# DIAGNOSTIC VALUE OF BONE MARROW TREPHINE

THESIS

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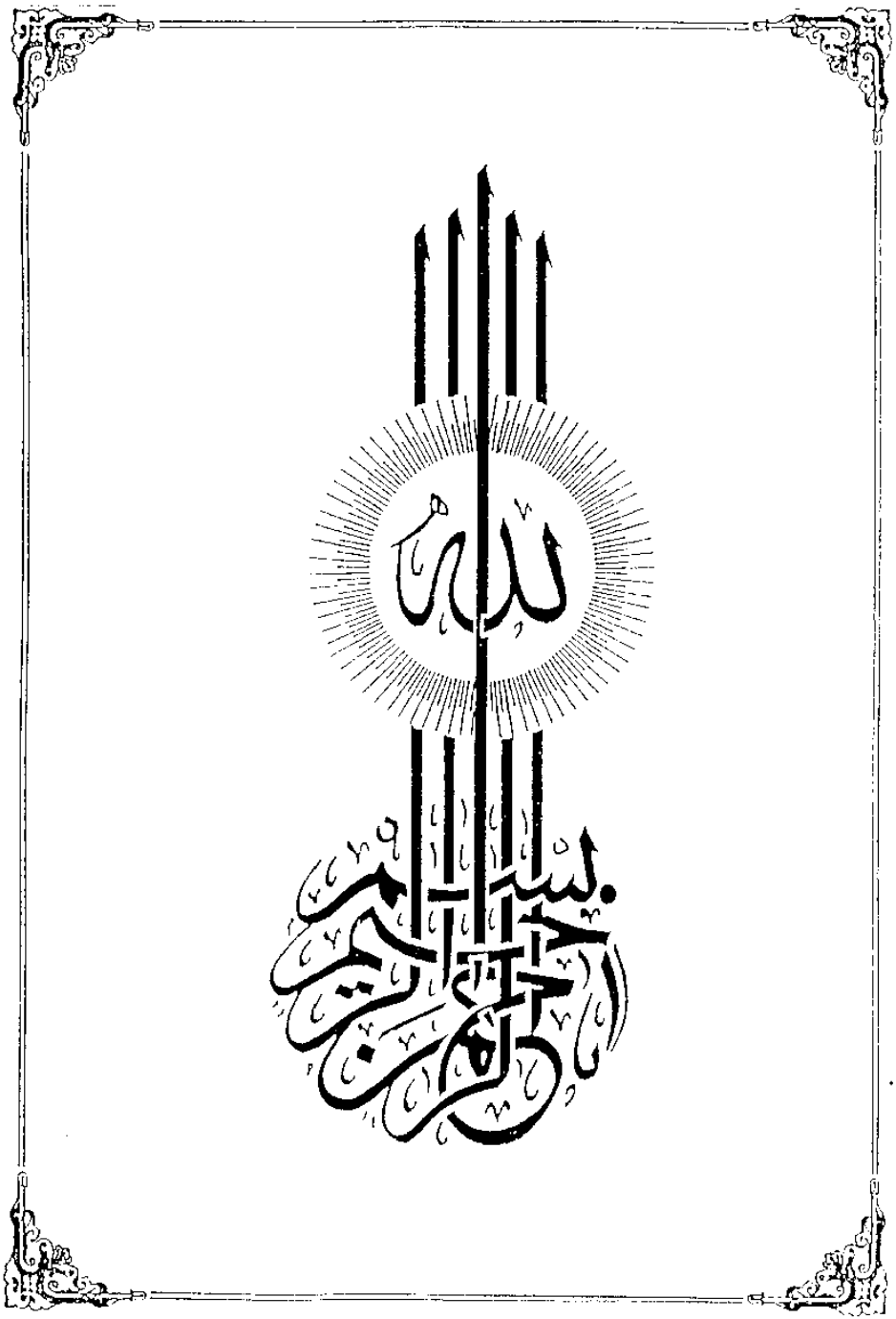
CONTENT OF THE THESIS



