STUDY OF TECHNETIUM SCINTIGRAPHY IN DIAGNOSIS OF TESTICULAR DISEASES

Thesis
Submitted for partial fulfillment of the M.D. Degree
in General Surgery

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1993

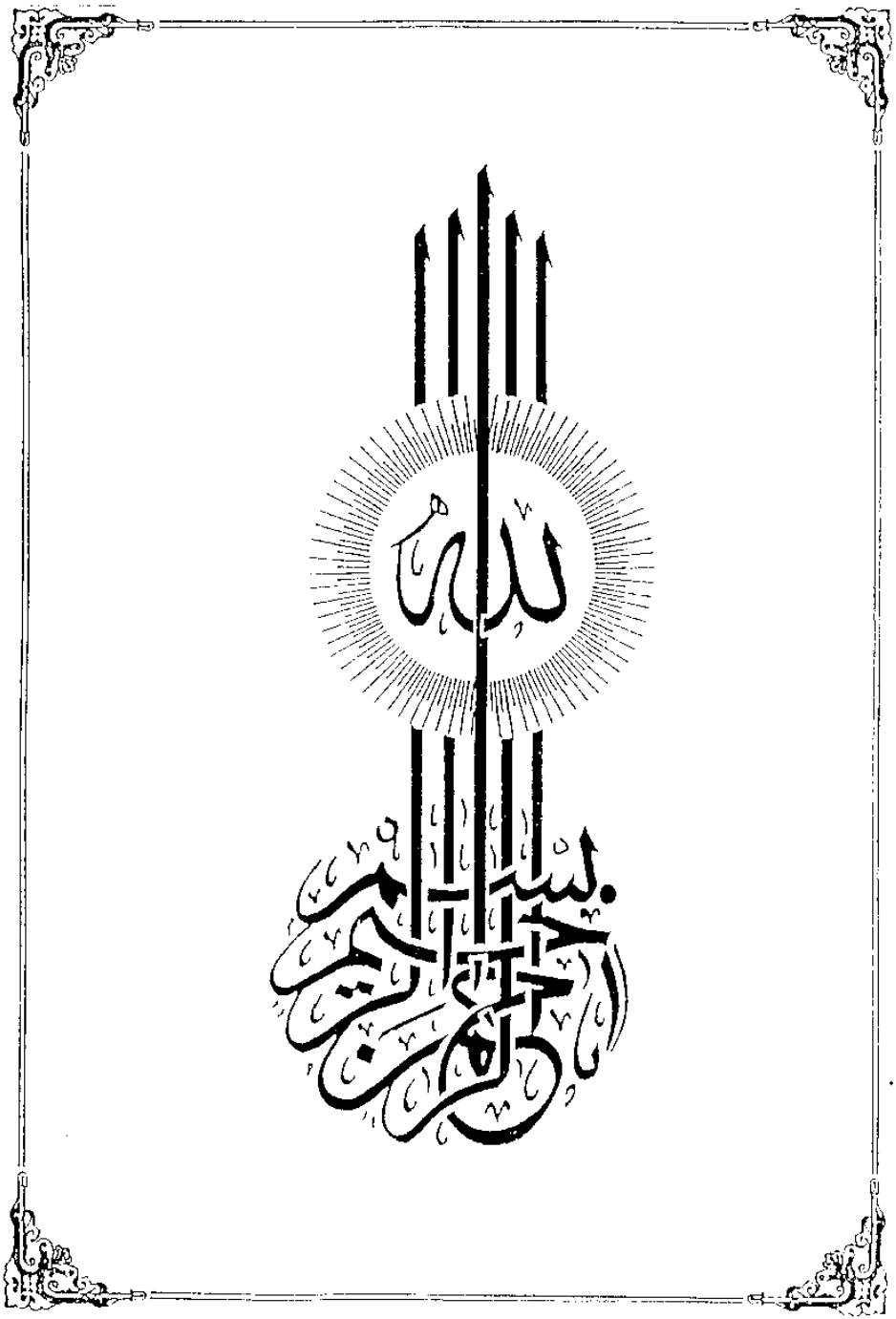
ACKNOWLEDGMENT

I would like to express may deep appreciation and thanks to **Professor Dr. Ahmed Tawfik Zaki Souidan**, professor of general surgery for valuable advices and continuous guidance throughout the fulfilment of this thesis.

Special grateful thanks and appreciation to **Professor Dr. Elzarief Abdel nabi Ali**, professor of general surgery for the help he provided me and for kind support and instructive guidance.

I would also wish to express my deepest gratitude to **Professor Dr. Laila Faris**, professor of Radiotherapy and Nuclear Medicine for time,effort and advice during the production of this thesis.

Finally, I would like to thank all staff members in unit six, General Surgery Ain Shams University for their cooperation and help.



