldwide [6].

One of the distinctive features of breast cancer in men is that it is often diagnosed at more advanced stages compared to breast cancer in women. This is partly due to the lack of awareness about the possibility of men developing the disease and reluctance to seek medical attention for breast-related symptoms. As a result, early diagnosis is challenging, and many cases are discovered when the cancer has already spread to other parts of the body[7].

Symptoms of breast cancer in men may include a lump or thickening in the breast, changes in the nipple, nipple discharge, breast or axillary pain, and changes in the appearance of the breast. However, it is important to note that these symptoms may also be related to benign and non-cancerous conditions, highlighting the importance of a proper medical evaluation for an accurate diagnosis[1].

Known risk factors for breast cancer in men include older age, family history of breast cancer, genetic mutations, exposure to ionizing radiation, use of hormone therapy, obesity, and chronic liver disease. Understanding these risk factors can help identify men at higher risk of developing the disease and implement strategies for prevention and early detection[14].

The diagnosis of breast cancer in men typically involves a combination of clinical examinations, imaging tests such as mammography and ultrasound, and biopsy for tissue analysis. Once the diagnosis is confirmed, treatment will depend on the stage of the cancer, the overall health of the patient, and other individual factors. Treatment options may include surgery, radiation therapy, chemotherapy, hormone therapy, and targeted therapies[3].

Although survival rates for male breast cancer have improved over the years, there are still significant challenges to be addressed. The lack of awareness about the possibility of men developing breast cancer can lead to delays in diagnosis and treatment, negatively affecting outcomes. Additionally, men often face stigmas and taboos associated with the disease, which can hinder seeking the necessary support and assistance[15].

Ongoing research is essential for improving the understanding of breast cancer in men and developing more effective prevention, diagnosis, and treatment strategies. This includes studies on the underlying mechanisms of the disease, identification of specific biomarkers, development of screening approaches tailored to men, and evaluation of new therapies and interventions[16].

Therefore, while male breast cancer is a rare condition, its prevalence is increasing, and its importance should not be underestimated[17]. It is crucial to raise awareness about the possibility of men developing the disease, promote early detection, and provide appropriate support to

affected men[18]. With continued efforts in research, education, and awareness, it is possible to improve outcomes and quality of life for men with breast cancer[19].

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EFFECTS OF EARLY MOBILIZATION ON THE INCIDENCE OF DELIRIUM IN THE ICU. REVIEW OF SYSTEMATIC REVIEWS

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ABSTRACT

INTRODUCTION: Delirium is understood as an acute change in mental state, with a wide variety of neuropsychiatric signs and symptoms, with a fluctuating course and explained by disorders in cerebral homeostasis. Early mobilization (EM) is defined as an energy-consuming activity that aims to maintain or support the patient's mobility through passive or active movement exercises. Objective: to review knowledge about the effects of EM on delirium in critically ill patients in hospital. Methods: a literature review, with research in the PubMed database, using meta-analyses published between 2014 and 2024, in English, using the terms: delirium, intensive care units and rehabilitation. Results: 7 articles discussing EM in intensive care units were included, and conflicting and inconclusive results were found on the effects of EM in relation to the duration and incidence of delirium and functional outcomes. A single strategy for performing EM was also not defined, the ABCDEF bundle obtained the most favorable results in relation to functional outcomes, incidence and duration of delirium. Conclusion: EM is both viable and safe, being an important tool in the multidisciplinary care of critically ill patients, however its use for delirium has demonstrated conflicting results. The available studies present large methodological differences, a small population studied, and, in general, few studies addressing the subject. We emphasize the need for further studies to be able to define both the effectiveness of the EM and a protocol for its implementation.

Keywords: Rehabilitation; Delirium; Intensive Care Units.

