VOL. 66 N.º 67 - MARCH 2025

GOIANA JOURNAL OF MEDICINE

ISSN: 0034-9585

Editora : D&D Comunicação Ltda

CIP - Brasil - Catalogação na Fonte
Dartony Diocen T. Santos CRB-1 (1° Região)3294

R454 Goiana Magazine of Medicine. / Medical Association of Goiás..
V.65, n. 65 – Goiânia:. D&D Communication Ltda, 2025

82p. : il. (Edition March)
ISSN: 0034-9585

1. Article. 2. Prevention. 3. Diseases. 4. Complication. 5. Medicine.
I.Título.

CDU: 616(52)=111

Índice para catalogo sistemático:

Printed in Brazil – 2025

CDU: 616(52)=111

GOIANA JOURNAL OF MEDICINE

Official dissemination body of the Goiás Medical Association, Goiana Academy of Medicine and Faculty of Medicine of the Federal University of Goiás.
Distribution: directed and free to the medical profession in Goiás and Brazil.

ASSOCIAÇÃO MÉDICA DE GOIÁS:
Ana Paula Machado, Jornalista.
Av. Portugal, nº 1.148, Ed. Órion Business & Health Complex,15º andar,
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D&D COMUNICAÇÃO
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SCIENTIFIC DISSEMINATION PLATFORM

In this edition of the Revista Goiana de Medicina, we reinforce the importance of scientific research, aligning with the expectations of its readers. With each issue, Revista Goiana de Medicina strives to be a useful and up-to-date tool, connected to the desires and challenges faced by the medical community of Goiás. An official publication of the Goiás Medical Association (AMG), the Faculty of Medicine of the Federal University of Goiás (FM/UFG), and the Goiás Academy of Medicine (AGM), our journal reaffirms its position as an important platform for scientific dissemination in the state. We invite everyone who wishes to share their work, discoveries, and reflections to be part of these pages that value and promote the excellence of Medicine in Goiás.

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GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67E24239
ISSN 0034-9585
e24239
SCIENTIFIC ARTICLE - CASE REPORT

121 UTERINE FIBROIDS – MYOMECTOMIES AS CONSERVATIVE SURGERIES

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ABSTRACT

Fibroids are benign tumors with a high prevalence among women of reproductive age. Their clinical presentation is heterogeneous, including abnormal uterine bleeding, pelvic pain, and infertility. The gold standard for diagnosis is ultrasonography, with magnetic resonance imaging and hysteroscopy serving as complementary methods. Treatment varies according to the patient's individual characteristics, with a focus on fertility preservation to guide clinical or surgical intervention. This report describes the case of a 31-year-old patient diagnosed with uterine fibroids who underwent myomectomy. During the procedure, 121 fibroids were removed, including subserosal and intramural fibroids of varying sizes, ranging from 0.5 cm to 10 cm in diameter within the uterine cavity. The procedure was successful, preserving the uterus, fallopian tubes, and ovaries. This case highlights the importance of an individualized approach to the management of uterine fibroids, emphasizing the role of multidisciplinary teams and modern techniques. Myomectomy proved effective in preserving fertility in complex cases, with rigorous follow-up required to ensure favorable outcomes.

Keywords: Fibroid, Hysteroscopy, Uterine myomectomy, Case reports, Fertility.

INTRODUCTION

Fibroids, also known as leiomyomas, are benign tumors of the uterine muscular wall, with high prevalence in women of reproductive age. The symptoms of fibroid disease are heterogeneous; most patients remain asymptomatic or progress gradually with the evolution of the fibroids. Symptoms are also associated with the size, quantity, and location of the fibroids. In cases of large fibroid disease, symptoms may include pelvic pain, dyspareunia, dysmenorrhea, urinary incontinence, abnormal uterine bleeding, and impaired fertility[1].

The treatment of fibroid disease is individualized, highlighting the characteristics of each patient2. However, a coherent diagnosis is necessary to initiate treatment. Initially, the pelvic physical examination provides valuable information, and at this point, the healthcare professional should be attentive to the presence of an enlarged uterus or masses and uterine sacral areas. As the gold standard, ultrasound

(USG) allows for an easy and low-cost diagnosis. Additionally, saline-enhanced ultrasound helps diagnose submucosal fibroids and indicates the distance of intramural fibroids from the endometrial cavity. Hysteroscopy may also be necessary to distinguish intracavitary fibroids from large endometrial polyps. For surgical planning, magnetic resonance imaging (MRI) can provide important information about the number of fibroids, their size, vascularization, relationship with the endometrial cavity and serosal surface, and boundaries with normal myometrium.[2,3]

In light of this, treatment strategies should be guided by the patient's desire to preserve fertility, the symptoms, and the severity of the fibroids. Medical therapies include progestin-based medications, intrauterine devices releasing progesterone, and gonadotropin-releasing hormone (GnRH) agonists. Surgical strategies include myomectomy via laparotomy or laparoscopy, uterine artery embolization, and hysterectomy.[2]

CASE REPORT

A 31-year-old female patient, followed at Clínica Fértile by Dr. Waldemar Naves do Amaral and his team, was diagnosed with uterine fibroids after presenting with symptoms of abnormal uterine bleeding and persistent pelvic pain. The diagnosis was confirmed through imaging exams, revealing multiple uterine fibroids of various sizes and locations.

After the clinical evaluation and considering the patient's persistent symptoms and the impact on her quality of life, a surgical approach was recommended. The patient underwent a Pfannenstiel laparotomy, a technique widely used in gynecological procedures due to its adequate access and preservation of the aesthetic appearance of the abdominal area, along with a surgical hysteroscopy.

During the surgical procedure, a myomectomy was performed, which involved the remarkable removal of 121 uterine fibroids. These fibroids were subserosal and intramural, ranging in size from 0.5 cm to 10 cm in diameter within the uterine cavity. The peritoneal cavity was carefully examined and hemostasis was achieved to prevent hemorrhagic complications. The uterus, fallopian tubes, ovaries, and adnexa were preserved, with the intention of maintaining the patient's reproductive function. During the hysteroscopy, diffuse endometrial polyposis was removed using a resectoscope.

The surgery was successful, and the patient showed good progress without any complications. During the hospital follow-up, she remained afebrile and showed no signs of alarm. Since the surgery, she has been regularly monitored with annual hysteroscopies. In the hysteroscopies conducted in 2022 and 2023, extensive fibrous synechia, also known as uterine adhesions, was revealed. This condition occurs when scar tissue forms within the uterus as a result of the removal of the 121 fibroids. It can affect the uterus's ability to perform its normal functions, such as menstruation, embryo implantation, and pregnancy development. However, this condition can often be treated with the removal of the adhesions through hysteroscopy.

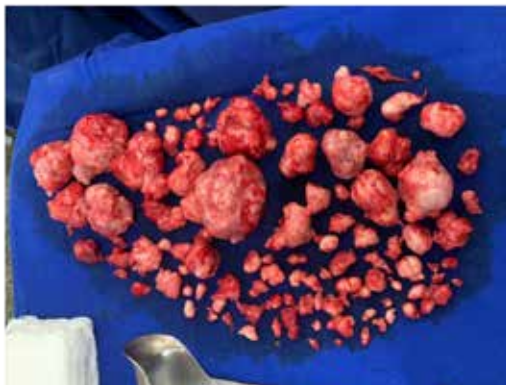

Figure 1 - 121 fibroids extracted during surgery

DISCUSSION

The described case presents a patient diagnosed with uterine fibroids after complaints of abnormal uterine bleeding and persistent pelvic pain. Imaging exams confirmed the presence of multiple fibroids of varying sizes and locations, highlighting the complexity of the clinical picture. Uterine fibroids originate from the smooth muscle cells of the myometrium and exhibit significant hormonal dependence, with overexpression of estrogen and progesterone receptors. These hormones stimulate tumor growth, which explains the predominance of this condition during the reproductive phase.[1,2] The variability in clinical presentation is striking: some women remain asymptomatic, while others, like the case in question, present severe symptoms that impact their quality of life.

The patient's diagnosis was confirmed by transvaginal ultrasound, which is highly sensitive in detecting and characterizing fibroids. The therapeutic decision included a surgical approach due to persistent symptoms and the impact on the patient's quality of life, with myomectomy being chosen to preserve the patient's reproductive potential. The surgical procedure was performed via Pfannenstiel laparotomy, a technique that provides adequate access to the uterus with aesthetic benefits for healing. In this way, 121 fibroids were removed, and surgical hysteroscopy was also performed, allowing the removal of diffuse endometrial polyposis using a resectoscope, complementing the approach and optimizing uterine conditions for future pregnancies.[3]

The preservation of the uterus, fallopian tubes, and ovaries was a crucial aspect of the management, considering the patient's desire to maintain fertility. Although myomectomy significantly improves symptoms and preserves reproductive function, it also requires rigorous follow-up due to the risk of fibroid recurrence and complications in future pregnancies, such as uterine rupture and hemorrhages.[4]

CONCLUSION

This case highlights the importance of an individualized therapeutic approach in the management of uterine myomatosis. The success of the surgery reflects the effectiveness of a multidisciplinary team

and modern techniques in treating complex gynecological conditions. Furthermore, it emphasizes the significance of options like myomectomy for patients who wish to preserve fertility, while also stressing the need for rigorous follow-up to ensure favorable reproductive and clinical outcomes. While conservative therapies are valid in less severe cases, well-planned surgical interventions remain essential in more challenging clinical scenarios, such as the one reported. The patient continues with regular follow-up to monitor for potential recurrences, considering the benign nature of the disease but its propensity for recurrence.

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Library Review: Romulo Arantes
Spell Check: Dario Alvares
Received: 26/11/24. Accepted: 26/11/24. Published in: 11/12/24.

GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67E25786
ISSN 0034-9585
e25786
SCIENTIFIC ARTICLE - CASE REPORT

ANESTHESIA FOR VIDEOLAPAROSCOPIC GASTROPLASTY IN A PATIENT WITH MORBID OBESITY WITH MONTGOMERY T-TUBE

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ABSTRACT

The Montgomery T-tube (MTT) is a silicone device used as a tracheal stent combined with a tracheostomy tube to prevent tracheal stenosis. The management of this device, the airways (AV) and mechanical ventilation (MV) of patients with TTM pose challenges to the anesthesiologist due to their relatively low frequency. In addition to the particularities conferred by the tracheal prosthesis, the patient in question underwent videolaparoscopic gastroplasty, which results in changes in respiratory mechanics and mechanical ventilation. This occurs both due to the increase in body mass and abdominal pressure resulting from obesity, and due to the inflation of the pneumoperitoneum.

Keywords: Obesity, Artificial respiration, Gastroplasty, Artificial intubation; Tracheal stenosis.

INTRODUCTION

The Montgomery T-tube (MTT) is a device introduced in 1960 that serves as a respiratory conduit and tracheal stent after laryngotracheoplasty. It is a silicone tube without a cuff, consisting of a long branch (intratracheal) and a short branch (extratracheal), extending through the tracheostomy stoma. Its sizes range from 4.5 to 16 mm in external diameter, allowing it to fit both adult and pediatric tracheas. The main indications for its use are post-laryngotracheoplasty (to keep the lumen open and prevent mucosal laceration due to scarring), tracheomalacia, recurrent polychondritis, post-tuberculous bronchostenosis, amyloidosis, tracheobronchial trauma, post-anastomotic bronchial stenosis, extrinsic compression, airway collapse, subglottic stenosis, and laryngotracheal reconstruction. [1-4]

Due to its infrequent use and the lack of familiarity associated with the device, the management of patients with the MTT (Montgomery T-tube) presents a challenge for anesthesiologists. The management of the device, the patient's airways (AW) with the MTT, and positive pressure ventilation during laparoscopic surgery are still underreported and not fully mastered.[4]

Among the difficulties encountered during the manipulation of the airways of these patients are

the possibility of displacements of the branches, due to the soft nature of the MTT, and the difficulty in maintaining controlled ventilation, as occlusion of the upper end of the intratracheal branch is required to prevent the loss of inspired gas. Additionally, standard catheter mounting connectors do not fit the shape of the MTT due to the variable internal diameter and the tube's thickness, which does not conform to the shape of the MTT. [1, 2]

In the preoperative evaluation, the feasibility of maintaining or the need to remove the MTT during the induction of general anesthesia should be assessed, in order to outline possible strategies for safely maintaining the patient's airway and methods for administering volatile agents and carrier gases.[2]

In addition to the careful assessment of whether to maintain or remove the MTT and the potential displacement during airway manipulation, attention should be paid to the ventilation of patients with this device. This is because, in addition to the narrowing of the airway passage, whether due to the need for a smaller diameter tube or the narrowing of the MTT itself, positive pressure, combined with the insufflation of the pneumoperitoneum, presents challenging characteristics in mechanical ventilation. This report aims to address the management of the MTT and the possible alterations encountered in mechanical ventilation during surgery and anesthetic monitoring in this class of patients.

CASE REPORT

A 31-year-old patient with grade 3 obesity (body mass index [BMI]: 49.13) and tracheal stenosis due to prolonged intubation during hospitalization for COVID-19 three years ago, with an MTT prosthesis (Figures 1 and 2) since then. The last prosthesis exchange was performed a year ago, with reports of significant desaturation and difficulty in performing the exchange. Bariatric surgery was indicated by a thoracic surgeon due to complications from the stenosis and recurrent exchanges of the Montgomery prosthesis, with the risk of developing respiratory complications, acute respiratory failure, and severe complications during prosthesis exchange due to obesity.

Figure 1: Extratracheal branch of the Montgomery T-tube.

Figure 2: Intratracheal branch of the Montgomery T-tube.

Echocardiogram within normal limits, ambulatory blood pressure monitoring and Holter without significant changes, electrocardiogram with sinus rhythm, duplex venous ultrasound of the lower limbs without changes, chest X-ray within normal limits, and total abdominal ultrasound showing marked hepatic steatosis.

In the airway assessment, the patient presented with Mallampati 1, upper lip bite test class 1, adequate cervical extension, cervical circumference greater than 40 cm, and an inter-incisor distance greater than 3 fingers. Positioning was performed with a specific pillow to align the oral, laryngeal, and pharyngeal axes, followed by pre-oxygenation with a mask (Figure 3). Peripheral venous puncture was performed with an 18G Jelco catheter. Monitoring included pulse oximetry, cardiograph, pneumatic cuff, bispectral index (BIS), gas analyzer, and capnography. The patient was admitted with a blood pressure of 160/90 mmHg, heart rate (HR) of 100 bpm, and 100% oxygen saturation.

Figure 3: Placement of pillow and pre-oxygenation with a facial O_2 mask with alignment of the oral, laryngeal, and pharyngeal axes.

Surgical planning for laparoscopic gastroplasty and anesthetic planning for general anesthesia with awake intubation via fiberoptic bronchoscopy, with assistance from the thoracic surgeon as a precaution for prosthesis mobilization (Figure 4). The patient was informed about the anesthesia and awake intubation, and was aware and cooperative. Topical anesthesia was performed in the oropharynx with 2% Lidocaine spray, followed by pre-oxygenation with a 100% O_2 facial mask. Sedation was performed with 10 mcg Sufentanil, 40 mcg Dexmedetomidine, and 10 mg Ketamine. A fiberoptic bronchoscopy was conducted for airway evaluation (Figure 5). Pre-oxygenation was resumed with 100% O_2.

Figure 4: Fiberoptic bronchoscopy with the patient awake.

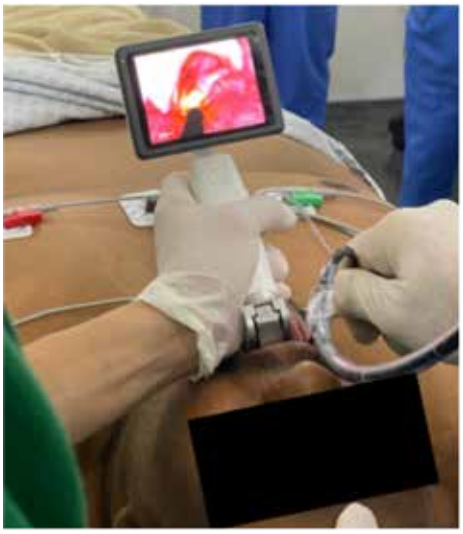

Figure 5: Video laryngoscopy with the patient awake.

After airway evaluation via video laryngoscopy, intubation was performed with bronchoscopy, assisted by the thoracic surgeon, with good visualization of the tracheal prosthesis. A 6-size cuffed tube was inserted with Lidocaine gel inside the MTT, with good patient tolerance, maintaining hemodynamic stability and hypoxemia up to 68%. After tube placement and cuff inflation, anesthetic induction was performed with 20 mg Ketamine, 50 mg Rocuronium, and 200 mg Propofol. After anesthetic induction, the patient remained hemodynamically stable, saturating 90-93%. An additional 50 mg of Rocuronium was administered at the start of the surgical procedure.

The patient maintained pressure-controlled ventilation during surgery with the following parameters: total flow of 2 liters, inspired oxygen fraction (FiO2) of 53%, respiratory rate (RR) of 14 breaths per minute (bpm), peak pressure of 32 mmHg, positive end-expiratory pressure (PEEP) of 4 cmH2O, expired volume of 600 ml, and an inspiratory:expiratory ratio of 1:2. Anesthesia maintenance was achieved with 1.1 MAC (minimum alveolar concentration) of Sevoflurane, maintaining an adequate anesthetic plan (monitored by BIS), with no need for additional doses of other anesthetics. Hemodynamic stability was maintained, and no vasoactive or vasopressor drugs were required.

At the end of the surgery, the patient was extubated in the operating room after the administration of 200 mg Sugammadex and adequate awakening guided by BIS, with no complications. The patient was maintained in the post-anesthesia recovery room (PACU) for two hours, receiving supplemental oxygen therapy via an oxygen mask (Figure 6).

Figure 6: Patient in PACU with supplemental oxygen therapy via O_2 mask.

