



The Complete Guide to Fine Needle Aspiration

with Dr. Celina Nadelman



CELINA M. NADELMAN, M.D.
Fine Needle Aspiration Specialist

Chapter 1



Education: Personal & Professional Insight into Pathology and Interventional Practices

My Role as a Pathologist: The Doctor Behind the Diagnosis

As a pathologist, my role extends beyond the confines of a laboratory; I am the "doctor's doctor." It's my responsibility to delve deep into the mysteries of human diseases, providing answers to the complex medical questions posed by clinicians. This role is not just about identifying diseases; it's about unraveling the intricate details of each patient's unique condition, guiding the treatment journey.

Embracing Interventional Pathology: A Direct Impact on Patient Care

My journey in pathology has led me to embrace the emerging field of interventional pathology. This role is distinct and dynamically differs from traditional pathology. As an interventional pathologist, I am not just confined to my microscope and slides; I engage directly with patients, particularly in performing biopsies, a significant shift from the conventional pathologist's role.

In this field, I take on a proactive role, not only in performing fine needle aspiration biopsies but also in making real-time evaluations during the procedure. This immediate assessment is crucial in guiding the process of sample collection, ensuring both accuracy and adequacy.

Fine Needle Aspiration Biopsy

In my practice, Fine Needle Aspiration Biopsy (FNA) is a pivotal procedure. This technique involves the use of very thin needles – typically 27 to 23 gauge – to obtain tissue samples from lumps, lesions, or masses. It is a procedure that embodies the principles of precision and patient comfort.

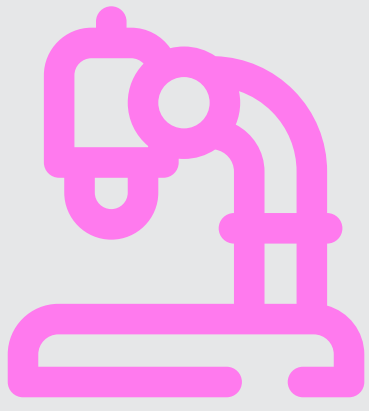
Understanding the Need for Biopsies

Why do we need biopsies like FNA? When a patient presents with a lump, lesion, or mass, it is essential to understand its nature. Is it benign or malignant? What's causing it? These are the questions I aim to answer through FNA. Despite the advancements in imaging, the definitive diagnosis of various conditions, notably cancer, relies on tissue analysis.

The Evolution of Medicine: Aligning with Personalized Care

The landscape of medicine is continually evolving, with significant advancements in personalized care and molecular/genetic testing. These developments have refined our approach in pathology, allowing us to work with smaller tissue samples while still obtaining comprehensive diagnostic data.

In my practice, this evolution is evident. FNA allows me to gather enough tissue for an in-depth analysis, which is not only instrumental in diagnosing the nature of the lump but also crucial in genetic and molecular profiling. Such detailed analysis is vital in tailoring treatment to the patient's specific condition.



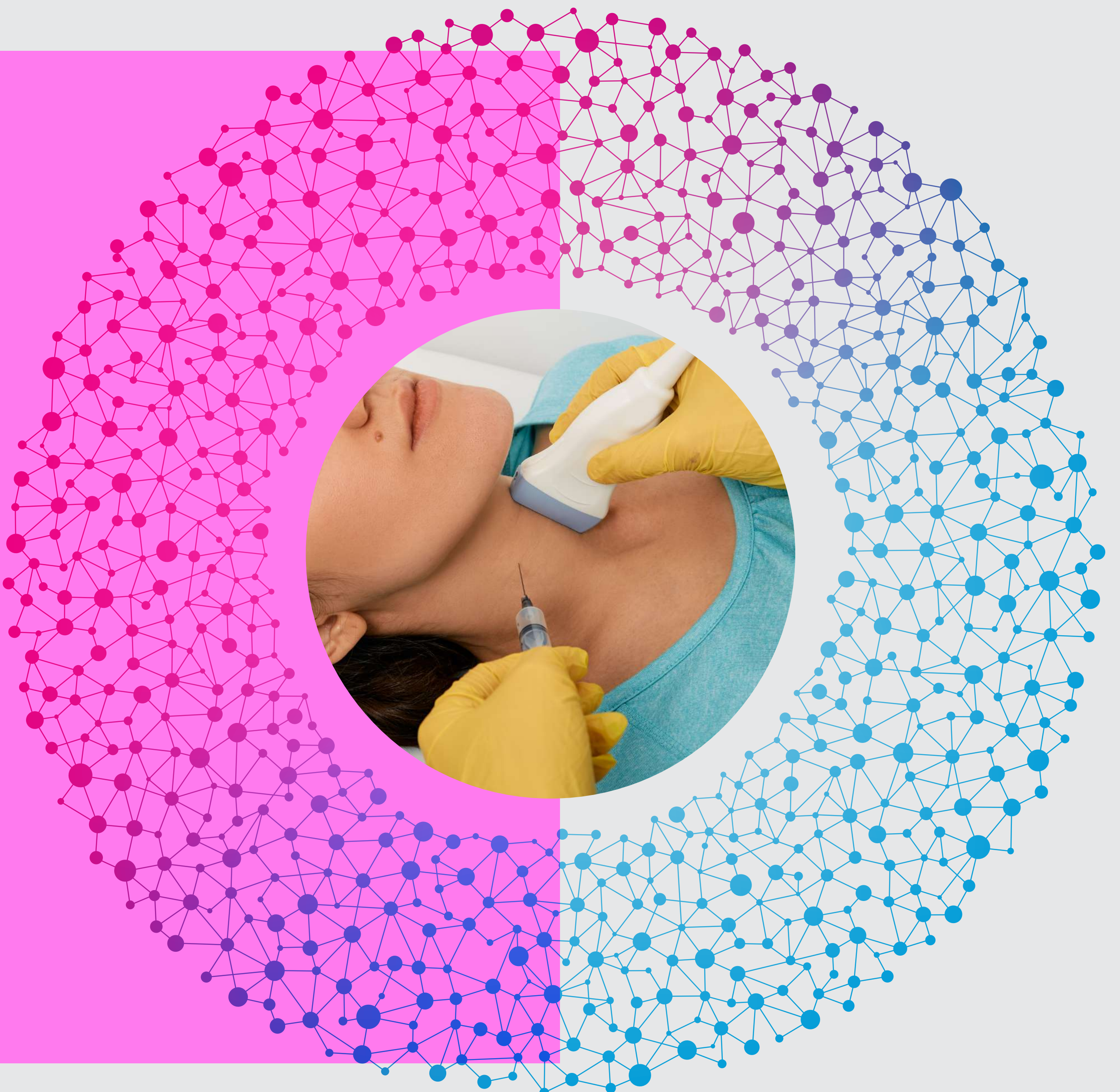
FNA: A Procedure Refined by Experience and Empathy