INTRODUCTION

Delirium is understood as an acute alteration of mental status, characterized by a wide range of neuropsychiatric signs and symptoms, with a fluctuating course and explained by disorders in cerebral homeostasis. Some authors refer to it as Acute Brain Insufficiency Syndrome. [1,2]

This condition is extremely common in hospitalized elderly patients. One-third of general medicine patients aged 70 years or older experience delirium; the condition is present in half of these patients at admission and develops during hospitalization in the other half. The prevalence in patients admitted to intensive care units (ICUs) who have undergone mechanical ventilation and in patients receiving palliative care can exceed 75% and 85%, respectively. [1]

In the study by Park and Kim, [3] the in-hospital mortality rates at 3, 6, and 12 months were significantly higher in patients with delirium. The delirium group also showed higher rates of adverse events, increased hospital costs, and higher rates of hospital readmission.

Delirium can be classified into three types. Hyperactive delirium is characterized by restlessness, agitation, and emotional lability. Hypoactive delirium is defined by the presence of apathy and reduced response capacity. Mixed delirium features alternating between hypoactive and hyperactive types. [4]

Delirium has a multifactorial etiology. Among non-modifiable risk factors, those stemming from preexisting patient conditions include advanced age and prior cognitive impairment; abstinence, smoking, and alcohol consumption. Modifiable risk factors relate to acute conditions or iatrogenic and environmental events that are amenable to intervention, such as emergency admission, hypoxia, pain, infections, physical restraints, sleep disturbances, invasive devices, surgical procedures, sedatives, opioid analgesics, and environmental factors like artificial lighting, noise, and family isolation.[5]

To prevent and treat delirium, non-pharmacological treatments such as Early Mobilization (EM) are recommended. EM is defined as any activity that expends energy, aimed at maintaining or supporting patient mobility through passive or active movement exercises. [6]

In a randomized controlled trial involving 104 patients, those in the EM intervention group demonstrated better functional outcomes (measured by the Barthel Index) at hospital discharge, a significant reduction in mechanical ventilation duration, and a notable decrease in the number of days with delirium during hospitalization. [7]

The aim of this work is to review the current knowledge regarding the effects of EM on in-hospital delirium in critically ill patients.

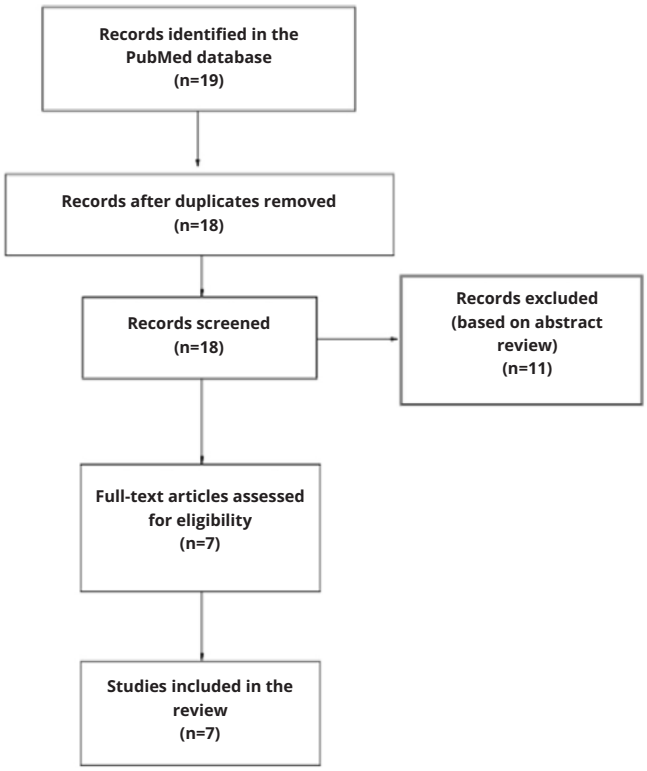
METHOD

A literature review was conducted in the PubMed database. The keywords used for the search were “delirium,” “intensive care units,” and “rehabilitation.” These keywords were combined using the Boolean operator AND (for different terms).

Articles were selected based on the following inclusion criteria: publication between January 2014 and May 2024, in Portuguese, English, or Spanish; and methodological design including meta-analyses with human samples.

Studies that did not address the effects of rehabilitation or Early Mobilization (EM) in patients with delirium and those for which full-text access was not available were excluded.