DISCUSSION

Patients with morbid obesity present altered respiratory mechanics due to the increase in body mass, as well as a two to threefold increase in intra-abdominal pressure compared to eutrophic patients. When undergoing laparoscopy, with the insufflation of pneumoperitoneum and the increase in intra-abdominal pressure, they experience an even more pronounced alteration in respiratory physiology. In the reported case, in addition to these factors, the patient had a MTT, a device used after laryngotracheoplasty that is infrequently used and poorly reported, presenting challenges both in terms of managing the device, the airway of the patient with the MTT, and positive pressure ventilation for laparoscopic surgeries.[5]

The MTT is a silicone device without a cuff, consisting of a long branch (intratracheal) and a short branch (extratracheal), which extends through the tracheostomy stoma. When handling it, there is a possibility of displacement of the branches, and maintaining controlled ventilation is challenging due to the need to occlude the upper end of the intratracheal branch to prevent the loss of inspired gas.[1]

Due to the soft material of the tube, displacement of the upper or lower branches may occur during tube insertion and manipulation. The MTT has the disadvantage of not fitting standard catheter connectors, unlike standard tracheostomy tubes, due to its variable internal diameter and tube thickness. Ventilation through the extratracheal branch is ineffective because of the open upper end of the intratracheal branch, which causes air leakage, making it difficult to maintain controlled ventilation. To prevent the loss of inspired gas, the upper end of the intratracheal branch of the tube must be sealed. Connecting the extratracheal branch to the anesthetic circuit for mechanical ventilation, through endotracheal tube connectors, combined with concurrent occlusion of the intratracheal branch using a balloon catheter, is an option. However, there is no specific balloon catheter or connector for the MTT, which does not ensure proper coupling and reliability of the connection. [1, 2, 4]

For ventilation with a facial mask and bag valve, the extratracheal branch should be occluded. If a laryngeal mask is used, the occlusion of the extratracheal branch should be performed simultaneously. However, this is contraindicated in patients with a high risk of aspiration.[1,4] The option of inserting the endotracheal tube through the extratracheal branch into the lower lumen of the intratracheal branch would have the advantage of securing the airway with the patient awake, prior to anesthetic induction. However, this technique is not feasible due to the smaller internal diameter of the extratracheal branch compared to the intratracheal branch, requiring a smaller caliber tube. Furthermore, the insertion is made more difficult due to the 90-degree angle between the two branches of the MTT.[4]

The alternative used in the case report was the insertion of the endotracheal tube with a cuff via the intratracheal branch of the MTT. It is necessary to evaluate the internal diameter of the MTT to select the appropriate endotracheal tube. Small tubes may cause high airway pressure and low tidal volume, while larger tubes can make passage through the MTT difficult and may displace it. A tomography scan can be used to measure the diameter of the branches.[4]

The preparation for intubation should include the preparation of medications to ensure the patient's comfort and the safe and successful management of the airway. The administration of anticholinergic agents helps reduce secretions but may induce stickier secretions. Hypnotic anesthetics and sedatives should be used to ensure patient comfort while maintaining respiratory drive. Muscle relaxants are essential to facilitate the passage of the endotracheal tube with less resistance. Topical/regional anesthesia with local anesthetics also contributes to the success of intubation, as does the lubrication of endotracheal tubes. Holding the extratracheal limb reduces the risk of unexpected removal or displacement of the MTT during intubation and extubation. Another important consideration is the proper coupling of the endotracheal tube cuff to the intratracheal branch wall of the MTT, guided by bronchoscopy, to prevent both leakage and damage to the branch wall. Bronchoscopy should be performed after intubation and extubation, under the supervision of a thoracic surgeon or an otolaryngologist, to detect possible abnormalities of the trachea or MTT and to insert an emergency tracheostomy tube or reinsert the MTT if necessary.4 Additionally, it is important to discuss with the thoracic surgeon or otolaryngologist the need for removal or replacement of the MTT with a new MTT or endotracheal tube, or the placement of a tracheostomy tube if severe tracheal obstruction or restenosis is detected.[4]

Laparoscopic surgery in the obese population requires special attention due to physiological differences related to increased body mass. Respiratory mechanics in obese patients undergo significant changes. Respiratory system compliance decreases exponentially as body mass index (BMI) increases, while airway resistance and pressure rise. The increase in BMI and intra-abdominal pressure directly impact ventilation, potentially leading to alveolar collapse. As a result, atelectasis, decreased functional residual capacity, and ventilation/perfusion ratio changes contribute to reduced arterial oxygenation and are common factors in surgeries that require peritoneal insufflation.[4,5]

The insufflation of pneumoperitoneum during laparoscopy in obese patients can lead to the systemic absorption of carbon dioxide (CO_2) and an increased need for CO_2 elimination. The rise in intra-abdominal pressure increases venous stasis, reduces intraoperative portal venous blood flow, decreases intraoperative urine output, lowers respiratory compliance, raises airway pressure, and impairs cardiac function. Intraoperative management to minimize adverse effects includes appropriate ventilatory adjustments to prevent hypercapnia and acidosis, the use of sequential compression devices to reduce venous stasis, and the optimization of intravascular volume to mitigate the impact of

increased intra-abdominal pressure on renal and cardiac function.[5]

In cases of orotracheal intubation requiring thinner tubes, airflow is compromised, leading to increased resistance and higher peak airway pressure. This occurs because airflow resistance varies inversely with the fourth power of the tube's lumen radius, according to Poiseuille's Law. As a result, with a reduction in the velocity of inspiratory and, especially, expiratory flows for the same lung volume, the patient will exhibit an obstructive ventilation pattern.[8]

Obese patients, who are treated as restrictive patients during mechanical ventilation, may also develop airflow obstruction when undergoing surgery with thin-caliber tubes, further complicating their ventilation and oxygenation. To mitigate the rise in peak pressure, one alternative is to increase inspiratory time, as this reduces inspiratory flow, given that inspiratory time and flow are inversely proportional. As inspiratory time increases, the predetermined tidal volume is delivered to the lungs more slowly. However, increasing inspiratory time affects the inspiratory-to-expiratory ratio, leading to a reduction in expiratory time. This must be carefully monitored to ensure that expiratory pressure returns to predetermined PEEP values, preventing an increase in intrinsic end-expiratory pressure (auto-PEEP). Studies indicate a positive correlation between body mass index (BMI) and the occurrence of auto-PEEP, identifying BMI as a predictive variable for its development.[8]

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Library Review - Romulo Arantes/ Izabella Goulart
Spell Check: Dario Alvares
Received: 15/02/25. Accepted: 28/02/25. Published in: 11/03/25.

GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67E25535
ISSN 0034-9585
e25535
SCIENTIFIC ARTICLE - CASE REPORT

EVALUATION OF CARDIOLOGICAL PROFILE PARAMETERS IN PATIENTS UNDERGOING ORTHOPEDIC SURGERY AT A TERTIARY HOSPITAL IN GOIÁS AND ANALYSIS OF FACTORS ASSOCIATED WITH PERIOPERATIVE COMPLICATIONS

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ABSTRACT

Introduction: Perioperative cardiovascular assessment aims to identify increased risk of complications and adjust preventive measures. Physical limitations and the need for a rapid approach to the orthopedic patient restrict stratification. **Objective:** To evaluate the association between electrocardiographic (ECG) and laboratory changes, increased cardiovascular structures on chest radiography, length of hospital stay and high levels of morbidity and mortality. **Methods:** Patients underwent detailed history taking and physical examination. The risk profile was determined using the Multicenter Study for Perioperative Evaluation (EMAPO). Electrocardiographic alterations included blocks, presence of pathological Q waves, QRS > 150 ms, presence of atrial fibrillation and other arrhythmias. Analysis of chest radiographs determined the cardiothoracic ratio and the presence of mediastinal widening. Postoperative complications were considered as in-hospital death or length of hospital stay longer than 7 days and assessed using the Postoperative Morbidity Survey (POMS). **Results:** Eighty patients with a mean age of 79 years (54 to 100 years) were included, 46 of whom were women (57.5%). The overall mortality rate was 11.2% (14 deaths). The presence of isolated atrial and/or ventricular extrasystoles on the ECG ($p = 0.000$), advanced age ($p = 0.001$), reduced glomerular filtration rate ($p = 0.002$), length of hospital stay in the postoperative period ($p = 0.000$), EMAPO score with moderate to high risk ($p = 0.011$) and POMS score with involvement of sites other than cardiac decompensation ($p = 0.001$) were statistically significant, considering mortality. The mortality rate among those operated was 8.7%, and no patient died during the operation. Of all patients, 48.8% had decompensation in the perioperative period, the majority of which were nosocomial infections. **Conclusion:** The patient's clinical stability and the speed of surgical procedure are related to a better outcome. Conduction disturbances on the ECG, except for total atrioventricular block, as well as changes in the cardiac area and mediastinum were not associated with complications and do not suggest the need for progression in the investigation for surgical release.

Keywords: Perioperative care, Risk, Femoral fractures; Cardiology, Indicators of morbidity and mortality.

INTRODUCTION

The stratification of perioperative cardiovascular risk in non-cardiac surgeries allows for the identification of potential cardiovascular complications that increase morbidity and mortality, identifying more vulnerable patients and enabling the initiation of preventive measures to avoid complications in the immediate and late perioperative period[1]. However, excessive evaluation can lead to the misuse of resources and delays in the performance of surgical procedures.

Hip fracture is the most common type of fracture, especially among the elderly, associated with a high rate of morbidity and mortality, and with a significant impact on the quality of life of this population.[2]

At the Hospital de Urgência de Goiás (HUGO), surgery for hip fracture correction accounts for a large portion of hospital admissions. The timing of the surgery is considered critical for survival, with the recommendation that surgical treatment for acute hip fractures should occur within 24 hours of the trauma.[3]

Early intervention is associated with better outcomes during hospitalization, such as a reduction in the occurrence of pressure ulcers, infections, hospital length of stay, and mortality, as well as superior functional outcomes.[4] Preoperative exams help adjust clinical management and provide benefits for the patient, as well as predict postoperative complications. On the other hand, excessive testing can cause anxiety and delay in treatment, without leading to significant changes in clinical and surgical outcomes.[5]

Patients admitted to the Hospital de Urgência de Goiás for hip fracture correction were evaluated from November 2023 to November 2024, from the request for preoperative evaluation to the cardiology residency service, through to hospital discharge and any potential readmissions within a 30-day period.

The aim of this study was to evaluate the association between electrocardiographic changes, laboratory results, enlargement of cardiovascular structures on chest radiographs, length of stay for surgical procedure, and elevated levels of morbidity, mortality, or prolonged perioperative hospitalization.

METHODS

Patients with femur fractures admitted to the Hospital de Urgências de Goiás from November 2023 to November 2024 were included. Eligible for inclusion in the study were patients who underwent orthopedic interventions for primary femur fracture correction and for whom cardiovascular risk assessment was requested from the cardiology service of HUGO. After obtaining approval from the HUGO Research Ethics Committee, under number CAAE: 767243.6.0000.0033, patients were asked and informed about consenting to the inclusion in the research project. Patients who did not accept inclusion in the research protocol were evaluated according to the standard procedure of the cardiology service for cardiovascular surgical risk clearance. Patients showing signs of systemic inflammatory response syndrome (SIRS) or sepsis in the preoperative period requiring antibiotic therapy, as well as those showing signs of heart failure (class III/IV according to the New York Heart Association, NYHA) or elevated systolic blood pressure (SBP) above 160 mmHg or diastolic blood pressure (DBP) above 100 mmHg, or inadequate heart rate in atrial fibrillation above 100 bpm and requiring specific treatment, were also included in the study. Polytraumatized patients requiring surgical interventions at other orthopedic sites or organs were not included.

Cardiovascular Risk Assessment

Patients who accepted inclusion in the cohort underwent routine cardiovascular risk assessment, which consisted of detailed medical history and physical examination, a 12-lead electrocardiogram

(ECG), chest radiography, and laboratory tests including complete blood count, renal function, and electrolyte levels (sodium, potassium, magnesium). A transthoracic echocardiogram was performed in those who showed significant abnormalities on cardiac auscultation or ECG signs of atrial and/or ventricular overload, changes suggestive of ischemia in ventricular repolarization, or a QRS complex duration above 150 ms. Each individual's risk profile was determined using the Multicenter Study for Perioperative Evaluation of the São Paulo State Cardiology Society (EMAPO)[6], classifying them into low, moderate, high, and very high-risk categories. The electrocardiographic changes eligible for evaluation included atrioventricular and interventricular blocks, presence of pathological Q waves, QRS duration above 150 ms, presence of atrial fibrillation, and other arrhythmias. The analysis of chest radiography determined the cardiothoracic index (CTI)[7], which expresses the ratio between the size of the heart and the transverse dimension of the chest measured on a posteroanterior (PA) chest radiograph. A CTI value above 0.5 should be interpreted as indicating heart enlargement and mediastinal widening. The number of days between admission and the date of the surgical procedure was measured and correlated with the occurrence of complications.

The length of stay in the postoperative period was counted in days from the surgical procedure (D0) until hospital discharge or death. Postoperative complications were considered as in-hospital death or a length of stay exceeding 7 days. Early postoperative complications were assessed through the Postoperative Morbidity Survey (POMS)[8], which covers multiple organ and system involvement. The criteria considered in the POMS were obtained through medical history, physical examination, and review of medical records on the third and fifth day after the surgical procedure. The application of protocols and collection of all patient information involved in the research was carried out by cardiology residents or internal medicine residents who were involved with the cardiology service during the data collection period.

Statistical Analysis

The tabulation and statistical analysis were performed using Microsoft Excel®, version 2010. Quantitative variables were presented as means, standard deviations, minimums, and maximums. The distribution of these variables was analyzed using the Kolmogorov-Smirnov test, when necessary, for normality testing. Qualitative variables were presented as absolute numbers and proportions. The chi-square test was used when necessary. For continuous variables, comparisons were made using the Student's t-test. SAS® University Edition software was used for these calculations. A significance level of 5% ($p \leq 0.05$) was adopted.

RESULTS

Patients A total of 80 patients were included in the study, with a mean age of 79 years (ranging from 54 to 100 years), including 46 women (57.5%) and 34 men (42.5%). The overall mortality rate in this population was 11.2% (14 deaths) during the follow-up period. Among the variables analyzed, those that were statistically significant in relation to mortality included the presence of isolated atrial and/or ventricular extrasystoles on the 12-lead electrocardiogram (p: 0.000), age (p: 0.001), glomerular filtration rate (p: 0.002), length of stay in the postoperative period (p: 0.000), EMAPO score (p: 0.011), and POMS score (p: 0.001).

Considering the 80 patients assessed, ten were not operated on, with four of them dying before the procedure and six receiving conservative treatment.

The mortality rate among the operated patients was 8.75%, and no patient died during the intraoperative period. Among the total number of patients, 48.8% experienced decompensation during the perioperative period, with most cases being due to nosocomial infections. Only one patient experienced cardiac decompensation, and the surgical team opted for conservative treatment. Among those who experienced decompensation at any site during the hospitalization period, 32.5% progressed to death.

The time interval between the request and the release of the surgical risk by the Cardiology team was assessed, and 90% received a response within the first 24 hours after the request from the attending team, with 73.8% being cleared for the procedure. Patients who underwent the procedure without prior cardiological evaluation or before the formal definition of the risk had worse outcomes and increased mortality (p: 0.000).

In the postoperative period, after hospital discharge, about 10% of patients who underwent the surgical procedure required rehospitalization due to complications. Among them, the majority presented with surgical wound infection or infections at other sites (47.0%). Other complications included cardiac decompensation (1.6%) and venous thromboembolism (1.6%).

The data collected in this research are presented in Table 1.

Table 1. Sample Characterization and Association with Mortality.

Variables	All (n=80)	Mortality		p-value
		Yes (n=14)	No (n=66)	
Sociodemographic				
Age	79.0±11.7	88.2±7.2	76.9±11.6	0.001
Men	34 (42.5)	3 (21.4)	32 (48.5)	0.173
Women	46 (57.5)	11 (78.6)	34 (51.5)	
Clinical				
Comorbidities				0.917
None	27 (33.8)	3 (21.4)	24 (36.3)	
Hypertension	17 (21.3)	6 (42.8)	11 (16.7)	
NIDDM	3 (3.8)	0 (0)	3 (4.5)	
IDDM	3 (3.8)	0 (0)	3 (4.5)	
Dyslipidemia	0 (0)	0 (0)	0 (0)	
Previous stroke	1 (1.3)	1 (7.1)	0 (0)	
Previous myocardial infarction	2 (2.5)	0 (0)	2 (3.0)	
Severe valvulopathy	0 (0)	0 (0)	0 (0)	
≥ 2 comorbidities	22 (33.8)	4 (28.6)	23 (34.8)	
Electrocardiographic				
Chamber overload				0.161
RAO	0 (0.0)	0 (0.0)	0 (0.0)	
LAO	6 (7.5)	0 (0)	6 (9.1)	
Biatrial	1 (1.3)	0 (0)	1 (1.5)	
RVO	1 (1.3)	0 (0)	1 (1.5)	
LVO	6 (7.5)	1 (7.1)	5 (7.5)	
Biventricular	0 (0.0)	0 (0.0)	0 (0.0)	
None	66 (82.5)	13 (92.8)	53 (88.3)	
Interventricular blocks				0.861
None	61 (76.3)	10 (71.4)	51 (77.3)	
RBCD	1 (1.3)	0 (0)	1 (1.5)	
RBBB	4 (5.0)	1 (7.1)	3 (4.5)	
LBBB	2 (2.5)	0 (0)	2 (3.0)	
RBBB and ASDB	3 (3.8)	2 (14.2)	1 (1.5)	
ASDB	7 (8.8)	1 (7.1)	6 (9.1)	
LBCD	2 (2.5)	0 (0)	2 (3.0)	
Atrioventricular blocks				0.330
None	76 (95)	14 (100)	62 (93.9)	
1st degree AVB	4 (5)	0 (0)	4 (6.1)	
2nd degree AVB type 1	0 (0)	0 (0)	0 (0)	
2nd degree AVB type 2	0 (0)	0 (0)	0 (0)	
Complete AVB	0 (0)	0 (0)	0 (0)	
QRS duration				0.963
< 120ms	70 (87.5)	12 (85.8)	58 (87.9)	
120-150ms	9 (11.3)	2 (14.2)	7 (10.7)	
> 150ms	1 (1.3)	0 (0)	1 (1.5)	
				0.453

