Advanced testicular carcinoma: a diagnostic approach based on clinical ultrasound in the emergency department

Carcinoma testicular avanzado: diagnóstico y abordaje en urgencias a través de la ecografía clínica

To the Editor,

Point-of-care ultrasound in the emergency department is gaining increasing importance due to the absence of radiation exposure, the ability to provide rapid diagnosis, and the possibility of performing serial examinations.

We present the case of a 48-year-old man with no relevant medical history who presented to the emergency department for 3 reasons: an 8-month history of right testicular mass, a 1-month history of hemoptysis, and a 15-day history low back pain.

On arrival, the patient was hemodynamically stable. Physical examination revealed a 3-cm right testicular mass of hard consistency, without inguinal lymphadenopathy. Cardiopulmonary auscultation was normal, and there was tenderness over the lumbar paravertebral muscles without spinous process pain.

A bedside scrotal ultrasound revealed the presence of a 3 cm × 2 cm solid, heterogeneous, intratesticular mass with increased vascularization, which are findings consistent with malignancy in approximately 95% of cases.[1] (Figure 1).

Additional studies included blood tests and lumbar radiography, both of which came out normal. However, the chest radiograph showed a "cannonball" pattern—multiple bilateral pulmonary nodules (Figure 2).

The patient was admitted for evaluation of suspected metastatic testicular tumor. A follow-up, formal scrotal ultrasound confirmed the same findings, and computed tomography (CT) revealed a large retroperitoneal mass suggestive of extensive lymphadenopathy, multiple pulmonary metastases with hemorrhagic halo, and a right testicular mass. A right orchiectomy was performed, confirming the diagnosis of choriocarcinoma.

Testicular cancer accounts for approximately 1% of all malignant tumors in men and is the most common neoplasm among men aged 15–35 years.[2] The most frequent histologic subtypes are germ cell tumors (90–95% of primary testicular neoplasms),[3] which generally have an excellent response to chemotherapy, even in advanced stages.[4]

Scrotal ultrasound has become the imaging modality of choice for the evaluation of testicular disease in emergency settings, given the of-

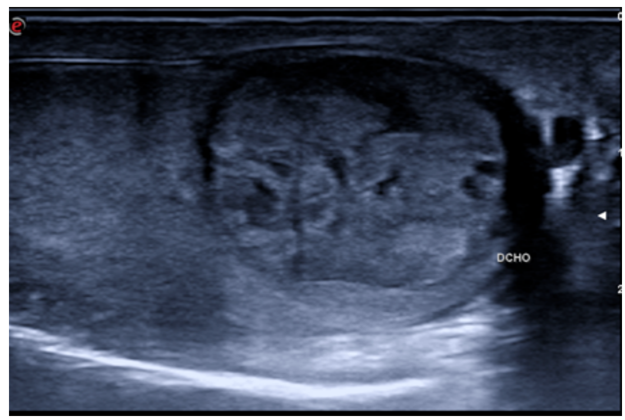

Figure 1. Longitudinal ultrasound image of the right testis showing a 2 cm × 3 cm solid lesion with well-demarcated margins and heterogeneous echogenicity.

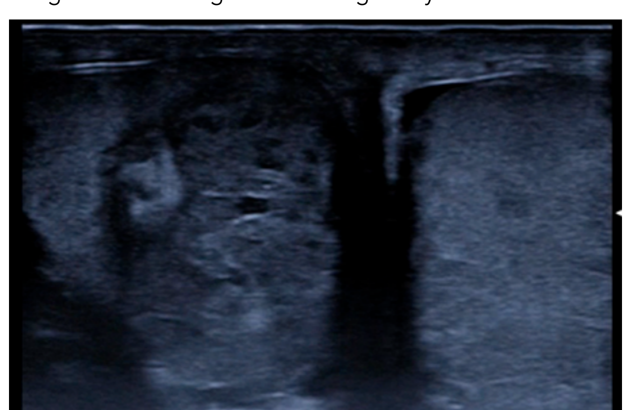

Figure 2. Dual-screen (transverse) view showing a normal left testis and a right testis with the lesion described in Figure 1.

