MICROSURGICAL TECHNIQUES AND OPTICAL MAGNIFICATION

THESIS

Submitted In Partial Fulfillment Of
The Master Degree
UROLOGY

By

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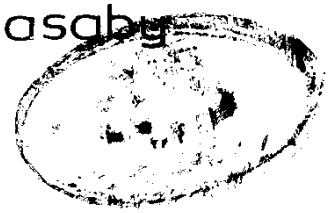
M.B., B.Ch.



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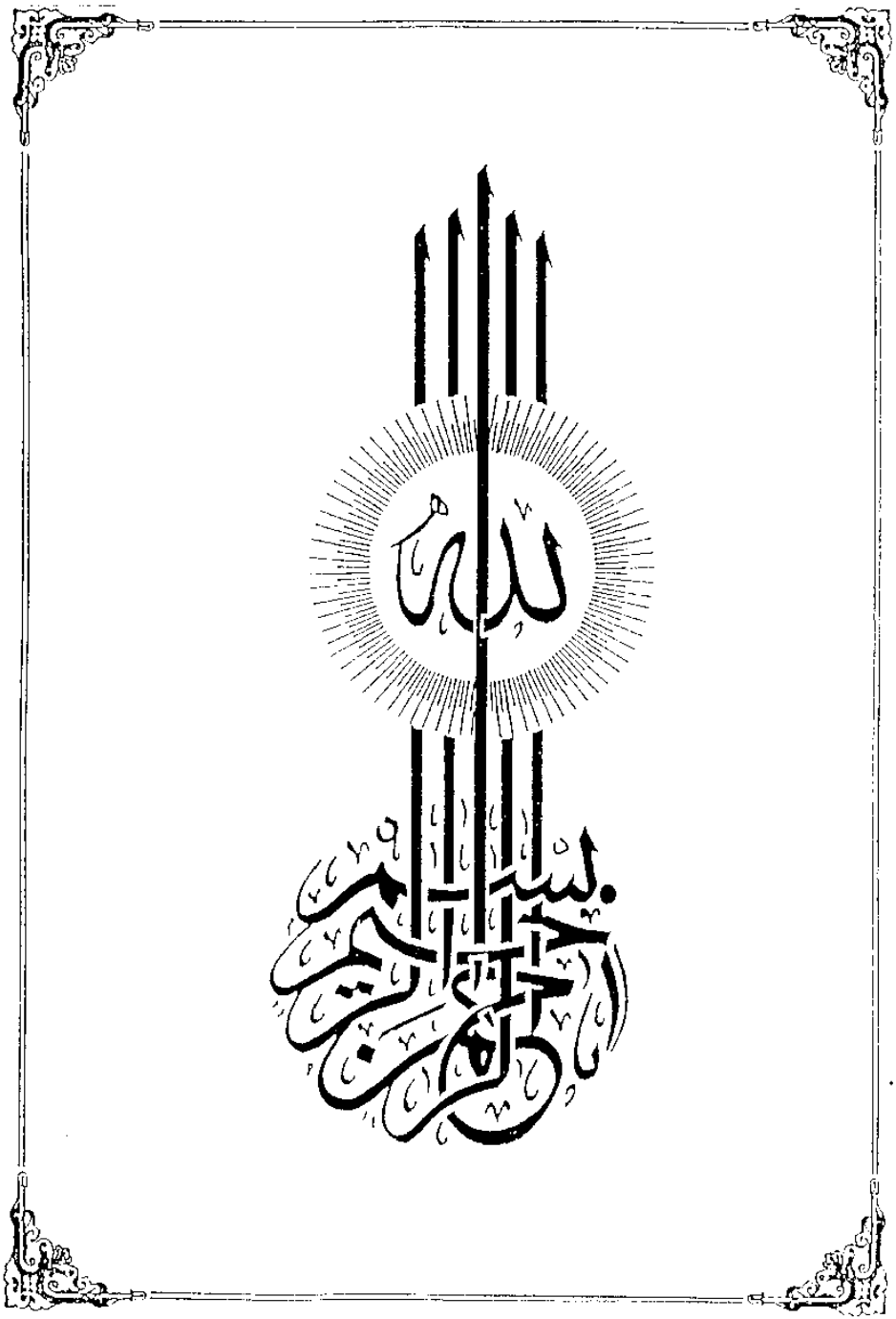
بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنـــا الا ما علمتنـــا
انك أنت العليـــم الحكيم