Pathological Q wave	72 (90)	13 (92.8)	59 (89.4)	
Absent	0 (0)	0 (0)	0 (0)	
Inferior	1 (1.3)	0 (0)	1 (1.5)	
Lateral	1 (1.3)	0 (0)	1 (1.5)	
Anterior	2 (2.5)	1 (7.2)	1 (1.5)	
Septal	4 (5)	0 (0)	4 (6.1)	
Two or more				0.153
Atrial fibrillation	3 (3.8)	1 (7.1)	2 (3.1)	
Paroxysmal	1 (1.3)	1 (7.1)	0 (0)	
Persistent	0 (0)	0 (0)	0 (0)	
First detected	0 (0)	0 (0)	0 (0)	
Long-standing persistent	1 (1.3)	0 (0)	1 (1.5)	
Permanent	75 (93.8)	12 (85.7)	63 (95.4)	
None				0.000
Other arrhythmias	67 (83.8)	6 (42.8)	61 (92.4)	
None	0 (0)	0 (0)	0 (0)	
Atrial flutter	5 (6.3)	1 (7.1)	4 (6.1)	
iVES, NSVT	7 (8.8)	6 (42.8)	1 (1.5)	
iAES, NSAT	1 (1.3)	1 (7.1)	0 (0)	
AE and VE				
Radiographic				0.062
Cardiothoracic index	54 (67.5)	6 (42.8)	48 (72.8)	
Normal	18 (22.5)	6 (42.8)	12 (18.2)	
Increased	5 (6.3)	1 (7.14)	4 (6.1)	
Poor quality of examination	3 (3.8)	1 (7.14)	2 (3.0)	
Not performed				0.959
Mediastinal enlargement	21 (26.3)	4 (28.6)	17 (25.7)	
Present	51 (63.8)	8 (57.1)	43 (65.1)	
Absent	5 (6.3)	1 (7.14)	4 (6.1)	
Poor quality of examination	3 (3.8)	1 (7.14)	2 (3.0)	
Not performed				
Laboratory				0.765
Hemoglobin	27 (34)	6 (42.8)	21 (31.8)	
> 12	38 (48)	4 (28.6)	34 (51.5)	
8-12	15 (19)	4 (28.6)	11 (16.7)	
< 8				0.310
Sodium	22 (27.5)	2 (14.3)	20 (30.3)	
< 135	56 (70)	11 (78.6)	45 (68.2)	
135-145	2 (2.5)	1 (7.1)	1 (1.5)	
> 145				0.784
Potassium	2 (2.5)	1 (7.1)	1 (1.5)	
< 3,5	77 (96.3)	12 (85.7)	65 (98.5)	
3,5-5,5	1 (1.3)	1 (7.1)	0 (0)	
> 5,5				**0.002**
Glomerular filtration rate	14 (17.5)	2 (14.2)	12 (18.2)	
> 90	28 (35)	3 (21.4)	25 (37.9)	
60-89	20 (25)	1 (7.1)	19 (28.8)	
45-59	13 (16.3)	3 (21.4)	10 (15.4)	
30-44	5 (6.3)	5 (35.7)	0 (0)	
15-29	0 (0)	0	0 (0)	
< 15				
Hospitalization time				0.055
Preoperative	2 (2.5)	0 (0)	2 (3.0)	
< 24h	2 (2.5)	0 (0)	2 (3.0)	
24-48h	11 (13.8)	3 (21.4)	8 (12.1)	
2-5 days	55 (68.8)	5 (35.7)	50 (75.7)	
> 5 days	10 (12.5)	6 (42.8)	4 (6.1)	
Not operated on				**0.000**
Postoperative	32 (40)	3 (21.4)	29 (43.9)	
< 48h	25 (31.2)	1 (7.1)	24 (36.4)	
2-7 days	12 (15)	3 (21.4)	9 (13.6)	
> 7 days	11 (13.8)	7 (50)	4 (6.1)	

	Not operated on			
Scores				**0.011**
EMAPO - Risk	1 (1.3)	0 (0)	1 (1.5)	
Very low	15 (18.8)	1 (7.1)	14 (21.2)	
Low	57 (71.3)	9 (64.3)	48 (72.7)	
Moderate	5 (6.3)	3 (21.4)	2 (3.0)	
High	2 (2.5)	1 (7.1)	1 (1.5)	
Very high				**0.001**
POMS	40 (50)	1 (7.1)	39 (59.1)	
No impairment	1 (1.3)	0 (0)	1 (1.5)	
Heart failure	39 (48.8)	13 (92.9)	26 (39.4)	
Impairment – other sites				
Evaluations				
Cardiology evaluation				
< 24h				0.583
24-48h	72 (90)	13 (92.9)	59 (89.4)	
> 48h	7 (8.8)	1 (7.1)	6 (9.1)	
Surgical risk clearance	1 (1.3)	0 (0)	1 (1.5)	
< 24h				**0.000**
24-48h	59 (73.8)	7 (50)	52 (78.8)	
> 48h	9 (11.3)	1 (7.1)	8 (12.1)	
Not cleared	7 (8.8)	1 (7.1)	6 (9.1)	
Time between risk clearance and surgery	5 (6.3)	5 (35.7)	0 (0)	
< 24h				
24-48h				
> 48h				0.602
	11 (15.7)	1 (14.3)	10 (15.1)	
Readmission	10 (14.3)	1 (14.3)	9 (13.6)	
No	49 (70)	5 (71.4)	43 (65.1)	
Yes (Infection)				
Yes (Heart failure/Arrhythmias)	47 (73.4)	12 (85.7)	48 (72.72)	
Yes (PTE/VTE)	3 (4.7)	2 (14.3)	1 (1.5)	
Yes (Other)	1 (1.6)	0 (0)	1 (1.5)	
No / No return for outpatient care	1 (1.6)	0 (0)	1 (1.5)	
	2 (3.1)	0 (0)	2 (3.0)	
	10 (15.6)	0 (0)	11 (16.7)	

Legend: NIDDM (Non-Insulin Dependent Diabetes Mellitus), IDDM (Insulin Dependent Diabetes Mellitus), CVA (Cerebrovascular Accident), AMI (Acute Myocardial Infarction), RVO (Right Ventricular Overload), LVO (Left Ventricular Overload), RAO (Right Atrial Overload), LAO (Left Atrial Overload), RBCD (Right Bundle Branch Conduction Disorder), RBBB (Right Bundle Branch Block), LBBB (Left Bundle Branch Block), ASDB (Anterosuperior Divisional Block), LBCD (Left Bundle Branch Conduction Disorder), AVB (Atrioventricular Block), iVES Isolated Ventricular Extrasystole), NSVT (Non-Sustained Ventricular Tachycardia), iAES (Isolated Atrial Extrasystole), NSAT (Non-Sustained Atrial Tachycardia), AE (Atrial Ectopies),VE (Ventricular Ectopies).

DISCUSSION

The fractures in the femoral neck are common injuries observed in the general population, especially among the elderly, responsible for a large portion of surgeries and hospital bed occupancy in orthopedic wards.[9] About 90% are secondary to falls, with a multifactorial etiology, including a combination of clinical comorbidities and environmental factors. Age-related factors, such as visual and cognitive impairment, gait and balance changes, loss of functional capacity, and drug use, contribute to events in this population.[10]

Characteristics related to the hospitalization period can have a significant impact on the patients' quality of life. In this study, all patients who died had a hospitalization period of more than two days before the procedure, with 11 out of 14 patients (78.5%) staying in the hospital for more than five days until the intervention or the surgical team's decision for conservative treatment. Morrissey et al. observed that for each hour of delay in femoral neck fracture surgery, the risk of mortality increases by 1.8%, becoming significant after 24 hours of hospitalization.[11]

Regarding the time for the cardiology team's evaluation and the release of surgical risks, 90% of the patients in the study were assessed in less than 24 hours, and 73.8% of the total assessed had their surgical risks cleared within 24 hours as well. On the other hand, 70% of the patients underwent femoral fracture correction surgery within 48 hours after the surgical risk was cleared. Lee et al. showed that if surgery is performed within the first 48 hours after the fracture, there are lower rates of perioperative complications.[12]

It was observed in this group that patients with more than one comorbidity did not have worse outcomes, which may be attributed to the number of patients assessed. In contrast to the resolution of the American Academy of Orthopaedic Surgeons, patients with more pre-existing comorbidities have a higher mortality risk when surgery is delayed for more than 48 hours.[13]

Surgical risk is related to specific factors of the patient and the surgery. There are several tools for perioperative risk assessment, such as EMAPO (Operated Patient Morbidity and Mortality Scale), Lee, NSQIP, ACS-SRC, among others, which will produce similar results when used correctly.[14]

For the assessment of surgical risk in this study, the EMAPO score was used (a Brazilian classification that evaluates 27 variables for estimating perioperative risk, which includes a detailed medical history, a comprehensive physical examination, and specific complementary tests), as shown in Annex 1. According to this score, 57 patients (71.25% of the total) had a score of 9 or higher, being classified as moderate risk. Of these, 9 patients progressed to death, representing 64.3%. Another score used was the POMS (a simple method for detecting and quantifying postoperative complications that prevent hospital discharge), where patients are evaluated in 9 domains (pulmonary, infectious, renal, gastrointestinal, cardiovascular, neurological, hematological, wound, and pain), shown in Annex 2[15]. Of the total number of patients assessed, 92.9% of the deaths had decompensation from non-cardiac sites.

The request for laboratory and imaging tests, such as chest radiography, echocardiogram, and electrocardiogram, should be made selectively, based on the patient's age, medical condition, planned procedure, and the likelihood that the results will alter treatment or aid in risk assessment. In most cases, there is no need to request routine or screening preoperative tests for patients who are clinically stable, especially if the patient is asymptomatic. There is data suggesting that preoperative tests increase costs and delay surgeries without improving outcomes16.[16]

Considering the laboratory tests requested in the preoperative period, as described in Table 1, both the hemoglobin and electrolyte (sodium and potassium) levels did not show significant alterations compared to baseline values that would impact the mortality rate. On the other hand, the glomerular filtration rate (GFR) evaluated, which includes creatinine values and the individuals' age, showed that 35.7% of the deaths had a GFR lower than 30 ml/min/1.73 m², with a significant p-value. Barbosa et al. evaluated 182 individuals with femur fractures and concluded that 57% had some preoperative complication, of which 14.3% had acute kidney injury and 18.7% had electrolyte disturbances, showing relevant alterations to the study.[17]

Electrocardiographic alterations such as chamber overload, intraventricular block, atrioventricular block, presence of pathological "Q" wave, duration of the QRS complex, and the presence of atrial fibrillation did not have relevance in the final outcome of patients undergoing surgical procedures, as can be seen in Table 1. On the other hand, 40% of the patients who died presented atrial arrhythmias (atrial ectopy or non-sustained atrial tachycardia) during hospitalization. Polanczyk CA et al. evaluated the incidence of supraventricular arrhythmias in 4,181 patients during the

perioperative period of non-cardiac surgeries and reported that it was a more common arrhythmia after surgery, with a 33% increase in both time and hospital stay.[18]

In this study, 45% of the patients underwent transthoracic echocardiography, and of these, 73.3% of the deaths had preserved ejection fraction. Studies show that performing a complete exam may cause an average delay of 1.6 days in the surgery, and the exam is not always available at the ideal time. Furthermore, most patients do not require any type of preoperative cardiological intervention, whether surgical or clinical.[19]

Karen et al. describe that performing transthoracic echocardiography significantly increases the time until surgery and does not improve patient survival, even if cardiac medical interventions were performed. It should be individually titrated for each patient according to perioperative risk.[20]

We observed that both early surgeries and early hospital discharge reduce the postoperative hospital stay time, in addition to preventing complications such as deep vein thrombosis, pulmonary embolism, and the risk of hospital-acquired infections. Other studies have also evaluated that the incidence of pulmonary infection, urinary tract infection, and deep vein thrombosis in the lower limbs was lower within 30 days in patients undergoing early surgery.[21]

The hospital readmission rate due to complications after the surgical procedure was 10%, of which only 1.6% had cardiac decompensation and 4.7% had infections (surgical site or other locations).

The main limitations of the study are described as follows. During the course of the project, including the period of data collection and patient follow-up, the hospital underwent an administrative reform, which altered the flow of admissions and surgeries, significantly impacting the sample size initially proposed. Additionally, some patients did not attend their post-discharge outpatient follow-up appointments, making it difficult to assess their postoperative condition.

CONCLUSION

The patient's clinical stability and the speed at which the surgical procedure is performed are related to better outcomes. Conduction disturbances on the electrocardiogram, except for total atrioventricular block, as well as changes in the cardiac and mediastinal areas, were not associated with complications and do not suggest the need for further investigation for surgical clearance. Among all the variables analyzed—age, glomerular filtration rate, presence of arrhythmias on the ECG (iAES, iVES, NSAT, NSVT), and postoperative hospitalization time—were linked to an unfavorable outcome. Patients classified as having moderate to very high cardiovascular risk by the EMAPO score had worse outcomes. Those with decompensation in other sites, according to the POMS score, were also associated with increased mortality.

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Library Review - Izabella Goulart
Spell Check: Dario Alvares
Received: 12/03/25. Accepted: 12/03/25. Published in: 25/03/25.

GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67E25524
ISSN 0034-9585
e25524
SCIENTIFIC ARTICLE - CASE REPORT

MATERNO-FETAL OUTCOMES OF WOMEN WITH DIABETES IN PREGNANCY ATTENDED AT A PUBLIC REFERENCE SERVICE IN THE CITY OF GOIÂNIA

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ABSTRACT

Introduction: Gestational diabetes and pre-pregnancy diabetes are conditions that can lead to significant complications for both the mother and the newborn. This study analyzed the maternal-fetal outcomes of 163 pregnant women diagnosed with diabetes treated at a public referral service in the city of Goiânia, with data collected between January 2023 and August 2024. **Objective:** To evaluate the main adverse maternal fetal outcomes related to gestational diabetes and diabetes mellitus prior to pregnancy. **Methods:** An observational, cross-sectional, analytical, and retrospective study was carried out with the objective of identifying the main maternal and neonatal complications and evaluating the efficacy of the diagnosis and treatment offered. **Results:** The results indicated that 58.3% of the pregnant women were diagnosed with gestational diabetes due to fasting glucose, and 50% had gestational hypertension as an associated comorbidity. Regarding obstetric outcomes, 50.3% of deliveries were cesarean sections, with failure to induce the main justification. Regarding newborns, 70% did not present neonatal complications, with 86.4% classified as having adequate weight for gestational age and 99.4% achieving good general conditions at the fifth minute of life (APGAR score between 7-10). **Conclusion:** The findings reinforce the importance of adequate prenatal care and effective glycemic control to minimize complications and improve maternal-fetal outcomes, especially in populations served by the public health system

Keywords: Gestational diabetes, maternal-fetal outcomes, prenatal care, public health, neonatology.

INTRODUCTION

Diabetes is the most common endocrinopathy during pregnancy, with a prevalence ranging from 3% to 25%, depending on the ethnic group, population, and diagnostic criteria used[1]. In Brazil, it is estimated that the prevalence of diabetes during pregnancy is around 18%[1]. Hyperglycemia during pregnancy is classified into four groups: type 1 and type 2 diabetes mellitus, pre-existing diabetes mellitus diagnosed during pregnancy (overt diabetes), and gestational diabetes mellitus.[2]

The development of diabetes includes factors such as insulin resistance, hormonal and metabolic changes during the adaptation of the body to fetal needs, as well as genetic and nutritional factors.[3]

Type 1 diabetes is associated with autoimmunity and the destruction of pancreatic β cells, which are

responsible for insulin production.[2] The disease typically manifests in children and adolescents, but it can be diagnosed in adulthood and is classified as latent autoimmune diabetes in adults (LADA)[4], with treatment consisting of exogenous insulin administration. In contrast, type 2 diabetes accounts for 90 to 95% of cases and is characterized by peripheral insulin resistance and partial deficiency in hormone production.[4]

Gestational diabetes mellitus (GDM) refers to transient hyperglycemia during pregnancy and is characterized by the functional incapacity of maternal pancreatic β cells to meet the insulin needs required for fetal development.[5] Additionally, pregnancy is marked by increased production of placental lactogen, cortisol, prolactin, and other counter-regulatory hormones that reduce the effectiveness of insulin in the body.[6]

In Brazil, it is recommended that all pregnant women undergo fasting blood glucose testing during their first prenatal visit, preferably in the first trimester. A value of ≥ 126 mg/dL or HbA1c ≥ 6.5% is characterized as pre-existing diabetes with a diagnosis during pregnancy (overt DM). In the case of fasting glucose values between 92 mg/dL and 125 mg/dL, the patient is diagnosed with gestational diabetes.[1,4]

In the case of pregnant women without a prior diagnosis of diabetes, i.e., with initial tests within normal limits, they should undergo an oral glucose tolerance test (OGTT) between the 24th and 28th week of gestation. The reference values for this test are: fasting glucose ≥ 92 mg/dL, glucose 1 hour after ingesting 75g of glucose ≥ 180 mg/dL, and glucose 2 hours after ingestion ≥ 153 mg/dL, with only one altered value being necessary for diagnosis.[1]

Regarding treatment, the initial measures include lifestyle changes, dietary adjustments, and physical activity. In women with pre-gestational type 1 or type 2 diabetes or gestational diabetes (GDM) who do not achieve good glycemic control with the aforementioned measures, pharmacological treatment should be initiated after 1-2 weeks of initial management. Approximately 15% to 60% of diabetic pregnant women require insulin in addition to initial measures for disease control.[5]

According to the American Diabetes Association (ADA, 2019), the expected glycemic values during treatment are: fasting glucose (GJ) < 95 mg/dL, postprandial glucose 1 hour after eating < 140 mg/dL, and postprandial glucose 2 hours after eating < 120 mg/dL. 7 Glucose measurements should be maintained throughout the pregnancy until delivery. Inadequate control is considered when 30 to 50% of the glycemic measures are abnormal.[8]

The treatment of poorly controlled diabetes with initial measures can be done with subcutaneous insulin or oral antidiabetic drugs. The insulin regimen is the most studied and can be administered with rapid-acting, ultra-rapid, intermediate, and long-acting subcutaneous insulin or by continuous insulin infusion. Pregnant women who were already using insulin before pregnancy should receive a lower dose of medication during the first trimester, with the dose potentially increasing between the 18th and 24th week. In the third trimester, due to the action of counter-regulatory hormones on insulin, an increase in dosage may be necessary based on the evaluation of fetal growth during the third trimester.[7,9]

Oral antidiabetic drugs (OADs) may be considered in some special situations, such as when adherence to or access to insulin is not feasible, and in cases of severe hyperglycemia that is not controlled with high doses of insulin, in addition to offering greater dosing convenience.[8,10] Some of the drugs studied include metformin and glibenclamide for treating gestational diabetes. A meta-analysis compared the use of metformin and insulin in pregnant women with gestational diabetes, showing that oral antidiabetic therapy was successful as monotherapy in 66% of cases.[10]

The presence of diabetes during pregnancy is associated with worse maternal and fetal outcomes. Among some of these fetal complications, the following stand out: spontaneous abortion, maternal and perinatal mortality, birth trauma, macrosomia, jaundice, infections, congenital malformations, perinatal asphyxia, hypoglycemia, and neonatal respiratory distress syndrome. Maternal complications include hypertension, preeclampsia, polyhydramnios, preterm labor, premature rupture of membranes, and an increased cesarean section rate.[5,7,9]

Diabetes is not an absolute indication for cesarean delivery. In patients with good glycemic control, the route of delivery is obstetric. According to the protocols of the American Diabetes Association (ADA, 2019), the recommendations are as follows: in women with well-controlled GDM through diet and physical activity, delivery should occur between 39 weeks and 40 weeks and 6 days; in women with well-controlled GDM on medication, delivery should occur between 39 weeks and 39 weeks and 6 days; women with pre-existing diabetes before pregnancy should be monitored starting at 37 weeks and, if glycemic control remains good, can reach 39 weeks. Delivery may be accomplished through labor induction or cesarean section, depending on medical indications.[11]

It is known that the main risk factor for the development of type 2 diabetes and metabolic syndrome in women is a history of GDM. In this context, it is clear that hyperglycemia during the pregnancy-puerperal cycle constitutes a significant public health issue, not only due to worse perinatal outcomes but also because of the increased risk of future diseases, following the obesity epidemic observed in several countries.[11]

The objective of this study is to identify maternal and fetal outcomes in women with diabetes treated at a public healthcare service in Goiânia.