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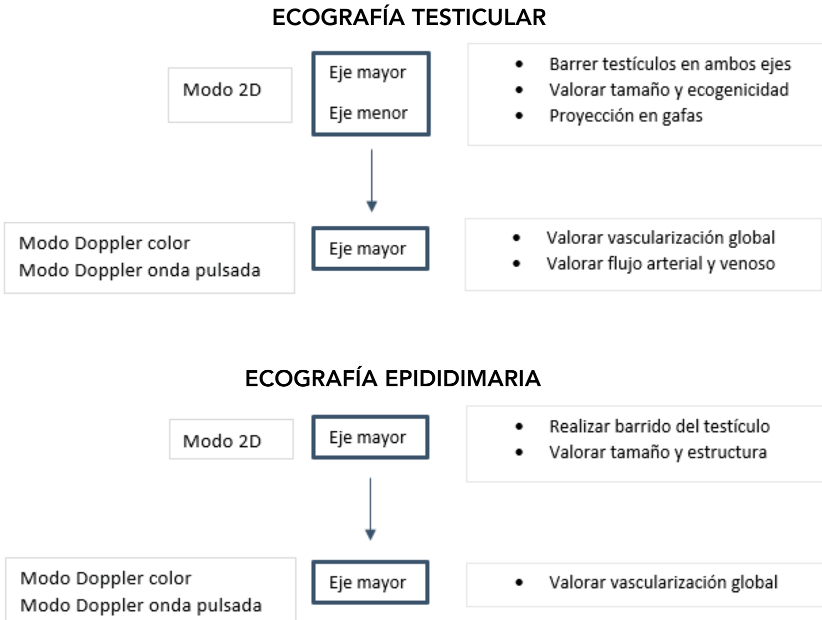

Figure 3. Flow diagram for systematic testicular and epididymal ultrasound examination (author's own elaboration).

ten atypical clinical presentations and the limited specificity of other complementary tests. It is particularly useful for conditions that pose an immediate risk to testicular viability.

The ultrasound examination should be performed with the patient in the supine position, soles of the feet together, and legs apart, with the penis positioned upward. The study must be bilateral, assessing both testes and epididymides[5] using a high-frequency probe.

A simple, systematic approach can be applied in daily practice (Figure 3). Begin with a 2D scan of the testes in both the longitudinal and transverse planes, assessing size, echogenicity, and a "dual-screen" (glasses) projection to compare both testes simultaneously (Figure 4). Normal testes appear as oval, homogeneous structures with smooth, rounded borders, measuring approximately 4–5 cm in length and 2–3 cm in width. Color and pulsed-wave Doppler should then be used to evaluate vascular structures. To assess the epididymis, focus on the longitudinal axis of the testes, starting with a 2D scan and then applying Doppler mode. The epididymis is located on the posterolateral surface of the testis.

We emphasize the usefulness of point-of-care testicular ultrasound in emergency medicine, as it allows for timely clinical assessment and diagnosis of time-sensitive conditions without exposing the patient to radiation or risk.[4] With a relatively short learning curve, emergency physicians can achieve optimal diagnostic value from this technique. We therefore advocate for reinforced training in testicular and scrotal ultrasound among emergency medicine specialists.