IN THE NAME OF ALLAH, THE
BENEFICENT, THE MERCIFUL

They said : ' Be glorified, we have no knowledge except that which you have tought us. Indeed you are the knower, the wise'.



TO MY PARENTS

A C K N O W L E D G E M E N T

" First and Foremost, thanks are due to God "

I would like to express my sincer gratitude to Prof. Dr. ABD EL WAHAB EL-KASABY , Ass. Prof. of Urology , Ain Shams University, to whome the choice of this work was attributed, and to express my thank fullness for his co-operation, association , personal concern, unlimited help, and kind care through out the whole work .

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I N T R O D U C T I O N

The use of microscopic surgery in the field of urology is recent and experience is limited, it is already playing an important role in operations on the genitourinary tract .

The essential components of microsurgery are optical magnification, illumination, microsurgical instruments, and precise atraumatic surgical technique .

This thesis presents a review of the indication of microsurgery in urogenital procedures . Extracorporeal microsurgery, or bench surgery has been used for correcting disorders of the intrarenal excretory tract, for removing kidney tumours, for preserving the traumatized kidney, and for transplantation of kidneys with vascular irregularities . Microsurgical techniques are very helpful in various operations on the urinary tract, including ureterotomy, pyeloureteral anastomosis, ureteroureteral anastomosis, and reestablishing urinary continuity of transplanted kidneys . Microscopic surgery has made substantial contributions to advances in treatment of disorders of the genital

apparatus, such as infertility, chordee, plastic induration of the cavernous bodies, impotence, ectopic testes, and correction of hypospadias .

An appreciation of these techniques will encourage the future development of innovative surgical approaches to urologic problems .

BASIC MICROSURGICAL TECHNIQUES, PRINCIPLES AND EQUIPMENTS

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The application of microsurgical techniques to the clinical practice of urology can be equally rewarding . Much of urologic surgery involve the reconstruction of small tubes (urethra ureter, vas deferens , and renal artery) to improve their ability to serve as conduits . These tubular structures may vary in size from 0.3 to 5 mm in diameter . Although the technical specifies may vary with the task, the general goals to be sought in repairing tubular structures are a non-constricting anastomosis, minimal tissue trauma, and sufficient approximation to avoid leakage of the tube's contents, i.e., no fistula . These goals can be accomplished if the surgeon has excellent visualization of the operative field, so that suture placement is accurate and tissues delicately handeled .

When the tubes, being reconstructed are less than 5 mm in diameter, visualization is tremendously facilitated by using some form of optical magnification which include : surgical loupes and the operating microscope combined with increased illumination of the operative field . Magnification of the operative site not only

allows for more accurate placement of sutures, but also encourages the use of small suture material and instruments, thereby minimizing operative trauma . Magnification also allows the surgeon to evaluate critically the results of his work at a time when technical deficiencies may be corrected .

Even an already accomplished surgeon will find that an application of microsurgical techniques, this article to operations such as pyeloplasty, uretero-ureterostomy urethroplasty, vasova ostomy, etc will allow improvement an what is already believed to be a satisfactory repair and reduce the number of technical failure , (Banowsky, 1982) .

Optical Magnification :

The limiting factor in any activity requiring precise hand to eye coordination is the eye . When properly guided by the eye, the hand has an almost unlimited capacity for minute, controlled movements . Optical magnification of the operative field not only assists the delicate coordination between hand and eye but also allows the use of appropriately small instruments and suture material so that vessels and delicate structures may be handled and joined in an a traumatic way (Banowsky, 1979) .