METHODOLOGY

This is an observational, cross-sectional, analytical, and retrospective study. The research was conducted at the Hospital e Maternidade Dona Íris (HMDI), located at Av. Emílio Póvoa, number 165, Goiânia – Goiás.

The study was conducted using the database provided, which contains 163 (one hundred and sixty-three) observations with information about the pregnant women, deliveries, and newborns. Data were collected between January 2023 and August 2024 from medical records available in the Tasy system. The sample included pregnant women diagnosed with gestational diabetes or pre-existing diabetes who had their deliveries performed at HMDI.

Pregnant women who were transferred to other units and did not deliver at the Hospital e Maternidade Dona Íris, as well as medical records with incomplete data, were excluded from the sample.

For the preparation of the report, the database of the pregnant women was used, excluding the names of the participants. The observed variables were:

- Age;
- Obstetric History (GRAVIDA/PARA);
- Gestational Age;
- Diabetes Diagnosis;
- Treatment;
- Delivery;
- Cesarean Section Reason;
- Other Comorbidities;

• APGAR Score;
• Fetal Weight;
• Neonatal Intercurrences;

Five variables needed transformation. The gestational age was initially in text format and was converted into numerical values. The GRAVIDA/PARA variable was in code format (e.g., "G3P1N1CA1"). This was split into six columns to represent the information in the code, such as the number of pregnancies, number of deliveries, number of cesarean sections, and number of live births. Gestational age was also initially in text format and was converted to numerical values. The delivery variable was separated into cesarean and normal deliveries, and for better analysis, it was consolidated into a single variable. The APGAR scores were recorded in columns corresponding to the first minute and the fifth minute of life.

The database contains 16 variables. The quantitative variables are: Age of the pregnant women; number of pregnancies; number of births; number of cesarean sections; number of live births; number of abortions; gestational age; APGAR at 1 minute; and APGAR at 5 minutes. The qualitative variables are: Diabetes diagnosis; treatment; type of delivery; reason for cesarean section; other comorbidities; fetal weight; and neonatal complications.

Descriptive statistics were used to assess the outcomes of the conditions of the pregnant women, the deliveries, and the neonates. Additionally, a chi-square test was applied to check the association between qualitative variables, and a correspondence plot was used to observe which categories of the fetal weight variable and diabetes diagnosis are related.

The chi-square test is calculated using the formula:

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where,
r is the number of rows (categories of variable A),
c is the number of columns (categories of variable B),
Oij is the observed frequency in the (i,j) cell,
Eij is the expected frequency in the (i,j) cell.

The correspondence analysis, in turn, is a multivariate statistical technique used to explore and visualize relationships between categories of qualitative variables.

All analyses were performed using Microsoft Excel and the R software with the following packages: readxl, dplyr, ggplot2, ade4, sjPlot, and reshape2. The next section presents the results of the exploratory data analysis.

RESULTS

The results were divided into the profile of the pregnant women, obstetric profile, and neonatal profile. Additionally, an association test between qualitative variables was conducted.

Profile of the Pregnant Women

The participants in the study range in age from 15 to 45 years, with 75% of the women being younger than 33 years old. The average age is 28.02, as shown in Table 1.

Table 1: Summary statistics of the pregnant women's age

Measure	Years
Minimum Value	15
First Quartile	22
Median	27
Median	28.02
Third Quartile	33
Maximum Value	45

Source: Compiled by the authors

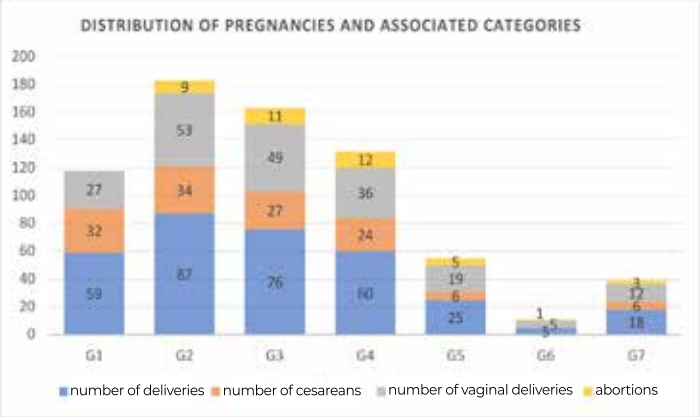
To understand the diabetes diagnosis of the patients, their reproductive history was examined. The analysis will be based on the number of pregnancies each of the 163 women had throughout their life. Table 2 shows the occurrence of pregnancies.

Table 2: Frequency distribution of pregnancies per woman

Number of Pregnancies	Number of Women
1	59
2	47
3	29
4	18
5	6
6	1
7	3

Source: Compiled by the authors

It is possible to observe that 36.8% of women had one pregnancy, and as the number of pregnancies increases, the number of women decreases. In Figure 1, based on the number of pregnancies, we can observe the other categories of the obstetric history.



Source: Compiled by the authors

Figure 1: Distribution of pregnancies and associated categories

It is noticeable that the number of cesarean sections decreases in women who have had two or more pregnancies. The rate drops from 54.23% for women with one pregnancy to 39.08% for those with two, 35.52% for those with three, 40% for those with four, 24% for those with five, 0% for those with six, and 33.3% for those with seven.

With this history, the majority of the pregnant women in the study were diagnosed with Gestational Diabetes Mellitus (GDM) by Fasting Blood Glucose (FBG), 58.3%. Following that, GDM was diagnosed through the Oral Glucose Tolerance Test (OGTT). The condition that can be considered chronic, such as Overt or Type 1 and Type 2 Diabetes Mellitus, occurred in 4 (2.5%) patients.

Table 3: Diabetes diagnosis in the sample

Diabetes	Outcomes
Gestational Diabetes Mellitus (GDM)	95 (58.3%)
Gestational Diabetes identified by Oral Glucose Tolerance Test (OGTT)	50 (30.7%)
Overt Diabetes Mellitus (Overt DM)	9 (5.5%)
Type 2 Diabetes Mellitus	5 (3.1%)
Type 1 Diabetes Mellitus	4 (2.5%)

Source: Compiled by the authors

In addition to diabetes, other comorbidities were reported, but not by all patients. The most frequent condition among these diseases was hypertension, with a higher number of cases being gestational hypertension, but chronic hypertension was also observed. Table 4 presents the occurrences of the other described comorbidities.

Table 4: Other comorbidities reported by the pregnant women

Comorbidities	Outcomes
Gestational Hypertension (GH)	18 (50%)
Hypothyroidism	7 (19.4%)
Chronic Hypertension (CH)	4 (11.1%)
Preeclampsia	3 (8.4%)
CH + Hypothyroidism	1 (2.8%)
Intrauterine Growth Restriction (IUGR)	1 (2.8%)
GH + Preeclampsia	1 (2.8%)

Source: Compiled by the authors

For the treatment of diabetes, three different forms of treatments were identified, as well as patients without follow-up (control).

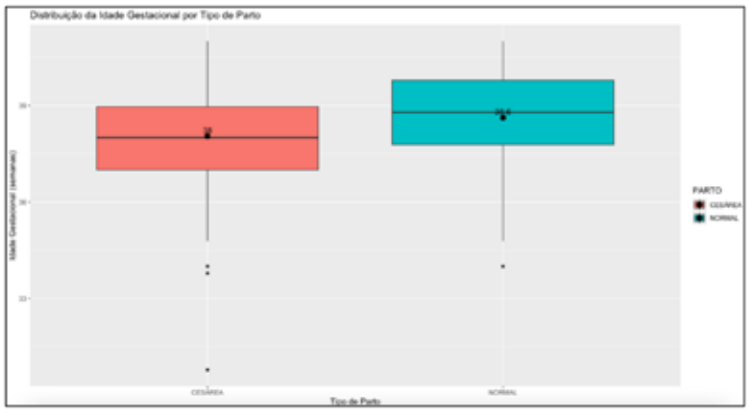
Table 5: Types of treatment

Treatment	Outcomes
Not Diagnosed Gestational Diabetes Mellitus	56 (34.4%)
Diet, No Control	38(23.3%)
Diet, Well Controlled	36 (22.1%)
Metformin, No Control	10 (6.1%)
Insulin, Well Controlled	10 (6.1%)
Insulin, Poorly Controlled	6 (3.7%)
Insulin, No Control HbA1c	6 (3.7%)
Type 2 Diabetes Mellitus (DM2), No Treatment	1 (0.6%)

Source: Compiled by the authors

Obstetric Profile

Among the deliveries in the study, 82 (50.3%) were cesarean sections and 81 (49.7%) were vaginal births. Regarding gestational age, on average, women who had a cesarean section were at 38 weeks of pregnancy, while those who opted for a vaginal birth were at 38.6 weeks.



Source: Compiled by the authors

Figure 2: Distribution of gestational age by type of delivery

The main justification for performing a cesarean section, at 11.1%, was due to induction failure. This is the most frequent reason for cesarean procedures. What the data show is that the variety of reasons for cesarean sections was the rule in this sample of pregnant women with diabetes.

Table 6: Obstetric outcome profile: Reasons for cesarean sections

Reasons for Cesarean Sections	Outcomes
Induction Failure	15 (1..9%)
Maternal Desire	11 (8.7%)
Fetal Distress	8 (6.3%)
Cessation of Progression	7 (5.6%)
Fetal Tachycardia	6 (4.8%)
Iterativity and GDM	6 (4.8%)
Previous Cesarean Section and GDM	4 (3.2%)
Breech Presentation	2 (1.6%)
Severe Preeclampsia	2 (1.6%)
Fetal Bradycardia	1 (0.8%)
Previous Cesarean Section + IUGR + GDM	1 (0.8%)
Previous Cesarean Section + Roprema	1 (0.8%)
Previous Cesarean Section + GDM + GH	1 (0.8%)
Early IUGR	1 (0.8%)
GDM Uncontrolled + Iterativity + Severe PE	1 (0.8%)

Placental Abruption	1 (0.8%)
Centralized Fetus	1 (0.8%)
Twin Pregnancy	1 (0.8%)
Iterativity + Type 1 DM	1 (0.8%)
Iterativity + Overt DM + GH	1 (0.8%)
Prosencephaly	1 (0.8%)
Previous Cesarean Section + DM and Severe PE	1 (0.8%)
Intrapartum Deceleration	1 (0.8%)
Undiagnosed GDM + Cesarean Section <18 Months	1 (0.8%)
Twin Pregnancy + Overt DM	1 (0.8%)
FM + GDM + Uncontrolled GH	1 (0.8%)
Iterativity + Uncontrolled Overt DM	1 (0.8%)
Fetal Death + 28 Weeks + Iterativity	1 (0.8%)

Source: Compiled by the authors

In the normal deliveries, 42 patients required induction to begin or accelerate the process, as shown in Table 7.

Table 7: Obstetric outcome profile: Reasons for normal deliveries

Reasons for Normal Delivery	Outcomes
Normal delivery after induction	42 (33.3%)

Source: Compiled by the authors

Almost 70% of the births from patients with diabetes during pregnancy had no complications. When complications were diagnosed, pulmonary issues and bilirubin accumulation in the blood were the most frequent.

Tabela 8: Desfechos ao Nascimento: Intercorrências

Complications	Outcomes
None	123 (75.4%)
Respiratory Distress Syndrome	12 (8.76%)
Jaundice	11 (8.16%)
Transient Tachypnea of the Newborn	4 (1.86%)
Respiratory Distress Syndrome and Jaundice	3 (1.26%)
Shoulder Dystocia	3 (1.26%)
Neonatal Intensive Care Unit (NICU)	1 (0.06%)
Caudal Regression Syndrome	1 (0.06%)
Respiratory Distress Syndrome, Jaundice, and Malformations	1 (0.06%)
Intrauterine Fetal Death	1 (0.06%)
Microcephaly	1 (0.06%)
Cardiac Malformation, Brain Malformation, Neonatal Respiratory Distress Syndrome	1 (0.06%)
Neonatal Asphyxia and Neonatal Respiratory Distress Syndrome	1 (0.06%)

Source: Compiled by the authors

The newborns were born with an appropriate weight for gestational age in 86.4% of cases. Out of the 163, only 6 (3.7%) were below the 10th percentile and 16 (9.9%) were above the 90th percentile.

Table 9: Birth outcomes: Fetal weight

Fetal Weight	Outcomes
Appropriate for Gestational Age (AGA)	140 (86.4%)
Large for Gestational Age (LGA)	16 (9.9%)
Small for Gestational Age (SGA)	6 (3.7%)

Source: Compiled by the authors

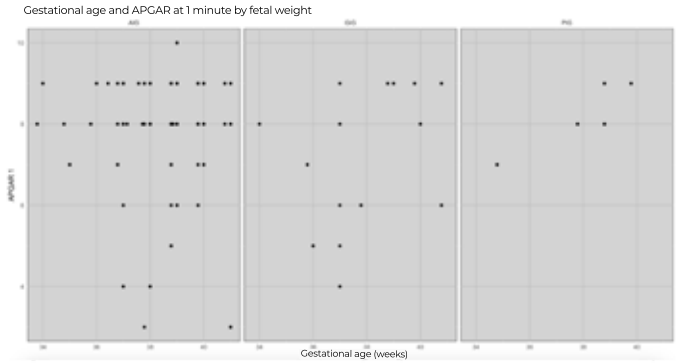
In the APGAR evaluation, which aims to determine the health condition of the newborn and the need for medical assistance, the outcomes are described in Table 10. One important note should be made regarding the APGAR scores at the first and fifth minutes of life. In one case, a value of 0 was recorded for both the first and fifth minute APGAR due to intrauterine fetal death, which was noted in the complications. An APGAR score between 7 and 10 is considered a healthy newborn with good vitality, an APGAR score between 4 and 6 indicates a moderately depressed condition due to moderate asphyxia, and an APGAR score between 0 and 3 indicates a critical condition with severe asphyxia.

Table 10: Birth outcomes: APGAR

APGAR 1 Minute	Outcomes
Healthy condition	148 (90.8%)
Moderately depressed condition	12 (7.4%)
Critical condition	3 (1.8%)
APGAR 5 Minutes	**Outcomes**
Healthy condition	162 (99.4%)
Critical condition	1 (0.6%)

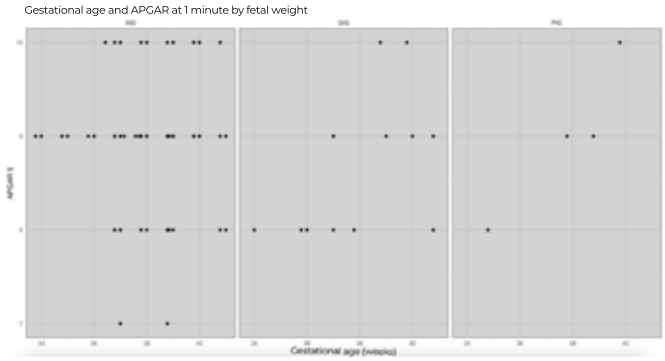
Source: Compiled by the authors

Figures 3 and 4 compare gestational age with APGAR at the first and fifth minutes by fetal weight. In this analysis, one observation was excluded because there was no record of weight. As mentioned in the previous paragraph, the reason for the absence of the data was due to intrauterine fetal death.



Source: Compiled by the authors

Figure 3: Gestational age and APGAR at 1 minute by fetal weight



Source: Compiled by the authors

Figure 4: Gestational age and APGAR at 5 minutes by fetal weight

Figure 4 (APGAR at 5 Minutes) demonstrates that even newborns with weight above the 90th percentile and below the 10th percentile had an APGAR score of 10.

Source: Compiled by the authors

Figure 5: Heatmap of neonatal complications by average gestational age and fetal weight

Figure 5 shows neonatal complications based on fetal weight and average gestational age, excluding fetal intrauterine death. The blue-shaded blocks indicate where the complication is observed at the corresponding birth weight. The color gradient ranges from darker to lighter tones, with lighter shades representing pregnancies near 40 weeks and darker shades corresponding to an average gestational age of about 34 weeks.

Chi-Square Test for Association Between Qualitative Variables

To assess the association between two qualitative variables, the chi-square test was used for the variables: Diabetes Diagnosis, Type of Delivery, Treatment, and Neonatal Complications. The results are presented in Table 1.

The hypotheses are formulated as follows:

Null hypothesis (H_0): The variables are independent (not associated).

Alternative hypothesis (H_1): The variables are dependent (there is an association).

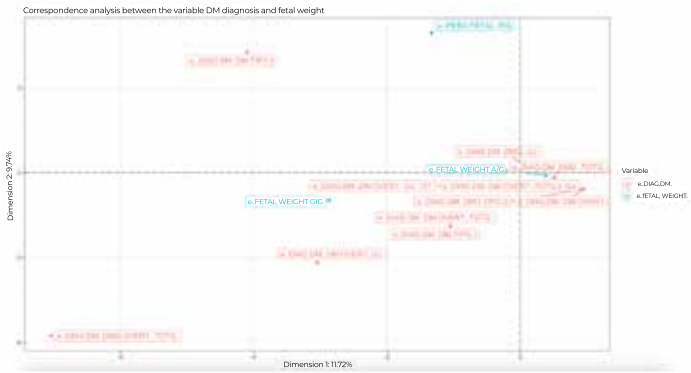
We reject H_0 at a 5% significance level.

Quadro 1: Results of the Chi-square association tests

Tested Hypotheses	p-value	Decision
Neonatal Complications vs Treatment	0.036	The variables are associated
Treatment vs Fetal Weight	0.060	The variables are not associated
Diabetes Diagnosis vs Fetal Weight	0.04844	The variables are associated
Diabetes Diagnosis vs Neonatal Complications	0.003286	The variables are associated

Source: Compiled by the authors

We can verify which categories of the variables are most associated through correspondence analysis. Since the variables in the study have many categories, we will present this only for the chi-square test of association between Diabetes Diagnosis and Fetal Weight, which was statistically significant.



Source: Compiled by the authors

Figure 6: Correspondence Analysis between the variable Diabetes Diagnosis and Fetal Weight

Figure 6 shows that AGA fetal weight AGA has a strong association with the diabetes diagnosis GDM (FBG), GDM OGTT, OVERT DM (OGTT and FBG) and DM Type 2. SGA Fetal weight shows an association, but with a weaker strength, with DM Type 2, while LGA fetal weight GIG also has a weaker association in intensity with DM OVERT and DM Type 1.