Figure 1 – Flowchart Demonstrating the Selection of Articles



RESULTS

Initially, 19 articles were found. After removing one duplicate and reviewing the abstracts, 12 articles were excluded for not meeting the inclusion criteria. The remaining 7 articles (totaling 42,003 patients) were assessed for eligibility and subsequently included in the review.

Data regarding the included articles can be viewed in Table 1.

Table 1. Summary of Included Articles, Their Objectives, and Main Conclusions
ABCDEF (Assess, prevent, and manage pain; Both spontaneous awakening and spontaneous breathing trials; Choice of analgesia and sedation; Delirium: assess, prevent, and manage; Early mobility and exercise; and Family engagement and empowerment); PICS (Post-Intensive Care Syndrome); MRC (Medical Research Council); ICU-AW (Intensive Care Unit-Acquired Weakness); ECR (Randomized Controlled Trial); RV (Virtual Reality); UTI (Intensive Care Unit); Early Mobilization (EM)

Table 1. Summary of Included Articles, Their Objectives, and Main Conclusions

Author/Yer	Number of participants	Objective	Conclusion
Sosnowski[8], et al / 2022	29.576	Identify the effectiveness of the ABCDEF bundle in delirium prevention, functional prognosis, and quality of life in adult ICU patients, and identify barriers and facilitators for the adoption of the ABCDEF bundle in practice.	Positive results for patients, including a reduction in the incidence and duration of delirium, have been demonstrated in the available research. Although limited and of variable quality, an increasing body of research supports the implementation of the ABCDEF bundle in its entirety for both ventilated and non-ventilated ICU patients. High-quality randomized controlled trials are needed to formally determine the relationship between the ABCDEF bundle and delirium outcomes in ICU settings worldwide.

Fuke[9], et al. / 2018	590	This meta-analysis aimed to evaluate the effectiveness of early mobilization (EM) for the prevention of post-intensive care syndrome (PICS) in ICU patients.	Early mobilization (EM) has a limited effect on the prevention of post-intensive care syndrome (PICS), although it has led to significant improvements in short-term physical outcomes, including MRC scores and the incidence of ICU-acquired weakness (ICU-AW). However, EM did not have a significant effect on cognitive function ('delirium') or mental health outcomes, nor on mortality in critically ill patients. Furthermore, rigorous randomized controlled trials are needed to confirm these results.
Xu[10], et al. / 2022	1.291	Search and collect randomized clinical trials on delirium in ICU patients following cognitive-functional exercise therapy interventions for systematic review and meta-analysis, in order to provide evidence for the prevention and treatment of delirium.	The results of the meta-analysis confirmed that cognitive-functional exercises can reduce the incidence and duration of delirium in ICU patients, as well as shorten patients' hospital stay. In conclusion, this study provides an evidence-based reference for the application of cognitive exercises in patients admitted to the ICU.
Herling[11], et al. / 2018	3.885	Evaluate the existing evidence on the effect of preventive interventions on delirium in the ICU, in-hospital mortality, number of delirium cases, days without coma, days without ventilator, length of ICU stay, and cognitive impairment.	There is insufficient evidence to determine the effects of physical and cognitive interventions on delirium. The effects of other pharmacological interventions, sedation, environmental interventions, and preventive nursing are unclear and warrant further investigation in large multicentric studies. Five studies are awaiting classification, and we identified fifteen ongoing studies evaluating pharmacological interventions, sedation regimens, physical therapy, occupational therapy, either combined or separately, and environmental interventions, which may alter the conclusions of the review in the future.
Hill[12], et al. / 2021	660	Identify the range of uses of Virtual Reality (VR) in intensive care unit (ICU) patients and assess its current stage of development, effectiveness, acceptability, and tolerability.	VR for intensive care is a new research domain, with most applications (including delirium) still in the early stages of development. There is significant potential for the use of VR in this clinical environment. A more robust evaluation of its effectiveness is needed before any clinical recommendations can be made.
Wang[13], et al / 2020	3.837	Evaluate the effects of early mobilization (MP) in critically ill patients.	The evidence from this review indicates that early mobilization (MP) can improve muscle strength in critically ill patients, reduce the incidence of complications in the ICU, and shorten the duration of mechanical ventilation, ICU stay, and hospital length of stay. The effect on delirium rates still needs to be determined through large-scale studies.
Nydahl[6], et al/2022	2.164	Determine whether early mobilization (MP) in adult ICU patients, either alone or as part of an intervention package, compared to standard practice, is effective in preventing delirium or reducing its duration.	Early mobilization (MP) in ICU patients may be effective in preventing delirium and potentially reducing its duration. However, due to the heterogeneity of the sample, specific methods, frequency, duration, or intensity of mobilization cannot be defined at this time. The key point is to reduce the time spent in bed.