Performing FNA requires a blend of skill, precision, and compassion. It's about ensuring the patient feels comfortable and understood throughout the procedure. The process involves gently inserting a needle into the lump and aspirating cells for analysis. This technique, though seemingly simple, demands a high level of expertise – both in execution and interpretation.

The analysis of the aspirated cells can reveal a wealth of information about the lump – from its benign or malignant nature to the type and aggressiveness of any cancer present. My expertise as both a practitioner and an interpreter of these results is crucial to ensuring diagnostic accuracy and, consequently, effective treatment planning.

Final Thoughts

My role as a pathologist, particularly in the realm of interventional pathology, is central to the diagnosis and treatment of various conditions. Fine Needle Aspiration Biopsy stands as a testament to the advancements in our field – a minimally invasive yet highly effective technique that aligns perfectly with the current trends in personalized medicine. As I continue my journey in this field, my commitment to my patients – to provide accurate diagnoses and compassionate care – remains steadfast.



Chapter 2

The Benefits of Fine Needle Aspiration (FNA)

Fine Needle Aspiration (FNA) is more than a medical procedure; it's a transformative approach in diagnostic medicine. This chapter delves into the myriad benefits of FNA, highlighting why it has become a preferred method for both patients and healthcare providers.



1. Speed and Efficiency

One of the most significant advantages of FNA is its rapid process. Unlike more invasive procedures, an FNA can be performed quickly – often within minutes. This swiftness is not just about convenience; it's a critical factor in patient care, especially in time-sensitive cases like cancer diagnosis. The quicker a diagnosis is made, the sooner a treatment plan can be formulated.

2. Expedited Results

The promptness of FNA extends to the delivery of results. Traditional biopsies, especially those requiring surgical intervention, often have longer processing times due to the complexity of sample preparation and analysis. In contrast, FNA samples are smaller and can be analyzed more swiftly, frequently providing preliminary results within 24 hours. This rapid turnaround is crucial in alleviating patient anxiety and expediting treatment decisions.

3. Enhanced Patient Management

FNA greatly improves patient management. The procedure's minimally invasive nature means it can be repeated if necessary, allowing for ongoing monitoring of a patient's condition. This is particularly beneficial in cancer care, where tracking the progression or response to treatment is vital.

4. No Need for Extensive Hospital Resources

FNA does not require a surgical suite or hospital setting. It can be performed in an outpatient clinic, making it more accessible and reducing the burden on hospital resources. This flexibility allows for more patients to be seen and treated in a timely manner.

5. Avoidance of General Anesthesia

General anesthesia, often necessary in surgical biopsies, is not required in FNA. This avoidance significantly reduces the risks associated with anesthesia, particularly in patients with underlying health conditions. Local anesthesia used in FNA is sufficient to ensure patient comfort, making the procedure well-tolerated by most.





6. Minimally Invasive with Less Morbidity

The less invasive nature of FNA results in lower morbidity. There's minimal damage to surrounding tissues, significantly reducing the risk of complications like infection or bleeding. The procedure's precision ensures that only the targeted area is affected, preserving the integrity of surrounding healthy tissue.