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LIST OF ABBREVIATIONS

- Adenosine Triphosphate	ATP
- Alpha Fetoprotein	AFP
- Computed Tomography	CT
- Cyclic-Adenosine monophosphate	c-AMP
- Dihydrotestosterone	DHT
- Follicle Stimulating Hormone	FSH
- Human chorionic gonadotrophins	HCG
- Human Placental Lactogen	HPL
- Interstitial cell stimulating hormone	ICSH
- Lactic Dehydrogenase	LDH.
- Luteinizing Hormone	LH.
- Luteinizing Hormone Releasing Hormone	LH-RH.
- Müllerian inhibiting substance	MIS.
- Neuron specific enolase	NSE.

Introduction & Aim of the Work

INTRODUCTION AND AIM OF THE WORK

The clinical evaluation of patients with acute scrotal pain is often difficult because of the non-specific nature of symptoms and difficulty in adequately examining the tender, swollen scrotum. Although epididymoorchitis is the most frequent cause of acute scrotal pain, the most important diagnosis to establish is testicular torsion, since this requires emergency surgical correction to preserve testicular viability and function. Therefore, assessment of the perfusion of the testis is the primary requirement for any imaging modality used in this clinical situation *(Middleton, et al., 1990).*

Testicular scintigraphy using technetium-99 m pertechnetate was introduced in 1973 as an imaging modality for the diagnosis of testicular torsion (*Nadel, et al., 1973).* Since, then it has become an important tool in the evaluation of acute and chronic testicular pain and swelling. The preoperative accuracy of clinical evaluation is in the range of 50 percent *(Riley, et al., 1976).* Scrotal perfusion scintigraphy is based on the rationale that compromising the blood supply to a particular site will delay or prevent delivery of blood borne radionuclide. The perfusion and tissue uptake are decreased in the case of testicular torsion, while inflammatory lesions show increased activity because of hyperemic reaction. The actual purpose of the scintigraphy is to confirm the absence of torsion. A confident clinical diagnosis of torsion is an indication for immediate surgery. When the clinical diagnosis is doubtful, the scintigraphy should be performed to confirm the diagnosis. Since the scintigraphy requires only minutes, its performance does not increase the chances of

testicular compromise if acute torsion is present *(Lutzker, 1985).* This technique obviates surgical exploration in cases of epididymoorchitis and direct surgical interference in cases of testicular torsion (*Hankins, 1979).*

In cases of scrotal trauma, scintigraphy may demonstrate traumatic epididymoorchitis with increased blood flow and tissue perfusion, or detect hematoma with a cold defect on the side of injury. Also testicular abscess appears as a central area of decreased activity surrounded by hyperemic rim.

Testicular imaging has been described to diagnose testicular tumors where perfusion is slightly increased (less than that seen with epididymoorchitis), and in cases of seminoma, demonstrate a moderate increase in activity throughout the testicle, whereas teratoma may exhibit areas of both increased and decreased activity (*walker and Margouleff, 1984).* On the other hand, avascular lesions as hydrocele or spermatocele are demonstrated as areas of decreased or absent activity in region corresponding to the lesion.

Lastly , testicular scintigraphy is used to detect the location of undescended testis , and also demonstrate grave structural changes in the testis as atrophy or lack of functional parenchyma of the testis (*Sultanov et al., 1991).*

Review of Literature

HISTORICAL REVIEW

Testicular torsion, the first reported case was in 1840 (*Abeshouse, 1936). O'Conor (1933)* observed that torsion of the spermatic cord is not a rare clinical entity and that the many cases of atrophy of the testis following orchitis may in fact be the end result of torsion. *Ormond (1931)* described the pathologic changes; the first effect in early rotation was the flattening of veins with partial obstruction of venous return. As the twisting continues, successive obliteration of the veins, partial obstruction of the artery, and finally obliteration of the artery occur. *Ottenheimer (1933),* emphasized the necessity of scrotal exploration and testicular fixation, opening the parietal tunica vaginalis, everting it, and suturing the cut edges behind the epididymis as in bottle hydrocelectomy.

Most early series dealing with spermatic cord torsion clearly demonstrated a marked delay in referral and diagnosis and a concomitant high orchiectomy rate necessitated by the frequent finding of testis infarction, estimated overall as high as 90% in the literature before 1966.

When fixation of the opposite side is not done, metachronous torsion of the contralateral testicle occurs in 5% to 10% of the cases (*Abeshouse, 1936).* The strongest argument for contralateral orchiopexy was made by *Campbell (1938),* who reported two college boys rendered infertile through torsion of the contralateral testicle. Simultaneous exploration of the opposite scrotum should be carried out, with excision of any redundant parietal tunica vaginalis and attachment to the scrotum with at least two non absorbable sutures (*O'Conor, 1933).*

If torsion occurs in an undescended testis after puberty, orchiectomy should be done. Attempting to salvage intraabdominal testis is likely to be futile and that there is little hope for effective spermatogenesis; since there is also a higher incidence of malignant degeneration, orchiectomy should be the procedure of choice. Torsion of an undescended testicle after 3 years of age is best treated by orchiectomy, if the opposite testis is normal *(Cooper, 1929).*

Undescended Testis, The first orchiopexy was performed in 1820 (*Rosenmerkel, 1820),* but because of the initial poor results, the procedure was not accepted until the turn of the century when Bevan described his technique for a successful orchiopexy (*Bevan, 1899).* Since then Bevan's principles for a successful orchiopexy included:

1- Mobilization of the testis.

