Different Anesthetic Techniques for Knee Arthroscopic Surgeries

An Essay

Submitted in Partial Fulfillment of the Master's

Degree in Anesthesia

By

Amr Saeed Hassan El-kholy

M.B., B.Ch.

Supervised by

Prof. Dr. Mohamed Saeed Abd El-aziz

Professor of Anesthesia and Intensive Care

Faculty of Medicine – Ain Shams University

Prof. Dr. Sameh Michel Hakim

Professor of Anesthesia and Intensive Care

Faculty of Medicine – Ain Shams University

Dr. Rasha Gamal Abu Sinna

Lecturer in Anesthesia and Intensive Care

Faculty of Medicine – Ain Shams University

Ain Shams University

Faculty of Medicine

٢٠١٢

بسم الله الرحمن الرحيم

" و ما توفيقى إلا بالله عليه توكلت وإليه أنيب"

صدق الله العظيم

(سورة هود ، آيه ٨٨)

Acknowledgments

First and foremost, thanks and praise Allah most gracious, most merciful

Words stand short when coming to express my deepest gratitude and greatest thanks to ***Prof. Dr. Mohamed Saeed Abd El-Aziz*** *Professor of Anaesthesia and Intensive care, Faculty of medicine, Ain Shams Univeristy, for his constant encouragement, constructive guidance and unlimited support all through my career. Working under his supervision is a real privilege. To him I feel indeed grateful.*

I am also greatly indebted to ***Prof. Dr. Sameh Michel Hakim*** *Professor of Anesthesia and Intensive care, Faculty of medicine, Ain Shams Univeristy, for his supervision, sincere help and continuing encouragement throughout the whole work.*

I would like to direct my special thanks to ***Dr.Rasha Gamal Abu Sinna*** *Lecturer of Anaesthesia and Intensive care, Faculty of medicine, Ain Shams Univeristy, for her irrvaluable help, fruitful advice, continuous support offered to me and guidance step by step till this essay finished.*

To my beloved family, I will always eternally indebted, for their continuous encouragement and infinite tolerant support.

Amr Saeed

List of Contents

List of Abbreviations

ACL: Anterior Cruciate Ligament

ASIS: Anterior Superior Iliac Spine

CI: Cardiac Index

CSF: Cerebrospinal Fluid

DVT: Deep Venous Thrombosis

LCL: Lateral Collateral Ligament

MAC: Monitored Anesthesia Care

MAP: Mean Arterial Blood Pressure

MCL: Medial Collateral Ligament

NSAID: Non Steroidal Anti Inflammatory Drugs

PACU: Post Anesthesia Care Unit

PCA: Patient Controlled Analgesia

PCL: Posterior Cruciate Ligament

PDPH: Post Dural Puncture Headache

PE: Pulmonary Embolism

PONV: Postoperative Nausea and Vomiting

PSIS: Posterior Superior Iliac Spine

SVRI: Systemic Vascular Resistance Index

TIVA: Total Intravenous Anesthesia

List of Figures

Introduction

The optimal anesthetic technique in knee arthroscopic surgeries would provide excellent operating conditions, rapid recovery, no postoperative side effects, high degree of patient satisfaction and early home discharge. In addition, it should improve the quality of care and decrease the costs of anesthetic services. General anesthesia, regional anesthesia and local anesthesia are all commonly used for arthroscopic knee surgeries; however, opinions differ as to the best anesthetic technique for these surgical procedures **(White, ٢٠٠١)**.

General anesthesia has been the standard anesthetic utilized in knee surgery and the benchmark by which all other techniques are measured. Although general anesthesia is remarkably safe, effective and often the best choice in many clinical situations, there are several disadvantages to employing it in the ambulatory surgery environment. For instance, post-operative nausea and vomiting (PONV) is a recognized complication of general anesthesia. When compared to regional blocks, PONV occurs significantly more frequently in general anesthesia patients. Post-operative pain is another frequent complication **(Buckenmaier, ٢٠٠٢).**

Regional anesthetic techniques treat surgical pain by attenuating the transmission of painful stimuli from the surgical site to the central nervous system. Clinical studies have also demonstrated improved recovery and rehabilitation following knee surgery with regional anesthesia. Other advantages of regional anesthesia compared to general anesthesia include reduced surgical stress response, improved immune functions and respiratory dynamics

and reduced thromboembolic complications **(Greengrass, ٢٠٠٠; Klein et al., ٢٠٠١).**

