



## REVIEW ARTICLE

# Evolution of prostate biopsy techniques. Looking back on a meaningful journey<sup>☆</sup>



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### KEYWORDS

Evolution;  
Prostate biopsy;  
Prostate cancer;  
Prostate specific antigen;  
Transrectal ultrasound

### Abstract

**Background:** The technique of prostate biopsy has evolved a long way since its inception to being a safe diagnostic procedure. The principles of the biopsy technique continue to improve with the knowledge about prostate cancer and availability of newer treatment options like active surveillance and focal therapy. Currently, we depend on accurate cancer information from the biopsy more than ever for deciding the ideal treatment option.

**Aim:** The aim of this review is to present the major milestones in prostate biopsy technique evolutions and its impact on the prostate cancer management.

**Acquisition of evidence:** We performed a detailed non-systematic literature review to present the historical facts on the transformations in prostate biopsy techniques and also the direction of present research to improve accurate cancer detection.

**Summary of evidence:** There is a clear change in trend in biopsy technique before and after the introduction of transrectal ultrasound and prostate specific antigen. In the earlier era, the biopsies were aimed at palpable nodules and obtaining adequate prostatic tissue for diagnosis while the later era has moved toward detection of non-palpable and early prostate cancer. Recently, there is an increasing trend toward image guided targeted biopsies to extract maximum cancer information from minimum biopsy cores.

**Conclusion:** Prostate biopsy techniques have seen major changes since its inception and have a major impact on prostate cancer management. There is a great potential for research which can further support the newer treatment options like focal therapy.

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**PALABRAS CLAVE**

Evolución;  
Biopsia prostática;  
Cáncer de próstata;  
Antígeno específico  
de la próstata;  
Ecografía transrectal

## Evolución de las técnicas de biopsia prostática. Mirando hacia atrás en un viaje significativo

**Resumen**

*Antecedentes:* La técnica de la biopsia de próstata ha evolucionado mucho desde sus inicios hasta ser un procedimiento de diagnóstico seguro. Los principios de la técnica de biopsia siguen mejorando con el conocimiento sobre el cáncer de próstata y la disponibilidad de opciones de tratamiento más nuevas, como la vigilancia activa y la terapia focal. Actualmente, dependemos de información más exacta sobre el cáncer de la biopsia que nunca para decidir la opción de tratamiento ideal.

*Objetivo:* El objetivo de esta revisión es presentar los principales hitos en la evolución de la técnica de la biopsia de próstata y su impacto en el manejo del cáncer de próstata.

*Adquisición de la evidencia:* Se realizó una revisión bibliográfica no sistemática detallada para presentar los hechos históricos sobre las transformaciones en las técnicas de biopsia de próstata y también la dirección de la actual investigación para mejorar la detección del cáncer precisa.

*Resumen de la evidencia:* Hay un claro cambio de tendencia en la técnica de biopsia antes y después de la introducción de la ecografía transrectal y el antígeno prostático específico. En la época anterior, las biopsias fueron dirigidas a los nódulos palpables y a la obtención de tejido prostático adecuado para el diagnóstico, mientras que la época posterior se ha desplazado hacia la detección del cáncer de próstata no palpable y temprano. Recientemente, existe una tendencia creciente hacia biopsias dirigidas guiadas por imagen para extraer el máximo de información del cáncer a partir de núcleos de biopsia mínimos.

*Conclusión:* Las técnicas de biopsia de próstata han visto grandes cambios desde su creación y tienen un impacto importante en el manejo del el cáncer de próstata. Hay un gran potencial para la investigación que puede apoyar aún más las opciones de tratamiento más nuevas, como la terapia focal.

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**Introduction**

Despite prostate cancer being the most common solid organ tumor in humans, the principles of prostate biopsy techniques are very different from the detection of other common cancers. While most of the solid organ cancers are detected with precise, targeted biopsy of the abnormal lesions, prostate biopsy technique is random, non-targeted and non-systematic and relies heavily on cancer detection by chance, 'hit or miss' and cognitive memory of the surgeons. Commonly used bi-sexant TransRectal UltraSound biopsy has the dual problem of poor cancer detection and over-diagnosis. Recent advances in the management of prostate cancer – concept of active surveillance, improved surgical outcomes with robotics and design of focal therapy demands more reliable and accurate information about the cancer in the biopsy. In this review, we present the evolution in the technique and principle of prostate cancer biopsies in the past century and the clinical performance of the current biopsy techniques.

**Acquisition and synthesis of evidence**

A non-systematic literature review was made in the MEDLINE using the key word 'Prostate biopsy', 'Prostate biopsy techniques' and 'history of prostate biopsy'. Moreover, a detailed search in the web based search engine was made to acquire information on evolution and evolving technologies

in prostate biopsy. The articles describing only the prostate biopsy techniques were included for the manuscript preparation.

**Timeline of evolution of prostate biopsy technique**

One of the most prominent developments that occurred in the evolution of prostate biopsy technique is the introduction of TransRectal Ultrasound (TRUS) and Prostate Specific Antigen (PSA) testing in the management of prostate cancer. The principles shifted from biopsy of palpable prostate nodules toward detection on non-palpable, early tumors. However, there are several important events that happened during the development of the current prostate biopsy technique and Fig. 1 summarizes the key landmarks in the pre-PSA era.

**Digital rectal examination (DRE)**

In the early 1900s, radical prostatectomies were performed solely on the physical examination of the prostate by DRE. Firmness, irregularity and nodularity were considered signs of prostate cancers. Grabstald et al. proposed a clinical staging of prostate cancer based on physical finding of prostate alone.<sup>1</sup> However, Colby et al.<sup>2</sup> showed in their retrospective review of RP performed solely based on DRE findings, 42% patients underwent unwanted RP for being disease. They

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