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Genetic Testing and Non-Chemotherapeutic Management of Prostate Cancer

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Abstract
Aim: The research aimed to carefully analyze the modern management advances as well as the future guidelines for the management of prostate cancer therapy.
Method and Materials: The study was aimed to provide the most recent non- chemotherapeutic measures employed in the management of prostate cancer globally. About thirty different journals article were searched online and data relating to prostate cancer was carefully generated.
Results: Data obtained revealed the advanced approaches used in the treatment of prostate cancer using different hyphenated techniques such as radiotherapy, radical prostatectomy, Cryotherapy, MRI-targeted, and Transperineal prostate biopsy and genetic testing of Prostate Cancer, etc. The study on the latest and future advances in the management of prostate cancer has shown that the gene expression data produced by the DNA microarray outline forecast with precision the patient's progression after prostatectomy.
Conclusion: Precision medicine is seen as the future mainstay in the management of prostate and other types of cancer as well as several disease conditions.

Keywords: Cancer, Genetic testing, Prostate cancer, Radiotherapy

Introduction
The management of prostate cancer (PCA) has improved importantly within the past years. Many types of research are consistently carried out to continue to improve patient outcomes. To maximize the resources and thus, the victims with the substantial healthy illness must be acknowledged. The main preclusion of prostate cancer gives way for the prospect diagnosis and treatment (Sartor *et al*., 2005) [21]. Despite the high proportions of individuals detected as well as treated for the disease, there have been studies and researches on the improvement in diagnosis and treatment of the patient (Shingleton *et al*., 2000) [22]. It is turning out to be a truism to mention that the advancement in computer technologies, as well as progress in molecular biology, biomedical imaging, and nanotechnologies (Chan *et al*., 2005) [3], have enhanced the possibility to switch from a population diagnosis and treatment method to a concept based on personalized medicine. The change from population to private patient treatment shows the application of information obtained from various disciplines and actors (Bubley Glenn, 2003) [1]. Also, the players and subjects cannot individually propose an all-inclusive offer (Dearnaley *et al*., 2007) [5]. It is certainly true in the sector of medical oncology and radiation alongside molecular and clinical radiology. The main benefits of bringing together information obtained from diverse preclinical and clinical fields lie in the likelihood of choosing a particular population of a subject who gain from specific non-pharmacological or pharmacological treatment (Chan *et al*., 2005) [3]. Simultaneously, this material may conversely be applied to select patients for who the risk of destructive effects may be higher. This part reviews the latest advancements in the management of the disease. This research aimed to review and critically evaluate the latest advances in prostate cancer therapy.

