

**COMPARATIVE STUDY BETWEEN PATHOLOGICAL
AND MRI STAGING OF URINARY BLADDER
CARCINOMA**

THESIS

*Submitted in Partial Fulfillment of the Master Degree (M.Sc.) in
Urology*

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*First and foremost, I feel always indebted to "ALLAH"
The most gracious, the most merciful*

Then

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LIST OF ABBREVIATIONS

BCG	: Bacillus Calmette Guérin
BPH	: Benign prostatic hyperplasia
CIS	: Carcinoma in situ
CT	: Computerized tomography
DRE	: Digital rectal examination
Gd-DTPA	: Gadolinium-diethylene triamene pentaacetic acid
HpF	: High power field
IVU	: Intra-venous urography
KUB	: Kidney-ureter-bladder plain X-ray
L.N.	: Lymph node
MRI	: Magnetic resonance imaging
RF	: Radio-frequency
SLE	: Submucosal linear enhancement
TNM	: Tumor-Lymph nodes-Metastasis other than lymph nodes
TUR-BT	: Trans-urethral resection of bladder tumor
WHO	: World health organization

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بسم الله الرحمن الرحيم

"وقل إعملوا فسيرى

الله عملكم ورسوله

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صدق الله العظيم

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ABSTRACT

Bladder cancer is the most common malignant tumor of the urinary tract. It accounts for approximately 8% of all male cancers and 3% of all female cancers (**Boring et al., 1993**). The mean age of incidence of bladder cancer in Egypt is 46 years with a peak incidence in the fifth decade (**El-Bolkainy et al., 1972**).

The **aim** of this study was to evaluate the usefulness of MRI in the staging of urinary bladder carcinoma and to correlate between the diagnostic accuracy of MRI and pathological staging. This pre-therapeutic staging of the urinary bladder neoplasms is of great value to choose the best therapeutic modality before proceeding into surgery, chemotherapy or radiotherapy; as well as anticipating the patients' prognosis.

INTRODUCTION AND AIM OF THE WORK

Bladder cancer is the most common malignant tumor of the urinary tract. It accounts for approximately 8% of all male cancers and 3% of all female cancers (**Boring et al., 1993**). The mean age of incidence of bladder cancer in Egypt is 46 years with a peak incidence in the fifth decade (**El-Bolkainy et al., 1972**).

Most bladder cancers are transitional cell tumors (70 to 90% in western countries), the remainder being squamous cell tumors (5 to 10%), mixed transitional cell and squamous cell lesions, adenocarcinomas (2%) and undifferentiated tumors (more than 3%) (**Shoukry et al., 1989**). The incidence differs in Egypt and areas where Schistosomiasis is endemic, where the incidence of transitional cell carcinoma is less and that of squamous cell carcinoma increases. The grade of malignancy ranges from well differentiated “low grade” lesions (Grade 1) to poorly differentiated “high grade” lesions (Grade 3). The pattern of growth is also variable, tumors being classified into papillary, solid, infiltrating, non-infiltrating and carcinoma in situ.

The depth of infiltration of the tumor through the layers of the bladder wall is an important factor in deciding the patient’s management and prognosis. For a complete diagnosis, clinical examination must be complemented with cystoscopic evaluation and

biopsy for typing, grading and staging of the tumor. However, this may not be enough for assessing invasive lesions which spread beyond the bladder, that is why imaging plays a key role in the evaluation of bladder tumors (**Frank et al., 2003**).

For optimum treatment planning and to estimate the prognosis, **Fernandez Mena et al. (2001)** stated that the main objectives of cystoscopy and diagnostic imaging techniques after detecting a tumor in the urinary bladder are to determine: (1) It's nature and histopathological structure, (2) the depth of bladder wall invasion, (3) tumor localization and involvement of the ureters and trigone, (4) involvement of bladder wall lymphatics, and (5) to determine whether there are regional and/or distant metastasis or not.

Magnetic resonance imaging (MRI) has been considered the best non-invasive technique for primary staging of urinary bladder tumors (**Hayashi et al., 2000**). MRI provides information about the depth of infiltration of the primary tumor, an overall assessment of the tumor volume, and a statement on the presence of metastases in lymph nodes or blood borne sites (**Husband, 1995**). Advantages of MRI over Computerized Tomography (CT) include avoiding exposure to ionizing radiation, avoiding iodine contrast media, and excellent soft tissue contrast, which is particularly important in assessing the infiltration into the different layers of the bladder wall.