7. Cost-Effective

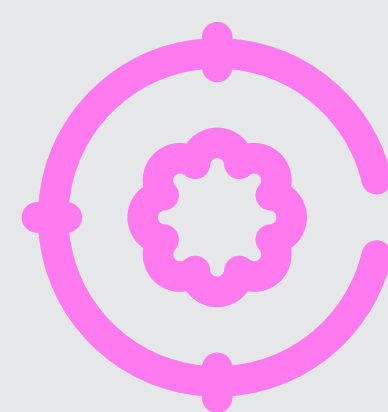
From an economic standpoint, FNA is a cost-saving procedure. It eliminates the costs associated with operating room usage and general anesthesia. The procedure can be performed at a fraction of the cost of a formal surgical biopsy, making it a financially viable option for both healthcare systems and patients.

8. Patient Comfort and Satisfaction

Patient comfort is paramount in any medical procedure, and FNA scores high in this regard. Its minimally invasive nature, coupled with the use of local anesthesia, ensures that patients experience minimal discomfort. This aspect of FNA often leads to higher patient satisfaction, as the procedure is less daunting compared to traditional surgical biopsies.

9. Diagnostic Accuracy

Despite its minimally invasive nature, FNA does not compromise on diagnostic accuracy. When performed by skilled professionals, it can provide definitive results. The procedure is particularly effective in diagnosing conditions like thyroid nodules, where it boasts a high accuracy rate.



Conclusion

Fine Needle Aspiration represents a significant advancement in diagnostic medicine. It's a testament to how medical procedures can evolve to become more patient-centric, cost-effective, and efficient without sacrificing accuracy or quality of care. FNA stands as a model procedure that aligns with the goals of modern healthcare – providing swift, accurate, and patient-friendly diagnostic solutions.

Do you need a needle biopsy?

Yes

No

Chapter 3

The Need for Accuracy with Fine Needle Aspiration (FNA)

In the realm of Fine Needle Aspiration (FNA), accuracy is not just a goal; it is an absolute necessity. This chapter focuses on the crucial need for precision in FNA procedures and how the expertise of a well-trained interventional pathologist can significantly enhance the accuracy of results.

The Importance of Expertise in FNA

The pivotal aspect of FNA is that it must be performed by an expert, specifically an interventional pathologist. While various medical professionals can conduct biopsies, the unique skills and knowledge of an interventional pathologist set them apart in the realm of FNA. They are not only adept at performing biopsies but also excel in Rapid On-Site Evaluation (ROSE). This expertise is critical as they understand the intricacies of the laboratory work, which directly impacts the quality of the diagnostic process.

Limitations of Non-Specialists

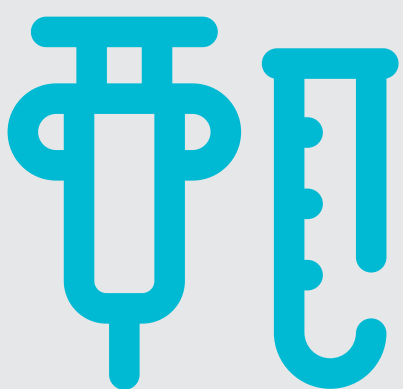
Physicians outside of pathology may conduct biopsies, but their lack of specific training in FNA often leads to suboptimal results. One common issue is poor smear technique, which can significantly compromise the diagnostic integrity of a sample. Non-specialists may not appreciate the importance of minimizing blood contamination in smears, as excessive blood can obscure cellular details and hinder an accurate diagnosis.

Moreover, the preparation of smears is a nuanced process. Interventional pathologists understand the need for preparing specimens in “two flavors” – both air-dried and alcohol-fixed smears – which are crucial for comprehensive cytological evaluation. This level of detail in specimen preparation is often beyond the scope of training for non-pathologists.

non-pathologists.

The Role of ROSE in FNA

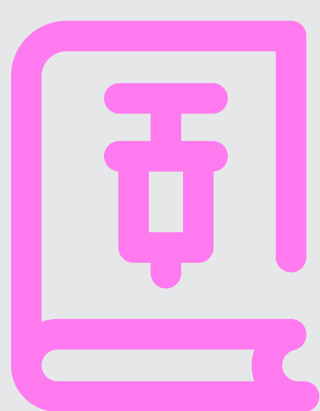
ROSE is a critical component of FNA that enhances the accuracy of the procedure. When I perform ROSE, I can immediately assess the quality of the sample. This real-time evaluation allows me to determine if additional material is needed, particularly for ancillary studies. Understanding what type of studies are necessary and where to direct these specimens in the lab is a skill unique to interventional pathologists.





The Importance of Expertise in FNAThe Expertise of an Interventional Pathologist

As an interventional pathologist, my training and experience equip me with a deep understanding of the entire diagnostic process. From knowing the subtleties of making a good smear to the ability to triage specimens effectively, these skills are essential for accurate diagnosis. Furthermore, my expertise allows me to provide a preliminary diagnosis almost immediately – a capability that is not usually available with other medical practitioners.