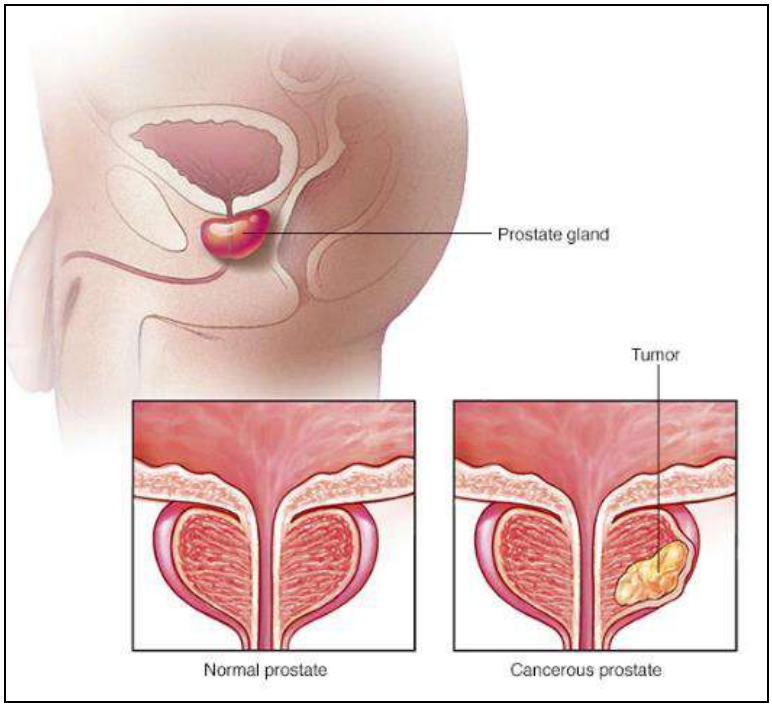

Fig 1: *Normal and cancerous prostate (*Mayo Clinic, 2020*).*

Radiotherapy associated with cancer

Radiotherapy remains the gold benchmark for the management of localized PCA. It is a powerful treatment method with outstanding oncological outcomes and with new technical improvements over the last years (Chan *et al*., 2005) [3]. There has been a current advance in the oncological result of men who are still at high risk for systematic failure. Its improvement is through improving each of therapeutic and diagnostic steps such as the diagnostic performance of conventional imaging modalities (Prostate Cancer guidelines, 2017) [18]. Currently, the traditional anatomic imaging method of MRI, CT, SPECT, and PET is being applied in the standard clinical practice to stage patients who have prostate cancer (Shingleton *et al*., 2000) [22]. The capacity of radiotherapy oncologists to identify prostate cancer and three-dimensional employer tools to trail little movement of the gland has advanced the efficiency of therapy prescription (Bubley Glenn, 2003) [1]. The improvement averts harmful side effects related to exposure to peri-prostatic radiation such as disturbance of gastrointestinal as well as complication of urinary. IMRT is efficient in advancing the outcome of oncologic. There has been increased precision, where the delivery of the amount of radiation to the tumor has raised from seventy to around eighty Gy on enhancing in the management of cancer (Chan *et al*., 2005) [3].

The latest advance has been in clinical imaging and molecular biology. There has been integration between the two that is anticipated to ease the development of new agents for molecular imaging, which is valuable in monitoring some biological events and which through micro-essays by researchers' analysis (Prostate Cancer guidelines, 2017) [18]. In connection to prostate cancer, advances in characterization, qualification, as well as the timing of biological processes may be realistic, this going to help in overcoming issues connected to the amplification of low-level signs *in vivo* biological processes. The improvement of integrated platforms of imaging with sufficiently high temporal as well as spatial resolution has helped in attaining adequate specificity. Improvement in the molecular-based method in radiology is certainly evident in the oncological diagnosis and treatment (Shingleton *et al*., 2000) [22]. There have been advances in the vast amount of particular inhibitors and drugs, the capability to change cellular systems genetically, and the establishment of a huge number of diagnostic tools able to monitor personal biological and molecular processes. These recent achievements have intensely improved the understanding of molecular oncology. This recent advance in the body of knowledge can be translated into modern molecular imaging and new drugs by giving room for the detection of a patient with individual profiles of molecular and enhancing the care of the patient (Doneux A, 2005) [6].

A significant improvement continues in the Theranostics that denote a study field incorporating two distinct methods that both entail all procedures of management of a patient with prostate cancer. This approach has advanced the application of molecular biomarkers that are significant in the diagnostic and treatment processes, in evaluating the best course of diagnosis and treatment, in observing the response of the patient, and in pinpointing the likely recurrence of the disease. It is also useful in anticipating potential harmful outcomes. The advancement in this approach has made it possible for application in the choosing of patients for a particular treatment, the estimation of drug response, safety and resistance, and observing of therapeutic response (Prostate Cancer guidelines, 2017) [18].

