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An osteopathic approach to the renal and urinary system

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This article reviews the anatomy, physiology, and pathophysiology of the renal and urinary systems. The clinically relevant interactions and contributions with the musculoskeletal system of interest and use to the osteopathic family physician will be discussed, and an osteopathic manipulative approach to the renal and urinary systems will be explored.

Introduction

Very little has been written about the osteopathic approach to renal and urinary issues. Many osteopathic physicians feel that the renal system is the realm of the specialist and our eyes glaze over at the mention of countercurrent multipliers, juxtaglomerular apparatus, and renal tubular acidosis.

In fact, many of the clinical dilemmas we face daily in our clinical practices involve the kidneys or related structures. In addition, there are many ways to use osteopathic thinking and practice that do not require advanced technical expertise or knowledge (ie, you do not have to be the osteopathic guru we all remember from medical school) to benefit our patients.

This article will address the overall approach and thought process by which the osteopathic family physician (OFP) may better understand the contribution of musculoskeletal physiology to the renal/urinary system, and practical ways to construct a rationally based treatment plan that could include the use of osteopathic manipulation as a viable treatment modality. The final section will review the osteopathic approach to several common diagnoses.

This article will use a model of musculoskeletal medicine to simplify the discussion. The somatic system can be broken into five pathophysiological elements: (1) Structural, (2) neurologic, (3) respiratory-circulatory, (4) metabolic-energetic, and (5) behavioral (See Figure 1). Although there is considerable overlap between the different elements, reducing the somatic system this way facilitates easier discussion, and the different elements can be treated with differing approaches.[1]

The kidneys are responsible for many physiological functions throughout the body. Acid-base balance in conjunction with the lungs, electrolyte balance, volume regulation, osmolality of the blood, erythropoietin secretion, and vitamin D metabolism are the main functions of the kidneys. Many common clinical conditions that the OFP encounters daily such as acute kidney injury, acute tubular necrosis, pyelonephritis, nephrolithiasis, chronic kidney disease, hypertension, acute infectious cystitis, and urinary incontinence involve the renal or urinary system. Other clinical disorders such as heart failure, myocardial infarction, sepsis, and malnutrition can affect renal function by altering volume and blood flow.[2] In addition, problems such as chronic interstitial cystitis and some urinary incontinence can be extremely challenging to treat using the best available conventional methods. Both patients and physicians can become frustrated by the lack of effective treatment options and this can lead to both patient and physician dissatisfaction.[3]

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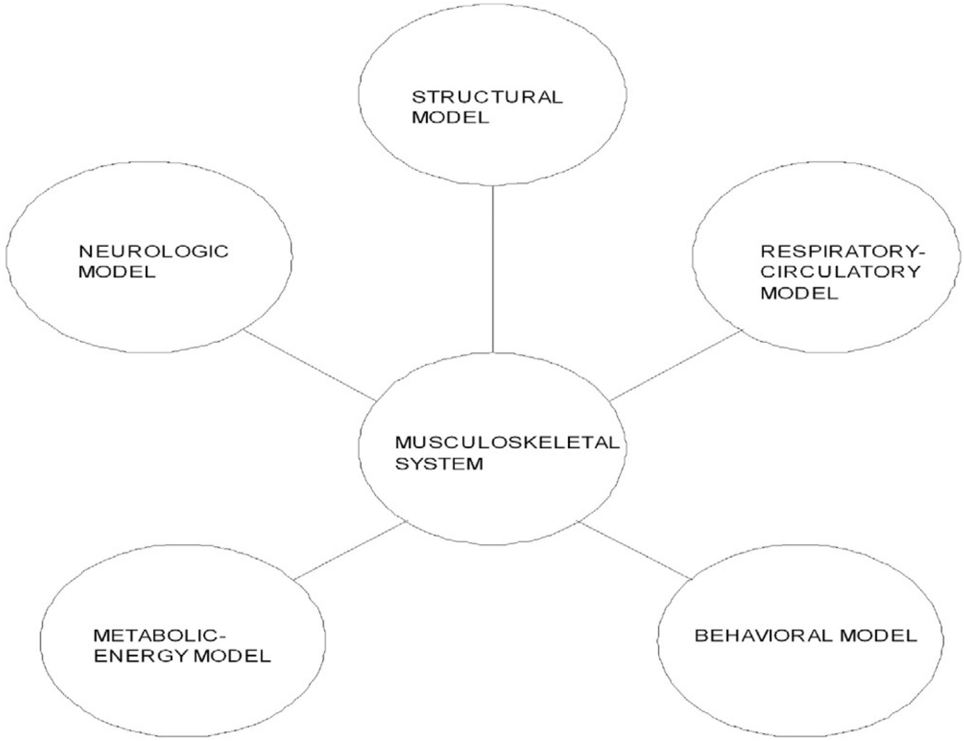

Figure 1 Model of aspects of musculoskeletal medicine.

Many drugs and medical interventions can have deleterious effects on the renal system. Nonsteroidal anti-inflammatory drug (NSAID) use is extremely common but can cause acute nephropathy, acute interstitial nephritis, and chronic kidney disease, and it can worsen hypertension. Computed tomography scan and cardiac catheterization contrasts can both cause acute kidney injury. Despite the many excellent standard medical treatments available, there are a myriad of clinical cases that can benefit from non-pharmacologic treatment. These are the situations in which the OFP can use osteopathic medicine to treat their patients.

Biological, physiological, pathophysiological, and clinical data will be cited to support an osteopathic approach whenever possible. However, it should be noted that there are few randomized clinical trials that have examined this subject. Therefore, biological and pathophysiological models, in the context of accepted osteopathic experience, will be used to support this approach.

Structural elements

Musculoskeletal changes can affect renal function either directly or through changes in cardiopulmonary function.

The kidneys are located in the retroperitoneal space between T12 and L3 and are about 10 cm in size.[4]

The kidneys are supported only by fascial connections through the renal fat. The primary attachment is through the diaphragmatic fascia as well as the psoas major fascia. The lower aspect of the renal fascia is in contact with the quadratus lumborum muscle (Figure 2).[4]

Both the lateral and medial lumbocostal arches cross posterior to, and are in contact with, the kidneys. The arches are in turn connected to rib 12. Lateral traction on the twelfth ribs can provide tension on the arches and thereby affect the kidneys, ureter, and fascial structures.[5] The kidneys are associated with the diaphragm and the pleura superiorly, psoas and quadratus lumborum muscles inferiorly, and peritoneum anteriorly, and they lie deep to ribs 11 and 12. Therefore, we can take advantage of the psoas and quadratus lumborum muscles to affect changes directly or we can use the relationship with the diaphragm to affect changes more indirectly (See Figure 3).

The subcostal nerve, iliohypogastric nerve, and the ilioinguinal nerves cross the kidneys posteriorly, and irritation of surrounding structures can lead to irritation of these nerves, which can cause some of the typical renal pain syndromes.[6]

The ureters travel along the course of the psoas muscle and are attached via the psoas fascia. The psoas in turn attaches to the lesser tubercle of the femur. Using the femur as a handle onto the psoas muscle, the practitioner can alter the tone in the ureter, decrease smooth muscle spasm, and assist the passage of stones. For example, if the femur is flexed and externally rotated, psoas muscle tone and ureter tone are decreased. This may aid in decreasing pain and allow a stone to pass easier over the pelvic brim and into the bladder (See Figure 4).

The bladder sits in the pelvic cavity, which is an osseous container with a muscular floor. The muscular floor is made up of the pelvic diaphragm, which not only supports pelvic structures but aids in structural integrity of the external urethral sphincter. The bladder is attached via the pubove-