The Caveat of FNA

The caveat with FNA lies in the necessity of having it performed by a well-trained interventional pathologist. The precision required for FNA goes beyond the mechanical aspect of the biopsy. It encompasses an understanding of cytology, pathology, and the nuances of specimen handling and processing.

Conclusion

In conclusion, the necessity for accuracy in FNA cannot be overstated. The expertise of a well-trained interventional pathologist is indispensable in achieving the high level of precision required for accurate diagnosis. This chapter underscores the importance of specialist involvement in FNA procedures and highlights the significant role of interventional pathologists in ensuring the integrity and reliability of the diagnostic process.



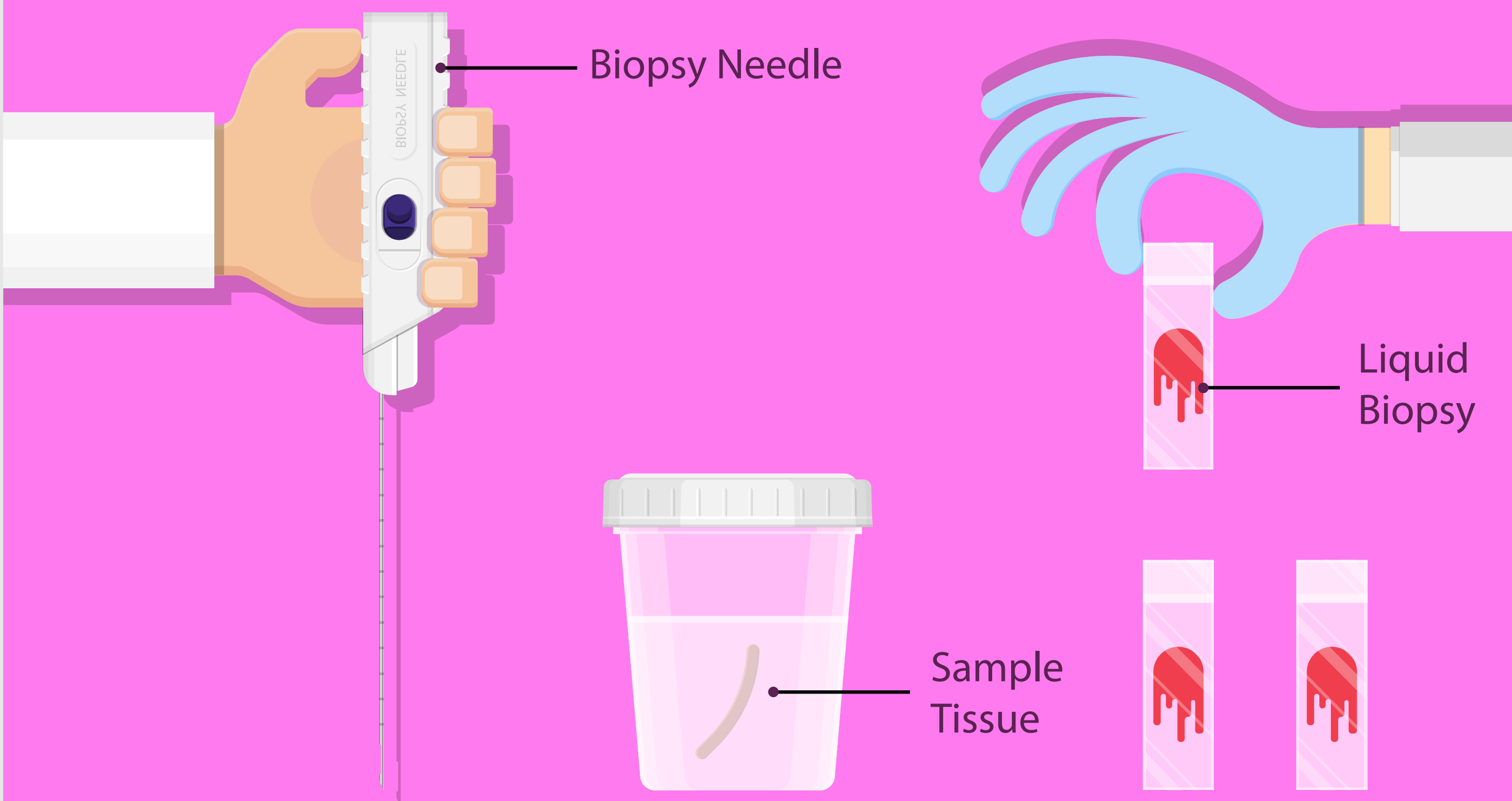


The Crucial Role of Pathologist in Cancer Diagnosis

Cancer remains a significant public health challenge in the United States, with an estimated 1,958,310 new cases diagnosed in 2023 and cancer being the second leading cause of death (Siegel et al., 2023). Pathologists, termed as the “doctor’s doctor,” are central to diagnosing and understanding cancer. They provide critical answers to questions raised by clinicians. Interventional pathologists extend this role by conducting biopsies, specifically Fine Needle Aspiration Biopsies (FNA), using thin needles (27, 25, 23 gauge) for tissue sampling.