Radical prostatectomy and Prostate Cancer

It is the treatment for locally advanced PCA. Prostate cancer victims that undergo this process have improved oncological results in comparison with the modalities. Nevertheless, the worsening in the value of lifespan happens virtually instant. Consequently, the responsibility s been was with the stakeholders to advance the result in victims undertaking treatment, as well as the introduction of slightly intrusive operation seemed like the initial procedure. Initially, the

limited laparoscopic method as well as recently by a surgical system of Da Vinci has rapidly been used as a method of choice for excellent results. The robotic treatment has been the greatest general approach for clinical elimination of the prostate in most areas (Prostate Cancer guidelines, 2017) [18]. A randomized assessment to open prostatectomy has not been carried out or is potential. Systematic evaluation of the latest literature around this process has given some improvement of the approach. This surgical method has continually evolved with technology and the latest advance, which are of absolute importance. There has been improved visualization in recent years enhanced by nerve-sparing techniques and robotic systems. The advance has refined to preserve the Veil of Aphrodite (Ponsky *et al*., 2012) [17].

The introduction of an interfacial plan within the adjacent prostate and prolonging this plane anteriorly has improved the sexual function in postoperative. There has been an advance in the compression of the lymph nodes of the gland, which has caused amplified its yield, as well as the elimination of the notes, denotes the main touchdown area for the prostate. It is attainable with inconceivable effectiveness by employing the robotic surgical approach. Recently, in efforts to advance the results of patients, the single port laparoscopic method has started gaining root among the surgeons of laparoscopic. The methods have been elaborated for essential prostatectomy, with the help of unresponsive support. Also, there has been the establishment of an innovative edge in the clinical treatment of a prostate tumor, the natural orifice endoscopic surgery; a method that is applied for additional urologic operations (Islam and Jiajun, 2015) [11].

Focal therapies in the management of Prostate Cancer

In the determination to minimize the radical local treatment side effects of prostate cancer, a new method of coordination therapies has been established. These kinds of treatments are a target at the biopsy site of PCA. Cryotherapy is one of the focal therapies that entail freezing regions of the gland with HIFU as well as a cooling probe, which are the wild-recognized methods (Prostate Cancer guidelines, 2017) [18]. These advanced methods bring smart choices to the victims because of the accuracy of the knowledge as well as the likelihood of minimized side effects of erectile dysfunction as well as incontinence (Shingleton *et al*., 2000) [22]. Also, the advances in these focal therapies can be finished in a lone case period of treatment that is appealing to patients also physicians (Bubley Glenn, 2003) [1]. The focal therapies for locally advanced PCA have the introduction of the freezing probes into the prostate under the guidance of ultrasound. Then the prostate is provided with more than one melt sequence of the freeze (Dearnaley *et al*., 2007) [5]. The physician is then in a position to evaluate the real-time efficiency treatment by the application of ultrasonography. The images correlate well with cellular destruction (Islam and Jiajun, 2015) [11]. A huge number of the technical elements are hard, such as the avoidance of harm to adjacent tissues because of the increasing ball of ice and attaining the negative 40C needed for tissue necrosis and detecting extremely vascular that can minimize efficiency. There has been the first achievement in the oncologic utility, as the adverse rate of biopsy because of the treatment is high. The problem has been addressed through advances in making a general catalog assessment of lasting oncologic achievement and has shown a hopeful of five years biochemical recurrence-free survival (Goetzl *et al*., 2007) [8].

The process employs hyperthermia to cause immediate as well as permanent coagulated necrosis of the aimed tissue. This advanced focal therapy has been shown to damage prostatic cancer without amplifying the danger of metastases actually (Sanda *et al*., 2008) [19]. Because of the minimal focal area, the adjacent tissues can be dodged and so the contingency mechanism, and periprostatic nerves are spared in a theoretical way. It can be applied to joint with the real-time imaging MRI, which advances the capability to detect the tissues that are malignant (Islam and Jiajun, 2015) [11]. High-intensity focused ultrasound has been demonstrated to need extensive urethral catheterization after treatment secondary to prostatic that may lead to blocking. The morbidity, as well as rates of recurrence related to management, overwhelmed initial information on the application of this tool. Nevertheless, within centers of quality, the turn learning has been approved, as well as the occurrence of urinary incontinence, as well as the reported sexual function, has been of encouragement to the patients. Also, there are adamant planning advances and determinations in these treatments within countrywide catalog archives as well as the organized design of clinical trials assessing efficacy. Promises in this progress have rested in the capability to sufficiently manage cancer as well as for their distribution from the influences of the profession into the public (Kirby and Manish, 2011) [12].