DISCUSSION

According to the Brazilian Society of Diabetes (SBD, 2022), one of the risk factors associated with the development of diabetes is advanced age, over 35 years.[1] In the research conducted at the maternity hospital, the majority of pregnant women were in the average age range of 28.02 years, with 75% of the women being younger than 33 years. This could be related to the lack of preconception planning and the increasing rates of metabolic syndrome in younger patients.

The pathophysiology of gestational diabetes is related to the physiological changes during pregnancy that increase glucose consumption and counterregulatory hormones. Additionally, both gestational diabetes and pre-existing diabetes are associated with a high risk of adverse maternal and fetal outcomes. Therefore, it is essential to correctly diagnose this condition during prenatal care, in the first trimester with fasting blood glucose and in the second trimester with the oral glucose tolerance test (OGTT). In this study, it was found that the majority of patients diagnosed with gestational diabetes (58.3%) were diagnosed through fasting blood glucose alterations, while 28.2% were diagnosed through the OGTT. Around 9 women (5.5%) were diagnosed with type 2 diabetes during pregnancy (overt DM), while 3.1% had already been diagnosed with type 2 diabetes and 2.5% had type 1 diabetes.

Approximately 56 women (34.4%) were diagnosed with diabetes at the time of hospital admission, and therefore, did not receive proper prenatal care. Among the diagnosed patients, 74 patients were identified who underwent the first-line treatment for gestational diabetes, which involves changes in diet and lifestyle. However, only 22.1% achieved good glycemic control. Among the pregnant women who required pharmacological treatment, around 13 women used insulin, of whom 6.1% achieved good glycemic control,

3.7% were poorly controlled, and 3.7% did not perform capillary blood glucose measurements. As for patients using metformin (6.1%), none performed any glycemic control. Additionally, one patient diagnosed with type 2 diabetes did not undergo any treatment.

In the short term, diabetes leads to the development of additional complications during pregnancy and becomes a risk factor for other comorbidities, with hypertension being the most common.[1,10] Among the 163 patients analyzed, 35 women presented other comorbidities during pregnancy, with 50% diagnosed with gestational hypertension (GH), followed by hypothyroidism (19.4%), chronic hypertension (11.1%), pre-eclampsia in 11.2% of cases, and 2.8% with intrauterine growth restriction (IUGR), which was strongly associated with women with pre-existing diabetes, a condition due to the vasculopathy observed in these patients.

The timing of pregnancy termination will depend on the pregnant woman's glycemic control and the type of treatment used. For patients who made changes to their diet and lifestyle and achieved good glycemic control, delivery can be performed between 39 weeks and 40 weeks and 6 days. In women with well-controlled diabetes using medication, delivery can occur between 39 weeks and 39 weeks and 6 days. For patients with pre-existing diabetes, the goal is to reach full term (37 weeks) and not exceed 39 weeks11. In contrast, patients who did not perform the glucose curve during prenatal care or did not achieve good control even with treatment may have the pregnancy terminated starting at 37 weeks. In the present study, the average gestational age for termination was between 38 weeks and 38 weeks and 6 days.

Regarding the mode of delivery, although diabetes is not an absolute indication for cesarean section, 82 (50.3%) women required the procedure. The main reasons for cesarean section were failure of induction of normal labor, followed by maternal request (7.9%); fetal distress (not detailed in the medical record) (6.3%); failure to progress in labor (5.6%); fetal tachycardia (4.8%); patients with a previous cesarean section, with or without other comorbidities, who did not desire vaginal delivery (4.8% of the sample); and women with 2 or more cesarean sections (repeat cesarean section), accounting for 8% of the sample.

Regarding the neonatal outcome, the results show that about 70% of newborns from mothers with diabetes did not present neonatal complications, which is a positive finding, as it indicates that most births occurred without immediate complications. However, the most frequent complications observed among neonates were respiratory distress syndrome (RDS) in 6.76% of the sample, which is attributed to prematurity and hyperinsulinemia that delays surfactant production. Jaundice was observed in 6.16% of cases, due to the increased production of red blood cells resulting from the hyperglycemic environment. These findings are consistent with the literature that describes these conditions as common in newborns of diabetic mothers.[1,12]

Regarding diabetes and fetal weight, in the present study, it was possible to verify that the majority of newborns (86.4%) were appropriate for gestational age (AGA), which is an important finding for neonatal prognosis, as AGA weight is often associated with better neonatal outcomes.

The analysis of the APGAR score revealed that the vast majority of newborns received APGAR scores between 7-10 in the first minute (90.8%) and the fifth minute (99.4%), suggesting good adaptation to the extrauterine environment. The APGAR score in the first minute showed that, despite many newborns presenting good conditions at birth, some were still classified as moderately depressed (APGAR 4-6) or critically depressed (APGAR 3-0), which may reflect episodes of asphyxia or initial respiratory difficulties, especially among neonates with low birth weight or pulmonary complications.

An important observation regarding the APGAR score in the first minute is the difference compared to the APGAR score in the fifth minute, which shows an overall improvement in the condition of the newborns after the first minutes of life. This finding can be explained by the time needed for newborns to adjust to air

breathing after birth, especially in cases of transient respiratory disturbances, such as transient tachypnea of the newborn, which was observed in 1.86% of the cases.

CONCLUSION

This study highlights the complexity of gestational diabetes (GDM) and its implications for both pregnant women and newborns. The analysis reveals that most pregnant women diagnosed with gestational diabetes did so late, emphasizing the importance of proper prenatal care to prevent complications. Although lifestyle modifications and diet represent the first line of treatment, a significant portion of the pregnant women required medications such as insulin or metformin, with adequate glycemic control being achieved by a minority.

Regarding maternal complications, a high incidence of associated comorbidities was observed, such as gestational hypertension and hypothyroidism, in addition to an increased risk of cesarean section. For the newborns, although most presented with good APGAR scores, respiratory complications like respiratory distress syndrome and jaundice were common, especially among babies of mothers with diabetes. The risk of excessive fetal growth and the impact of hyperinsulinemia were also highlighted, with a significant portion of the newborns being classified as large for gestational age.

Therefore, the results reinforce the need for early diagnosis and rigorous monitoring during pregnancy, with appropriate treatment strategies to ensure the health of both the woman and the newborn. Proper management of gestational blood sugar, coupled with careful handling of comorbidities, is crucial to minimize risks and improve maternal and neonatal outcomes.

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Library Review - Romulo Arantes/ Izabella Goulart

Spell Check: Dario Alvares
Received: 15/02/25. Accepted: 28/02/25. Published in: 18/03/25.

GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67E24240
ISSN 0034-9585
e24240
SCIENTIFIC ARTICLE - CASE REPORT

EXTENSIVE UTERINE MYOMATOSIS IN A WOMAN WITH SPINAL MUSCULAR ATROPHY: CASE REPORT

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ABSTRACT

Uterine fibroids, the most prevalent benign tumors in the female pelvis and common in women of reproductive age, have variable characteristics and are influenced by hormonal factors, such as estrogen and progesterone. This report describes the case of a 43-year-old female patient with a large uterine fibroid associated with spinal muscular atrophy (SMA) type II. The patient was at high surgical risk due to severe ventilatory disorders and restricted mobility. After diagnosis by pelvic ultrasound, she underwent total abdominal hysterectomy and bilateral salpingectomy. Surgery revealed a myomatous uterus comparable to a 7-month gestation, weighing 1340 g. The anatomopathological examination identified a myometrium with leiomyoma, secretory endometrium and chronic cervicitis, with no signs of malignancy. The study reinforces the relevance of early diagnosis and individualized management of uterine fibroids, especially in cases associated with challenging health conditions such as SMA.

Keywords: Leiomyoma, Hysterectomy, Case reports, Spinal muscular atrophy.

INTRODUCTION

Uterine fibroid, also known as leiomyoma or uterine fibroma, is the most common benign tumor in the female pelvis[1], primarily affecting women of reproductive age. It is a monoclonal mesenchymal neoplasm originating from smooth muscle cells of the myometrium and exhibits heterogeneous characteristics in terms of size, number, and location. The high prevalence of this type of tumor underscores its importance in women's health, requiring careful attention in both diagnosis and clinical management.

From a physiological perspective, fibroids are influenced by hormonal factors, primarily estrogen and progesterone, whose receptors are often overexpressed in these lesions. These hormones play a crucial role in tumor growth, explaining the relationship between fibroids and hormonal changes typical of reproductive age and the menopausal transition [2,3].

The clinical presentation of fibroids can be highly variable. Some women remain asymptomatic, while

others may experience significant symptoms such as abnormal uterine bleeding, pelvic pain, a sensation of pressure in the pelvic region, and anemia. Additionally, fibroids can cause compression symptoms in adjacent organs, including increased urinary frequency and bowel disturbances. The location and size of the fibroids are key factors in determining the severity of these symptoms, as well as their impact on fertility and reproductive outcomes[2,3].

The treatment of fibroids is individualized and considers the severity of symptoms, the size and location of the fibroids, as well as the patient's reproductive desires. For those seeking to preserve fertility, myomectomy—performed through techniques such as laparoscopy or hysteroscopy—is often recommended, as it allows selective removal of fibroids with faster recovery and symptom improvement. On the other hand, hysterectomy is considered a definitive solution for women who do not wish to conceive in the future[2,4].

Alternatively, there are conservative management options, particularly for patients who prefer to avoid surgery. These include selective progesterone receptor modulators, gonadotropin-releasing hormone (GnRH) agonists, and levonorgestrel-releasing intrauterine devices. These therapies aim to reduce the size of the fibroids and control symptoms, providing clinical relief without surgical intervention[2,3].

CASE REPORT

Female patient, 43 years old, virgin, with no active sexual life, under the care of Dr. Waldemar Naves do Amaral at Hospital Amparo and Clínica Fértile. During consultation and clinical anamnesis, uterine myomatosis was hypothesized. To confirm the diagnosis, a transabdominal pelvic ultrasound was requested, revealing a large uterine fibroid measuring 9.9 cm x 8.3 cm in its largest area and 5.6 cm x 4 cm and 4.8 cm x 4.7 cm in smaller areas. The patient had Spinal Muscular Atrophy (SMA) type II, was on Risdiplam, presented significant musculoskeletal alterations, had limited abdominal access, a high pneumological risk, severe ventilatory disorder, and relied on a wheelchair for mobility.

The patient underwent a total abdominal hysterectomy and bilateral salpingectomy. The surgical procedure was performed by Dr. Waldemar and his gynecological surgery team. Extensive uterine myomatosis was identified, with the uterine size comparable to a 7-month pregnancy, weighing 1340 grams, and with apparently normal fallopian tubes and ovaries.

The sample was sent for examination. The histopathological examination of the uterus revealed a myometrium containing leiomyoma, a secretory endometrium, a cervix with chronic cervicitis, and no signs of malignancy. Upon evaluation of the fallopian tubes, the smaller tube showed vascular congestion, a focus of chronic perivascular inflammatory process, and no signs of malignancy. The larger fallopian tube displayed Morgagni's hydatids and no malignancy.

The surgery progressed successfully, and the patient had a good recovery, with no complications. During her hospital stay, she remained afebrile and showed no signs of alarm.

Figure 1 - Uterine Myomatosis and Adnexa

Figure 2 - Patient with SMA Type II

DISCUSSION

This study presents a case report aimed at describing the surgical treatment of a large uterine fibroid. Uterine fibroids affect about 40% of women of reproductive age. The main risk factors include advanced age, early menarche, family history, obesity, and nulliparity. Fibroids originate from the uterine smooth muscle tissue and follow a benign course, with their origin linked to the hormones estrogen and progesterone.[5] Large fibroids are difficult to treat clinically, often leading to heavy menstrual bleeding, which can progress to severe anemia and a higher chance of requiring additional surgeries. In patients who do not wish to become pregnant, the traditional treatment is hysterectomy. For women who wish to preserve fertility, abdominal myomectomy is the treatment of choice. However, complication rates in subsequent conceptions are high, including uterine perforation, excessive bleeding, and fluid overload. Additionally, treatment is more complex in cases with concomitant comorbidities[6].

Spinal muscular atrophy (SMA), for example, is an autosomal recessive genetic condition that affects the lower motor neurons and can be divided into 5 different subtypes. Type II, also known as Dubowitz disease, is the intermediate phenotype, with the following characteristics: trunk and limb weakness, inability to stand or walk, progressive scoliosis, contractures in the knees and hips, and joint laxity in the hands and fingers. Despite advances in new medications for treatment and the discovery of the responsible gene, SMA remains characterized as an incurable disease.[7]

The diagnosis of fibroids is made through ultrasound, which provides reliable data, especially when combined with transvaginal ultrasound, which is accurate in more than 90% of cases.[5,8] To determine the treatment, whether surgical or medical, it is necessary to identify the size of the fibroid. In the presented case, the complexity lies in the size of the fibroid associated with the existing comorbidities. Surgery for large fibroids is challenging, and the standard approach consists of total hysterectomy along with bilateral salpingo-oophorectomy[9], which was performed in the reported case. For the best surgical outcome, a multidisciplinary approach, involving specialties such as general surgery, plastic surgery, and urology, may be recommended to assist the gynecological surgeon.

CONCLUSION

The study reports a successful case of total hysterectomy combined with bilateral salpingectomy for a large fibroid. Fibroids are benign tumors with a high prevalence, primarily affecting women of reproductive age. The diagnosis is made through ultrasound, as the clinical presentation can vary. For treatment, it is essential to analyze the factors reported by the patient and the size of the fibroid, with options for both medical and surgical approaches.

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Received: 26/11/24. Accepted: 26/11/24. Published in: 11/12/24. Updated on: 26/02/2025.

GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67E25401
ISSN 0034-9585
e25401
SCIENTIFIC ARTICLE - CASE REPORT

OSTEOMYELITIS OF THE DISTAL FIBULA IN A NINE-YEAR-OLD CHILD: A CASE REPORT

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ABSTRACT

Osteoarticular infections, such as acute hematogenous osteomyelitis, are among the diseases in Pediatric Orthopedics that needs faster diagnostic responses and immediate treatment. Acute hematogenous osteomyelitis is a severe, invasive bone infection that can cause reckless harm to the patient if not promptly treated. This study aimed to report the case of a child with acute hematogenous osteomyelitis in an unusual place, in the left distal fibula, addressing diagnostic flow, effective treatment, and appropriate cynical support. This study highlights the need for clinical suspicion for a quick and accurate diagnosis by the pediatrician, and the correct surgical therapy performed by the orthopedist, in order to avoid sequelae, being a relevant topic in medical education.

Keywords: Acute haematogenous osteomyelitis, Bone infection, Bone fistula, Devitalized bone tissue, Orthopaedics, Paediatrics

INTRODUCTION

Orthopedics has had a close relationship with Pediatrics since its inception. In the mid-18th century, the French physician Nicolas Andry defined it as “the art of correcting bodily deformities in children,” with the term’s etymology deriving from the Greek orthós (straight) + paidós (child) + the suffix -ia[1]. It was only at the end of the 19th century that this term was extended to encompass the study and treatment of musculoskeletal diseases at all ages.[1]

Among the various diseases in Pediatric Orthopedics, osteoarticular infections are among those that require the fastest diagnostic response and immediate, precise treatment.[2] In this context, acute hematogenous osteomyelitis stands out. Its annual incidence ranges from 1:5,000 to 1:10,000 children, affecting those between 3 and 14 years old. It is more prevalent among Black individuals and economically disadvantaged populations, occurring approximately three times more frequently in boys than in girls[3]. Patients with some form of immunosuppression or sickle cell disease are more prone to developing osteomyelitis, with the latter group being particularly susceptible due to vascular obstruction, leading to infarction and bone necrosis.[4]

Acute hematogenous osteomyelitis is defined as a severe, invasive bone infection, usually bacterial, that occurs after the pathogen spreads through the bloodstream. If not promptly treated, it can cause serious and permanent damage to the patient.[5] The disease's pathophysiology involves bacterial invasion of the bone, triggering a local inflammatory response, bone destruction, and abscess formation, which compromises vascularization and hinders antimicrobial access to the infection site.[5] In some cases, distant infectious foci are detected. However, in many instances, no apparent sources of contamination are identified that could lead to acute hematogenous osteomyelitis. The most commonly affected sites are the distal metaphysis of the femur and the proximal tibia, adjacent to the knee joint. Less frequently affected bones include those of the feet, hands, radius, clavicle, and fibula.[6]

The duration of disease progression is not the most important factor in classifying osteomyelitis as acute, subacute, or chronic; rather, its pathophysiology is fundamental to defining the condition.[2] Acute osteomyelitis is primarily characterized by the presence of systemic symptoms. Subacute osteomyelitis occurs when there is a balance in the parasite-host relationship, with minimal or absent clinical manifestations. Chronic osteomyelitis develops when there is bone necrosis (sequestrum formation), and its hallmark clinical feature is a cutaneous bone fistula.[2] Laboratory tests only show findings consistent with an infectious process in cases of acute osteomyelitis.[2]

The information in this study was obtained through a review of the medical record, an interview with the patient, photographic documentation of clinical progression, and a literature review.

The literature review was conducted in March and April 2024 through searches in the Medical Literature Analysis and Retrieval System Online (MEDLINE via PubMed®) and consultations of the following theoretical books: Sizínio Hebert – Ortopedia e Traumatologia: Princípios e Prática, 5th edition, Artmed, 2017; and Tachdjian's Pediatric Orthopaedics: From the Texas Scottish Rite Hospital for Children, 6th edition, Elsevier, 2021.

OBJECTIVE

To report the case of a child with acute hematogenous osteomyelitis in an uncommon location—the distal left fibula—focusing on the diagnostic process, effective treatment, and appropriate clinical support.

CASE REPORT

Endometriosis LRS, a 9-year-old male, was admitted to the Hospital das Clínicas at the Federal University of Goiás (HC-UFG) with a history of a left ankle sprain 20 days prior, for which he had been using an immobilizing splint since then. Fifteen days before admission, he developed a fever that partially improved with the use of simple analgesics, with daily fever spikes, significant pain in the left ankle, local edema and erythema, as well as poor appetite and fatigue. He had used amoxicillin for 3 days and cephalexin for 4 days without clinical improvement. Urination and bowel movements were present and normal, with no other signs or symptoms in the clinical history.

Initially, the diagnosis of infectious cellulitis was assumed. However, on the fourth day of hospitalization (and the fourth day of antibiotic treatment with oxacillin), the child developed a rupture of a blister on the left lateral malleolus, with drainage of serosanguineous and purulent secretion, worsening of edema in the left foot and ankle, as well as a significant deterioration in general condition, including limping and the inability to place the left foot on the ground.

On physical examination, the child was in fair general condition, pale, hydrated, acyanotic,

febrile, and breathing normally in ambient air. Cardiac and pulmonary auscultation showed no abnormalities, and the abdominal and neurological exams were unremarkable. The left lower limb presented with edema, erythema, and a ruptured blister in the area of the left lateral malleolus.