DISCUSSION

This study aimed to verify the evidence regarding the practice of Early Mobility (EM) in patients diagnosed with delirium in a critical hospital environment. To this end, the ABCDEF bundle has supposedly proven to be a great ally when it comes to reducing the incidence and duration of delirium[8]. Sosnowski's study[8] investigated the efficacy of this bundle on delirium, functional outcomes, and quality of life through a meta-analysis of 18 articles that applied it entirely to adult patients admitted to an ICU. The ABCDEF bundle emerged as an evidence-based, multicomponent guide to coordinate and facilitate interdisciplinary care described in the 2013 guidelines on the management of Pain, Agitation, and Delirium in adult patients in critical care units[14]. Its components are: Assess, prevent, and manage pain; spontaneous awakening trials and spontaneous breathing trials; choice of analgesia and sedation; delirium: assess, prevent, and manage; early mobilization and exercise; and family engagement and empowerment[8]. EM is an integral part of the ABCDEF bundle and is considered one of the only interventions that resulted in a decrease in the days of delirium[14].

Although Sosnowski's study[8] indicates that the implementation of the ABCDEF bundle is associated with a decrease in the incidence and duration of delirium, several points must be considered, such as the considerable heterogeneity among the analyzed studies, which introduces variability in the potential benefit of the intervention and a lower level of certainty of evidence. Additionally, the application of the ABCDEF bundle can be hindered by several barriers: hemodynamic or respiratory instability; patient fatigue or refusal; deep sedation; lack of glasses and/or hearing aids; lack of knowledge and communication issues among the multidisciplinary team; and limited treatment time8 due to light and noise conditions. Therefore, it can be inferred that the implementation of this bundle cannot guarantee the specified results with precision, and high-quality clinical trials are needed to formally determine these benefits.

Corroborating the uncertainty of these benefits, Fuke[9] conducted a meta-analysis to evaluate the effectiveness of Early Mobility (EM) in preventing Post-Intensive Care Syndrome (PICS). PICS is defined as a syndrome encompassing new or worsening impairments in physical, cognitive, or mental health that arise after critical illness and persist after acute care hospitalization9. The complications experienced by ICU survivors include deterioration in physical capabilities (decreased muscle strength), psychological health (anxiety and depression), and cognitive function (delirium). The persistence of symptoms such as reduced ability to perform activities of daily living, depression, post-traumatic stress disorder, anxiety, and delirium contributes to adverse effects on the quality of life of individuals who have survived a critical illness[15].

As inferred by Fuke[9], Early Mobility (EM) significantly improved short-term physical performance (increased scores on the Medical Research Council and lower incidence of ICU-acquired muscle weakness) in the groups that performed EM compared to those that did not or only followed standard treatment. On the other hand, there were no differences between the two groups in terms of delirium-free days. However, the authors noted that the sample size studied for evaluating delirium was small; this, combined with the fact that the study analyzed EM individually without the interference of multiple components and the multidisciplinary team (as advocated by the ABCDEF bundle), strengthens the argument and the results found by Sosnowski[8].

In Herling's meta-analysis[11], which included randomized controlled trials, no evidence was found of preventive effects of Early Mobility (EM) and cognitive exercises for delirium. Additionally, Herling[11] concluded that while EM may reduce the duration of ventilation and hospital stay, the effect of abstaining from sedation for delirium prevention is uncertain.

