Regional Anesthesia for Laparoscopic Surgery

Essay

Submitted for fulfillment of Master Degree in Anesthesia

By

Usama Mahmoud Sayed Ali

M.B.B.CH

Supervised by

Prof. Dr. Hanem Abdel-Fattah Abdel-Sattar

Professor of Anaesthesia
Faculty of Medicine **– Cairo University**

Prof. Dr. Ashgan Raouf Ali

Professor of Anaesthesia
Faculty of Medicine **– Cairo University**

Dr. Nazmy Edward Seif

Lecturer of Anaesthesia
Faculty of Medicine **– Cairo University**

Faculty of Medicine
Cairo University
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Abstract

Regional anesthesia including (Peripheral nerve blocks and neuraxial block) is considered as safe alternative to general anesthesia for outpatient laparoscopy without associated respiratory depression. Local anesthesia infiltration has shown to be effective and safe in microlaparoscopy for limited and precise gynecologic procedures. However, intravenous sedation is sometimes required.

With the realization of smaller incisions, better cosmesis, less postoperative pain, same-day surgery, speedier postoperative recovery, and the potential for reduced complications, laparoscopic approaches have all but replaced the traditional laparotomic alternatives for certain commonly performed surgical procedures

Key word

Laparoscopic Surgery

Anatomical considerations

Combined spinal-epidural

End-tidal CO2

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List of Abbreviations

LA	Local anasthetic
ASU	Ambulatory surgical unit
ASA	American Society of Anesthesiologists
CO	Cardiac out put
CO2	Carbon dioxide
COPD	Chronic obstructive pulmonary disease
CSE	Combined spinal-epidural
CSF	Cerebral spinal fluid
CT	Computed tomography
CVP	Central venous pressure
DL	Diagnostic laparoscopy
DVT	Deep venous thrombosis
ETCO2	End-tidal CO2
FEV1	Forced expiratory volume in the 1st second
FiO 2	Fraction of inspired oxygen
FRC	Functional residual capacity
FVC	Forced vital capacity
GA	General anaesthesia
GERD	Gastroesophageal reflux disease
HR	Heart rate
IAP	Intra-abdominal pressure
ICP	Intracranial pressure
IJV	Internal jugular vein
LA	Local anasthetic
LC	Laparoscopic cholecystectomy
MAP	Mean arterial pressure
MRI	Magnetic resonance imaging
NIBP	Noninvasive blood pressure
NSAIDs	Nonsteroidal anti-inflammatory drugs
OSA	Obstructive sleep apnea
PACU	PostanAesthesia care unit
PaCO2	Tension of carbon dioxide in arterial blood
PAP	Pulmonary artery pressure
PDPH	Post dural puncture headache
PE	Pulmonary embolism

PECO2	Tension of carbon dioxide in expired air
PEEP	Peak end-expiratory pressure
pka	Acid dissociation constant
PnP	Pneumoperitoneum
PONV	Postoperative nausea and vomiting
PP	Pneumoperitoneum
PvC02	Mixed venous blood PCO2
RSB	Rectus sheath block
SBP	Systolic blood pressure
SSA	Selective spinal anesthesia
SV	Stroke volume
SVR	Systemic venous return
TAPB	Transversus abdominis plane block
TRI	Transient radical irritation
US	Ultrasound
V/Q	Ventilation-perfusion
VR	Venous return

Introduction

Laparoscopy (also known as minimally invasive surgery or videoscopic surgery) has allowed surgeons to perform the same procedures as in traditional open surgery, using small incisions (keyhole surgery) instead of large abdominal incisions. Studies have shown major benefits to the patient in terms of reduced post operative pain, increased post operative comfort, and reduced hospital stay, quicker return to normal physical activities and ultimately a quicker return to work. Improved cosmoses and reduced wound complications associated with large scars are also major advantages associated with this technique.[1]

Regional anesthesia offers several advantages: quicker recovery decreased postoperative nausea and vomiting (PONV), less postoperative pain, shorter postoperative stay, cost effectiveness, improved patient satisfaction, and overall safety, and early diagnosis of complications. Sequelae of general anesthesia such as sore throat, muscle pain, and airway trauma can be avoided.[2]

However, this anesthetic approach requires a relaxed and cooperative patient, low intra abdominal pressure to reduce pain and ventilatory disturbances, reduced tilt, a precise and gentle surgical technique, and a supportive operating room staff. Any compromise may result in increased patient anxiety, pain, and discomfort, necessitating supplementation with intravenous sedation. The combined effect of pneumoperitoneum and sedation can lead to hypoventilation and arterial oxygen desaturation.[3]

A variety of laparoscopic surgeries can be done under regional anesthesia include intra-abdominal surgeries (as cholecystectomy, spleenectomy, removal of adrenal gland, appendectomy, colectomy & inguinal hernia repair) and gynecologic surgeries (ectopic pregnancy, hysterectomy, ovarian & Fallopian tubes surgeries).[4]

New techniques and updates have evolved in this topic such as ultrasound-guided transversus abdominus plane block or segmental spinal anesthesia for laparoscopic cholecystectomy and inguinal block for laparoscopic hernia repair.[5]

Aim of the work

The aim of this work is to shed light on the benefits of regional anesthesia in laparoscopic surgeries compared with general anesthesia and the new technique updated that can be performed.

