

Early Diagnosis and Treatment Strategies for Prostate Cancer

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Abstract: Prostate cancer, as a common malignant tumor in males, requires preventive measures and early screening to reduce the incidence rate and improve treatment outcomes. For high-risk groups such as men with a family history, specific racial backgrounds, or advanced age, it is recommended to start prostate cancer screening at the age of 45 or 10 years earlier than the earliest onset age in the family. Screening methods include PSA testing, digital rectal examination (DRE), and more precise imaging tests. For the general population, prostate cancer screening is typically initiated at the age of 50, with a screening frequency of once a year, primarily using PSA testing and DRE. Additionally, maintaining a healthy lifestyle, such as balanced diet, moderate exercise, and avoiding smoking and alcohol, can also help reduce the risk of prostate cancer. Regular screening and a healthy lifestyle can effectively prevent the occurrence of prostate cancer and enable early treatment of detected lesions, thereby improving patient survival rates and quality of life.

Keywords: Prostate; Cancer; Early Diagnosis; Treatment Strategies

1. Introduction

1.1 Incidence and Hazards of Prostate Cancer

Prostate cancer, as a malignancy unique to males, exhibits certain trends and characteristics globally. Firstly, the incidence of prostate cancer is closely related to age, with its rate gradually increasing as age advances. This is mainly due to the slowed division and renewal of prostate cells with aging, thereby increasing the risk of cell mutation and carcinogenesis. In developed countries such as the United States and Europe, prostate cancer has become one of the most common types of cancer among males. Statistics show that a large number of males are

diagnosed with prostate cancer every year, including a significant portion of young patients. In China, with the improvement of living standards and advances in medical technology, the incidence of prostate cancer is also on the rise. The hazards of prostate cancer are mainly reflected in its high mortality rate. Due to the inconspicuous early symptoms of prostate cancer, many patients are already in the middle or late stages upon diagnosis, missing the optimal treatment window. Additionally, prostate cancer tends to be highly malignant, prone to metastasis and spread, posing a serious threat to patients' life safety. Therefore, improving the early diagnosis rate of prostate cancer is



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of great significance for reducing its mortality rate.

1.2 Importance of Early Diagnosis and Treatment

Early diagnosis and treatment of prostate cancer are crucial for improving treatment outcomes. The lesions of early-stage prostate cancer are typically small and have not yet invaded surrounding tissues or metastasized to distant sites, making treatment more effective at this stage. According to statistics, the treatment outcomes for early-stage prostate cancer are favorable, with a five-year survival rate of over 90%. Therefore, through early diagnosis and timely treatment, it is possible to effectively reduce the mortality rate of prostate cancer and improve the quality of life for patients. To achieve early diagnosis of prostate cancer, a series of diagnostic methods and approaches need to be employed. These diagnostic methods not only assist doctors in detecting prostate cancer lesions in a timely manner but also provide important evidence for formulating treatment plans. In the following sections, we will provide a detailed overview of early diagnostic methods for prostate cancer.

2. Early Diagnostic Methods for Prostate Cancer

2.1 PSA Testing and Its Influencing Factors

Prostate-specific antigen (PSA) testing is one of the important methods for early diagnosis of prostate cancer. PSA is a protein produced by prostate cells and is mainly present in prostatic fluid. When the prostate undergoes carcinogenesis, cancer cells disrupt the normal structure of the prostate tissue, leading to the release of PSA into the bloodstream, resulting in elevated levels of PSA in the blood. Therefore, by detecting the level of PSA in the blood, the risk of prostate cancer can be indirectly assessed. However, it is important to note that PSA levels are influenced by various factors. For example, diseases such as prostate inflammation and benign prostatic hyperplasia can also lead to elevated PSA levels. In addition, age, race, genetic factors, etc., can also affect PSA levels to a certain extent. Therefore, when conducting PSA testing, it is necessary to consider the specific situation of the patient and make comprehensive judgments based on other examination results.

2.2 Digital Rectal Examination (DRE)

Digital rectal examination is one of the routine

methods for prostate cancer screening. Through digital rectal examination, doctors can palpate the size, shape, and texture of the prostate. In the early stages of prostate cancer, the prostate may exhibit abnormal manifestations such as enlargement and hardening. Therefore, digital rectal examination can detect these abnormal manifestations, providing important clues for the diagnosis of prostate cancer. It is important to note that the accuracy of digital rectal examination is influenced by the experience and skill level of the doctor. Therefore, when performing digital rectal examination, it is necessary to select experienced doctors to improve the accuracy of diagnosis.