The **aim** of this study was to evaluate the usefulness of MRI in the staging of urinary bladder carcinoma and to correlate between the

diagnostic accuracy of MRI and pathological staging. This pre-therapeutic staging of the urinary bladder neoplasms is of great value to choose the best therapeutic modality before proceeding into surgery, chemotherapy or radiotherapy; as well as anticipating the patients' prognosis.

ANATOMY OF THE URINARY BLADDER

(David Cormack, 2004)

The bladder is a hollow muscular organ lying behind the symphysis pubis. It has four surfaces; superior (dome), posterior (base) and two inferolateral surfaces. Extending from the dome of the bladder to the umbilicus is a fibrous cord, the medial umbilical ligament, which represents the obliterated urachus. The ureters enter the bladder postero-inferiorly in an oblique manner. The area lying between the two ureteric orifices and the bladder neck is called the trigone. At the bladder neck lies the internal sphincter which is not a true sphincter but a thickening formed by interlaced and converging muscle fibers of the detrusor as they pass distally to become the smooth musculature of the urethra.

The bladder is related posteriorly to the seminal vesicles, vasa deferentia, ureters and rectum in males; while in females, the uterus and vagina are interposed between the bladder and rectum. The peritoneum covers the dome in males while it covers the dome and posterior wall in females forming a recess called the vesico-vaginal pouch. Superiorly, the bladder is related to the small intestine. Anteriorly, the bladder is related to the posterior surface of the pubic symphysis and to the lower part of the anterior abdominal wall when

the bladder is distended. Inferiorly, the bladder is related to the pelvic floor muscles and in males, to the prostate too.

The urinary bladder is lined by a multilayered epithelium, called transitional epithelium or urothelium, which rests on a thin basal lamina. The muscular coat of the urinary bladder contains loose anastomosing strands of smooth muscles, separated by abundant connective tissue. It consists of three layers, an inner longitudinal layer, a central circular layer, and an outer longitudinal layer. These layers intermingle at their margins and cannot be separated from one another. In the trigone region, thin, but dense bundles of smooth muscle encircling the intravesical opening of the urethra constitute the internal sphincter of the bladder.

The bladder is supplied with blood by the superior and inferior vesical arteries which arise from the anterior division of the internal iliac artery and by smaller branches from the obturator and inferior gluteal arteries. In females, the uterine and vaginal arteries also send branches to the bladder. It is surrounded by a plexus of veins that ultimately drains into the internal iliac veins.

Lymphatics from the lamina propria and muscularis drain to channels on the bladder surface, which run with the superficial vessels within the thin visceral fascia. Small paravesical lymph nodes can be

found along the superficial channels. The bulk of the lymphatic drainage passes to the external iliac lymph nodes. Some anterior and lateral drainage may go through the obturator and internal iliac nodes, whereas portions of the bladder base and trigone may drain into the internal and common iliac groups.

The urinary bladder receives innervation from the pelvic plexus, which is located as a rectangular network on the lateral aspect of the rectum. The innervation accompanies the vessels and utilizes the vasculature as a framework. The portion of the pelvic plexus that supplies the bladder is called the vesical plexus. The plexus receives input from S2 to S4 spinal cord segments by means of pelvic splanchnic nerves and additional input from T10 to L2 spinal cord segments by means of the presacral nerves. The primary supply to the detrusor is by parasympathetic nerves, which are uniformly and diffusely distributed throughout the detrusor. The bladder neck smooth muscles are supplied by a rich plexus of sympathetic nerve terminals. The external sphincter, which is striated is supplied by the pelvic splanchnic nerve.

EPIDEMIOLOGY AND PATHOGENESIS OF URINARY BLADDER CANCER

Bladder cancer is approximately three times more common in men than in women. The disease is diagnosed more often in Caucasians than in African-Americans. Its incidence shows a positive social class gradient in both sexes, as reflected by the distribution of bladder cancer in different occupational categories, incidence rates being highest among 'white collar' workers and lowest among 'blue collar' workers (**Michael, 2002**).

At presentation, it was found that 70-75 % were superficial tumors confined to the mucosa. The natural history of bladder cancer is based on two processes: tumor recurrence and tumor progression to a higher stage of the disease. Within 5 years tumor recurrence occurs in 50-70 % of patients with superficial tumors, either at the same site of previously resected lesion or in a different site. On the other hand progression to a higher stage occurs in only 10-15 % of the patients. By comparison, over 80% of patients who presented with invasive transitional cell carcinoma had no previous history of superficial disease. These observations suggested that superficial and muscle invasive transitional cell carcinomas may represent separate but related disease processes. In contrast to superficial bladder cancer, urothelial dysplasia and carcinoma in situ (CIS) may truly represent