However, as the authors themselves mentioned, the quality of the included study on delirium is low due to the small sample size of only 87 participants.The study in question, conducted by Brummel[16], implemented early intervention in surgical and medical ICU patients. The control group only received mobilization when requested by the medical team, about 1 to 2 times per week. There were two intervention groups: one performing only EM once a day and the other undergoing physical therapy combined with cognitive exercises (such as puzzles, recalling phrases, and sequences of numbers, among others). The primary objective of this study was to determine the feasibility of combined EM and cognitive exercises in ICUs. Therefore, the authors discussed that the ability to assess the effectiveness of the interventions on patient outcomes is limited.

In Xu's study[10], seven articles were included in the meta-analysis and evaluated functional cognitive exercises (active or passive exercises in bed, sitting at the bedside, standing, sitting in a chair, and ambulation with assistance) for the treatment of delirium in the ICU. Comparing the cognitive interventions between Xu's[10] meta-analysis and Herling's[11], it was observed that Xu's intervention[10] focused on motor activities, while Herling's aimed at exercises that stimulate memory and logical reasoning. Thus, motor activities presented better evidence in reducing the length of stay in patients with delirium, also reducing the incidence of delirium in ICU patients and improving quality of life compared to patients who did not undergo the intervention. Functional cognitive exercises combined with medication treatment for delirium yielded better results than cognitive exercises alone, provided that sedatives are managed correctly to ensure cognitive stimulation is effectively performed.

In the Nydahl meta-analysis[6], an analysis of 13 studies with 2,164 patients was performed, and it was shown that EM can reduce the risk of developing delirium in the ICU in 47% of cases, and reduce the duration of existing delirium by almost two days, as long as the dosage is adapted to the patients' conditions in relation to duration, frequency and intensity (favoring more frequent and shorter sessions) and centering on the patient and their family. Given all this, adherence to the ABCDEF package should be a priority, as it has a multidisciplinary approach focused on the patient in a biopsychosocial way. However, there are specific cases in which EM did not show benefits, such as in those patients with acute and severe cases of stroke, as it can generate a reduction in cerebral perfusion and an increase in its dysfunction.

The study by Hill[12] aimed to develop the use of virtual reality (VR) in ICU patients to prevent post-traumatic stress disorder (PTSD). Twenty-one studies were included in the review. The most common approach using VR for relaxation was to develop relaxing environments with corresponding ambient sounds. A similar approach was used regarding delirium, utilizing VR to help relax patients; other studies employed natural environments with guided meditation through VR software. For neurocognitive stimulation and sleep, similar approaches to those used for relaxation and delirium were implemented. The study indicated that there was no effect on delirium itself, but it significantly reduced anxiety and depression in these patients. There are substantial limitations to the evidence base used in the review. There was widespread methodological fragility in the studies themselves, which were also small and employed a wide range of varied outcomes to assess efficacy and acceptability. Based on this, limited confidence should be placed in the estimates of effects identified in the studies.

The systematic review and meta-analysis by Wang[13] investigated the effects of early mobilization on the prognosis of critically ill patients, including thirty-nine studies in the current meta-analysis. The main findings of this article identified that early mobilization improved some physical functional indices (MRC score, Barthel index, lower occurrence of acquired weakness, decreased complication rates, and shorter length of stay). However, early mobilization did not show any results regarding handgrip strength, delirium rates, mortality,

or health-related quality of life concerning the physical and mental functions of these patients. Overall, the results indicated that early mobilization improved the progression of these critically ill patients. Although many studies reported that early mobilization reduced the incidence of delirium or increased delirium-free days, this was not supported by the current meta-analysis, consistent with the findings of other studies where no observable relationship was found between physical rehabilitation and the incidence of delirium. However, this discrepancy may be explained by the late initiation of mobilization exercises and differences in the diagnosis and assessment of delirium.

CONCLUSION

The EM is both viable and safe, serving as an important tool in the multidisciplinary care of critically ill patients; however, its use for delirium has shown conflicting results. The available studies exhibit significant methodological differences, small study populations, and overall few studies addressing the subject. We emphasize the need for larger studies to define both the effectiveness of EM and a protocol for its implementation.

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