2.3 Imaging Examinations: TRUS, MRI, etc.

Imaging examinations are important methods for the diagnosis of prostate cancer. Through imaging examinations, doctors can observe the morphology, size, density, and other characteristics of the prostate, as well as the condition of surrounding tissues. This information helps doctors assess the risk of prostate cancer and determine the location and extent of the lesion. Commonly used imaging examination methods include transrectal ultrasound (TRUS) and magnetic resonance imaging (MRI), among others. TRUS can clearly display the internal structure of the prostate, which is important for detecting small lesions and determining the extent of tumor infiltration. MRI can provide more detailed imaging information, helping doctors more accurately determine the staging and prognosis of prostate cancer. It is important to note that imaging examinations also have certain limitations. For example, certain types of prostate cancer may present characteristics of benign lesions on imaging, leading to misdiagnosis or missed diagnosis. Therefore, when performing imaging examinations, it is necessary to make comprehensive judgments based on other examination results.

2.4 Pathological Diagnosis: Transrectal Ultrasound-Guided Prostate Systematic Biopsy

Pathological diagnosis is the gold standard for diagnosing prostate cancer. Through pathological diagnosis, the cellular morphology and structural characteristics of prostate tissue can be directly observed to determine the presence of cancer cells. In the diagnosis of prostate cancer, commonly used pathological diagnostic methods include transrectal

ultrasound-guided prostate systematic biopsy. Transrectal ultrasound-guided prostate systematic biopsy is a minimally invasive diagnostic method. Through transrectal ultrasound guidance, doctors can accurately insert a biopsy needle into the prostate tissue to obtain tissue samples for pathological examination. This method has the advantages of minimal trauma and rapid recovery, and has become one of the important means for diagnosing prostate cancer. During pathological diagnosis, it is necessary to select experienced pathologists to ensure the accuracy of the diagnosis. At the same time, it is also necessary to make comprehensive judgments based on the specific situation of the patient and other examination results to formulate appropriate treatment plans.

3. Treatment Strategies for Prostate Cancer

The treatment strategy for prostate cancer varies depending on factors such as the patient's specific condition, tumor stage, age, health status, and personal preferences. Below, we will discuss the main treatment strategies for early and advanced prostate cancer.

3.1 Treatment Methods for Early Prostate Cancer

For patients with early-stage prostate cancer, the main treatment goal is to eradicate the tumor, prevent recurrence and metastasis, while preserving the patient's quality of life.

3.1.1 Radical Prostatectomy

Radical prostatectomy is the preferred treatment method for early-stage prostate cancer. This surgery involves removing the entire prostate and surrounding lymph nodes to eradicate the tumor. The surgery can be performed through open surgery, laparoscopic surgery, or robot-assisted surgery. After surgery, patients need to undergo rehabilitation training to recover urinary and sexual function.

3.1.2 Brachytherapy

Brachytherapy (also known as seed implantation therapy) is a localized treatment method suitable for low-risk and intermediate-risk prostate cancer patients. Doctors use transrectal ultrasound guidance to directly implant radioactive seeds into the prostate tissue, delivering a uniform dose of radiation to the prostate. This treatment method can precisely deliver radiation doses to tumor tissue while minimizing damage to surrounding normal tissue.

3.1.3 Hormone Therapy

Hormone therapy is used as adjuvant therapy for early-stage prostate cancer or palliative treatment for advanced prostate cancer. By reducing the levels of androgens in the body, hormone therapy suppresses the growth and spread of cancer cells. Treatment methods include medical castration therapy and surgical castration therapy. Medical castration therapy involves orally administered drugs to suppress pituitary secretion of gonadotropins, thereby lowering testosterone levels; surgical castration therapy involves surgical removal of the testicles or ovaries to reduce testosterone production.

3.2 Treatment Strategies for Advanced Prostate Cancer

The treatment goals for patients with advanced prostate cancer mainly focus on symptom relief, controlling tumor growth, prolonging survival, and improving quality of life.

3.2.1 Hormone Therapy

Hormone therapy is often used as a first-line treatment for patients with advanced prostate cancer. By using methods such as medical castration therapy, antiandrogen therapy, and luteinizing hormone-releasing hormone analog therapy, hormone therapy reduces the level of androgens in the body, thereby inhibiting the growth and spread of cancer cells. Hormone therapy can alleviate symptoms such as pain and difficulty urinating in prostate cancer patients and prolong their survival.

