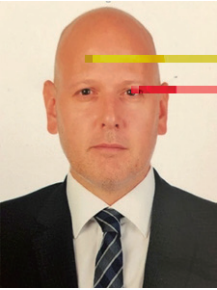


Principles and Applications
in Breast Imaging



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Abstract: This document discusses the principles and applications of breast imaging, covering mammography, ultrasound, and MRI. It highlights the importance of early detection and the role of various imaging modalities in diagnosing breast cancer. The text also touches upon the latest technological advancements in the field, such as digital breast tomosynthesis and contrast-enhanced MRI.

Introduction: Breast imaging is a critical component of breast cancer diagnosis and management. This section provides an overview of the different imaging techniques used in breast imaging, including mammography, ultrasound, and MRI. It also discusses the challenges and future directions in this field.

Summary

The summary of the document highlights the key findings and conclusions. It emphasizes the importance of a multidisciplinary approach in breast imaging, involving radiologists, oncologists, and other healthcare professionals. The document also discusses the role of patient education and shared decision-making in the management of breast cancer.

Conclusion: In conclusion, breast imaging plays a vital role in the early detection and management of breast cancer. Continued research and technological innovation are essential to improve the accuracy and efficiency of breast imaging techniques. The document provides a comprehensive overview of the current state of the field and offers insights into future research directions.

Introduction

US Elastography is a non-invasive, quantitative imaging technique that provides information on the mechanical properties of tissues. It is based on the principle of strain imaging, where the displacement of tissue under an applied force is measured. This displacement is related to the stiffness of the tissue, which is a key indicator of its mechanical properties.

The stiffness of a tissue is defined as the ratio of stress to strain. In the context of US Elastography, stress is the force applied to the tissue, and strain is the resulting displacement. The stiffness is measured in Pascals (Pa) or kilopascals (kPa). The stiffness of a tissue is a key indicator of its mechanical properties, and it is used to differentiate between normal and diseased tissues.

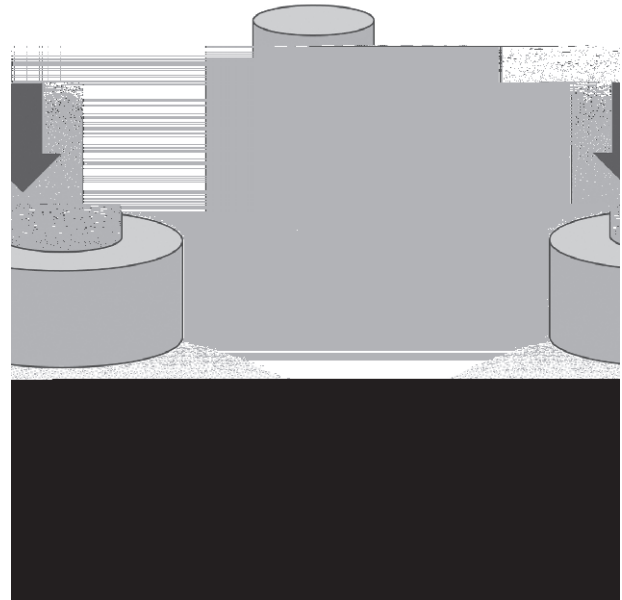
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US Elastography Technique

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The diagram illustrates the mechanical properties of the tissue and how they are measured using US Elastography.

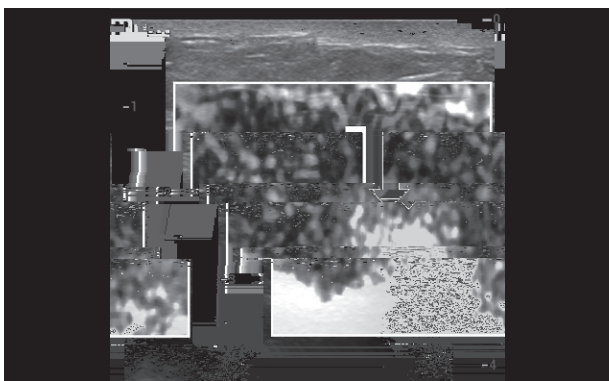
The image shows a breast ultrasound scan with a white shadowing artifact. This artifact is caused by the presence of a dense structure, such as a calcification or a fibrous band, which blocks the sound waves and creates a dark, shadowed area behind it. This can obscure underlying tissue and make it difficult to identify any lesions.