Biopsy Procedures used to Diagnose Cancer



Innovation and Development in Fine Needle Aspiration Biopsy

Cancer remains a significant public health challenge. Recent advancements in FNAB, particularly in its application in lung and thyroid cancers, have significantly improved its diagnostic accuracy and utility (Nguyen et al., 2005). In lung cancer, FNAB allows for precise classification and molecular characterization necessary for targeted therapies. Techniques like endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) and CT-guided percutaneous biopsies have increased the diagnostic yield, especially for peripheral lung lesions (Zhan et al., 2017).

For thyroid cancers, ultrasound-guided FNAB has become instrumental in routine and specialized pathological diagnosis. The use of fine needle injection (FNI) in conjunction with FNAB, especially in the context of thermal ablation treatments, has emerged as a significant advancement. Techniques like the liquid isolation method have been developed for safe thermal ablation of thyroid nodules, with agents like sodium hyaluronate gel being used to create an effective isolation zone (Feldkamp et al., 2016).

Fine Needle Aspiration Biopsy and Molecular Techniques

The application of molecular techniques in FNAC, such as in-situ hybridization and polymerase chain reaction (PCR), has enhanced the potential of molecular testing in FNAB acquired material. These techniques are particularly valuable in cases where core needle biopsy is not available or when cytology is indeterminate or suspicious. Molecular tests on FNAB specimens can distinguish benign from malignant lesions and are crucial for targeted therapy, e.g., EGFR inhibitors for non-small cell lung cancer (NSCLC) (Krishnamurthy, 2007).



Recent Technological Advances

Technological advancements like the development of automated image cytometers, incorporating bioengineering and artificial intelligence (AI), have been pivotal in automating the interpretation of FNAB staining. These technologies ensure quality control and reduce variability in interpretation.

Advantages of Fine Needle Aspiration

The benefits of FNA biopsies have been reinforced by these advancements:

- **Speed and Efficacy:** Quick process and rapid results facilitate timely patient management.
- **Minimally invasive:** Eliminates the need for extensive surgical procedures.
- **Cost-Effectiveness:** More affordable compared to traditional surgical methods.
- **Advanced Diagnostic Capabilities:** Enhanced accuracy and molecular testing capabilities.
- **Patient Safety and Comfort:** Reduced invasiveness and general anaesthesia requirements.



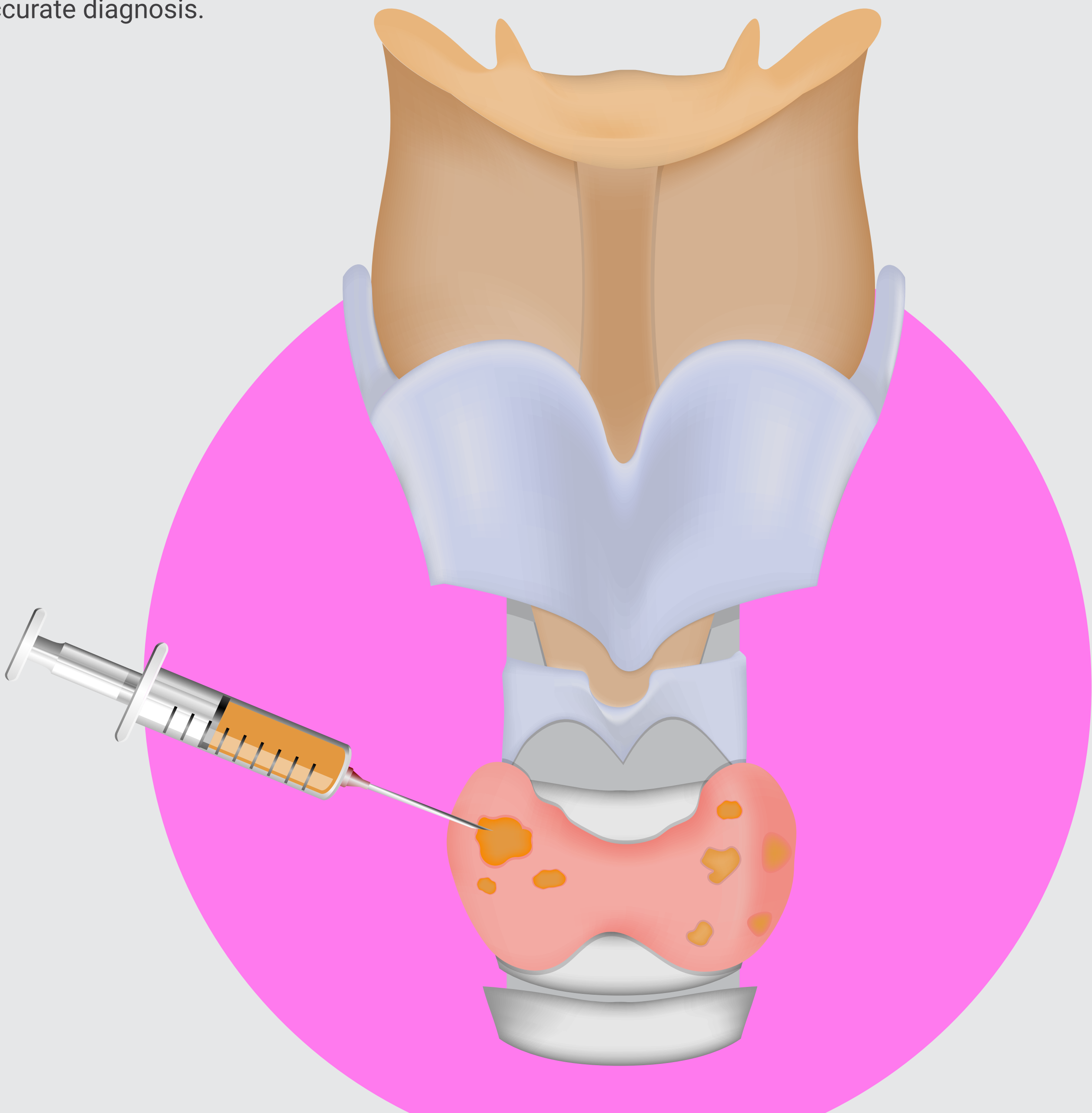
The Essential Role of Trained Interventional Pathologist in FNA