Nomograms for Risk Stratification

Advancement in the large dataset, as well as statistical analysis of patients with prostate cancer, has yielded some nomograms. It can forecast the possibility of negative prostate cancer. Earlier, there was a discussion on the grouping of an individual with PCA into high-risk, medium-risk, and low-risk groups. The Partin Table has been advanced with the most current update to converse the potential of PCA, which either metastatic or extra-prostatic to the lymph lumps (Chan *et al*., 2005) [3]. Therefore, a likelihood recurrence of prostates in five years is predictable and has been confirmed in the external cohorts through the application of the UCSF-Capra score (Islam and Jiajun, 2015) [11]. Others know advance explains the possibility of cancer-specific survival considering some preoperative values, such as age, early hormone treatment, and digital rectal assessment, a method of diagnosis, pathology, and biopsy. The recent advancement and application of nomograms have advanced the ability of clinicians to detect at high risk for progression as well as the death of prostate cancer (NHS Choices, 2017) [16].

Multiparametric MRI

Multiparametric MRI advancement has led to a significant effect on the management and the treatment of prostate cancer. This method usually comprises of triple imaging series that includes diffusion-weighted imaging to sense as well as describe tumors, combining a superficial circulation coefficient outline of the prostate (Dearnaley *et al*., 2007) [5]. T2-weighted imaging defines the structure of the prostate and the anatomy and to map cancer vascularity is dynamic contrast imaging is used (Shingleton *et al*., 2000) [22]. There is growing fact that suggests that MRI of the prostate is a piece of valuable secondary screening equipment to

facilitate the recognition of destructive cancers while minimizing the over detection of low-grade wounds. The method will aid in distinguishing among patients that need the prostate biopsy and those with a high PSA level who are suitable for observing (Eckel F, 2011) [7].

Experiments from skilled health care practitioners show that mpMRI has a sensitivity of more than 96 percent and has a negative projection value of more than 92 percent. The need for biopsies will reduce to a particular group because of the use of mpMRI. Also, if a biopsy is compulsory, then it means that mpMRI will assist further exact targeted biopsy (Kole Bastiaan, 2016) [14]. It must be known that only experienced practitioners should use and analyze results from mpMRI. It is not currently eligible for a Medicare rebate, creating a cost burden for patients. Patients have to consider risk factors like genetic factors like BRCA gene mutations, PSA characteristic that comprises velocity, doubling time (Islam and Jiajun, 2015) [11], PSA density, and free- to- total ratio, and strong family history. These considerations are necessary when patients are undergoing a prostate biopsy. However, with mpMRI, these factors are not required. The only situation where these factors are considered is when using mpMRI I in a patient reaching the age of seventy years (Dearnaley *et al*., 2007) [5].

Prostate biopsy: MRI-targeted and Transperineal biopsy

The Prostate biopsy advancement is held by proof in males with alleged prostate cancer based on an examination, family history, and PSA testing. Central biopsies can be taken through transperineal or trans-rectal methods with ultrasound assistance. The present medical practice procedures back 21 to 24-main sampling for first diagnostic biopsies. Patients worry that prostate biopsy can result in tumor development or seedling in the needle track though there is no evidence of such occurrence (Venkitaraman *et al*., 2007) [23].

The MRI-targeted biopsy advancement has a significant function in prostate sampling. It can assist in the prevention of under-sampling during the biopsy. Nowadays MRI-targeted biopsies have turned to be usual in tertiary centers (Sandblom and Varenhorst, 2008) [20]. They are done using in- gantry MRI- guided biopsy or MRI–ultrasound fusion. These MRI- targeted biopsies will substitute random biopsies. This replacement will be possible since the MRI-targeted biopsy identifies fewer low-grade cancers as well as additional high-grade cancers compared with standard template biopsy. Though, some tiny quantities of significant tumors can be neglected in other portions with targeted biopsy alone. Thus, a combination of a particular technique and random template biopsy is advisable (Dearnaley *et al*., 2007) [5].