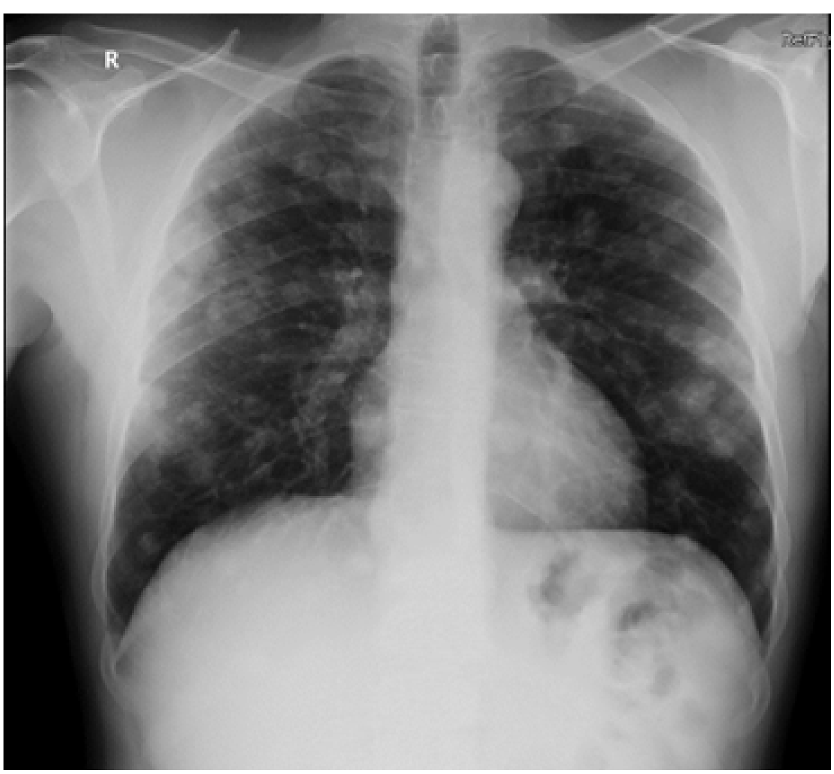

Figure 4. Posterior-anterior chest X-ray showing multiple pulmonary nodules with defined contours, without calcifications, and distributed in both lung fields. Image consistent with a balloon release pattern.

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Doubts about natural language processing

Dudas sobre el Procesamiento de Lenguaje Natural

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Manuel Pardo Ríos.

To the Editor,

I have read with interest the article published in Rev Esp Urg Emerg on natural language processing (NLP) in the review of scientific literature by Calero-Sánchez *et al.*[1] The objective proposed in the study is of considerable depth—no more and no less than making a bibliographic search simpler and more efficient. But after a double reading of the document, the process for carrying it out does not seem so simple. Perhaps for an expert in computer engineering it is straightforward, but in the solitude of a clinical researcher, applying filters and tags to documents in search of scientific evidence seems very complicated. Tools such as NL-PEXPLO-RER, the CLEF eHealth Evaluation Lab, or Jupyter Notebooks are usually beyond our understanding, although perhaps it is not necessary to know how to use them now that ChatGPT, Gemini, or Copilot are available.[2]

Another thing I have not quite understood from the article is that NLP can automatically generate the summary of a scientific text, or hundreds of texts, since in most cases scientific documents already come with their abstract. Therefore, what is the usefulness of asking ChatGPT to make a summary for you?

Also, what is the point of having an NLP system identify concepts for you, if these scientific documents all have their own keywords?

Another added difficulty: the proposal to save PubMed searches to a file in CSV format is not part of clinicians' usual practice. And from this file, performing preprocessing and "tokenizing" and "lemmatizing" to refine the search seems scarcely feasible.

With all this, I do not intend to devalue the mentioned article[1] nor to generate controversy on the subject, but rather to highlight the probable gaps and doubts that health care professionals may have about this topic, and to express my desire that, for the readers of Rev Esp Urg Emerg, this document may serve as a reference for future work on NLP.

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Natural language processing: authors' reply

Procesamiento de Lenguaje Natural. Respuesta de los autores

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Editor in Charge:
Manuel Pardo Rios.

To the Editor,

Following the interesting questions raised by Nogué in his letter, we now try to respond to his comments.[1] Regarding tools such as NL-PEXPLORER, CLEF eHealth Evaluation Lab, or Jupyter Notebooks, it is true that some of these tools have certain complexities that require having a computer engineer nearby. However, it is also true that medical professionals and those from other disciplines are increasingly accustomed to using tools that facilitate tasks such as data cleaning and analysis, among others. With simple instructions, excellent results can be achieved. And, as you rightly point out, what is coming with generative artificial intelligence (GAI) models promises even more to facilitate the lives of researchers. Specifically, regarding the tools mentioned in the article:

– The NLP-EXPLORER tool is provided as an example because it has objectives aligned with those of our work. Although the field of interest is Natural Language Processing, it provides articles related to a search term by extracting from the articles terms grouped by tasks, the data on which they are based, and other relevant aspects not available in the key-

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words. It should be interpreted as an example of the usefulness of this type of tool and the interest they generate in different research fields.