A well-trained interventional pathologist to ensure the most accurate results should conduct fine needle aspiration (FNA). The expertise of an interventional pathologist is crucial for several reasons:

- **Rapid On-Site Evaluation (ROSE):** Unlike other physicians, interventional pathologists can perform ROSE, which is integral in evaluating the adequacy of a biopsy sample in real-time. This immediate assessment allows the pathologist to determine if additional material is needed for ancillary studies (Witt, 2021).
- **Laboratory Knowledge and Smear Techniques:** Interventional pathologists have a deep understanding of laboratory processes and the nuances of creating a good smear. They are skilled in preparing slides with minimal blood contamination, which can otherwise compromise the diagnostic process.
- **Specimen Triage and Preliminary Diagnosis:** Only an interventional pathologist can effectively triage specimens and provide a preliminary diagnosis immediately after ROSE. This expertise is crucial in deciding what type of further studies are needed and where to send these studies within the lab (Witt, 2021).

The Importance of Timely Healthcare

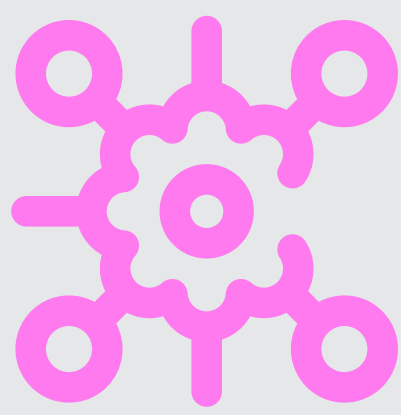
In an era where healthcare systems are expanding and patient-to-doctor ratios are increasing, timely access to medical care has become a crucial issue. Delayed healthcare often translates to denied healthcare. A significant challenge faced by patients in large medical systems is the difficulty in scheduling appointments promptly. Furthermore, many of these systems do not include Rapid On-Site Evaluation (ROSE) in their biopsy protocol, which is essential for immediate and accurate diagnosis.



The Unique Role of an Interventional Pathologist / FNA Specialist and Board-Certified Cytopathologist

As an interventional pathologist, I have witnessed the significant benefits of a more personal approach to diagnostics:

- **Direct Patient Interaction:** Unlike most pathologists who are isolated in laboratories, interventional pathologists engage directly with patients. Conducting a focused history (involving family, exposure, and cancer history) and physical examination are integral in making the most accurate diagnoses. Physically feeling and observing the lump under ultrasound enhances diagnostic accuracy.
- **Quality Control Adherence:** Our laboratory and clinic strictly adhere to Quality Control measures set by CLIA (federal government) and the California Department of Health, ensuring the highest standards of care.
- **One-Stop-Shop Approach vs Large Labs:** Comparing our comprehensive service to that of large, external labs highlights the benefits of a streamlined and patient-centric approach in FNAs
- **Calming Atmosphere:** Recognizing the anxiety associated with biopsies, whether due to the procedure itself or the potential diagnosis, we emphasize creating a calming and reassuring environment for our patients.