2- Sufficient dissection to obtain adequate length of the spermatic vessels to allow placement of the testis into the scrotum.

3- Retention of the testis in the scrotum.

4- Repair of an associated hernia.

Various operations for undescended testis have been described later since the turn of the century. The *Torek (1931)* procedure was used commonly in the earlier part of the century and involved fixation of the testis and the scrotum into the medial aspect of the thigh. A second operation was then required to free the testis from the thigh. Many surgeons including *Gross and Jewett (1956)* have stated that this procedure should be abandoned because of possible injury to the blood supply of the testis and the necessity for a second procedure. So Torek procedure is no longer performed.

Ombrédanne described a transseptal fixation of the testis as early as 1910. *Pryn (1972)* modified Ombrédanne's transseptal fixation by using Dartos pouch.

In cases of bilateral nonpalpable undescended testes, both retroperitoneal and intraperitoneal dissections has been described by *Flinn and King (1971)*. If the testis appears to be quite high and unlikely to reach the scrotum easily, *Fowler-Stephens (1959)* described high ligation and division of the spermatic vessels to obtain greater length. The testicular blood supply then resides on the vessels of the vas deferens by leaving a portion of the peritoneum on the spermatic vessels that help to preserve any collateral blood supply to the testis. *Silber and Kelly (1976)* have recommended a microvascular anastomosis of the spermatic vessels to the epigastric vessels to achieve successful placement of the intraabdominal testis into the scrotum.

In the medical treatment of undescended testis, the use of Human chorionic gonadotrophin (HCG) was predicted on the concept that some hormonal defect involving the hypothalamic pituitary testicular axis occured during gestation. The greatest success with HCG occurs in those testes that are located high in the scrotum or at the external inguinal ring. An added benefit of HCG therapy is that it increases the vascularity of the testis, lengthens the testicular artery, increases the size of the vas, and facilitates surgical repair should it be necessary. *Bartsch and Frick (1974)* advocated the use of Luteinzing hormone-releasing hormone (LH - RH) as it will stimulate the patient's own gonadotropins rather than relying on HCG.

Testicular tumor, the original treatment for testicular tumors was simple castration. Radical inguinal orchiectomy has been the primary diagnostic and therapeutic choice for testicular neoplasm for the last 90 years, having been formally established at the turn of the century by the work of *Stinson (1897).* The rationale for the use of radical orchiectomy as opposed to transscrotal orchiectomy includes the early control of the venous and lymphatic portals, the removal of the surrounding paratesticular fascial layers and a distinctly lower incidence of scrotal and inguinal recurrences. (*Markland, 1977).*

Tanner (1922) found a 5.5 % - 4 year survival. Attempts were made to improve survival by surgical removal of the draining lymphatics and regional lymph nodes. Later, retroperitoneal lymph node dissection was performed either simultaneously or shortly after simple orchiectomy. *Hinman in 1933* reported a 20 % 5 year survival. However, the routine use of retroperitoneal lymph node dissection for seminoma was abandoned in 1959 after *Patton and Mallis,* demonstrated no survival advantage to patients treated with radical surgery and postoperative radiation therapy in comparison to inguinal orchiectomy and postoperative radiotherapy alone (*Patton and Mallis, 1959). In 1925, Coley,* advocated intramuscular administration of mixed toxins form streptococcus pyogenes and serratia marcescens following orchiectomy until febrile response was obtained. He also advocated heavy radium and X ray treatment to the abdomen and supraclavicular regions in conjunction with the use of these toxins *(Coley, 1925).* This practice was not used and was abandoned in the 1940s.

The first standardised treatment programs for seminoma were adopted in the late 1940's following reports of large series of service personnel treated during world war II. *(Friedman and Moore, 1946).*

In 1951, Boden and Gibb defined the value of staging for prognosis. They divided patients into three groups; Group A, with no demonstrable metastases, Group B, with intraabdominal metastases only and Group C, with extraabdominal metastases. Since 1951 several staging systems have been proposed to better correlate clinical stage at presentation with outcome. *Moss, in 1969,* proposed a staging system that separated patients with extra-abdominal metastases into 2 stages; stage III included those with metastases confined to mediastinal or supraclavicular lymph nodes; while stage IV defined those with disease evident beyond the mediastinal or supraclavicular lymph nodes. *In 1975 Doornbos, Hussey and Johnson* were the first to divide stage II patients into two groups. A, and B, based on the size of retroperitoneal metastases.

Technological advances, both diagnostic and therapeutic, have dramatically changed the approach and outcome of patients with testicular tumors from a once ultimately lethal disease to one now that is usually curable. With the advent of potentially curative chemotherapy, patients, following inguinal orchiectomy, can now be selected to receive either radiotherapy or chemotherapy based on tumor markers, volume of nodal disease and stage *(Graham and Bagshaw, 1983).*