Local intra-articular knee anesthesia is an ideal technique for knee arthroscopy because it is simple and bears low levels of morbidity. It reduces pain and analgesic consumption allowing early rehabilitation with shorter hospital stay and reduction of costs. However, there are situations in which it is preferable to use general or regional anesthesia, as in the case of children, patients with psychiatric disorders, non-cooperative or apprehensive patients and more extensive forms of surgery (**Regidor et al., ٢٠٠٧).**

Aim of the Work

The aim of this work is to review current literature on anesthetic techniques for knee arthroscopic surgeries and to outline advantages, disadvantages and clinical application of each technique.

Anatomy and Nerve Supply of the Knee Joint

The knee joint is our largest and most superficial joint (Fig.١). It is primarily a hinge type of synovial joint, allowing flexion and extension; however, the hinge movements are combined with gliding and rolling and with rotation about a vertical axis. Although the knee joint is well constructed, its function is commonly impaired when it is hyperextended (e.g., in body contact sports, such as ice hockey). Because the knee joint is involved in weightbearing, it has an efficient 'locking' mechanism to reduce the amount of muscle energy required to keep the joint extended when standing **(Agur et al., ٢٠١٠).**

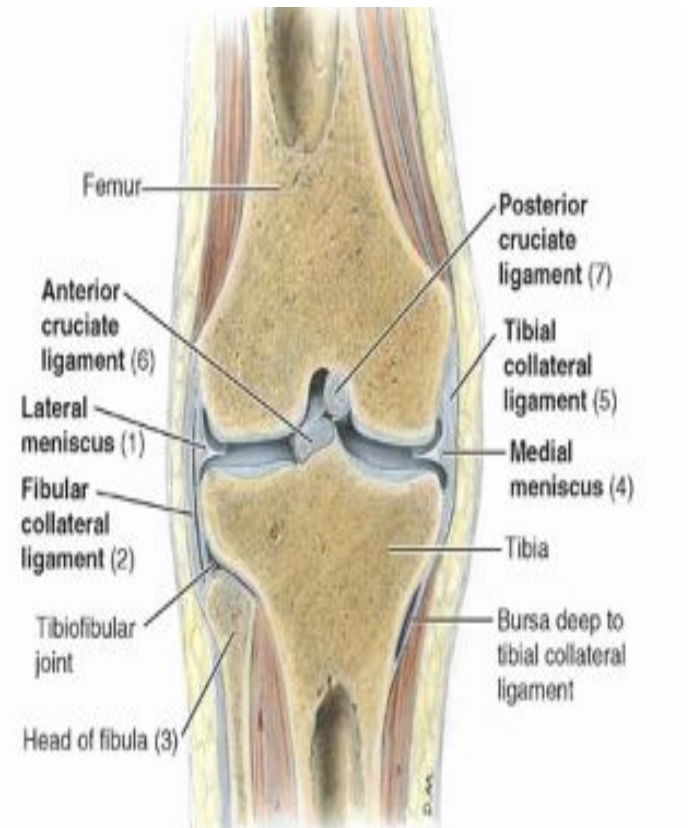

Fig.١ Coronal section of the knee joint. From Agur et al. (٢٠١٠).

The Articular bodies :

The articular bodies of the femur are its lateral and medial condyles. These diverge slightly distally and posteriorly, with the lateral condyle being wider in front than at the back while the medial condyle is of more constant width. The radius of the condyles' curvature in the sagittal plane becomes smaller toward the back. This diminishing radius produces a series of involute midpoints. The resulting series of transverse axes permit the sliding and rolling motion in the flexing knee while ensuring the collateral ligaments are sufficiently lax to permit the rotation associated with the curvature of the medial condyle about a vertical axis **(Platzer, ٢٠٠٤).**

The pair of tibial condyles are separated by the intercondylar eminence composed of a lateral and a medial tubercle. The patella is inserted into the thin anterior wall of the joint capsule. On its posterior surface is a lateral and a medial articular surface, both of which communicate with the patellar surface which unites the two femoral condyles on the anterior side of the bone's distal end **(Platzer, ٢٠٠٤).**