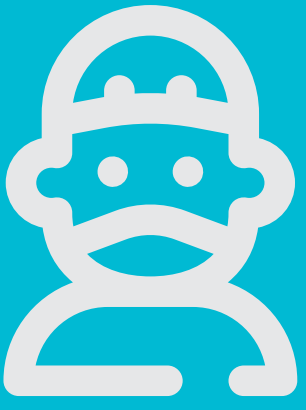


Addressing the Fear of Biopsy and the Importance of Experience

- **Reducing Fear Through Expertise:** It is understandably scary for patients to undergo a biopsy, especially with an inexperienced practitioner. The expertise of an interventional pathologist in performing ROSE minimizes the chances of non-diagnostic specimens, thereby reducing the need for repeat procedures.
- **Challenges with Large Patients Centres:** We often see patients who require repeat biopsies due to unsatisfactory experiences at larger centers. The expertise in conducting FNAs is not uniformly distributed, even among trained specialists like endocrinologists.
- **Minimally Invasive Procedure:** preferable over more invasive diagnostic methods. This approach is less traumatic for patients and often results in quicker recovery and less anxiety associated with the procedure.



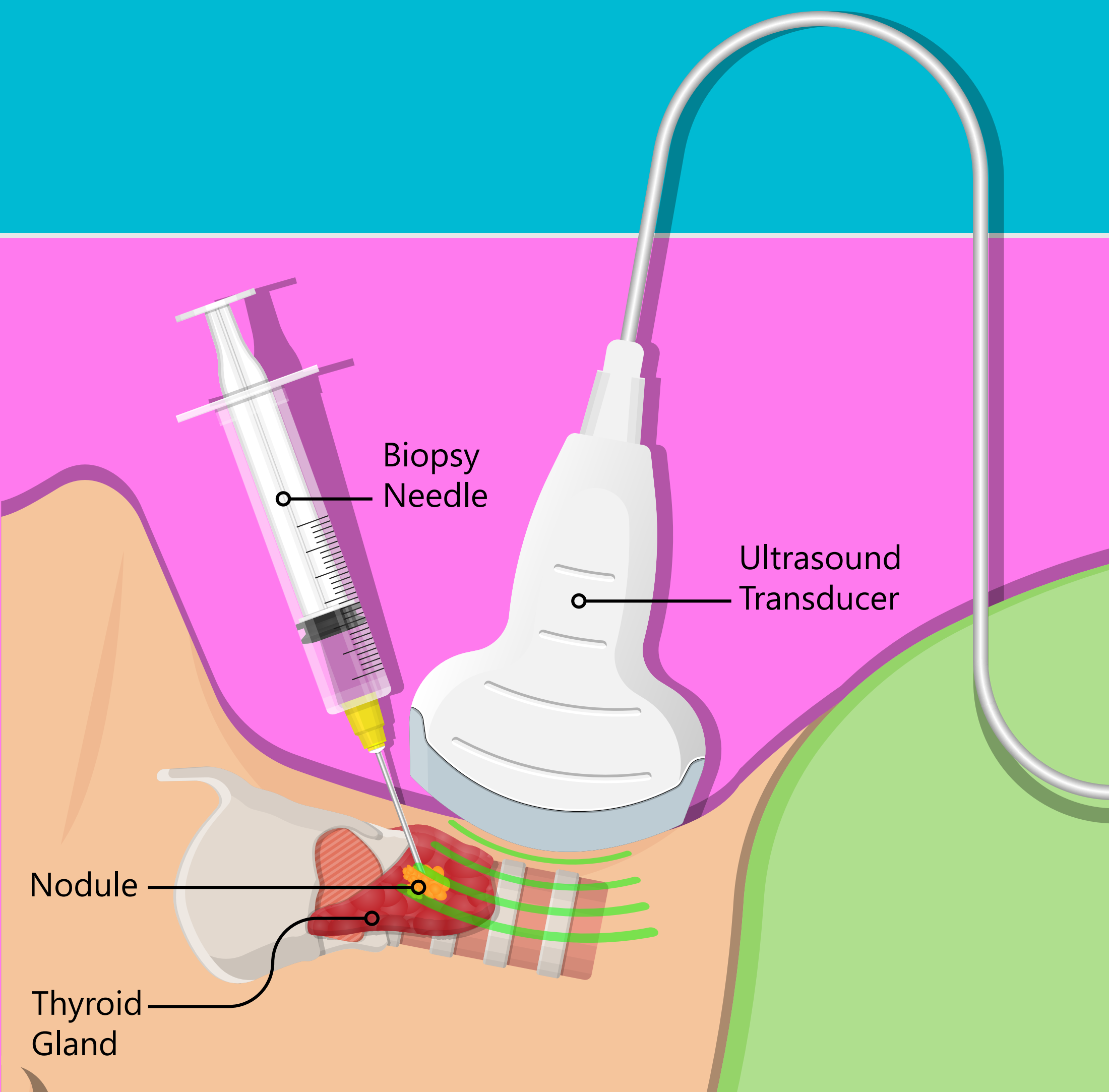
Cancer Statistics and the Impact of Early Detection



Cancer remains the second most common cause of death in both men and women, next only to cardiovascular diseases.

Cancer risk increases with age, making early detection increasingly important for successful treatment outcomes.

Early cancer detection significantly influences survival rates and the possibility of a cure.



Thyroid Nodules and Cancer Incidence

Over the past decade, there has been a notable increase in thyroid nodules and thyroid cancers (Papanastasiou et al., 2019). This surge is attributed to the advancements in medical imaging technologies that now detect even smaller thyroid nodules.