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# INTRUDUCTION

# A N D

# AIM OF WORK

# REVIEW ON
# DIAGNOSTIC VALUE OF BONE MARROW TREPHINE

## (1) INTRODUCTION AND AIM OF WORK

Bone marrow examination has been the cornestone of haematology practice since its introduction into routine clinical use in 1940's. In standard practice, bone marrow is aspirated with 14 - guague heavy needle and the spicules of marrow are smeared on glass slide or cover slips and stained with Wright's and Giemsa stains. These smears are the most appropriate manner to examine the fine morphologic details of the haematopoietic cells. Several milliliters of marrow may be aspirated and cultured for bacteria, mycobacteria and fungi. Additional marrow may be embeded in paraffin (these histologic sections are routinely performed on clotted bone marrow) and stained with hematoxylin and eosin. Such paraffin sections facilitate the examination of much larger amount of marrow, but they lack the fine morphologic detail of Wright's and Giemsa stained smears. The needle biopsy of bone marrow makes it possible to obtain a core of bone and its enclosed marrow, which is routinely stained with hematoxylin and eosin. A bone marrow aspirate can be obtained through the biopsy needle before performing the marrow biopsy. Needle biopsy can be performed on an out patient basis.

It is generaly obtained from the posterior iliac crest; in experienced hand, complications are quite rare and the procedure has minimal morbidity. It has become the standard method for obtaining a specimen of bone marrow when marrow aspiration leads to a "dry tap", as in aplastic anemia, myelofibrosis and myelopthisic processes. (Ellman 1976).

Moreover, evaluation of bone marrow cellularity and abnormal architectural pattern, and detection of structures other than haematopoietic cells within the marrow are best achieved by bone marrow biopsy. (Grann et al 1966).

The biopsy technique in most instances is not a substitute for examining marrow by aspiration and smear, but it is a complimentary procedure which provides additional information. (Ellman 1976).

As regard its diagnostic value bone marrow biopsy has a significant value in identification, classification, staging of lymphoproliferative disorders, as well as in monitoring the course of disease and the response to therapy. (Bartel et al 1984).

Bone marrow biopsy may be done in any blood change raising the question of myelofibrosis, metastatic tumours, lymphoma or granulomatous diseases of the marrow, also it is and end point of aplasia (Wintrobe et al 1981).

The aim of this work is to evaluate the role of bone marrow biopsy as a complimentary process to bone marrow aspiration in the diagnosis and therapy of diffrent blood diseases.

# REVIEW OF LITERATURE

## (2) HYSTORICAL DEVELOPMENT OF TREPHINE BIOPSY

Open biopsies of bone by routine surgical procedures show great technical difficulties. This is more apparent when it concerns the larger and deeply located bones and those which contain abundant red marrow, like the pelvic bones and the vertebral bodies. To overcome these difficulties several attempts have been made to devise special instruments for performing trephine biopsy of bone. The first set of these instruments was recorded under the name of Barret & Patended in Great Britain on May 10, 1901. Later on many other similar instruments have been invinted (Ackermann 1963).

In 1903 Pianese punctured the epiphysis of femur by a trocar (Wintrobe et al 1981).

In 1908 the first biopsy of bone marrow was performed by Chedini, where trephining of the tibia had been done. Zadek (1922) and Peobody (1927) continued drilling into this heavily protected marrow. The tibial marrow was normally acellular and gave information only in hyperplastic condition as pernicious anemia. Trephining of the sternal bone marrow was introduced by Seyfarth in 1923. Then Custer and his co-workers began to compare the cellularity of the sternal bone marrow with that of the other bones. Later on, in 1929 puncture of the marrow with a hollow needle was

introduced by Arinkin and modified by other workers (Dameshek et al 1937).

In 1939, Fravorite described a special needle with a screw-like obturator which by rotation in the marrow retained particles within its thread. Later on, Turkel and Bethel (1943) described a trephine needle giving a bone dust. However, the specimen obtained was claimed to contain too frequent bone cortex without sufficient marrow for the diagnosis (Mcfarland et al 1958).

For obtaining undiluted bone marrow with ease a new sternal puncture needle was introduced by Reddy in 1952. Then a simple biopsy needle to obtain a sample large enough for histological examination was introduced by Sacker and Nordin in 1954. (Sacker et al 1954).