3.2.2 Chemotherapy

Chemotherapy is one of the adjuvant treatment methods for advanced prostate cancer. By administering chemotherapy drugs to patients, cancer cells' growth and spread can be killed or inhibited. Chemotherapy drugs can be administered orally, intravenously, or locally. Chemotherapy can relieve symptoms, control tumor growth, and prolong patient survival. However, chemotherapy drugs may also cause certain side effects such as nausea, vomiting, and fatigue, which need to be managed under a doctor's guidance.

3.2.3 Radiation Therapy

Radiation therapy is a common treatment method for advanced prostate cancer. Radiation therapy delivers a certain dose of radiation to the prostate and surrounding tissues through external beam radiation therapy or

brachytherapy, thereby killing or inhibiting the growth and spread of cancer cells. Radiation therapy can be used to control local tumors and alleviate pain caused by bone metastases. The effectiveness of radiation therapy depends on factors such as the patient's specific condition, tumor stage, and radiation dose.

3.2.4 Immunotherapy and Targeted Therapy

Immunotherapy and targeted therapy are emerging treatment methods for advanced prostate cancer. Immunotherapy activates the patient's own immune system to attack cancer cells, including the use of immunotherapy checkpoint inhibitors. Targeted therapy targets specific molecules in tumors, such as using anti-angiogenic drugs or androgen receptor antagonists. These emerging treatment methods have shown certain efficacy in clinical trials, providing new treatment options for patients with advanced prostate cancer. It is important to note that treatment strategies for prostate cancer need to be individualized based on the patient's specific condition. When formulating a treatment plan, doctors will consider factors such as the patient's age, health status, tumor stage, and pathological type, and select the most appropriate treatment method. At the same time, patients need to actively participate in the treatment process, maintain good communication and cooperation with doctors, and jointly formulate the best treatment plan.

4. Prevention and Screening Recommendations for Prostate Cancer

Prostate cancer, as one of the common malignancies in men, has significant implications for reducing incidence and improving treatment outcomes through prevention and early screening. Below are screening recommendations for high-risk populations and the general population to help individuals better understand and take appropriate preventive measures.

4.1 Screening Recommendations for High-Risk Populations

For individuals with risk factors for prostate cancer, it is recommended to enhance screening efforts to detect and treat potential malignancies at an earlier stage. High-risk factors include: **Family History:** Men with a family history of prostate cancer, especially those with first-degree relatives (such as fathers or brothers) affected by prostate cancer, have a significantly increased

risk of developing the disease. It is recommended for this population to undergo prostate cancer screening starting at the age of 45, or earlier, at an age 10 years younger than the earliest age of diagnosis in the family. **Ethnic Background:** Men of African descent, Caribbean black descent, and Northern European ancestry have relatively higher incidence rates of prostate cancer. It is advisable for men of these ethnic backgrounds to increase awareness of prostate cancer screening and follow medical advice for regular screening. **Advanced Age:** As age increases, the incidence of prostate cancer gradually rises. For men over 50 years old, it is recommended to intensify screening efforts for prostate cancer. In addition to routine PSA testing and digital rectal examination (DRE), high-risk individuals may consider more precise imaging studies such as MRI and CT scans during screening to assess the prostate's health condition more accurately.

4.2 Screening Recommendations for the General Population

For individuals in the general population without obvious risk factors, screening for prostate cancer is equally important. Below are screening recommendations for the general population: **Starting Age for Screening:** It is generally recommended to begin prostate cancer screening at the age of 50. However, the specific starting age may vary depending on individual health status and medical advice. If individuals have concerns or worries, they can communicate with their doctor and initiate screening earlier. **Screening Frequency:** It is generally recommended to undergo prostate cancer screening annually. However, the specific screening frequency may vary depending on individual circumstances. Doctors will develop personalized screening plans based on factors such as the patient's age, health status, and family history. **Screening Methods:** PSA testing and digital rectal examination (DRE) are common methods for prostate cancer screening. PSA testing can detect levels of prostate-specific antigen (PSA) in the blood, which helps detect signs of prostate cancer. DRE involves examining the size, shape, and texture of the prostate gland by digital palpation. In addition, individuals in the general population can also reduce the risk of prostate cancer by maintaining a healthy lifestyle. This includes maintaining a balanced diet, engaging in moderate

exercise, avoiding unhealthy habits such as smoking and excessive drinking, and maintaining good mental health while avoiding prolonged stress.

Conclusion

In conclusion, prevention and screening for prostate cancer are of paramount importance in reducing incidence rates and improving treatment outcomes. Whether in high-risk populations or the general population, individuals should enhance awareness of prostate cancer screening and follow medical advice for regular screening. Additionally, maintaining a healthy lifestyle can also help reduce the risk of prostate cancer.

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