Anaesthetic Considerations in Laparoscopic Surgery

Essay Submitted for the Partial Fulfillment of the Master Degree in Anaesthesiology and I.C.U.

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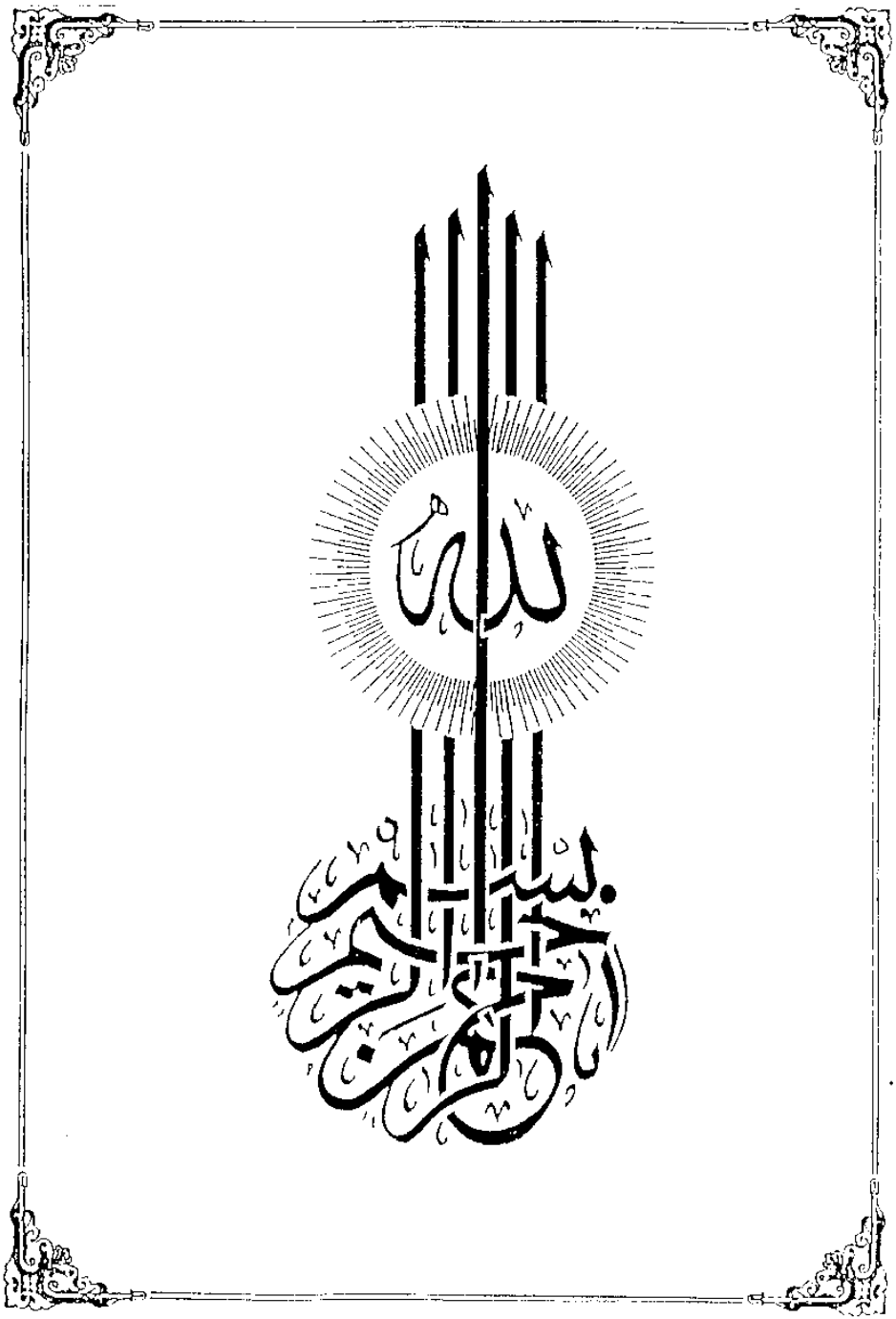
بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم



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Sherif Farouk

To My Family

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Introduction

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The importance of performing an internal examination of the many compartments of the body has been recognized for several centuries. The Arabian physician ***Aboul-Kassim (936-1013)*** is often credited with being the first to use reflected light to inspect an internal organ; the cervix ***(Filipi et al., 1991).***