PROGRESSION ON PHYSICAL EXAMINATION:

Figures 1 and 2: Appearance of the left ankle on the first day of hospitalization, with local edema and erythema.

Figures 3 and 4: Appearance of the left ankle on the fourth day of hospitalization, showing a blister on the left lateral malleolus with drainage of serosanguineous and purulent secretion; and worsening of edema in the foot and ankle.

X-rays and magnetic resonance imaging (MRI) of the left foot and ankle were requested and performed, as shown in the following figures.

Figures 4 and 5: X-ray of the tibio-tarsal joint on the first day of hospitalization.

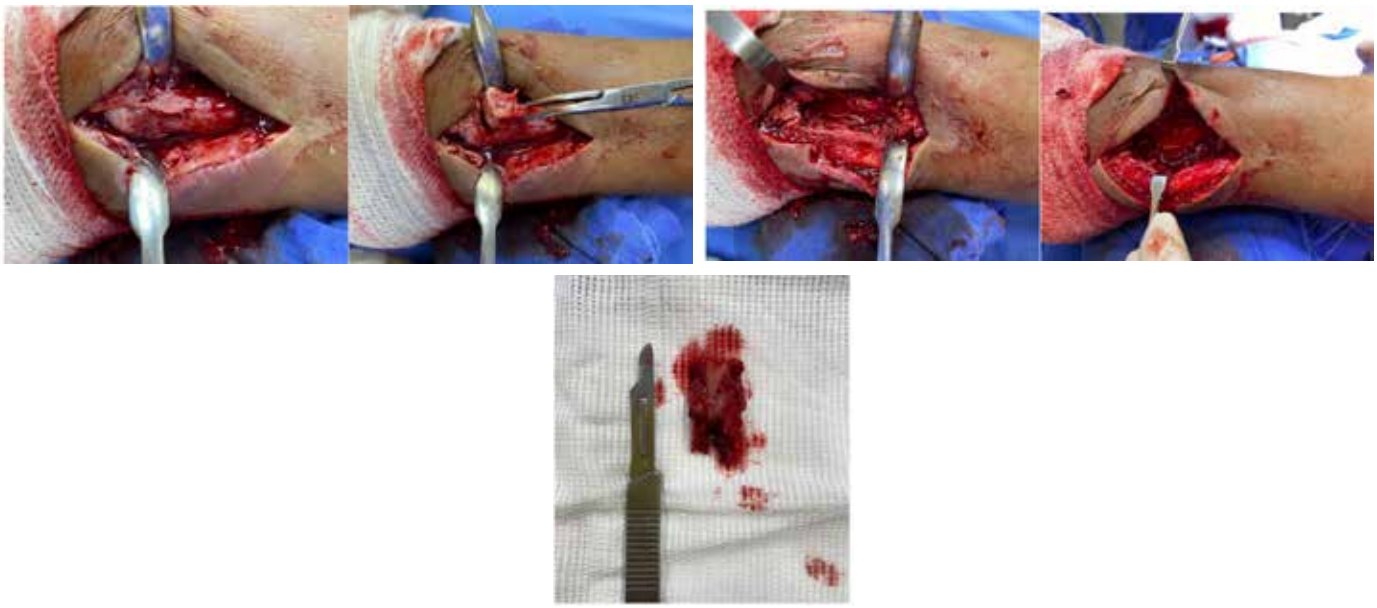
Figures 6 and 7: Magnetic resonance imaging (MRI) of the left lower limb, showing nonspecific signs

Figure 8: X-ray of the left ankle after twenty days of clinical progression, already showing signs of bone rarefaction in the left fibula.

The patient underwent initial surgical intervention, with the removal of a bone fragment for culture, which yielded the following results: Acid-fast bacilli (AFB) negative; fungal culture negative; bacterioscopy: Gram-positive cocci in pairs with a positive culture for Staphylococcus aureus resistant to penicillin and sensitive to oxacillin. Intravenous antibiotic therapy was continued. However, the patient continued to experience significant pain in the left ankle, daily fever, and secretion from the surgical wound, showing no considerable clinical improvement.

Figures 9 and 10: Appearance of the surgical wound after the first surgical procedure.

Three days later, the child was taken back to the operating room, now with a diagnosis of acute osteomyelitis. This time, the child underwent sequestrum removal, diaphysectomy, and extensive lavage with saline solution, presenting a clinical picture compatible with Chronic Osteomyelitis Cyerny Mader 4A.



Figures 11, 12, 13, 14, and 15: Intraoperative photos (second surgical procedure) showing the removal of the necrotic bone fragment.

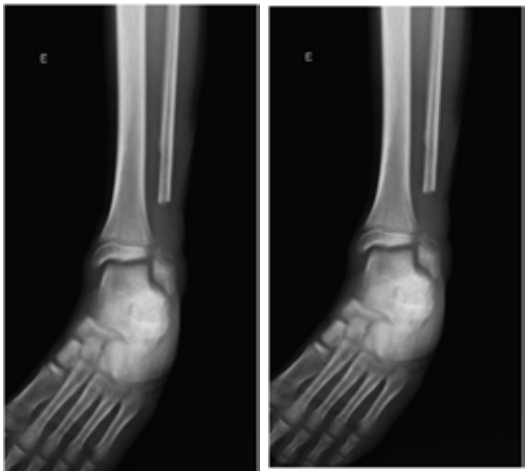


Figure 16: Immediate postoperative X-ray (second surgical procedure) of the left tibio-tarsal joint showing bone defect due to the removal of the necrotic bone fragment.

Figure 17: Appearance of the surgical wound after the second surgical procedure.

After the second surgical intervention, which involved extensive lavage, sequestrum removal, and diaphysectomy of the left fibula, the patient showed significant clinical improvement. The fever subsided, there was no further drainage of purulent secretion, and the local pain resolved. The patient was discharged on the second postoperative day, with a prescription for oral cephalexin for seven days and a referral for an outpatient follow-up appointment in seven days for medical

reevaluation. During hospitalization, the patient received twelve days of intravenous antibiotic therapy with oxacillin and continued with oral cephalexin for an additional seven days at home, totaling nineteen days of antibiotic treatment.

The child continued with outpatient clinical follow-up at HC-UFG. One month after the second surgical procedure, radiographic imaging showed bone growth at the site of the bone defect in the left fibula, resulting from the second surgical procedure.

Figure 18: X-ray of the left fibula 30 days postoperatively (second surgical procedure), showing new bone formation at the site of the previous defect.

Figure 19: X-ray of the left fibula one year postoperatively (second surgical procedure), showing complete filling of the previous defect with new bone tissue.

DISCUSSION

Acute hematogenous osteomyelitis is an infection that primarily affects the bone metaphysis, a region that contains a growth zone and is therefore more vascularized2. When the aggressor pathogen settles in the metaphysis, it triggers local inflammation, with the formation of exudate and interstitial

infiltration, increasing local pressure and causing ischemia, followed by bone necrosis. The pus infiltrates the periosteum, and without surgical drainage, it separates the periosteum, causing further tissue necrosis, which can lead to an external fistula and result in a necrotic bone fragment, known as a sequestrum.[2]

Most osteomyelitis cases are caused by Staphylococcus aureus (the etiological agent in 90% of acute hematogenous osteomyelitis cases), followed by group B streptococci, enterococci, pneumococci, gonococci, salmonella, pseudomonas, and more recently, Kingella kingae.[2] The diagnosis is primarily clinical. The patient presents with significant and progressive pain, functional limitation, edema, erythema, and local hyperthermia.[6] The "one finger point" sign, which refers to intense pain upon palpation of the bone metaphysis during a physical examination, is crucial. When positive, it indicates the need for bone aspiration in a surgical center. The presence of pus during the aspiration confirms the diagnosis and requires the surgical removal of all necrotic bone material and vigorous lavage with physiological saline solution.[6]

In the reported case, the patient's diagnosis was delayed due to the request for imaging exams, such as MRI, which is not a routine or necessary diagnostic test. A simple X-ray, a low-cost and quick examination that is easier to perform, initially reveals only nonspecific signs and takes about ten to fourteen days to show early osteomyelitis changes, such as bone rarefaction in the metaphyseal region2. It is known that acute hematogenous osteomyelitis is among the diagnoses that require rapid and immediate treatment initiation.[2] Therefore, whenever there is suspicion of this disease, the patient should be hospitalized, undergo bone aspiration and surgical removal of necrotic tissues, along with culture and histopathological analysis of the removed material, intravenous antibiotic therapy, and clinical and nutritional support with a pediatrician.[2]

The positive culture of the bone fragment plays an important role in clinical management, as it is relevant for defining the appropriate antibiotic therapy to be used. The histopathological examination should be performed to rule out the differential diagnosis of Ewing's tumor. It is a primary bone tumor with high lethality, and children and adolescents of the male sex are the most likely population to develop it.[7] Therefore, in the presence of bone pain, local swelling, hyperemia, and radiological images revealing subperiosteal bone reaction, it is essential to rule out the possibility of Ewing's tumor with a biopsy.

With delayed appropriate treatment, recurrence or reactivation of the infectious process may occur, potentially leading to bacteremia and even death.[2] Typically, after the surgical removal of the affected bone fragment, antibiotic therapy is maintained for four to six weeks. If the child shows good clinical progress, oral antibiotic therapy should be initiated, with outpatient follow-up.[2]

Patients with delayed treatment may also develop sequelae resulting from injuries to the growth plate.[6] Damage to the growth plate can lead to angular deformities such as varus, valgus, antecurvatum, and recurvatum. It can also result in bone shortening and subsequent limb length discrepancy.[6] In the clinical case presented in this study, the patient had some delay in the initial diagnosis, presented a picture compatible with Chronic Osteomyelitis Cyerny Mader 4A, but had an excellent clinical evolution without sequelae.

Hematogenous acute osteomyelitis is, therefore, a disease of childhood, and often children with osteomyelitis symptoms present to the pediatric emergency department for their first consultation. This highlights the great importance of pediatricians mastering the clinical presentation, pathophysiology, diagnostic flow, and treatment of this condition.

CONCLUSION

The reported case and the publications cited in this work highlight the discussion on the necessity of clinical suspicion for a quick and accurate diagnosis by the pediatrician, as well as the proper surgical therapy carried out by the orthopedic surgeon. It is the pediatrician who often receives the child, raises the diagnostic suspicion, requests joint follow-up with the orthopedic team, and provides the necessary clinical support for the patient. The goal is to prevent acute hematogenous osteomyelitis from progressing to chronic osteomyelitis, leaving physical sequelae and compromising the child's or adolescent's academic, social, and athletic life due to a long-term chronic infection. Preventing this outcome is a joint effort of pediatrics and orthopedics, and it needs to be widely disseminated and studied during medical training.

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Library Review - Izabella Goulart
Spell Check: Dario Alvares

Translation: Soledad Montalbetti
Received: 29/01/25. Accepted: 21/03/25. Published in: 04/04/25.

GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67P
ISSN 0034-9585
e25548
SCIENTIFIC ARTICLE - CASE REPORT

MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS OF ENDOMETRIOSIS: AN INTEGRATIVE REVIEW

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ABSTRACT

The diagnosis of endometriosis requires a comprehensive approach, combining clinical history, invasive and non-invasive examinations. Laparoscopy, the gold standard for definitive diagnosis, is invasive, expensive and involves risks. In this sense, imaging diagnosis has gained prominence, especially transvaginal ultrasound (TVUS), the first choice in investigation, and magnetic resonance imaging (MRI). Despite being the secondary imaging examination, MRI plays an essential role in determining the extent of the disease, aiding in surgical and multidisciplinary planning. Its high sensitivity allows the identification of deep lesions and provides a precise anatomical view, and is therefore especially useful in the evaluation of deep pelvic endometriosis. In addition, MRI allows the differentiation of endometriosis from other gynecological pathologies and the evaluation of adhesions and complications, being an indispensable tool for more effective therapeutic planning.

Keywords: Diagnostic Imaging, Endometriosis, Endometrioma, Magnetic resonance imaging, Review.

INTRODUCTION

The The diagnosis of endometriosis requires a comprehensive approach that considers the patient's clinical history, as well as invasive and non-invasive techniques. The definitive diagnosis is made through laparoscopy, with histological confirmation of the presence of ectopic endometrial glands and/or stroma. However, laparoscopy is an invasive procedure, costly, and involves surgical risks.

In this context, imaging diagnosis has become a fundamental tool, especially in therapeutic planning. Transvaginal ultrasound (TVUS) is often the first choice for diagnosis, while magnetic resonance imaging (MRI) is used for a more detailed anatomical evaluation of the pelvic organs, particularly in cases of deep pelvic endometriosis, with the aim of optimizing the surgical strategy and the work of a multidisciplinary team.[1]

Although magnetic resonance imaging (MRI) is considered a secondary modality for the diagnosis of endometriosis, it plays an essential role in evaluating the extent and location of lesions, especially

in more advanced stages. MRI provides an accurate anatomical representation of the pelvic organs, allowing for the identification of endometriotic lesions with greater sensitivity due to its ability to distinguish soft tissues more clearly. This technique has become established as a crucial diagnostic tool, particularly for determining the stage of the disease and planning more suitable surgical approaches.[1]

The conduct of this integrative review is justified by the growing importance of accurate diagnosis and the appropriate choice of imaging modalities in the management of endometriosis. Despite significant advances in diagnostic techniques, challenges still exist in recognizing and thoroughly evaluating the different forms of the disease, especially in cases of deep pelvic endometriosis, which require a more refined analysis of the pelvic anatomy. Transvaginal ultrasound and magnetic resonance imaging have emerged as complementary tools in diagnosis and therapeutic planning, but their indications, limitations, and effectiveness vary depending on the clinical context and the stage of the disease.

Thus, an integrative review on the topic becomes essential to consolidate the existing scientific evidence, updating knowledge about imaging diagnostic modalities and their implications in the management of endometriosis. This analysis will not only identify gaps in current knowledge but also provide support for future research, as well as contribute to clinical practice, helping healthcare professionals make more informed decisions in the diagnosis and treatment of this complex condition.

METHODS

A The present narrative review aimed to analyze the role of magnetic resonance imaging (MRI) in the study of endometriosis, focusing on its application in the diagnosis and clinical management of the disease. Studies published between 2005 and 2025, in English, Portuguese, and Spanish, that addressed the use of MRI in the evaluation of endometriosis were included. The research was conducted in the PubMed, Scopus, Google Scholar, and Lilacs databases, using keywords such as “endometriosis,” “magnetic resonance imaging,” “imaging diagnosis,” and related terms.

Articles that addressed the application of magnetic resonance imaging (MRI) in the diagnosis and clinical management of endometriosis were selected, including clinical studies, systematic reviews, and guidelines. Works that focused on other diagnostic methods, distinct gynecological pathologies, or studies conducted in non-human populations were excluded. The topics covered in the analysis include: the role of MRI in the study of endometriosis, with an emphasis on the location of lesions, and the interpretation of images in relation to the anatomy of the pelvis. A detailed analysis of the anatomical compartments of the pelvis was conducted, considering the anterior compartment (bladder and uterus), the middle compartment (ovaries and adnexal structures), and the posterior compartment (rectum, intestines, and retroperitoneal space). Furthermore, the review addressed the different forms of endometriosis, such as superficial, ovarian, deep, and extra-pelvic, with the specific characteristics of each in the context of MRI. The analysis was conducted through the qualitative selection of studies, with a critical approach to the most relevant evidence.

ROLE OF MAGNETIC RESONANCE IMAGING IN THE STUDY OF ENDOMETRIOSIS

An MRI examination is necessary because deeper structures are difficult to visualize using ultrasound (USG) techniques. Although endometriosis lesions can be diagnosed in any organ, pelvic involvement is by far the most common. There are three different types of involvement due to endometriosis in the pelvis: ovarian endometriomas, endometriotic implants on the peritoneal surface, and deep pelvic endometriosis, which is considered when it affects at least 5 mm below the peritoneal surface. In this

context, the European Society of Urogenital Radiology provides recommendations on the ideal MRI protocol and guidelines for the diagnosis of pelvic endometriosis.[2]

For patient preparation, fasting for 3 to 6 hours and bladder emptying one hour before the exam are recommended. The study can be performed on any day of the menstrual cycle, and knowing the date of the last menstruation can help in the interpretation of some MRI findings. Additionally, an antiperistaltic agent is recommended to prevent evacuation artifacts, unless contraindicated, and the distension of the vagina or rectum with gel can make pelvic endometriosis easier to visualize.[3]

As a standard protocol, images weighted in T2WI and T1WI (with and without fat suppression) were considered, as well as rapid spin-echo images and single-shot imaging. Oblique axial T2WI is useful for evaluating endometriosis of the uterosacral ligament (USL). T1WI with contrast, diffusion-weighted imaging (DWI), and susceptibility-weighted imaging (SWI) are not recommended for evaluating ovarian endometriotic cysts in deep endometriosis.3 DWI is a rapid imaging sequence that helps detect suspicious lesions (neoplastic, inflammatory, lymphadenopathies). Contrast enhancement and DWI are recommended for patients with suspected ovarian malignancy, and T1-weighted images, with and without fat suppression, are essential for evaluating and characterizing possible hemorrhagic foci (Table 1).[2]

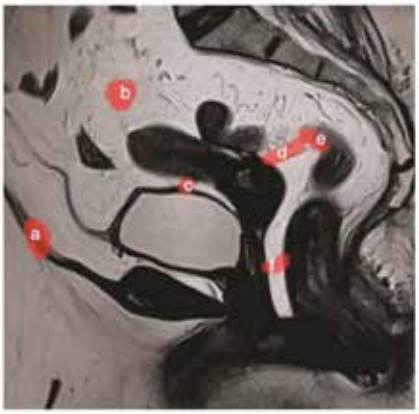
Table 1. Suggested protocols for the diagnosis of endometriosis and related diseases based on the European Society of Urogenital Radiology guidelines. DIE = Deep Infiltrative Endometriosis; DWI = Diffusion-weighted Imaging; T1WI = T1-weighted Imaging; T2WI = T2-weighted Imaging.