– CLEF eHealth Evaluation is a website that offers events, competitions, and evaluation frameworks for competitions involving automatic processing of biomedical texts, and it has been active since 2012. This highlights the interest these tools also generate in the clinical field.

– Jupyter Notebook is a tool that is beginning to prove useful for teaching and research in the biomedical field.[2,3]

Some courses on this are available online.[4-6]

Currently, in Google Colaboratory it is available with Google's AI assistant for code generation, which makes it even more useful in fields outside computer science.

Regarding the doubts about the usefulness of the summary, with the proposals in the article, GAI can not only produce summaries—which, as you note, are already included in the articles. It is also possible to ask about different elements of research papers: their methods, what data they used, where the data were obtained, what the main result of the article is, to compare two or more articles, request questions about the article, etc. The important thing is that, by working with our everyday language, the questions can be whatever our imagination and experience suggest.

Regarding the keywords of an article, these are a good starting point for defining the scope of the work. Systems based on natural language processing also allow us to obtain semantically equivalent words and thus explore other articles that include these new words—derived from the keywords—in their titles. This process is automatic, so we do not need to search one by one but rather through simple calls to programs such as WordNet, as described in the article.[7]

With our method, we also examine the "useful" words in the title, which are often not included among the keywords. In this way, a wider range of words and their semantic equivalents is covered.

Finally, regarding how to archive searches obtained from PubMed, the most widely used formats for computer-based data processing today are CSV, XLS, TXT, JSON, etc. It is understandable that readers unfamiliar with these data formats face an extra step before they can begin working with them. Once the data are available in these formats, functions such as "tokenizing," "lemmatizing," etc., are performed just as we indicated at the beginning of this letter to the editor.

In any case, we thank Prof. Nogué for his comments, which not only help improve the understanding of our article but also demonstrate the interest it has generated among healthcare professionals. This group and computer scientists are being pushed to inevitably understand one another.

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Fatal metformin-associated lactic acidosis with a high osmolar gap

Acidosis láctica fatal asociada a metformina con GAP osmolar elevado

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To the Editor,

Metformin-associated lactic acidosis (MALA) is a rare complication with a high mortality rate and is usually related to some predisposing factor that, by itself, produces a hydroelectrolytic disorder.[1] Clinically, it is characterized by an acute gastrointestinal-like presentation accompanied by hyperventilation, drowsiness, and coma. Analytically, it features an elevated anion gap (AG), base deficit, and hyperlactatemia (a prognostic marker), although secondary hyperkalemia is the most severe complication.[2,3] Definitive treatment consists of drug clearance through hemodialysis techniques.[4]

Serum osmolality or osmolarity is defined as the concentration of solute in the intravascular compart-

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ment relative to the extravascular one. Tonicity (or effective serum osmolarity), which determines water movement between compartments via osmosis, depends on it. An increase in osmolarity affects the entire organism, especially the brain, where it can cause seizures and death. Exogenous solutes such as toxic alcohols, urea, or ketones can influence this exchange and alter tonicity.[5]

We present a case with suspected MALA, accompanied by unusually high serum osmolarity and osmolar gap (OG), which could not be explained in the absence of typical toxins.

A 61-year-old man with a past medical history of hypertension, hyperlipidemia, type 2 diabetes mellitus with associated nephropathy and neuropathy, and ischemic heart disease. Former smoker for 7 years and regular alcohol consumption. His medications included enalapril (20 mg/day), rosuvastatin (40 mg/day), metformin (1,700 mg/day), sitagliptin (100 mg/day), and acetylsalicylic acid (100 mg/day). One month earlier, he had been treated in the emergency department (ED) for acute alcohol intoxication.

He was brought to the ED by basic ambulance after a syncopal episode at home in the context of 24 hours of gastroenteritis. On arrival, his blood pressure was 90/60 mmHg; heart rate, 130 bpm; respiratory rate, 25 breaths per minute; axillary temperature, 35.5°C; and oxygen saturation, 97% on room air. Physical examination showed pallor of skin and mucous membranes, decreased level of consciousness with drowsiness, Kussmaul-type breathing with ketotic odor, and diffuse abdominal tenderness. Cardiopulmonary auscultation was normal.