Transperineal biopsy advancement of the prostate had decreased the possibility of infection as well as permitted template selection of the prostate posteriorly, and anteriorly which happened to be a challenge to trans-rectal biopsy. There is a disadvantage of substantial risk infection, mainly in the age of multi-resistant bacteria. In transperineal, the fusion of mpMRI biopsies templates is simpler than in trans-rectal (Gulley James, 2011) [9].

Genetic testing of Prostate Cancer

Genetic analysis advancement of prostate tissue has turned to be popular in trying to increase differentiation from insignificant to significant types of cancer. Though Gleason's six diseases are considered moderately harmless, a tiny proportion remains relevant. Thus, the use of a new genetic biomarker is trying to address the problem of accurate classification of tumors into insignificant and significant Genomic Prostate core, Oncotype, and the Prolaris and Decipher tests are commercially available genetic tests (Cramer, 2007) [4].

Another advancement is the application of digital rectal exams as well as the monitoring of the PSA levels in the blood as a medium of PCA screening. This modern method has decreased the mortality related to PCA. Nevertheless, the absence of PSA specificity for PCA (demonstrated cause biopsy rate that ranges from 70 percent to 80 percent. Nearly ten years ago, it was noted that the CpG island in the prostate-specific antigen (PSA) was hyper-methylated in more than 90 percent of the cases of prostate cancer (Hamilton W., 2010) [10]. From that time, a vast number of studies have used this discovery intending to create a means to identify PCA in clinically relevant samples, such as urine and blood, for the reason of enhancing the diagnostic precision and accuracy of PCA progression and detection. In recent years, research studies have shown the capacity to identify hypermethylated CpG islands in the urine as well as blood on diagnostic samples has provided promise that the assessment may ultimately be an enhancement over our present diagnostic tools. These advances show that little unnecessary prostate test as well as biopsies that more precisely distinguish PCA from the benevolent prostate condition. There are also larger prospective screening studies that are attempting to confirm these findings before the modalities are accessible for the procedural clinical application. From the studies, the prospects for enhanced detection of prostate cancer are promising (Shingleton *et al*., 2000) [22].

The constant growth over the number of years in the distribution of EBRT has caused the advancement of 3-D conformal radiation treatment. The treatment comprises of an image-based treatment, which applies a sophisticated program of a computer to more accuracy-aimed beams of radiation from four to five different directions (Gulley James, 2011) [9]. The advanced system has an external model cast that is applied to maintain the victim in place. Gold seeds that are non-radioactive are sometimes put into the prostate to act as a marker to fill in for day-to-day changes of the prostate gland around the pelvis and detect the organ more precisely. The advance has been identified as more precise and targeting from different directions makes it easy to minimize the radiation gotten by the adjacent tissues. Hence, reducing the side effects of the therapy at the same time raising the radiation dose to the prostate has been indicated to be the better outcome of the process (Hamilton W., 2010) [10].

Another advancement in PCA management is the autologous immunotherapy techniques. This method has been discovered in the previous few years as an approach to training the immune system of the patient to know their prostate cancer cells (Bubley Glenn, 2003) [1]. Presently, the merely FDA certified immunotherapy of prostate cancer therapy being employed is the Sipuleucel-T. This form of treatment needs leukapheresis to eliminate the immune cells of the patient. From this advance, the cells are indicated, especially the immature dendritic cells, are developed in the lab as well as are roused using the PAP (prostatic acid phosphatase). PAP is an antigen articulated in 90 percent of

the PCA. In this process, a phase of dual-blind trial provides the patients with a placebo or provide arterial infusion every two weeks for a complete of three injections. The function of Provenge in this approach was to prolong the life of the patient by 4.1 months. The rate of three years survival increases in the Provenge diagnosed patients from 25 percent to 33 percent. This advance is noted not to have effects on the entire development, which were monitored as well as observed during the process (Gulley James, 2011) [9].