Ideal MRI Protocols for the Diagnosis of Endometriosis	
Patient Preparation	Fasting for 3 to 5 hours
	Bladder emptying one hour before the exam
	Use of antiperistaltic agents (unless contraindicated)
	(Optional) Vaginal/rectal opacification with gel
T2WI	Axial/sagittal images and oblique (optional) 3D images-T2WI
T1WI	Images with or without fat saturation
DWI, Enhanced Contrast T1WI:	Not recommended for ovarian endometriomas/DIE, necessary in case of suspected ovarian malignancy

LOCATION OF ENDOMETRIOSIS

Common sites for finding endometriosis include the anterior abdominal wall (a), ovaries (b), vesicouterine septum (c), rectouterine septum (d), rectum (e), and rectovaginal pouch (f), as illustrated in Figure 1.[4]

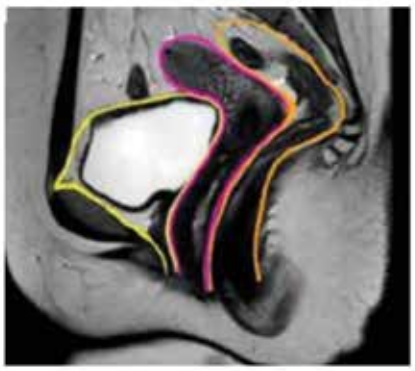
Figure 1. Most Common Locations of Endometriosis.[4]



ANATOMY AND INTERPRETATION OF MAGNETIC RESONANCE IMAGING

Guidelines from the European Society of Urogenital Radiology have established techniques to be used for MRI in endometriosis. It was recommended to divide the pelvic compartment for analysis, as well as to include the investigation of the intestines and urinary system, regions that are also affected by endometriosis. The pelvic compartment is divided into three parts: anterior, middle, and posterior. The anterior compartment includes the space between the posterior pubic symphysis and the anterior surface of the uterus, including the prevesical space, round ligaments, urinary bladder, distal ureters, vesicouterine space, and vesicovaginal space. The middle compartment includes the uterus, ovaries, fallopian tubes, broad ligament, and vagina. The posterior compartment includes the rectosigmoid colon, rectouterine space, rectovaginal space, and uterosacral ligaments. It is important to note that in the posterior compartment, deep infiltrative endometriosis is more frequently found (Figure 2).[5]

Figure 2. Sagittal section of the female pelvis delineating the three compartments: anterior, middle, and posterior, from left to right, respectively.[5]



ANTERIOR COMPARTMENT

MRI is an indispensable tool in the evaluation of deep infiltrative endometriosis present in the anterior compartment, as its assessment through ultrasound presents limitations. Deep endometriosis in the anterior compartment is less frequent than in the posterior compartment, accounting for approximately 6% of cases, with the most commonly affected areas being the vesicouterine space and the urinary bladder.[5]

The vesicouterine space is the peritoneal recess between the uterus and the bladder, and when affected by endometriosis, it results in the formation of adhesions, uterine anteversion, and even complete obliteration in severe cases. Bladder involvement, in turn, is rare (<1% of endometriosis cases), but it is the most common site of involvement in the urinary tract, followed by the distal ureters.[5]

Bladder endometriosis is almost always associated with endometriosis in the vesicouterine space (anterior pouch); therefore, the dome, posterior wall, and trigone are the most common areas of involvement. Depending on the depth of bladder wall involvement, multifocal involvement can occur in two patterns: extrinsic, where the involvement is restricted to the serosa, with no involvement of the detrusor muscle layer and the mucosa, making it not evident in cystoscopy; or intrinsic, where there is infiltration of the bladder wall, affecting the detrusor muscle layer, creating mural masses that can be visualized in cystoscopy. In cases of involvement of the mucosa, in cases of full-thickness endometriosis, the lesions can even simulate bladder carcinoma. Therefore, when reporting bladder endometriosis, the essential information that the surgeon needs for planning is: the precise location of the lesion, the depth of detrusor invasion, and the distance from the ureteral orifice, which will require ureteral reimplantation if involved.[5]

Ureteral endometriosis can affect any segment, with distal ureters being the most commonly involved. It can present in two varieties: extrinsic and intrinsic, similar to bladder involvement. The extrinsic variety is more common and presents as dense hypointense nodules adjacent to the distal ureter. Because ureters are smaller structures (4 mm to 5 mm in diameter), their direct evaluation is limited in MRI due to lower spatial resolution. Ureteral dilation is one of the few findings that can indirectly suggest its presence. When present, it is strongly associated with deep endometriosis in other locations, such as endometriomas, uterosacral ligaments, endometriosis larger than 3 cm in the rectovaginal space, vagina, bladder, and intestines.[4]

Finally, another structure in the anterior compartment is the round ligament, which originates from the anterolateral part of the fundus below the fallopian tube, running anterolaterally and terminating at the labia after passing through the inguinal canals. The portion affected by endometriosis is the proximal part of the ligament adjacent to the uterus, resulting in shortening, thickening, and a nodular appearance. Other rarely involved locations in the anterior compartment include the pre-vesical space, vesicocervical, and vesicovaginal endometriosis. In the case of pre-vesical endometriosis, obliteration of the spaces and mass effect on the bladder can occur. Urachus involvement is also rarely reported.[5]

MIDDLE COMPARTMENT

In the middle compartment, formed by the ovaries, uterus, fallopian tubes, and broad ligament, a range of changes can be observed. Regarding the ovaries, in addition to endometriomas, another form of ovarian involvement is secondary adhesions caused by deep endometriosis, which result in the medial retraction of the ovaries through the midline behind the uterus in the retro-uterine space. Medially displaced ovaries are close to each other, a condition referred to as "kissing ovaries." Medialized

ovaries in preoperative imaging are an important marker of moderate to severe endometriosis.[6]

The uterus can be affected either directly or indirectly in deep endometriosis. The uterine axis becomes distorted due to retraction caused by dense adhesions, which may result in a retroverted uterus when the posterior compartment is affected and an anteverted uterus when the anterior compartment is involved. Additionally, the uterine torus, where the uterosacral ligaments attach, is typically not visible in healthy individuals but becomes thickened due to endometriosis implants. Finally, the uterus may be involved in serous plaques on the anterior and posterior surfaces, which can be highly invasive and mimic focal adenomyosis, particularly in the posterior wall. However, deep endometriosis should not be mistakenly diagnosed as focal adenomyosis, as deep uterine endometriosis is an "outside-in" process, whereas focal adenomyosis occurs "inside-out." When analyzing the junctional zone, it may appear diffusely thickened with altered signal in adenomyosis.[5]

Involvement of the fallopian tubes occurs in about 30% of women with endometriosis. Deep endometriosis implants in the serosa or subserosa of the tubes are usually not visible on imaging. In contrast, chronic repeated bleeding within the implant and potential peritubular adhesions can cause tubal obstruction and dilation.[5,7]

Hematosalpinx is considered a distinctive finding in endometriosis and may be the only imaging finding indicating its presence, as intraluminal T1W hyperintensity, suggesting hematosalpinges, was observed in only 40% of cases. In the remaining 60% of cases, no T1W hyperintensity is observed in the dilated fallopian tube. Additionally, unlike endometriomas, hypointensity on T2 is not a characteristic of tubal involvement because endometriotic implants affect the serosal surface of the tube rather than the lumen itself. Differential diagnoses for hematosalpinx include pyosalpinx (associated with significant fat deposition around the tube, with a history of fever and elevated white blood cell count) and fallopian tube malignancy (more common in older age groups, presenting with enhanced solid nodules).[5]

Like the uterus, vaginal involvement in endometriosis can be direct or indirect. Directly, the most common site is the posterior vaginal fornix, usually secondary to a lesion that extends from the retrocervical region. Vaginal endometriosis has a very high association with recurrence and the formation of rectovaginal fistulas post-surgery. Therefore, meticulous evaluation of this region and communication about the exact depth of involvement are essential for pre-surgical planning. Indirect involvement due to adhesions in the surrounding area will cause an angled and elevated posterior vaginal fornix, situated above the uterine isthmus.[5]

POSTERIOR COMPARTMENT

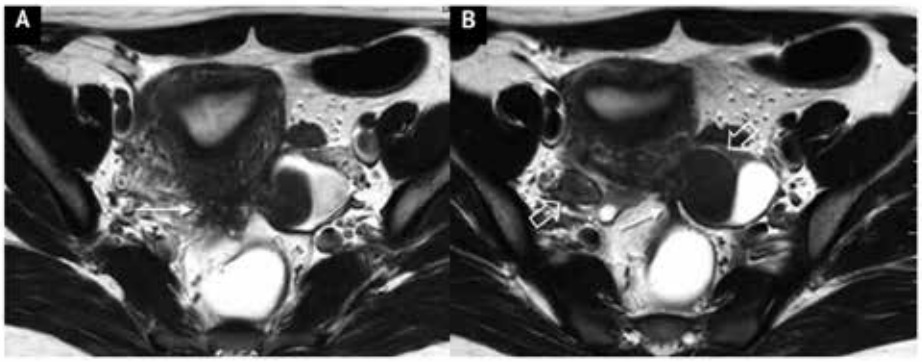
The posterior compartment, which includes the rectouterine pouch, rectovaginal septum, sigmoid colon, and uterosacral ligaments, is the most common site of deep endometriosis in the pelvis. The rectouterine pouch or posterior fornix is responsible for the majority of symptomatic endometriosis cases and is associated with severe disease. Due to its deep position and being the most dependent portion of the peritoneal cavity, it becomes inaccessible to laparoscopy, making it even more problematic in endometriosis due to obliteration of the compartment. Therefore, magnetic resonance imaging becomes crucial in evaluating endometriosis and adhesions in the rectouterine pouch. Typical imaging findings include endometriosis implants, either active glandular or chronic stromal/fibrotic, hypointense linear adhesions, and tethering between the uterus and the anterior rectum (Figure 3). The rectovaginal septum is an extraperitoneal space between the vagina and the lower rectum, extending from the rectouterine pouch to the perineal body. Preoperative mapping of this region is critical, as resection

of the implants predisposes to rectovaginal fistula formation. Depending on the location, lesions may occur in the septum (10%) or the posterior vaginal fornix (65%), with some lesions presenting as a funnel-shaped form involving the posterior fornix with extension to the anterior rectum (Figure 3).[5]

The uterosacral ligaments originate from the uterine torus, attach posteriorly to the sacrum, and are considered the second most common site of endometriosis after the ovaries in some studies. The proximal third is the most commonly involved area, presenting as asymmetric shortening, thickening (>4 mm), and nodularity of the affected ligament.[8]

Figure 3. A) Deep endometriosis in the rectouterine pouch in axial T1W; B) Fat-suppressed in T1W; C) Axial image in T2W. Obliteration of the rectouterine pouch with a star-shaped ill-defined lesion (white arrows) appearing hypointense on T1W and T2W images with associated uterine retroversion. Presence of multiple foci seen within the lesion, appearing hyperintense on T1W and hypointense on T2W images, suggestive of hemorrhagic foci within the ectopic glands.[5]

Figure 4. Representation of an implant on the posterior uterine side with adhesions to the ovaries and rectal fascia. Axial T2-weighted images. Endometriosis implant identified on the posterior surface of the uterus in the uterine torus region [(arrow in image A)]. Both ovaries [(empty arrows in image B)] are located behind the uterus with adhesions between the uterus and ovaries, and an endometrioma in the left ovary. Additionally, in this case, a fibrous band can be seen due to adhesions between the anterior surface of the rectum and the uterine implant [(long arrow in B)].[9]



SUPERFICIAL ENDOMETRIOSIS

Of the three types of pelvic endometriosis, the most difficult to diagnose on magnetic resonance imaging are the implants on the peritoneal surface, which can be millimeter-sized in laparoscopy. In magnetic resonance imaging, they can only be properly diagnosed when they have hemorrhagic contents, appearing as hyperintense foci in T1-weighted images with fat suppression. Peritoneal implants can cause adhesions between the pelvic organs and the intestinal loops. In pelvic magnetic

resonance imaging of women with endometriosis, it is common for the ovaries to be located in a lower position, centered in the pelvis, while the uterus remains in retroflexion. Hypointense bands can also be found between the organs, which are "peaks" of retraction on the intestinal wall or loculations in the peritoneal fluid.[9]

OVARIAN ENDOMETRIOSIS

The ovary is the most common location for endometriosis, and the most common imaging findings are endometriomas or endometriotic cysts. These cysts are due to cyclical bleeding of the endometrial tissue, and their content consists of blood decomposition products at different stages of evolution. On magnetic resonance imaging, these cysts are typically diagnosed as hyperintense cysts on T1-weighted images with fat suppression and shadowed on T2-weighted images. Signal loss on T2-weighted images is a very specific sign of endometrioma, whether it is intense, subtle, or layered. Additionally, the identification of hyperintense foci on T1, even without signal loss on T2 images, is also suggestive of endometriosis.[10]

DEEP ENDOMETRIOSIS

Regarding deep endometriosis, the most frequently affected area is the retrocervical portion (Figure 2), located in the posterior compartment of the pelvis with an obliterated Douglas pouch at the lower part, although it can also be present in all areas of the pelvis. In this scenario, attention should be given to any invasions, thickening, or tissue retractions that appear hypointense in the most common locations: the posterior face of the uterus, retrocervical area, uterosacral ligaments, posterior fornix of the vagina, retrovaginal septum, and anterior retosigmoid face. The presence of hemorrhagic foci helps and ensures the diagnosis, but any hypointense thickening, nodularity, or plaque in any of these structures on T2-weighted images should be suspected.

Figure 5. Bilateral Ovarian Endometriosis. Image (A) T2-weighted and Image (B) T1-weighted. Both ovaries are located in a more central and posterior position than usual, and in both ovaries, we can see cysts with characteristic signs of endometriomas: they are hyperintense on the T1-weighted image with fat suppression (B), while on the T2-weighted image (A) they show slight shading.[9]

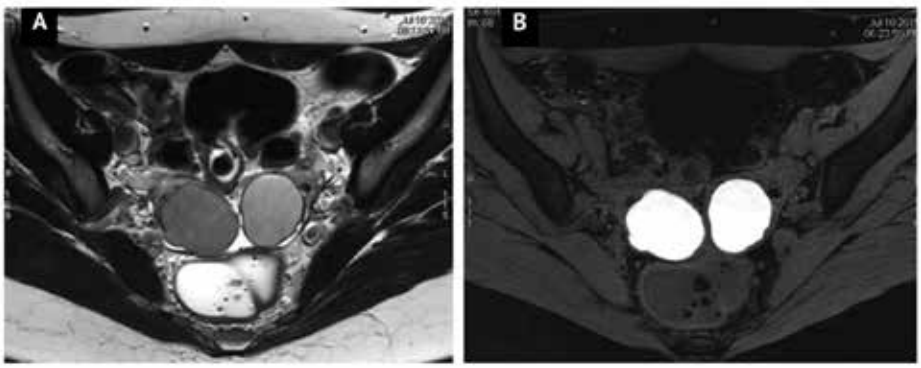
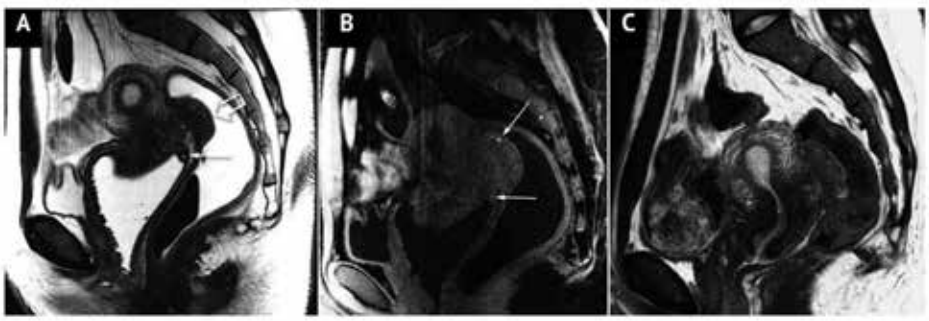


Figure 6. Deep Endometriosis of the Rectal Wall and Vaginal Fornix. Sagittal image (A) T2-weighted showing hypointense thickening of the posterior vaginal recess wall with small hyperintense glandular foci (arrow). Significant focal thickening of the rectal wall (hollow arrow in A) is indicative of deep involvement, although it does not reach the rectal lumen: on posterior endoscopy, it was described as extrinsic compression. On the T1-weighted image with fat suppression (B), small hyperintense hemorrhagic foci (arrows) are observed both in the rectal lesion and in the vaginal wall. The endometriotic involvement of the rectum and vagina is in continuity with the implant at the bottom of the Douglas pouch. As a correlation, (C) shows a sagittal T2-weighted image from the same patient's MRI study acquired weeks earlier; this image contributes to the diagnosis of pelvic endometriosis.[8]



EXTRAPELVIC ENDOMETRIOSIS

Extrapelvic endometriosis is a rare condition of endometriosis found in locations distant from the pelvic organs, with abdominal wall endometriosis and thoracic endometriosis being the most common. Regarding abdominal wall endometriosis, the most frequent sites are the inguinal and umbilical regions. These patients are often admitted to the hospital with cyclical abdominal pain and are not referred to a gynecologist. Magnetic resonance imaging (MRI) shows a solid hypointense mass on T2-weighted images (T2WI) with hyperintense hemorrhagic cysts or hyperintense hemorrhagic cysts on T1-weighted images (T1WI). Saturated fat T1WI is recommended for the diagnosis of abdominal wall endometriosis (Figure 7).[11]

Thoracic endometriosis is characterized by the presence of endometriotic lesions in the thoracic cavity. The most common clinical presentation is catamenial pneumothorax, which occurs in 70% of cases of thoracic endometriosis, followed by catamenial hemothorax and pulmonary nodules.[2]

Much less frequently, endometriotic implants affect other parts of the intestinal tract, such as intestinal loops, the cecum, or appendix. The diagnosis of these lesions is difficult to make through pelvic magnetic resonance imaging, and when there is clinical suspicion of small bowel involvement, a magnetic resonance enterography or computed tomography scan may be indicated. Figure 8 represents intestinal endometriosis. In cases of suspected small bowel involvement, magnetic resonance enterography should be performed, as the distension of the intestinal loops with liquid facilitates the detection of implants in the intestinal wall.

Figure 7. Axial FS T1WI (B); axial T2WI (C); axial F1 T1WI with contrast (D). The lesion (arrows) shows low signal on T1 and T2WI with an ill-defined border. There is a small point of intensity on FS T1WI (arrow). The mass is almost uniformly enlarged. The patient received hormonal therapy, which reduced the lesion. FS = fat saturation; WI = weighted imaging.[2]

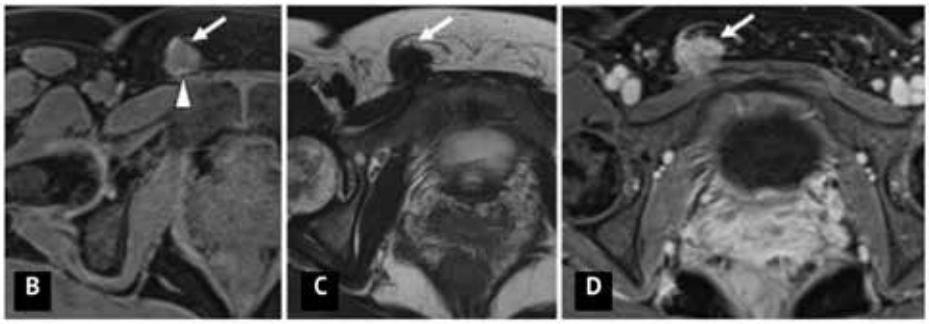


Figure 8. Patient with clinical signs of intestinal obstruction, showing in image (A) an incomplete obstruction due to an extrinsic lesion in an ileal loop in the pelvis (arrow) with adhesions between the loops. The MRI enterography (B and C) identified two endometriosis implants affecting the small intestine, one in the pelvis and another more cranially (arrows).