Practical applications of strain elastography

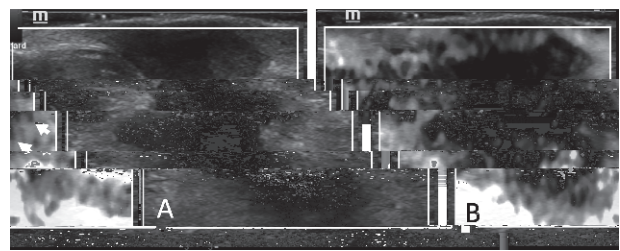
Strain elastography is a technique used in ultrasound to measure the stiffness of tissues. It is based on the principle that stiffer tissues deform less under stress than softer tissues. By applying a known stress to the tissue and measuring the resulting strain, the stiffness can be determined. This technique is particularly useful in the diagnosis of breast lesions, as it can help to distinguish between benign and malignant tumors.

A. White shadowing: In the image, a white shadowing artifact is visible, which is caused by the presence of a dense structure, such as a calcification or a fibrous band, which blocks the sound waves and creates a dark, shadowed area behind it. This can obscure underlying tissue and make it difficult to identify any lesions.

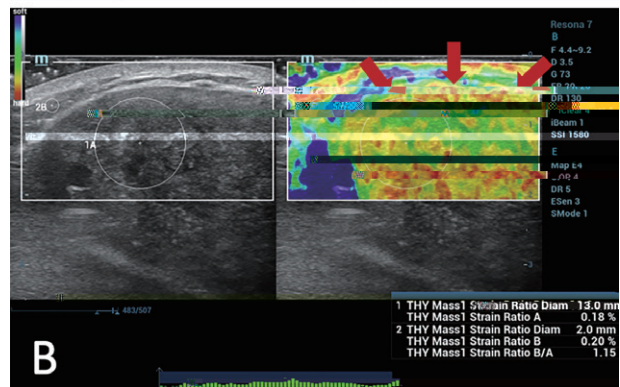
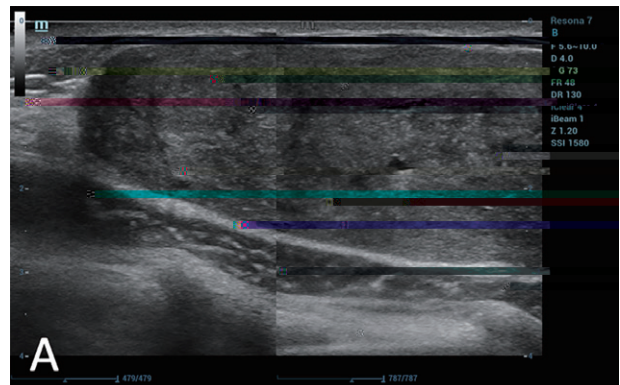
B. Breast conserving surgery (BCS): In the image, a breast conserving surgery (BCS) is shown. The image displays a breast with a large, well-defined mass. The mass is surrounded by a thin layer of tissue, which is characteristic of a BCS. The image also shows the surrounding breast tissue, which appears normal.



The image shows a breast ultrasound scan with a large, well-defined mass. The mass is surrounded by a thin layer of tissue, which is characteristic of a breast conserving surgery (BCS). The image also shows the surrounding breast tissue, which appears normal.



The image shows two breast ultrasound scans, labeled A and B, showing strain elastography results. Scan A shows a mass with a strain ratio of 0.18%, and scan B shows a mass with a strain ratio of 0.20%.



The image shows a breast ultrasound scan with strain elastography results. The image displays a mass with a strain ratio of 0.20% and a diameter of 2.0 mm. The surrounding breast tissue appears normal.

C. Diagnosing phyllodes tumor: In the image, a phyllodes tumor is shown. The image displays a large, well-defined mass with a characteristic leaf-like appearance. The mass is surrounded by a thin layer of tissue, and the surrounding breast tissue appears normal.