Despite this increased detection rate, the fatality rate from thyroid cancer has remained stable, as it is rarely lethal.

Thyroid cancer, while it can affect individuals of any age, is approximately three times more common in women than in men. Notably, it tends to be diagnosed younger than most other adult cancers (Papanastasiou et al., 2019).



Breast Cancer and Diagnostic Approaches

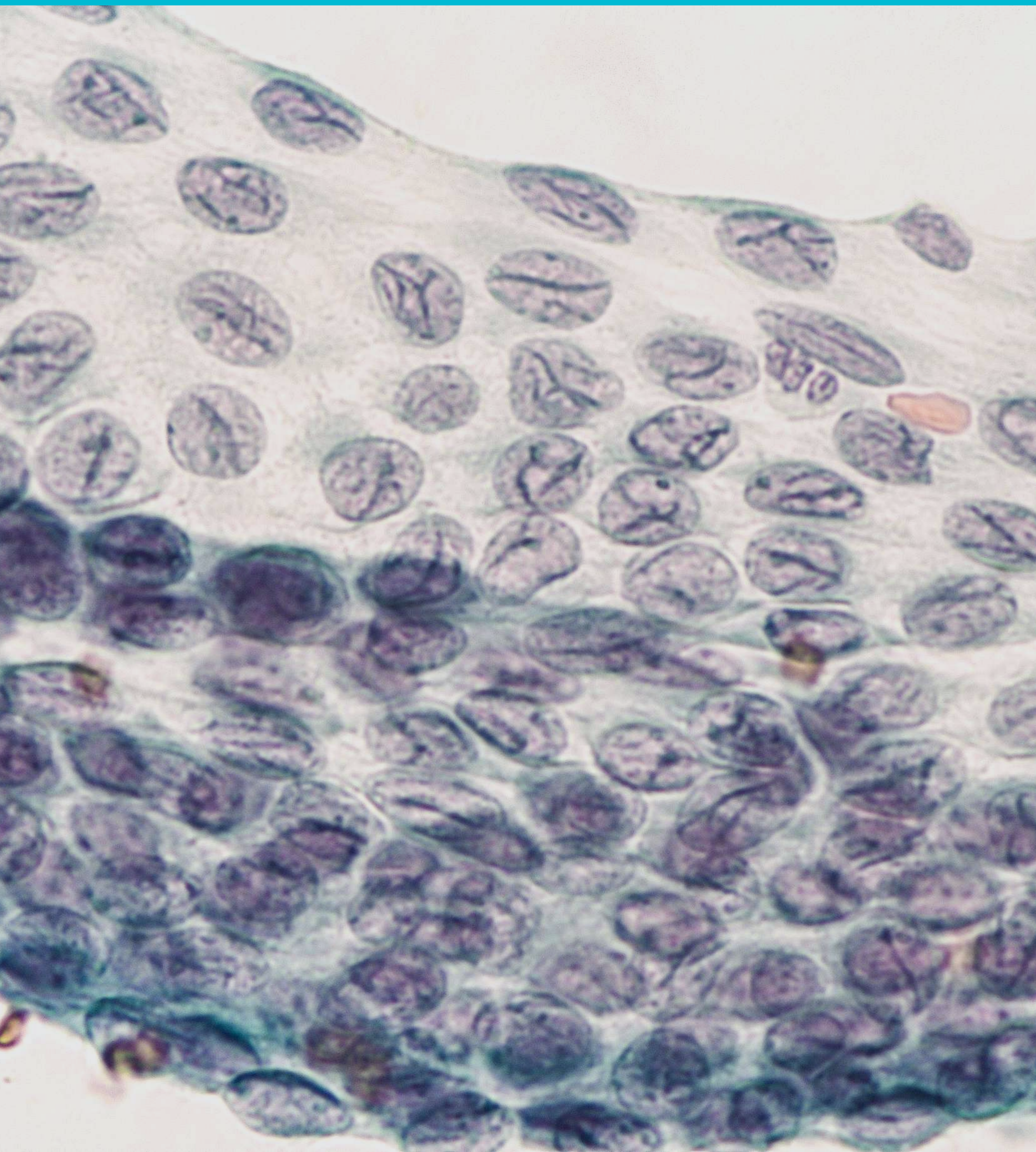
In breast cancer, most palpable masses or abnormalities detected on mammograms typically undergo core needle biopsies using stereotactic techniques (X-ray).

Some patients may opt for less invasive diagnostic methods, such as FNA, which can diagnose cancer but are unable to confirm invasion. Ancillary tests can supplement these procedures for a more comprehensive evaluation (Kazi et al., 2017).

Lymph Node Enlargement and Its Implications

Lymph nodes can enlarge for various reasons, including metastatic cancer, inflammation from infection or other inflammatory factors, and lymphoma (Chong et al., 2023).

Understanding the underlying cause of lymph node enlargement is crucial for appropriate treatment planning and management.



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