As magnification increases, the field of vinion decreases, the depth of focus becomes more shallow, and a greater intensity of light is needed for adequate illumination as a source of light that provide adequate illumination at 1.25 X may be completely inadequate at 10 X and nullify any advantage offered by the magnification (Banowsky, 1982) .

Magnification may be accomplished with either surgical loupes or an operating microscope . In cho s-ing any form of them over the other depending upon the size of the vessels or minute structure, the anticipated duration of the operation, and wether the procedure is being done in situ or extracorporeally (Novick,1984).

A. **Surgical Loupes** : (Fig. 1 & 2)

These loupes are avilable with different focal lengths provide a wide range of magnification (1.5 X to 10 X), and interpupillary distances specific for the owner . Use of an additional light source, e.g. a surgical headlight, significantly enhances the effectiveness of the loupes . Such head lights are composed of fibrooptic system, are extremely light, and allow the illumination spot to be adjusted while remaining coaxial with the surgeon's line of vision . The use of

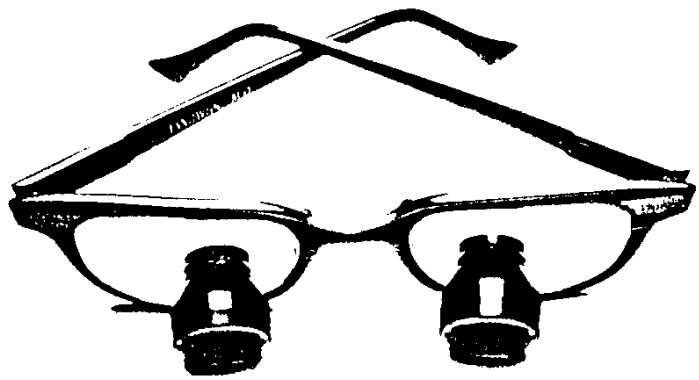

Fig. (1) : A pair of 3.5 x surgical loupes .
(Banowksy, 1982) .

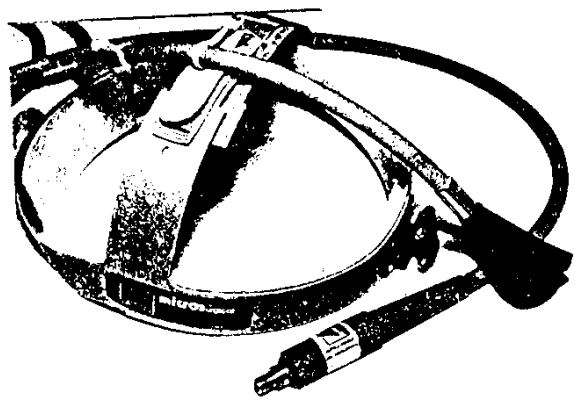

Fig. (2) : Fiber-optic head lamp enhances use of surgical loupes (Banowsky, 1984) .

a 6.0 X loupes together with a head light can be worn comfortably for 2 to 3 hours and provide ample magnification for the majority of branch renal artery repairs (Novick, 1984) .

Magnification (2.0 X to 6.5 X) is the most common Lower levels of magnification i.e, less than 2.0 X are usually inadequate . Higher levels of magnification (6.5 X) can be troublesome and awakward to use because of constriction of the field of vision and shallow depth of focus . The surgeon's head must be kept perfectly still or the operative field changes or goes out of focus (Banowsky, 1982) .

For most urologic operations in which magnification is needed, loupes of 2.5 X to 3.5 X provide an effective combination of magnification field size and depth of focus . Surgical loupes have many advantages over an operating microscope . They are less expensive to purchase and initially they are easier to use . Surgical loupes are also less cumbersome in the operative field and are less conductive to breaches in sterile technique . They do, however, have significant limitations surgical loupes usually lack variable magnification and require an independent light source . Focus is achieved, maintained or lost by movement of