D. Diagnosing cysts: In the image, a cyst is shown. The image displays a well-defined, anechoic mass with a thin wall. The mass is surrounded by a thin layer of tissue, and the surrounding breast tissue appears normal.

shear wave elastography (SWE) technique. The shear wave velocity (SWV) is a measure of the stiffness of the tissue. The SWV is directly proportional to the shear modulus of the tissue. The SWV is measured by the time delay between the incident and reflected shear waves. The SWV is measured by the time delay between the incident and reflected shear waves. The SWV is measured by the time delay between the incident and reflected shear waves.

E. Diagnosing non-mass abnormalities: The SWV is a measure of the stiffness of the tissue. The SWV is directly proportional to the shear modulus of the tissue. The SWV is measured by the time delay between the incident and reflected shear waves. The SWV is measured by the time delay between the incident and reflected shear waves.

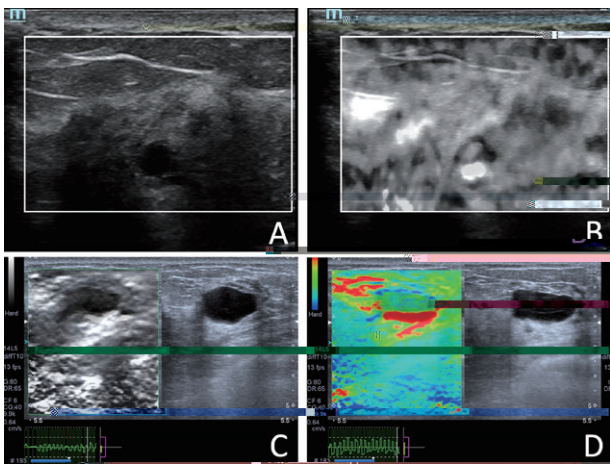


Figure 1: Shear wave elastography (SWE) technique. The SWV is a measure of the stiffness of the tissue. The SWV is directly proportional to the shear modulus of the tissue. The SWV is measured by the time delay between the incident and reflected shear waves. The SWV is measured by the time delay between the incident and reflected shear waves.

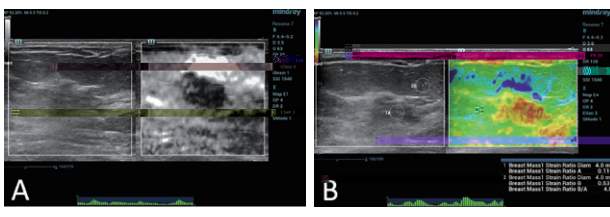


Figure 2: Shear wave elastography (SWE) technique. The SWV is a measure of the stiffness of the tissue. The SWV is directly proportional to the shear modulus of the tissue. The SWV is measured by the time delay between the incident and reflected shear waves. The SWV is measured by the time delay between the incident and reflected shear waves.

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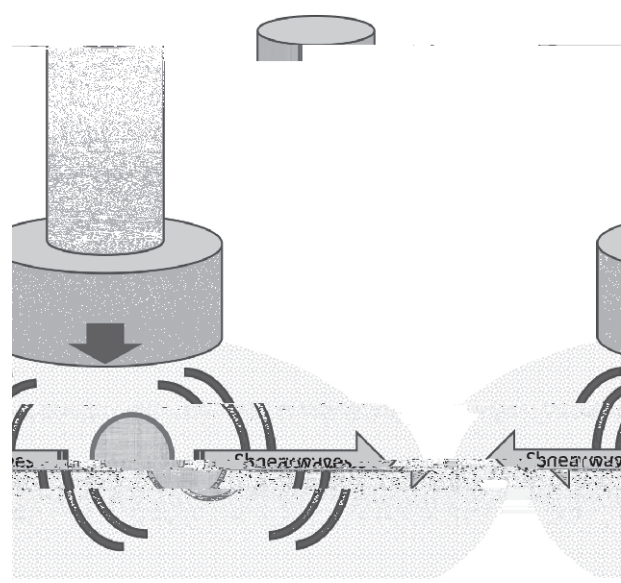
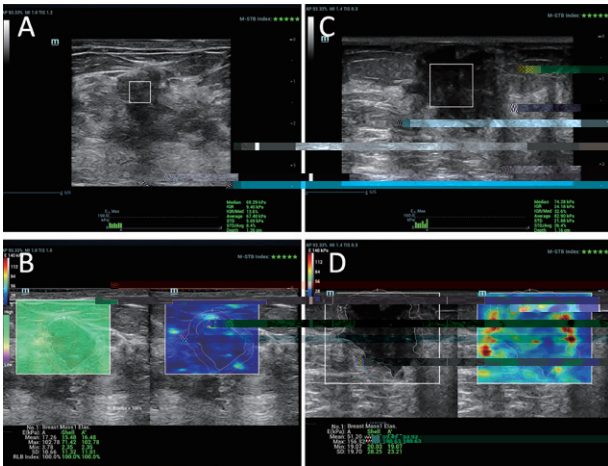
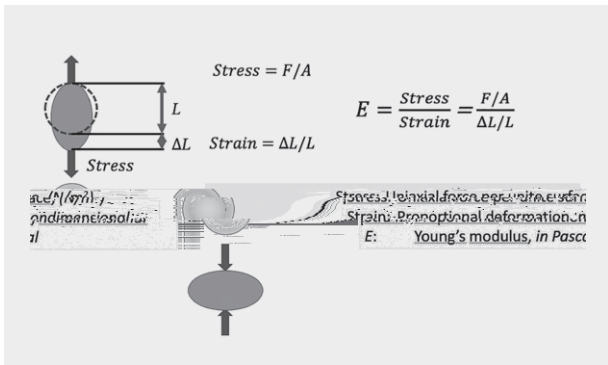


