



## REVIEW ARTICLE

# A review of the pathophysiological factors involved in urological disease associated with metabolic syndrome<sup>☆</sup>



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### KEYWORDS

Metabolic syndrome;  
Endothelial dysfunction;  
Kidney stones;  
Hypogonadism;  
Erectile dysfunction

### Abstract

**Introduction:** Metabolic syndrome is a constellation of disorders that includes insulin resistance, central obesity, arterial hypertension and hyperlipidaemia. These disorders can have implications for the genitourinary apparatus.

**Objectives:** To conduct a review on the pathophysiological aspects that explain the relationship between metabolic syndrome and sexual dysfunction, lower urinary tract syndrome, prostate cancer and stone disease.

**Methods:** We performed a qualitative, narrative literature review through a literature search on PubMed of articles published between 1997 and 2015, using the terms pathophysiology, metabolic syndrome, endothelial dysfunction, lipotoxicity, mitochondrial dysfunction, kidney stones, hypogonadism, erectile dysfunction, lower urinary tract syndrome and prostate cancer.

**Synthesis of the evidence:** Metabolic syndrome constitutes an established complex of symptoms, defined as the presence of insulin resistance, central obesity, hypertension and hyperlipidaemia.

Endothelial dysfunction secondary to lipotoxicity generates an inflammatory state, which involves renal cell metabolism, vascularization of the pelvis and androgen production. These facts explain the relationship between metabolic syndrome, nephrolithiasis, lower urinary tract syndrome, hypogonadism and erectile dysfunction in men.

**Conclusions:** Strategies such as proper diet, regular exercise, insulin treatment, testosterone-replacement therapy, therapy with antioxidants and free-radical inhibitors and urological treatments classically used for lower urinary tract syndrome have shown promising results in this syndrome.

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**PALABRAS CLAVE**

Síndrome metabólico;  
Disfunción endotelial;  
Litiasis renal;  
Hipogonadismo;  
Disfunción eréctil

## Aspectos fisiopatológicos implicados en la patología urológica asociada al síndrome metabólico. Revisión bibliográfica

**Resumen**

**Introducción:** El síndrome metabólico es una constelación de trastornos entre los que se incluyen la resistencia a la insulina, la obesidad central, la hipertensión arterial y la hiperlipidemia. Estas alteraciones pueden tener implicaciones sobre el aparato genitourinario.

**Objetivos:** Efectuar una revisión para describir los aspectos fisiopatológicos que explican la relación entre el síndrome metabólico y la disfunción sexual, el síndrome del tracto urinario inferior, el cáncer de próstata o la enfermedad litiasica.

**Métodos:** Se realiza una revisión bibliográfica narrativa cualitativa mediante una búsqueda bibliográfica en PubMed de los artículos publicados entre 1997 y 2015, utilizando los términos *fisiopatología*, *síndrome metabólico*, *disfunción endotelial*, *lipotoxicidad*, *disfunción mitocondrial*, *litiasis renal*, *hipogonadismo*, *disfunción eréctil*, *síndrome del tracto urinario inferior* y *cáncer de próstata*.

**Síntesis de la evidencia:** El síndrome metabólico constituye un complejo sintomático establecido y definido como la presencia de resistencia insulínica, obesidad central, hipertensión e hiperlipidemia.

La disfunción endotelial secundaria a la lipotoxicidad producida genera un estatus inflamatorio en el que se ven implicados el metabolismo celular renal, la vascularización de la pelvis o la producción de andrógenos. Estos hechos explican la relación entre el síndrome metabólico, la litiasis renal, el síndrome del tracto urinario inferior, el hipogonadismo y la disfunción eréctil del varón.

**Conclusiones:** Estrategias como el cuidado de la alimentación, el ejercicio regular, el tratamiento con insulina, tratamientos sustitutivos con testosterona o antioxidantes e inhibidores de los radicales libres, así como los tratamientos urológicos clásicamente utilizados en el síndrome del tracto urinario inferior han demostrado resultados prometedores en este síndrome.

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**Introduction**

Metabolic syndrome (MetS) is defined as the presence of hyperinsulinemia or insulin resistance in the same individual along with certain vascular risk factors such as dyslipidemia, hypertension (HTN) or central obesity prevalence. These factors are often associated with hypercoagulability, endothelial dysfunction, and inflammation.<sup>1</sup>

Inflammation and endothelial dysfunction have a direct implication on the genito-urinary system, constituting the pathogenic mechanism of diseases such as renal calculi,<sup>2</sup> erectile dysfunction<sup>3</sup> and lower urinary tract syndrome.<sup>4</sup> It has been shown that, in turn, MetS is closely related to hypogonadism, which certainly has implications in patients with late male hypogonadism, as well as patients with disseminated prostate carcinoma that undergo chemical castration.<sup>5</sup>

According to the most extensive studies, the prevalence of MetS is between 11% and 26% in men and between 7.5% and 18% in women. These figures vary depending on the criteria used.

Knowledge of the relationship between MetS and urologic disease is necessary. On the one hand, in order to identify this type of patients with urological consultation reasons. In this case, different specialists must take care of the patient to prevent non-urological complications associated with this process. On the other hand, the urologist can help the

treatment of the MetS itself, prevention of complications and treatment of urological complications associated with this process.

The aim of this paper is to describe the scientific evidence that explains the existing pathophysiological relationship between MetS and its pathological consequences on the genitourinary system.

**Material and methods**

We carried out a non-systematic literature review of the evidence collected from 1997 to January 2015. The following terms were introduced in order to proceed with the review: *pathophysiology*, *metabolic syndrome*, *endothelial dysfunction*, *lipotoxicity*, *mitochondrial dysfunction*, *renal stones*, *hypogonadism*, *erectile dysfunction*, *lower urinary tract syndrome* and *prostate cancer*. They were combined according to the title of the following sections. The search was realized in PubMed.

**Inclusion criteria**

Spanish and English articles published until January 2015 were included. *In vitro* or *in vivo* studies were included, both in animal and human models.

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