CONCLUSION

Endometriosis is a common chronic inflammatory disease that affects women of reproductive age and can severely impact their quality of life, as well as interfere with fertility. The initial imaging study in suspected endometriosis should be performed through detailed ultrasound. Magnetic resonance imaging (MRI) analysis is beneficial for detailing some lesions detected by ultrasound and, due to its high contrast and objectivity, can contribute to the early and accurate diagnosis of ovarian endometriotic cysts and deep disease involvement, avoiding the need for invasive procedures. Furthermore, MRI plays an important role in assessing the severity, leading to the selection of the ideal treatment and preoperative planning.[5]

The different forms of involvement make endometriosis a challenging disease in terms of its nonspecific symptoms and the complexity involved in interpreting diagnostic exams, leading to diagnostic errors and delays in treatment. Although laparoscopy is the gold standard for diagnosis, it is an invasive procedure and has limitations in extensive disease with obliteration of spaces. Therefore, imaging becomes essential in its evaluation when there is mastery of anatomy and interpretation of findings, with magnetic resonance imaging being the ideal tool for accurately observing the pelvic organs.[12]

In this way, the magnetic resonance imaging study protocol must be fully understood in order to establish a thorough analysis of endometriotic lesions, especially deep ones, as they are often very subtle. This is because, in magnetic resonance imaging, the fibrous component is usually predominant. It is crucial that radiologists are familiar with both common and uncommon locations of endometriosis, its characteristic imaging findings, and are capable of correlating these findings with the severity of the disease, to better describe the sites of involvement and guide treatment selection.

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Library Review - Izabella Goulart
Spell Check: Dario Alvares

Translation: Soledad Montalbetti
Received: 23/03/25. Accepted: 25/03/25. Published in: 03/04/25.

GOIANA JOURNAL OF MEDICINE

DOI: 10.63162/V66N67E25526
ISSN 0034-9585
e25526
SCIENTIFIC ARTICLE - CASE REPORT

ORTHODEOXIA-PLATYPNEA SYNDROME ASSOCIATED WITH ATRIAL SEPTAL DEFECT: CASE REPORT

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ABSTRACT

Orthodeoxia-platypnea syndrome (POS) is a rare clinical condition, with few reports in the literature. Characterized by the presence of a pulmonary arteriovenous shunt (arteriovenous malformation and hepatopulmonary syndrome) or intracardiac right-to-left shunt (patent foramen ovale and/or related interatrial septal defects). Atrial septal defect (ASD) is the most prevalent cause of POS, representing around 87% of cases. The treatment of this syndrome varies according to its etiology. In this report, a POS situation associated with the presence of an ASD is presented, and the diagnostic strategy and approach used to treat this condition are discussed.

Keywords: Dyspnea, Interatrial communication, Hypoxia, Cardiology, Rare Syndromes.

INTRODUCTION

The Orthodeoxia-platypnea syndrome (POS) is a rare condition characterized by the presence of desaturation (orthodeoxia) and dyspnea (platypnea) in the upright position, with improvement of the symptoms in the supine position.[1] This phenomenon is caused by the presence of a pulmonary arteriovenous shunt (arteriovenous malformation and hepatopulmonary syndrome) or an intracardiac right-to-left shunt (patent foramen ovale and/or related interatrial septal defects).[2] Although its prevalence is underestimated, POS has relatively simple tests for diagnosis, such as comparing arterial blood gas measurements taken in different patient positions or evaluating the intracardiac impact of the right-to-left shunt through the use of a transesophageal echocardiogram with contrast in both the supine and upright positions.[1]

The first case of POS was described by Burchell and associates in 1949, with few cases reported since then.[3] A meta-analysis of 150 articles comprising 239 patients between 1949 and 2016 showed that interatrial communication was the most prevalent cause of POS in the studies, found in 208 patients (87%). The Patent Foramen Ovale (PFO) was the most commonly responsible for the intracardiac

shunt. In addition to PFO, defects in the atrial septum (ASD) and atrial septal aneurysm (ASA) were reported. Extracardiac causes of POS included intrapulmonary arteriovenous malformations (9.2%) and pulmonary parenchymal diseases (3.7%) (4).

Transesophageal echocardiography represents the primary diagnostic modality, providing good visualization of any defects or aneurysms that may be present in the atrial septum[4]. The definitive treatment of POS secondary to an intracardiac shunt involves closing the interatrial defect, carefully considering not only the severity of the patient's symptoms but also the patient's underlying medical conditions. The individual's ability to tolerate an invasive procedure must also be considered when making the decision. Recently, percutaneous closure has surpassed cardiac surgery in the treatment of ASD and PFO, due to reduced morbidity, mortality, and costs[5]. As for extracardiac causes, the approach is individualized for each etiology, such as pulmonary artery embolization for the treatment of symptomatic primary pulmonary arteriovenous malformation; liver transplantation for hepatopulmonary syndrome; treatment of the underlying pulmonary condition for patients with primary parenchymal lung disease, among other treatment modalities.[4]

The case report describes the percutaneous closure of an ASD as treatment for POS in a patient with low functional capacity.

CASE REPORT

A The patient is an 81-year-old female with a recent history of pulmonary embolism (PE), admitted due to desaturation, asthenia, and a non-productive cough. A chest CT angiogram performed at admission ruled out a new PE and the presence of opacities. The patient was transferred to the intensive care unit (ICU) for persistent severe hypoxemia at rest. In the ICU, it was observed that hypoxia worsened in the supine position but improved in the lateral decubitus positions. Due to suspicion of interatrial shunt, a transthoracic echocardiogram was performed, which showed an ejection fraction of 70%, septal wall: 10 mm, posterior wall: 9 mm, diastolic diameter: 45 ml, systolic diameter: 27 ml, systolic pulmonary artery pressure: 32 mmHg, left ventricle (LV) with preserved global and segmental systolic function at rest, and signs of redundancy in its leaflets with passage of microbubbles on agitated contrast, suggestive of a patent foramen ovale (PFO). The patient showed improvement in hypoxemia and was discharged from the ICU. On the ward, she experienced a fall from her own height, which resulted in the return of hypoxemia, especially when sitting on the bed, and she was again transferred to the ICU. The hypothesis of hepatorenal syndrome was raised, and an abdominal CT angiogram was performed, revealing narrowing of the inferior vena cava without flow obstruction. She underwent sequential balloon catheter angioplasty of the intrahepatic segment of the inferior vena cava. However, the patient continued to experience hypoxemia.

Subsequently, in the hemodynamics department, the patient underwent pulmonary arteriography and right heart catheterization, which revealed the absence of pulmonary arterial hypertension, with significant transvalvular gradients and right chamber overload. Easy passage of the catheter from the right atrium to the left atrium was observed at the location of the oval fossa. A suspicion of an atrial septal defect (ASD) or patent foramen ovale (PFO) was raised.

The patient was referred for percutaneous closure of the ASD. A new transesophageal echocardiogram (TEE) prior to the procedure showed the presence of an ASD in the fossa ovalis region (ostium secundum), measuring approximately 5-6 mm, with exclusive left-to-right flow. The interatrial septum was hypermobile, with an aneurysmal appearance. The left atrium was catheterized using a Multipurpose

catheter, with a 0.035 long guide, 3 mm J-tip, and rigid. The catheter was removed, leaving the guide in place, over which a 10 French (FR) sheath-introducer set was advanced. Once the sheath reached the left atrium (LA), the 0.035 guide and introducer were removed. A 28LA/28RA prosthesis was chosen, which was advanced through the sheath into the LA. The 28 disk was opened in the LA, then the set was pulled towards the interatrial septum (IAS), and its position was corrected using TEE and fluoroscopy. Once positioned parallel to the septum, the 28 disk was released in the right atrium (RA), with full deployment of the prosthesis (Figure 01). The procedure was completed, and all material was removed for hemostatic compression. During the procedure, the patient experienced temporary ST segment elevation on the monitor, and coronary angiography was performed via the left femoral artery with 6 FR, revealing chronic changes similar to a previous exam. The most likely cause of this complication was suspected coronary gas embolization. After the procedure, the patient showed significant improvement in their hypoxia, remaining stable, with no change in peripheral oxygen saturation in the supine position, while sitting, and in orthostasis.

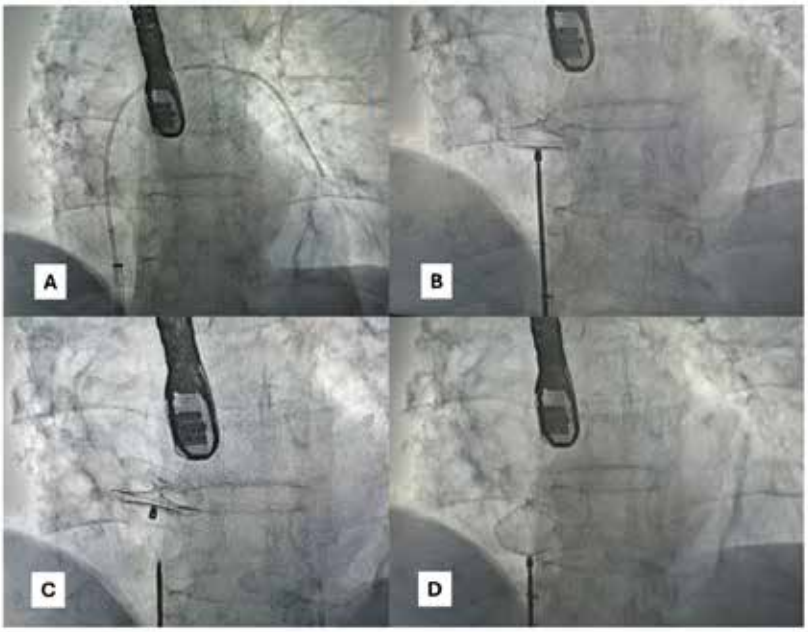

Figure 01. Images of the atrial septal defect (ASD) closure procedure. A) Crossing the ASD with the MP-multipurpose catheter, positioned in the left pulmonary vein; B) Placement of the prosthesis; C) Release of the prosthesis; D) Final appearance after the procedure.

DISCUSSION

Orthodeoxia-platypnea syndrome (POS) is a condition characterized by the presence of dyspnea associated with desaturation in the orthostatic or sitting position, with improvement of the condition in the supine position.[6] The primary mechanisms are related to intracardiac or extracardiac abnormalities, and various etiologies. In the presence of the suspected clinical picture, the etiology associated with the identified condition should be investigated; even so, POS may occur without identifiable pulmonary or cardiac disease in 13% to 47% of cases. POS secondary to

an atrial septal defect (ASD) has been most commonly reported in situations where the ventricular filling pressure is capable of generating a transient pressure gradient from the right atrium to the left in the orthostatic position, as cited in our report.[7]

The diagnostic test of choice for this syndrome is the transthoracic echocardiogram, which should be performed with agitated saline contrast, improving diagnostic performance. If the results of the transthoracic echocardiogram are inconclusive or negative, with a high index of suspicion remaining, a transesophageal echocardiogram (TEE) is recommended. At the same time, sources of intrapulmonary shunt can be investigated with agitated saline injection. Perfusion scintigraphy and pulmonary arteriography should also be considered in this context.[7]

The patent foramen ovale (PFO) is relatively prevalent in the general population (around 25-30%, depending on the individual's age). However, most people with a PFO never develop symptoms of orthodeoxia-platypnea syndrome (POS) because the left atrial pressure is 5-8 mmHg higher than the right atrial pressure, resulting in functional closure without shunt. Therefore, for POS to occur, in addition to the anatomical septal interruption between the two heart chambers, a second anatomical/functional phenomenon is necessary to direct the blood flow from the right to the left through the interatrial communication (ASD).[7]

As reported by Knapper and colleagues, percutaneous closure of the interatrial defect is the gold standard treatment for POS in the context of intracardiac shunt, showing symptomatic improvement in more than 95% of patients, with rare adverse events and a good prognosis.[5] Similarly, in our case, other therapeutic measures were undertaken without improvement of the condition. Only after the percutaneous closure of the ASD did the patient show significant reversal of hypoxia in orthostasis.

CONCLUSION

In the case now reported, percutaneous closure of the ASD was the procedure of choice for the treatment of POS, with successful outcomes, and no recurrence of the hypoxia.

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Spell Check: Dario Alvares
Received: 15/02/25. Accepted: 28/02/25. Published in: 27/03/25.

GOIANA JOURNAL OF MEDICINE

DOI 10.63162/V66N67E25525
ISSN 0034-9585
e25525
SCIENTIFIC ARTICLE - CASE REPORT

ORGANIC PERSONALITY DISORDER SECONDARY TO NEUROCYSTICERCOSIS: A CASE REPORT

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ABSTRACT

Neurocysticercosis is the most common type of neuroparasitic infection. In this condition, the central nervous system (CNS) is infested with larvae from the tapeworm Taenia solium. Reported neuropsychiatric manifestations associated with neurocysticercosis include depression, cognitive dysfunction, dementia, and visual hallucinations. Organic personality disorder is a behavioral and personality change that may be a residual or concomitant disorder resulting from brain injury, dysfunction, or disease. There is no literature linking neurocysticercosis and personality disorders. In this article, we report a novel case of a 58-year-old man presenting with personality disorder after a neurocysticercosis episode. Upon evaluation, the patient displayed impulsivity, poor inhibitory control, expressed thoughts of killing his wife, and showed no remorse. He has a history of alcoholism and neurocysticercosis with 19 cysts on imaging studies at the age of 10. The patient's personality prior to the neurocysticercosis episode was characterized as hyperthymic. Diagnostic hypotheses of bipolar affective disorder type 2, corticobasal dementia, and organic personality disorder secondary to neurocysticercosis are raised. The literature presents poorly understood mechanisms behind the development of mental disorders due to neurocysticercosis. Cases of mental disorders associated with neurocysticercosis and its high prevalence in the psychiatric population are well-documented. We conclude that this report is novel and highly significant in encouraging further studies on mental disorders associated with neurocysticercosis, promoting clinical investigation of this condition in psychiatric patients, and encouraging investigation in patients with personality disorders.

Keywords: Neurocysticercosis, Personality disorders, Neurocognitive disorders, Delirium, Neglected diseases.

INTRODUCTION

Neurocysticercosis is the most common type of neuroparasitic infection. Currently, it affects more than 50 million individuals worldwide. In this condition, the central nervous system (CNS) is infested with larvae from the tapeworm Taenia solium. It is transmitted via the fecal-oral route and is associated with poor hygiene conditions. The diagnosis is based on neuroimaging and serology. Reported neuropsychiatric manifestations associated with neurocysticercosis include depression, cognitive

dysfunction, dementia, and visual hallucinations. Depending on the location of the cysts in the CNS, focal neurological or psychiatric symptoms may manifest.[1] A Brazilian study showed that up to 75% of severe mental disorders are associated with neurocysticercosis, and more than 15% of patients with neurocysticercosis develop psychotic disorders. According to the DSM-V TR, organic personality disorder is a behavioral and personality change that may be a residual or concomitant disorder resulting from brain injury, dysfunction, or disease.[2] There is no literature linking neurocysticercosis and personality disorders. In this article, we report a case of a 58-year-old man presenting with a personality disorder after an episode of neurocysticercosis.

CASE REPORT

The patient is a 58-year-old, male, black, married, public servant from the interior of Goiás. He started psychiatric follow-up in 2024 at a psychiatric service in Goiânia-GO. At that time, the patient reported a 15-year history of Othello syndrome, exhibiting pathological jealousy toward his wife. Seven years ago, he began showing a low frustration threshold, with crying and agitation when contradicted. He also presented depressive symptoms at that time, and was prescribed Fluoxetine 20 mg and Sodium Valproate 500 mg. He has continued to use these medications until the consultation. One year ago, he began experiencing atypical postural/kinetic tremor in his left upper limb and jaw. During the consultation, the patient exhibited impulsivity, poor inhibitory control, talked about killing his wife, and showed no remorse. On mental examination, the patient was logorrheic, with a prolix speech, dysphoric mood, some irritability, and a lack of insight. No abnormalities were found on physical examination. He has a history of alcoholism and neurocysticercosis, with 19 cysts detected on imaging at the age of 10. Prior to the neurocysticercosis episode, his personality was characterized as hyperthymic. He has a family history of siblings with bipolar affective disorder. The diagnostic hypotheses raised include bipolar affective disorder type 2, corticobasal dementia, and organic personality disorder secondary to neurocysticercosis. Given the clinical presentation, the following interventions were made: fluoxetine was discontinued, Sodium Valproate was increased to 1 g/day, and Olanzapine 5 mg/day was introduced.

DISCUSSION

There is limited data in the literature on the mechanisms by which this disease causes mental disorders. The presence of parasites can cause structural changes in the CNS, with significant involvement of immune mechanisms, leading to edema, reactive gliosis, and arachnoiditis, which in turn may influence proliferative endarteritis with lumen occlusion and hydrocephalus. As a result of all this, it can lead to intracranial hypertension and brain edema. These mechanisms depend on the parasitic load and the location of the parasites in strategic areas of cognitive and affective levels.[3]

In an observational study that evaluated individuals with neurocysticercosis using the Mini-Mental State Examination, 38.75% of these patients showed cognitive deficits.[4]

There are case reports in the literature associating neurocysticercosis with frontotemporal dementia, bipolar affective disorder, and suicidal ideation.[5-8]

A Brazilian observational study found that in patients with neurocysticercosis, 65.8% had psychiatric disorders, 87.5% had cognitive decline, 52.6% had depression, and 14.2% had psychosis.[9] In a case-

control study in Venezuela, the prevalence of neurocysticercosis was observed in 18.35% of patients admitted to a psychiatric hospital and in 1.57% of the controls.[10]

Given this, it is noted that there are poorly understood mechanisms by which mental disorders are produced as a result of neurocysticercosis. Mental disorders associated with this condition and its high prevalence in the psychiatric population are well documented in the literature. It is questioned whether the presence of a mental disorder increases the risk of poor hygiene conditions and, consequently, of neurocysticercosis.

No other case reports were found in the literature associating organic personality disorder and neurocysticercosis.

CONCLUSION

We conclude that this report is unprecedented and of great importance in encouraging further studies on mental disorders associated with neurocysticercosis, promoting clinical investigation of this condition in psychiatric patients, and encouraging the investigation of this condition in patients with personality disorders.

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Library Review - Romulo Arantes/ Izabella Goulart

Spell Check: Dario Alvares
Received: 25/02/25. Accepted: 28/02/25. Published in: 25/03/25.