Laparoscopy has long been a standard form of treatment for gynaecological diseases but has only recently shown promise in the treatment of general surgical disorders such as cholelithiasis and appendicitis ***(Reddick and Olsen, 1990).***

If conducted safely, laparoscopic surgery minimizes the tissue trauma required to gain exposure and access to the surgical site. Wound size and postoperative pain are reduced, hospital stay is shortened and patients can return to normal activities earlier. ***(Wastell, 1991).***

Origin of Laparoscopy

Credit for the origin of laparoscopy is usually given to ***George Kelling*** who was the first to examine the abdominal cavity with an endoscope. This milestone reported in 1901, was performed in a live dog using a Nitze cystoscope ***(Thomas A. Stellato, 1992).***

Dimitri Ott in 1901, described ventroscopy by which he inspected the abdominal cavity of a pregnant woman with the help of a head mirror and a speculum introduced into a culdoscopic opening ***(Hulka, 1994).***

Jacobaeus in 1910 suggested in a brief report the possibility of examining body cavities endoscopically, a month later Kelling rapidly reported his performance of peritoneoscopy on two patients ***(Thomas A Stellato, 1992).***

Bertram M. Bernheim in 1911, first used laparoscopy in the United States, using a half inch diameter proctoscope and ordinary light for illumination ***(Hulka, 1994).***

In 1925, a carefully written summary and experimental study was reported by ***Nadeau and Kampmeier.*** The authors give a detailed historical summary of laparoscopy. In addition, they critique the instruments available and also report on an experiment they performed in dogs to study the absorption of air in pneumoperitoneum ***(Thomas A. Stellato, 1992).***

A land mark paper was published in 1937 by ***John C. Ruddock. Ruddock*** titled his report "peritoneoscopy" and detailed a personal experience of 500 cases ***(Hulka, 1994).***

In 1938, the spring-loaded needle developed by Janos Veress remains almost unchanged to the present day which is the most commonly used device for creating pneumoperitoneum for laparoscopy *(Thomas A. Stellato, 1992).*

In 1941. two gynaecologists, ***Frank H. Power and Allen C. Barnes*** reported performing tubal sterilization by electro- coagulating the cornual portion of the tube *(Hulka, 1994).*

The introduction of an endoscope through the abdominal wall was initially associated with a number of major and minor complications. The risk of injury to the underlying bowel and vascular structures has always been a major concern. In 1946 ***Daker*** introduced an alternative method. He inserted the scope into the pelvis through the cul-de-sac and named the procedure culdoscopy, the patient was placed in a knee chest position and given a local anaesthetic only.

Raoul Plammer in 1944 advocated placing patients in the Trendelenburg position to bring the air into the pelvic cavity and stressed the importance of monitoring the intra-abdominal pressure so that it does not exceed 25 mmHg *(Davis, 1991).*

In 1960, ***Patrick Steptoe*** described for the first time the complete instrumentation and techniques for gynaecologic laparoscopy ***(Hulka, 1994).***

Professor ***Semm*** devised a number of laparoscopic surgical procedures to replace conventional open operations such as direct microsurgical suturing that allowed laparoscopic management of ectopic pregnancies often with preservation of the affected tube and tubal sterilization by endocoagulation ***(Filipi et al., 1991).***

The first laparoscopic procedure performed by general surgeons appears to have been liver biopsy guided under direct vision. ***Semm in 1983*** performed the first appendicectomy through a laparoscope ***(Filipi et al., 1991).***

Video imaging, improved instrumentation and the growing recognition of the potential of laparoscopy for diagnostic and staging procedure made therapeutic laparoscopy for gastrointestinal disease a reality by the end of the 1980's ***(Warshaw et al., 1986).*** The first laparoscopic cholecystectomy was described in 1989 by ***Reddick and Olsen (Pierre et al., 1994).***

Surgical Requirements

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The technology of endoscopic video equipment is moving forward quickly. Equipments fall into two broad categories, those major pieces of equipment that enable the surgeon to perform laparoscopy and those instruments related to the performance of specific procedures *(Talamini and Gadaez, 1991).*

In laparoscopic surgery, the surgical site is accessed by trocars and cannulae inserted through puncture wounds in the anterior abdominal wall. An endovideo camera attached to the primary cannula displays the surgical site on video monitors, allowing viewing for the surgeon and assistants. Complex two handed surgical dissection and manipulation is performed under vision with instruments inserted through the accessory cannula. Specially designed laparoscopic instruments and facilities such as electrocautery and laser are increasingly available to facilitate dissection and haemostasis *(Hunter, 1991).*

Figure (1) shows a convenient arrangement of equipment and the operating room team for gynaecological procedures.