Method

A secondary meta-analysis was used in data obtained from different journals. Online searches of reliable journals related to prostate cancer, the criteria of exclusion and inclusion, data synthesis and extraction, and screening of literature on the advances in the management of the tumor. The modified search strategy was employed in sorting online journals, where the search of advances in prostate cancer was run from various online libraries. The criteria for inclusion and exclusion were applied to the full-text article on qualitative studies of advances in the management of prostate tumors that explored the improvement of supportive care for prostate cancer. A screening of the review articles followed by the title and abstract. The full texts were obtained that met requirement. Data extraction and synthesis: an interpretive approach was used for the thematic synthesis of the evidence of qualitative articles. The themes identification was driven by the research topic as well as established in the information. The information was pulled out individually using customized means and inconsistencies were resolved.

Results and Discussion

The online search produced about 30 latest articles. All articles describing the areas of diagnosis, prevention, and management of prostate cancer as well as the current state of a qualitative study into the prevention and management of PCA were involved within this synthesis. The articles publishing dates were between 2010 and 2017 in different countries and continents across the globe. The double critical assessment demonstrated that the items were of high value and nothing was rejected because of poor quality. On the aspect of the negative score on reflexivity as well as ethical consideration were not enough to permit discard of specific papers. Some journal outcomes are presented under the introduction above.

The current development in genomic research, as well as for biotechnology, has caused a dramatic increase in the amount as well as the accessibility of molecular data necessary to the study of prostate carcinogenesis. A significant advance entails the generation of an extensive database of DNA series as well as the patterns of gene expression (Bubley Glenn, 2003) [1]. DNA quantification plays an important role in the detection of the gene responsible for coding most metabolizing drug enzymes using Polymerase Chain Reaction (Bunu *et al*., 2020) [2]. This information has been discovered to explore and identify candidate biomarkers to assess Prostate Cancer on a foundation of the homology with identifiable oncogenes. The second advancement has been the application of the robotic system to produce DNA microarray relating to thousands of unique expressed genes in the tissue of the prostate. These kinds of arrays make an active approach to check the expression of many genes concurrently (Chan *et al*., 2005) [3]. Also, the outcome in the particular gene expression profile applies to molecular fingerprints for cancer staging as well as diagnosis. The indexes, as well as catalogs, have distinctly expressed genes alongside the protein that code has been extensively applied to check informative biomarker. In this guideline (Shingleton *et al*., 2000) [22] mainly chosen genes coding for proteins distinctively showed neoplastic and normal prostate tissues that emerged as possible molecular makers (Bubley Glenn, 2003) [1]. The analysis of the DNA microarray has also been applied to show the global biological distinctiveness between normal prostate pathological characteristics and to detect genes that expect the disease's scientific performance. A group of the gene discovers that resiliently related to the prostate cancer's stage of differentiation as per the measure of the Gleason score.

It was discovered that MRI, CT, SPECT, and PET are used in clinical practice to a prostate cancer patient that the cancer is in stage (Klotz Laurence, 2004) [13]. There are current improvements in using MRI to treat prostate cancer, this is through the diagnostic performance of conventional imaging modalities (Prostate Cancer guidelines, 2017) [18]. This report tackles mostly the newest treatment for prostate cancer and it was found that there are lots of new treatments for the disease but the most recommended is between MRI and genetic testing of prostate cancer to my understanding, genetic testing is the most improved one, and the advised one to use. Although apart from MRI and genetic testing there are other new treatments for this disease which was outlined above. They all have their advantages and disadvantages.

Conclusion

These studies on the latest and future advances in the management of PCA have shown that the gene expression data produced by the DNA microarray outline forecast with precision the patient progression after prostatectomy. The information supports the notion that prostate cancer clinical performance is correlated to particular distinctiveness in the profile of gene expression that is identifiable at the duration of diagnosis and treatment. The advance in the style of gene expression permits the detection of a potential target for cancer treatment. The studies on the expression profiles of benign as well as malignant PCA samples give room for the identification of a sequence of differentially expressed genes between the normal gland and cancerous glands.

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