Untill the Vim - Silverman needle was introduced by Mackferland and Dameshek in 1958, routine surgical trephines was performed in all cases of dry tap. Since that time this needle was subjected to various modifications. Brody and Frinch (1959), reported their experience with Silverman needle biopsies in patient with inadequate aspiration or dry taps. They concluded that: "dry tap is the principal indication of needle biopsy." In 1960, Westerman et al described the specific diagnostic value of Silverman needle biopsies.Moreover, Pearson et al (1960) demonstrated the

adequancy of this biopsy technique in children (Ellis et al 1964).

In 1961, Conrad and Crosby described the usefulness of employing a modified Vim Silverman needle biopsy. While Marcel and his collegues (1961), described other modification of the Vim Silverman needle to adapt better biopsy.

The technique of the needle punched out biopsy has been applied for the study of the bone marrow, though it did not entirely replaced the surgical biopsy, yet it is a safe, simple and useful procedure

Later on the bone and marrow biopsy with saw toothed modification of the Vim - Silverman needle was introduced (Miller et al 1968).

Further development of bone marrow biopsy needle took place till Jamshidi overcame the major limitations of most marrow biopsy instruments by the introduction of a new device which gave a bone marrow biopsy with unaltered architecture (Jamshidi et al 1971). This needle was met with considerable approval, but certain problems became apparent with its use leading to its modification (Inwood 1975). More recently, Islam in 1982, introduced a bone marrow biopsy needle with core securing device, which ensure an adequate specimen in each attempt.

Although approachs to the vertebral bodies by surgical exposure and needle biopsy have been known for many years, yet its use was limited. This is due to : 1) the hazard of injury to the surrounding structure. 2) the possibility of deep bleeding which is difficult to control. 3) the inadequate amounts of material obtained for study.

In 1928, Duncan and Ferguson reported a case in which Von Lackum used a transpedicle approach to curette a giant cell tumour in the body of the fourth lumbar vertebrae. In 1932, Oompere reported an approach for excision of hemivertebrae. Then in 1935, Robertson and Ball reported a method of needle biopsy that had been used since 1932. In 1948, Valls and Ottolenghi presented a device for making an accurate needle approach to the vertebral bodies. They also described techniques for making approaches at all spinal levels but not above the ninth thoraxic vertebra because of the possibility of injury to the azygos and hemiazygos systems. Michele and Krueger (1949), described a new technique for obtaining biopsy material, and illustrated the proper method for its use.

Then Siffert and Arkin (1949) applied a new invented instruments to biopsy the lumber vertebral bodies, but they failed to describe the details of the results they obtained. Ackermann (1954), anounced the sucess of the first vertebral biopsy with no subsequent complications. Trephine

biopsies have been applied to nearly all bones of the human body except for the upper cervical spines, which are not anatomically accessible to such procedures (Ackermann 1963).

Craig (1956), designed a new set of instruments to obtain more sucessful result in taking biopsies of sclerotic or softened bones, in discs or fibrous tissues.

## (3) ANATOMY AND VASCULATURE OF BONE MARROW

ATOMY OF BONE MARROW:

The bone marrow is a soft tissue, as it contains ood, heamatopoietic cells, and fat. It provides the croenviroment in which the stem cell can proliferate d diffrentiate into heamatopoietic cell. Erythrocytes, anulocytes and monocytes are released from marrow as st mitotic cells, and complete their maturation in the sculature and tissues. Lymphocytes develop in the rrow and complete their development in the thymus and ripheral lymphatic organs. Megakaryocytes & polyploid lls remain in the marrow and release cytoplasmic fragments the circulation. The red colour of active marrow is due to ythropoiesis, it is distributed throughout the bones of the ial skeleton. Fat cells give some areas of marrow the ellow colour. In human by the age of 18 years all the marrow f the limbs become yellow.

White marrow may occur due to extreme atrophy or arvation. In excessive destruction of blood cells, the vel of haematopoiesis is increased two to eight times that normal. For development of each cell specific chemical viroment and helper cells must be present and changed according the body needs. The marrow delivered these cells to the sculature at the appropriate points of their development.

It maintains a stable pool of pluripotent stem cells has a reserve of reticulocytes and granulocytes which