Figure 3: Schematic diagram of the shear wave elastography (SWE) technique. The SWV is a measure of the stiffness of the tissue. The SWV is directly proportional to the shear modulus of the tissue. The SWV is measured by the time delay between the incident and reflected shear waves. The SWV is measured by the time delay between the incident and reflected shear waves.

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Shear-wave elastography (SWE) is a non-invasive imaging technique that measures the stiffness of tissues. It is based on the principle of shear-wave propagation. When a shear wave is applied to a tissue, it causes a local deformation. The speed of the shear wave is related to the stiffness of the tissue. SWE can be used to identify areas of increased stiffness, which may be indicative of a tumor or other pathological changes in the tissue.



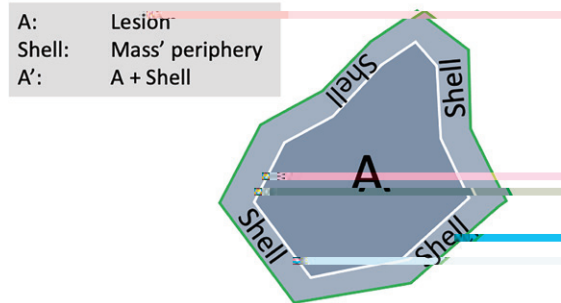
The diagram illustrates the mechanical properties of a material under stress. Stress is defined as the internal force exerted on a surface, and strain is defined as the proportional deformation. The Young's modulus (E) is the ratio of stress to strain, representing the material's stiffness. The diagram shows a cylindrical sample of length L being compressed by a force F, resulting in a change in length ΔL. The stress is defined as F/A , and the strain is defined as $\Delta L/L$. The Young's modulus E is defined as $E = \frac{\text{Stress}}{\text{Strain}} = \frac{F/A}{\Delta L/L}$.

Practical applications of shear-wave elastography

Shear-wave elastography (SWE) has several practical applications in medical imaging. It is used to identify areas of increased stiffness in tissues, which may be indicative of a tumor or other pathological changes. SWE can be used to differentiate between benign and malignant lesions, and to monitor the response of a tumor to treatment. SWE is also used in the diagnosis of liver disease, where increased stiffness is a sign of fibrosis or cirrhosis.

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No. 1: Breast Mass 1 Elas.		
E(kPa):	A	Shell A'
Mean:	17.26	15.48
Max:	102.78	102.78
Min:	3.78	2.35
SD:	10.66	11.32
RLB Index:	100.0%	100.0%

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গণিত-৪ (১ম পত্র) - ১৯৯৯-২০০০ সালের প্রশ্নপত্র
১. একটি চক্রে দুইটি সেক্টর আঁকুন যাদের ক্ষেত্রফল যথাক্রমে $\frac{1}{4}$ এবং $\frac{1}{2}$ ।
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