The Articular Capsule:

The articular capsule has a synovial and a fibrous membrane separated by fatty deposits. The two layers are adjacent on each side, but they part company centrally to accommodate intercondylar and infrapatellar structures that are intracapsular that is inside the fibrous layer but extra-articular that is excluded from the articular cavity by synovial membrane **(Drake et al., ٢٠٠٧).**

Anteriorly, the synovial membrane is attached on the margin of the cartilage both on the femur and the tibia, but on the femur, the

suprapatellar bursa (Fig.٢) or recess extends the joint space proximally. The articularis genu pulls the synovial membrane of the suprapatellar bursa superiorly during extension of the knee so that it will not be caught between the patella and femur within the knee joint. Behind, the synovial membrane is attached to the margins of the two femoral condyles which produce two extensions similar to the anterior recess. Between these two extensions, the synovial membrane passes in front of the two cruciate ligaments at the center of the joint, thus forming a pocket **(Agur and Dalley, ٢٠٠٩).**

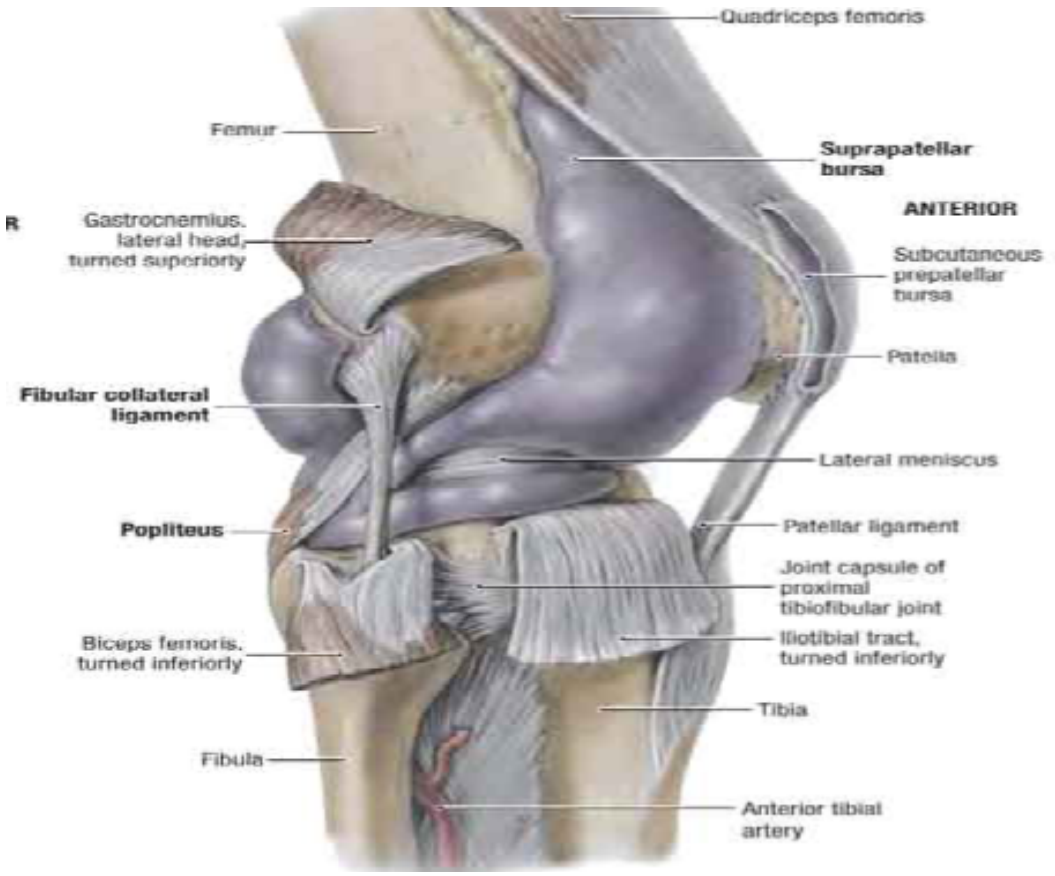

Fig.٢ lateral view of the knee joint. This figure shows the suprapatellar bursa. From Agur and Dalley (٢٠٠٩).