ROLE OF TOMOGRAPHY
IN DIAGNOSIS OF PRIMARY LUNG TUMOURS

Thesis

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بسم الله الرحمن الرحيم

Dedication

To my parents and grandparents

for their love and forbearance

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INTRODUCTION

AND

AIM OF WORK

INTRODUCTION AND AIM OF THE WORK

Bronchogenic carcinoma, which accounts for 90% of all primary lung tumors, has become much more common in recent years, so much so that it has become the commonest and most fatal malignancy in men (*Houston et al., 1985*).

This striking rise in the incidence of bronchogenic carcinoma is mainly attributed to the wide spread habit or cigarette smoking and air pollution with diesel, petrol and other industrial fumes (*Ellis and Calne, 1983*).

Early detection of bronchogenic carcinoma is made difficult by its late symptomatisation and confusion with so many of the common pulmonary lesions, which is rather unfortunate since early detection provides ideal candidates for surgery, which has advanced so much in recent years to provide such patients with a fair survival rate.

It is regrettable that many clinicians and some radiologists are led into the misconception that Computed Tomography has taken over from conventional Tomography as a diagnostic tool, making it a thing of the past, overlooking the fact that Computed Tomography is an expensive investigation only available in a limited number of centers and ignoring the valuable diagnostic information obtained by conventional Tomography which is a simple, inexpensive and widely available in most centers.

Hence, the aim of this work is to throw some light on the value of chest tomography in diagnosis of primary lung tumours.

REVIEW OF LITERATURE

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The aim of tomography is to blur out overlying structures, but to keep a selected plane of the body in sharp focus. This is achieved by moving the X-ray tube and film about an axis at the level of interest *(Armstrong and Wastie, 1981)*.

Satisfactory chest tomograms were produced by a very simple home made apparatus coupling the X-ray tube column and the Potter-Bucky diaphragm allowing their simultaneous movement in opposite directions *(Twining, 1937)*.

Various refinements on this simple apparatus were made including vertical coupling, a V-shaped contactor to keep the current on over a given arc of swing, devices for propelling the tube column at a constant rate of movement, full mechanization with the layer selection and the preparation of the column for its final run controlled electrically with push-button switches *(Simon, 1978)*.

More complex movements of the tube and Potter-Bucky diaphragm such as circular and hypocycloidal movements were devised, but results may be disappointing in structures of low inherent contrast as the lung *(Clark, 1979)*.

Frontal chest tomography is the most widely adopted technique for chest tomography with lateral chest tomograms done when it is necessary to avoid compression of the lesion.

55° posterior oblique tomography of the chest is extremely useful for evaluation of the major bronchi, the pulmonary hila and the posterior segments of the upper and lower lobes (*Rabin and Baron, 1980*).

Multi-section tomography was considered mathematically by Ziedes de Plantes (1933) and applied practically by Watson (1951) producing a valuable saving of time, energy and amount of radiation received by the patient, in addition to the obvious advantage of recording call layers in exactly the same phase of respiration and therefore being more comparable than sequential films (*Simon, 1978*).

PHYSICAL PRINCIPLES OF TOMOGRAPHY

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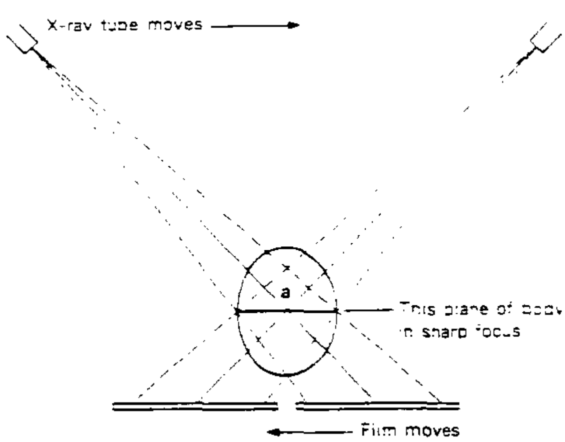
Conventional radiography produces a two-dimensional image of all the structures between the X-ray tube and the film. This results in the superimposition of the images derived from structures at all levels.

Tomography provides a radiographic demonstration of the structures in a pre selected plane by blurring out the images of structures above and below this plane. This is achieved by arranging that the images of the structures outside the plane of interest are moved across the surface of the film during exposure and are thus blurred out, whilst the image of each structure within this plane is projected in a constant size and shape on a fixed position on the film (*Meredith and Massey, 1977*).

In the simplest form of tomography, the tube and film are moved in opposite directions with the same angular velocity. This is known as linear tomography.



Principle of Tomography

Sophisticated apparatus are available by means of which more complicated movements can be obtained and the choice now includes the following movements:

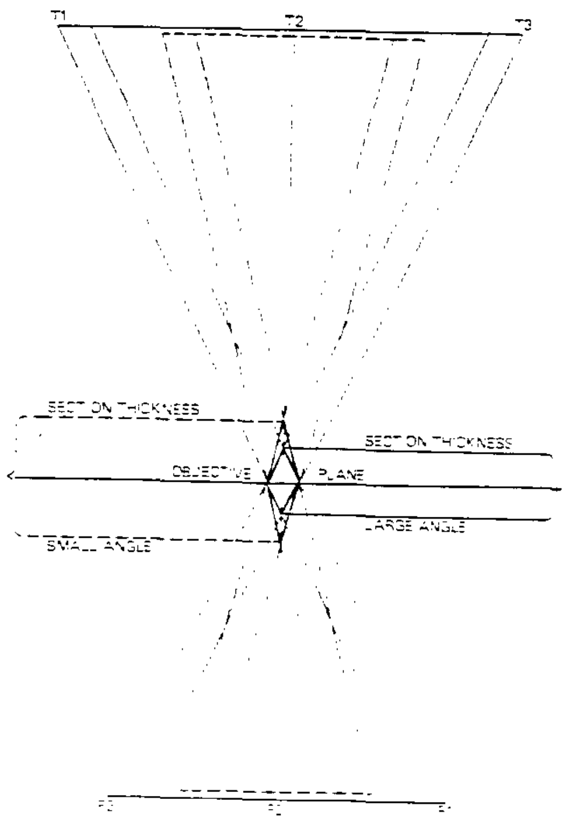
1. Linear
2. Circular
3. Elliptical
4. Multi-directional (hypocycloidal)
5. Asymmetrical
6. Transverse axial
7. Rotational (*Bryan, 1979*).

Plane of the Object

The plane of the object is the section in focus and occurs at the level of the fulcrum of the opposing movements of the tube and film.

Thickness of the Tomographic Section

The thickness of tissue in focus on a tomographic section depends by and large on the exposure angle, the wider the exposure angle the thinner the section and vice versa the narrower the exposure angle the thicker the thickness.



Thickness of the Tomographic Section

For linear movement tomography:

103 arc ...... 2.0 cm thick section
203 arc ...... 1.0 cm thick section
303 arc ...... 0.5 cm thick section
503 arc ...... 0.25 cm thick section

The choice of thin or thick sections depends on the region of the body being examined and on the size of the lesion being demonstrated (*Clark, 1979*).