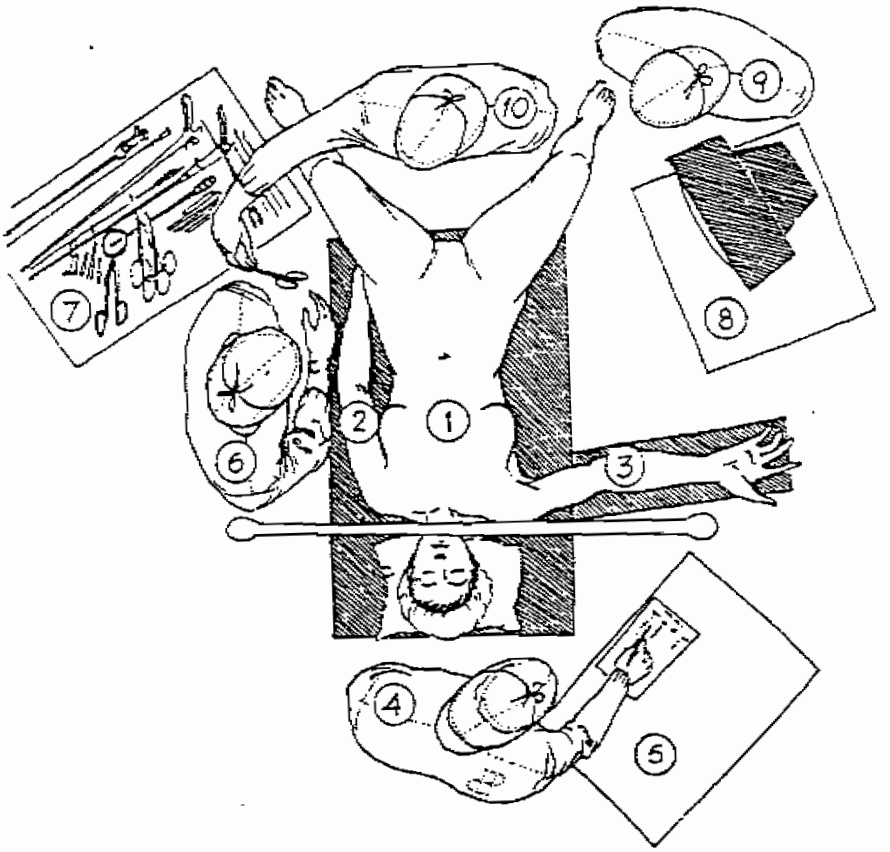

Figure (1): Shows a convinient arrangement of equipment and the operating room team. The patient (1) has her left arm (2) at her side to make room for the surgeon. Her right arm (3) has an intravenous line for the anaesthesiologist (4) with monitoring equipment (5). The surgeon (6) is on the patient's left side, with sterile equipment (7) behind or beside. Non sterile "utilities" (8) are visible across the patient. The non sterile circulating assistant (9) manages the utilities; the sterile assistant (10) stands at the foot of the operating table to manipulate the uterus and to hand the surgeon instruments from the table

(Hulka , 1994).

During surgery, the patient is positioned so as to produce gravitational displacement of the abdominal viscera away from the surgical site. In laparoscopic procedures, this is accomplished by filling the peritoneal cavity with a gas that distends the abdominal wall and provides an area for light and manipulation, a process termed pneumoperitoneum. Many gases have been used for establishing pneumoperitoneum including room air, nitrous oxide, oxygen and carbon dioxide. Air and oxygen create a higher risk in terms of air embolism. In addition, they support combustion.

Carbon dioxide is the standard gas used for pneumoperitoneum. It suppresses combustion and appears to be relatively innocuous to the tissue of the peritoneum. It is readily excreted via the lungs and if accidently injected directly into blood vessels resulting in carbon dioxide embolism, this is more easily treated than air or nitrous oxide embolism. Not only it is the safest gaseous medium currently in use but it is also readily available, inexpensive and easy to use ***(Cuschieri and Berci, 1990).***

Carbon dioxide has high blood solubility which reduces the duration of postoperative abdominal discomfort caused by residual pneumoperitoneum and minimizes the adverse effects of gas introduced extraperitoneally ***(Heddle and Platt, 1992).***

The disadvantages of carbon dioxide include peritoneal irritation and hypercarbia from systemic gas absorption ***(Sharp et al., 1982).***