Initial venous blood gas revealed: pH 6.6 (7.35–7.45), bicarbonate 4.1 mmol/L (20–26), sodium 142.1 mmol/L (135–145), potassium 6.57 mmol/L (3.6–4.8), chloride 103 mmol/L (95–105), glucose 212 mg/dL (70–100), lactate 20.85 mmol/L (0.5–2.2) (amperometric enzymatic method), AG 39 mmol/L (8–16). Ketone bodies 4.9 mmol/L (0.6–1). Blood tests showed marked leukocytosis with left shift, acute renal failure with creatinine 3.3 mg/dL (0.72–1.25), blood urea nitrogen 32.2 mg/dL (6–20), creatine kinase B 552 U/L (30–200) and extremely high osmolality: 823 mOsm/kg (275–295) with a calculated OG of 494 mOsm/L. Hemoglobin and coagulation were normal. Blood ethanol and urine toxicology (detectable drugs measured by qualitative immunochromatography) tested negative. Chest X-ray and ECG showed no abnormalities. Early treatment was initiated to correct acidosis and hyperkalemia with IV bicarbonate, fluid therapy, calcium gluconate, glucose with insulin, and nebulized salbutamol. Due to rapid clinical deterioration, advanced life support measures were initiated, including orotracheal intubation and norepinephrine infusion (0.5 µg/kg/min). Poor clinical response and the ineffectiveness of these measures led to the abrupt appearance of complications, including several episodes of pulseless electrical activity and cardiorespiratory arrest. The patient died 5 hours after ED arrival. A few days later, reference laboratory results (serum gas chromatography) for methanol, ethylene glycol, and metformin (sample taken at the end of care) were received, with only metformin detected at 52 mg/L (toxic > 5 mg/L). Clinical autopsy was declined by the family.

Management of a patient with MALA must be immediate due to its high mortality. Elevated lactate associated with metabolic acidosis and increased AG should raise suspicion in a diabetic patient. Moreover, the presence of serum hyperosmolarity is a poor prognostic sign that necessitates ruling out exogenous solutes, and when combined with renal failure, indicates early intervention with extracorporeal clearance.

In this case, the possibility of other toxins, along with unusually high OG values, limited the ability to adopt definitive treatment, given the severity on presentation. Despite adherence to all initial life support recommendations (airway protection, fluid resuscitation, correction of electrolyte disturbances, vasoactive drugs), the patient rapidly progressed to multiple organ failure with inability to undergo hemodialysis, which would have reduced lactate, improved acidosis, and lowered the extremely high metformin levels.[2,4,6,7]

Reviewing the scientific literature, few cases of MALA with AG and OG as elevated as in this case have been described in the absence of other substances.[5,8] In all such reports, the presence of a typical toxin is confirmed, but very few describe metformin alone as the sole cause.[1,9] Our first suspicion was diabetic and alcoholic ketoacidosis, given the patient's past medical history (regular alcohol intake, sitagliptin use) and analytical findings (ketosis of 4.9 mg/dL). Although ethanol levels were negative and glucose levels < 250 mg/dL, this does not rule out these diagnoses.[10,11] Generally, these entities produce an OG of 15–20 mOsm/L.[5] Such extremely high serum osmolarity and OG (> 100 mOsm/L) led us to consider accumulation of other toxic substances such as alcohols (ethanol, methanol, ethylene glycol) and prompted a broader differential diagnosis.[5,8,9,12-14] Factors such as chronic renal failure, severe lactic acidosis, and shock also contributed.[15]

Hypotheses such as the presence of other toxic alcohols not routinely measured (isopropanol, propylene glycol, diethylene glycol, etc.) or a sample error must also be considered, despite lack of supporting evidence. Therefore, despite the unusual nature of this case—in which metformin alone generated such an osmolar gap—we consider it important to highlight this finding (pending further studies), as well as to emphasize the usefulness of measuring serum osmolarity as a clue in diagnosing potentially fatal conditions that may present in the ED.

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