ANATOMICAL CONSIDERATIONS

1) The vertebral column:

The spine is one of the most important parts of our body. The 3 main functions of the spine are:

- Protect the spinal cord, nerve roots and several of the body's internal organs.
- Provide structural support and balance to maintain an upright posture.
- Enable flexible motion.[6]

The spine is divided into 4 main regions; cervical, thoracic, lumbar and sacral. Each region has specific characteristics and functions.[7]

Spinal curves:

The normal spine has S like curve when looking at it from the sagittal plane. This allows for an even distribution of weight. The cervical and the lumbar spines curve slightly inward, the thoracic and the sacral spines curve outward. Even though the lower portion of the spine holds most of the body's weight, each segment relies upon the strength of the others to function properly (Figure 1).[8]

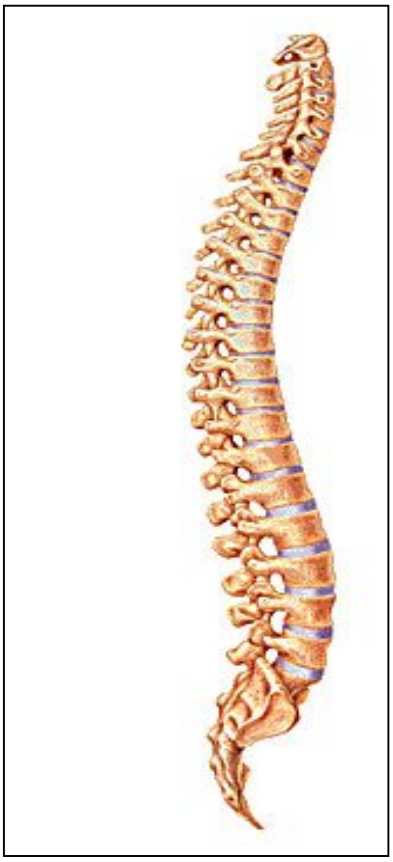

Figure (1): Curvatures of the vertebral column.[8]

The thoracic convexity (kyphosis) and the lumbar concavity (lordosis) are of major importance to the distribution of local anaesthetic (LA) solution in the subarachnoid space.[9]

Vertebral structures:

The individual bones of the spine are the vertebrae. These are the building blocks of the vertebral column. Each vertebra is composed of a body anteriorly and a neural arch posteriorly (figure 2).[10]

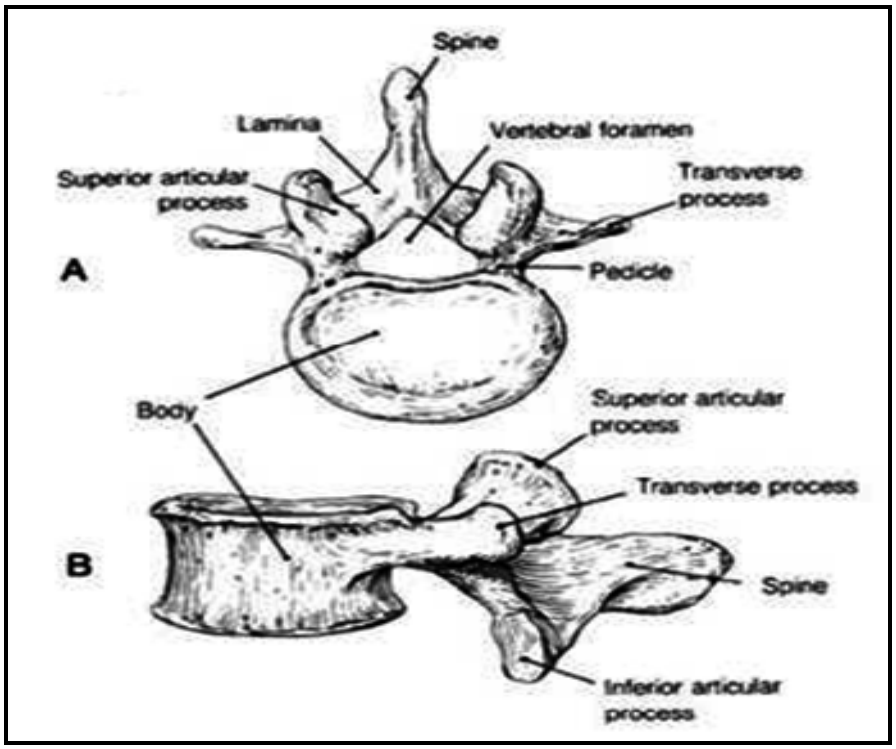

Figure (2): Characteristics of lumbar vertebrae.[11]

The arch encloses the vertebral foramen, which helps to form a canal in which the spinal cord is housed. Protruding from the posterior extreme of each neural arch is a spinous process and extending from the lateral edges of each arch are transverse processes. The neural arch of each vertebra is divided into component parts by these processes; the laminae and the pedicles. At the point where the laminae and pedicles meet, each vertebra contains two superior articular facets and two inferior articular facets. The former pair of facets forms synovial articulations, with the two inferior articular facets of the vertebra immediately above forming the intervertebral foramen, through which spinal nerves pass.[11]